DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, U.S. ARMY GARRISON, FORT WAINWRIGHT

FINAL

FORT WAINWRIGHT
POST WIDE WORK PLAN

FORT WAINWRIGHT, ALASKA

MARCH 2011

U.S. Army Corps of Engineers, Alaska District
Environmental Remediation Services
Contract No. W911KB-06-D-0006
Task Order No. 20

Prepared by
Jacobs Engineering Group Inc.
4300 B Street, Suite 600
Anchorage, Alaska 99503

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
API	American Petroleum Institute
AST	aboveground storage tank
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	contaminant of potential concern
COR	contracting officer's representative
CPR	cardiopulmonary resuscitation
CQC	contractor quality control
CQCM	Contractor Quality Control Manager
DPW	Directorate of Public Works
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
EOD	explosive ordnance disposal
EPA	U.S. Environmental Protection Agency
EPP	Environmental Protection Plan
FSP	Field Sampling Plan
FWA	Fort Wainwright
GAC	granular-activated carbon
GPS	global positioning system
HAZCAT	hazard categorization
HAZWOPER	Hazardous Waste Operations and Emergency Response
IRA	Interim Removal Action
Jacobs	Jacobs Engineering Group Inc.
LEL	lower explosive limit
MEC	munitions and explosives of concern
OSHA	Occupational Safety and Health Association
POC	Point of Contact
PPE	personal protective equipment

ACRONYMS AND ABBREVIATIONS (Continued)

QAPP	Quality Assurance Project Plan
RA	remedial action
RI	remedial investigation
SCP	Stockpile Construction Plan
SI	site inspection
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SUXOS	Senior Unexploded Ordnance Supervisor
SWPPP	Storm Water Pollution Prevention Plan
TSDF	treatment, storage, and disposal facility
USACE	U.S. Army Corps of Engineers
USAED	U.S. Army Engineer District, Alaska
UST	underground storage tank
UXO	unexploded ordnance
WMP	Waste Management Plan
°F	degrees Fahrenheit

1.0 INTRODUCTION

This Work Plan will serve as a guide to environmental remediation activities to be performed at various sites throughout Fort Wainwright (FWA) near Fairbanks, Alaska (Figure 1-1). The purpose of this Work Plan is to integrate work at multiple sites within Fort Wainwright (FWA) into a flexible framework to allow activities to be arranged as necessary based on federal funding and scheduling constraints. The work described herein will be performed by Jacobs Engineering Group Inc. (Jacobs) for U.S. Army Engineer District, Alaska (USAED) under Environmental Remediation Services Contract No.W911KB-06-D-0006, Task Order Number 20, Fort Wainwright Environmental Support.

This Work Plan provides general overarching guidelines and appendices to be used as the basis for conducting environmental support work at all FWA sites. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) procedures will be followed at each specific site to determine the nature and extent of potential contamination or the extent of remedial action needed. These procedures include, but are not limited to, site inspection, remedial investigation, interim removal action, and remedial action activities. The most current U.S. Environmental Protection Agency (EPA) and Alaska Department of Environmental Conservation (ADEC) regulations and guidance criteria will be followed for all activities conducted at FWA sites. These regulations and guidance criteria will be reviewed annually and updated if necessary.

If any unexpected conditions arise, such as health or safety hazards or contaminants of special concern, this Work Plan and/or site-specific work plan addendums will be changed as necessary.

This Work Plan is divided into six sections:

- Section 1.0 discusses the organization of the Work Plan and presents information describing the environmental setting at Fort Wainwright.
- Section 2.0 discusses the data quality objectives (DQO) with details provided in the site-specific work plan addendums.
- Section 3.0 discusses project personnel qualifications and responsibilities.

- Section 4.0 discusses project execution and the technical approach for potential activities throughout FWA.
- Section 5.0 discusses project safety and refers to the Site Safety and Health Plan (Appendix A).
- Section 6.0 lists references cited within this report.

In addition to this Work Plan, the following appendices provide detailed safety, quality, and overall management plans and procedures that will be followed at all sites, unless otherwise specified in the site-specific work plan addendums:

- Appendix A Site Safety and Health Plan (SSHP)
- Appendix B Field Sampling Plan (FSP)
- Appendix C Quality Assurance Project Plan (QAPP)
- Appendix D Environmental Protection Plan (EPP) and Storm Water Pollution Prevention Plan (SWPPP)
- Appendix E Waste Management Plan (WMP)
- Appendix F Stockpile Construction Plan (SCP)
- Appendix G Geophysical Survey Plan
- Appendix H Munitions of Explosive Concern (MEC) Support Plan
- Appendix I Responses to Comments

A site-specific work plan addendum will be prepared for each site prior to beginning work. The site-specific work plan addendum will provide information specific to the site including analytes of concern, technical approach, as well as any planned deviations from this Work Plan.

1.1 SITE DESCRIPTION

All potential job sites are located on FWA, which occupies a 1,577,095-acre military installation along the western side of Fairbanks, Alaska. The main cantonment is 20,553 acres. FWA is located in interior Alaska approximately 350 miles north of Anchorage. Both the Parks and Richardson Highways provide transportation between Anchorage and the Fairbanks/FWA area. The Alaska Railroad and the Fairbanks International Airport also service this area (Figure 1-1). The FWA field office will be the operational headquarters,

staging, and storage area for all personnel and equipment. Personnel and equipment will be moved to and from each specific site as needed. The FWA field office is currently set up, so no mobilization is required. Demobilization from this field office is not expected to occur during the 2010 field season. Therefore, neither mobilization nor demobilization is discussed in this Work Plan.

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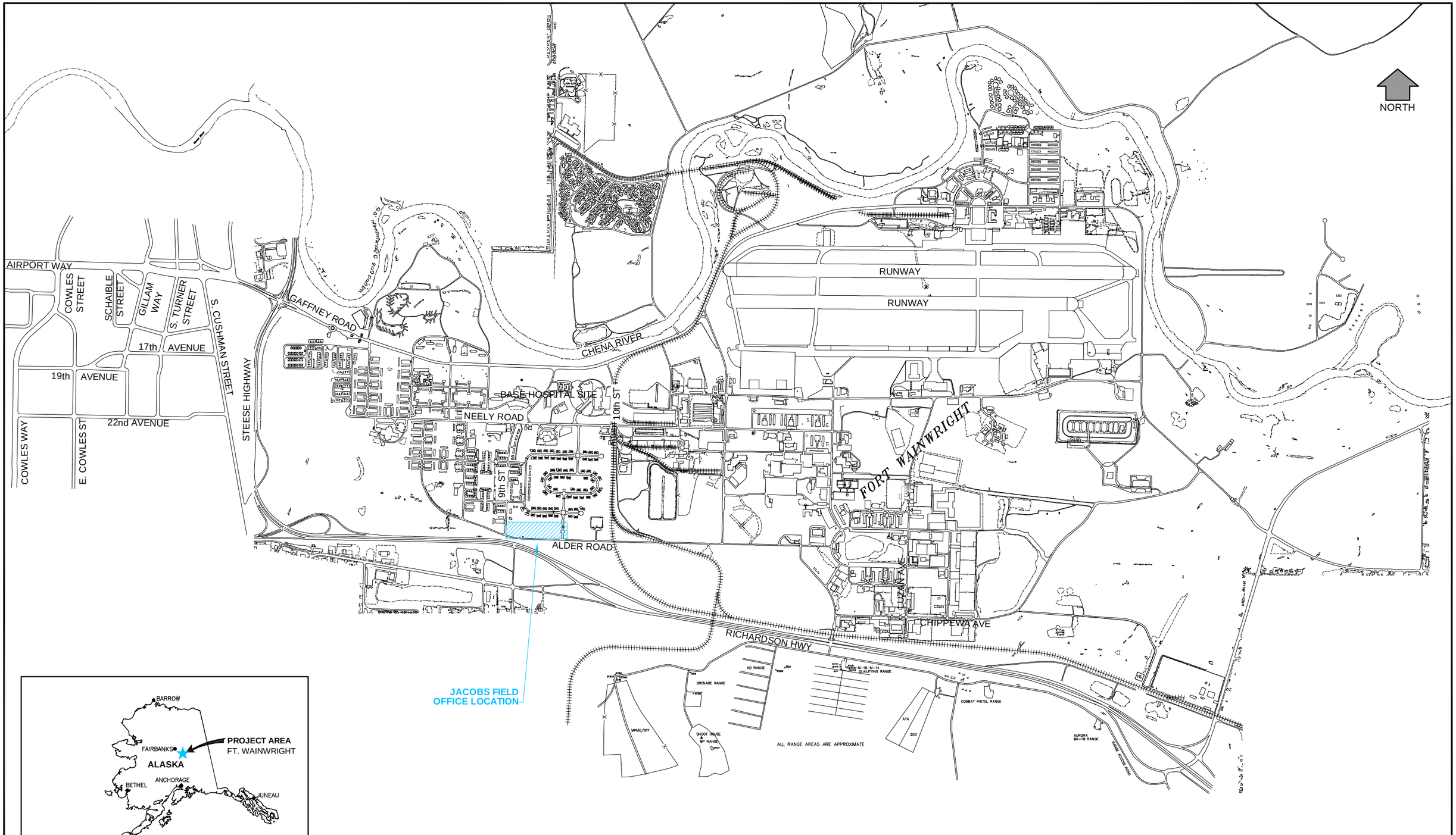

FT. WAINWRIGHT SITE VICINITY AND FIELD OFFICE LOCATION MAP

FORT WAINWRIGHT, FAIRBANKS, ALASKA

JACOBS	DATE: 10 January 2010	PROJECT MANAGER: S. Belway	FIGURE NO.: 1-1

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FWA is approximately 460 feet above sea level and the topography is level. FWA is located in the Tanana River Valley, a generally flat lowland area between the Yukon-Tanana Upland to the north and the Tanana-Kuskokwim lowland to the south. FWA is bounded to the north by Birch Hill and to the south by the Tanana River.

Soils at FWA consist of glacial outwash and fluvial deposits of gravel-sand and silt. FWA lies within the discontinuous permafrost zone of Alaska. Bedrock at FWA is anticipated to consist of granite and schist. The depth to bedrock within the FWA boundary varies from a few feet in upland areas to several hundred feet near the Tanana River. The area is underlain by as much as 15 feet of grey silt above sand and gravels deposited by the Tanana River. These river deposits are part of the pleistocene/holocene Chena Alluvium Formation. They are composed of well-stratified layers and lenses of unconsolidated sand and rounded river gravels (Pewe et al. 1976). Sedimentary facies in this deposit are typical of braided stream deposits in that they are both vertically and laterally discontinuous. At depths greater than 600 feet below ground surface (bgs), the Chena Alluvium Formation lies unconformably on bedrock (Claar and Lily 1999). In addition to the Chena Alluvium Formation, slough and swale deposits are also prominent at FWA. These isolated deposits are composed of fairly well sorted, stream-laid silt and silty sand (Pewe et al. 1976).

The climate at FWA is typical of interior Alaska, characterized by large diurnal and seasonal variation, low precipitation, and low humidity. Fairbanks has a variable climate with temperatures reaching as high as 96 degrees Fahrenheit (°F) in the summer and as low as −62°F in the winter. Fairbanks has a mean annual snowfall of 66.7 inches of snowfall and a mean annual precipitation of 10.49 inches (Western Regional Climate Center 2006).

1.2 HYDROGEOLOGY AND HYDROLOGY

Groundwater throughout the region exists with alluvial deposit (sands and gravels) as an unconfined aquifer. The depth to the water table is less than the depth to annual frost penetration, and frozen ground may form a seasonal confining layer. Groundwater is recharged to the alluvial plain aquifer via the Chena River, which runs in a westerly direction

though the center of FWA. Locally, shallow groundwater tends to flow towards the Chena River; however, groundwater direction is influenced by a variety of factors including frozen ground and historical sloughs of the Chena River. The gradient across FWA is generally shallow and conductivity is slow, although regional variations may exist. Drinking water aquifers are present within the area, and FWA uses water wells for some of its drinking water supply. Groundwater is generally encountered between 10 to 20 feet bgs.

Several small lakes, ponds, reservoirs, and cooling ponds are present at FWA. In some cases, these surface water bodies may be indirectly continuous with the groundwater (i.e. they may respond slowly to changes in groundwater height).

2.0 DATA QUALITY OBJECTIVES

All projects under this Work Plan will follow the CERCLA response and cleanup procedures, as appropriate. The CERCLA steps include site inspection (SI), remedial investigation (RI), interim removal action (IRA), and remedial action (RA).

Data quality objectives (DQOs) that may apply to new or continuing project work at FWA during the 2010 field season will be listed in the site-specific work plan addendums. The site-specific DQO tables will be used as a decision guide for procedures of collecting, analyzing, and evaluating data to ensure overall project objectives are met. The DQO tables will provide a full list of contaminants of potential concern (COPC) for the specific site. Appropriate site-specific COPCs will be based on site history and knowledge.

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3.0 PERSONNEL QUALIFICATIONS AND RESPONSIBILITIES

This section describes key site personnel and the order in which people will be informed of new developments or changes at sites.

The Site Manager is responsible for overseeing all onsite employees and activities, and for ensuring and verifying that all employee conduct and all site activities are in accordance with this Work Plan and all applicable federal and state regulations.

The Site Safety and Health Officer (SSHO) will oversee all field activities and ensure that each activity is performed in a safe manner following Occupational Safety and Health Administration (OSHA) and industry guidelines. The SSHO reports directly to the Site Manager.

The Contractor Quality Control Manager (CQCM) ensures that all quality standards are met or exceeded. The CQCM is responsible for providing the Site Manager with daily contractor quality control (CQC) reports detailing each day's activities, quantities, etc.

The Project Chemist both supports and monitors performance of the sampling team and the analytical laboratory. The Project Chemist ensures that DQOs are met through proper sample collection, preservation, and packaging methods. The Project Chemist is responsible for reporting chain-of-custody and laboratory performance information, receiving, checking, archiving, and retrieving laboratory data, coordinating sample shipment and transportation, and providing the Field Sampler(s) and the Project Manager with timely reporting of sample shipping and laboratory analytical data.

The Senior Unexploded Ordnance Supervisor (SUXOS) is responsible for supervising the unexploded ordnance (UXO) team and will have authority in all UXO-related matters unless U.S. Army or Air Force explosive ordnance disposal (EOD) personnel are onsite, in which case EOD personnel would have final authority. Upon being contacted, the SUXOS will report to any site where munitions and explosives of concern (MEC) have possibly been identified, and if any MEC are found.

The Field Sampler is responsible for guiding site investigations and excavations, collecting samples, completing appropriate documentation, submitting samples to the laboratory, and reviewing analytical results. The Field Sampler is also responsible for implementation of the FSP (Appendix B) and coordination of QAPP (Appendix C) requirements that affect the laboratory and field programs. The Field Sampler will report to the Site Manager while working onsite and to the Project Chemist regarding the FSP. The Field Sampler will meet ADEC requirements for a Qualified Person as defined by Alaska Administrative Code (AAC), Title 18, Section 75.990(100) (ADEC 2008).

Table 3-1 identifies the site-specific project personnel, including the client and customer project team members. Table 3-2 identifies potential events at the sites and the proper routes of communication.

Table 3-1
Identification of Key Project Personnel

Name	Role	Contact Numbers	Designated Backup	Contact Numbers
Gene Clare	DPW Restoration Program Manager	907-361-9689 907-687-6334 (cell)	Dave Beistel	907-361-7724
Dave Beistel	DPW Restoration Program Manager	907-361-7724	Gene Clare	907-361-9689
Joe Malen	Fort Wainwright DPW Point of Contact	907-388-7518 (cell) 907-361-4512	Rielle Markey	907-353-6160
Bob Gray	DPW Waste Specialist (DRMO)	907-361-9949	-	-
Robert Brock	USAED Project Manager/COR	907-753-5612 907-250-1144 (cell)	Meseret Ghebresllassie	907-753-2881
Terry Heikkila, PE	Jacobs Program Manager	907-751-3312 907-227-3466 (cell)	Sarah Belway PM	907 382 2569 (cell)
Sarah Belway, PE	Jacobs Project Manager,	907-356-1280 907-382-2569 (cell)	Dave Frandsen	865-621-1632 (cell)
TBD	SSHO		TBD	

Table 3-1
Identification of Key Project Personnel (Continued)

Name	Role	Contact Numbers	Designated Backup	Contact Numbers
TBD	Site Manager		TBD	
Mike Koerner	SUXOS	907-356-1280	Scott Roberts	907-356-1280
Jess Young	CQC	907-751-3328	TBD	TBD
Kari Hagen	Jacobs Project Chemist	907-451-0550	Angela Elmore	907-751-3414
Mike Utley	USAED Project Chemist	907-753-2691	Sean Benjamin	907-753-5514
Jacques Gusmano	EPA, Region X, Remedial Project Manager	907-271-5083	-	-
Debra Caillouet	ADEC Project Manager	907-269-0298	-	-
Paul Lhotka	ADEC Spill Prevention and Response *In case of an actual spill, the Spill Response Hot Line will be called*	907-451-2175 907-451-2121	Outside Normal Business Hours	1-800-478-9300

Note: For definitions, see the Acronyms and Abbreviations section.

USAED and Directorate of Public Works (DPW) will immediately be informed of new developments (i.e., discovered contamination or MEC) and potential changes to the Work Plan or site-specific work plan addendum.

Table 3-2
Anticipated Events

Event	Required Notifications	Responsible Party	Minimum Information Required for Notification
Waste ready for pickup	DRMO (Gray)	Jacobs (Belway)	Type of waste, quantity of waste, and characterization results
MEC discovery	Jacobs (Frandsen)	Jacobs (SUXOS/	Type, quantity and location of

Table 3-2
Anticipated Events (Continued)

Event	Required Notifications	Responsible Party	Minimum Information Required for Notification
	DPW (Malen)	UXO technicians)	MEC encountered
	EOD	DPW (Malen)	Type, quantity and location of MEC encountered
	USAED (Brock)	Jacobs (Frandsen)	Type, quantity and location of MEC encountered
Sample results	USAED (Brock) USAED (Utley)	Jacobs (Belway)	Summary of preliminary results and sample locations
	DPW (Malen)	USAED (Brock)	Summary of preliminary results and sample locations
Newly discovered contamination	USAED (Brock) USAED (Utley)	Jacobs (Belway)	Estimated type, quantity or extent, and location
	DPW (Malen)	USAED (Brock)	Estimated type, quantity or extent, and location

Note: For definitions, see the Acronyms and Abbreviations section.

3.1 CERTIFICATES

Field personnel shall hold current required certifications for their job responsibilities or classification. All employees shall have a minimum of the following certificates:

- Current 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training
- Current 8-hour HAZWOPER refresher course
- Proof of enrollment in a medical monitoring program
- Valid government-approved operator's license and proof of insurance for all motorized vehicles and operating equipment
- Current first aid/cardiopulmonary resuscitation (CPR)/blood-borne pathogen certifications

4.0 PROJECT EXECUTION AND TECHNICAL APPROACH

All activities listed in this section have previously been conducted at FWA, and are likely to be conducted again in 2010. The technical approach for any activity not listed in this document and needed to complete site work will be provided in the appropriate site-specific work plan addendums.

The CERCLA process includes several phases. Table 4-3 presents the activities that may be included for each phase. This work plan and the appendices attached describe these activities in further detail. Any other information will be included in the site-specific work plan addendums.

Table 4-3 Proposed Activities for Each Potential CERCLA Phase

Phases	Activities														
	Site Security	Utility Clearance	Site Survey	Geophysical Survey	MEC Investigation	UST/AST Removal and Decommissioning	Test Pit Investigation for Anomalies	Excavation and Waste Characterization	Soil Boring	Well Installation and GW Monitoring	Sampling	Stockpile Construction	Waste Management	Backfilling	Site Restoration
Site Inspection	X		X	X							X		X		
Remedial Investigation	X	X	X	X	X		X		X	X	X	X	X	X	X
Remedial Action/ Interim Removal Action	X	X	X			X		X			X	X	X	X	X

4.1 SITE SECURITY AND UTILITY CLEARANCE

Site security and utility clearance issues are addressed in the SSHP (Appendix A). Site-specific details will also be addressed in the site-specific work plan addendum.

4.2 SITE SURVEY

A site survey will be conducted to document relevant site features including test pits and/or excavation dimensions, known or potential munitions of explosive concern (MEC) locations, and stockpile locations, as necessary. Depending on the type of location being surveyed, a variety of survey equipment may be used. Handheld global positioning systems (GPS) may be appropriate for general locations, however real time kinematic-grade GPS equipment is generally more appropriate to document sample locations and during geophysical surveys for increased accuracy.

Quality checks will be completed on the survey points and referenced on existing geographic information system site maps where available, to ensure collected data are reproducible. In the absence of National Geodetic Survey control points or Continuously Operating Reference Stations near the work area, a control point may be established in accordance with the U.S. Army Corps of Engineers (USACE) *NAVSTAR Surveying Manual* (USACE 2003). All data will be collected in Universal Transverse Mercator Zone 6N, World Geodetic System 1984. The vertical reference will be North American Vertical Datum 1988. Data will be collected in meters.

GPS will be used to reacquire positions of drums and incidental metallic debris identified during the geophysical survey. Site-specific survey data will be submitted as an appendix to the final reports.

4.3 GEOPHYSICAL SURVEY AND MEC INVESTIGATION

Detailed information regarding geophysical survey activities is provided in Appendix G. MEC investigation activities described in Appendix H. Any deviations from these plans will be addressed in the site-specific work plan addendum.

4.4 UST/AST REMOVAL AND DECOMMISSIONING

This section describes the processes that will occur if an underground storage tank (UST) or aboveground storage tank (AST) is found. A certified UST specialist will oversee all UST/AST decommissioning/closure activities.

4.4.1 Draining of Underground Storage Tanks and Pipeline

Overlying soil will be carefully removed to reveal the top of the UST or any fill ports, return lines, or vents. The fill port or other openings will be exposed to the atmosphere and vented to release potential flammable or toxic vapors. Once the tank has been uncovered and the ports are exposed, any fuel and/or water will be measured in the tank. The tanks will be vented to atmosphere and any explosion hazard will be eliminated by grounding and bonding all pumps and equipment used to transfer the liquid to prevent static electricity buildup. The liquid will be pumped and transferred to 55-gallon drums or other containers appropriate for transport if the quantity is less than 300 gallons.

If the quantity is greater than 300 gallons, the fuel layer will be pumped off and containerized and the water layer will be treated onsite using a granular-activated carbon (GAC) treatment system. Rinsate water produced from cleaning the tanks will also be run through the GAC system. The first 300 gallons of treated water will be containerized and sampled prior to surface discharge. After the analytical results indicate that the system is meeting applicable standards, the treated water will be discharged to the ground in a manner to prevent erosion and direct discharge to a water body. Each day that the system is in operation, visual inspection and field screenings will be conducted to verify that the treatment system is still in compliance. Field parameters will be based on initial sample results of tank contents. Prior to

demobilization, the GAC will be sampled for COPC to ensure proper waste characterization and disposal.

Piping associated with the UST or AST will be tested for the presence of any fuel. Adequate spill containment in the form of a containment berm or absorbent pads will be provided during this process. Should any fuel remain within the piping, it will be containerized for transport and disposal.

After pumping all water and fuel from the UST and/or pipeline, a lower explosive limit (LEL) reading will be collected. If concentrations are less than 1-percent sustained, the tank and pipeline will be considered safe for removal. If a flammable atmosphere exists, the vapors will be ventilated using clean air from blowers or using carbon dioxide to displace the explosive vapors from the tank. All blowers or gas injection equipment will be grounded and bonded to prevent static electricity buildup. After stabilization, the atmosphere will be tested again for LEL.

4.4.2 Removal and Cleaning of Tanks and Pipeline

After the UST or AST has been stabilized and no flammable atmosphere is present, soil will be excavated from around the tank so that the tank can be safely removed. After soil excavation is complete, the LEL of the tank atmosphere will be measured and recorded. If safe for removal (i.e., less than 1 percent sustained), piping will be cut with nonsparking tools. The ends of the UST will be cut off using an oxy-acetylene torch, and residual sludge will be scraped out of the UST into a container approved for transportation. The tank will be cleaned within the excavation area if conditions allow, according to American Petroleum Institute's (API) recommended practices (API 1996). Cleaning will occur within a designated area to contain any contaminated water generated during the cleaning process. During the tank-cleaning process, adequate secondary containment and absorbent pads will be provided under any likely source of spillage. The cleaned tank will be cut into shippable pieces and transported to C&R Pipe and Steel, a smelting/recycling center in Fairbanks. All open excavations will be shored, secured, and clearly marked.

4.4.3 Excavation of Petroleum-Contaminated Soil

Following tank removal, characterization samples will be collected from any stained areas or areas most likely to have been contaminated (i.e. downgradient from fill ports) in accordance with the FSP (Appendix B). If initial sampling indicates that contaminated soil is present, a general characterization of the soil will be conducted. Once contaminated soil volumes and concentrations have been estimated, a management decision will be made as to the best approach to mitigate risks associated with contaminated soil.

Overburden excavated during UST and pipeline removal activities will be placed in a suspected-clean soil pile. Clean overburden soil will be stockpiled on a liner and used for backfilling purposes. The overburden will be sampled to confirm that is clean per 18 AAC 78 (ADEC 2006). Where applicable, procedures outlined in Section 4.5 (Test Pit Investigations, Excavations, and Waste Characterization) will also be followed.

4.4.4 Confirmation Sampling

Field screening will be used to guide the excavation. Field screening procedures are discussed in the FSP (Appendix B). Once field screening indicates that contaminated soil no longer remains on site, confirmation samples will be collected from the excavation areas where gross contamination was indicated. Samples will be collected in accordance with the site-specific work plan addendum and the FSP (Appendix B).

Soil samples will not be collected from below the groundwater table unless specified in the site-specific work plan addendum. In those cases, soil samples will be collected from the floor of the excavation unless a significant layer of free product is present on the water table. If free product is present, soil samples will be collected from the sidewalls above the groundwater interface.

Soil samples will be collected and submitted to an approved laboratory for the COPCs identified in the site-specific work plan addendum and based on the product that was stored in the tank.

All samples collected will be analyzed in accordance with the FSP (Appendix B) and the QAPP (Appendix C). Following completion of excavation and receipt of acceptable sample results, the site will be backfilled and restored, as described in Sections 4.10 and 4.11.

4.5 TEST PIT INVESTIGATIONS, EXCAVATIONS, AND WASTE CHARACTERIZATION

The general overall objective for all excavations at Fort Wainwright will be to investigate and/or remove underground hazards that could potentially contaminate soil and groundwater. The following procedures apply to all excavations at FWA:

- Excavation size may be limited by groundwater or onsite structures. Excavation will not continue below the groundwater table except for removal of debris (e.g., drums) that is visible above the water table, or if it is specified in the site-specific work plan addendum. If required, excavation in close proximity to structures will only occur where there is evidence of MEC or contamination, and after evaluation by a structural engineer.
- Should MEC or suspected MEC be encountered then all work will stop until a UXO technician evaluates the item. All practices and procedures from the MEC Plan (Appendix H) will be followed before work continues. In accordance with Army guidance, excavation areas where only MEC or ordnance is of concern (i.e., where no drums or other containers or debris that may indicate the presence of hazardous materials or waste are present) the MEC Plan (Appendix H) will be followed.
- For excavations where MEC is a COPC, a UXO Technician will perform a handheld magnetometer sweep of the bottom of all excavations when drums, ordnance, or other COPC are not visible to ensure there are no other hazardous items present in the area that may require removal. An EM-61 survey or similar may be performed upon completion of excavations.
- Field screening techniques may be employed to determine sampling locations and guide excavations. The appropriate field screening technique will be identified in the site-specific work plan addendum. Potential field screening techniques are described in the FSP (Appendix B).
- Soil will be excavated from areas of identified debris or contamination. Clean overburden will be segregated and stockpiled separately from contaminated soil near the excavation. Contaminated soil in stockpiles will be sampled as soon as practicable and will remain covered during project activities.

Should drums be encountered within the excavation, the following procedures will be followed:

- If a drum is confirmed to be empty and has been inspected to be free of dirt, gross contamination, or deleterious material; it will then be moved to the waste staging area. Drums with noticeable residual contamination will be triple-rinsed prior to disposal. All wastewater generated during rinsing will be containerized and characterized for disposal.
- An intact drum or drums containing liquid, sludge, crystalline substance, powders, etc., will be considered potentially hazardous material and flagged for further investigation. Flagged drums will be carefully moved into a position where they can be opened and sampled in a designated staging area. Caution will be taken to minimize compromising the integrity of the drums. Duck ponds or catchment liners will be placed under the drum to provide additional spill protection. Overpacks will be used to contain leaking drums. Spill response kits will also be available at each work area.
- The contents of drums will be characterized using hazard categorization (HAZCAT) procedures (Appendix B, Attachment B-3) and will be sampled by personnel in Level B personal protective equipment (PPE) (Appendix A). The level of PPE will not be reduced until the contents of the drum are adequately identified for safe handling. Drums will be segregated into potential waste streams based on visual observations. Analytical samples will be collected from each stratum encountered in a drum in accordance with the FSP (Appendix B). Representative samples from each waste stream will be analyzed and further categorized.
- After the drums have been segregated, they will be placed into appropriate containers for transportation. Further detail is provided in the WMP (Appendix E). Temporary labels will be placed on waste packages listing suspected COPCs until analytical results are available.
- All overpacked or repackaged drums will be safely staged at the site. Once analytical results of the drum contents have been received, they will immediately be forwarded to DPW for waste profile generation. DPW has identified Mr. Bob Gray, DPW Hazardous Waste/ Hazardous Materials, Building 3489, Fort Wainwright, Alaska, (907) 361-9949, as the point of contact (POC) for turnover of all hazardous materials or potentially hazardous waste drums. As often as necessary, Jacobs will contact Mr. Gray to arrange the pickup of all hazardous waste/materials drums staged at the site.

There are three main types of excavations that will be conducted at FWA:

- Test pits
- Investigation of known contamination or anomalies
- Investigation of unknown contamination or anomalies

Test pits are generally dug to help localize, investigate, and characterize contamination or anomalies. Test pits are limited in size and are generally backfilled within the day that they are excavated. Where appropriate, samples will be taken from the test pit sidewalls and floor, as specified in the site-specific work plan addendum. Test pits may be used to help delineate the full extent of contamination or to give an initial indication of the type of conditions anticipated at a particular site. Test pit information may also be used to guide further investigation at a site and a test pit investigation may be extended into a more detailed investigation.

The second type of excavation will be for an area where the type of contamination is known. Evidence from previous investigations and historical evidence will be used to help delineate the extent of contamination prior to any excavation taking place. Information relating to types and concentrations of contaminants and historical use of the site will be among the information used to develop an excavation plan for the site. Where possible, contaminated soil will be excavated to the horizontal and vertical extent of contamination, and will not extend below groundwater unless otherwise specified in the site-specific work plan addendum. The contaminated soil will be either transported directly to an offsite treatment, storage, and disposal facility (TSDF) or stockpiled in accordance with Appendix F.

Field screening will guide the excavation and segregation of contaminated soil. The appropriate field screening technique will be determined based on the COPC and discussed in the site-specific work plan addendum. The excavation will continue until field screening indicates clean boundaries have been reached, at which point confirmation soil samples will be collected (Appendix B). Additional excavation may be required if COPCs are detected above their cleanup level. Cleanup levels for each COPC will be presented in the site-specific work plan addendums.

The third type of excavation that may be necessary is for that of unknown contamination or anomalies. Without previous investigations or historical information, field screening and onsite observations will be solely relied on to guide the excavation. Excavation and sampling

activities will proceed in accordance with the site-specific work plan addendum and this Post Wide Work Plan.

4.6 WELL INSTALLATION AND GROUNDWATER MONITORING

This information is provided in the FSP (Appendix B). Deviations from this plan will be provided in the site-specific work plan addendums.

4.7 SAMPLING AND SOIL BORING ACTIVITIES

Sampling and soil boring activities are detailed in the FSP (Appendix B). Sampling frequencies, COPCs, and further details will also be provided in the site-specific work plan addendums.

4.8 STOCKPILE CONSTRUCTION

In the event of extensive excavation, contaminated soils will be temporarily stockpiled until they can be disposed of either offsite or at the Fort Wainwright Landfill pending analytical results. The SCP (Appendix F) provides further detail.

4.9 WASTE MANAGEMENT

Any waste generated during the course of fieldwork will be managed, containerized, and transported according to State of Alaska and federal standards and regulations. Detailed information regarding waste management can be found in the WMP (Appendix E).

4.10 BACKFILLING

In the event that excavation is required, clean native soil (overburden removed from the excavation if appropriate) will be used to backfill the excavations. The fill material will be inspected to ensure that it is free of trash, debris, wood, ice, and other deleterious materials. The final grade shall match the preexisting grade.

Unclassified fill material will be placed in 1-foot lifts in the excavation and compacted with several passes of the heavy equipment at the site. If necessary, backfilling may be performed in sampled portions of the excavation while soil removal continues concurrently. After backfilling and grading, all equipment will undergo dry decontamination procedures to prevent dirt and debris from leaving the site. In excavation areas where utilities are encountered, backfilling activities will be performed in accordance with *Replacement Housing, Fort Wainwright,* Specification 02300, "Earthwork" (USAED 2004).

Backfill and borrow material shall be selected to meet site-specific requirements. Backfill material should be non-frost susceptible. Additional requirements may apply to backfilling around utilities. Sources of borrow material will be submitted for review and approval prior to use.

4.11 SITE RESTORATION

Following removal and any necessary backfilling activities, the surface of any excavations at the site shall be finished with tracked equipment to the approximate (and possibly original) grade and slope that does not allow ponding of water at excavated areas, channeling during times of high precipitation, and excessive erosion because of grade or compaction.

5.0 SAFETY

The SSHP (Appendix A) addresses general work activities. A site-specific activity hazard analysis will be completed for each site-specific definable feature of work, and the analysis will be reviewed by all site personnel. All site personnel will use the buddy system as defined in the SSHP (Appendix A). All MEC-specific health and safety requirements are outlined in the MEC Support Plan (Appendix H).

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6.0 REFERENCES

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APPENDIX A

Site Safety and Health Plan

FINAL

FORT WAINWRIGHT
POST WIDE WORK PLAN

APPENDIX A
Site Safety and Health Plan

FORT WAINWRIGHT, ALASKA

MARCH 2011

U.S. Army Corps of Engineers, Alaska District
Environmental Remediation Services
Contract No. W911KB-06-D-0006
Task Order No. 20

Prepared by
Jacobs Engineering Group Inc.
4300 B Street, Suite 600
Anchorage, Alaska 99503

FORT WAINWRIGHT POST WIDE WORK PLAN
APPROVAL, ACKNOWLEDGMENT, AND COMMITMENT

Providing for a safe work environment and protecting the health and safety of onsite workers and visitors is everyone's responsibility. This Site Safety and Health Plan addresses post-wide emergency preparedness, escape routes, safety risks, work conditions, and possible contaminants of concern. This plan will be followed by anyone associated with this job that is authorized by the Site Safety and Health Officer, Safety and Health Manager, or the Contractor Quality Control/Site Manager to enter the job site. Safety shall be everyone's responsibility.

Name	Date	Name	Date
Site Safety and Health Officer	5-19-11	Site Manager	5-19-11
Jacobs HSE Manager	5-20-11	CQC System Manager	
Project Manager	5.20-11		
			5-19-11
	5-19-11		5-19-11
	5-19-11		5-20-11
Trudy L. O'Kelley	5-19-11		

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Attachment A-6 Project-Specific Forms

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ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Government Industrial Hygienists
AFB	Air Force Base
AHA	Activity Hazard Analysis
ATV	all terrain vehicle
BTEX	benzene, toluene, ethylbenzene, and xylenes
CFR	Code of Federal Regulations
COPC	contaminants of potential concern
CQC	contractor quality control
dB	Decibel
DDT	dichlorodiphenyltrichloroethane
DPW	Directorate of Public Works
DRO	diesel-range organics
EOD	explosive ordnance disposal
FWA	Fort Wainwright, Alaska
GRO	gasoline-range organics
HSE	health, safety, and environment
HSEP	Health, Safety, and Environment Procedure
HSM	Health and Safety Manager
IDLH	immediately dangerous to life or health
Jacobs	Jacobs Engineering Group Inc.
LEL	lower explosive limit
mg/m^3	milligrams per cubic meter
MSDS	Material Safety Data Sheet
MEC	munitions and explosives of concern
NIOSH	National Institute of Occupational Safety and Health
OFR	Office of the Federal Register
OSHA	Occupational Safety and Health Administration
PADS	Physical Agent Data Sheet
PAH	polycyclic aromatic hydrocarbon
PEL	permissible exposure limit
PID	photoionization detector

ACRONYMS AND ABBREVIATIONS (Continued)

PM	Project Manager
POL	petroleum, oil, and lubricants
PPE	personal protective equipment
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RRO	residual-range organics
SCBA	self-contained breathing apparatus
SM	Site Manager
SOR	Safety Observation Report
SPA	Safe Plan of Action
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
STEL	short-term exposure limit
SVOC	semivolatile organic compounds
TLV	threshold limit value
TWA	time-weighted average
USACE	U.S. Army Corps of Engineers
USAED	U.S. Army Engineer District, Alaska
UXO	unexploded ordnance
VOC	volatile organic compounds
°F	degrees Fahrenheit

1.0 INTRODUCTION AND PURPOSE

This Site Safety and Health Plan (SSHP) is a requirement of the U.S. Army Engineer District, Alaska (USAED), under the Environmental Restoration Services contract. This SSHP will serve as the basis for safety and health procedures to be followed for all future field activities at Fort Wainwright, Alaska (FWA) sites. This document is applicable to Jacobs Engineering Group Inc. (Jacobs) personnel and all other individuals authorized to access controlled site areas in order to conduct fieldwork for the USAED. This plan complies with applicable sections of the Code of Federal Regulations (CFR), Title 29, Sections 1910.120 and 1926.65; Office of the Federal Register (OFR) *Hazardous Waste Operations and Emergency Response* (OFR 2005); and the U.S. Army Corps of Engineers (USACE) *Safety and Health Requirements Manual* EM 385-1-1 (USACE 2008).

This SSHP will discuss issues and procedures to be followed during fieldwork activities scheduled for fiscal year 2010. The work described herein will be performed by Jacobs for USAED under Environmental Restoration Services Contract No.W911KB-06-D-0006, Task Order Number 20 – Fort Wainwright Environmental Support. Figure 1-1 in the Work Plan shows most potential work site locations. Any sites not on this map will be specified in a site-specific work plan addendum.

This SSHP is organized as follows:

- Section 1.0 presents the introduction and purpose.
- Section 2.0 presents the project organization and responsibilities.
- Section 3.0 presents specific project information.
- Section 4.0 presents the Activity Hazard Analyses (AHA) and Safe Plans of Action (SPA).
- Section 5.0 presents Health, Safety, and Environmental Procedures (HSEP).
- Section 6.0 summarizes the Respiratory Protection Program.
- Section 7.0 presents the Air Monitoring Plan.
- Section 8.0 summarizes the Hazard Communication Program.
- Section 9.0 summarizes asbestos abatement procedures.

- Section 10.0 identifies personal protective equipment (PPE) and associated requirements.
- Section 11.0 presents site control.
- Section 12.0 summarizes elements related to inspections.
- Section 13.0 identifies emergency procedures.
- Section 14.0 summarizes orientation and training requirements.
- Section 15.0 lists required site postings.
- Section 16.0 contains the references for this report.

The following attachments support this SSHP:

- Attachment A-1 provides key personnel and contact information and a map showing health care facility locations and emergency routes.
- Attachment A-2 provides project-specific hazards and requirements.
- Attachment A-3 provides a site-specific respiratory protection plan
- Attachment A-4 provides the Fort Wainwright Hazard Communication Program.
- Attachment A-5 provides Jacobs' Health, Safety, and Environmental Procedures applicable to this Work Plan.
- Attachment A-6 provides forms specific to this Work Plan.

Before entering any site, all personnel shall be briefed to this SSHP and commit to follow applicable procedures by signing the *Site Project Safety and Health Agreement Sign-off Sheet* (Exhibit 1, Attachment A-6). A copy of this SSHP and referenced documents shall be made available to all personnel at the job site.

Safety and health are basic Jacobs values to be adhered to at all Jacobs job sites. Applicable Jacobs HSEPs are listed in Attachment A-5 and can be found on the attached CD. The site-specific planning approach to safety will be conducted using a three-tiered process as follows:

- HSEPs will be reviewed and applied as appropriate to develop AHAs for this project.
- AHAs will be developed and included in this SSHP. They will describe common hazards associated with work activities and the plan to mitigate these hazards. The AHAs will also identify appropriate changes in approach from the HSEPs. Each new site will complete an AHA for any additional site-specific hazards.

- The field crew will develop SPAs while onsite. The AHAs will be the primary reference for the SPAs, with site-specific conditions addressed. The SPAs will be treated as "living documents" and will be updated as necessary to account for changes in approach or conditions.

The Site Safety and Health Officer (SSHO) and the Health, Safety, and Environment (HSE) Manager will maintain copies of this SSHP. Copies will be made available at each site with each work crew, as approved by the SSHO. Modifications due to changing field conditions will require approval of individuals identified in Attachment A-1. Each supervisor, lead person, laborer, operator, and visitor will be held accountable for working safely and following procedures and guidance set forth in this SSHP.

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2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section identifies the project organization and personnel responsibilities for the management and implementation of this SSHP.

Safety is an essential part of every worker and line-management function. Safety is the responsibility of each person to ensure that project personnel comply with all safety-related rules and requirements. The assignments in Sections 2.1 to 2.6 have been established to assist with the maintenance of a safe project site.

2.1 BEYONDZERO^{SM}

At Jacobs we are dedicated to keeping our employees safe, healthy, and working toward bright futures. BeyondZero^{SM}, the name of our program to promote a culture of caring, moves far beyond efforts to have an Incident and Injury-Free® safety performance. It is something deeper, something embedded in our culture. Not many companies implement a true culture of caring where concern for employees' health, safety, and happiness extends outside the office walls, beyond the project site fence into our homes, our cars, and all the places we interact with family and fellow employees. The BeyondZero^{SM} culture of caring is about the safekeeping of our employees, their families, our clients, and our communities. Through our leadership in sustainability, we reinforce this culture in everything we do.

2.2 SITE MANAGEMENT HEALTH, SAFETY, AND ENVIRONMENT RESPONSIBILITIES

Site management shall:

- Understand Jacobs and USACE HSE policies and procedures, and this SSHP. Site management may, if the need arises, apply more stringent HSEP or work practices.
- Implement Jacobs BeyondZero^{SM} program.
- Effectively communicate and implement HSE policies and procedures and this SSHP.
- Provide the resources necessary to maintain a safe and healthful work environment and ensure implementation of HSE policies and procedures.

- Assign clear responsibilities that are necessary to achieve a safe and healthful work environment.
- Verify that subordinates and subcontractors are executing these responsibilities properly.
- Enforce HSEPs and issue disciplinary actions and/or contractual actions when required.
- Ensure that HSE deficiencies identified in audits and inspections are promptly corrected.
- Ensure that HSEP 21.3 (Travel to Remote and Difficult Locations) is followed when planning travel to job sites (Attachment A-5 on CD).

2.3 SITE SAFETY AND HEALTH OFFICER RESPONSIBILITIES

The SSHO reports, administratively, to the Site Manager (SM). The SSHO reports functionally to the Jacobs Alaska Operations HSE Manager. As a member of the site management staff, the SSHO shall:

- Support and advise site management in its duty to implement HSE policies and procedures.
- Ensure the adequacy of site SPAs.
- Assess the work to determine compliance with HSE policies and procedures, promptly communicating concerns and recommendations to the SM for action.
- Take immediate action on any imminent danger observed.
- Review and approve PPE, safety equipment, and first-aid supplies.
- Educate management and supervision in the application of HSE policies and procedures.
- Ensure HSE orientation of site employees and subcontractor personnel.
- Ensure prompt and adequate treatment for injured employees and subcontractor personnel.
- Ensure adequate investigation and analysis of accidents (injury and non-injury).
- Provide HSE information for the education of managers, supervisors, and employees concerning:
  - BeyondZero^{SM} program
  - Accident analysis (cause, trends, results, and corrective actions)
  - Analysis of inspection results and needed corrective actions
  - Safe work procedures
  - HSE training requirements
- Communicate and promote HSE excellence recognition programs.
- Ensure preparation, submittal, and/or maintenance of required HSE recordkeeping documentation such as inspection reports, training records, AHAs/SPAs/Safety Observation Reports (SOR), injury logs, accident investigation reports, etc.

- Provide HSE evaluations of employees and supervisors to management as necessary.
- Lead by positive example.

2.4 EMPLOYEE RESPONSIBILITIES

Employee acceptance of the HSE procedures and policies is the ultimate key to success of the HSE program. Each Jacobs and subcontractor employee shall perform to the following responsibilities:

- Comply with procedures established for his/her safety and health and for preservation of the environment.
- Assist management and supervision in the positive development of coworker attitudes toward HSE and workplace morale including but not limited to implementation of the BeyondZero^{SM} program.
- Suggest improvements in methods or procedures that prevent incidents and protect the environment.
- Stop, or bring to management's attention, any unsafe acts or conditions and any potentially harmful environmental practices.
- Immediately correct imminent danger situations (e.g., exposure to falls from elevations, electrocution hazards, exposure to unprotected excavations, etc.).
- Notify supervisor when there is insufficient understanding of:
  - Task(s) to be performed
  - HSEPs
  - Assigned safety equipment
- Promptly report to supervisor incidents or accidents involving personnel or property, no matter how minor.
- Learn the approved HSE safe practices for each work task and put them into practice.
- Ask for assistance from the supervisor or the HSE department when unsure of a work task or its safe practice.
- Participate in and maintain an active interest in the HSE program.
- Be attentive to safety discussions led by the supervisor and request explanations of points not understood.
- Never bypass the function of a safety device.
- Immediately flag safety device malfunctions to warn others of the hazard, and promptly report the malfunction to your supervisor.

- Promptly report any potential work-related injury or illness to the supervisor, no matter how minor the injury.
- Never attempt to perform a job alone when good judgment indicates assistance is needed.
- Inspect, use, and maintain the PPE provided.
- Do not participate in clowning, scuffling, practical joking, or horseplay of any kind on the job. Running is prohibited.
- Be cautious in walking or moving around the work area to avoid slips, trips, or falls. Be especially cautious when weather conditions create a potentially slippery walking surface.
- Plan ahead and try to anticipate any potential hazards.
- Observe safe practices off the job as well as on the job.
- Participate in the development of SPAs.
- Participate in the SOR program.

2.5 SUBCONTRACTOR RESPONSIBILITIES

Subcontractors will perform the following specific duties:

- Follow the requirements set forth in this plan.
- Attend Supervising for Safety training at Jacobs prior to starting fieldwork.
- Attend site-specific orientation.
- Agree to abide by this SSHP by signing the sign-off sheet (Attachment A-6) before working onsite. This sign-off sheet will be retained by the SSHO.
- Provide the SSHO with copies of Material Safety Data Sheets (MSDS) and Physical Agent Data Sheets (PADS) for hazardous chemicals and physical exposures onsite.
- Provide the SSHO with copies of required training certifications and medical authorizations to work onsite, including those required by 29 CFR 1910.120(e) and (f) (OFR 2005).
- Develop SPAs that address specific hazards associated with tasks to be performed for each phase of work (e.g., underground utilities and approved roads), including developing and providing specific work procedures to Jacobs for review of potential hazards.
- Ensure workers are trained in safe and proper use of all tools they may use.
- Appoint an onsite Competent Safety Representative for each job site.
- Provide all necessary PPE to employees and ensure its proper use.
- Maintain all necessary records and submit required reports.
- Conduct daily safety briefings.

- Obtain all work permits as required.
- Conduct safety inspections on a daily basis, report discrepancies using the SOR form (Attachment A-6), and promptly correct unsafe conditions.
- Conduct regular inspections of equipment. Defective or unsafe equipment must be red-tagged and immediately taken out of service or repaired.
- Provide inspection documentation and corrective actions to the SSHO on a weekly basis.
- Actively participate in the Jacobs BeyondZero^{SM} program.
- Provide other subcontractor information and subcontractor safety performance requirements, as required.

The SM will inform the subcontractor foreman or leader of any safety and health violations. The SSHO, Contractor Quality Control (CQC) System Manager, or SM can halt subcontractor work under eminently dangerous conditions and resume work when the unsafe condition is corrected. Repeated violations could cause termination of the subcontract.

2.6 VISITOR RESPONSIBILITIES

Visitors entering a controlled area at the site will be responsible to:

- Provide the SSHO with copies of required training certifications and medical authorizations, as required by 29 CFR 1910.120 (e) and (f) (OFR 2005).
- Provide the SSHO with MSDS/PADS copies for any hazardous chemicals and / or physical exposures that the visitor may bring onsite.
- Comply with provisions of this SSHP.

Visitors must obtain clearance from the SSHO and sign in on the *Visitor Check-in Log* (Attachment A-6) before obtaining access to controlled areas. In most cases, visitor access will be limited to the support zone. Visitors will receive a job-specific safety briefing and will be escorted at all times in controlled areas. Visitors in areas requiring PPE must have the appropriate training and PPE in order to gain entry to the project site(s). Jacobs will not be responsible for distributing or obtaining PPE for visitors.

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3.0 PROJECT INFORMATION

This section briefly discusses planned or potential activities. Jacobs will perform this work for the USAED under the Environmental Remediation Services Contract W911KB-06-D-0006.

3.1 FORT WAINWRIGHT

FWA is an active U.S. Army installation occupying a 915,000-acre military reservation located east of Fairbanks, Alaska (Figure 1-1).

The potential work phases for the 2010 field season include the following activities:

- Site access control and site set up
- Utility clearance
- Site survey
- Geophysical survey
- Munitions and explosives of concern (MEC) investigation
- Excavation and waste characterization
- Soil boring
- Well installation and groundwater monitoring
- Sampling
- Stockpile construction
- Waste management
- Backfilling
- Site restoration

3.2 FORT WAINWRIGHT UNIQUE HAZARD ELEMENTS

3.2.1 Utilities

Utility lines, including electric, water, sewer, and any additional lines, may be present at any of the FWA sites. These features shall be located prior to commencing excavation. Precautions will be taken to avoid causing any damage to existing utilities.

Underground utilities exist throughout the FWA area. All active and abandoned lines will be located prior to and confirmed during the field activities. All utilities will be assumed live until proven otherwise. Field personnel will visually inspect the area upon arrival and contact the responsible parties to provide the necessary locates during the SI phase. In the event that excavation activities encounter unanticipated buried utilities, work will be discontinued, Doyon Utilities and the Directorate of Public Works (DPW) will be contacted, and the area photographed. If work can continue around a buried utility, the utility will first be de-energized, if required, and the excavation will continue by hand until the line(s) can be supported and excavation activities can continue. Table 3-4 provides a list of the potential utilities and responsible parties.

Table 3-1
Fort Wainwright Responsible Parties for Utility Locates and Clearance Activities

Utility Locate/Clearance	Company	Contact Number
Civilian telephone and cable	GCI	(907) 452-7191
Military telephone and cable	507th Signal Co.	(907) 353-0597
Alarm cables	Honeywell Building Solutions	(907) 451-8602
Military buried power, overhead power, steam/condensate, water, and sewer	Doyon Utilities	(907) 361-4512
Intertie between Fort Wainwright and the local power grid	Golden Valley Electric Association	(907) 452-1151

3.2.2 Contaminants of Potential Concern

Diesel-range organics (DRO); gasoline-range organics (GRO) including benzene, toluene, ethylbenzene, and xylenes (BTEX); pesticides (primarily dichlorodiphenyltrichloroethane [DDT]); polychlorinated biphenyls (PCB); residual-range organics (RRO); Resource Conservation and Recovery Act (RCRA) metals; semivolatile organic compounds (SVOC) including polycyclic aromatic hydrocarbons (PAH); volatile organic compounds (VOC); and asbestos were identified in previous investigations as the primary contaminants of potential

concern (COPC) associated with the FWA sites. Below are the COPCs that have been identified at FWA sites, as well as the routes of entry, and hazards associated with each:

DRO: Hazards associated with DRO are as follows:

- Combustible Acute: Inhalation of vapors from combustion may contribute to the occurrence of irregular heartbeat.
- Inhalation: Can cause light-headedness, vertigo, drowsiness, narcosis, headache and dizziness, unconsciousness, and death in extreme cases. Exposure to vapors can elevate carboxyhemoglobin level in the cardiovascular system.
- Eyes: Liquid/high vapor concentration can cause pain and irritation with slight corneal injury possible.
- Skin: Prolonged/repeated contact can cause irritation and dermatitis.
- Ingestion: Burning of throat and mouth
- Chronic: Cancer hazard, contains methylene chloride, which is listed as an animal lung carcinogen. Major chemicals which have permissible exposure limits (PEL) or threshold limit values (TLV) associated with the ingredients of DRO are:
  - Anthracene—Occupational Safety and Health Administration (OSHA) PEL: 0.2 milligrams per cubic meter (mg/ m3) time-weighted average (TWA) for coal tar pitch volatiles; American Conference of Government Industrial Hygienists (ACGIH) TLV: 0.2 mg/ m3 TWA
  - Naphthalene—OSHA PEL: 10 parts per million (ppm); 15 ppm short-term exposure limit (STEL) ACGIH TLV: 10 ppm; 15 ppm STEL
  - Diesel fuel as total hydrocarbons—ACGIH TLV 100 ppm

GRO: Hazards associated with GRO are as follows:

- Exposure Routes: Inhalation, skin absorption, ingestion, skin and/or eye contact
- Symptoms: Irritation to eyes, skin, and mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration of a liquid); possible liver and kidney damage (potential occupational carcinogen)
- Target Organs: Eyes, skin, respiratory system, central nervous system, liver, kidneys
- Major chemicals included as part of GRO are:
  - Benzene—OSHA PEL: 1 ppm; ACGIH TLV: 0.5 ppm; carcinogen
  - Ethylbenzene—OSHA PEL: 100 ppm; ACGIH TLV: 100 ppm/125 STEL
  - Toluene—OSHA PEL: 200 ppm; ACGIH TLV: 50 ppm
  - Xylenes—OSHA PEL: 100 ppm; ACGIH TLV: 100 ppm/150 STEL

BTEX: Hazards associated with BTEX are as follows:

- Exposure Routes: Inhalation, ingestion, absorption
- Symptoms: Conjunctival irritation, nose and throat discomfort, headache, allergic skin reaction, dyspnea, declines in serum cholinesterase levels, nausea, emesis, epistaxis, fatigue, dizziness
- Target Organs: Liver, kidney, and central nervous system

Pesticides (DDT): Hazards associated with Pesticides (DDT) are as follows:

- Exposure Route: Inhalation, skin absorption, ingestion, skin and/or eye contact
- Symptoms: Irritation of eyes and skin; paresthesia of tongue, lips, and face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort); headache; lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; potential occupational carcinogen
- Target Organs: Eyes, skin, central nervous system, kidneys, liver, peripheral nervous system

PCBs: Hazards associated with PCBs are as follows:

- Exposure Limits: OSHA PEL TWA 1 mg/m^3 for Aroclor 1242; TWA 0.5 mg/m^3 for Aroclor 1254
- Exposure Routes: Ingestion, skin contact
- Symptoms: Eye irritation, gastrointestinal disturbances, and discoloration of nails, skin, etc. Vapors can cause severe eye inflammation and swelling of adjoining tissues. Exposure can cause liver damage, and overexposure can have delayed adverse health effects.
- Target Organs: Liver, kidney, heart, skin, and central nervous system. PCBs are probable human carcinogens.

RRO: Hazards associated with RRO are as follows:

- Exposure Routes: Inhalation, skin absorption, ingestion, skin and/or eye contact.
- Symptoms: Irritation to eyes, skin, and mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid); possible liver and kidney damage (potential occupational carcinogen).
- Target Organs: Eyes, skin, respiratory system, central nervous system, liver, kidneys.

RCRA Metals: Hazards associated with RCRA metals are as follows:

- Exposure Route: Ingestion, absorption
- Target Organs: Liver, kidney, heart, and central nervous system. Some RCRA metals are probable human carcinogens.

SVOCs: Hazards associated with SVOCs are as follows:

- Exposure Routes: Inhalation, ingestion, skin and/or eye contact.
- Symptoms: Irritation of eyes, nose, or throat; respiratory system sensitization, cough, pulmonary secretions, chest pain, or dyspnea (breathing difficulty); asthma, dermatitis, bronchitis.
- Target Organs: Eyes, respiratory system, respiratory system, skin, bladder, kidneys.

PAHs: SVOCs include the PAHs. Hazards associated with PAHs are as follows:

- Exposure Routes: Inhalation, ingestion, dermal contact.
- Symptoms: Injury to the liver and kidneys, skin damage.
- Target Organs: Liver, kidney, and central nervous system. PAHs are probable human carcinogens.

VOCs: Hazards associated with VOCs are as follows:

- Exposure Routes: Inhalation, ingestion, absorption.
- Symptoms: Conjunctival irritation, nose and throat discomfort, headache, allergic skin reaction, dyspnea, declines in serum cholinesterase levels, nausea, emesis, epistaxis, fatigue, dizziness.
- Target Organs: Damage to liver, kidney, and central nervous system.

Asbestos: Hazards associated with asbestos are as follows:

- Exposure limit: OSHA TWA 0.1 fiber per cubic centimeter
- Exposure routes: Ingestion, inhalation.
- Symptoms: Labored breathing.
- Target Organ: Lungs.

3.2.3 Drums with Unknown Contents

All intact unopened drums with unknown contents will be flagged for hazard categorization testing. Flagged drums will be carefully moved into a position where they can be opened and sampled. Drum sampling will be conducted by a three-person sampling team. Each member of this team will be trained for the specific Level B PPE that they will be using. Two of the three members of the field crew will don Level B PPE. The third member will be positioned upwind from the drums as far away as is practicable to observe the sampling and send for help, if needed.

The two members of the field crew in Level B will then sample each drum by performing the following actions:

- Open the drum using non-sparking tools.
- Take readings of the drum atmosphere using a four-gas meter and photoionization detector. If the results indicate that the atmosphere is not combustible, sampling may continue.
- Collect a sample of the drum contents and perform hazard categorization testing according to the Field Sampling Plan (Appendix B). If the results indicate that the drum contents are not hazardous, further drum sampling and management may continue at a lower level of protection.

3.2.4 Extreme Weather Site Work

Due to the constantly and rapidly changing weather in Alaska, personnel should be fully advised of the need to dress warmly and in layers with a waterproof and windproof outer shell. Adequate footwear is required. The need for adequate clothing shall be discussed at project-specific planning meetings, the preconstruction meeting, site safety orientations, and daily tailgate meetings.

For the purposes of this SSHP, temperatures below –20 degrees Fahrenheit (°F) will be referred to as extreme cold weather, and temperatures above 80°F will be referred to as extreme hot weather. Due to the location of FWA, site personnel should be prepared for both hot and cold temperatures as well as the effects of wind chill throughout the course of the fieldwork. Wind effects on skin and threshold temperatures should be taken into account when assigning work activities. The PADS on cold stress and heat stress (Attachment A-4) should be reviewed by site personnel prior to starting site work.

Field personnel wearing additional PPE during hazardous waste management activities may be susceptible to heat stress. Four environmental factors affect the amount of stress workers experience in hot work areas: temperature, humidity, sun (radiant heat), and wind. Additional stress levels are associated with age, weight, fitness, medical condition, and acclimation to heat. Symptoms of heat stress are heat rash (prickly heat), increased heart rate, loss of concentration, and irritability. These symptoms may lead to fainting or death. The following steps are recommended to reduce the risk of heat stress:

- Move to a cooler place.
- Reduce workload or pace.
- Rest in cool areas (may consider taking longer breaks and monitor stress).
- Wear lightweight clothing.
- Perform strenuous activities during hours when the sun is less intense or temperatures are cooler.
- Drink plenty of water (1 quart per person per hour).

3.2.5 Ambient Air Temperature Monitoring

When the ambient air temperature falls below 30°F or rises above 80°F, the SSHO will monitor the air temperature and provide work/rest regimens to the SM. Work/rest regimens will be based upon the guidelines in the ACGIH *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* (ACGIH 2010). Table A-3-1 presents information regarding wind chill, which supervisors should take into account when assigning duties and arranging a warm up schedule.

Table A-3-1
Cooling Power of Wind on Exposed Flesh Expressed as Equivalent Temperature (°F)

Wind Chill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

3.2.6 Munitions and Explosives of Concern

Due to the potential to encounter Munitions and Explosives of Concern (MEC) at the FWA project sites, all work will be conducted after the subsurface has been cleared by an unexploded ordnance (UXO) support team as described in the MEC Support Plan (Appendix H). The objective of the MEC-related work will be to allow for the safe execution of all phases of work at the site.

No explosive disposal operations will be performed by contractors. Operations related to explosives management, storage, transport, and disposal, including disposition of UXO, discarded military munitions, and munitions potentially presenting an explosive hazard are not part of the scope of this SSHP. The U.S. Army explosive ordnance disposal (EOD) team at FWA will provide support activities to safely dispose of UXO and/or perform venting and demilitarization, if necessary.

3.2.7 All-Terrain Vehicle Operations

All-terrain vehicles (ATV) will be a means of transportation at some FWA sites. All personnel operating ATVs shall receive applicable training and certification. Appropriate protection, including helmets, safety glasses, and gloves will be worn during the operation of ATVs. Only one person is to ride on an ATV at any given time.

3.2.8 Uneven Terrain

Some job sites may exist either on rocky, steep hillsides or on hummocky tundra landscape. Caution must be taken when traversing these areas by foot. The specifics of the terrain and the hazards presented by traversing the terrain should be considered when generating safe plans of action for specific sites and project tasks.

3.2.9 Wild Animals

At many FWA sites, site personnel are likely to encounter wild animals, such as moose, fox, and, possibly, brown and/or black bear. Prudence should be exercised in any potential animal encounter. Workers shall maintain a safe distance from wild animals encountered at the

project site. Workers should avoid surprising wild animals. Workers shall calmly contact the site safety manager (SM) and/or co-workers in the area *as soon as possible* if a bear is sighted on or near the project site. Workers shall be familiar with and follow the guidelines provided in Attachment A-5, *Working Safely Around Wild Animals* (HSEP 7.4, provided on CD) for encounters with wild animals.

For potential USAED job sites that may require self-defense, personnel will be provided with an air horn, pepper spray, and safety whistles. The functionality of these safety tools shall be checked periodically and replaced if used in an emergency. All personnel shall be trained in the proper and safe operation of the equipment. Pepper spray should be carried on the belt or on another readily accessible location.

3.2.10 Pinches, Cuts, and Scrapes

Employees shall inspect objects (e.g., equipment, tools, boxes, cut piping) for rotating parts, sharp points, edges, nails, and possible pinch points that could injure hands, arms, feet, legs, or body. The potential hazard shall be removed to the extent possible before handling the object. Work gloves shall be used to protect hands.

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4.0 ACTIVITY HAZARD ANALYSES AND SAFE PLANS OF ACTION

AHA/SPAs are required for all tasks. AHA/SPAs are used to define the activities to be performed, identify the hazards anticipated with each task, and identify the control measures, including resources to mitigate the hazards.

AHAs are developed during a project's planning stages and therefore may or may not depict actual site conditions (Attachment A-2). As personnel mobilize to the site and encounter actual site conditions, SPAs will be developed by the site crew and Jacobs field personnel to identify actual site conditions and hazards for the activity to verify that protective measures are in place to mitigate incidents. SPAs will also be developed by the site crew for activities not covered by an AHA.

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5.0 HEALTH AND SAFETY ENVIRONMENTAL PROCEDURES/ STANDARD OPERATING PROCEDURES

This SSHP is not intended to repeat or duplicate Jacobs Corporate HSEPs and Safe Operating Procedures, nor is this plan intended to duplicate U.S. Army or CFR requirements. In the case of conflict, the most stringent requirements shall apply.

This SSHP is intended as a personnel resource. This plan brings together site- and task-specific corporate procedures (including Jacobs' corporate HSEPs and Safe Operating Procedures) to create a concise and relevant document designed for usability by all members of the FWA project team.

Field personnel shall participate in a medical surveillance program. Specifics for the baseline, interim, and periodic physicals can be found in Attachment A-5, *Medical Monitoring Program for Environmental Project Work* (HSEP 4.1, provided on CD). Fieldworkers must provide documentation (e.g., a physician's letter) to the SSHO of their participation in the medical surveillance program and evidence that they are current. Workers with medical limitations, as well as employers of subcontract employees, are responsible for notifying the SM and the SSHO of said limitations so that work tasks will be appropriately assigned. For guidance, the SSHO may contact Jacobs' occupational medical consultant (Dr. Alexander Baskous 907-279-4953) in Alaska for issues such as chemical exposure, necessary medical testing, presence of onsite pesticides, and determining baseline cholinesterase levels.

Each Jacobs' employee is responsible for completing a monthly *Hazardous Material Exposure and Field Activity Report* form (Attachment A-6) and for notifying management if an incident or exposure occurs. The Jacobs Anchorage Safety and Health Office ensures distribution of blank forms to appropriate employees, collects the completed forms, and then forwards the completed forms to Jacobs Corporate Safety and Health Office in Denver for review and retention.

Subcontractors shall provide the SSHO with documentation of their employee's participation in a medical surveillance program, evidence they are current, and any medical restrictions before their employees are sent to a field project. Documentation will be retained on site.

Medical surveillance required for the use of PPE is specified in Attachment A-5, *Medical Monitoring Program for Environmental Project Work* (HSEP 4.1, provided on CD). In addition to the medical surveillance prescribed for hazardous-waste workers, each SSHP will identify any site-specific medical monitoring required.

6.0 RESPIRATORY PROTECTION PROGRAM

All employees will be provided protection from occupational exposure where potential hazards exist for dusts, fumes, mists, radionuclides, toxic gases, vapors, or oxygen deficiency. Where feasible, exposure to contaminants at concentrations presenting potential health hazards will be eliminated by engineering controls. When effective engineering controls are not feasible, use of personal respiratory protective equipment will be required to achieve this goal.

The Respiratory Protection Program (Attachment A-3) provides the minimum procedures to be followed when respiratory hazards are encountered. The intent of this program is to enhance the protection of worker health and prevent the inhalation of harmful airborne substances or oxygen-deficient atmospheres.

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7.0 AIR MONITORING PLAN

Under supervision of the SSHO, air monitoring will be conducted at each site where petroleum, oil, and lubricants (POL) or other contaminants are present. The air monitoring results will be documented on the *Air Monitoring Record Form* (Attachment A-6) or project logbooks. Monitoring of personnel's breathing zones as well as area monitoring will be conducted to verify the field team is using appropriate types and levels of PPE. The type and extent of monitoring conducted will depend upon the site-specific conditions and potential contaminants encountered at the site. The information contained in this section is provided as background reference to the participants in this project. Under the guidance of the SSHO, air monitoring will be implemented following the guidelines in this section. Section 10.0 of this SSHP provides general PPE recommendations. The AHAs contained in this plan specifically address the required PPE expected to be used at sites on FWA. Circumstances such as exceeding action levels established in the *Project-Specific Air Monitoring Requirements* table (Attachment A-6) or encountering drums with unknown contents will require an upgrade of PPE, to a minimum of protection Level B (Section 10.4.3), until conditions warrant a reduction in the level of PPE. The SSHO, with the assistance of trained field personnel, will identify these conditions and may require additional PPE.

Field crews will use the photoionization detector (PID) equipped with a 10.6 electron-volt lamp as the primary method of monitoring. This method is not considered complete but is the most readily available real-time indicator of organic vapors in the atmosphere. Prior to PID use on the job, background levels must be established by using the PID to monitor outside the exclusion zone and upwind of the site. The PID readings should be sustained for 1 minute to determine exposure. The highest reading during the one minute duration will be recorded in field logbooks or equivalent. Monitoring using a PID will be conducted at all sites.

A combustible gas (oxygen, carbon monoxide, and hydrogen sulfide) monitor will be used where work is conducted in excavations or in areas where these constituents can accumulate. This monitor will also be able to read and report lower explosive limits (LEL). When working with an explosion hazard, a PID will be used in conjunction with a multi-gas meter. An action level for combustible gas indicator readings will be set at one percent of the LEL; 0 percent

should be the goal as specified in Attachment A-5, *Confined Space Entry* (HSEP 7.2, provided on CD). Above 1-percent LEL, the work is considered "hot work" and requires special precautions. An oxygen level between 19.5 and 23.5 percent must be present, carbon monoxide levels must be maintained at or below the time-weighted average (TWA) of 10 ppm, and hydrogen sulfide levels must have a TWA of 5 ppm or less.

All instruments used onsite will be calibrated in accordance with the manufacturers' instruction manuals. All calibrations will be recorded in the *Health and Safety Calibration Log* (Attachment A-6).

8.0 HAZARD COMMUNICATION PROGRAM

The Hazard Communication Program has been established to inform workers and subcontractors of potential site-specific chemical hazards and to comply with the requirements of 29 CFR 1910 and USACE Safety and Health Manual 385-1-1 (USACE 2003).

8.1 HAZARD COMMUNICATION TRAINING

The SSHO will present Hazard Communication training in accordance with the FWA Hazard Communication Program (Attachment A-4). Hazard communication training will be provided before starting work. This training will be documented using the Hazard Communication and Right-to-Know Standards form contained in the FWA Hazard Communication Program.

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9.0 ASBESTOS ABATEMENT

All asbestos-abatement activities will be accomplished in accordance to OSHA 1926.1101, EPA Part 763, and Attachment A-5, *Asbestos Exposure Protection (*HSEP 9.1, provided on CD). All asbestos will be classified either as friable or non-friable. This determination will be made after initial air sampling has been done and the results reviewed. The contractor shall hire a third party contractor who is independent of the abatement contractor to perform required personal and area air monitoring, per EPA 763, Subpart E, Appendix A-2. All asbestos workers shall have successfully completed a 40-hour asbestos abatement worker training course or an 8-hour yearly refresher and possess both a current card for the training class and a State of Alaska Certified Asbestos worker's card. All training records must be submitted prior to any worker commencing work and will be maintained on site.

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10.0 PERSONAL PROTECTIVE EQUIPMENT

All workers at FWA field sites are required to appropriately protect themselves from chemical and physical hazards. All field personnel shall, at minimum, wear the following PPE:

- Safety glasses
- Hard hat
- Safety-toe boots
- Class 2 or 3 high-visibility vest

Additional PPE (i.e., neoprene boots, impervious gloves, Tyvek® coveralls, and respirators) may be required depending upon the site conditions. Additional requirements are described below and indicated in the AHA.

10.1 HEARING PROTECTION

Adequate hearing protection is required in all areas that may expose workers to high levels of noise. This includes work areas around aircraft, heavy equipment, generators, compressors, and other noise-generating equipment. Loud noises are considered to be any noise over 85 decibels (dB). If you have to raise your voice to be heard at an arm's length away, you may need hearing protection. Hearing protection includes one or a combination of the following:

- Engineering controls (where feasible)
- Ear plugs
- Ear muffs

Monitoring, as part of previous investigations, revealed sound levels up to 90 dB were measured adjacent to a working excavator. Personnel shall wear hearing protection when working around this type of heavy equipment unless equipment-specific monitoring indicates otherwise.

10.2 EYE PROTECTION

Eye protection meeting American National Standards Institute Z 87 requirement (safety glasses with side shields) is required to be worn by all field personnel. Eye protection that may be used includes:

- Safety glasses with side shields (minimal eye protection);
- Goggles (splash, dust, and foreign object protection); and
- Face shields with safety glasses and side shields for splash and foreign object protection.

A known challenge in Alaska is fogging of eye protection. Therefore, antifog solution will be provided on site.

10.3 PROTECTIVE CLOTHING

Clothing sufficient to protect workers from heat and cold as well as from contact with substances such as petroleum is required when gross contamination could be potentially encountered (i.e., during excavation or sampling). The following articles of clothing are required for preventing contact with hazardous substances:

- Rain gear or Tyvek® coveralls (poly-coated for liquid contact)
- Neoprene boots or Tyvek® booties
- Gloves: Nitrile, latex, and cotton gloves
- Double nitrile gloves for personnel handling samples

The following additional safety equipment and information will be brought to the work sites:

- Portable eyewash
- First aid kit
- Type A-B-C fire extinguisher

10.4 LEVELS OF PERSONAL PROTECTIVE EQUIPMENT

Sections 10.4.1 to 10.4.4 describe the four different levels of PPE.

10.4.1 Level D

A work uniform affording minimal protection is needed, used for nuisance contamination only. The following constitute Level D equipment and may be used as appropriate:

- Coveralls (as applicable)
- Gloves (as applicable)
- Boots/shoes, chemical-resistant steel toe (shank optional, as applicable)
- Boots, outer, chemical-resistant (disposable) (as applicable)
- Safety glasses (chemical splash goggles optional, as applicable)
- Hard hat
- Safety vest
- Escape mask (as applicable)
- Face shield (as applicable)
- Level D is the expected level of PPE to be used during the majority of the FWA work.

10.4.2 Level C

Level C applies when the concentration(s) and type(s) of airborne substance(s) are known, and the criteria for using air purifying respirators are met. The following constitute Level C equipment and may be used as appropriate:

- Full-face or half-mask, air-purifying respirators (National Institute of Occupational Safety and Health [NIOSH] approved)
- Hooded chemical-resistant clothing (overalls, two-piece chemical-splash suit, disposable chemical-resistant overalls)
- Coveralls (as applicable)
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant
- Boots, outer, chemical-resistant steel toe (shank optional, as applicable)
- Boot-covers, outer, chemical-resistant (disposable) (as applicable)
- Hard hat
- Safety vest
- Escape mask (as applicable)
- Face shield (as applicable) if not, safety glasses or chemical splash goggles

10.4.3 Level B

Level applies when the highest level of respiratory protection is necessary, but a lesser level of skin protection is needed. The following constitute Level B equipment and may be used as appropriate:

- Positive-pressure, full face-piece self-contained breathing apparatus (SCBA) or positive-pressure, supplied-air respirator with escape SCBA (NIOSH approved)
- Hooded chemical-resistant clothing (overalls and long-sleeved jacket, coveralls, one or two-piece chemical-splash suit, disposable chemical-resistant overalls)
- Coveralls (as applicable)
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant
- Boots, outer, chemical-resistant steel toe and shank
- Boot-covers, outer, chemical-resistant (disposable) (as applicable)
- Hard hat
- Safety vest

10.4.4 Level A

The following constitute Level A equipment and may be used as appropriate:

- Positive-pressure, full-face SCBA or positive-pressure, supplied-air respirator with escape SCBA, approved by the NIOSH
- Totally encapsulating chemical-protective suit
- Coveralls (as applicable)
- Long underwear (as applicable)
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant
- Boots, chemical-resistant, steel toe and shank
- Safety vest
- Hard hat (under suit)
- Disposable protective suit, gloves and boots (depending on suit construction, may be worn over totally encapsulating suit)

11.0 SITE CONTROL

Access and egress to each site will be controlled by Jacobs. Visitors will either be asked to sign a log and/or their visit will be recorded in field logbooks. "No entry" signs will be posted at site entrances. The FWA field office trailer on site will be used as a base for all activities. Fencing, caution tape, or other materials will be used to set a safety perimeter if there are unsafe conditions present (i.e. an open excavation, potential MEC). For sites occupied by another contractor, Jacobs will ensure the current site setup is in accordance with the Jacobs SSHP site control protocol.

Prior to activities at any FWA site, all Jacobs personnel and all subcontractors will be required to attend a site-specific safety briefing at which details of the SSHP (this Appendix) will be covered, along with specific MEC-related information if applicable (Appendix H).

Control at each site will be set up and implemented as described in Attachment A-5, *Site Controls* (HSEP 7.3.2, provided on CD). Effective site control procedures will reduce the potential exposure of the project team, other workers in the vicinity, and the surrounding environment to the onsite hazards. Site control includes the following activities:

- Limiting site access only to essential personnel
- Establishing work zones within the site and documenting personnel entering and exiting the exclusion zones
- Alerting personnel to the presence of wildlife in the area
- Alerting personnel to the presence of MEC-related hazards
- Conducting operations in a manner that reduces the exposure of personnel and equipment and eliminates the potential for offsite dispersion of contaminants
- Establishing decontamination procedures for personnel and equipment

11.1 WORK ZONES

Clearly delineated work zones help ensure that:

- Site personnel are adequately protected from existing hazards; and
- Specific activities and hazards are confined to the appropriate areas. Personnel can be accurately and quickly located and evacuated during an emergency.

Personnel will use *Site Controls* in Attachment A-5 (HSEP 7.3.2, provided on CD) as a guideline when establishing work zones. Vehicles and ATVs will be staged to provide efficient evacuation due to wildlife or other emergencies.

11.2 BUDDY SYSTEM

The SSHO will require personnel to work with a buddy at all times. The buddy must be capable of the following responsibilities:

- Assisting his/her partner
- Monitoring partner for signs of chemical or other exposures (e.g., heat or cold)
- Periodically verifying the integrity of partner's PPE
- Notifying SSHO when emergency help is needed
- Observing the work area for wildlife or unexpected weather hazards
- Keeping the SM informed of the location and expected time of return of the work team

11.3 DUST CONTROL

All excavations, embankments, stockpiles, access roads, plant sites, waste areas, and work areas will be maintained to prevent excess dust from becoming a hazard or nuisance. Dust control measures, such as sprinkling, will be performed as work proceeds and whenever a dust nuisance or hazard occurs. Any dirt or mud, which is tracked onto paved or surfaced roadways, shall be cleaned away within the day it is deposited.

11.4 COMMUNICATIONS

Communication among personnel at the project site will be conducted using verbal, and/or visual and/or hand signals, and two-way common-band-frequency radios. Verbal communication at the sites may be impaired by onsite background noise caused by heavy equipment and use of PPE. Hand signals to be used among personnel within the exclusion zone will be reviewed during tailgate safety meetings to be conducted before starting work. Communication with personnel not located at the project site will be made via radios or cellular telephones.

11.5 SITE SAFETY AND SECURITY

Site security is essential for the following reasons:

- Prevent unauthorized, unprotected, or unqualified people from being exposed to site hazards
- Maintain established and safe working procedures
- Protect personnel from wildlife

Site safety and security will be maintained by:

- Limiting access at control points only to authorized and essential personnel
- Assigning the responsibility for enforcing exit and entry requirements
- Requiring the SSHO to approve all visitors to the site
- Stopping work immediately if unauthorized personnel or wildlife attempt to or succeed in accessing the work area or exclusion zone. Site workers shall notify site management immediately. If dangerous wildlife (such as bears) enter the work area, workers shall walk to the nearest vehicle and leave the job site. A copy of *Working Safely Around Wild Animals* in Attachment A-5 (HSEP 7.4, provided on CD) shall be presented to all personnel working at FWA.

11.6 DECONTAMINATION PROCEDURES

Decontamination protects workers, the public, and the environment by limiting exposure to harmful substances and by preventing the spread of contamination. The SSHO will oversee decontamination procedures to determine their effectiveness and will take corrective actions to rectify any deficiencies.

11.6.1 Personnel Decontamination

At areas where an exclusion zone is necessary, all personnel exiting an exclusion zone will follow decontamination procedures. Under no circumstances (except emergency evacuation) will personnel be allowed to leave the exclusion zone before decontamination. The SSHO may approve simplification of the procedures in the field when a determination has been made that decontamination procedures may be less stringent.

An example of decontamination procedures at a POL-contaminated site would occur as follows:

- **Segregated equipment drop:** Deposit equipment used onsite (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross-contamination.
- **Outer boots and gloves wash and rinse:** Scrub outer boots and outer gloves, with decontamination solution or detergent water. Rinse off using copious amounts of water.
- **Outer boot and glove removal:** Remove outer boots and gloves. Deposit in container with plastic liner.
- **Boot, gloves, and outer garment removal:** Remove boots, white Tyvek® coveralls, and inner gloves, and deposit the items in separate containers lined with plastic.
- **Field wash:** Thoroughly wash hands and face. Shower as soon as possible.

11.6.2 Equipment and Vehicle Decontamination

Small instruments and equipment will be protected from contamination by draping, masking, or otherwise covering the instruments with plastic to the degree possible without hindering the operation of the unit. Contaminated protective coverings will be removed from the equipment and disposed of in the appropriate containers. Any soil or obvious contamination on the equipment will be brushed or wiped with damp disposable wipes, and the equipment will be dried. The units will be checked, field calibrated, and recharged as required prior to the next day's operation.

Equipment used onsite will undergo decontamination prior to leaving the site to eliminate contaminant migration from the site, as well as the potential for cross-contamination of sites. Gross decontamination includes the removal of potentially contaminated materials by use of a shovel or other hand tools and stiff bristle brushes. All materials removed during gross decontamination will be accumulated and managed with similar waste streams according to the project-specific waste management plan. Equipment used onsite will be completely decontaminated when no longer required on site.

11.7 WASTE HANDLING AND DISPOSAL

Waste generated on site from field activities includes investigation-derived waste, discarded PPE, laboratory waste, field trash, and office trash. Wastes will be containerized, transported to the designated waste staging area, and shipped offsite for disposal. Disposal of all wastes will be in accordance with state and federal requirements. Project-specific waste management plans will provide additional information regarding waste-handing, transportation, and disposal.

11.8 CONFINED SPACE

Personnel may be required to enter confined spaces to perform operations and maintenance, and / or sampling duties. Potentially hazardous confined spaces include but are not limited to:

- Space large enough and so configured that an employee can bodily enter and perform assigned work
- Space with limited or restricted means of entry or exit (e.g., tanks, vessels, silos, storage bins, hoppers, vaults, and pits)
- Space not designed for continuous employee occupancy

Confined Space Entry in Attachment A-5 (HSEP 7.2, provided on CD), will be followed when conducting confined space work. Confined space entry is not expected to be required during the field season.

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12.0 INSPECTIONS

This section describes site and equipment inspections to be performed on a routine basis at all FWA sites.

12.1 SITE INSPECTIONS SAFETY EVALUATION

The following inspections are required:

- The SSHO shall conduct daily safety inspections of each project site. Observations noted during the inspection will be documented on SORs (Attachment A-6) and noted in the *Daily Health and Safety Report* (Attachment A-6) or Construction Quality Control Report (Appendix C). Deficiencies shall be posted on the deficiency tracking log (Appendix C).
- The SM shall conduct a safety review of the job site before any new phase of work is initiated and periodically thereafter.
- The Jacobs Health and Safety Manager (HSM) will conduct periodic project audits and will use the *Safety Evaluation Process* in Attachment A-5 (HSEP 2.2, provided on CD) or equivalent.

All site inspection results should be reviewed with the Project Manager (PM) and site personnel, as applicable. All deficiencies will be corrected. Serious deficiencies must be corrected immediately.

12.2 EQUIPMENT INSPECTIONS

Any machinery or mechanized equipment shall be inspected and tested by a competent person to be in safe operating condition prior to use at the site. Inspections and tests shall be in accordance with the manufacturer's recommendations and shall be documented. Records of tests and inspections shall be maintained at the project office; Attachment A-6 contains USAED equipment inspection forms. The Jacobs equipment inspection form (Attachment A-6) may be used to supplement the USACE equipment inspection forms.

12.2.1 Daily/Shift Inspections and Tests

All machinery and equipment shall be inspected daily (when in use) to ensure safe operating conditions as indicated below:

- Tests shall be conducted at the beginning of each shift during which equipment is in use to determine that brakes and operating systems are in proper working condition and that all required safety devices are in place and functional.
- Whenever any machinery or equipment is found to be unsafe, or when a deficiency affecting the safe operation of equipment is observed, the equipment shall be immediately taken out of service and its use prohibited until unsafe conditions have been corrected.
- A tag indicating that the equipment shall not be operated shall be placed in a conspicuous location on the equipment and that the tag shall not be removed until the deficiency is corrected and verified (see below). Where required, lockout/tag-out procedures shall be followed.
- The tag shall remain in its attached location until it is demonstrated to the individual who found the equipment unsafe that the equipment is safe to operate.
- When deficiencies are corrected, the machinery or equipment shall be retested and re-inspected before being returned to service.

12.2.2 Vehicle Inspections

All motor vehicles owned or rented by Jacobs or our subcontractors will be inspected prior to use. All deficiencies found during the inspection will be noted and corrected prior to use of the equipment. Attachment A-6 contains the vehicle inspection form. Vehicles that cannot be brought to safe operating condition will not be used. In addition to pre-use inspections, the vehicle's primary driver will be responsible for insuring scheduled and periodic maintenance to maintain a safe operable condition. At no time will anyone operate a vehicle she/he believes to be unsafe.

12.3 SAFETY OBSERVATION REPORTS

All site personnel, not just the SSHO, are to complete an SOR form when real or potential unsafe acts or unsafe conditions have been identified. The success of this program increases when SORs completed by non-HSE specialists exceed those completed by HSE specialists. This ensures all personnel are developing safety-conscious attitudes.

SORs shall also be used to encourage and reward safe behavior. Providing positive reinforcement of a job or task well executed is far more encouraging than recognizing unsafe behavior. Encouragement can be rewarding for the whole project and lead the project in providing a better and healthier environment.

Any corrective measures shall be documented on the SOR form (Attachment A-6). All SORs shall be submitted to the SSHO within 24 hours of their completion. Completed forms shall be maintained with project records and a copy forwarded to the Jacobs Anchorage HSE Group weekly.

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13.0 EMERGENCY PROCEDURES

The following sections describe pre-emergency planning, emergency equipment and supplies, emergency contacts, emergency procedures, emergency response and accident follow-up, evacuation information, contacts, post-incident notifications, record keeping, and vehicle accident procedures.

13.1 PRE-EMERGENCY PLANNING

The SSHO and SM will coordinate with applicable emergency service providers for all job-site locations. Contacts, contact numbers, and primary gathering points will be reviewed prior to mobilization to any FWA work site. Attachment A-1 contains an emergency contact list.

13.2 EMERGENCY COMMUNICATION

In addition to communication methods described in the SSHP, the following communication and contact methods will be used:

- Air horn blast

The following visual hand signals will be used:

- Clutching throat = Personal distress
- Arm waving and pointing towards the exit direction = Evacuate the area

When placing a call for emergency response, report the following information:

- Your name
- Your company's name
- Type of emergency and perceived severity
- Location of accident or injury
- Time of incident
- Type of first aid or response being given

DO NOT HANG UP until the operator or emergency dispatcher has received the complete information and directs you to hang up.

Notify the SSHO and/or the SM and your immediate supervisor immediately after hanging up the phone. Further information or assistance may be needed from you to complete the accident investigation process.

Upon receiving notification of an incident or accident, the SSHO or SM will notify the FWA DPW immediately after hanging up the phone. Further information or assistance may be needed from you to complete the accident investigation process.

13.3 EMERGENCY MEDICAL TREATMENT

Should a person become injured, site personnel, along with the SSHO, will determine the severity of the injury(s) sustained. If the victim cannot be treated onsite, evacuation will likely be necessary. Fairbanks Memorial Hospital and the Fairbanks Memorial Hospital Tanana Valley Clinic are located approximately 5 miles west and 4 miles west, respectively, of the Jacobs FWA Field Office in the city of Fairbanks.

Bassett Army Community Hospital is located on Post. This facility can only be used in the event of a medical emergency requiring advanced care. Onsite personnel are to call 911 in the event of a medical emergency requiring advanced care. The emergency medical responders will then decide where to transport the injured person. In the event that a serious injury occurs and further treatment is needed, evacuation to Anchorage will be arranged. Attachment A-1 contains a list of emergency contacts.

An *Authorization for Medical Treatment* form (Attachment A-6) shall be taken with the employee to the destination medical facility. The site personnel shall complete the top portion of the form and the doctor at the medical facility shall complete the bottom portion of the form. The SM shall perform the following actions:

- Secure the accident area and complete an accident report with all applicable witness statements.
- Prepare figures depicting the general site layout, directions, emergency contacts, and the location of the medical facility.

13.4 FIRE

Upon notification of a fire, all field crews will assemble at the predetermined point onsite. While hot work is in progress, the equipment necessary to prevent the spread of any fire in remote locations will be available onsite at all times.

A fire watch shall be assigned while hot work is in progress. A *Welding/Brazing/Hot Work Permit* (Attachment A-6) shall be completed and approved by the SSHO prior to hot work activities. Upon completion of hot work, the fire watch shall keep watch for an additional 30 minutes to ensure fire does not develop.

13.5 PERSONAL PROTECTIVE EQUIPMENT FAILURE

If any site worker experiences a failure of PPE, that person and his/her buddy will immediately leave the exclusion zone through the decontamination area. The SSHO shall be notified of any defect or failure of PPE. Reentry into the exclusion zone will not be permitted until the equipment has been properly repaired or replaced.

13.5.1 Other Equipment Failure

If other equipment onsite fails to operate properly, the equipment shall be red-tagged and removed from service and the SSHO notified. After completion of repairs, the equipment shall be re-inspected and evaluated and appropriate actions taken. The SSHO will evaluate the safety hazards to site personnel before continuing operations.

13.6 EVACUATION

If an evacuation of the work area is necessary, the following steps should be followed:

- After receiving the signal to evacuate, all non-response personnel are to leave the work area in an upwind direction and assemble at a predetermined point.
- The supervisor will account for field team members at the assembly points.
- The supervisor will complete an incident report with applicable witness statements as soon as possible after an incident.

Evacuation routes and assembly points shall be designated to facilitate access and provide direction for emergency responders. All onsite personnel will be advised of evacuation routes and assembly points during the safety orientation and/or daily tailgate meetings. The SSHO or SM shall document the actual evacuation routes and assembly points, whenever evacuation occurs.

13.7 EMERGENCY RESPONSE AND ACCIDENT FOLLOW-UP

Following an incident or emergency, the SM or designee shall directly notify the HSM, the PM, and the client as soon as possible. The SM shall be prepared to provide the following information:

- SSHO name
- Project name and number
- Exact location of incident
- Name of victim and their employer
- Nature and extent of injuries
- The name and address of medical facility (if personnel were transported off site)
- The name of physician providing offsite care
- A phone number where the SSHO can be contacted during the next 24 hours

The *USAED Incident Reporting Process* (Attachment A-6) shall be followed, and follow-up form 265-R (USACE Report of Accident form) shall be completed and submitted within 24 hours. For a recordable incident, form ENG 3394 shall be completed and submitted to USACE area office within 3 days.

13.8 EXPOSURE TO BLOODBORNE PATHOGENS

The following procedures will be implemented when a potential exposure to blood-borne pathogens occurs:

- The SSHO must be notified immediately when a first aid incident occurs.
- The SSHO shall provide a report to the HSM, as required by reporting procedures.

- The report shall include names of all first aid providers who rendered assistance, and a description of the incident including time, date, and types of barriers used.
- If a blood borne pathogen or other potentially infectious material exposure has occurred, the description of the incident (above) must include an exposure summary. This summary is necessary to ensure proper post-exposure evaluation and prophylaxis occurred, and that follow-up procedures were made immediately available, as per Jacobs policy requirement.
- The report shall be recorded on the first aid register.
- A Hepatitis B vaccination must be offered to all workers who have occupational exposure to blood or other potentially infectious materials.

An accident with any of the consequences listed below shall be reported immediately to the Jacobs HSM. A government-designated representative will also be notified if any of following events occur:

- Fatal injury
- One or more persons admitted to a hospital
- Property damage in an amount specified by the designated authority

Daily records of all first-aid treatments not otherwise reportable shall be maintained on prescribed forms and provided to the HSM weekly.

13.9 VEHICLE ACCIDENT

The SM and SSHO shall be promptly notified of any accidents involving vehicles. The SM will be responsible for notifying the PM, HSM, and the client representative. A determination of operator drug testing will be made at that time. Procedures specified in *Vehicle Accidents* in Attachment A-5 (HSEP 5.2, provided on CD) shall be followed and report forms completed.

13.10 INJURY AND ILLNESS

An initial accident investigation will begin in accordance with *Accident and Incidents Investigation and Reporting* in Attachment A-5 (HSEP 5.1, provided on CD). At a minimum, the following actions will occur:

- The scene will be secured with no movement of material or equipment until a review of the accident is completed.

- Signed statements from witnesses will be obtained.

If an employee requires medical treatment, the *Authorization for Medical Treatment* form (Attachment A-6) shall be completed. This form should be delivered to the HSM as soon as possible. Other forms required to be completed in the event of an accident are included in Attachment A-6: *USACE Accident Investigation Report* (Form 3394), *USACE Report of Accident* (Form 265-R), and the *Incident Reporting Flowchart* (Exhibit 17).

13.11 SPILL OR RELEASE PROCEDURES

The SSHO and SM shall be notified immediately when a spill or release occurs. The SSHO or SM shall notify the PM and client as soon as the site is under control and an AHA/SPA has been developed and implemented. Regulatory agencies will be notified by the PM or the client. No one shall enter the site until the AHA/SPA is in place and the approach has been approved by site and project management. Appropriate methods to contain, control, or remove product released shall be followed by personnel involved as described in the AHA/SPA. Personnel involved with contaminant cleanup shall wear appropriate PPE, as defined in the AHA/SPA for the specific contaminants spilled or released.

14.0 ORIENTATION AND TRAINING

Prior to the start of work activities, all personnel working on this project and any new person visiting or conducting work on this project shall be briefed on this SSHP. All personnel shall sign the *Site Project Safety and Health Agreement Sign-off Sheet* (Attachment A-6) indicating they have been briefed and understand the requirements contained in this SSHP.

Prior to work, a daily safety tailgate meeting will be held to discuss planned work activities, safety precautions, AHA/SPA, emergency response updates, employee concerns, SOR, site conditions, monitoring results, injury/illnesses that may have occurred, exclusion zone entries, client issues, and other topics of concern to employees. Tailgate meetings should precede daily work activities, led by the subcontractor with assistance from the SM and the SSHO. The *Site Tailgate Meeting and Exclusion Zone Entry Log* (Attachment A-6) will be used to document the meeting.

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15.0 SITE POSTINGS

The following employment-related posters are required to be displayed prominently at each field office:

- Employee Polygraph Protection Act
- Notice To Employees-Federal Minimum Wage
- You Have A Right To A Safe And Healthful Workplace
- Equal Employment Opportunity Is The Law
- The Alaska Human Rights Law & Federal Law Prohibit Sexual Harassment
- Jacobs' Sexual Harassment Policy
- Unemployment Insurance
- Family and Medical Leave Act
- Safety and Health Protection on the Job
- Alaska Wage and Hour Act
- Notice of Insurance
- Uniformed Services Employment and Reemployment Rights Act
- Map denoting route to nearest care facility
- Emergency phone numbers
- Copy of SSHP
- OSHA 300A Form
- Copy of Deficiency Tracking Log
- Safety and health promotional posters
- Date of last lost workday injury

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16.0 REFERENCES

ACGIH (American Conference of Government Industrial Hygienists). (2008). *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*.

Jacobs Engineering Group Inc. Health, Safety, and Environmental Procedures.

Office of the Federal Register. 2005 (October). *Hazardous Waste Operations and Emergency Response.* National Archives and Records Administration. 29 CFR 1910.120 and 1926.65.

USACE (U.S. Army Corps of Engineers). 2003 (November). *Safety and Health Requirements Manual.* EM 385-1-1.

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ATTACHMENT A-1

Project-Specific Contacts and Maps

Fort Wainwright Post Contact List and Emergency Numbers

Hospital Location and Emergency Route

CONTACT LIST AND EMERGENCY NUMBERS

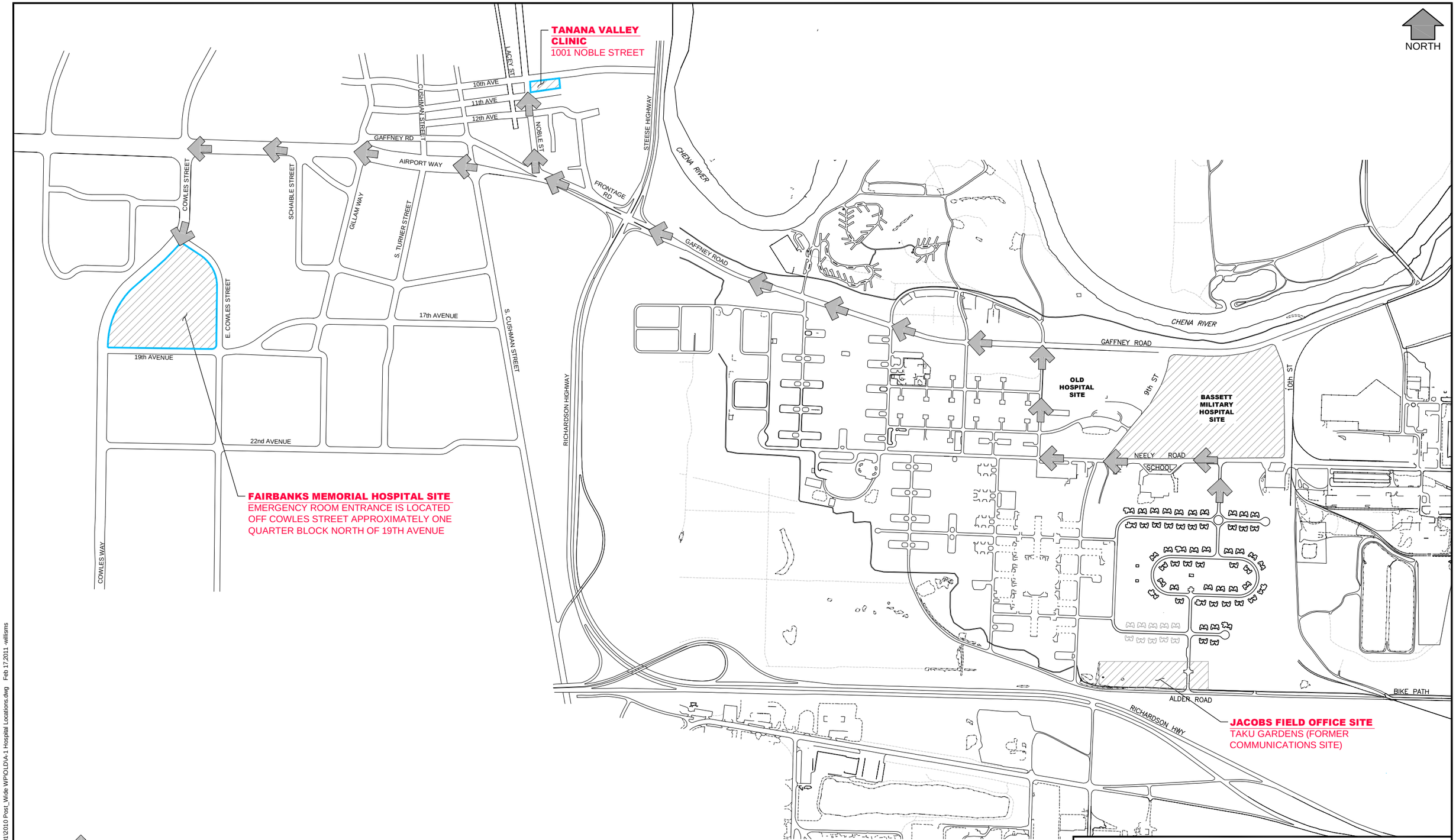
Client: USAED P.O. Box 6898 JBER, Alaska 99506-0898		Phone: Fax:	(907) 753-2689 (907) 753-5626
Jacobs 4300 B Street, Suite 600 Anchorage, AK 99518		Phone: Fax:	(907) 563-3322 (907) 563-3320
Project Manager	Sarah Belway	Phone: Mobile:	(907)356-1280 (907) 382-2569
SSHO	TBD	Phone Mobile:	
Site Manager	TBD	Phone: Mobile:	
CQC System Manager	Jess Young	Phone: Mobile	(907) 751-3328
Environmental Scientist	Caitlin Jelle	Phone:	(907) 751-3437
Project Chemist	Kari Hagen	Phone:	(907) 451-0550

EMERGENCY CONTACTS

Medical and Fire Emergency	**911**
Fairbanks Memorial Hospital Tanana Valley Clinic Location 1001 Noble St, Fairbanks, AK 99701	(907) 458-5606
Fairbanks Memorial Hospital 1650 Cowles St. Fairbanks, AK 99701	(907) 452-8181

Alaska Airlines	1-800-252-7522

Spills and Toxins	
National Response Center (Oil & Toxic Chemical Spills)	(800) 424-8802
Chemtrec (Customer ID #JAC001)	(800) 424-9300
Poison Control Center	(800) 222-1222



EMERGENCY ROUTE AND HOSPITAL LOCATION

FT. WAINWRIGHT, FAIRBANKS, ALASKA

JACOBS	DATE: 31 March 2010	PROJECT MANAGER: J. Lipka	FIGURE NO.: A-1

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ATTACHMENT A-2

Project Specific Hazards and Requirements

Project-Specific Activity Hazard Analysis

Summer Hazard Awareness

Project Specific Chemical Hazards

Project Site Orientation and Training

Table A-2-1 Project-Specific Activity Hazard Analysis

Job/Step	Hazards	Safe Plan
Operations on and around Water	Drowning	Personnel will wear approved personal floatation devices (PFDs) when on or near water
	Fall	Fall protection will be utilized. Life ring or throw seat with 150 feet of line will be positioned at each job site where water hazards exists. Boats exceeding 16 foot will be required to carry same.
	Hypothermia	Personnel will wear "Mustang" survival suits when accessing site in small water craft, and during any instances where hypothermia danger exists.
	Rough Seas	The person in charge of the craft will make the determination if it is safe to proceed or stop the transport activity. (HSEP 21.3)
	Slip, Trip, and Fall	No person should move about a boat with both hands completely occupied. One hand must be free for support.
	Pinch, Crush	All persons should take special precautions and be careful of hands and fingers around doors, hatches, and hinges.
Hazards Working around Heavy Equipment	Equipment Malfunction/Misuse	Only qualified personnel will be authorized to operate equipment (HSEP 8.3)
(GeoProbe, Drill Rig, and Backhoe, etc.)		Equipment will only be operated in accordance with the manufacturer's instructions.
		Use of equipment for a specific task will be discussed in detail during the daily safety meeting.
		The operator will inspect, test, and document equipment daily at the start of each shift. If such equipment is found to be unsafe, it will be taken out of service and tagged until the unsafe condition has been corrected.
		Maintenance and repairs will be performed in accordance with the manufacturer's specifications.
	Unsafe Operation	Activities will be determined by the field supervisor and thoroughly discussed with the operator and ground support personnel during the daily safety meeting.
		Ground support personnel assisting the operation will remain in sight of the operator and will serve as a safety watch.
Hazards Working around Heavy	Unsafe Operation (continued)	All ground support personnel will be familiar with traffic patterns and work areas. Barriers and signs will be used to identify the work area.

Project-Specific Hazard Analyses
(continued)

Job/Step	Hazards	Safe Plan
Equipment		
(GeoProbe, Drill Rig, and Backhoe, etc.) (continued)	Unsafe Operation on Slopes and Soft or Unstable Ground	Side slopes will be avoided when possible. Slopes will be negotiated by traveling up or down the slope with the attachments in low position. Raising and lowering the attachments on steep side slopes will be avoided.
	Injury to Operator and Support Personnel	Operator will access and exit machine by means of a ladder or step pads and hand holds provided by the machine's manufacturer.
		Ladders and step pads will be kept free of any debris or buildup of mud.
		The operator and ground support personnel will wear appropriate level of PPE and hearing protection as required in the Project-Specific Personal Protective Equipment Requirements Table (in this Attachment).
		The operator will wear a seat belt or other approved restraining devices as required.
		The equipment will have a proper, working backup alarm, or the operator will be assisted by a dedicated signal person.
		Ground support personnel will yield right-of-way to the equipment. Ground support personnel will yield to personnel on the ground who enter the work area.
		Ground support personnel will not stand close to or work under any raised portion of the equipment or its attachments.
	Fire	The engine will be shut off during fueling operations.
		The fire extinguisher will be mounted on the machine and will be inspected and recharged as necessary.
		Caution will be used to prevent overfilling of the machine and to prevent spilling of fuel on ground.
		The machine engine compartment and exhaust system will be kept free of oil, fuel, and debris accumulation.
Loading and Transporting Debris/Waste Streams	Injury to Co-workers	Ground support personnel will yield right-of-way to all heavy equipment operators.
		Support personnel will wear appropriate level of PPE and hearing protection as required in the Project Specific Personal Protective Equipment Requirements Table.
		Ground support personnel will be familiar with work zones and traffic patterns.
Vehicular and	Tipping Truck, Overturning Machine	Only authorized personnel will operate the unit.

Project-Specific Hazard Analyses
(continued)

Job/Step	Hazards	Safe Plan
Equipment Movement(s)		
		Seat belts and factory-installed restraining devices will be used during operations.
		Slopes will be negotiated by going straight up and down.
		Severe or sudden turns will be avoided.
		The unit will be operated on level and solid surface when possible. Otherwise, caution will be used when proceeding.
		On unpaved roadways, vehicles will not exceed 10 mph to minimize dust emissions.
		Water spray will not be used on haul routes to minimize dust emissions.
		Operations will cease until dust is controlled.
Working around Debris Piles and Staging Areas	Slips, Trips, Falling Debris, Cuts from Sharp Objects	Workers will refrain from walking or climbing on the debris pile.
		Workers will remain a safe distance away from equipment placing debris in the piles or containers.
		Any recognized instability of the piles will be immediately corrected.
		If possible, workers will refrain from handling debris.
		Leather gloves must be worn when handling debris.
	Back Injuries	Personnel will evaluate the size and weight of material and avoid lifting items weighing more than 80 pounds.
		Personnel will use proper lifting techniques (i.e., lift with the legs and not with the back).
Working around Debris Piles and Staging Areas (continued)	Fire	Fire extinguishers will be stationed near debris piles and container loading areas.
		If possible, torch work will be avoided. If torch cutting at debris piles or staging areas are required, the area will be prewet and a continuous water spray used. A 30-minute fire watch will be maintained after cutting has been completed.
		Fire extinguishers will be stationed near debris piles.
		Flammable and combustible liquids will be kept a safe distance from the staging areas.
	Injury to Co-workers/Transporters	Ground support personnel will yield right-of-way to all heavy equipment operators.

Project-Specific Hazard Analyses
(continued)

Job/Step	Hazards	Safe Plan
		All ground support personnel will be familiar with work zone, traffic patterns, and incoming transport trucks.
		Ground support personnel will assist in hook-up of roll-off containers, avoiding all pinch points and contact areas for hook-ups.
		Before hooking up to the transport truck, ground support personnel will ensure that the load is at a proper fill height and the load is properly covered.
		All support personnel will avoid climbing on loaded roll-off or getting under a roll-off container when raising or lowering a load.
		Hook-up personnel will wear leather work gloves and adequate protective footwear.
	Tipping truck	Only authorized DOT Commercial Driver's License (CDL) licensed drivers will operate unit.
		Seat belts will be required at all times when moving a vehicle or truck.
		Severe or sudden turns will be avoided.
		Roll-offs will be located on flat and solid surfaces before hooking up the container.
Barge Loading/Offloading	Water	PFDs will be worn by all personnel in the area of operations.
		Throw rings with at least 150 feet of line attached will be positioned on dock.
	Falling Objects	Hard hats will be worn at all times while working onsite.
		No personnel will work or walk under suspended loads.
	Equipment Malfunction/Misuse	Only qualified personnel shall be authorized to operate equipment. Said operator *shall* inspect, test, and document equipment daily at the start of each shift. If the equipment is found to be unsafe, it will be taken out of service and tagged until the unsafe condition has been corrected.
		Equipment will only be operated in accordance with the manufacturer's instructions.
		Use of equipment for specific tasks will be discussed in detail during the barge offload/onload safety meeting (HSEP 17.10).
	Injury to Operator and Support Personnel	Appropriate PPE and hearing protection will be worn by the operator and ground support personnel as required in the Project-Specific Personal Protective Equipment Requirements Table.
		Only the designated individual will use proper hand signals to direct the barge crane operator.

Project-Specific Hazard Analyses
(continued)

Job/Step	Hazards	Safe Plan
		The operator will wear seat belts or other approved restraining device as required.
	Forklift related Accidents	Follow forklift operations procedures.
		Utilize spotter to direct container movement.
	Unsafe Operations – Rough Seas	Operation will be halted at the direction of the barge captain.
	Slips, Trips, and Falls	Use of fall protection devices as required.
		Keep work areas clear of obstructions and debris.
	Night Operations	Ensure sufficient lighting is available for the *safe* performance of ALL operations
Aircraft Operations	Propeller	Personnel must be aware of hazards present and stay clear of these danger areas. (HSEP 21.3)
		Aircraft must be positioned in such a way to limit the hazards to personnel. Ensure clearance to enter and exit is given by the air crew prior to approaching or leaving aircraft.
All-Terrain Vehicle Operations	Head Injury	Ensure helmets are worn by operators.
	Hand Injury	Ensure gloves are worn by operators.
	Foot Injury	Ensure protective footwear is worn by operators.
	Eye Injury	Wear eye protection.
	Rollover	Safe speeds observed when traveling up and down grades.
	Collision/Operation	Individuals operating ATVs must be appropriately trained.
	ATV Malfunction/Misuse	Only trained, authorized personnel shall be allowed to operate ATVs according to manufacturer's instructions.
Site Investigation	Slips, Trips, and Falls	Trip and slip hazards will be avoided. Tundra and tall grass shall be evaluated for hazardous objects, holes, etc.
		Unguarded openings will be barricaded and marked; for work at heights greater than 6 feet, 100 percent fall protection measures will be instituted.
	Asbestos-Containing Material (ACM)	HSEP 9.1, 9.2, and 9.3 will be referred to regarding asbestos exposure protection.
		Appropriately trained personnel will utilize the project work plan for guidance for asbestos sampling.
		Project-Specific Medical Monitoring Requirements Table, Project-Specific Air Monitoring

Project-Specific Hazard Analyses
(continued)

Job/Step	Hazards	Safe Plan
		Requirements Table, and Project Specific Employee Training Requirements outline specific training, medical, and air monitoring requirements.
	Protruding Sharp Objects from Debris	Employees will wear appropriate footwear, with shank protection, at all times.
		Sharp objects such as nails will be immediately identified to fellow team members.
	Improper Lifting Techniques	Safe lifting techniques will be used.
		Two people or mechanical means will be used to move heavy loads.
	Sharp Objects or Splinters	Personnel will use heavy leather work gloves.
	Falling Objects	Hard hats will be worn where needed at all times.
		Any object that appears to be unsecured will be removed immediately.
	Objects in eye	Safety glasses with side shields will be worn at all times.
		If hand tools that can produce flying objects will be used, a face shield will be used in conjunction with safety glasses.
	Excessive noise	Hearing protection will be provided when levels exceed 85 decibels A-weighted (dBA) steady state or 140 dBA impulse, regardless of the duration of exposure.
Using Absorbent Materials for Contaminated Materials	Dermal contact with contaminated media	Wear PPE as prescribed in the Project-Specific Personal Protective Equipment Requirements Table.
	Inhalation of vapors	Perform monitoring as prescribed in the Project-Specific Air Monitoring Requirements Table.
	Manual lifting hazards – muscle strain, crushed toes, pinched fingers or hands	Use proper lifting techniques.
Drum Handling		
Drums	Manual lifting hazards – muscle strains, crushed toes, pinched fingers or hands	Use proper lifting techniques.
	Heat stress	Comply with Jacobs HSEP 11.5, Heat Stress Control Work Instructions.
	Inhalation of gases or vapors	Wear PPE as prescribed in the Project-Specific Personal Protective Equipment Requirements Table.
	Dermal contact with potential	Wear PPE as prescribed in the Project-Specific Personal Protective Equipment

Project-Specific Hazard Analyses
(continued)

Job/Step	Hazards	Safe Plan
	contaminants	Requirements Table.
Sampling of Drums/Underground Storage Tanks (USTs)		
Deheading/Opening of Drums and USTs	Sharp edges from deheaded drums	Wear PPE as prescribed in the Project-Specific Personal Protective Equipment Requirements Table.
	Inhalation of gases or vapors	Wear PPE as prescribed in the Project-Specific Personal Protective Equipment Requirements Table.
	Heat stress	Comply with Jacobs HSEP 11.5.
	Dermal contact with potential contaminants	Wear PPE as prescribed in the Project-Specific Personal Protective Equipment Requirements Table.
	Pressure relief	Drums showing signs of overpressure will be vented prior to opening.
	Heat stress	Comply with Jacobs HSEP 11.5.
	Fire/Explosion	Personnel shall use nonsparking tools to open drums, vents, and fill ports on USTs.
		Perform Lower Explosive Limit (LEL) monitoring as prescribed in the Project-Specific Air Monitoring Requirements Table.
	Inhalation of gases or vapors	Wear PPE as prescribed in the Project-Specific Personal Protective Equipment Requirements Table.
	Dermal contact with potential contaminants	Wear PPE as prescribed in the Project-Specific Personal Protective Equipment Requirements Table.
Excavation Activities	Excavation collapse	Comply with Jacobs HSEP 8.4: Excavations
		Excavated materials or debris (i.e., spoils) as well as equipment will not be placed closer than 2 feet from the edge of the excavation.
		Personnel will not enter an excavation more than 4 feet deep.
	Exceeding personnel exposure limits	Monitoring shall be conducted as required in the SSHP monitoring section. PPE shall be worn as described above. Personnel not needing to get off the clean area of the site (backfill clean soil) are required to wear modified level D; hard hat, safety glasses, steel toed boots, orange vest. Respirators should be used by site personnel when the action levels in this SSHP are exceeded, or dust emissions cannot be controlled.
	Encountering utilities	Coordinate utility locates with local utility company and/or landowners. Follow requirements of Jacobs HSEP 7.3.3, Utility Clearance and utility locates. Use magnetometers as required by the procedure. Also, ensure that all utilities are marked.
	Contact with contaminated soil	Samplers shall wear nitrile gloves (two layers), steel toed boots, and safety glasses when

Project-Specific Hazard Analyses
(continued)

Job/Step	Hazards	Safe Plan
		sampling. Air purifying respirator with organic cartridges shall be worn when: action levels are exceeded, or dust emissions are visible.
	Slips, Trips, and Falls	The area around the excavation will be kept clear of debris and trip hazards. Maintain good housekeeping.
Sampling Environmental Media		
Obtaining and Handling Samples	Heat stress	Comply with Jacobs HSEP 11.5, Heat Stress.
	Skin contact with contaminated or sample preservatives	Wear PPE as prescribed in the Project-Specific Personal Protective Equipment Requirements Table.
	Inhalation of gases or vapors	Perform monitoring as listed in the Project-Specific Air Monitoring Requirements Table.
		Wear PPE as prescribed in the Project-Specific Personal Protective Equipment Requirements Table.
Decontaminating Sampling Equipment	Skin contact with decontamination solution (e.g., hexane or methanol)	Wear PPE as prescribed in the Project-Specific Personal Protective Equipment Requirements Table.
	Inhalation of vapors from hexane or methanol	Perform monitoring as shown in the Project-Specific Personal Protective Equipment Requirements Table.
		Wear PPE as prescribed in the Project Specific-Personal Protective Equipment Requirements Table.
		Ensure adequate ventilation.
Facility Conditioning		
Building Conditioning without explosives	Falling Objects	Hard hats will be worn at all times while working on site.
	Equipment Malfunction/Misuse	Only qualified personnel shall be authorized to operate equipment. Said operator *shall* inspect, test, and document equipment daily at the start of each shift. If the equipment is found to be unsafe, it will be taken out of service and tagged until the unsafe condition has been corrected.
		Equipment will only be operated in accordance with the manufacturer's instructions.
		Use of equipment for specific tasks will be discussed in detail during the building conditioning safety meeting and at the daily tailgate meetings.
	Injury to Operator and Support Personnel	Appropriate PPE and hearing protection will be worn by the operator and ground support personnel as required in the Project-Specific Personal Protective Equipment Requirements

Project-Specific Hazard Analyses
(continued)

Job/Step	Hazards	Safe Plan
		Table.
		Only the designated individual will use proper hand signals to direct the equipment operator.
		The operator will wear seat belts or other approved restraining device as required.
	Hand hazards/Pinch points	Small tools will be inspected daily before use and replaced if necessary.
		Appropriate PPE will be worn to protect hands during activities (i.e., leather gloves)
	Exposure to hazardous building materials	All personnel will be made aware of potential hazardous building materials and locations as well as receive the appropriate training for handling if necessary. See Safe Plan for handling of lead and asbestos building materials.
	Manual lifting hazards – muscle strain, crushed toes, pinched fingers or hands	Use proper lifting techniques and appropriate PPE..
Building Conditioning with explosives (additional to above)	Transporting explosives	Only authorized and licensed carriers will be contracted to transport explosives to the site. The appropriate permits will be acquired. If necessary, explosives and blasting caps will be transported separately.
	Handling and storing explosives onsite	Only authorized personnel will handle explosives. Explosives will be stored in the appropriate magazines and the area will be labeled accordingly.
		Explosives will be handled and stored in accordance with guidelines developed by The Institute of Manufactures of Explosives (IME) and local, state, and federal guidelines.
		Explosives will be stored separate from blasting caps.
	Accidental detonation	Only redundant, non-electric blasting caps and detonating cord assemblies will be used to reduce the risk of accidental detonation due to electrical storms or radio interferences.
	Crush and shrapnel injuries during and after explosions	The area will be cleared at least an hour before detonation. Radio frequencies will be used as well as audible warnings for non-radio communications. No personnel will enter the blast area prior to clearance from the explosive professionals.
Abatement	Slips, trips, and falls	Use proper PPE, use correct lifting procedures, use buddy system or forklift for handling heavy loads. Maintain good housekeeping.
	Injury from using hand tools	Check the tools prior to work, replace any damaged tools. Receive training and use proper techniques.
	Exposure to airborne asbestos	Only properly trained and certified personnel must enter the area. Use proper PPE (respiratory protection). Proper air monitoring must be practiced. Follow HSEPs 9.1 and

Project-Specific Hazard Analyses
(continued)

Job/Step	Hazards	Safe Plan
		9.2
	Ladders	Use ladders correctly, use scissors lift, or Genie Lift, use scaffolding, use fall protection equipment. Go through ladder safety training. Set up ladder on level ground. Comply with HSEP 18.3
	Lead exposure	Comply with HSEP 9.4. Use proper PPE. Use only personnel with the proper training and certifications.
All Tasks	Poor Communication(s)	Cease operation(s) until adequate communications are established and In place.
	Working Alone	Personnel will not work alone. The buddy system will be enforced.
	Wildlife Encounter	Follow Procedures outlined in Section 1.2.1 … Contact SSHO and/or SM Avoidance is the prudent measure. Deterrents such as noisemakers, pepper spray, etc. may be employed where available. Destruction of the animal as a last resort
	1. Heat Stroke (Symptoms: red, hot, dry skin; no perspiration; dizziness; confusion; rapid breathing and pulse; high body temperature)	**This is a MEDICAL EMERGENCY!** Cool victim rapidly by soaking in cool (not cold) water. Loosen restrictive clothing. Get medical attention immediately!
	2. Heat Exhaustion (Symptoms: pale, clammy, moist skin; shallow breathing; profuse sweating; weakness; normal temperature; headache; dizziness; vomiting)	Move victim to a cool, air-conditioned area. Loosen clothing, place head in low position. Have victim drink cool (not cold) water. Notify supervisor. Advise co-worker(s). Seek shelter/warmth.
	Cold:	
	1. Frostbite (Symptoms: blanched, white, waxy skin, but resilient tissue; tissue cold and pale)	Move victim to a warm area. Warm frostbitten area quickly in warm (not hot) water. Have victim drink warm fluids – not coffee or alcohol. Do not break any blisters. Elevate the injured area and get medical attention. Do NOT Thaw if appendage is likely to refreeze.
	2. Hypothermia (Symptoms: shivering; apathy; sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration)	Move victim to a warm area. Have victim drink warm fluids – not coffee or alcohol. Get medical attention. Remove any wet clothing and provide warmth directly to head and torso.
	3. Dermal Contact with Super-cooled Liquids	Avoid contact, especially in freezing weather… Seek immediate medical attention. Advise co-workers and SSHO/Site Management.

Project-Specific Hazard Analyses
(continued)

Job/Step	Hazards	Safe Plan
All Tasks—UXO Awareness	**Unexploded Ordnance** (**UXO**), Encountering of Any Suspect/Unknown or Suspicious Items	Do NOT investigate. Cease ALL operations within immediate & adjacent areas. Do NOT use radios or cell phones near UXO. Avoid Contact or disturbance. Cordon off area immediately and advise site management. Follow the procedures outlined in Corporate Health and Safety Plan (CHSP) 9.5. No operations will resume in affected area until approval from the SSHO and the client are obtained to continue.
	Chemical Event	Cease operations and proceed upwind. Notify site management.
Elevated Surfaces	Fall hazard	Jacobs' HSEP 13.8 Fall Protection and Prevention Policy will be followed.

Notes:

ACM	=	asbestos-containing material	FID	=	flame ionization detector	UXO	=	Unexploded Ordinance
APR	=	air purifying respirator	GFCI	=	ground fault circuit interrupter	PEL	=	permissible exposure limit
dBA	=	decibels, A-weighted scale	JSA	=	Job Safety Analysis	PID	=	photoionization detector
CDL	=	commercial driver's license	kV	=	kilovolt	PPE	=	personal protective equipment
CHSP	=	Corporate Health & Safety Plan	LEL/O_2	=	lower explosive limit/oxygen			
DOT	=	Department of Transportation	OSHA	=	Occupational Safety and Health Administration			

JACOBS

HSE Advisory 2006-17

June 12, 2006

Summer Hazards

Protect Yourself from the Sun

People who work outdoors should avoid prolonged exposure to sunshine because of the damaging effects of ultraviolet (UV) radiation. Repeated daily exposure to the sun increases an individual's risk of developing a number of health problems, including:

- Aging, wrinkling, and drying out of the skin
- Skin cancer
- Lip cancer.
- Damage to the eyes.

Fair-skinned individuals are at greatest risk. However, excessive exposure to the sun's UV rays can even be harmful if you have dark hair and dark skin.

Take Steps to Protect Yourself

Avoid sun exposure between 10:00 am and 3:00 pm, whenever possible. Solar radiation is strongest during these hours.

Limit your time in the sun. If you must work outside, take your breaks indoors, if possible. At least try to get into the shade for a few minutes every hour.

Liberally apply sunscreen lotion on the face, neck, hands, forearms, ears, and any other unprotected skin. Use a product with a sun protection factor (SPF) of 15 or higher.

Apply sunscreen before heading outdoors. Reapply lotion as required during the day. Sweating increases the need for frequent application.

Eye damage can result from prolonged exposure to the sun. Always wear sunglasses that filter at least 90 percent of the sun's ultraviolet rays.

Choose the right clothing to protect your body. Cover as much as possible. Lightweight, tightly woven shirts and long pants will block most of the sun's rays. Light-colored cotton is most comfortable under hot summer conditions. Garments should fit comfortably and not be too tight. Loose or floppy clothes should not be worn if there is any chance of being caught in machinery.

Wear Effective Headgear

Always wear a hat, which provides a shade to the ears, face, temples, and back of the neck. Standard baseball caps don't offer much protection against the sun. You need to add a neck shade to protect the back of the neck and the ears.

The best choices in headgear include pith helmets, just like the ones they wear in the jungle-and straw hats with extra wide brims.

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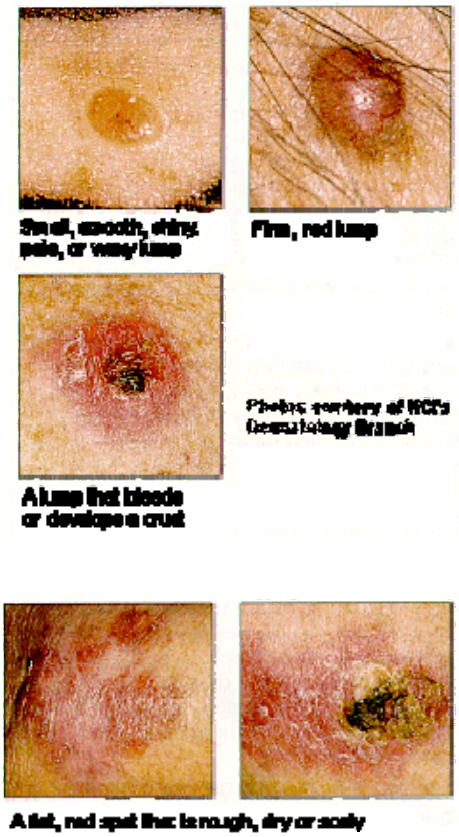
Learn to Recognize Skin Problems



Check skin regularly for signs of damage that could indicate a health problem. Take a close look at the top of your head, face, lips, and the tips of your ears. Use a full-length mirror for a "head-to-toe" inspection.

Look for changes in the size, shape, or color of moles. In particular, watch for:

- Irregular borders on moles (ragged, notched, or blurred edges).
- Moles that aren't symmetrical (one half doesn't match the other).
- Colors that aren't uniform throughout.
- Moles that are bigger than a pencil eraser.

Also be on the lookout for:

- Sores that bleed and don't heal.
- A change in the sensation of a mole, such as itchiness or pain
- Red patches or lumps. Don't overlook the top of the head.
- New moles.

Any of the above could be cancer. See your doctor, if any indication of any of these problems. When skin cancer is caught early, treatments are more effective.

Do:	**Do Not:**
• Wear a hat that completely shades the ears, face, and neck. • Use a sunscreen with SPF of 15 or greater. • Wear sunglasses to protect your eyes against ultraviolet rays.	• Consider a suntan to be "cool" or a sign of health. • Use sun lamps, tanning beds, or other artificial tanning devices. • Ignore skin changes that could be cancerous.

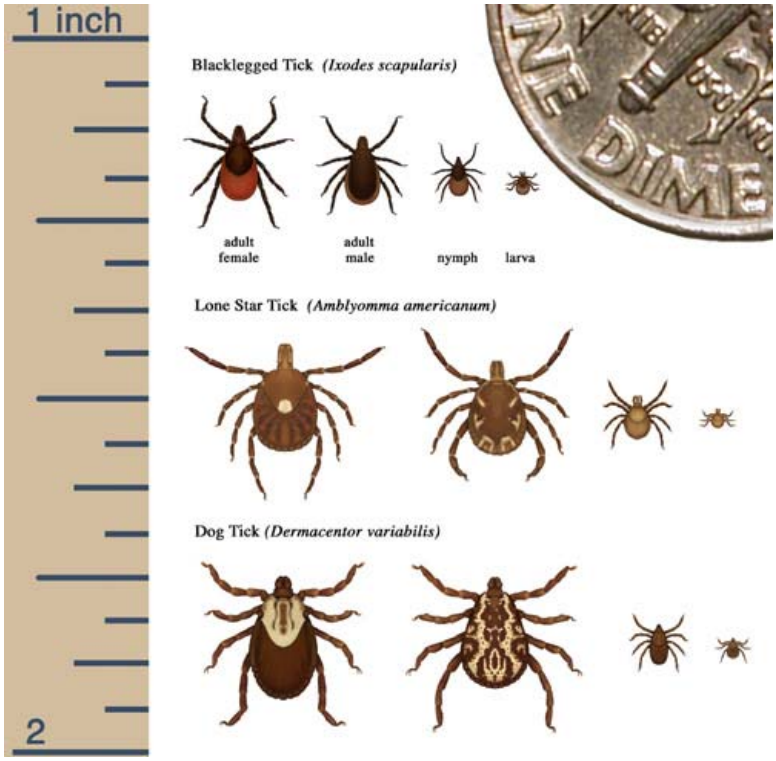
What Does OSHA Say About Sun Protection?

Sunburn — Section 5(a) (1) of the OSHA Act and 29 CFR 1926.28(a) of the OSHA standards require protection against all known and recognized hazards. Considering the potential for sunburn, a shirt is considered PPE in the same manner as goggles and respirators. An employer could be cited for failure to require and enforce the use of PPE including shirts as protection against “bareback” injuries.

Melanoma (skin cancer) — OSHA addresses worker exposure to the sun’s radiation indirectly under 29 CFR 1926.95(a) requiring employers to protect such employees against overexposure to the sun’s radiation.

Employee Training — While OSHA does not require training specifically on sun exposure, it does require training to recognize and avoid unsafe conditions at worksites and to understand the regulations applicable to the work environment to control or eliminate the hazards (Sec. 1926.21(b)(2) and Section 5(a)(1) of the OSHA Act).

Protect Yourself From Tick-Borne Diseases



Spring and summer are a time when many people spend more time outdoors, so it's important to remember how to prevent tick bites. Some common diseases transmitted by a tick bite include:

- Babesiosis – Rocky Mountain spotted fever
- Ehrlichiosis – Southern tick-associated rash illness
- Lyme Disease – Tick-borne relapsing fever
- Q-fever – Tularemia

Other less well-known tick-borne diseases include anaplasmosis, Colorado tick fever, and Powassan encephalitis.

Some species and some life stages of ticks are so small that they can be difficult to see, but all hungrily look for animals and, sometimes, people to bite. Depending on the species, you can find ticks in various environments, often in or near wooded areas. You may come into contact with ticks when walking through infested areas or by brushing up against infested vegetation (such as leaf litter or shrubs). Ticks also feed on mammals and birds, which play a role in maintaining ticks and the pathogens they carry.

Tick-borne diseases can occur worldwide. Fortunately, there are some simple steps you can take to protect yourself and your family:

Avoid tick-infested areas. Many local health departments, parks, and cooperative extension services have information about the areas most infested with ticks. If you are in a tick-infested area, walk in the center of the trails to avoid contact with vegetation.

Wear light-colored clothing, which allows you to see ticks that are crawling on your clothing. Tuck your pant legs into your socks so that ticks cannot crawl up inside of your pant legs. Some ticks can crawl down into shoes and are small enough to crawl through most socks.

Use chemical repellent with DEET and wear protective clothing. Repellents containing DEET (N, N-diethyl-m-toluamide) can be applied to the skin, but they protect for only a few hours before reapplication is necessary.

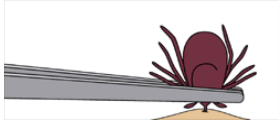
Check your body for ticks after being outdoors, even in your own yard. Conduct a body check upon return from potentially tick-infested areas by searching your entire body for ticks. Use a hand-held or full-length mirror to view all parts of your body and remove any tick you find. Check these parts of your body and your child's body for ticks.

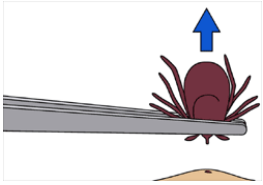
- Under the arms
- In and around the ears
- Inside belly button
- Back of the knees
- In and around the hair
- Between the legs
- Around the waist

Check your clothing and pets for ticks. Ticks may be carried into the house on clothing and pets. Both should be examined carefully, and any ticks that are found should be removed. Placing clothes into a dryer on high heat effectively kills ticks.

Safe Tick Removal

Early tick removal may reduce the risk of infection of some tick-borne diseases.





- Use fine-tipped tweezers and protect bare hands with a tissue or gloves to avoid contact with tick fluids.
- Grab the tick close to the skin. Do not twist or jerk the tick, as this may cause the mouthparts to break off and remain in the skin.
- Gently pull straight up until all parts of the tick are removed.
- After removing the tick, wash your hands with soap and water (or waterless alcohol-based hand rubs when soap is not available).
- Clean the tick bite with an antiseptic such as iodine scrub, rubbing alcohol, or water containing detergents.
- Watch for signs of illness such as rash or fever, and see a health care provider if these develop.

Protect Yourself from West Nile Virus

Mosquitoes transmit West Nile virus (WNV) to birds and other animals through their bite. The WNV normally cycles between mosquitoes and birds. However, people may also be infected if a WNV-infected mosquito bites them.

Most cases of WNV are probably not acquired in the workplace, but outdoor workers are at risk of WNV infection from the bite of an infected mosquito.

Workers should take the following steps when working at sites where mosquitoes may be actively biting:

- Wear long-sleeved shirts, long pants, and socks when possible
- Spray exposed skin with an insect repellent.
- Read and follow label directions for repellent use.

- Do not apply pump or aerosol products directly to the face. These products should be sprayed onto the hands and then carefully rubbed over the face, avoiding the eyes and mouth.
- DEET (N,N-diethyl-m-toluamide or N,N-diethyl-3-methylbenzamide) is the most effective insect repellent available. The more DEET a repellent contains the longer time it will be effective. DEET concentrations higher than 50% do not increase the length of protection.
- Use repellents at the lowest effective concentration.
- Do not apply repellents to cuts, wounds, or irritated skin.
- When needed, reapply repellents according to label directions.
- Wash treated skin with soap and water after returning indoors.
- Spray clothing with products containing DEET as mosquitoes may bite through thin clothing. Wash treated clothing before wearing it again. There is no need to apply repellent to skin that is protected by clothing.

This and other HSE Advisories are stored on JNet in the HSE Advisories folder.

Project-Specific Chemical Hazards

Potential Site Contaminant	Health Hazard Rating at This Site	Route of Entry	Symptoms/Effects of Exposure	PEL/TLV ppm or mg/m^3	IDLH ppm or mg/m^3
Benzene	Low	Inhalation Ingestion Contact Absorption	Irritation of eyes and skin, headache, vertigo, fatigue, giddiness, tremors, nausea, vomiting, liver injury	1 ppm (OSHA)	500 ppm (ACGIH)
Ethylbenzene	Low	Inhalation Ingestion Contact Absorption	Irritation of eyes or mucous membranes, flush face, dizziness, headache, potential liver damage	100 ppm	800 ppm (10% LEL)
Toluene	Low	Inhalation Ingestion Contact Absorption	Irritation of eyes and nose, fatigue, weakness, confusion, euphoria, dizziness, headache, liver and kidney damage	100 ppm (OSHA/NIOSH) 25 ppm (ACGIH)	300 ppm, ceiling
Xylenes	Low	Inhalation Ingestion Contact Absorption	Irritation of eyes and nose, dizziness, excitement, drowsiness, nausea, vomiting, abdominal pain, dermatitis	100 ppm	900 ppm
GRO	Low	Inhalation Ingestion Absorption	Irritation of eyes, skin, or mucous membranes, headache, fatigue, dizziness, nausea, possible liver and kidney damage	300 ppm	500 ppm, STEL
DRO	Low	Inhalation Ingestion Contact Absorption	Irritation of eyes, skin, or mucous membranes, headache, fatigue, dizziness, nausea, possible liver and kidney damage	NA	NA

Notes:

ACGIH = American Conference of Government Industrial Hygienists
CNS = central nervous system
FCC = fibers per cubic centimeter
GI = gastrointestinal
IDLH = immediately dangerous to life and health
mg/m^3 = milligrams per cubic meter
NA = not applicable
NIOSH = National Institute of Occupational Safety and Health
OSHA = Occupational Safety and Health Administration
PEL = permissible exposure limit
ppm = parts per million
REL = recommended exposure limit
STEL = Short-Term Exposure limit
TLV = threshold limit value
$\mu g/m^3$ = micrograms per cubic meter

Project Site Orientation and Training

1) Sign-in
2) Introduction
3) Project Review
   a) Project-wide
   b) Site-specific
4) Emergency Procedures
   a) Emergency numbers
   b) Emergency contact sheet (handout)
   c) Emergency routes (map)
   d) Earthquake event
      i) If outside, stay away from buildings, structures, trees, telephones and power poles and lines.
      ii) If inside, stay inside stay away from windows and get under desk or tables
      iii) If driving, do not drive under or over bridges, through tunnels, do not park under trees or overhanging objects. Locate an area clear of overhead hazards, park and remain in the vehicle
5) Personal protective equipment (PPE)
   a) Safety glasses
   b) Hard hats
   c) Vest
   d) Steel/composite toe boots
   e) Hearing protection
   f) Gloves
6) Hazard Communication
   a) Chemical inventory list
   b) Material Safety Data Sheets
   c) Physical Agent Data Sheets
   d) Labeling
   e) Training
7) Drug and Alcohol program
   a) Provide attendees with copies of the following:
      i) Drug and alcohol policy
      ii) Consent to drug and alcohol testing as a condition of employment
      iii) Consent to enter a rehabilitation treatment and counseling
8) Hazardous Waste Program
   a) HAZWOPER 1910.120 and 1926.65
   b) Hazardous substances
      i) Diesel-range organics
      ii) Gasoline-range organics
         (1) Benzene, toluene, ethylbenzene, and xylenes
      iii) Pesticides
         (1) DDT (dichlorodiphenyltrichloroethane)
      iv) PCBs (polychlorinated biphenyls)
      v) Residual-range organics

vi) Resource Conservation and Recovery Act Metals
vii) Semivolatile organic compounds
(1) Polycyclic aromatic hydrocarbons
viii) Volatile organic compounds
ix) Asbestos

9) PPE levels, D, C, B, A
10) Work Zones
11) Exclusion Zones
12) Clean Zone
13) Tailgate meeting
    a) Time (7am daily)
    b) Location (at our office)
14) Activity Hazard Analysis (AHA)
    a) Procedure
    b) Review of AHAs
15) Safe Plan of Action (SPA)
    a) Procedure
    b) Review of SPAs
16) Safety Observation Reports (SOR)
    a) Procedure
    b) Review submitted SORs
17) Wild animals
    a) Clear the area
        i) Evaluate and control the area before entry by determining areas of recent sightings through local Fish and Game, state troopers, etc.;
        ii) Conduct a site observation from an off-site elevated point, if possible;
        iii) Conduct a controlled walkthrough in the area;
        iv) Arrange briefing by a local specialist if possible, e. g., Fish and Game, etc.;
        v) Utilize appropriate noisemakers / deterrents.
    b) What to do if you encounter a bear
        i) Make yourself appear big
        ii) Use air horn and pepper spray
        iii) Make loud noise
        iv) Don't run
    c) What to do if you get attacked
        i) Surrender, fall to the ground and play dead
        ii) Lie flat on your stomach or curl up in a ball with you hands covering the back of your neck
        iii) Don't move until the bear has moved out of sight
        iv) Fight off the attack
    d) What do you do if you encounter a moose
        i) Give them space, at least 100 feet
        ii) If the moose appears to be alarmed (ears pinned back, raised hackles) back away slowly
        iii) Do not get between a mother and her calf (s)
    e) What to do if you get charged

        i) Keep a tree or other large object between you and the animal
        ii) If in an open area run away
18) Beyond Zero
    a) Review program
19) Project Safety agreement
    a) Sign agreement

ATTACHMENT A-3

Respiratory Protection Program

Jacobs HSEP 13.9f1, Rev 4.

JACOBS

Site-Specific Respiratory Protection Program

(HSEP 13.9f1, Rev 4)

Company Name: Jacobs Engineering, Group

Facility Name: Fort Wainwright, Alaska

Location: Fort Wainwright, Alaska

Program Administrator: Sarah Belway

Site HSE Supervisor: Ed Swegle or Pete Redmond

Date: 2010

Revision Number:

May 2010

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Site-specific Respiratory Protection Program

This Site-specific Respiratory Protection Program has been developed to define site-specific procedures for respirator use at this site.

This Program establishes acceptable HSE standards and procedures to be used when respiratory protection is required.

This United States Respiratory Protection Program has been developed in accordance with the provisions of 29 CFR 1910.134 and 29 CFR 1926.103.

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1.0 PROGRAM ADMINISTRATION

The Program Administrator is responsible for the overall administration of this Program and for required evaluations of the Program's effectiveness.

The Program Administrator has designated the Site HSE Supervisor to assist with administration of the Program and evaluation of the Program's effectiveness.

Program components include:

- Program administration,
- Medical evaluations of employees required to use respirators,
- Procedures for selecting respirators for use in the workplace,
- Fit testing procedures for tight-fitting respirators,
- Procedures for proper use of respirators in routine and reasonable foreseeable emergency situations,
- Training of respirator wearers in the respiratory hazards to which they are potentially exposed during routine and emergency situations,
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and maintaining respirators,
- Procedures to verify adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators, and
- Procedures for regularly evaluating the effectiveness of the program.

Regular program effectiveness observations should be documented through the use of Appendix C, Respiratory Protection Program Checklist. Safety Observation Reports (SORs) and Safety Evaluation Reports (SERs) can also be used to document Program effectiveness.

The Site Supervisor, in conjunction with the site HSE Supervisor, shall ensure that noted deficiencies are corrected as soon as possible.

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2.0 MEDICAL EVALUATION

A medical evaluation will be completed to determine the worker's ability to use a respirator, before the respirator wearer is fit tested or required to use the respirator in the workplace.

Based on the findings of the medical evaluation, a medical examination may also be required.

2.1. Medical Evaluation Procedures

2.1.1. A physician or other licensed health care professional (PLHCP) performs all respirator user medical evaluations. Each respirator wearer shall complete the Medical Questionnaire for Respirator Users (Appendix A), which is forwarded to a Jacobs-designated physician for a written determination of the worker's ability to use the selected respirator, under the defined working conditions.

2.1.2. All respirator users will complete the Medical Questionnaire for Respirator Users, Appendix A.

2.1.3. If a pre-employment or annual physical is required and conducted, it may be used to meet the requirements of this section, if it includes the same information as the Medical Questionnaire for Respirator Users, Appendix A.

2.1.4. The medical questionnaire and examinations are administered confidentially during the respirator wearer's normal work hours or at a time and place convenient to the worker. The medical questionnaire is also administered in a manner that ensures the respirator wearer understands its content.

2.1.5. The respirator wearer is also provided an opportunity to discuss the questionnaire and examination results with the PLHCP.

2.1.6. Any worker who refuses to be medically evaluated for respirator use will not be allowed to use a respirator.

2.2. Medical Examinations

2.2.1. A medical examination is provided for any worker who gives a positive response to any of Questions 1 through 8 in Section 2 of the Medical Questionnaire for Respirator Users, Appendix A, or whose initial medical examination demonstrates the need for a follow-up medical examination.

The medical examination shall include any medical tests, consultations, or diagnostic procedures that the PLHCP deems necessary to make final determination on the respirator wearer's ability to use a respirator.

2.3. Supplemental Information for the PLHCP

2.3.1. Supplemental information concerning the specific type(s) of respirator to be used and the anticipated working conditions is provided to the PLHCP, with each Medical Questionnaire for Respirator Users, Appendix A, before the PLHCP makes a recommendation concerning a worker's ability to use a respirator.

If requested by the PLHCP, a copy of the OSHA Respiratory Protection standard is to be provided to the PLHCP by the site HSE supervisor.

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2.4. Medical Recommendation

2.4.1. Following the evaluation and/or examination, a written recommendation regarding the worker's ability to use the respirator must be provided by the PLHCP. The recommendation shall provide the following information:

- Any limitations on respirator use related to the medical condition of the worker or to the workplace conditions in which the respirator will be used, including whether or not the worker is medically able to use the respirator;
- The need, if any, for follow-up medical evaluations; and
- A statement that the PLHCP has provided the worker with a copy of the PLHCP's written recommendation.

2.4.2. For negative pressure respirator work, if the PLHCP finds a medical condition that may place the worker's health at increased risk, a powered air-purifying respirator (PAPR) can be provided if the PLHCP determines that the worker can use the PAPR.

2.4.3. If a worker is wearing a PAPR because of medical restrictions and if a subsequent medical evaluation finds that the worker is medically able to use a negative pressure respirator, then there is no longer a requirement to provide a PAPR.

3.0 ADDITIONAL MEDICAL EVALUATIONS AND/OR EXAMINATIONS

3.1.1. An additional medical evaluation and/or examination shall be conducted if:

- A worker reports medical signs or symptoms that are related to ability to use a respirator;
- A PLHCP, supervisor, Site HSE Supervisor, or the Respirator Program Administrator determines that a worker needs to be reevaluated;
- Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for worker reevaluation; or
- A change occurs in workplace conditions, e.g., physical work effort, protective clothing, temperature, that may result in a substantial increase in the physiological burden placed on a worker.

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4.0 RESPIRATOR SELECTION

This section presents the types of respirators available on-site and the criteria and procedure to be used to determine respiratory protection needed for specific tasks.

4.1.1. Criteria for Respirator Selection

4.1.2. The respirator type that is selected for each work scenario shall be appropriate for the chemical state and physical form of the contaminant. The respirator type is to be chosen using the selection logic presented in Appendix D. The parameters used making the selection are to be documented on Form 3-1, Respirator Selection Worksheet, or equivalent.

4.1.3. For each type of task for which respiratory protection is required, the selection sequence in Appendix D shall be addressed. Task examples include permit-required confined space entry, first line breaks, process valve maintenance activities, painting, cleaning, or degreasing with solvents, etc.

For routine tasks, where conditions or hazards do not change, a single respiratory hazard selection evaluation is generally sufficient. If hazards, work sequences, or conditions change, the respirator selection criteria must be re-evaluated.

4.2. Particulate Exposure Respirator Selection

4.2.1. For particulate exposures, the particulate cartridge Types N, R, and P refer to standard performance designations established by NIOSH.

- N refers to no oil exposure and 95%, 99%, or 100% (99.97%) filter efficiency.
- R refers to some oil up to eight hours and 95%, 99%, or 100% (99.97%) filter efficiency.
- P cartridge types can be used with oil exposure with no time restriction and 95%, 99%, or 100% (99.97%) filter efficiency. Individual manufactures may have different designations. To aid in decision-making on the appropriate type of respirator, individual manufacturer literature will also be used.

4.3. Assigned Protection Factors (APFs)

4.3.1. Assigned Protection Factors (APFs) as specified by OSHA and NIOSH are presented in Tables 1-3 in Appendix D.

4.3.2. The lower of the two factors for each respirator and contaminant type shall be used in conjunction with exposure limits and workplace concentrations to assess the appropriateness of the respirator.

4.3.3. Fit factors determined for an individual by quantitative fit testing or other methods are not to be substituted for the APF provided in tables. The fit factor determined through fit testing must be greater than the APF; otherwise the respirator is not to be used.

4.4. 3.4 Filtering Facepiece Respirator

4.4.1. Filtering facepiece respirators (dust mask) are a class of air-purifying halfmask respirator. The APF of the filtering facepiece respirators are equal to that for the air-purifying half-mask respirator. Filtering facepiece respirators are not to be

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used for contaminants with substance-specific standards (as listed in 29 CFR 1910.1001-1450, Subpart Z) or to protect against class A-1 carcinogens (as listed in American Conference of Governmental Hygienists TLVs and BEIs, 2006). This respirator provides protection against low levels of certain dusts and/or fumes, but does not supply oxygen, and shall not be used in an oxygen deficient atmosphere. It is not to be used in any atmosphere that is immediately dangerous to life or health.

4.4.2. All requirements that apply to air-purifying respirators apply to filtering facepiece respirators when used for protection against contaminants with workplace concentrations greater than the respective action levels.

4.5. Cartridge Change Schedule

4.5.1. For each task involving the use of a cartridge respirator, a respirator cartridge change schedule shall be provided.

4.5.2. Two options are available for those jobs involving vapor or gas exposures.

- The cartridge change-out schedule can be based on end-of-service-life indicator (ESLI) on the cartridge. There are ESLIs for mercury vapor cartridges and carbon monoxide, chlorine, ethylene oxide, and hydrogen sulfide canisters. There is also an OSHA contaminant-specific cartridge and canister change schedule for benzene, acrylonitrile, formaldehyde, methylenedianiline and 1,3 butadine. Refer to the contaminant specific regulation.
- Or, manufacturers' change schedules may be used. If software calculations are used, a copy of the calculation printout must be attached to the Respirator Selection Worksheet, Form 3-1. The 3M cartridge change schedule is located http://www.3m.com/occsafety/html/software.html. The MSA cartridge life expectancy calculator is http://www.msanet.com/msanorthamerica/msaunitedstates/cartlife/index.html.

5.0 IMMEDIATELY DANGEROUS TO LIFE OR HEALTH ATMOSPHERES

5.1.1. Worker exposure to any of the following Immediately Dangerous To Life Or Health (IDLH) task conditions shall be avoided.

- Oxygen concentrations less than 19.5% or greater than 23.5%, or
- Atmospheres greater than 1% of the Lower Explosive Limit, or
- Atmospheres that are potentially Immediately Dangerous to Life or Health (IDLH), or
- Unprotected exposure to known human carcinogens, mutagens, or teratogens, or
- Unprotected exposure to known chemical sensitizers.

5.1.2. When work in these environments seems to be absolutely necessary, the Project Manager shall appeal to the appropriate Senior Operations Manager and Senior HSE Manager for written approval to proceed and specific safe work procedures.

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5.1.3. For tasks for which there is the *potential* for IDLH atmospheres, the respirator must be a full facepiece supplied-air respirator in positive pressure mode and 5-minute (minimum) escape cylinder.

Examples of jobs that have the *potential* to become IDLH:

- Breaking into flare lines,
- Initial opening of all H2S or CO equipment vessels and lines,
- Confined space entry work where inert gas, e.g., nitrogen purge, may be present, or
- Working in certain process or sanitary sewers.

In *potential* IDLH atmospheres, ongoing air monitoring shall be conducted to verify contaminant concentrations and to detect changes.

5.1.4. For work in atmosphere with the *potential* for IDLH conditions, trained rescue standby person(s) located outside the *potential* IDLH area are posted and equipped with an SCBA or supplied-air respirator on separate supply. This includes work in confined spaces that require supplied-air respiratory protection.

5.1.5. Standby persons will be equipped with:

- Continuous-flow or pressure-demand SCBAs or a continuous flow or pressure-demand, supplied-air respirator with a 5-minute (minimum) escape air cylinder and
- Appropriate retrieval equipment (harnesses, wristlets, anklets) for removing an employee, who enters the hazardous atmosphere.

5.1.6. Retrieval equipment must be used unless it would increase the overall risk of rescue. Situations may exist in which retrieval lines would pose an entanglement problem, especially if airlines and/or electrical cords are present.

Verify that visual or signal line communication is maintained between personnel in the *potential* IDLH atmosphere and personnel located outside the *potential* IDLH atmosphere.

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Form 3-1, Respirator Selection Worksheet (Example)

Task Description	Potential IDLH (Y/N)	Major Contaminant (separate line for each)	Exposure Limit (e.g., PEL Limit & Units)	Estimated Concentration & Units	Type of Respirator	MUC	Cartridge Change Schedule
Example: Exterior Painting of tank 301	N	Benzene	PEL, 1 ppm, STEL, 5 ppm	0 – 1 ppm	Air purifying, full facepiece	10	
Example continued: ditto	N	Toulene	PEL 200 ppm	10 – 50 ppm	Air purifying, full facepiece	10	

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6.0 FIT TESTING REQUIREMENTS

Respirator fit testing is performed in accordance with the fit test protocols and procedures described below.

6.1. General Fit Test Protocols

The Program Administrator will designate qualified persons to conduct qualitative and/or quantitative fit tests.

6.1.1. The following fit testing requirements will be met.

- Each respirator wearer will be fit-tested on each, specific (model, size) respirator worn prior to initial use and annually thereafter.
- Spectacles (glasses), goggles, faceshields, or welding helmets will be worn in a manner that does not interfere with the facepiece seal of the respirator.
- Contact lenses (soft and gas permeable only) may be worn with a full-facepiece respirator. However, some clients have policies, which prohibit their use on their sites.
- Respirator wearers shall be clean-shaven. Facial hair shall not interfere with the sealing surface of the facepiece and the face or interfere with valve function.
- User seal checks are performed each time the respirator is donned.

Fit tests shall be documented and retained until the next fit test is administered.

Fit test Form 4-1, Qualitative Respirator Fit-Test Record, and Form 4-2, Quantitative Respirator Fit-Test Record, may be used to document the fit test.

6.1.2. The respirator wearer shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

6.1.3. Prior to the selection process, the respirator wearer shall be shown how to don a respirator, how it should be positioned on the face, how to set strap tension, and how to determine an acceptable fit.

A mirror will be available to assist the respirator wearer in evaluating the fit and positioning of the respirator. This instruction does not constitute the respirator wearer's formal training on respirator use, because it is only a review.

6.1.4. Respirator wearers shall be informed that they are being asked to select the respirator that provides the most acceptable fit.

6.1.5. The respirator wearer shall be instructed to hold each chosen facepiece up to the face and eliminate those that obviously do not give an acceptable fit. The more acceptable facepieces are noted in case the one selected proves unacceptable.

6.1.6. The most comfortable facepiece is donned and worn at least five minutes to assess comfort. If the respirator wearer is not familiar with using a particular respirator, then he/she shall be directed to don the facepiece several times and to adjust the straps each time to become adept at setting proper tension on the straps.

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6.1.7. Assessment of comfort shall include a review of the following points with the respirator wearer.

- Position of the respirator on the nose
- Room for eye protection
- Room to talk
- Position of respirator on face and cheeks

6.1.8. The following criteria shall be used to help determine the respirator fit.

- Chin properly placed
- Adequate strap tension, not overly tightened
- Fit across nose bridge
- Respirator of proper size to span distance from nose to chin
- Tendency of respirator to slip
- Self-observation in mirror to evaluate fit and respirator position

6.1.9. The respirator wearer shall conduct negative and positive pressure user seal checks each time the respirator is donned.

Before conducting the negative and positive pressure user seal checks, the respirator wearer shall be told to seat the respirator on the face by moving the head from side-to-side and up and down slowly, while taking in a few slow deep breaths.

Another facepiece shall be selected and retested if the respirator wearer fails the user seal check.

The test shall not be conducted if there is any hair growth between the skin and the facepiece-sealing surface, such as stubble beard growth, beard, mustache, or sideburns, which cross the respirator-sealing surface.

Any type of apparel or obstruction, which interferes with a satisfactory fit, shall be altered or removed.

6.1.10. If the respirator wearer exhibits difficulty in breathing during the tests, he or she shall be referred to a physician or other PLHCP for a medical re-evaluation to determine whether they can wear a respirator while performing their duties.

6.1.11. If the respirator wearer finds the fit of the respirator unacceptable, the respirator wearer shall be given the opportunity to select a different respirator and to be retested.

6.1.12. A tight fitting powered air purifying respirator (PAPR) can be fit tested by not turning the fan motor on.

6.1.13. Exercise Regimen

Prior to the commencement of the fit test, the respirator wearer shall be given a description of the fit test and the respirator wearer's responsibilities during the test procedure.

The description of the process shall include a description of the test exercises that the respirator wearer will be performing.

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The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.

The fit test shall be performed while the respirator wearer is wearing any applicable safety equipment that may be worn during actual respirator use, which could interfere with respirator fit.

6.1.14. Test Exercises

The following test exercises are performed for all fit testing methods prescribed in this procedure, except for the Control Negative Pressure (CNP) method. A separate fit testing exercise regimen is contained in the CNP protocol. The respirator wearer shall perform exercises, in the test environment, in the following manner.

- Normal Breathing

  In a normal standing position, without talking, the respirator wearer shall breathe normally.

- Deep Breathing

  In a normal standing position, the respirator wearer shall breathe slowly and deeply, taking caution so as not to hyperventilate.

- Turning Head Side To Side

  Standing in place, respirator wearer shall slowly turn his or her head from side to side between the extreme positions on each side.

  The head shall be held at each extreme momentarily so the respirator wearer can inhale at each side.

- Moving Head Up And Down

  Standing in place, the respirator wearer shall slowly move his or her head up and down.

  The respirator wearer shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).

- Talking

  The respirator wearer shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The respirator wearer can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

- Rainbow Passage

  “When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.”

- Grimace

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The respirator wearer shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT.)

- Bending Over

  The respirator wearers shall bend at the waist as if they were to touch their toes. Jogging in place shall be substituted for this exercise in those test environments, such as shroud type QLFT units, which do not permit bending over at the waist.

- Normal Breathing

  In a normal standing position, without talking, the respirator wearer shall breathe normally.

Each test exercise shall be performed for one minute except for the grimace exercise, which shall be performed for 15 seconds.

The respirator wearer shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

6.2. Qualitative Fit Test Requirements

6.2.1. Negative-pressure air purifying respirators that will be worn in concentrations that are equal to or less than 10 times the PEL may be fit tested using qualitative fit test requirements (QLFT). (QLFT may only be used to fit negative pressure air purifying respirators that allow for a fit factor of 100 or less.)

QLFT is not to be used to test for respirator fit if the site contaminants being protected against have a substance-specific standard or are class A1 carcinogens

6.2.2. The person administering the QLFT will be able to prepare test solutions, calibrate equipment, and perform tests properly; recognize invalid tests; and ensure that test equipment is in proper working order.

6.2.3. The QLFT equipment is to be kept clean and well maintained so as to operate within the parameters for which it was designed.

6.3. Quantitative Fit Test Requirements

6.3.1. The following quantitative fit test (QNFT) methods are acceptable.

Quantitative fit testing using a non-hazardous test aerosol (such as corn oil, polyethylene glycol 400 [PEG 400], di-2-ethyl hexyl sebacate [DEHS], or sodium chloride) generated in a test chamber, and employing instrumentation to quantify the fit of the respirator; The QNFT is to be used for fit factors greater than or equal to 100 for tight fitting half-facepiece or greater or equal to 500 for tight fitting full facepiece respirators.

If the site contaminants being protected against have a substance-specific standard or are class A1 carcinogens, it is required that the QNFT be used to test for respirator fit

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Quantitative fit testing using ambient aerosol as the test agent and appropriate instrumentation (condensation nuclei counter) to quantify the respirator fit;

Quantitative fit testing using controlled negative pressure and appropriate instrumentation to measure the volumetric leak rate of a facepiece to quantify the respirator fit.

6.3.2. QNFT Procedure

- The person administering the QNFT will be able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly, and ensure that test equipment is in proper working order.
- The QNFT equipment must be kept clean, maintained, and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.
- Once a respirator has been modified or altered with a fit test probe, the facepiece will only be used for fit testing. When the facepiece is returned to the original NIOSH tested-and-certified configuration, the facepiece may be returned to service.

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Form 4-1, Qualitative Respirator Fit-Test Record

Name: (print) _____ Respirator User Identification Number: _____

Date: _____ Project: _____ Location: _____

Personal Use Conditions/Limitations: The following personal use conditions may affect the prospective respirator wearer's ability to obtain a proper face-seal, properly wear the respirator in the work environment, or may be prohibited by HSEP 13.9, Respiratory Protection Program.

Check all that apply:

_____ None _____ Beard/Facial Hair _____ Dentures

_____ Prescription Eyeglasses _____ Contact Lenses

Scars/Other: Explain:_____

Fit-Test Record

Respirator (Make, Model and Size): _____

Qualitative Fit-Testing Agent:

_____ Bitrex™ (Denatonium Benzoate)

_____ Isoamyl Acetate (Banana Oil)

_____ Irritant Smoke (Stannic Chloride)

_____ Saccharin Solution

Fit-Test Results

_____ **PASS:** Fit-Test Agent Not Detected Inside the Facepiece by Respirator Wearer (Worker's signature is required.)

I have been fit-tested to assure proper respirator size, as well as facepiece to face seal. I have been instructed in the proper use, care and limitations of the respirator listed above. I have demonstrated the proper donning of this equipment according to training received.

_____ **FAIL:** Fit-Test Agent Detected Inside the Facepiece by Fit-Tested Worker.

Worker must not wear the respirator until a successful (passing) fit-test is obtained. This test is ended. Do not have this form signed.

Person Performing Fit-Test: _____

Respirator Wearer's Signature: _____

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Form 4-2, Quantitative Respirator Fit-Test Record

Name: (print) _____ Respirator User Identification Number: _____

Date: _____ Project: _____ Location: _____

Personal Use Conditions/Limitations: The following personal use conditions may affect the prospective respirator wearer's ability to obtain a proper face-seal, properly wear the respirator in the work environment, or may be prohibited by HSEP 13.9, Respiratory Protection Program.

Check all that apply:

_____ None _____ Beard/Facial Hair _____ Dentures

_____ Prescription Eyeglasses _____ Contact Lenses

Scars/Other: Explain:_____

Fit-Test Record

Respirator (Make, Model and Size): _____

Quantitative Fit-Testing

Ambient Aerosol Condensation Nuclei Counter (Portacount): ☐ Yes ☐ No

Controlled Negative Pressure: ☐ Yes ☐ No

Fit-Test Results

_____ **PASS:** I have been fit-tested to assure proper respirator size, as well as facepiece to face seal. I have been instructed in the proper use, care and limitations of the respirator listed above. I have demonstrated the proper donning of this equipment according to training received.

_____ **FAIL:** Worker must not wear the respirator until a successful (passing) fit-test is obtained. This test is ended. Do not have this form signed.

Person Performing Fit-Test: _____

Respirator Wearer's Signature: _____

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7.0 PROPER RESPIRATOR USE

7.1. General Requirements

7.1.1. All respirators, filters, cartridges, and components used at this site shall be certified by NIOSH (a U.S. certification) and shall be worn in accordance with all manufacturers' instructions.

7.1.2. Respirators shall be used only for the purpose intended and shall not be modified in any way.

7.1.3. Tight-fitting facepiece respirators are not to be worn by workers, who have any condition that interferes with the face-to-facepiece seal or valve function (such as facial hair).

7.1.4. If a worker wears corrective glasses or goggles or other personal protective equipment, the Site HSE Supervisor shall ensure that such equipment is worn in a manner that does not interfere with the seal of the facepiece to the face of the user.

7.1.5. For all tight-fitting respirators, a user seal check is conducted each time the respirator is donned. Tight-fitting respirators that cannot be seal-checked are not acceptable for use.

7.1.6. Site management shall ensure appropriate surveillance of work area conditions and degree of worker exposure or stress. When there is a change in work area conditions or degree of worker exposure or stress that may affect respirator effectiveness, the Site HSE Supervisor shall reevaluate the continued effectiveness of the respirator.

The worker's Supervisor will ensure that workers can leave the area:

- To wash their faces and respirator facepieces as necessary to prevent eye or skin irritation associated with respirator use;
- If they detect vapor or gas breakthrough, changes in breathing resistance or leakage of the facepiece; or
- To replace the respirator or the filter, cartridge, or canister elements, when vapor or gas breakthrough is detected, changes in breathing resistance occurs, or when there is leakage of the facepiece. The respirator will be replaced or repaired before allowing the worker to return to the work area.

7.1.7. Prior to use, the following items are visually inspected, as appropriate:

- Tightness of connections
- Condition of facepiece
- Head straps
- Valves and connecting tube
- Cartridge/Canisters
- Elastic parts (for pliability)
- Respirator function

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7.2. Procedures for Using the Respirator

Inspect the respirator before use to verify that all parts are present and in good working order.

Follow the manufacturer's instructions when donning and adjusting the respirator straps. Some disposable single-use respirators utilize elastic straps and adjustable buckles.

If detection of vapor inside the facepiece (by smell or otherwise) or difficult breathing is experienced, workers are trained to leave the area immediately, report the condition to their supervisor, and provide the respirator to the Site HSE Supervisor for inspection.

7.3. Particulate Filter Respirator

Particulate Filter Respirators provide protection against low levels of certain dusts and/or fumes (Appendix D Table 1). This respirator does not supply oxygen and shall not be used in an oxygen deficient atmosphere. These respirators cannot be used in any atmosphere that is immediately dangerous to life or health.

7.4. Chemical Cartridge Respirator/Air Purifying Respirator (Non-IDLH)

7.4.1. Limitations

This respirator does not supply oxygen and shall not be used in an oxygen deficient atmosphere. These respirators cannot be used in any atmosphere that is immediately dangerous to life or health. Workers are trained to leave the area immediately if an odor is detected inside the respirator.

7.4.2. These respirators provide protection against low levels of certain gases and vapors. Respirator canisters or cartridges shall be specifically selected for concentrations of gases and/or vapors that may be encountered (Appendix D Table 2)

7.4.3. Air purifying respirators (APRs) shall not be used for rescue or emergency work.

7.4.4. Cartridges are replaced in accordance with cartridge change schedule stated in the Respirator Selection Worksheet, Form 3-1, or if workers can smell or otherwise detect vapors inside the facepiece, or if difficulty breathing is experienced, the cartridges will be changed.

7.5. 5.5 Airline Respirator

7.5.1. Limitations

An airline respirator shall not be used in any atmosphere that is immediately dangerous to life or health, including an oxygen deficient atmosphere, unless equipped with a self-contained escape (5, 15, or 30 minute) air cylinder.

7.5.2. Procedures for Using Airline Respirators

- Workers shall inspect all equipment before each use to assure all parts are present and in good working order.
- If using an escape air cylinder, user will ensure that air supply is of sufficient capacity (5, 15, or 30 minute) to permit safe escape from work area.
- The worker will then follow the manufacturer's instruction to select correct length of airline hose.

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- Connect hose to regulator and air supply. (The maximum air pressure at the point of attachment of hose to air supply is determined by manufacturer's instructions.)
- The worker will then don the respirator and adjust to obtain a snug but comfortable fit and perform a user seal check.
- Next the worker shall connect the respirator to the regulator and adjust the airflow in the facepiece.
- In case of respirator malfunction, workers are trained to leave the area immediately, report the condition to their supervisor.

7.5.3. Procedures for Using Airline Respirators with Compressors

- If using a compressor, the worker and their supervisor, or the Site HSE Supervisor, will verify that the compressor's air intake is in an uncontaminated area. Air-purifying filters and/or sorbents shall be used if necessary to assure Grade D quality air. (Refer to the section below related to Breathing Air Quality.)
- Record on a tag, which will be maintained at the compressor, the most recent filter change date and the signature of the person authorized to perform the filter change.
- If the compressor is oil-lubricated, it shall be equipped with high temperature and carbon monoxide alarms that are both audible and visual.
- For compressors that are not oil-lubricated, ensure that carbon monoxide levels in the breathing air do not exceed 10 ppm.
- In-line air purifying sorbent filters with water and oil traps shall be installed between the compressor and user(s).

7.6. Self-Contained Breathing Apparatus (SCBA)

7.6.1. SCBAs are provided primarily for use in emergency response when spills, leaks, or other circumstances present respiratory hazards.

7.6.2. Grade D breathing air quality cylinders shall be stored and maintained in a fully charged state and shall be recharged if the pressure falls to 90% of the manufacturer's recommended pressure level.

7.6.3. Limitations

Air supply is generally rated for 30 minutes.

Heavy exertion and excitement will increase the breathing rate and deplete the air supply sooner. Workers are trained to leave the area when the alarm indicates low air supply.

7.6.4. Procedures for Using the Equipment

Workers shall inspect the unit before each use and ensure a sufficient air supply (at or above 90%) and that the regulator and low pressure warning devices function properly.

The user will then open the cylinder air supply valve.

Next, don unit so cylinder is on the user's back with the valve pointing down and engage and tighten the harness.

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Then the worker will don the respirator and adjust to obtain a snug but comfortable fit and perform a user seal check.

The worker will then connect the facepiece hose to the regulator.

Workers are trained to use the bypass only in the event of regulator failure and to leave area immediately, whenever the low-pressure alarm sounds.

7.6.5. Care and maintenance of SCBAs is performed by a qualified person.

7.6.6. Bottles are refilled only with breathing air that meets the specifications for Grade D Breathing Air in Compressed Gas Association Commodity Specification G-7.1-1989. Grade D has an oxygen content of 19.5-23.5%, condensed hydrocarbon of 5 mg/m^3 or less, carbon monoxide of 10 ppm or less, carbon dioxide of 1,000 ppm or less, and lack of noticeable odor.

7.6.7. SCBA emergency use respirators are kept accessible to the work area and stored in compartments or in covers that are clearly marked as containing emergency respirators.

7.6.8. All respirators maintained for use in emergency situations shall be inspected at least monthly and in accordance with the manufacturer's recommendations, and shall be checked for proper function before and after each use.

7.6.9. Emergency escape-only respirators shall be inspected before being carried into the workplace for use.

7.6.10. For respirators maintained for emergency use, the Site HSE Supervisor or Supervisor will assure the presence of a tag or label containing the date the inspection was performed, the name (or signature) of the person who made the inspection, the findings, required remedial action, and a serial number or other means of identifying the inspected respirator.

This information is provided on a tag or label that is attached to the storage compartment for the respirator, is kept with the respirator, or is included in inspection reports stored as paper or electronic files. This information shall be maintained until replaced following a subsequent inspection.

7.7. Breathing Air Quality

7.7.1. Air supply shall be free of harmful quantities of contaminants, and shall meet specification for Grade D Breathing Air as described in the Compressed Gas Association publication G-7 1988, Compressed Air for Human Respiration.

7.7.2. Compressed oxygen shall not be used in supplied-air respirators or in open circuit self-contained breathing apparatus.

7.7.3. Breathing air may be supplied to respirators from cylinders or air compressors. Cylinders must have a dated label or sticker affixed to them indicating "Certified Breathing Air" or equivalent.

7.7.4. Workers are instructed to stop work immediately if they experience difficulty in breathing, smell any unusual odors, or experience an ill feeling such as a headache or upset stomach, etc. and report the situation to their Supervisor.

7.8. User Seal Checks

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Workers shall test the seal of their respirator to their face prior to using by performing both negative-pressure and positive-pressure user seal checks according to the following guidelines.

7.8.1. Negative-Pressure Seal Check Procedure

Close inlet openings of the respirator, canister(s), cartridge(s), or filter(s) by covering with palm of hands, by replacing the inlet seal on the canister(s), or by squeezing a breathing tube or blocking its inlet so as not to allow the passage of air.

Inhale gently and hold breath for ten seconds.

Verify that a satisfactory fit has been achieved by assuring that the facepiece collapses slightly and no inward leakage of air into facepiece is detected.

If inward leakage is detected the respirator wearer will reposition the facepiece and/or straps and repeat this sequence until a satisfactory fit check is obtained.

7.8.2. Positive-Pressure Seal Check Procedure

Close exhalation valve or breathing tube or both.

Exhale gently.

Verify that a satisfactory fit has been achieved by assuring that a slight buildup of positive pressure is generated inside the facepiece without detection of outward leakage between the sealing surface and the face.

If outward leakage is detected, the respirator wearer will reposition the facepiece and/or straps and repeat this sequence until a satisfactory seal check is obtained.

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8.0 TRAINING

Training is provided to all workers who are required to use respirators, prior to them using the respirator in the workplace.

8.1. Training Content

The training is comprehensive and is to be conducted on an annual basis or more often, if necessary. At a minimum, the training includes the following topics:

- The nature of the hazard(s), including physical properties, odor characteristics, physiological effects on the body, and known concentration levels of toxic material or airborne radioactive level;
- How improper fit, usage, or maintenance can compromise the protective effect of the respirator;
- The physical characteristics, functional capabilities, and limitations of various types of respirators;
- How to use the respirator in emergency situations;
- How to inspect, don, doff, use, and check the seal of the respirator;
- Procedures for maintenance and storage of the respirator; and
- How to recognize the medical signs and symptoms that may limit or prevent the effective use of respirators.

8.2. Training Documentation

Training documentation is maintained for all workers who are assigned work that requires the use of a respirator. (Form 6-1 may be used to document training.)

Re-training is administered annually and when the following situations occur:

- Changes in the workplace or the type of respirator render previous training obsolete;
- Inadequacies in the respirator wearer's knowledge or use of the respirator indicate that the worker has not retained the requisite understanding or skill; or
- Situations arise in which retraining appears necessary to ensure safe respirator use.

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Form 6-1, Air-Supplied Respirator Training

Name: (print) _____ Respirator User Identification Number: _____

Date: _____ Project: _____ Location: _____

I Have Been Trained and Understand	APR	SAR
	(√ as applicable)	
The workplace hazards		
Respirator capabilities and limitations		
How improper fit, usage, and maintenance can compromise respirator		
How to use the respirator		
How to use the respirator in an emergency		
How to don, doff, and seal check the respirator		
Cartridge change schedule (APR only)		
How to maintain and store the respirator		
The medical signs & symptoms that may limit effective use of respirator		

APR=Air Purifying Respirator
SAR=Supplied Air Respirator

Respirator Description	
Type (APR/SAR)	
Manufacturer	
Model	
Size	
Type (APR/SAR)	
Manufacturer	
Model	
Size	
Type (APR/SAR)	
Manufacturer	
Model	
Size	
Type (APR/SAR)	
Manufacturer	
Model	
Size	

Person Performing Training: _____

Respirator Wearer's Signature: _____

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9.0 RESPIRATOR MAINTENANCE

9.1. Cleaning and Sanitization

The following provides guidelines for cleaning and sanitizing respirators. Recommendations provided by the equipment manufacturer may be used provided the procedures are as effective as those listed here.

9.1.1. Respirators will be cleaned and sanitized before being issued. Commercial wipes may also be used by the wearer to clean his/her respirator between uses during the work shift.

9.1.2. Cleaning, disinfecting, and storage of respirators shall be performed as follows:

- Remove filters, cartridges, or canisters. Disassemble facepiece by removing speaking diaphragms, demand- and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.
- Wash components in warm (43º C [110º F] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
- Rinse components thoroughly in clean, warm (43º C [110º F] maximum), preferably running water. Drain.
- When the cleaner used does not contain a disinfecting agent, respirator components will be immersed for two minutes in one of the following:
  - Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43º C (110º F);
  - Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of water at 43º C (110º F); or
  - Other commercially available cleansers of equivalent disinfectant quality when used as directed, as recommended or approved by the respirator manufacturer.
- Rinse components thoroughly in clean, warm (43º C [110º F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.
- Components are hand-dried with a clean lint-free cloth or air-dried.
- Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.
- Test the respirator to verify that all components work properly.

9.1.3. Chemical cartridges and mechanical filters shall be discarded and replaced as defined in Section 3.0 of this Program.

9.2. Inspecting and Storing

Respirators are stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, and they shall be packed or stored to prevent deformation of the facepiece and exhalation valve.

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Inspection and replacement of respirator parts shall be performed according to the following:

9.2.1. All respirators must be inspected by the wearer prior to each use.

9.2.2. Storage shall be in a convenient, clean, and sanitary location. At a minimum, respirators shall be stored in a protective bag.

9.2.3. SCBAs shall be inspected monthly and after each use by a qualified person. The wearer shall self-inspect the SCBA prior to each use. SCBA inspections shall include checking cylinder pressure and units shall be brought to the rated pressure. Units shall be recharged after each use.

9.2.4. Airline respirators shall receive a functional check before and after each use.

9.2.5. Replacement of parts shall be made only with those specifically designed for the respiratory device used. All maintenance and repair shall be performed only by appropriately trained persons and shall be documented.

For some respiratory equipment's maintenance and repairs, e.g., SCBAs, escape units, the manufacturer will provide training certification for the person doing the maintenance or repairs.

9.3. Repairing, Discarding, and Maintaining Respirators

9.3.1. Defective equipment shall be immediately removed from service and repaired prior to use. Repairs shall be made only by an appropriately trained, designated qualified person, and only with the manufacturer's approved replacement parts.

9.3.2. Defective equipment not repaired immediately shall be tagged:

Danger — Do Not Use – Defective

9.3.3. Specific defect(s) will be listed on the tag.

9.3.4. Users may self-perform repairs only if they have been appropriately trained and approved parts are available. Reducing and admission valves, regulators, and alarms for air-supplied respirators shall only be repaired by the manufacturer or a certified technician trained by the manufacturer.

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10.0 VOLUNTARY RESPIRATOR USE REQUIREMENTS

Workers may voluntarily use a respirator with the approval of their Supervisor. The Site HSE Supervisor and Supervisor will evaluate requests for voluntary respirator use to determine if the worker can perform the activities safely and respirator use will not in itself create a hazard.

If it is determined that voluntary use will be permitted, a copy of Appendix B of this program shall be provided to the worker.

A medical evaluation and PLHCP's written determination will also be provided for all workers who are permitted to use respirators voluntarily, prior to their use of a respirator. (See Section 2.0 of this program).

Additionally, all requirements for cleaning, maintaining and storage of respirators contained in this Program shall also apply to workers permitted to use respirators voluntarily. (See Section 7.0 of this program).

Respirators worn on a voluntary basis do not require fit testing.

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11.0 Respirator Program Evaluation

The effectiveness of this site-specific Respiratory Protection Program will be evaluated with routine observations and formal Program evaluations.

11.1. Routine Observations

The Site HSE Supervisor shall be responsible for conducting routine observations related to the effective selection, use, maintenance, storage and other aspects of this Program. Observations shall be noted through the use of SORs or equivalent documented routine safety inspections. Noted deficiencies shall be corrected as soon as possible.

11.2. Program Evaluations

Formal Program evaluations shall be conducted on an annual basis and documented on Respiratory Protection Program Checklist, Appendix C. SORs and SERs can also be used to document Program effectiveness.

Noted deficiencies are corrected as soon as possible.

11.3. Content of Program Evaluations

Program evaluations shall conform to the following:

- Program administration,
- Medical evaluations of employees required to use respirators,
- Procedures for selecting respirators for use in the workplace,
- Training of respirator wearers in the respiratory hazards to which they are potentially exposed during routine and emergency situations,
- Initial and annual fit testing for tight-fitting respirators,
- Procedures for proper use of respirators in routine and reasonable foreseeable emergency situations,
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and maintaining respirators,
- Procedures to verify adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators,
- Procedures for regularly evaluating the effectiveness of the program,
- Voluntary use procedures, and
- Other applicable observations.

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APPENDIX A – OSHA Respirator Medical Evaluation Questionnaire

TO THE EMPLOYER: Answers to questions in Section 1, and to question 9 in Section 2 of Part A, do not require a medical examination.

TO THE EMPLOYEE: Can you read: ☐ Yes ☐ No

Your employer must allow you to answer this questionnaire during normal working hours, or at a time and place that is convenient to you. To maintain your confidentiality, your employer or supervisor must not look at or review your answers, and your employer must tell you how to deliver or send this questionnaire to the health care professional who will review it.

PART A. SECTION 1. (Mandatory) The following information must be provided by every employee who has been selected to use any type of respirator. (Please Print):

Today's Date: _____Location/Job #: _____

Your Name: _____ DEN/SSN:_____

Your Age (to nearest year): _____ Sex: ☐ Male ☐ Female

Your height: _____ft. _____in. Your weight:_____lbs.

Your job title:_____

A phone number where you can be reached by the health care professional who reviews this questionnaire. (Include the area code):_____

The best time to reach you at this number:_____

Has your employer told you how to contact the health care professional who will review this questionnaire? ☐Yes ☐No

Check the type of respirator you will use (you can check more than one category):

A. ☐ N, R, or P disposable respirator (filter mask, non-cartridge type only).

B. ☐ Other type (for example, half- or full-face piece type, powered-air purifying, supplied air, self-contained breathing apparatus).

Have you ever worn a respirator? ☐Yes ☐No

If yes, what types? _____

Have you ever failed a respirator examination or pulmonary function test? ☐Yes ☐No

If yes, why?

Have you ever been denied or turned down for the use of a respirator? ☐Yes ☐No

If yes, why?

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PART A. SECTION 2. Name:

(Mandatory) Questions 1 through 9 below must be answered by every employee who has been selected to use any type of respirator.

1.	Do you **currently** smoke tobacco, or have you smoked tobacco in the last month? If yes, how long have you smoked? _____ What do you smoke? (please circle) ☐ Cigarettes ☐ Cigars ☐ Pipe tobacco How much do you smoke per day? _____ If **NO**, are you a former smoker? ☐YES ☐NO • How long since you quit? _____ • How many years did you smoke? _____ • How much did you smoke per day? _____	☐YES ☐NO
2.	Have you **ever** had any of the following conditions? **Explain all yes answers in the space provided below.** A. Seizures (fits) B. Diabetes (sugar disease) C. Allergic reactions that interfere with your breathing D. Claustrophobia (fear of closed-in places): E. Trouble smelling odors **Explain all yes answers here** (include dates and treatment): _____ _____	☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO
3.	Have you **ever** had any of the following pulmonary or lung problems? **Explain all yes answers in the space provided below.** A. Asbestosis B. Asthma C. Chronic bronchitis D Emphysema E. Pneumonia F Tuberculosis G. Silicosis H. Pneumothorax I. Lung cancer J. Broken ribs K. Any chest injuries or surgeries L. Any other lung problem that you have been told about **Explain all yes answers here** (include dates and treatment): _____ _____	☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO

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4.	Do you **currently** have any of the following symptoms of pulmonary or lung diseases? **Explain all yes answers in the space provided below.**	☐YES ☐NO
	A. Shortness of breath	☐YES ☐NO
	B. Shortness of breath when walking fast on level ground or walking up a slight hill or incline	☐YES ☐NO
	C. Shortness of breath when walking with other people at an ordinary pace on level ground	☐YES ☐NO
	D. Have to stop for a breath when walking at your own pace on level ground	☐YES ☐NO
	E. Shortness of breath when washing or dressing yourself	☐YES ☐NO
	F. Shortness of breath that interferes with your job	☐YES ☐NO
	G. Coughing that produces phlegm (thick sputum)	☐YES ☐NO
	H. Coughing that wakes you early in the morning	☐YES ☐NO
	I. Coughing that occurs mostly when you are lying down	☐YES ☐NO
	J. Coughing up blood in the last month	☐YES ☐NO
	K. Wheezing	☐YES ☐NO
	L. Wheezing that interferes with your job	☐YES ☐NO
	M. Chest pain when you breathe deeply	☐YES ☐NO
	N. Any other symptoms that you think may be related to lung problems	☐YES ☐NO
	Explain all yes answers here (include dates and treatment): _____ _____ _____	
5.	Have you **ever** had any of the following cardiovascular or heart problems? **Explain all yes answers in the space provided below.**	
	A. Heart attack	☐YES ☐NO
	B. Stroke	☐YES ☐NO
	C. Angina	☐YES ☐NO
	D. Heart failure	☐YES ☐NO
	E. Swelling in your legs or feet (not caused by walking)	☐YES ☐NO
	F. Heart arrhythmia (heart beating irregularly)	☐YES ☐NO
	G. High blood pressure	☐YES ☐NO
	H. Any other heart problem that you have been told about	☐YES ☐NO
	Explain all yes answers here (include dates and treatment): _____ _____ _____ _____ _____	
6.	Have you **ever** had any of the following cardiovascular or heart symptoms? **Explain all yes answers in the space provided below.**	
	A. Frequent pain or tightness in your chest	☐YES ☐NO
	B. Pain or tightness in your chest during physical activity	☐YES ☐NO
	C. Pain or tightness in your chest that interferes with your job	☐YES ☐NO
	D. In the past two years, have you noticed your heart skipping or missing a beat	☐YES ☐NO
	E. Heartburn or indigestion that is not related to eating	☐YES ☐NO

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	F. Any other symptoms that you think may be related to heart or circulation problems **Explain all yes answers here** (include dates and treatment): _____ _____ _____ _____ _____	☐YES ☐NO
7.	Do you **currently** take medication for any of the following problems? **Explain all yes answers in the space provided below.** A. Breathing or lung problems B. Heart trouble C. Blood pressure D. Seizures (fits) **List medications and dosages**: _____ _____ _____ _____ _____	☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO
8.	If you have used a respirator, have you **ever** had any of the following problems? (If you have never used a respirator, check the following space and go to question 9) ☐ **Explain all yes answers in the space provided below.** A. Eye irritation B. Skin allergies or rashes C. Anxiety D. General weakness or fatigue E. Any other problem that interferes with you use of a respirator **Explain all yes answers here** (include dates and treatment): _____ _____ _____ _____	☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO
9.	Would you like to talk to the health care professional that will review this questionnaire about your answers on this questionnaire?	☐YES ☐NO

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Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary.

10.	Have you **ever** lost vision in either eye (temporarily or permanently)? **Explain all yes answers here** (include dates and treatment): _____ _____ _____	☐YES ☐NO
11.	Do you **currently** have any of the following vision problems? A. Wear contact lenses B. Wear glasses C. Color blind D. Any other eye or vision problem **Explain all yes answers here** (include dates and treatment): _____ _____ _____	☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO
12.	Have you **ever** had an injury to your ears, including a broken eardrum? **Explain all yes answers here** (include dates and treatment): _____ _____ _____	☐YES ☐NO
13.	Do you **currently** have any of the following hearing problems? A. Difficulty hearing B. Wear a hearing aid C. Any other hearing or ear problem **Explain all yes answers here** (include dates and treatment): _____ _____ _____	☐YES ☐NO ☐YES ☐NO ☐YES ☐NO
14.	Have you **ever** had a back injury? **Explain all yes answers here** (include dates and treatment): _____ _____ _____ _____ _____	☐YES ☐NO
15.	Do you **currently** have any of the following musculo-skeletal problems? **Explain all yes answers in the space provided below.** A. Weakness in any part of your arms, hands, legs or feet B. Back pain C. Difficulty fully moving your arms and legs	☐YES ☐NO ☐YES ☐NO ☐YES ☐NO

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	D. Pain or stiffness when you lean forward or backward at the waist E. Difficulty fully moving your head up or down F. Difficulty fully moving your head side to side G. Difficulty bending at your knees H. Difficulty squatting to the ground I. Climbing a flight of stairs or a ladder carrying more than 25 pounds J. Any other muscle or skeletal problem that interferes with using a respirator **Explain all yes answers here** (include dates and treatment): _____ _____ _____ _____ _____	☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO

12.0 PART B: DISCRETIONARY QUESTIONS		
Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the health care professional who will review the questionnaire.		
1.	In your **present** job, are you working at high altitudes (over 5,000 feet) or in a place that that has lower than normal amounts of oxygen? **If yes**, do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you are working under these conditions? Explain below: _____ _____ _____ _____	☐YES ☐NO ☐YES ☐NO
2.	At work or at home, have you **ever** been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into skin contact with hazardous chemicals? **If yes**, name the chemicals if you know them: _____ _____ _____ _____	☐YES ☐NO
3.	Have you **ever** worked with any of the materials, or under any of the conditions, listed below: A. Asbestos B. Silica (e.g., in sandblasting) C. Tungsten / cobalt (e.g., grinding or welding this material) D. Beryllium E. Aluminum F. Coal (for example, mining)	☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO

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	G. Iron H. Tin I. Dusty environments J. Any other hazardous exposures **<u>If yes</u>**, describe these exposures: _____ _____ _____	☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO
4.	List any previous occupations: _____ _____	
5.	List your current and previous hobbies: _____ _____	
6.	List any second jobs or side businesses you have: _____ _____	
7.	Have you been in the military services? **<u>If yes</u>**, were you exposed to biological or chemical agents (either in training or combat): **<u>If yes</u>, please list them in the space provided**: _____ _____ _____	☐YES ☐NO ☐YES ☐NO
8.	Have you ever worked on a HAZMAT team? **<u>If yes</u>, please list them in the space provided**: _____ _____	☐YES ☐NO
9.	Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications)? **<u>If yes</u>, please list them in the space provided**: _____ _____ _____ _____	☐YES ☐NO
10.	Will you be using any of the following items with your respirator(s)? A. HEPA Filters B. Canisters (For example, gas masks) C. Cartridges	☐YES ☐NO ☐YES ☐NO

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		☐YES ☐NO
11.	How often are you expected to use the respirator(s)? A. Escape only (no rescue) B. Emergency rescue only C. Less than 5 hours per week D. Less than 2 hours per day E. 2 to 4 hours per day F. Over 4 hours per day	 ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO
12.	During the period you are using the respirator(s), is your work effort: A. Light (less than 200 kcal per hour) **<u>If yes</u>**, how long does this period last during the average shift:_____ hrs _____ min *Examples of light work effort are sitting while writing, typing, drafting, or performing light assembly work; or standing while operating a drill press (1-3 lbs.) or controlling machines.* B. Moderate (200 to 350 kcal per hour) **<u>If yes</u>**, how long does this period last during the average shift:_____ hrs _____ min *Examples of moderate work are sitting while nailing or filing; driving a truck or bus in urban traffic; standing while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lbs.) at trunk level; walking on a level surface about 2 mph or down a 5 degree grade about 3 mph; or pushing a wheelbarrow with a heavy load (about 100 lbs) on a level surface.* C. Heavy (above 350 kcal per hour) **<u>If yes</u>**, how long does this period last during the average shift:_____ hrs _____ min *Examples of heavy work are lifting a heavy load (about 50 lbs) from the floor to your waist or shoulder; working on a loading dock; shoveling; standing while bricklaying or chipping castings; walking up an 8 degree grade about 2 mph; climbing stairs with a heavy load (about 50 lbs).*	 ☐YES ☐NO ☐YES ☐NO ☐YES ☐NO
13.	Will you be wearing protective clothing and/or equipment (other than the respirator) when you are using your respirator? **<u>If yes</u>**, please describe this protective clothing and/or equipment_____ _____ _____ _____	☐YES ☐NO
14.	Will you be working under hot conditions (temperature of 77 degrees F)?	☐YES ☐NO
15.	Will you be working under humid conditions?	☐YES ☐NO

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16. Describe the work you will be doing while you are using your respirator:_____
_____
_____
_____

17. Describe any special or hazardous conditions you might encounter when you are using your respirator(s):
(For example, confined spaces, life-threatening gases):_____
_____
_____

18. Provide the following information, if you know it, for each toxic substance that you will be exposed to when you are using your respirator(s):
Name of the first toxic substance: _____
Estimated maximum exposure level per shift:_____
Duration of exposure per shift:_____
Name of the second toxic substance: _____
Estimated maximum exposure level per shift:_____
Duration of exposure per shift:_____
Name of the third toxic substance: _____
Estimated maximum exposure level per shift:_____
Duration of exposure per shift:_____
The name of any other toxic substances that you will be exposed to while using your respirator:
_____
_____
_____
_____

19. Describe any special responsibilities you will have while using your respirator(s) that may affect the safety and well-being of others (for example, rescue, security):_____
_____
_____
_____
_____
_____

DATE: _____SIGNED:_____

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Appendix B – Employees Using Respirators When Not Required Under the Standard

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker.

Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA or other applicable regulations or standards.

If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following.

1. Read and follow all instructions provided by the manufacturer on use, maintenance, cleaning, and care, and warnings regarding the respirators limitations.
2. Choose respirators certified for use to protect against the contaminant of concern. In the U.S., National Institute for Occupational Safety and Health (NIOSH) respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is tested and certified for and how much it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

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Appendix C – Respiratory Protection Program Checklist

Site Name:_____Location: _____
Site Manager:_____Site HSE Supervisor:_____
Reviewer:_____Date Reviewed: _____

PROGRAM ADMINISTRATION

Yes	No	
❑	❑	Are the Program Administrator and Site HSE Supervisor identified?
❑	❑	Are the nine program elements followed?
❑	❑	If program include emergency respirator use, are procedures in place?
❑	❑	Is the Site HSE Supervisor effectively administering the program?
❑	❑	Is the written program updated as necessary to account for changes in the workplace affecting respirator use?
❑	❑	Equipment, training, and medical evaluations provided at no cost to employees?

Comments:_____
_____

MEDICAL EVALUATION

Yes	No	
❒	❒	All employees in respirator jobs have been evaluated to determine their ability to wear a respirator prior to respirator use.
❒	❒	A physician or other licensed health care professional (PLHCP) has been identified to perform the medical evaluations.
❒	❒	Employees are provided follow-up medical exams if they answer positively to any of questions 1 through 8 in the medical questionnaire for respiratory use in Appendix A, or if their initial medical evaluation reveals that a follow-up exam is needed.
❒	❒	Medical evaluations are administered confidentially during normal work hours, and in a manner that is understandable to employees.
❒	❒	Employees are provided the opportunity to discuss the medical evaluation results with the PLHCP.
❒	❒	Written recommendations are obtained from the PLHCP regarding each employee's ability to wear a respirator, and the PLHCP has given the employee a copy of these recommendations.
❒	❒	Employees who are medically unable to wear a negative pressure respirator are provided with a powered air-purifying respirator (PAPR) if they are found by the PLHCP to be medically able to use a PAPR.
❒	❒	Employees are given additional medical evaluation when:

- The employee reports symptoms related to his or her ability to use a respirator.

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Yes No

- The PLHCP, respiratory protection program administrator, or supervisor determines that a medical reevaluation is necessary.
- Information from the respiratory protection program suggests a need for reevaluation.
- Workplace conditions have changed in a way that could potentially cause increased risk to the employee's health.

Comments:_____
_____

RESPIRATOR SELECTION

Yes No

❒ ❒ The specific hazards for each respiratory protection task have been identified.

❒ ❒ Respirators are NIOSH certified, and used under the conditions of the certification.

❒ ❒ Respiratory job exposures characterized as routine or incident-related.

❒ ❒ Respirator job exposures are evaluated for IDLH exposure potential.

❒ ❒ Estimated exposure concentration is included for tasks with routine exposures.

❒ ❒ Respirator manufacturer and model information are specified for each respirator job.

❒ ❒ A sufficient number of respirator sizes and models are provided to be acceptable and correctly fit the users.

❒ ❒ For IDLH jobs, full facepiece pressure demand SARs with escape cylinder or full face piece pressure demand SCBAs, with a minimum service life of 30 minutes, are provided.

❒ ❒ Respirators used for escape only are NIOSH certified for the atmosphere in which they will be used.

❒ ❒ Oxygen deficient atmospheres are considered IDLH.

❒ ❒ Respirators selected are appropriate for the chemical state and physical form of the contaminant.

❒ ❒ Air-purifying respirators used for protection against gases and vapors are equipped with ESLIs or a change schedule has been specified and implemented.

❒ ❒ Air-purifying respirators used for protection against particulate are equipped with NIOSH-certified HEPA filters or other filters certified by NIOSH for particulate.

❒ ❒ Air-purifying respirators used for routine gas and vapor exposure protection have service life documentation using manufacturer software, attached to program.

Comments:_____
_____

FIT TESTING

Yes No

❑ ❑ All employees who are using tight fitting respirator facepieces have passed an

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Yes	No	
		appropriate fit test prior to being required to use a respirator.
❑	❑	Fit testing is conducted with the same make, model, and size of respirator that the employee will be expected to use at the worksite.
❑	❑	Fit tests are conducted annually and when different respirator facepieces are to be used.
❑	❑	Provisions are made to conduct additional fit tests in the event of physical changes in the employee that may affect respirator fit.
❑	❑	Employees are given the opportunity to select a different respirator facepiece, and be retested, if their respirator fit is unacceptable to them.
❑	❑	Fit tests are administered using OSHA-accepted QNFT or QLFT protocols.
❑	❑	QNFT is used in all situations where a negative pressure respirator is intended to protect workers from contaminant concentrations greater than 10 times the PEL.
❑	❑	For tight-fitting respirators and powered air-purifying respirators: • All tests are conducted in the negative pressure mode. • QLFT is achieved by temporarily converting the facepiece-into a negative pressure respirator with appropriate filters, or by using an identical negative pressure APR.
❑	❑	QNFT is achieved by modifying the facepiece with an adaptor to allow for sampling inside the mask midway between the nose and mouth. The facepiece is restored to its approved configuration before being used in the workplace.

Comments:_____
_____

PROPER RESPIRATOR USE

Yes	No	
❑	❑	Workers using tight-fitting respirators have no conditions, such as facial hair, that would interfere with a face-to-facepiece seal or valve function.
❑	❑	Workers wear corrective glasses, goggles, or other protective equipment in a manner that does not interfere with the face-to-facepiece seal or valve function.
❑	❑	Workers perform user seal checks prior to each use of a tight-fitting respirator.
❑	❑	Procedures are in place for conducting ongoing surveillance of the work area for conditions that affect respirator effectiveness, and when such conditions exist, are taken to address those situations.
❑	❑	Employees are permitted to leave their work area to conduct respirator maintenance, such as washing the facepiece, or to replace respirator parts.
❑	❑	Employees do not return to their work area until their respirator has been repaired or replaced in the event of breakthrough, a leak in the facepiece, or a change in breathing resistance.
❑	❑	There are procedures for respirator use in IDLH atmospheres to ensure that the appropriate number of standby personnel are deployed; standby personnel and employees in the IDLH environment maintain communication; standby personnel

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Yes	No	
		are properly trained, equipped, and prepared; the Site HSE Supervisor is notified when standby personnel enter an IDLH atmosphere; and the Site HSE Supervisor will respond to the notification.
❑	❑	Standby personnel are equipped with a pressure demand or other positive pressure. SCBA, or a positive pressure supplied air respirator with an escape bottle, and appropriate retrieval equipment or other means for rescue.

Comments:_____
_____

TRAINING AND INFORMATION

Yes	No	
❑	❑	Employees can demonstrate knowledge of the following: • Why the respirator is necessary and the consequences of improper fit, use, or maintenance. • Limitations and capabilities of the respirator. • How to effectively use the respirator in emergency situations. • How to inspect, don, doff, use, and check the seals of the respirator. • Maintenance and storage procedures.
❑	❑	Training is provided prior to employee use of a respirator
❑	❑	Retraining is provided: • Annually. • Upon changes in workplace conditions that affect respirator use. • Whenever retraining appears necessary to verify safe respirator use. • Respirator voluntary use requirements are provided to voluntary users.

Comments:_____
_____

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RESPIRATOR MAINTENANCE AND CARE

Cleaning and Disinfecting

Yes	No	
❑	❑	Respirators are provided that are clean, sanitary, and in good working order.
❑	❑	Respirators are cleaned and disinfected as often as necessary when issued for the exclusive use of one employee; before being worn by different individuals; after each use for emergency use respirators; and after each use for respirators used for fit testing. Commercially available mild detergents or cleaner/sanitizer recommended by the manufacturer are used.

Storage

Yes	No	
❑	❑	Respirators are stored to protect them from damage from the elements, and from becoming deformed.
❑	❑	Emergency respirators are stored, to be accessible to the work area, in compartments marked as such, and in accordance with manufacturer's recommendations.

Inspections

Yes	No	
❑	❑	Routine-use respirators are inspected before each use and after cleaning.
❑	❑	SCBAs and emergency respirators are inspected monthly and checked for proper function before and after each use.
❑	❑	Emergency escape only respirators are inspected before being carried into the workplace for use.
❑	❑	Inspections include: check of respirator function; tightness of connections; condition of the facepiece, head straps, valves, cartridges, and condition of elastomeric parts.
❑	❑	For SCBAs, inspection includes checking that cylinders are fully charged, and that regulators and warning devices function properly.
❑	❑	Emergency use respirators are inspected. The inspection documentation is attached to the respirator or its compartment, or stored with inspection reports.
❑	❑	Respirators that have failed inspection are taken out of service.

Repairs

Yes	No	
❑	❑	Repairs are made only by trained personnel.
❑	❑	Only NIOSH-approved parts are used.
❑	❑	Reducing and admission valves, regulators and alarms are adjusted or repaired only by the manufacturer or a technician trained by the manufacturer.

Comments:_____

_____

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BREATHING AIR QUALITY AND USE

General

Yes	No	
❑	❑	Compressed breathing air meets the requirements for Grade D breathing air.
❑	❑	Compressed oxygen is not used in respirators that have previously used compressed air.
❑	❑	Oxygen concentrations greater that 23.5 percent are used only in equipment designed for oxygen service or distribution.
❑	❑	Breathing air couplings are incompatible with outlets for other gas systems.
❑	❑	Breathing gas containers are marked with appropriate NIOSH certification.

Breathing Air Cylinders

Yes	No	
❑	❑	Breathing air cylinders are tested and maintained according to DOT 49 CFR Part 173 and 178.
❑	❑	A certificate of analysis for breathing air has been obtained from the supplier.
❑	❑	Moisture content in the cylinder breathing air does not exceed a dew point of -500° F at 1 atmosphere pressure.

Air Compressors

Yes	No	
❑	❑	Are constructed and situated to prevent contaminated air from getting into the system and are set up to minimize the moisture content.
❑	❑	Are equipped with in-line air-purifying sorbent beds and/or filters that are maintained or replaced following manufacturer's instructions and are tagged with information on the most recent change date of the filter and an authorizing signature.
❑	❑	Carbon monoxide does not exceed 10 ppm in the breathing air from compressors that are oil-lubricated, and high-temperature and carbon monoxide alarms are used on oil-lubricated compressors, or the air is monitored often enough to verify that carbon monoxide does not exceed 10 ppm if only a high-temperature alarm is used.

Comments:_____

_____

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PROGRAM EVALUATION

Yes	No	
❑	❑	Workplace evaluations are being conducted to verify that the written respiratory protection program is being effectively implemented.
❑	❑	Employees required to wear respirators are being regularly consulted to assess the employees' views and to identify problems with respirator fit, selection, use and maintenance.
❑	❑	Any problems identified during evaluations are corrected.

RECORDKEEPING

Yes	No	
❑	❑	Records of medical evaluations are being retained for the term of employment plus 30 years.
❑	❑	Fit testing records are being retained for 1 year.
❑	❑	A copy of the current respiratory protection program has been retained onsite.
❑	❑	Access to these records is provided to workers.

Comments:_____
_____

CORRECTIVE ACTIONS REQUIRED

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

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Appendix D – NIOSH Respirator Selection Logic Sequence - 2004

To use this selection logic, first assemble the necessary toxicologic, safety, and other relevant information for each respiratory hazard, as follows:

- General use conditions
- Physical, chemical, and toxicological properties of the contaminants
- Occupational Exposure Limit (STEL,REL, PEL, TLV)
- Expected concentration of each respiratory hazard
- IDLH concentration
- Oxygen concentration or expected oxygen concentration
- Eye irritation potential
- Environmental factors such as presence of oil aerosols

General use conditions should include a description of the job task, including the duration and frequency, location, physical demands, industrial processes, and issues affecting the comfort of the respirators.

After all criteria have been identified and evaluated and after the requirements and restrictions of the respiratory protection program have been met, follow this sequence of questions to identify the class of respirators that should provide adequate respiratory protection. If there exist site contaminants with a substance–specific standard, respirator selection must meet or exceed the respirators required in that standard.

Step 1 Is the respirator intended for use during fire fighting?

a. If yes, only a full-facepiece, pressure-demand, self-contained breathing apparatus (SCBA) meeting the requirement of the NFPA 1981, Standard on Open-circuit Self-contained Breathing Apparatus for Fire and Emergency Services (2002 edition) is required.

b. If no, proceed to Step 2.

Step 2 Is the respirator intended for use in an oxygen-deficient atmosphere, i.e., less than 19.5% oxygen?

a. If yes, any type of SCBA other than escape only, or supplied-air respirator (SAR) with an auxiliary SCBA is required. Auxiliary SCBA must be of sufficient duration to permit escape to safety if the air supply is interrupted.
If yes, and contaminants are also present, proceed to Step 3 to determine if the hazard requires the SCBA or SAR/SCBA to meet a specific APF level.

b. If no, proceed to Step 3.

Step 3 Is the respirator intended for entry into unknown or IDLH atmospheres (e.g., an emergency situation)?

a. If yes, one of two types of respirators is required: a pressure-demand SCBA with a full facepiece or a pressure-demand SAR with a full facepiece in combination with an auxiliary pressure-demand SCBA. Auxiliary SCBA must be of sufficient duration to permit escape to safety if the air supply is interrupted.

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b. If no, proceed to Step 4.

Step 4 Is the exposure concentration of each of the contaminants, as determined by acceptable industrial hygiene methods, less than its respective exposure limit?

a. If yes, a respirator is not required for routine work. For escape respirators, determine the potential for generation of a hazardous condition caused by an accident, spill, or equipment failure. Proceed to Step 6.

b. If no, proceed to Step 5.

Step 5 Are conditions such that a worker who is required to wear a respirator can escape from the work area and not suffer loss of life or immediate or delayed irreversible health effects if the respirator fails, i.e., are the conditions not immediately dangerous to life or health (IDLH)?

a. If yes, conditions are not considered to be IDLH. Proceed to Step 6.

b. If no, conditions are considered to be IDLH. See Section 3.2 for further guidance.

Step 6 Is the contaminant an eye irritant, or can the contaminant cause eye damage at the workplace concentration?

a. If yes, a respirator equipped with a full facepiece, helmet, or hood is required. Proceed to Step 7.

b. If no, a half-mask or quarter-mask respirator may still be an option, depending on the exposure concentration. Proceed to Step 7.

Step 7 Determine the maximum hazard ratio (HR) by the following:

- Divide the time-weighted average (TWA) exposure concentration for the contaminant determined in Step 4 by the applicable exposure limit. If the exposure limit is an 8-hour limit, the TWA used must be an 8-hour average. If the exposure limit is based on 10 hours, use a 10-hour TWA.
- If the contaminant has a ceiling limit, divide the maximum exposure concentration for the contaminant determined in Step 4 by the ceiling limit.
- If the contaminant has a short term exposure limit (STEL), divide the maximum 15-min TWA exposure concentration for the contaminant determined in Step 4 by the STEL.
- For escape respirators, determine the potential for generation of a hazardous condition caused by an accident or equipment failure.

If the calculated maximum HR is greater than 1, proceed to Step 8.

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Step 8 If the physical state of the contaminant is:

- a particulate (solid or liquid aerosol) during periods of respirator use, proceed to Step 9;
- a gas or vapor, proceed to Step 10;
- a combination of gas or vapor and particulate, proceed to Step 11.

Step 9 Particulate Respirators

Is the particulate respirator intended only for escape purposes?

The maximum use concentration (MUC) is the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected by a class of respirator and is determined by the lesser of:

- APF X exposure limit
- The respirator manufacturer's MUC for a hazardous substance (if any)

If the respirator is intended for use in an oxygen-deficient atmosphere, only SCBA or SAR with an auxiliary SCBA, can be selected from the Table.

For multi-component mixtures the MUC can be calculated by:
C1/MUC1 + C2/MUC2 +…Cn/MUCn= 1

The MUC for the selected respirator class must exceed the expected contaminant concentration.

Step 10 Gas/Vapor Respirators

10.1 Is the gas/vapor respirator intended only for escape?

a. If yes, refer to escape respirators.

b. If no, the gas/vapor respirator is intended for use during normal work activities. Proceed to Step 10.2.

10.2 An air-purifying chemical cartridge/canister respirator that has a sorbent suitable for the chemical properties of the anticipated gas/vapor contaminant(s) and for the anticipated exposure levels is required. Information on cartridges or canisters approved for use for classes of chemicals or for specific gases or vapors can be found in the NIOSH Certified Equipment List http://www.cdc.gov/NIOSH/npptl/topics/respirators/cel/. Proceed to Step 10.3.

10.3 Respirators that have not been eliminated from Table 2 by the previous steps and that have APFs equal to, or greater than, the maximum hazard ratio determined in Step 7 are required. Note, however, that the maximum use concentration (MUC) is the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected by a class of respirator and is determined by the lesser of:

- APF X exposure limit
- The respirator manufacturer's MUC for a hazardous substance (if any)

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The IDLH, unless the respirator is a pressure-demand, full-facepiece SCBA or combination pressure-demand SAR with a full facepiece in combination with an auxiliary pressure-demand SCBA.

For multi-component mixtures the MUC can be calculated by:
$/C_1/MUC_1 + C_2/MUC_2 + \ldots C_n/MUC_n = 1$

If the respirator is intended for use in an oxygen-deficient atmosphere, only SCBA or SAR with an auxiliary SCBA, can be selected from the Table.

Step 11. Combination Particulate and Gas/Vapor Respirators

11.1 Is the combination respirator intended for "escape only" purposes?

a. If yes, refer to the section on escape respirators, for a discussion and selection of "escape only" respirators.

b. If no, the combination respirator is intended for use during normal work activities. Proceed to Step 11.2.

11.2 From Table 3, select a respirator type, not eliminated by the previous steps, and have APFs equal to, or greater than, the maximum hazard ratio determined in Step 7. Note, however, that the maximum use concentration (MUC) is the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected by a class of respirator and is determined by the lesser of:

- APF X exposure limit
- The respirator manufacturer's MUC for a hazardous substance (if any)
- The IDLH, unless the respirator is a pressure-demand, full-facepiece SCBA or combination pressure-demand SAR with a full facepiece in combination with an auxiliary pressure-demand SCBA.

For multi-component mixtures the MUC can be calculated by:
$C_1/MUC_1 + C_2/MUC_2 + \ldots C_n/MUC_n = 1$

If the respirator is intended for use in an oxygen-deficient atmosphere, only SCBA or SAR with an auxiliary SCBA, can be selected from the Table.

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Table 1 - Respirator Assigned Protection Factors - Particulate

Respirator Type	APF-NIOSH	APF-OSHA
Quarter Mask	5	5
Air-Purifying Half-mask with appropriate type of particulate filter[1]	10	10
Air-Purifying Full facepiece with appropriate type of particulate filter	10	50
Air-purifying full facepiece with N-100, R-100, or P-100 filter.	50	50
Negative pressure (demand) supplied-air with half-mask	10	10
Negative pressure (demand) supplied-air with full facepiece	50	50
Powered air-purifying with Hood or helmet and HEPA filter	25	25/1000[2]
Powered air purifying with loose fitting facepiece		25
Powered air-purifying with tight-fitting facepiece (half-mask)and high efficiency filter	50	50
Powered air-purifying with tight-fitting full facepiece and high efficiency filter	50	1000 ??
Continuous flow supplied-air with hood or helmet	25	25/1000[2]
Continuous flow supplied-air with tight fitting half-mask facepiece	50	50
Continuous flow supplied-air with tight fitting full facepiece	50	1000
Continuous flow supplied-air with loose fitting facepiece		25
Pressure-demand supplied air with half-mask	1000	50
Pressure-demand supplied air with full facepiece	2000	1000
Pressure-demand self-contained with full facepiece [3]	10,000	10,000
Pressure-demand self-contained with helmet/hood		10,000

[1] Includes elastomeric facepiece and filtering facepiece.

[2] Employer must have evidence provided by manufacturer that testing demonstrates performance at a level of protection of 1000 or greater to received APF=1000.

[3] May be in combination with auxiliary pressure-demand self-contained breathing apparatus.

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Table 2 - Respirator Assigned Protection Factors – Gas/Vapor

Respirator Type	APF-NIOSH	APF-OSHA
Air-Purifying Half-mask with appropriate type of gas/vapor cartridge[1]	10	10
Air-Purifying Full facepiece with appropriate type of gas/vapor cartridge	50	50
Negative pressure (demand) supplied-air with half-mask	10	10
Negative pressure (demand) supplied-air with full facepiece	50	50
Powered air-purifying with Hood or helmet with appropriate type of gas/vapor cartridge	25	25/1000[2]
Powered air purifying with loose fitting facepiece		25
Continuous flow supplied-air with hood or helmet	25	25/1000[2]
Continuous flow supplied-air with loose fitting facepiece		25
Continuous flow supplied-air with half-mask facepiece	50	50
Continuous flow supplied-air with full facepiece	50	1000[2]
Powered air-purifying with tight-fitting facepiece (half-mask) and appropriate gas/vapor cartridge	50	50
Powered air-purifying with tight-fitting facepiece (full facepiece) and appropriate gas/vapor cartridge	50	1000
Negative pressure (demand) self-contained with half mask.		10
Negative pressure (demand) self-contained with full facepiece	50	50
Pressure demand supplied air with half-mask	1000	50
Pressure demand supplied air with full facepiece	2000	1000
Pressure demand self-contained with full facepiece [3]	10000	10000
Pressure demand self-contained with helmet/hood		10,000

[1] Includes elastomeric facepiece

[2] Employer must have evidence provided by manufacturer that testing demonstrates performance at a level of protection of 1000 or greater to received APF=1000.

[3] May be in combination with auxiliary pressure-demand self-contained breathing apparatus.

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Table 3 - Respirator Protection Factors - Gas/Vapor and Particulate Combination

Respirator Type	APF-NIOSH	APF-OSHA
Air-Purifying Half-mask equipped with appropriate gas/vapor cartridge in combination with appropriate type of particulate filter[1]	10	10
Air-Purifying Full facepiece equipped with appropriate gas/vapor cartridge in combination with appropriate type of particulate filter[1]	10	50
Negative pressure (demand) supplied-air with half-mask	10	10
Negative pressure (demand) supplied-air with full facepiece	50	50
Powered air-purifying with hood or helmet	25	25/1,000[2]
Continuous flow supplied-air with hood or helmet	25	25/1,000[2]
Continuous flow supplied-air with loose fitting facepiece		25
Continuous flow supplied-air with half-mask facepiece	50	50
Continuous flow supplied-air with full facepiece	50	1,000[2]
Powered air-purifying with tight-fitting facepiece (half-mask) equipped with appropriate gas/vapor cartridge in combination with high efficiency filter	50	50
Powered air-purifying with tight-fitting facepiece (full facepiece) equipped with appropriate gas/vapor cartridge in combination with high efficiency filter	50	1,000
Powered air purifying with loose fitting facepiece		25
Negative pressure (demand) self-contained with full facepiece	50	50
Negative pressure (demand) self-contained with half-mask		10
Negative pressure (demand) self-contained with helmet/hood		50
Pressure demand supplied air with half-mask	1,000	50
Pressure demand supplied air with full facepiece	2,000	1,000
Pressure demand self-contained with full facepiece [3]	10,000	10,000
Pressure demand self-contained with helmet/hood		10,000

[1] Includes elastomeric facepiece

[2] Employer must have evidence provided by manufacturer that testing demonstrates performance at a level of protection of 1000 or greater to received APF=1000.

[3] May be in combination with auxiliary pressure-demand self-contained breathing apparatus.

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Appendix E – Definitions

Administrative Controls	Methods of controlling employee exposures to contaminants by job rotation, work assignment, or time periods away from the contaminant.
Air-purifying respirator	A respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.
Atmosphere-supplying respirator	A respirator that supplies the users with breathing air from a source independent of the ambient atmosphere, and includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units.
Canister or cartridge	A container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.
Dust	Dry particulate aerosols generated by handling, crushing, or grinding organic or inorganic material. Particle size ranges from 1 µm to 1 mm diameter.
Emergency situation	Any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.
End-of-service-life indicator (ESLI)	A system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.
Engineering Controls	Methods of controlling employee exposures by modifying the source or reducing the quantity of contaminants released into the work environment.
Escape-only respirator	A respirator intended to be used only for emergency exit.
Filter or air purifying element	A component used in respirators to remove solid or liquid aerosols from the inspired air.
Filter facepiece (dust mask)	A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.
Fume	Aerosol particles generated from heating a solid material. These particles range in diameter from .001 to 1 µm.
Gas	A state of matter in which the material has very low density and viscosity, can expand and contract in response to changes in temperature and pressure, easily diffuses into other gases, and that uniformly distributes throughout any container.
High efficiency particulate air (HEPA) filter	A filter that is at least 99.97% efficient in removing monodispersed particles of 0.3 micrometers or greater in diameter. The equivalent NIOSH particulate filters are the N100, R100 and P100 filters.
Hood	A respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.
Immediately dangerous to life or health (IDLH)	An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

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Mist	Suspended droplet aerosols produced from bulk liquids by mechanical processes such as splashing, bubbling, or spraying. Particle sizes range from .01 to 10 µm in diameter. .
Negative pressure respirator (tight fitting)	A respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.
Oxygen deficient atmosphere	An atmosphere with an oxygen content below 19.5%.
PLHCP	A physician or other licensed health care professional.
Positive pressure respirator	A respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.
Pressure-demand respirator	A supplied-air respirator that admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.
Powered air purifying respirator (PAPR)	An air purifying respirator that uses a blower to force the ambient air through air purifying elements to the inlet covering.
Pressure demand respirator	A positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.
Qualitative fit test (QLFT)	A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.
Quantitative fit test (QNFT)	An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.
Radionuclides	An atom capable of spontaneously emitting radiation.
Respiratory inlet covering	That portion of a respirator that forms the protective barrier between the user's respiratory tract and an air purifying device or breathing air source, or both. It may be a facepiece, helmet, hood suit, or mouthpiece respirator with nose clamp.
Self contained breathing apparatus (SCBA)	A supplied-air respirator for which the breathing air source is designed to be carried by the user.
Supplied air respirator (SAR) or air line respirator	A supplied-air respirator for which the source of breathing air is not designed to be carried by the user.
Tight fitting facepiece	A respiratory inlet covering that forms a complete seal with the face.
User seal check	An action conducted by the respirator user to determine if the respirator is properly seated to the face.
Vapor	The gaseous form of a substance, which is at equilibrium with its liquid or solid state.

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ATTACHMENT A-4

Fort Wainwright Hazard Communication Program
Physical Agent Data Sheets
Material Safety Data Sheets – Hard copies in binder at FWA field office

FORT WAINWRIGHT HAZARD COMMUNICATION PROGRAM

1.0 PURPOSE AND SCOPE

The purpose of this plan is to provide the minimum requirements to Jacobs employees for maintaining and implementing this site-specific Hazard Communication Program.

2.0 RESPONSIBILITIES

Responsibilities specific to this Hazard Communication Program include the following:

2.1 SITE MANAGEMENT

Site Management is responsible for ensuring that this site-specific Hazard Communication Program has been effectively communicated and implemented to all employees assigned to the site. The following is a list of Site Management responsibilities:

- Ensure that Material Safety Data Sheet (MSDS) are maintained in the Jacobs Fort Wainwright Field Office and employees know and understand to request and/or how to access them.
- Ensure employees are trained in the recognition of hazardous materials and the method and means to protect themselves from these hazards.
- Continuously monitor the work to ensure compliance with this program.
- Confirm each job is properly prepared and that employees are aware of any hazardous substances that may be encountered as part of their work or as a result of someone else's work in the area.
- Maintain a list of all workplace chemicals and products containing hazardous materials.
- Maintain MSDSs for the workplace chemicals and products containing hazardous materials.
- Ensure all workplace containers of chemicals or products containing hazardous materials are properly labeled.

2.2 SITE SAFETY AND HEALTH OFFICER

The Site Safety and Health Officer shall assist Site Management in compliance with this Hazard Communication Program.

2.3 SUBCONTRACTORS

Subcontractors are responsible for the following:

- Comply with the provisions of this program and communicate hazards associated with their work during daily pre-job meetings.
- Provide copies to the SSHO of MSDS for chemicals or products containing hazardous materials brought on-site.
- Attend site-specific orientation.

2.4 EMPLOYEES

Employees are responsible for the following:

- Understanding hazards associated with the chemicals and products containing hazardous materials they are working with and are present their work location.
- Knowing the proper handling and PPE required to handle the chemicals and products associated with their assigned task. This training must be documented.
- Knowing where the MSDSs are located for chemicals and products used in the workplace. Employees must be able to understand all forms of labeling and warning for hazards in the workplace

3.0 DEFINITIONS

Acute	Severe, often dangerous conditions in which relatively rapid changes occur.
Acute Exposure	An intense exposure over a relatively short period of time.
Asphyxiant	A chemical (gas or vapor) that can cause death or unconsciousness by suffocation. Simple asphyxiants, such as nitrogen, either use up or displace oxygen in the air. They become especially dangerous in confined or enclosed spaces. Chemical asphyxiants, such as carbon monoxide and hydrogen sulfide, interfere with the body's ability to absorb or transport oxygen to the tissues.
Boiling Point	The temperature at which the vapor pressure of a liquid equals atmospheric pressure or at which the liquid changes to a vapor. The boiling point is usually expressed in degrees Fahrenheit. If a flammable material has a low boiling point, it indicates a special fire hazard.
"C" or Ceiling	A description usually seen in connection with a published exposure limit. It refers to the concentration that should not be exceeded, even for an instant. It may be written as TLV-C or Threshold Limit Value - Ceiling (See also Threshold Limit Value).
Carcinogen	A substance or physical agent that may cause cancer in animals or humans.
C.A.S. Number	Identifies a particular chemical by the Chemical Abstracts Service, a service of the American Chemical Society that indexes and compiles summaries of worldwide chemical literature called "Chemical Abstracts."
CC – Cubic Centimeter	A volumetric measurement, which, in the case of water, is also equal to one milliliter (mL).
Chemical	As broadly applied to the chemical industry, a naturally occurring substance or a compound produced by chemical reactions for either direct industrial and consumer use or for reaction with other chemicals.
Chemical Reaction	A change in the arrangement of atoms or molecules to yield substances of different composition and properties (See Reactivity).
Chronic	Persistent, prolonged, or repeated conditions.
Chronic Exposure	A prolonged exposure occurring over a period of days, weeks, or years.
Combustible Liquid	According to the DOT and NFPA, combustible liquids are those having a flash point at or above 100 ºF (37.8 ºC). Combustible liquids do not ignite as easily as flammable liquids. However, combustible liquids can be ignited under certain circumstances and must be handled with caution. Substances, such as wood, paper, etc., are termed "ordinary combustibles."
Concentration	The amount of one substance mixed with, and in the presence of, another substance. For example, 5 parts (of acetone) per million (parts of air).

Corrosive	A substance that, according to the DOT, causes visible destruction or permanent changes in human skin tissue at the site of contact.
Dermatitis	An inflammation or irritation of the skin.
Dyspnea	Shortness of breath; difficult or labored breathing.
EPA	The Environmental Protection Agency is the governmental agency responsible for administration of laws to control and/or reduce pollution of air, water, and land systems.
EPA Number	The number assigned to chemicals regulated by the EPA.
Flammable Liquid	By DOT and NFPA, a flammable liquid is one that has a flash point below 100 ºF. (See Flash Point)
Flash Point	The lowest temperature at which a liquid gives off enough vapor to form an ignitable mixture and burn when a source of ignition (sparks, open flames, cigarettes, etc.) is present. Two tests are used to determine the flash point: open and closed cup. The test method is indicated on the MSDS after the flash point.
Hazardous Material	Any substance or compound that may produce adverse effects on the health and safety of humans.
Ingestion	Taking a substance into the body through the mouth as food, drink, medicine, or unknowingly as on contaminated hands or cigarettes, etc.
Inhalation	The breathing in of an airborne substance that may be in the form of gases, fumes, mists, vapors, dusts, or aerosols.
Irritant	A substance that produces an irritating effect when it contacts the skin, eyes, nose, or respiratory system.
Lower Explosive Limit (LEL)	Also known as Lower Flammable Limit. The lowest concentration of a substance that will produce a fire or flash when an ignition source (flame, spark, etc.) is present. It is expressed in percent of vapor or gas in the air by volume. Below the LEL or LFL, the air/contaminant mixture is theoretically too "lean" to burn (See also UEL).
Odor Threshold	The minimum concentration of a substance at which a majority of test subjects can detect and identify the substance's characteristic odor.
OSHA	The Occupational Safety and Health Administration is a Federal Agency under the Department of Labor that publishes and enforces safety and health regulations for most business and industries in the United States.
Oxygen Deficiency	An atmosphere having less than the normal percentage of oxygen found in normal air. Normal air contains 20.8% oxygen at sea level.
Reactivity	A substance's propensity to under a chemical reaction or change that may result in effects, which can be dangerous, such as explosion, burning, or generation of corrosive or toxic emissions. Reaction initiators, such as heat, other chemicals, dropping, etc., will usually be specified as "Conditions to Avoid" when a chemical's reactivity is described in an MSDS.

Time Weighted Average (TWA)	The average concentration, over a given work period, e.g., 8-hour workday, of a person's exposure to a chemical or a potentially harmful agent. The average is determined by sampling for the contaminant during the period of exposure.
Upper Explosive Limit (UEL)	(Also known as Upper Flammable Limit.) The UEL is the highest concentration of a mixture that will burn or explode when an ignition source is present. Theoretically, above this limit, the mixture is said to be too "rich" to support combustion. The airborne concentration range between the LEL and the UEL constitutes the flammable range or explosive range.

4.0 PROGRAM

4.1 GENERAL

The purpose of Hazard Communication program is to communicate the hazards of workplace chemicals and communicate protective measures to control the hazards. Hazard Communication is accomplished by:

- Maintaining a list of all workplace chemicals and products containing hazardous materials
- Labeling workplace chemical and product containers
- Maintaining Material Safety Data Sheets for the workplace chemicals and products containing hazardous materials
- Implementing a training program to communicate the hazards of chemicals and products, and appropriate protective measures

Upon completion of Hazard Communication training, Jacobs employees and subcontractors will understand the components of Hazard Communication and will understand the hazards of the chemicals and products used in their workplace and the protective measures to control those hazards.

4.2 HAZARD EVALUATION

The manufacturers are responsible for assessing the following:

- Physical hazards, such as flammability, combustibility, explosion, reaction, and radioactivity
- Health hazards, such as irritation, corrosion, sensitization, or toxicity of the chemicals and products they produce.

MSDSs shall be requested for chemicals and products purchased or brought onto the site. The site relies on the evaluation performed by the chemical and product manufacturers or importers, who originated the MSDS, for the accuracy of this information.

MSDSs will be maintained at the Jacobs FWA Field Office.

4.3 WRITTEN HAZARD COMMUNICATION

A list of the chemicals or products containing hazardous materials used on FWA sites will be maintained and updated at least annually or when products are introduced to the site. The Site Manager or Project Manager or their designee will maintain the product list.

4.4 LABELS

Labels and other forms of warnings are to be conspicuously placed on containers so the message is readily visible. The product manufacturer, importer or distributor will label, tag or mark the product container identifying the hazardous chemicals, appropriate hazard warnings, and name and address of the manufacturer, importer or responsible party.

Labeling Systems

There are multiple labeling systems currently in use including the National Fire Protection Association (NFPA) 704M labeling system, the Hazardous Materials Information System (HMIS®), the U.S. Department of Transportation labeling system, and the United Nations Hazard Class Number system.

The HMIS® system uses colored bars, while NFPA uses colored diamonds. HMIS® attempts to convey full health warning information to all employees while NFPA is meant primarily for fire fighters and other emergency responders.

NFPA 704M. The NFPA 704 standard, commonly known as the NFPA diamond, is a four section multicolor diamond shape indicating health (blue), flammability (red), instability (yellow), and related or special hazards (white) that are presented by short-term, acute exposure to a material during a fire, spill or other emergency-related condition. These

identifiers in sign form are found on the outside doors or walls and the inside of many facilities that use chemicals in their daily processes. Numbers in the three colored sections range from 0 (least severe hazard) to 4 (most severe hazard). The fourth, special hazards section is left blank and is used only to denote special fire fighting measures/hazards.

NPCA/HMIS. The National Paint & Coatings Association (NPCA) HMIS uses standard labels to communicate hazards through the use of colors, numbers, letters of the alphabet, and symbols.

The HMIS is a five-part rectangle that provides identification of the chemical, acute health hazard, flammability, reactivity, personal protective equipment designations, and chronic health hazard information.

The chemical identity is conveyed by the chemical name and should be the same as the name on the MSDS. The acute health (blue), flammability (red), reactivity (yellow) hazards are communicated by numerical ratings similar to the NFPA system.

An alphabetical designation is used to denote recommended personal protective equipment.

Chronic health hazards may be communicated by placing on the label denoting reference to the specific MSDS, or the actual chronic information may be written on the label if space allows.

Labels for Transfer Containers

When hazardous materials are transferred from one container to another, the new container will be marked appropriately with the hazard warning.

4.5 WORK PLACE INVENTORY

An up-to-date hazardous chemical inventory must be maintained.

4.6 EMPLOYEE INFORMATION AND TRAINING

Employees shall be informed of operations in their work area where hazardous chemicals are present, the location of the written Hazard Communication program, list of hazardous chemicals, and MSDSs.

Training will include methods to detect hazardous chemicals in the workplace, physical and health hazards of the hazardous chemicals in the workplace, measures employees can take to protect themselves, an explanation of the labeling system, and MSDSs.

Training will be documented using the Hazard Communication and Right-To-Know Training Form.

4.7 TRADE SECRETS

The manufacturer may withhold specific information regarding the chemicals used in a product. Those chemicals will be listed in the MSDSs as a "Trade Secret." For emergency or first aid treatment or non-emergency conditions, the product manufacturer will disclose the specific chemical identity to a health professional.

4.8 PHYSICAL AGENT DATA SHEETS

Physical Agent Data Sheets (PADS) are provided for the following hazards:

- Cold Stress
- Hand-Arm Vibration
- Heat Stress
- Ionizing Radiation
- Lasers
- Noise
- Radio Frequency/Microwave Radiation
- Ultraviolet Radiation

The PADS are provided in this attachment.

4.9 MATERIAL SAFETY DATA SHEETS (MSDS)

A binder with MSDS sheets for each hazardous chemical used at FWA will be maintained at the FWA office. The MSDSs provide the following information:

- The chemical or product name and common name of all ingredients which are known health hazards
- The chemical or product name and common name of all ingredients which are known physical hazards
- The physical and chemical characteristics of the hazardous materials such as vapor pressure and flash point
- The physical hazards of the hazardous material including fire, explosion, and reactivity
- The primary routes of entry
- The Permissible Exposure Limit, Threshold Limit Value, and other exposure limit used by the manufacturer
- Whether the hazardous material is listed in the National Toxicology Program Annual report on Carcinogens, International Agency for the Research on Cancer Monographs, or by OSHA
- Applicable precautions for safe handling and use
- Applicable engineering controls, work practices, or personal protective equipment control measures known to the manufacturer
- Emergency and first aid procedures
- Date the MSDS was prepared and name, address and telephone number of the manufacturer

MSDS sheets are included for the following chemicals:

Acetone
Ammonium Chloride
Ascorbic Acid
Buffer Solution pH 4.00
Buffer Solution pH 7.0
Buffer Solution pH 10.00
Chloroacetic Acid
Ethylenediamine
Ferrous Ammonium Sulfate
Hydrochloric Acid, Concentrated
Magnesium Carbonate
Manganese Sulfate
Methanol
Nitric Acid
Phosphoric Acid, Liquid
Potassium Acetate
Potassium Chloride
Potassium Hydroxide
Potassium Iodide
Sodium Bisulfate
Sodium Hydroxide
Sodium Sulfite
Sodium Thiosulfate
Sulfuric Acid
Zinc Acetate

Physical Action Data Sheets

Cold Stress

Hand-Arm Vibration

Heat Stress

Ionizing Radiation

Lasers

Noise

Radio Frequency/Microwave Radiation

Ultraviolet Radiation

Alaska Department of Labor and Workforce Development
Labor Standards and Safety
3301 Eagle Street/PO Box 107022
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PHYSICAL AGENT DATA SHEET

COLD STRESS

HYPOTHERMIA

FROSTBITE

Alaska Department of Labor and Workforce Development
Labor Standards and Safety
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Physical Agent Data Sheet

HYPOTHERMIA

Hypothermia is a temperature-related disorder. Therefore it is necessary to understand human physiology as it pertains to temperature stress.

Man is considered a tropical animal. Normal functioning of the human animal requires a body temperature of 37 degrees Celsius (98.6 degrees Fahrenheit). The body can self-compensate for small upward or downward variations in temperature through the activation of built-in thermoregulatory system, controlled by temperature sensors in the skin. The response to an upward variation in body temperature is the initiation of perspiration, which moves moisture from the body tissues to the body surface. When the moisture reaches the surface it evaporates, carrying with it a quantity of heat. The response to downward variation in body temperature is shivering, which is the body's attempt to generate heat. Shivering is an involuntary contraction and expansion of muscle tissue occurring on a large scale. This muscle action creates heat through friction.

THE DISORDER

Hypothermia is defined as a core temperature of the body less than 35 degrees Celsius (95 degrees Fahrenheit). Hypothermia is also considered the clinical state of sub-normal temperature when the body is unable to generate sufficient heat to efficiently maintain functions.

Many variables contribute to the development of hypothermia. Age, health, nutrition, body size, exhaustion, exposure, duration of exposure, wind, temperature, and wetness of body or clothes, medication and intoxicants (alcohol) may decrease heat production or increase heat loss.

The healthy individual's compensatory responses to heat loss via conduction, convection, radiation, evaporation and respiration may be overwhelmed by exposure. Medication may also interfere with heat generation or regulation. Children will have different symptoms than adults depending on the severity of the cold.

Definitions:

> Conduction: Direct transfer of heat by contact with a cooler object
> Convection: Cool air moving across the surface of the body, heat is transferred to the cool air warming the air.
> Radiation: Heat radiated outward from the warm body to the cooler environment.
> Evaporation: The process of losing heat from the body by vaporization of water from the body surface.
> Respiration: Inspired air raised to body temperature that is then exhaled.

Each of these causes of heat loss can play a large or small role in the development of hypothermia, depending on clothing, head cover, wind, weather, etc.

Once hypothermia develops, two body compartments, the shell (skin) and the core (the remainder of the body) share the heat deficit. The skin constitutes about 10% of a 150 pound mass.

Hypothermia can be recognized as impending, mild, moderate and severe. Below is a brief description of the various stages:

> Impending: Person's core temperature has decreased to 96.8 degrees Fahrenheit (36 degrees C). Individual will increase exercise in an attempt to warm up. The skin may become pale, numb and waxy. Muscles can become tense and shivering may begin. Fatigue and weakness may begin to show.
>
> Mild: Core temperature has dropped to 93.2 degrees Fahrenheit (34 degrees C). Intense, uncontrolled shivering has begun. The individual may still be alert and able to help self; however, movements become less coordinated and the coldness is causing some pain and discomfort.
>
> Moderate: Core temperature has dropped to 87.7 degrees Fahrenheit (31 degrees C). Shivering slows or stops completely, mental confusion and apathy set in. Speech is slow and slurred. Breathing becomes slow and shallow followed by with drowsiness.
>
> Severe: Core temperature is below 87.7 degrees Fahrenheit (31 degrees C). Skin may have a blue-gray color; iris of the eyes may be dilated, may appear drunk, denies problems and may refuse help. This leads to a gradual loss of consciousness. There may be little or no breathing, lack of response to verbal or painful stimuli and may appear dead.

(Temperatures used in above descriptions are approximate. Symptoms may start at different temperatures depending on the individual and circumstances.)

Treatment Preface

Always act on the fact that **"no one is dead until warm and dead."**

Think ABCD – Airway, Breathing, Circulation and Degrees.

In sudden exposure to cold water there is a greater chance for resuscitation with sudden submersion and with prolonged exposure to cold water. Quick onset of hypothermia, easy to reverse. Slow onset, the harder to reverse the process.

The sole consensus regarding prehospital treatment is that all patients at some point should be rewarmed. Core first then extremities. The best way to rewarm the core is by warm air and warm IV solutions.

Initial management principles emphasize prevention of further heat loss, rewarnimg as soon as is safely possible at a "successful" rate and rewarming the core before the shell, in an attempt to avoid inducing lethal side effects during rewarming. This treatment goal is important, since hypothermia itself may not be fatal above 77 degrees Fahrenheit (25 degrees C) core temperature.

The person must be handled very carefully and gently and not be allowed to exercise, as muscular action can pump cold blood to the heart.

Cold blood going to the heart can cause ventricular fibrillation

Hypothermia causes several reactions within the body as it tries to protect itself and retain its heat. The most important of these is vasoconstriction, which halts blood flow to the extremities in order to conserve heat in the core of the body.

Treatment of Hypothermia

Be able to recognize the symptoms of hypothermia in yourself and others. The victim may deny he/she is in trouble. Even mild symptoms demand attention:

> Impending: Seek or build a shelter to get the person out of the cold, windy, wet environment.
> Start a fire or get a cookstove going to provide warmth. Provide the person with a hot drink (no alcohol, coffee or tea). Insulate the person with extra clothes.
>
> Mild: Remove or insulate the patient from the cold ground, protect from the wind, eliminate evaporative heat loss with a vapor barrier. Keep the head and neck covered, remove to a warm environment. Consider covering patient's mouth and nose with a light fabric to reduce heat loss through breathing. Provide the person with a warm, sweetened drink (no alcohol, coffee or tea) and some high-energy food. Limited exercise may help to generate some internal heat, but it depletes energy reserves.
>
> Moderate: Remove the person from the cold environment, keeping the head and neck covered. Apply mild heat (comfortable to your elbow) to the head, neck chest, armpits and groin of the patient. Use hot water bottles, wrapped Thermo-pads, or warm moist towels. Do not place the hot water bottles next to the skin, wrap in cloth first. Offer sips of warm, sweetened liquids (no alcohol, coffee or tea) if the patient is fully conscious, beginning to rewarm and is able to swallow. Patient should be seen by a physician ASAP.
>
> Severe: Place person in a prewarmed sleeping bag with one or two other people. Skin to skin contact in the areas of the chest (ribs) and neck is effective. Exhale warm air near the patient's nose and mouth, or introduce steam into the area. Keep the patient awake. Apply mild heat, with the aim of stopping temperature drop, not rewarming. If patient has lost consciousness be very gentle, as the heart is extremely sensitive. Check for pulse at the carotid artery. If there is any breathing or pulse, no matter how faint, do not give CPR but keep a very close watch for changes in breathing and heart beat (vital signs). If no pulse can be found begin CPR immediately, stopping only when the heart begins to beat or the person applying CPR cannot carry on any longer without endangering themselves.

In all of the above, it is imperative that the victim be removed out of the wet and windy weather, remove all wet clothing, and put the victim into dry clothing and a warm sleeping bag.

Recent research has concluded that the safest and most effective method of treating hypothermia is through inhalation rewarming. Equipment is available; however, out in the field, alternative methods which have been described must be used where equipment is lacking.

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Physical Agent Data Sheet

FROSTBITE

GENERAL INFORMATION

Frostbite is the freezing of some part of the body. Fingers, toes, and even whole arms and legs can be lost as a result of frostbite. Injuries can happen at home, in the cities and also in more isolated areas of the State.

In extreme cold it is important to prevent heat loss from as many areas of the body as possible. Exposed limbs and head are major areas of heat loss, but keeping enough blood flowing to the hands and feet is the key to preventing frostbite. The trunk and the head should be warm enough so that the brain is able to command the blood vessels in the hands and feet to open up and keep the extremities warm.

ESSENTIAL CLOTHING

This includes thermal underwear, insulated footwear or mukluks with liners; double mittens and a parka, preferably down-filled with a good ruff. A parka that can be opened at the neck to allow heat to escape will prevent overheating and sweating. Quilted or skin pants are necessary if no warm shelter is immediately available. Tight cloths, especially tight gloves or tight boots should not be worn. The tightness interferes with good circulation in the hands and feet. If there is a reduction in blood flow to these areas, then the possibility of frostbite increases as the extremity cools down.

FACTORS LEADING TO FROSTBITE

Tall thin persons are more likely to get frostbite than those of stocky build.

People in poor physical condition are more susceptible than those in good health.

Certain diseases slow down the blood flow in the hands and feet especially in elderly people.

Heavy smokers often have poor circulation in the vital organs and decreased circulation in the arms and legs.

Children and elderly people who cannot produce large amounts of body heat for long periods of time can experience a lowering of deep body temperature and frostbite.

Alcohol causes the blood vessels to dilate (become larger). This leads to a false sense of warmth. This also leads to faster loss of heat from the body because of dilation of blood vessels. More important, people act with poor judgment after drinking.

Don't touch cold metal with bare or wet hands. You will freeze to the metal and tear the skin if pulled away without proper thawing with warm water, heat or urine.

Be careful when handling gasoline, kerosene or liquids other than water. Contact with bare skin in cold temperatures can cause instant frostbite.

> *Frostbite is more likely to occur when you are injured, frightened or careless.*

HOW TO RECOGNIZE FROSTBITE

Exposed parts of the body should be inspected routinely. This is done best with a partner. Just before freezing, the skin, especially the face with its many blood vessels, becomes bright red. Then small patches of white appear, as freezing actually occurs.

The loss of the sensations of touch, pressure and pain may occur without awareness of any numbness or other sensations. Therefore, it is important to test these sensations often. Wear clothing that is not restrictive but loose.

There may be no pain associated with frostbite if the freezing or temperature change is slow. Only if there is a rapid change in temperature does the body register pain.

The skin becomes less elastic. This is best noted in the finger pads. If touched or squeezed the pads will remain pitted. Any further cooling will result in frostbite.

Serious freezing is most common in the feet, followed by the hands and then the head (nose, ears). This is because of the poorer circulation in the feet and hands. Also with the poorer circulation there is in conjunction less sensation to these areas. Exposed head areas are less likely to freeze because of a better blood supply.

EARLY TREATMENT OF FROSTBITE

Early rewarming.

Thawing and refreezing should always be avoided.

Limbs should be rewarmed in stirred water just above normal body temperature (100 – 105 degrees Fahrenheit). Always use a thermometer to get accurate temperatures. Never try to thaw in cold water or snow. Since feeling is lost, fires, stoves, exhaust pipes, etc., should never be used. Serious damage to the skin could result.

Rewarming is an acutely painful experience and medication to alleviate pain should be given if available. After thawing, a deep aching pain may persist for several days, depending upon severity of the injury. Pain is a good sign; this tells us that the nerves are still alive and functioning.

A dull purple color, swelling and/or blistering of the extremity after thawing indicate a more serious injury and require medical attention.

SUMMARY

Poor circulation and poor production of body heat will lower resistance to frostbite.

Most cases of frostbite occur as a result of lack of knowledge, careless preparation, unavoidable accident, or the effects of alcohol on judgment. Forethought can prevent injury.

If freezing does occur, proper rewarming in warm water will give maximum benefit. The injured limb should be handled gently and a medical judgment made of the extent of injury and the need for further treatment.

Physical Agent Data Sheet (PADS)
- Hand-Arm Vibration

1.0 Description

Hand-arm vibration is caused by the use of vibrating hand-held tools, such as pneumatic jack hammers, drills, gas powered chain saws, and electrical tools such as grinders. The nature of these tools involves vibration (a rapid back and forth type of motion) which is transmitted from the tool to the hands and arms of the person holding the tool.

2.0 Health Hazards

Vibration Syndrome and Vibration-Induced White Finger (VWF) are the major health hazards related to the use of vibrating tools. Carpal Tunnel Syndrome is another health problem that has been linked in one study to the use of smaller hand-held vibrating tools.

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Vibration Syndrome

Vibration Syndrome is a group of symptoms related to the use of vibrating tools and includes -some or all of the following: muscle weakness, muscle fatigue, pain in the arms and shoulders, and vibration-induced white finger. Many researchers believe that other symptoms--headaches, irritability, depression, forgetfulness, and sleeping problems--should also be included in descriptions of Vibration Syndrome.

Vibration-Induced White Finger

Vibration-Induced White Finger (VWF), also known as "Dead Finger" or "Dead Hand" is the result of impaired circulation (poor blood supply in the fingers, caused by the prolonged use of vibrating tools. VWF may appear after only several months on the job, or may not appear until twenty to forty years on the job.

The harmful health effects of vibrating tools are related to the length of time that a worker has been using vibrating tools and to the frequency of the vibration (how fast the tool goes back and forth). The longer a person uses a vibrating tool, and the faster the tool vibrates, the greater the risk of health effects. The length of the initial symptom-free period of vibration exposure (i.e., from first exposure to the first appearance of a white finger) is known as the latent interval. It is related to the intensity of the vibration - the shorter the latent period, the more severe the resulting VWF if vibration exposure continues.

Temporary tingling or numbness during or soon after use of a vibrating hand tool is not considered to be VWF, however tingling and numbness in the fingers lasting more than an hour after finishing work may indicate early stages of VWF. Table 1 lists the stages that Vibration White Finger may progress through if exposure continues.

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Table 1
Stages of Vibration White Finger
(Taylor-Pelmear System)

Stage	Condition of Fingers	Work & Social Interference
00	No tingling, numbness or blanching of fingers	No complaints
OT	Intermittent tingling	No interference with activities
ON	Intermittent numbness	No interference with activities
TN	Intermittent tingling and numbness	No interference with activities
1	Blanching of a fingertip with or without tingling and/or numbness	No interference with activities
2	Blanching of one or more fingers beyond tips, usually during winter	Possible interference with activities outside work, no interference at work
3	Extensive blanching of fingers; frequent episodes in both summer and winter	Definite interference at work, at home, and with social activities; restriction of hobbies
4	Extensive blanching of most fingers; frequent episodes in both summer and winter	Occupation usually changed because of severity of signs and symptoms

The technical name for VWF is Raynaud's Syndrome of Occupational Origin. Raynaud's Syndrome may also occur in people who do not use vibrating hand-held tools. Several different kinds of medical illnesses can cause Raynaud's Syndrome. Raynaud's Syndrome also appears in some people who are otherwise entirely healthy.

It is important that people with Raynaud's Syndrome avoid the extensive use of vibrating tools because they can develop the most severe complications of VWF very quickly.

Many of the symptoms of Vibration Syndrome will disappear shortly after a worker stops using the types of tools which transmit vibration to the hands and arms. Fatigue and muscular pain in the arms and shoulders will generally disappear. In the early stages, if

a worker stops using vibrating tools, VWF will not get any worse and may get slightly better.

Carpal Tunnel Syndrome

Carpal Tunnel Syndrome (CTS) is a group of symptoms in the hand which arise from pressure on one of the nerves which passes through the palm side of the wrist. The early symptoms are similar to the early symptoms of white finger and consist of tingling in the fingers. For the most part only the thumb, index, and middle fingers are affected in CTS. Later, symptoms can progress to numbness. Pain in the wrist and fingers may also develop. CTS may occur in people using small hand tools like pneumatic screwdrivers. Carpal Tunnel Syndrome also occurs among people having repetitive motion of the wrist or fingers, such as using a cash register, or picking fish from a net; or with forceful motion of the wrist, such as in using a wrench. Pinching or flexing with the wrist bent upwards, downwards, or sideways increases the occurrence of CTS.

The symptoms of CTS are frequently worse at night and a person may be awakened from sleep by pain or the feeling of pins and needles in fingers, hand or wrist.

Carpal Tunnel Syndrome may improve if diagnosed in the early stages and exposure to the type of activity which caused it is stopped. In moderate cases most of the symptoms of CTS can be relieved by a surgical operation which relieves the pressure on the nerve which causes the CTS symptoms. If the surgery is performed too late, only some of the symptoms may be relieved. In very severe cases the symptoms are irreversible and may include weakness of the hand due to loss of muscle function.

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3.0 Preventing Hand-Arm Vibration Diseases

Job Modification to Reduce Vibration Exposure

Wherever possible, jobs should be redesigned to minimize the use of hand-held vibrating tools. Where job redesign is not feasible, ways to reduce tool vibration should be found. Where practical, substitute a manual tool for a vibrating tool. Whenever possible, high vibration tools should be replaced by improved, low vibration tools designed to absorb vibration before it reaches the handgrip.

Determine vibration exposure times and introduce work breaks to avoid constant, continued vibration exposure. A worker who is using a vibrating tool continuously should take a 10 minute break after each hour of using the tool.

Medical Evaluation

Workers whose occupations place them at risk for developing VWF should have pre-employment physicals and thereafter should be checked at least annually by doctors who know about the diagnosis and treatment of VWF. Diagnostic tests which can be

used include plethysmography, arteriography, skin thermography, and sensory tests,, such as two point discrimination depth sense, pinprick touch and temperature sensation. X-rays may also be useful.

Workers that have a past history of abnormalities in blood circulation and especially workers who have Raynaudis Syndrome should not be permitted to use vibrating hand-held tools. Workers who have moderate to severe symptoms of VWF should be reassigned to work which removes them from further direct exposure to vibrating tools.

If workers develop symptoms of tingling or numbness, or if their fingers occasionally become white or blue, or painful especially when cold, they should be examined by a doctor who knows about the diagnosis and treatment of VWF and CTS.

Work Practices

Workers using vibrating hand-held tools should wear multiple layers of warm gloves and should wear anti-vibration gloves whenever possible. Before starting the job, warm the hands. This is especially important when it is cold. workers using vibrating tools should not allow the hands to become chilled. If the hands of a worker using vibrating tools become wet or chilled, he should dry them and put on dry, warm gloves before resuming exposure to vibration. Workers exposed to cold should dress adequately to keep the whole body warm because low body temperature can make a worker more susceptible to VWF.

A worker using a vibrating hand-held tool should let the tool do the work by grasping it as lightly as possible, consistent with safe work practice. The tighter the tool is held, the more vibration is transmitted to the fingers and hand. The tool should rest on a support or on the workpiece as much as possible. The tool should be operated only when necessary and at the minimum speed (and impact force) to reduce vibration exposure.

Tools should be regularly maintained to keep vibration to a minimum. Keeping chisels and chainsaws sharp, for example, will reduce vibration. Using new grinder wheels will also reduce vibration.

Education

Employees who use or will be using vibrating hand-held tools should receive training about the hazards of vibration and they should be taught how to minimize the ill effects of vibration.

Smokers are much more susceptible to VWF that non-smokers, and the VWF in smokers is usually more severe, therefore workers who use vibrating hand-held tools should not smoke.

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4.0 Recommended Exposure Limits

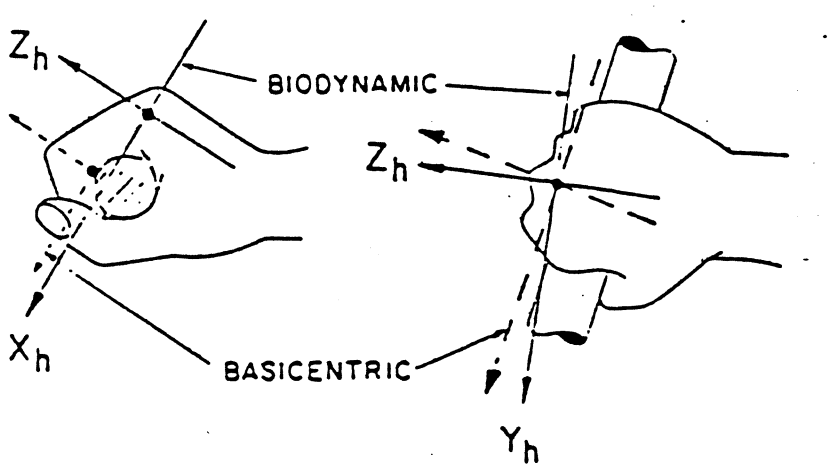
Table 2 contains the American Conference of Governmental Industrial Hygienists (ACGIH) recommendations on the limits for exposure of the hand to vibration.

Table 2 **Threshold Limit Values for Exposure of the Hand to Vibration in Either X_h, Y_h, Z_h, Directions**		
Total Daily Exposure Duration[a]	**Values of the Dominant,[b] Frequency-Weighted, rms, Component Acceleration Which Shall Not be Exceeded a_k, (a_{keg})**	
	m/s^2	**g[c]**
4 hours and less than 8	4	0.40
2 hours and less than 4	6	0.61
1 hour and less than 2	8	0.81
less than 1 hour	12	1.22

[a] The total time vibration enters the hand per day, whether continuously or intermittently.

[b] Usually one axis of vibration is dominant over the remaining two axes. If one or more vibration axes exceeds the Total Daily Exposure then the TLV has been exceeded.

[c] g = 9.81 m/s . d



Biodynamic and basicentric coordinate systems for the hand, showing the directions of the acceleration components (ISO 5349 and ANSI S3.34-1986).

Physical Agent Data Sheet (PADS)
- Heat Stress

1.0 Description

Heat stress is caused by working in hot environments like laundries, bakeries, or around boilers or incinerators. Four environmental factors affect the amount of heat stress felt by employees in hot work areas: temperature, humidity, radiant heat (such as from the sun or a furnace), and air velocity. How well or how poorly an individual reacts to heat stress is dependent on personal characteristics such as age, weight, fitness, medical condition, and acclimatization.

The body has several methods of maintaining the proper internal body temperature. When internal body temperature increases, the circulatory system reacts by increasing the amount of blood flow to the skin so the extra heat can by given off.

Sweating is another means the body uses to maintain stable internal temperatures. When sweat evaporates, cooling results. However, sweating is effective only if the humidity level is low enough to permit evaporation and if the fluids and salts lost are replaced.

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2.0 Health Effects—Heat Disorders

Heat stroke, the most serious health problem for workers in hot environments is caused by the failure of the body's internal mechanism to regulate its core temperature. Sweating stops and the body can no longer rid itself of excess heat. Signs include: mental confusion, delirium, loss of consciousness, convulsions or coma; a body temperature of 106 degrees Fahrenheit or higher; and hot dry skin which may be red, mottled or bluish. Victims of heat stroke will die unless treated promptly. While medical help should be called, the victim must be removed immediately to a cool area and his/her clothing soaked with cool water. He/she should be fanned vigorously to increase cooling. Prompt first aid can prevent permanent injury to the brain and other vital organs.

Heat exhaustion develops as a result of loss of fluid through sweating when a worker has failed to drink enough fluids or take in enough salt, or both. The worker with heat exhaustion still sweats, but experiences extreme weakness or fatigue, giddiness, nausea, or headache. The skin is clammy and moist, the complexion pale or flushed, and the body temperature normal or slightly higher. Treatment is usually simple: the victim should rest in a cool place and drink salted liquids. Salt tablets are not

recommended. Severe cases involving victims who vomit or lose consciousness may require longer treatment under medical supervision.

Heat cramps, painful spasms of the bone muscles, are caused when workers drink large quantities of water but fail to replace their bodies' salt loss. Tired muscles, those used for performing the work, are usually the ones most susceptible to cramps. Cramps may occur during or after working hours and may be relieved by taking salted liqids by mouth or saline solutions intravenously for quicker relief, if medically determined to be required.

Fainting may be a problem for the worker unacclimatized to a hot environment who simply stands still in the heat. Victims usually recover quickly after a brief period of lying down. Moving around, rather that standing still, will usually reduce the possibility of fainting.

Heat rash, also known as prickly heat, may occur in hot and humid environments where sweat is not easily removed from the surface of the skin by evaporation. When extensive or complicated by infection, heat rash can be so uncomfortable that it inhibits sleep and impairs a worker's performance or even results in temporary total disability. It can be prevented by showering, resting in a cool place, and allowing the skin to dry.

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3.0 Medical Conditions Aggravated By Exposure to Heat

Persons with heart or circulatory diseases or those who are on "low salt" diets should consult with their physicians prior to working in hot environments.

4.0 Preventing Heat Disorders

One of the best ways to reduce heat stress on workers is to minimize heat in the workplace. However, there are some work environments where heat production is difficult to control, such as when furnaces or sources of steam or water are present in the work area, or when the workplace itself is outdoors and exposed to varying warm weather conditions.

5.0 Acclimatization

Humans are, to a large extent, capable of adjusting to the heat. This adjustment to heat, under normal circumstances, usually takes about 5 to 7 days, during which time the body will undergo a series of changes that will make continued exposure to heat more endurable.

On the first day of work in a hot environment, the body temperature, pulse rate, and general discomfort will be higher. With each succeeding daily exposure, all of these responses will gradually decrease, while the sweat rate will increase. When the body

becomes acclimated to the heat, the worker will find it possible to perform work with less strain and distress.

Gradual exposure to heat gives the body time to become accustomed to higher environmental temperatures. Heat disorders in general are more likely to occur among workers who have not been given time to adjust to working in the heat or among workers who have been away from hot environments and who have gotten accustomed to lower temperatures. Hot weather conditions of the summer are likely to affect the worker who is not acclimatized to heat. Likewise, workers who return to work after a leisurely vacation or extended illness may be affected by the heat in the work environment. Whenever such circumstances occur, the worker should be gradually reacclimatized to the hot environment.

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6.0 Lessening Stressful Conditions

Many industries have attempted to reduce the hazards of heat stress by introducing engineering controls, training workers in the recognition and prevention of heat stress, and implementing work-rest cycles. Heat stress depends, in part, on the amount of heat the worker's body produces while a job is being performed. The amount of heat produced during hard, steady work is much higher than that produced during intermittent or light work. Therefore, one way of reducing the potential for heat stress is to make the job easier or lessen its duration by providing adequate rest time. Mechanization of work procedures can often make it possible to isolate workers from the heat source (perhaps in an air-conditioned booth) and increase overall productivity by decreasing the time needed for rest. Another approach to reducing the level of heat stress is the use of engineering controls which include ventilation and heat shielding.

7.0 Number and Duration of Exposures

Rather than be exposed to heat for extended periods of time during the course of a job, workers should, wherever possible, be permitted to distribute the workload evenly over the day and incorporate work-rest cycles. Work-rest cycles give the body an opportunity to get rid of excess heat, slow down the production of internal body heat, and provide greater blood flow to the skin.

Workers employed outdoors are especially subject to weather changes. A hot spell or a rise in humidity can create overly stressful conditions. The following practices can help to reduce heat stress:

Postponement of nonessential tasks

Permit only those workers acclimatized to heat to perform the more strenuous tasks, or

Provide additional workers to perform the task keeping in mind that all workers should have the physical capacity to perform the task and that they should be accustomed to the heat.

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8.0 Thermal Conditions in the Workplace

A variety of engineering controls can be introduced to minimize exposure to heat. For instance, improving the insulation on a furnace wall can reduce its surface temperature and the temperature of the area around it. In a laundry room, exhaust hoods installed over those sources releasing moisture will lower the humidity in the work area. In general, the simplest and least expensive methods of reducing heat and humidity can be accomplished by:

Opening windows in hot work areas,

Using fans, or

Using other methods of creating airflow such as exhaust ventilation or air blowers.

9.0 Rest Areas

Providing cool rest areas in hot work environments considerably reduces the stress of working in those environments. There is no conclusive information available on the ideal temperature for a rest area. However, a rest area with a temperature near 76 degrees Fahrenheit appears to be adequate and may even feel chilly to a hot, sweating worker, until acclimated to the cooler environment. The rest area should be as close to the workplace as possible. Individual work periods should not be lengthened in favor of prolonged rest periods. Shorter but frequent work-rest cycles are the greatest benefit to the worker.

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10.0 Drinking Water

In the course of a day's work in the heat, a worker may produce as much as 2 to 3 gallons of sweat. Because so many heat disorders involve excessive dehydration of the body, it is essential that water intake during the workday be about equal to the amount of sweat produced.

Most workers exposed to hot conditions drink less fluids than needed because of an insufficient thirst drive. A worker, therefore, should not depend on thirst to signal when and how much to drink. Instead, the worker should drink 5 to 7 ounces of fluids every 15 or 20 minutes to replenish the necessary fluids in the body. There is no optimum temperature of drinking water, but most people tend not to drink warm or very cold fluids

as readily as they will cool ones. whatever the temperature of the water, it must be palatable and readily available to the worker. Individual drinking cups should be provided, never use a common drinking cup.

Heat acclimatized workers lose much less salt in their sweat than do workers who are not adjusted to the heat. The average American diet contains sufficient salt for acclimatized workers even when sweat production is high. If, for some reason, salt replacement is required, the best way to compensate for the loss is to add a little extra salt to the food. Salt tablets should not be used. CAUTION: PERSONS WITH HEART PROBLEMS OR THOSE ON A "LOW SODIUM" DIET WHO WORK IN HOT ENVIRONMENTS SHOULD CONSULT A PHYSICIAN ABOUT WHAT TO DO UNDER THESE CONDITIONS.

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11.0 Protective Clothing

Clothing inhibits the transfer of heat between the body and the surrounding environment. Therefore, in hot jobs where the air temperature is lower than skin temperature, wearing clothing reduces the body's ability to lose heat into the air.

When air temperature is higher than skin temperature, clothing helps to prevent the transfer of heat from the air to the body. The advantage of wearing clothing, however, may be nullified if the clothes interfere with the evaporation of sweat.

In dry climates, adequate evaporation of sweat is seldom a problem. In a dry work environment with very high air temperatures, the wearing of clothing could be an advantage to the worker. The proper type of clothing depends on the specific circumstance. Certain work in hot environments may require insulated gloves, insulated suits, reflective clothing, or infrared reflecting face shields. For extremely hot conditions, thermally-conditioned clothing is available. One such garment carries a self-contained air conditioner in a backpack, while another is connected to a compressed air source which feeds cool air into the jacket or coveralls through a vortex tube. Another type of garment is a plastic jacket which has pockets that can be filled with dry ice or containers of ice.

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12.0 Recommended Exposure Limits

These Threshold Limit Values (TLVS) refer to heat stress conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse health effects. The TLVs shown in Table I are based on the assumption that nearly all acclimatized, fully clothed workers with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 38 degrees Celsius (100.4 degrees Fahrenheit).

Since measurement of deep body temperature is impractical for monitoring the workers' heat load, the measurement of environmental factors is required which most nearly correlate with deep body temperature and other physiological responses to heat. At the present time, Wet Bulb Globe Temperature Index (WBGT) is the simplest and most suitable technique to measure the environmental factors. WBGT values are calculated by the following equations:

Outdoors with solar load: WBGT = 0.7 NWB + 0.2 GT + 0.1 DB

Indoors or Outdoors with no solar load: WBGT = 0.7 NWB + 0.3 GT

Where: WBGT = Wet Bulb Globe Temperature Index
NWB = Natural Wet Bulb Temperature
DB = Dry Bulb Temperature
GT = Globe Temperature

The determination of WBGT requires the use of a black globe thermometer, a natural (static) wet-bulb thermometer, and a dry bulb thermometer.

Higher heat exposures that shown in Table I are permissible if the workers have been undergoing medical surveillance and it has been established that they are more tolerant at work in heat than the average worker. Workers should not be permitted to continue their work when their deep body temperature exceeds 38.0 degrees Celsius (100.4 degrees Fahrenheit).

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Table 1
Permissible Heat Exposure Threshold Limit Values
(Values are given in degrees Centigrade WBGT (Fahrenheit)]

	Work Load		
Work- Rest Regimen	**Light**	**Moderate**	**Heavy**
Continuous work	30.0 (86.0)	26.7 (80.1)	25.0 (77.0)
75% Work, 25% Rest/Hour	30.6 (87.1)	28.0 (82.4)	25.9 (78.6)
50% Work, 50% Rest/Hour	31.4 (88.5)	29.4 (85.0)	27.9 (82.2)
25% Work, 75% Rest/Hour	32.2 (90.0)	31.1 (88.0)	30.0 (86.0)

13.0 References

1. "Working in Hot Environments," US Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, 1986.

2. "Threshold Limit Values and Biological Exposure Indices for 1986 - 1987," American Conference of Governmental Industrial, Hygienists, 6500 Glenway Avenue, Building D-7, Cincinnati, OH 45211-4438.

Physical Agent Data Sheet (PADS) – Lasers

1.0 Description

A laser is a device which produces a concentrated beam of electromagnetic energy. The beam of energy can be in the form of visible light or in the form of invisible infrared or ultraviolet radiation.

Lasers differ in many ways, but there are certain characteristics which all lasers have in common. For all lasers, the production of the concentrated beam of energy requires three basic processes. First, an energy source is applied to a solid, gaseous or liquid substance called the lasing material. The lasing material then produces radiation having a specific wavelength. Then by using mirrors, lenses and shutters, the light or infrared waves or ultraviolet rays are magnified and focused to produce the laser beam.

Lasers may be different from one another in several specific ways. The basic categories are:

1. Type of lasing material used.

   The lasing material may be solid, like ruby crystals or glass; may be a gas or mixture of gases, such as carbon dioxide or a helium-neon mixture; or liquid containing special dyes.

2. Source of energy applied.

   The energy applied to the lasing material may come from a powerful light source, electric current, or a chemical reaction.

3. Continuous or pulsed emission of the laser beam.

   The energy applied to the lasing material may be continuous or applied on pulses. Some lasers can produce hundreds of thousands of pulses per second.

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2.0 Hazards

The hazards related to the use of lasers vary depending on the type of laser, the power of the laser, the purpose and manner in which the laser is used, and the safety features of the laser.

Health Hazards

Eye injuries are the most serious danger from laser beams. The cornea of the eye is like a glass window that allows light to enter the eye. It is located in the very front part of the eyeball. The cornea is very sensitive and injuries to the cornea can be very painful. most injuries to the cornea heal without permanent damage. If the deep layers of the cornea are affected, permanent injuries can occur. The types of eye injuries which occur from improper use of lasers depend on the wavelengths of the laser beams. Laser injuries to the cornea are usually caused by lasers having short wavelengths in the ultraviolet and long wavelengths in the infrared ranges.

The lens of the eye is located toward the front of the eyeball but behind the cornea. Injuries to the lens can result in loss of transparency of the lens. The lens becomes cloudy and then blocks some of the light rays entering the eye, thus making it hard to create clear images on the retina. When the lens of the eye becomes cloudy, it is called a cataract. While damage to the cornea usually heals completely in a day or two, damage to the lens almost always persists. Very slight damage to the lens may go unnoticed, but repeated minimal damage can add up to serious damage later on. Damage to the lens may not cause problems until many years after the injuries to the lens occurred. Lens damage is most likely to occur with certain lasers that produce beams in the near-ultraviolet and near-infrared wavelength range.

The retina of the eye is the surface upon which visual images are produced. It is located in the back of the eyeball. Certain lasers in the wavelength ranges of visible light and near-infrared wavelength ranges can burn permanent blind spots in the retina causing partially or totally obscured vision.

Skin burns may also occur from the use of lasers but are less likely to occur and are less serious than eye injuries. When skin is exposed to a potentially dangerous laser beam, a person will usually feel the heat and remove the exposed part of the body from the path of the laser beam.

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Electrical Hazards

Some lasers require high voltage power supplies and some workers have received electrical shock because of carelessness while working around these power supplies. Almost all laser power supplies under certain circumstances, could possible cause electrical shock or electrocution. Following the general safety standards for other electrical or electronic equipment provides protection against the dangers of electrical shock or electrocution.

Chemical Hazards

Laser welding or cutting of metals will cause formation of many of the same metal oxides and other fumes that are produced in conventional welding processes.

Explosions can occur when ice collects in valves or connectors in lasers which require very cold liquids, such as liquid nitrogen.

Lasers are commonly used in the workplace to perform the following functions:

Welding and machining
Surgery
Communication: via fiber optic technology
Shock hardening, glazing, drilling
Cutting textiles
Leveling and alignment of building sites

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3.0 Safety Classifications of Lasers

For safety purposes, lasers are divided into Classes I, II, III, and IV; Class I being least hazardous and Class IV most hazardous. Almost all reported eye injuries have been from Class IV lasers.

Almost all lasers that produce visible light beams are so bright that they can produce eye injuries. Therefore, to reduce risk of health hazards to the eye, many are designed in a way, such as enclosing the laser beam in a box, which prevents direct eye exposure to the beam.

Any laser which by itself is in Class II, III, or IV may be reclassified to a lower risk category if the laser beam is enclosed in such a way to decrease the risk of hazardous exposure to people.

Class I lasers are considered entirely safe even if used improperly. Class I lasers do not require any warning labeling. Some more hazardous lasers may be placed in the Class I category when they are part of a consumer or office machine which shields the user from the hazards of the laser beam. These machines, however, must have some type of warnings which are visible if the shields are removed.

Class II lasers are often referred to as "low-power" or "low-risk" lasers. These lasers are hazardous only when someone stares directly into the laser beam even though the beam hurts the eyes. Class II lasers require warnings to avoid staring directly into the beam.

Class III lasers are Moderate Risk or Medium Power lasers. They can produce eye injuries when the laser beams are viewed directly or when a sharp reflection is viewed directly. Class III is subdivided into Class IIIA and IIIB. Class IIIA is considered to be hazardous only when the laser beam is collected and focused by optical instruments, for example when surveyors look into a laser beam with a telescope-like instrument. Class IIIA lasers require warnings to prevent such hazardous practices. These lasers can

cause serious eye injuries before someone who accidentally looks directly into the beam has a chance to blink.

Class IV lasers produce beams that when reflected, even if it is not a sharp reflection, may cause serious eye and skin injuries, and where the beam may be a fire hazard. It is critical that the dangers of Class IV lasers are clearly marked with warning signs.

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4.0 Safety Precautions

Class I Controls

No user safety rules are necessary.

Class II Controls

1. Never permit a person to continuously stare into the laser source if exposure levels exceed the applicable permissible exposure level for the duration of intended staring.
2. Never point the laser at an individual's eye unless a useful purpose exists and the exposure level and duration will not exceed the permissible limit.

Class III Controls

1. Do not aim the laser at an individual's eye.
2. Permit only experienced personnel to operate the laser.
3. Enclose as much of the beam path as possible. Even a transparent enclosure will prevent individuals from placing their head or reflecting objects within the beam path. Terminations should be used at the end of the useful path of the direct and any secondary beams.
4. Shutters, polarizers and optical filters should be placed at the laser exit port to reduce the beam power to the minimal useful level.
5. Control spectators.
6. A warning light or buzzer should indicate laser operation. This is especially needed if the beam is not visible, e.g., for infrared lasers.
7. Do not permit laser tracking of nontarget vehicles or aircraft.
8. Operate the laser only in a restricted area, for example, in a closed room without windows, and place a warning sign on the door.
9. Place the laser beam path well above or well below the eye level of any sitting or standing observers whenever possible. The laser should be mounted firmly to assure that the beam travels only along its intended path.
10. Always use proper laser eye protection if a potential hazard exists for the direct beam or a specular reflection.

11. A key switch should be installed to minimize tampering by unauthorized individuals.
12. The beam or its specular reflection should never be directly viewed with optical instruments such as binoculars or telescopes without sufficient protective filters.
13. Remove all unnecessary mirror-like surfaces from within the vicinity of the laser beam path.

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Class IV Controls

Fortunately, these high-power lasers are seldom used outside of research laboratories and restricted industrial environments where personnel access is carefully controlled.

These lasers should only be operated within a localized enclosure, or in a controlled workplace, or where the beam is directed into outer space. If a complete local enclosure is not possible, laser operation indoors should be in a light-tight room with interlocked entrances to assure that the laser cannot emit while a door is open.

1. Eye protection is needed for all individuals working within the controlled area. If the laser beam irradiance is sufficient to be a serious skin or fire hazard, a suitable shielding should be used between the laser beam and any personnel.
2. Remote firing with video monitoring or other remote (safe) viewing techniques should be chosen when feasible.
3. Outdoor high-power laser devices such as satellite laser transmission systems and laser radar (LIDAR) should have positive stops on the azimuth and elevation transverse to assure that the beam cannot intercept occupied areas or nontarget aircraft.
4. Beam shutters, beam polarizers, and beam filters should always be used to limit use to authorized personnel only. The flashlamps in optical pump systems should be shielded to eliminate any direct viewing.
5. Backstops should be diffusely reflecting-fire resistant target materials where feasible. Safety enclosures should be used around microwelding and microdrilling work pieces to contain hazardous reflections from the work area. Microscopic viewing systems used to study the work piece should ensure against hazardous levels of reflection of laser irradiation back through the optics.

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5.0 Emergency Procedures

Anyone who is suspected of having a laser-related eye injury should be examined as soon as possible by an ophthalmologist, a physician who specializes in the care of eye injuries and diseases.

Laser-related skin burns should be treated as any other skin burns. Cold water should be applied immediately to the burn area for first and second degree burns (reddened

skin or blistering skin). Third degree burns (open wound) should be covered with a sterile dressing and the person taken to a medical facility. Never put ointments, creams or butter on burns.

6.0 Permissible Exposure Limits

Lasers used in construction shall comply with the Alaska Construction Code, Section 05.040(e):

Nonionizing radiation

1. Only qualified and trained employees shall be assigned to install, adjust, and operate laser equipment.
2. Proof of qualification of the laser equipment operator shall be available and in posession of operator at all times.
3. The employer shall provide antilaser eye protection as specified in section 50 of this subchapter for employees working in areas where a potential exposure to direct or reflected laser light greater than 5 milliwatts exist.
4. Areas in which lasers are used shall be posted with standard laser warning placards.
5. Beam shutters or caps shall be utilized, or the laser turned off, when laser transmission is not actually required. The laser shall be turned off whenever the laser is left unattended.
6. Only mechanical or electronic means shall be used as a detector for guiding the internal alignment of the lasers.
7. The laser beam shall not be directed at employees.
8. Under conditions of rain, snow, fog or dust the use of laser systems is prohibited.
9. Laser equipment shall bear a label to indicate maximum output.
10. Employees shall not be exposed to light intensities above:
    a. Direct staring: one microwatt per square centimeter.
    b. Incidental observing: two and one-half watts per square centimeter.
    c. Diffused reflected light: two and one-half watts per square centimeter.
11. Laser units in operation shall be set up above the heads of the employees.

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7.0 References

1. Sliney, D. & Walbarsht, M., Safety with Lasers and Other Optical Sources. Plenum Press, New York, NY 10013.

Physical Agent Data Sheet (PADS) – Noise

1.0 Description

Sound is created when a vibrating source (like a bell, motor or a stereo speaker) sends sound waves through the air to your ear. Every sound has two aspects: its pitch (frequency) and its loudness (intensity). On a stereo, frequency is determined by the bass/treble control. Intensity is determined by the volume control. Noise (unwanted sound) is usually made up of many frequencies. The disturbing and harmful effects of noise depend both on the loudness and the frequency of the tones making up noise.

Loudness is measured in units called decibels (dB). A conversational voice is about 65 dB. A shout is 90 dB or greater.

Frequency is measured in units called Hertz (Hz). The frequency of a locomotive horn is about 250 Hz. The frequency of a table saw is about 4,000 Hz.

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2.0 Health Effects

Excessive noise can destroy the ability to hear, and may also put stress of other parts of the body, including the heart.

For most effects of noise, there is no cure, so that prevention of excessive noise exposure is the only way to avoid health damage.

Hearing

The damage done by noise depends mainly on how loud it is and on the length of exposure. The frequency or pitch can also have some effect, since high-pitched sounds are more damaging than low-pitched sounds.

Noise may tire out the inner ear, causing temporary hearing loss. After a period of time away from the noise hearing may be restored. Some workers who suffer temporary hearing loss may find that by the time their hearing returns to normal, it is time for another work shift so, in that sense, the problem is "permanent."

With continual noise exposure, the ear will lose its ability to recover from temporary hearing loss, and the damage will become permanent. Permanent hearing loss results from the destruction of cells in the inner ear, cells which can never be replaced or repaired. Such damage can be caused by long-term exposure to loud noise or, in some cases" by brief exposures to very loud noises.

Normally, workplace noise first affects the ability to hear high frequency (high-pitched) sounds. This means that even though a person can still hear some noise, speech or other sounds may be unclear or distorted.

Workers suffering from noise-induced hearing loss may also experience continual ringing in their ears, called "tinnitus." At this time, there is no cure for tinnitus, although some doctors are experimenting with treatment.

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Other Effects

Although research on the effects of noise is not complete, it appears that noise can cause quickened pulse rate, increased blood pressure and a narrowing of the blood vessels over a long period of time, these may place an added burden on the heart.

Noise may also put stress on other parts of the body by causing the abnormal secretion of hormones and tensing of the muscles.

Workers exposed to noise sometimes complain of nervousness, sleeplessness and fatigue. Excessive noise exposure also can reduce job performance and may cause high rates of absenteeism.

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3.0 Permissible Exposure Limit

The Action level for noise is an average noise level of 85 dB for an eight-hour day. When employees are exposed to noise levels, which exceed the Permissible Exposure Limit, the employer must install or use engineering or administrative controls to lower the noise levels. While these controls are being designed or installed employees must wear hearing protection. If the controls still do not reduce noise exposures to below 90 dB, hearing protection must continue to be worn.

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4.0 Protective Measures

Suitable hearing protectors (earplugs or muffs) must be made available at no cost to employees who are exposed to an average of 85 dB or greater for an eight-hour day. Employees must be given the opportunity to select from three different types of appropriate hearing protectors.

Hearing tests (audiometric exams) must be given to employees who are exposed to an average of 85 dB or greater for an eight-hour day. Hearing tests will show whether employees are experiencing any hearing losses. Hearing tests are also useful in

showing how well the earplugs and earmuffs are working. Hearing tests must be given annually.

Employees should also receive training in the effects of noise on hearing, an explanation of the hearing tests, and instruction on the proper fitting and care of earplugs or muffs.

Noise away from work can also cause hearing loss. Hearing protectors should be worn when operating noisy equipment or tools such as chain saws, brush cutters, power lawn mowers, or when using firearms.

Refer to Alaska Administrative Code, Occupational Health and Environmental Control 04.0104 for specific regulations on Noise Exposure and Hearing Conservation Programs.

Physical Agent Data Sheet (PADS) - Ultraviolet Radiation

1.0 Description

Ultraviolet (UV) is the name for a band of energy on the electromagnetic spectrum that lies between visible light and x-rays. UV has some of the properties of visible light and other properties of the x-rays. Like visible light, some UV is actually visible but most is invisible like x-rays. UV, like light, cannot penetrate very far into most solids. Some UV, like x-rays, can ionize atoms or molecules which visible light cannot do.

Common sources of UV include the sun (especially when reflected by water, snow or ice), sun tanning lamps, mercury discharge lamps, welding arcs, plasma torches, and some lasers.

2.0 Health Hazards

The nature and seriousness of UV injuries depend on the length of exposure, the intensity of the UV, the type or wavelength of UV, the sensitivity of the individual, and the presence of certain chemicals (photosensitizers).

Skin

UV from the sun causes sunburns and skin cancer. UV from other sources can also cause skin burns varying in degree from mild reddening of the skin (first degree burns) to more severe and painful blistering (second degree burns). Long-term skin exposure to UV can cause actinic skin (a dry, brown, inelastic wrinkled skin) and skin cancer. Fair skinned individuals are more likely to develop both sunburns and skin cancer.

Some drugs, such as the antibiotic tetracycline, can cause skin burns from UV to happen faster and to be more severe. Products containing coal tar can also cause this reaction. These substances are called photosensitizers.

UV exposure may trigger cold sores (Herpes Simplex) in some individuals.

Eyes

When UV is absorbed by the eyes and eyelids, it can cause keratoconjunctivitis or "welders' flash." This is a very painful condition that feels like grit in the eyes and may make the eyes water and very sensitive to light. The condition usually occurs 6-12 hours after exposure and may last 6-24 hours. The painful injury may make a person unwilling or unable to open his/her eyes during this time period, but most discomfort is gone within 48 hours with no lasting injury. The maximum sensitivity of the eye occurs at a UV wavelength of 270 manometers.

Cataracts or clouding of the lens of the eye can occur during high exposures to wavelengths in the range of 295-300 nanometers.

3.0 Skin Safety and Health Precautions

Skin burns from high, short-term exposure to UV and skin cancer from long-term exposure can be prevented by covering exposed skin with clothing and protective equipment such as gloves and face shields.* Barrier creams or lotions with sun protection factors (SPF) of 15-18 will also help prevent skin burns.

* Welders' helmets should provide protection for the neck area as well as the face and eyes.

Eyes

Tinted goggles and/or face shields should be worn to prevent burns of the cornea and eyelids. Selection of the appropriate degree of tint should be based on the anticipated wavelength and intensity of the UV source. (see Table 1)

Table 1
Shade No. 3.0: is for glare of reflected sunlight from snow, water, sand, etc.; stray light from cutting and welding, metal pouring and work around furnaces and foundries; and soldering (for goggles or spectacles with side shields worn under helmets in arc welding operations, particularly gas-shielded arc welding operations).
Shade Nos. 4.0 and 5.0: are for light acetylene cutting and welding; light electric spot welding.
Shade Nos. 6.0 and 7.0: are for gas cutting, medium gas welding, and non-gas-shielded arc welding using current values up to 30 amperes.
Shade Nos. 8.0 and 9.0: are for heavy gas cutting and nongas-shielded arc welding and cutting using current values from 30 to 75 amperes.
Shade Nos. 10.0 and 11.0: are for arc welding and cutting using current values from 75 to 200 amperes.
Shade Nos. 12.0 and 13.0: are for arc welding and cutting using current values from 200 to 400 amperes.
Shade No. 14.0: is for arc welding and cutting using current

values over 400 amperes (including carbon arc welding and cutting), and for atomic hydrogen welding.
NOTE: ordinary window glass, 1/811 in thickness, is sufficient protection for the eyes and skin against the ultraviolet radiation from ordinary sources such as sunlight. In cases of extremely intense sources of ultraviolet and visible radiation, it is not adequate.

In sunny conditions on water, snow and ice, extra precautions should be taken to protect against reflected sunlight. Sunglasses with side shields should be worn. When applying protective ointments or lotions, special attention should be paid to the nose, lips, underside of the chin, and tops of the ears.

In workplaces, operations such as welding which produce high levels of UV should be performed behind enclosures or barriers to absorb the radiation and shield nearby workers.

UV sources like mercury discharge lamps should be operated only with all safety devices in place and in accordance with manufacturer's instructions.

4.0 First Aid Procedures

Skin burns: immediate application of cold (cold water, ice, cold clean cloths) to the affected area will reduce the severity and relieve pain associated with first and second degree burns. Do not apply any burn ointments, creams, or butter to skin burns.

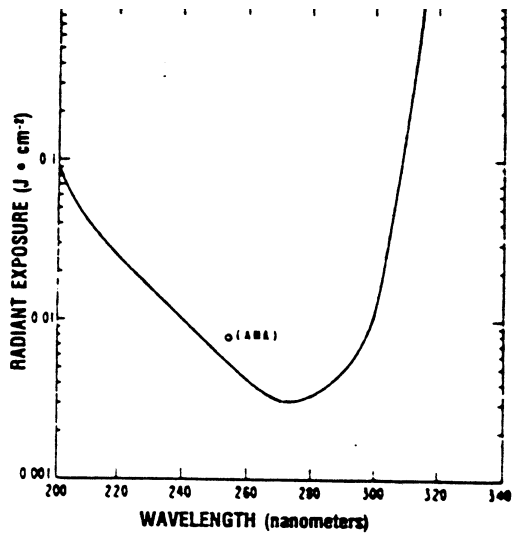
Eyes: place sterile dressings over the eyes of a person suffering from UV burns of the eyes and seek medical attention.

5.0 Recommended Exposure Limits[2]

The following section is very technical and is included for the use of safety and health professionals who have the skills and equipment to measure UV levels.

These threshold limit values (TLVS) refer to ultraviolet radiation in the spectral region between 200 and 400 nm and represent conditions under which it is believed that nearly all workers may be repeatedly exposed without adverse effect. These values for exposure of the eye or skin apply to ultraviolet radiation from arcs, gas and vapor discharges, flourescent and incandescent sources, and solar radiation, but do not apply to ultraviolet lasers. These values do not apply to ultraviolet radiation exposure of photosensitive individuals or of individuals concomitantly exposed to photosensitizing agents. These values should be used as guides in the control of exposure to continuous sources where the exposure duration shall not be less that 0.1 sec (Figure 1).

Figure 1



These values should be used as guides in the control of exposure to ultraviolet sources and should not be regarded as a fine line between safe and dangerous levels.

6.0 Recommended Values

The threshold limit value for occupational exposure to ultraviolet radiation incident upon skin or eye where irradiance values are known and exposure time is controlled are as follows:

1. For the near ultraviolet spectral region (320 to 400 nm), total radiance incident upon the unprotected skin or eye should not exceed 1 mW/cm for periods greated than 110 seconds (approximately 16 minutes) and for exposure times less than 10 seconds should not exceed one J/cm.

2. For the actinic ultraviolet spectral region (200 to 315 nm), radiant exposure incident upon the unprotected skin or eye should not exceed the values given in Table 2 within an 8-hour period.

Table 2 **Relative Spectral Effectiveness by Wavelength***		
Wavelength (nm)	**TLV (mJ/cm^2)**	**Relative Special λEffectiveness S**

200	100	0.03
210	40	0.075
220	25	0.12
230	16	0.19
240	10	0.30
250	7	0.43
254	6	0.5
260	4.6	0.65
270	3.0	1.0
280	3.4	0.88
290	4.7	0.64
300	10	0.30
305	50	0.60
310	200	0.015
315	1000	0.003

* See Laser TLVS.

3. To determine the effective irradiance of a broadband source weighted against the peak of the spectral effectiveness curve (270 nm), the following weighting formula should be used:

$$E_{eff} = \Sigma\ E\lambda\ S\lambda\ \Delta\ \lambda$$

where:

E_{eff} = effective irradinace relative to a monochromatic source at 270 nm in W/cm^2 [J/ (s cm^2)]

$E\lambda$ = spectral irradiance in W/(cm nm)

$S\lambda$ = relative spectral effectiveness (unitless)

$\Delta\ \lambda$ = band width in manometers

4. Permissible exposure time in seconds for exposure to actinic ultraviolet radiation incident upon the unprotected skin or eye may be computed by dividing 0.003 J/cm^2 by E_{eff} in W/cm^2. The exposure time may also be determined using Table 3 which provides exposure times corresponding to effective irradiances in μ W/cm^2.

Table 3 Permissible Ultraviolet Exposures	
Duration of Exposure Per Day	**Effective Irradiance E_{eff} μ(W/cm^2)**
8 hrs	0.1
4 hrs	0.2
2 hrs	0.4
1 hr	0.8
30 min	1.7
15 min	3.3
10 min	5.0
5 min	10.0
1 min	50.0
30 sec	100.0
10 sec	300.0
1 sec	3,000.0
0.5 sec	6,000.0
0.1 sec	30,000.0

5. All the preceding TLVs for ultraviolet energy apply to sources which subtend an angle less than 80 degrees. Sources which subtend a greater angle need to be measured only over an angle of 80 degrees.

Conditioned (tanned) individuals can tolerate skin exposure in excess of the TLV without erythemal effects. However, such conditioning may not protect persons against cancer.

7.0 References

1. Sunlight and Man. Fitzpatrick et all Eds. University of Tokyo Press, Tokyo, Japan (1974).

2. Threshold Limit Values and Biological Exposures Indices for 1986 - 1987. American Conference of Governmental Industrial Hygienists, 6500 Glenway Avenue, Building D-7, Cincinnati, Ohio 45211-4438.

Physical Agent Data Sheet (PADS) - Radio Frequency/Microwave Radiation

1.0 Description

Radiofrequency and microwave radiation are both forms of energy called electromagnetic radiation. Sunshine contains three other forms of electromagnetic radiation: ultraviolet rays, infrared (heat) waves, and visible light waves.

These forms of energy are transmitted by waves. The distance between wave peaks is the "wavelength." The number of wave peaks passing a given point in one second is the "frequency."

Radiofrequency or radiowaves have a range of frequencies and wavelengths. Very High Frequency (VHF) radiowaves are used for TV and FM radio. Medium Frequency (MF) radiowaves are used for AM radio. Radiofrequency is used in heat sealers and glue driers.

Microwaves are actually just radiowaves of higher frequencies. Microwaves are used for radar and satellite communications, for telephone and TV transmissions, for microwave ovens, and for diathermy in medical clinics.

Electromagnetic radiation can interact with objects (or people) in three different ways. The energy waves can pass through an object without being changed, like light through a window. It can be reflected, like light off a mirror, or it can be absorbed and cause the object to heat up, like a sidewalk in the sun.

The health hazards of electromagnetic radiation are related only to the absorption of energy. The effects of absorbed energy depend on many different factors such as its wavelength and frequency, its intensity and duration. Different materials also absorb energy differently.

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2.0 Health Hazards

When microwaves or radiowaves are absorbed by body tissues, localized or spot heating can occur. The increased temperature can damage tissues, especially those with poor temperature control such as the lens of the eye.

Cataracts, clouding of the lens of the eye, may occur at the very high energy levels encountered close to radiating radar antennas. Heat damage to tissues is caused by high levels of exposure for short periods of time.

The health effects of low levels of exposure to radiowaves or microwaves for long periods of time are much harder to find and to prove. Some scientific studies show health effects from long-term, lowlevel exposure, other studies do not.

The following list includes health effects which some researchers suspect may be related to excessive radiofrequency/microwave exposure:

- Psychological changes, e.g., insomnia, irritability, mood swings,
- depression
- Headaches
- Nervous system abnormalities
- Hormonal changes
- Miscarriages and birth defects
- Male Infertility
- Altered immunity
- Leukemia

Of course, many of these health effects are relatively common, and most people having these problems have NOT had excessive exposure to radiofrequency/microwave radiation.

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3.0 Safety and Health Precautions

Employers who have people working around devices which produce radiofrequency/microwave radiation need to be sure that those devices are properly shielded to prevent leakage of radiation. Safety information regarding proper use and shielding of those devices can usually be obtained from owner/operators manuals, manufacturers, and the Alaska Department of Labor Occupational Safety and Health Section.

Radiofrequency sealers and heaters have been among the major sources of employee exposure to radiofrequency/microwave radiation. When these machines are used, employees should use mechanical or electrical devices that allow them to stay as far away form the source of radiation as possible. Whenever possible, these sealers should be turned off when not being used. Maintenance and adjustment of this type of equipment should be performed only by trained technicians and only when the machines are turned off.

Warnings should be posted to keep everyone away from the source of radiation except for those workers who are absolutely essential to performing the job.

People who are regularly exposed to significant levels of radiofrequency/microwave radiation should have preemployment and annual physical exams. The doctors should pay careful attention to the eyes to look for

cataracts, to the nervous system for any abnormalities to the blood, to detect any early evidence of leukemia, and to the reproductive system to detect any abnormalities. Information concerning the frequency and intensity of the radiation exposures and duration of exposures should be provided to the physician.

In work areas where there is known or suspected to be significant amounts of radiofrequency/microwave radiation present, specialists should measure the amounts of radiation present. If excessive radiofrequency/microwave radiation is detected, modifications in the workplace should be made to reduce radiation exposure of workers. Afterwards, additional measurements should be made to determine if the radiation exposure has been reduced.

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4.0 Permissible Exposure Limits

The State of Alaska's permissible exposure limit is specified in Article I of Subchapter 4, Occupational Health and Environmental Control Code [04.0106(a)], Alaska Occupational Safety and Health Standards. For normal environmental conditions and for incident electromagnetic energy of frequencies from 10 MHz to 100 GHz, the radiation protection guide is 10 mW/cm (milliwatts per square centimeter) as averaged over any possible six-minute period.

Further information can be obtained from the Alaska Department of Labor, Occupational Safety and Health Section.

5.0 Microwave Cooking Ovens

Microwave ovens used for heating food, when used in accordance with manufacturer's instructions, do not expose personnel to microwave radiation.

Microwave ovens do not need to be included in an employer's Hazard Communication program.

Labor Standards & Safety Division
Alaska Department of Labor & Workforce Development
Occupational Safety and Health

Revised: September 2004

Physical Agent Data Sheet (PADS)
- Ionizing Radiation

- Description
- Occupations with Exposure to Ionizing Radiation
- Health Effects
- Emergency Procedures
  - Spills
  - Loss of a sealed source
  - Rupture or broken sealed source
  - Major Calamity
- Medical Treatment
- Safety Procedures and Control Measures
- Licensing, Registration, Consultation
- Personal Protective Equipment
- Permissible Exposure Limit
- References and Resources

Description

Ionizing Radiation is the name given to a band of energy on the electromagnetic spectrum. X-rays and radioactive substances are examples of ionizing radiation. In order to understand the difference between ionizing and non-ionizing radiation it is necessary to review the structure of an atom.

All matter is made up of atoms. Molecules are collections of atoms hooked together in various combinations and shapes. An atom is the smallest unit of an element (like helium, oxygen or carbon) that still has all the properties of that element. Atoms are so small they cannot be seen with even the most powerful microscope.

All atoms are made up of three major subatomic particles: protons, neutrons, and electrons. Protons and neutrons make up the nucleus or center of the atom. Protons have a positive electric charge but neutrons have no electric charge. Electrons circle the nucleus and have a negative charge. In the neutral atom the negative charges of the electrons exactly balance the positive charges of the protons in the nucleus. If an atom has too many or too few electrons in orbit to balance the charge of the protons, the atom is called an ion.

The number of protons in the nucleus of an atom determines which element it is. Isotopes of the same element have the same number of protons but varying numbers of neutrons. The helium atom ($^{4}He_{2}$) has two protons and two neutrons in the nucleus. The carbon atom ($^{12}C_{6}$) has six protons and six neutrons in the nucleus. An example of

an unstable isotope of carbon is carbon-14 ($^{14}C_6$). The superscript indicates the atomic weight while the subscript number indicates the number of protons. If the atom has too many or too few neutrons for the number of protons, the atom may be unstable. If unstable the nucleus will give off bursts of energy (radiation) in an attempt to become stable.

These bursts of energy or disintegrations may be in the form of alpha particles (two protons and two neutrons - positively charged), beta particles (a negatively-charged electron), x-rays, or gamma rays (types of high energy electromagnetic waves). If these charged particles or waves interact with another atom, they have enough energy to knock an electron out of its orbit, creating an ion. That is why this type of radiation is called ionizing radiation.

Other forms of energy, like visible light, radio waves, and infrared light, do not have enough power to knock electrons out of their orbits so they are called non-ionizing radiation.

Amounts of ionizing radiation can be expressed in several different units. A **roentgen** (R) is an amount of x-rays or gamma radiation that causes a specified amount of ionization among the atoms and molecules in a cubic centimeter of air. Another unit is the **rad**, which applies to all ionizing radiation. It is a measure of the amount of energy absorbed from radiation in a specific volume of material.

A third unit, which is more useful and used more commonly, is the **REM** (Roentgen Equivalent Man). Measuring radiation in rems or millirems (one thousandth of a rem) allows direct comparison of the biological effects of different types of radiation. Alpha particles, beta particles, and x-rays or gamma radiation, differ in their ability to cause damage in tissues due to their differences in ionizing and penetrating ability. Alpha particles are 20 times more damaging in tissue then the same amount of x-rays. Measuring radiation in rems takes this difference into account so that one rem of alpha radiation in tissues has the same effect as one rem of beta radiation or one rem of x-rays. A rem is a relatively large quantity of radiation so most human exposures are measured in millirems. An easy way to remember the difference between these units is that a roentgen is a measure of how much you are exposed to, the rad is how much you absorb, and the rem is how much damage it does.

All people receive ionizing radiation from naturally occurring sources. Depending on where you live, most people receive an exposure in the range of 100 millirems per year from cosmic radiation from outer space and from naturally occurring isotopes (excluding radon) in the ground, air, food, and water. Radon is estimated to add another 200 millirems per year to our background. Medical and dental uses of x-rays can also contribute to a person's yearly radiation exposure. A typical well-conducted chest x-ray involves an exposure of 30 milliroentgens.

OCCUPATIONS WITH EXPOSURE TO IONIZING RADIATION	
With the use of radioactive isotopes in industry and the increasing use of x-ray sources, ionizing radiation exposures may occur in a wide variety of occupations. The following examples show the diversity of occupations potentially exposed to ionizing radiation.	
Aircraft workers	Military personnel
Atomic energy plant workers	Nuclear medicine workers with exposure to energetic radiation from selected radioisotopes (e.g. technetium-99m, iodine-131, tritium-3, etc.)
Biologists	Nurses
Cathode ray tube makers	Oil well loggers
Ceramic workers	Ore assayers
Chemists	Pathologists
Density testers	Petroleum refinery workers
Dental assistants	Physicians
Dentists	Physicists
Dermatologists	Pipeline oil flow testers
Drug makers	Pipeline weld radiographers
Drug sterilizers	Plasma torch operators
Electron microscope makers	Plastic technicians
Electron microscopists	Prospectors
Electrostatic eliminator operators	Radar tube makers
Embalmers	Radiologists
Fire alarm makers	Radium laboratory workers
Food preservers	Radium refinery workers
Food sterilizers	Research workers
Gas mantle makers	Television tube makers
High voltage television repairmen	Thickness gauge operators
High voltage vacuum tube makers	Thorium-aluminum alloy workers
High voltage vacuum tube users	Thorium-magnesium alloy workers
Industrial fluoroscope operators	Thorium ore producers
Industrial radiographers	Tile glaziers
Inspectors using, and workers in proximity to, sealed gamma ray Uranium sources (e.g. cesium-137, cobalt-60, and iridium-192)	Uranium dye workers
Klystron tube operators	Uranium mill workers
Liquid level gauge operators	Veterinarians
Luminous dial painters	X-ray technicians / aides
Machinists	X-ray diffraction apparatus operators
	X-ray tube makers, fabricated metal product

Health Effects
The health risks and effects of exposure to ionizing radiation are dependent on the type of radiation (alpha, beta, gamma or x-ray), the energy, the dose rate, the quantity, and the body part exposed.

Alpha particles, due to their relatively large size and mass, do not travel very far in air (a few centimeters) and cannot pass through skin or even a sheet of paper. Alpha radiation is only hazardous if inhaled or ingested. It is the most damaging to tissue if it is inhaled or ingested. Beta particles are more penetrating than alpha; a thin sheet of aluminum will stop beta radiation, but beta radiation is not as damaging to tissue.

X-rays (and gamma rays) are the most penetrating and least damaging to tissue. Their penetrating capability makes them useful for medical diagnoses.

Some body parts are more sensitive to damage from ionizing radiation than other body parts. The reproductive and blood-forming organs and the eyes are the most sensitive while the extremities such as arms, hands, and feet are less sensitive.

The quantity of ionizing radiation to which a person is exposed is the greatest factor in the risk and severity of a radiation-related injury. Information on the health effects of a single large dose of ionizing radiation is readily available from studies of the casualties and survivors of the atomic explosions in Hiroshima and Nagasaki, from studies of people exposed to radioactive fallout from the early atom bomb testing and from accidents involving ionizing radiation.

Health effects of a single acute dose of whole body radiation.	
Dose	**Acute Effects**
less than 25 rems	No detectable effect
25 - 50 rems	Drop in white blood cell count, no serious injury
50 - 100 rems	Possible injury and sickness; no disability
100 - 200 rems	Acute radiation sickness (nausea, vomiting, diarrhea, weakness, shock, skin sores, hair loss); possible disability
200 - 400 rems	Acute radiation sickness; disability certain, possible death without treatment
400 - 500 rems	50% death rate without treatment
> 600 rems	100% death rate

Occupational exposure to ionizing radiation is usually limited to a small area of the body such as the hands, resulting in reddening of the skin or dermatitis. Whole body radiation and acute radiation sickness occurs very rarely in occupational settings.

The health effects of long-term exposure to low levels of ionizing radiation are less easily studied and documented. The concern about possible health effects, cancer and genetic effects in particular, from low level radiation stems from the known health effects of high doses of radiation and the assumption that the degree of risk is directly related to the degree of exposure. It is assumed (not proven) for safety sake, that any exposure to radiation above natural background levels contributes to small increases in the risk of developing cancer. Reducing exposure to the lowest level possible will, therefore, reduce the risk to the lowest level possible.

Emergency Procedures

The following emergency procedures were developed for medical facilities but can be generally applied to any workplace where radioactive substances are used.

Initial report: All incidents involving environmental contamination should be reported first to the Alaska Department of Environmental Conservation Area Response Team (SOSC).

Southeast Alaska:	Bob Mattson (Juneau) Bob_mattson@dec.state.ak.us	907-465-5349
Central Alaska:	Gary Folley (Soldotna) Gary_folley@dec.state.ak.us	907-262-5210 ext 234
Northern Alaska:	Ed Meggert (Fairbanks) Ed_meggert@dec.state.ak.us	907-451-2124
Secondary report:	Doug Dasher (Fairbanks) Doug_dasher@dec.state.ak.us	907-451-2172

A. Spills

Accidental spillage of radioactive material is rare, but cannot be prevented absolutely, and may occur in any laboratory, in any hall or passageway traversed by messengers transporting such material.

Except for a major accident to a shipping container or a serious spill in the hot laboratory, the amount of radioactive material involved in a spill will usually be small and the radiation from it will not constitute a serious hazard. The real danger is the spread of the contamination on shoes or other contaminated garments. The following is a general outline of the procedure to be followed in the event of a spill.

- Confine the spill immediately by dropping paper towels or other absorbent material onto it.

- Put on waterproof gloves.

- Check shoes for visible signs of contamination. If it appears
- possible that they are contaminated, remove shoes when leaving the contaminated region.

- If fans, ventilators, or air conditioners are operating in the area, they should be shut off. Preferably this should be done by someone not involved in the spill and therefore not likely to spread contamination.

- Mark off or isolate in some way the entire suspect area and police it to be sure that no one walks through it.

- **CALL THE RADIATION PROTECTION SUPERVISOR (RPS)** (aka Radiological Safety Officer) designated by the employer. If the number is not posted in a convenient place, and you do not know it, call the company telephone operator, report an emergency and ask the operator to find the supervisor.

- In general, inexperienced personnel should not attempt to clean up a spill. It is better to wait a little while for the RPS than to risk spreading the contamination by erroneous procedures. If the spilled material is covered and bystanders are kept a few feet away, there is little or no danger from the radiation.

- If any of the spilled material has splashed onto a person or clothing, immediate steps should be taken to remove it. Laboratory coats or outer garments should be taken off and left in the contaminated area. Hands or other skin areas should be washed thoroughly with soap. If it is certain that shoes or feet are not contaminated, it is permissible to walk to a washing facility, which subsequently, however, must be treated as a contaminated area until cleared by the RPS. If there is doubt about contamination of the feet, a washbowl and soap should be brought to the suspect area for cleaning them.

- The RPS should bring decontamination materials and a survey meter, and the clean-up operation will proceed under the supervision of the RPS.

- If the RPS is not immediately available, or cleanup must proceed without him or her, one person should do the work. This person should put on waterproof

gloves, shoe covers and a surgical facemask if it is available. He will then take up the spilled material with absorbent paper, which must be handled with forceps or tongs, and deposit it immediately in a waterproof container. After as much as possible has been removed in this way, the surface should be washed with damp, not wet, rags held in forceps, always working toward the center of the contaminated area rather than away from it.

- A survey meter should have been obtained from the office of the RPS, and careful monitoring carried out during this procedure, on area and personnel. Preferably, the meter should be operated by someone not involved in the spill, so that the instrument is not likely to be contaminated.

- Reduction of counting rate to five times background, over an area of 1 or 2 square feet or to ten times background over a few square inches is usually satisfactory, especially for short-lived nuclides. Eventually, the RPS should check the area and give it clearance.

- When the operation is finished, gloves and other protective garments should be carefully checked for residual contamination. If any is found, the garments should be left with the other contaminated material for ultimate clearance or disposal by the RPS.

B. Loss of a Sealed Source

The following is a general outline of the procedure to be followed in the event of loss of a sealed source:

- Call the Radiation Protection Supervisor (RPS).

- If all sources are supposed to have been removed from the patient, he or she should be checked with a survey meter to make sure that none has inadvertently been left behind.

- Try to make sure that all bandages, linen, and bedding have been kept in the patient's room. If this is not the case, try to stop them on the way to the laundry or the incinerator.

- Check all this material, a little at a time. Then check the room, to be sure the source is not on the floor or furniture.

- Check the drain tap of any accessible plumbing facility.

- Check the incinerator.

- Check all barrels of ashes or garbage. The more active the source, the easier it should be to find it.

C. A Ruptured or Broken Sealed Source

- Shut off all fans and ventilators.
- Drop damp towels on the suspect material; throw nothing away.
- Call the Radiation Protection Supervisor. The RPS will remove the questionable material and check the area for contamination.
- If possible, evacuate the room. If not, keep all personnel several feet from the suspect material until the RPS arrives.

D. A Major Calamity: Fire, Earthquake, A Massive Spill

- Call the Radiation Protection Supervisor.
- Report the incident to the Alaska Department of Environmental Conservation Area Response Team (SOSC)
- Prevent access to suspect areas, or removal of anything from them. Shut off ventilating system; close drains if possible.
- Do not try to do anything until the RPS arrives. The RPS must be given complete charge.
- If for any reason the RPS cannot take charge, wait for the Alaska Department of Environmental Conservation Area Response Team (SOSC) or follow their instructions.

Medical Treatment

Medical treatment of a person who has been accidentally over exposed to ionizing radiation will depend on the dose. Exposures less than 25 rems generally do not require treatment. The treatment will also depend on whether the source of the radiation is outside the body such as from x-ray equipment or a gamma emitter, or from inside the body such as when a radioactive dust is inhaled or ingested.

When the source of radiation is outside the body, and treatment is considered necessary, it is started after the entire radiation dose has been received. The dose cannot be lessened, therefore the objective of the treatment is to lessen the acute effects of radiation sickness, prevent secondary infections and provide transfusions to supplement weakened and damaged blood cells.

When the source of the radiation (the emitter) has been inhaled or swallowed, radiation exposure will continue and the goal of treatment is to reduce the quantity of the emitter in the body. This may be accomplished by speeding up the excretion of the emitter by chelating therapy. A chelating agent is a chemical which binds with radioactive heavy metals enabling the body to excrete them faster. Chelating therapy is effective for internal emitters which are soluble in body fluids. Insoluble emitting substances which have been inhaled can be removed to some extent by bronchopulmonary lavage, a procedure which rinses out the lung's air sacs and airways.

Safety Procedures and Control Measures

The specific aspects, equipment, and procedures of a workplace radiation safety program will depend on the nature of the source, the type of radiation emitted, and the circumstances of its use. Only general concepts of protection and control can be covered in a data sheet of this scope. The National Council on Radiation Protection and Measurements (NCRP) offers recommendations for specific uses of radiation emitting substances and equipment. Publications from NCRP are available from their website: http://www.ncrp.com

Restricted Access: Only authorized trained personnel should be allowed in work areas where radiation emitting substances or equipment are used. Signs and warning notices using the standard radiation symbol must be posted.

Shielding: The selection of materials and designs for shielding will depend on the type of radiation, the use factor of the equipment, occupancy times, and workload.

Ventilation: Operations that routinely produce airborne contamination should utilize engineered containment and ventilation systems to prevent airborne releases. Appropriate respirators may be used but only when effective engineering controls are not feasible.

Radiation Monitoring: Radiation survey equipment appropriate for the type of radiation to be measured must be maintained and used to evaluate exposure conditions for employees. Working areas must be monitored at a frequency that will ensure safe working conditions. Individuals working in most industrial settings and many medical facilities must wear appropriate radiation monitoring devices to measure actual occupational exposures. Records of results for area and personal monitoring must be maintained.

Licensing and Registration: All by-product radioactive material and special nuclear material must be licensed by the Nuclear Regulatory Commission, and conditions of that license must be met by the user. Radioactive materials not under the jurisdiction of the Nuclear Regulatory commission and all x-ray sources must be registered with the

Alaska Department of Health and Social Services (H&SS), Radiological Health program. Use must meet requirements of the Alaska Radiation Protection Regulations, H&SS, in addition to the Occupational Safety and Health regulations of the Alaska Department of Labor & Workforce Development and the Environmental regulations of the Department of Environmental Conservation. The NRC and the state may conduct inspections of licensees and registrants to ensure compliance.

Consultation: Radiological Health is a program within the Department of Health and Social Services, State Public Health Laboratories. This program is responsible for safe use of radiation sources within the State of Alaska. Under Alaska statute, the program is responsible for Radiation Protection including the development of policies for evaluating radiation hazards, conducting surveys/investigations and training. This includes measurement and safe use of radiation, reviewing plans and shielding specifications for radiation sources, inspecting facilities where radiation sources are used, and contracting with other agencies where a cooperative effort is required in order to address radiation hazards. These responsibilities include both ionizing and non-ionizing sources, and radiation producing devices as well as radioactive materials. The main office is in Anchorage, however radon related activities are conducted out of the University of Alaska Fairbanks.

Contact: Clyde E. Pearce, RHS
Telephone: (907) 334-2107
Facsimile: (907) 334-2161
E-mail: clyde_pearce@health.state.ak.us

Emergency Response: Environmental surveys and disaster response to radiation in the environment are the responsibility of the Department of Environmental Conservation.

Initial report: All incidents involving environmental contamination should be reported first to the Alaska Department of Environmental Conservation Area Response Team (SOSC).

Southeast Alaska:	Bob Mattson (Juneau) Bob_mattson@dec.state.ak.us	907-465-5349
Central Alaska:	Gary Folley (Soldotna) Gary_folley@dec.state.ak.us	907-262-5210 ext 234
Northern Alaska:	Ed Meggert (Fairbanks) Ed_meggert@dec.state.ak.us	907-451-2124
Secondary report:	Doug Dasher (Fairbanks) Doug_dasher@dec.state.ak.us	907-451-2172

Personal Protective Equipment
Respirators used for protection against airborne contamination should be approved by the National Institute of Occupational Safety and Health (NIOSH). If air-purifying respirators are used, only high efficiency (HEPA) cartridges approved for dusts, fumes, mists, and radionuclides or radon daughters (progeny) may be used. A good respirator program must include consideration of respirator type, fit, maintenance, testing, and training.

Protective clothing must be provided if the potential for skin or clothing contamination exists. Selection must be based on the nature of the contaminant (liquid or dry material) and the type of radiation emitted. Appropriate methods of laundering or disposal are also required. Contaminated clothing must not be taken home.

Permissible Exposure Limit
The US DOL Occupational Safety and Health Administration (OSHA) regulations 29 CFR 1910.1096, adopted by reference by the State of Alaska under Alaska Administrative Code 8 AAC 61.1010(b), state that:

. . . (b) Exposure of individuals to radiation in restricted areas.

(1) No employer shall possess, use, or transfer sources of ionizing radiation in such a manner as to cause any individual in a restricted area to receive in any period of one calendar quarter from sources in the employer's possession or control a dose in excess of the limits specified in Table 1-18.

Table 1-18 **Rems per calendar quarter**	
Whole body: Head and trunk; active blood-forming organs; lens of eyes; or gonads	1 1/4
Hands and forearms; feet and ankles	18 3/4
Skin of whole body	7 1/2

(2) An employer may permit an individual in a restricted area to receive doses to the whole body greater that those permitted under 29 CFR 1910.1096 (b) (1) so long as:

(A) During any calendar quarter the dose to the whole body shall not exceed three rems; and

(B) The dose to the whole body, when added to the accumulated occupational dose to the whole body, shall not exceed five (N-18) rems, where "N" equals the individual's age in years at his last birthday; and

(C) The employer maintains adequate past and current exposure records that show that the addition of such a dose will not cause the individual to exceed the amount authorized in this form. "Dose to the whole body" shall be deemed to include any dose to the whole body, gonad, active blood forming organs, head and trunk, or lens of the eye.

(3) No employer shall permit any employee who is under 18 years of age to receive in any period of one calendar quarter a dose in excess of 10 percent of the limits specified in Table 1-18.

These regulations (29 CFR 1910.1096) also cover definitions, exposure to airborne radioactive material, precautionary measures and personal monitoring, caution signs, labels and symbols, evacuation warnings, instruction of personnel, waste disposal, notification of incidents, reports of overexposure, records and disclosure.

References and Resources

1. Occupational Diseases - A Guide to Their Recognition, DHEW (NIOSH) Publication No. 77-181. 1978.

2. Radiation Protection for Medical and Allied Health Personnel, National Council on Radiation Protection and Measurements (NCRP) Report No. 48. 1986. Access NCRP publications at: http://www.ncrp.com

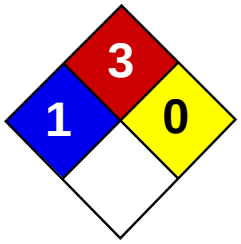
3. Cralley, Lewis J. and Cralley, Lester V. Patty's Industrial Hygiene and Toxicology Volume III, pg. 359 - 404, John Wiley and Sons, Inc. 1979.

4. OSHA General Industry Regulations, 29 CFR 1910, as amended, and adopted by the State of Alaska in Alaska Administrative Code, 8 AAC 61.1010(b) under the authority of AS 18.60.030, and specifically 29 CFR 1910.1096

   http://www.osha.gov/pls/oshaweb/owastand.display_standard_group?p_toc_level=1&p_part_number=1910

Material Safety Data Sheets

Acetone
Ammonium Chloride
Ascorbic Acid
Buffer Solution pH 4.00
Buffer Solution pH 7.0
Buffer Solution pH 10.00
Chloroacetic Acid
Ethylenediamine
Ferrous Ammonium Sulfate
Hydrochloric Acid, Concentrated
Magnesium Carbonate
Manganese Sulfate
Methanol
Nitric Acid
Phosphoric Acid, Liquid
Potassium Acetate
Potassium Chloride
Potassium Hydroxide
Potassium Iodide
Sodium Bisulfate
Sodium Hydroxide
Sodium Sulfite
Sodium Thiosulfate
Sulfuric Acid
Zinc Acetate



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Acetone MSDS

Section 1: Chemical Product and Company Identification

Product Name: Acetone

Catalog Codes: SLA3502, SLA1645, SLA3151, SLA3808

CAS#: 67-64-1

RTECS: AL3150000

TSCA: TSCA 8(b) inventory: Acetone

CI#: Not applicable.

Synonym: 2-propanone; Dimethyl Ketone; Dimethylformaldehyde; Pyroacetic Acid

Chemical Name: Acetone

Chemical Formula: C3-H6-O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Acetone	67-64-1	100

Toxicological Data on Ingredients: Acetone: ORAL (LD50): Acute: 5800 mg/kg [Rat]. 3000 mg/kg [Mouse]. 5340 mg/kg [Rabbit]. VAPOR (LC50): Acute: 50100 mg/m 8 hours [Rat]. 44000 mg/m 4 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [SUSPECTED]. The substance is toxic to central nervous system (CNS). The substance may be toxic to kidneys, the reproductive system, liver, skin. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 465°C (869°F)

Flash Points: CLOSED CUP: -20°C (-4°F). OPEN CUP: -9°C (15.8°F) (Cleveland).

Flammable Limits: LOWER: 2.6% UPPER: 12.8%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks, of oxidizing materials, of acids.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Vapor may travel considerable distance to source of ignition and flash back.

Special Remarks on Explosion Hazards:
Forms explosive mixtures with hydrogen peroxide, acetic acid, nitric acid, nitric acid + sulfuric acid, chromic anydride, chromyl chloride, nitrosyl chloride, hexachloromelamine, nitrosyl perchlorate, nitryl perchlorate, permonosulfuric acid, thiodiglycol + hydrogen peroxide, potassium ter-butoxide, sulfur dichloride, 1-methyl-1,3-butadiene, bromoform, carbon, air, chloroform, thitriazylperchlorate.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, acids, alkalis.

Storage:
Store in a segregated and approved area (flammables area) . Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Keep away from direct sunlight and heat and avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 500 STEL: 750 (ppm) from ACGIH (TLV) [United States] TWA: 750 STEL: 1000 (ppm) from OSHA (PEL) [United States] TWA: 500 STEL: 1000 [Austalia] TWA: 1185 STEL: 2375 (mg/m3) [Australia] TWA: 750 STEL: 1500 (ppm) [United Kingdom (UK)] TWA: 1810 STEL: 3620 (mg/m3) [United Kingdom (UK)] TWA: 1800 STEL: 2400 from OSHA (PEL) [United States]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Fruity. Mint-like. Fragrant. Ethereal

Taste: Pungent, Sweetish

Molecular Weight: 58.08 g/mole

Color: Colorless. Clear

pH (1% soln/water): Not available.

Boiling Point: 56.2°C (133.2°F)

Melting Point: -95.35 (-139.6°F)

Critical Temperature: 235°C (455°F)

Specific Gravity: 0.79 (Water = 1)

Vapor Pressure: 24 kPa (@ 20°C)

Vapor Density: 2 (Air = 1)

Volatility: Not available.

Odor Threshold: 62 ppm

Water/Oil Dist. Coeff.: The product is more soluble in water; log(oil/water) = -0.2

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, ignition sources, exposure to moisture, air, or water, incompatible materials.

Incompatibility with various substances: Reactive with oxidizing agents, reducing agents, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 3000 mg/kg [Mouse]. Acute toxicity of the vapor (LC50): 44000 mg/m3 4 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [SUSPECTED]. Causes damage to the following organs: central nervous system (CNS). May cause damage to the following organs: kidneys, the reproductive system, liver, skin.

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May affect genetic material (mutagenicity) based on studies with yeast (S. cerevisiae), bacteria, and hamster fibroblast cells. May cause reproductive effects (fertility) based upon animal studies. May contain trace amounts of benzene and formaldehyde which may cancer and birth defects. Human: passes the placental barrier.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. May be harmful if absorbed through the skin. Eyes: Causes eye irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury. Inhalation: Inhalation at high concentrations affects the sense organs, brain and causes respiratory tract irritation. It also may affect the Central Nervous System (behavior) characterized by dizzness, drowsiness, confusion, headache, muscle weakeness, and possibly motor incoordination, speech abnormalities, narcotic effects and coma. Inhalation may also affect the gastrointestinal tract (nausea, vomiting). Ingestion: May cause irritation of the digestive (gastrointestinal) tract (nausea, vomiting). It may also

affect the Central Nevous System (behavior), characterized by depression, fatigue, excitement, stupor, coma, headache, altered sleep time, ataxia, tremors as well at the blood, liver, and urinary system (kidney, bladder, ureter) and endocrine system. May also have musculoskeletal effects. Chronic Potential Health Effects: Skin: May cause dermatitis. Eyes: Eye irritation.

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 5540 mg/l 96 hours [Trout]. 8300 mg/l 96 hours [Bluegill]. 7500 mg/l 96 hours [Fatthead Minnow]. 0.1 ppm any hours [Water flea].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Acetone UNNA: 1090 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Benzene California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Benzene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Benzene, Formaldehyde Connecticut hazardous material survey.: Acetone Illinois toxic substances disclosure to employee act: Acetone Illinois chemical safety act: Acetone New York release reporting list: Acetone Rhode Island RTK hazardous substances: Acetone Pennsylvania RTK: Acetone Florida: Acetone Minnesota: Acetone Massachusetts RTK: Acetone Massachusetts spill list: Acetone New Jersey: Acetone New Jersey spill list: Acetone Louisiana spill reporting: Acetone California List of Hazardous Substances (8 CCR 339): Acetone TSCA 8(b) inventory: Acetone TSCA 4(a) final test rules: Acetone TSCA 8(a) IUR: Acetone

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R11- Highly flammable. R36- Irritating to eyes. S9- Keep container in a well-ventilated place. S16- Keep away from sources of ignition - No smoking. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References:
-Material safety data sheet issued by: la Commission de la SantÃ© et de la SÃ©curitÃ© du Travail du QuÃ©bec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. LOLI, RTECS, HSDB databases. Other MSDSs

Other Special Considerations: Not available.

Created: 10/10/2005 08:13 PM

Last Updated: 11/06/2008 12:00 PM

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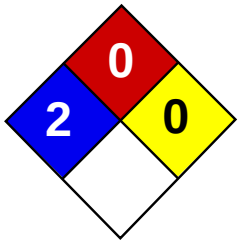

Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Ammonium chloride MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ammonium chloride

Catalog Codes: SLA3415, SLA1069, SLA2575, SLA4078, SLA1732, SLS3118

CAS#: 12125-02-9

RTECS: BP4550000

TSCA: TSCA 8(b) inventory: Ammonium chloride

CI#: Not applicable.

Synonym: Ammonium Chloratum; Ammonium Chloridum; Ammonium Muriate; Sal Ammonia; Salmiac

Chemical Name: Ammonium Chloride

Chemical Formula: NH4Cl

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Ammonium chloride	12125-02-9	100

Toxicological Data on Ingredients: Ammonium chloride: ORAL (LD50): Acute: 1650 mg/kg [Rat.]. 1300 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of eye contact (irritant). Slightly hazardous in case of skin contact (irritant, sensitizer), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Reaction between Ammonium Chloride and Bromine pentafluoride at ambient or slightly elevated temperature is violent, and ignition often occurs.

Special Remarks on Explosion Hazards: Explosive reaction between bromine trifluoride and ammonium halides.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 10 STEL: 20 (mg/m3) from ACGIH (TLV) [United States] Inhalation TWA: 10 STEL: 20 (mg/m3) [United Kingdom (UK)] Inhalation TWA: 10 STEL: 20 (mg/m3) from NIOSH [United States] Inhalation TWA: 10 STEL: 20 (mg/m3) from OSHA (PEL) [United States]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Solid crystalline powder.)

Odor: Odorless. (Slight.)

Taste: Cooling, Saline.

Molecular Weight: 53.49 g/mole

Color: White.

pH (1% soln/water): 5.5 [Acidic.]

Boiling Point: 520°C (968°F)

Melting Point: Decomposition temperature: 338°C (640.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.53 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol.

Solubility:

Soluble in cold water, hot water, methanol. Insoluble in diethyl ether, acetone. Almost insoluble in ethyl acetate. Very slightly soluble in Ethanol; Solubility in Ethanol: 0.6 g/100 ml water at 19 deg. C. Solubility in Water: 29.7 g/100ml water at O deg. C 75.8 g/100 ml water at 100 deg. C 37.8 lbs./100 lbs. water at 70 deg. F 28.3% (w/w) in water at 25 deg. C Soluble in liquid ammonia.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, moisture.

Incompatibility with various substances: Reactive with oxidizing agents, acids, alkalis.

Corrosivity:
Extremely corrosive in presence of copper. Corrosive in presence of steel, of stainless steel(304). Slightly corrosive in presence of aluminum, of stainless steel(316).

Special Remarks on Reactivity:
Incompatible with lead and silver salts. It can react violently with ammonium nitrate and potassium chlorate. Also incompatible with bromine trifluoride, ammonium halides, bromine pentafluoride, alkalis and their carbonates. At fire temperature, ammonium chloride may dissociate into ammonia and hydrogen chloride. Hygroscopic; keep container tightly closed.

Special Remarks on Corrosivity: Severe corrosive effect on brass and bronze.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 1300 mg/kg [Mouse].

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant, sensitizer), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose: LDL [Human Infant] - Route: Oral; Dose: 2000 mg/kg

Special Remarks on Chronic Effects on Humans: May affect genetic material (mutagenic) Animal: passes through the placental barrier.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: It can cause skin irritation which is usually mild. Eyes: Causes moderate eye irritation. It may cause Salt Cataract, increased ocular pressure, and degeneration of the retina Inhalation: It can cause respiratory tract and mucous membrane irritation which is usually mild. Ingestion: May be harmful if swallowed. May cause digestive tract irritation with nausea and vomiting, and thirst. May affect behavior/central nervous system (headache, somnolence, confusion, drowsiness, tremor, convulsions, coma), eyes (Mydriasis), cardiovascular system (bradycardia), respiration (respiratory stimulation, apnea, hyperventilation, pulmonary edema). May cause serious metabolic acidosis with h y p o k a l e m i a . T r a n s i e n t hyperglycemia and glycosuria may also occur. Chronic Potential Health Effects: Skin: Prologned or repeated contact may cause dermatitis, an allergic reaction. Inhalation: Prolonged or repeated inhalation may affect the kidneys. Ingestion: Prolonged or repeated ingestion may affect metabolism (anorexia, metabolic acidosis) and urinary system (enlargement of kidneys). Inhalation: Prolonged or repeated inhalation may cause bronchospasm (asthma)

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: : Not available. UNNA: 9085 PG: III

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois toxic substances disclosure to employee act: Ammonium chloride Illinois chemical safety act: Ammonium chloride New York release reporting list: Ammonium chloride Rhode Island RTK hazardous substances: Ammonium chloride Pennsylvania RTK: Ammonium chloride Minnesota: Ammonium chloride Massachusetts RTK: Ammonium chloride Massachusetts spill list: Ammonium chloride New Jersey: Ammonium chloride New Jersey spill list: Ammonium chloride Louisiana spill reporting: Ammonium chloride California Director's List of Hazardous Substances: Ammonium chloride TSCA 8(b) inventory: Ammonium chloride CERCLA: Hazardous substances.: Ammonium chloride: 5000 lbs. (2268 kg)

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References:
-Material safety data sheet emitted by: la Commission de la SantÃ© et de la SÃ©curitÃ© du Travail du QuÃ©bec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Manufacturer's Material Safety Data Sheet.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

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Health	1
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Ascorbic acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ascorbic acid

Catalog Codes: SLA1306, SLA4315, SLA1972

CAS#: 50-81-7

RTECS: CI7650000

TSCA: TSCA 8(b) inventory: Ascorbic acid

CI#: Not available.

Synonym: Vitamin C, Ascorvit, Vicomin C, Acorbate, Ascorbutina, Catavin C, Cevex, Secorbate; 3-Keto-L-gulofuranolactone; 3-Oxo-L-gulofuranolactone

Chemical Name: L-Ascorbic Acid

Chemical Formula: C6H8O6

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Ascorbic acid	50-81-7	100

Toxicological Data on Ingredients: Ascorbic acid: ORAL (LD50): Acute: 11900 mg/kg [Rat]. 3367 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention if irritation occurs.

Skin Contact:
Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops. Cold water may be used.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 660°C (1220°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
As with most powdered organic solids, fire is possible at elevated temperatures or by contact with an ignition source.

Special Remarks on Explosion Hazards:
Fine dust dispersed in air in sufficient concentrations, and in the presences of an ignition source is a potential dust explosion

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Air Sensitive Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystals solid. Powdered solid.)

Odor: Odorless.

Taste: Acid. Sharp. Pleasant

Molecular Weight: 176.13 g/mole

Color: White. White to slightly yellowish.

pH (1% soln/water): Not available.

Boiling Point: Decomposition temperature: >190°C (374°F)

Melting Point: Decomposition temperature: >190°C (374°F)

Critical Temperature: 783°C (1441.4°F)

Specific Gravity: 1.65 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: The product is more soluble in water; log(oil/water) = -2.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:
Soluble in hot water. Partially soluble in cold water. Insoluble in diethyl ether. Solubility in Water: 1g/3ml water. Solubility in water: 80% @ 100 deg. C and 45% @ 45 deg. C. Solubility in alcohol: 1g/30 ml alcohol. Solubility in absolute alcohol: 1 g/50 ml absolute alcohol. Solubility in glycerol: 1g/100 ml glycerol. Solubility in propylene glycol: 1 g/20 ml propylene glycol. Insoluble in chloroform, benzene, petroleum ether, oils, fats, fat solvents.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, light, air, incompatible materials, dust generation

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Air and light sensitive. Aqueous solutions are rapidly oxidized by air, accelerated by alkalies, iron, copper.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 3367 mg/kg [Mouse].

Chronic Effects on Humans: MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May affect genetic material (mutagenic). May cause adverse reproductive effects and birth defects (teratogenic) based on animal test data. Human: passes through the placenta, excreted in maternal milk.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause skin irritation. Low hazard for normal industrial handling. Eyes: May cause eye irritation. Inhalation: May cause respiratory tract irritation. Low hazard for normal industrial handling. Ingestion: Ingestion of small amounts during normal industrial handling is a low hazard. Ingestion of large amounts may cause gastrointestinal tract irritation, hypermotility, diarrhea, acidification of the urine which may cause stones in the urinary tract and may cause renal failure coordination, somnolence), eyes(lacrimation), blood (anemia). Chronic Potential Health Effects: Ingestion: Prolonged or repeated ingestion may affect the blood/bone marrow and metabolism. . May also affect behavior (psychomotor

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations: TSCA 8(b) inventory: Ascorbic acid

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
This product is not classified according to the EU regulations. S24/25- Avoid contact with skin and eyes.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

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Material Safety Data Sheet

NCL of Wisconsin, Inc.
PO Box 8
Birnamwood, WI 54414
Emergency Telephone No: 800-424-9300 (Chemtrec)

Date of this revision: 11-02-2004

Product Identification

Product Name: YSI 3821 Buffer Solution, PH = 4.0
Synonyms: None. Molecular Weight: NA
Chemical Name: NA Chemical Family: NA
Product CAS#: NA Formula: NA

Ingredients

1. Potassium Acid Phthalate CAS# 877-24-7
   Percent: <2 SARA: Not Listed.
   TLV: Not established. PEL: Not Established
   Hazard: May cause eye and respiratory tract irritation.

2. Red Food Coloring CAS# Not listed.
   Percent: <0.02 SARA: Not listed
   TLV: Not established. PEL: Not established
   Hazard: None known.

3. Deionized Water CAS# 7732-18-5
   Percent: >98 SARA: Not listed.
   TLV: Not applicable PEL: Not applicable
   Hazard: None.

Precautionary Measures

Avoid contact with eyes, skin, and clothing. Wash thoroughly after handling. Minimal contact, as with all chemicals, is a good policy to follow.

Emergency/First Aid

In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. If swallowed, give two glasses of water or milk to dilute. Call a physician.

DOT Hazard Class: Not Regulated

Physical Data Section One

Appearance: Clear Pink solution
Odor: Odorless
Solubility: Infinitely soluble in water.
Boiling Point: 100° C (212° F)
Melting Point: 0° C (32° F)
Specific Gravity: 1.0
Vapor Density (Air=1): Essentially the same as water.
Vapor Pressure (mm Hg): Essentially the same as water.
Evaporation Rate: Essentially the same as water.

Fire and Explosion Information — Section Two

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be and explosion hazard
Fire Extinguishing Media: Use any suitable means for extinguishing surrounding fire.

Reactivity Data — Section Three

Stability: Stable under ordinary conditions of use and storage
Hazardous Decomposition Products: May emit toxic fumes of carbon monoxide, carbon dioxide, and potassium oxide if involved in a fire.
Hazardous Polymerization: This substance does not polymerize.
Incompatibilities: Strong solutions of nitric acid.

Leak/Spill/Disposal Information — Section Four

Flush to sewer with large amounts of water.
Ensure compliance with Federal, State, and local regulations
Reportable Quantity: 5000 lbs.

Health Hazard Information — Section Five

A. Exposure/Health Effects

Inhalation: May cause irritation to mucous membranes due to slight acidity.
Ingestion: Large doses may cause nausea, vomiting and abnormal sensations in hands and feet. Because of slight acidity, may cause irritation to mucous membranes.
Skin Contact: May cause irritation, redness, and pain.
Eye Contact: May cause irritation and damage.
Chronic Exposure: No information found.
Cancer information: No information found for any ingredient
Aggravation of Pre-existing Conditions: No information found

B. First Aid

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion: If swallowed, give two glasses of water to dilute. Give medical attention immediately.
Skin Exposure: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing. Get medical attention if irritation develops or persists.
Eye Exposure: Wash eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attentions immediately.

Occupational Control Measures — Section Six

Ventilation System: In general, dilution ventilation is a satisfactory health hazard control for this material. However, if conditions of use create discomfort to a worker, a local exhaust should be considered.

Personal Respirators (NIOSH Approved): For conditions of use where exposure to mist exists, a dust/mist respirator may be worn. For emergencies, a self-contained breathing apparatus may be necessary.

Skin Protection: Rubber gloves and lab coat, apron or overalls.

Eye Protection: Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material.

Maintain eye-wash fountain and quick-drench facilities in work areas.

Storage and Special Information — Section Seven

Keep in a tightly closed container. Protect container from physical damage.

The information contained herein is provided in good faith and is believed to be correct as of the date hereof. However, NCL of Wisconsin, Inc. makes no representation as to the comprehensiveness or accuracy of the information. It is expected that individuals receiving the information will exercise their independent judgment in determining its appropriateness for a particular purpose. Accordingly, NCL of Wisconsin, Inc will not be responsible for damages of any kind resulting from the use of or reliance upon such information. NO REPRESENTATIONS, OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR TO THE PRODUCT TO WHICH THE INFORMATION REFERS.

END OF MATERIAL SAFETY DATA SHEET

Material Safety Data Sheet

NCL of Wisconsin, Inc.
PO Box 8
Birnamwood, WI 54414
Emergency Telephone No: 800-424-9300 (Chemtrec)

Date of this revision: 11-02-2004

Product Identification

Product Name: YSI 3822 Buffer Solution, pH = 7.00
Synonyms: None. Molecular Weight: NA
Chemical Name: NA Chemical Family: NA
Product CAS#: NA Formula: NA

Ingredients

1. Potassium Phosphate Monobasic CAS# 7778-77-0
   Percent: <1 SARA: Not Listed.
   TLV: Not established. PEL: Not Established
   Hazard: Moderately toxic - May cause Irritation.

2. Sodium Hydroxide CAS# 1310-73-2.
   Percent: <1 SARA: Not listed
   TLV: 2 mg/m³ PEL: 2 mg/m³

3. Yellow Food Coloring CAS# Not listed.
   Percent: <0.02 SARA: Not listed.
   TLV: Not established. PEL: Not established.
   Hazard: None Known.

4. Deionized Water CAS# 7732-18-5
   Percent: >98 SARA: Not listed.
   TLV: Not applicable PEL: Not applicable
   Hazard: None.

Precautionary Measures

Avoid contact with eyes, skin, and clothing. Wash thoroughly after handling. Minimal contact, as with all chemicals, is a good policy to follow.

Emergency/First Aid

In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. If swallowed, give two glasses of water or milk to dilute. Call a physician.

DOT Hazard Class: Not Regulated

Physical Data Section One

Appearance: Clear yellow solution
Odor: Odorless
Solubility: Infinitely soluble in water.
Boiling Point: 100° C (212° F)
Melting Point: 0° C (32° F)
Specific Gravity: 1.0

Vapor Density (Air=1): Essentially the same as water.
Vapor Pressure (mm Hg): Essentially the same as water.
Evaporation Rate: Essentially the same as water.

Fire and Explosion Information — Section Two

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be and explosion hazard
Fire Extinguishing Media: Use any suitable means for extinguishing surrounding fire.

Reactivity Data — Section Three

Stability: Stable under ordinary conditions of use and storage
Hazardous Decomposition Products: None known.
Hazardous Polymerization: This substance does not polymerize.
Incompatibilities: None known.

Leak/Spill/Disposal Information — Section Four

Flush to sewer with large amounts of water.
Ensure compliance with Federal, State, and local regulations
Reportable Quantity: 5000 lbs.

Health Hazard Information — Section Five

A. Exposure/Health Effects

Inhalation: No information found.
Ingestion: Large doses may cause diarrhea.
Skin Contact: Prolonged contact may cause irritation.
Eye Contact: May cause irritation and damage.
Chronic Exposure: Potassium phosphate, one of the ingredients, may sequester calcium and cause calcium phosphate deposits in the kidneys.
Cancer information: No information found for any ingredient
Aggravation of Pre-existing Conditions: No information found

B. First Aid

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion: If swallowed, give two glasses of water to dilute. Give medical attention immediately.
Skin Exposure: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing. Get medical attention if irritation develops or persists.
Eye Exposure: Wash eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attentions immediately.

Occupational Control Measures — Section Six

Ventilation System: In general, dilution ventilation is a satisfactory health hazard control for this material. However, if conditions of use create discomfort to a worker, a local exhaust should be considered.

Personal Respirators (NIOSH Approved): For conditions of use where exposure to mist exists, a dust/mist respirator may be worn. For emergencies, a self-contained breathing apparatus may be necessary.

Skin Protection: Rubber gloves and lab coat, apron or overalls.

Eye Protection: Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material.

Maintain eye-wash fountain and quick-drench facilities in work areas.

Storage and Special Information — Section Seven

Keep in a tightly closed container. Protect container from physical damage.

The information contained herein is provided in good faith and is believed to be correct as of the date hereof. However, NCL of Wisconsin, Inc. makes no representation as to the comprehensiveness or accuracy of the information. It is expected that individuals receiving the information will exercise their independent judgment in determining its appropriateness for a particular purpose. Accordingly, NCL of Wisconsin, Inc will not be responsible for damages of any kind resulting from the use of or reliance upon such information. NO REPRESENTATIONS, OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR TO THE PRODUCT TO WHICH THE INFORMATION REFERS.

END OF MATERIAL SAFETY DATA SHEET

Material Safety Data Sheet

NCL of Wisconsin, Inc.
PO Box 8
Birnamwood, WI 54414
Emergency Telephone No: 800-424-9300 (Chemtrec)

Date of this revision: 11-02-2004

Product Identification

Product Name: YSI 3823 Buffer Solution, PH = 10.00
Synonyms: None. Molecular Weight: NA
Chemical Name: NA Chemical Family: NA
Product CAS#: NA Formula: NA

Ingredients

1. Disodium EDTA dehydrate CAS# 6381-92-6
   Percent: 1 SARA: Not Listed.
   TLV: Not established. PEL: Not Established
   Hazard: Slight. May cause irritation. Moderately toxic by ingestion.

2. Potassium Carbonate CAS# 584-08-7
   Percent: <1 SARA: Not listed
   TLV: Not established. PEL: Not established
   Hazard: Slight. Causes irritation.

3. Potassium Borate CAS# 12228-88-5.
   Percent: <1 SARA: Not listed.
   TLV: Not established. PEL: Not established.
   Hazard: Unknown

4. Potassium Hydroxide CAS# 1310-58-3
   Percent: <1 SARA: Listed.
   TLV: 2 mg/m³ PEL: 2 mg/m³
   Hazard: Moderate. May cause burns.

5. Blue Food Coloring CAS# Not listed.
   Percent: <0.02 SARA: Not listed.
   TLV: Not established. PEL: Not established.
   Hazard: None known.

6. Deionized water CAS# 7732-18-5
   Percent: >98 SARA: Not listed
   TLV: Not applicable. PEL: Not applicable.
   Hazard: None.

Precautionary Measures

Avoid contact with eyes, skin, and clothing. Wash thoroughly after handling. Minimal contact, as with all chemicals, is a good policy to follow.

Emergency/First Aid

In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. If swallowed, give two glasses of water or milk to dilute. Call a physician.

DOT Hazard Class: Not Regulated

Physical Data — Section One

Appearance: Clear blue solution.
Odor: Odorless
Solubility: Infinitely soluble in water.
Boiling Point: 100° C (212° F)
Melting Point: 0° C (32° F)
Specific Gravity: 1.0
Vapor Density (Air=1): Essentially the same as water.
Vapor Pressure (mm Hg): Essentially the same as water.
Evaporation Rate: Essentially the same as water.

Fire and Explosion Information — Section Two

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be and explosion hazard
Fire Extinguishing Media: Use any suitable means for extinguishing surrounding fire.

Reactivity Data — Section Three

Stability: Stable under ordinary conditions of use and storage
Hazardous Decomposition Products: None known.
Hazardous Polymerization: This substance does not polymerize.
Incompatibilities: None known.

Leak/Spill/Disposal Information — Section Four

Flush to sewer with large amounts of water.
Ensure compliance with Federal, State, and local regulations
Reportable Quantity: 5000 lbs.

Health Hazard Information — Section Five

A. Exposure/Health Effects

Inhalation: May cause sore throat and irritation to mucous membranes.
Ingestion: If sufficient amounts are ingested, systemic poisoning may occur.
Skin Contact: Prolonged contact may cause irritation.
Eye Contact: May cause irritation.
Chronic Exposure: No information found for any ingredient.
Cancer information: No information found for any ingredient
Aggravation of Pre-existing Conditions: No information found

B. First Aid

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion: If swallowed, give two glasses of water to dilute. Give medical attention immediately.
Skin Exposure: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing. Get medical attention if irritation develops or persists.
Eye Exposure: Wash eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attentions immediately.

Occupational Control Measures — Section Six

Ventilation System: In general, dilution ventilation is a satisfactory health hazard control for this material. However, if conditions of use create discomfort to a worker, a local exhaust should be considered.

Personal Respirators (NIOSH Approved): For conditions of use where exposure to mist exists, a dust/mist respirator may be worn. For emergencies, a self-contained breathing apparatus may be necessary.

Skin Protection: Rubber gloves and lab coat, apron or overalls.

Eye Protection: Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material.

Maintain eye-wash fountain and quick-drench facilities in work areas.

Storage and Special Information — Section Seven

Keep in a tightly closed container. Protect container from physical damage.

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END OF MATERIAL SAFETY DATA SHEET

MSDS Number: **M7921** * * * * * *Effective Date:* ***05/26/09*** * * * * * *Supercedes:* ***07/27/06***

MSDS Material Safety Data Sheet

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker®

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

MONOCHLOROACETIC ACID

1. Product Identification

Synonyms: Chloroacetic acid; chloracetic acid; chloroethanoic acid
CAS No.: 79-11-8
Molecular Weight: 94.50
Chemical Formula: CH2ClCOOH
Product Codes: 0216

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Chloroacetic Acid	79-11-8	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE. CAUSES BURNS TO ANY AREA OF CONTACT. MAY BE FATAL IF SWALLOWED OR INHALED.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 1 - Slight
Reactivity Rating: 1 - Slight
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Corrosive. Extremely destructive to tissues of the mucous membranes and upper respiratory tract. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. Inhalation may be fatal as a result of spasm inflammation and edema of the larynx and bronchi, chemical pneumonitis and pulmonary edema.
Ingestion:
Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea.
Skin Contact:
Corrosive. Symptoms of redness, pain, and severe burn can occur.
Eye Contact:
Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns.
Chronic Exposure:
Liver and kidney dysfunctions have been reported.
Aggravation of Pre-existing Conditions:
Persons with pre-existing lung disease may be more susceptible to the effects of this substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
Ingestion:
DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician, immediately. Wash clothing before reuse.
Eye Contact:
Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately.

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5. Fire Fighting Measures

Fire:
Flash point: 126C (259F) CC

Flammable limits in air % by volume:
lel: 8
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.
Fire Extinguishing Media:
Water spray, dry chemical, alcohol foam, or carbon dioxide.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Keep unnecessary and unprotected personnel away.

Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Pick up spill for recovery or disposal and place in a closed container.

If material comes in contact with water, neutralize liquid with alkaline material (soda ash, slaked lime) then absorb with an inert materail (e.g., vermiculite, dry sand, earth) and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer.

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7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Storage in metal containers is not recommended, since material is corrosive to metals. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
AIHA Workplace Environmental Exposure Level (WEEL):
0.5 ppm (TWA), skin contact can invalidate TWA
1.0 ppm (STEL), skin contact can invalidate STEL

- ACGIH Threshold Limit Value (TLV):
0.5 ppm (TWA) inhalable fraction and vapor
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, and engineering controls are not feasible, a full-face piece respirator with an organic vapor cartridge and particulate filter (NIOSH type N100 filter) may be worn up to 50 times the exposure limit, or the

maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P particulate filter. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Colorless crystals.
Odor:
Penetrating, burning odor.
Solubility:
Very soluble in water.
Density:
1.580
pH:
No information found.
% Volatiles by volume @ 21C (70F):
No information found.
Boiling Point:
189C (372F)
Melting Point:
61 - 63C (142 - 145F)
Vapor Density (Air=1):
3.26
Vapor Pressure (mm Hg):
1 @ 43C (109F)
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Oxides of carbon as well as ionic or oxidized halogen.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong bases, oxidizing agents and most common metals.
Conditions to Avoid:
Heat, incompatibles.

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11. Toxicological Information

Oral rat LD50: 580 mg/kg; inhalation rat LC50: 180 mg/m3; investigated as a tumorigen, mutagen.

```
--------\Cancer Lists\-------------------------------------------------------
                                        ---NTP Carcinogen---
Ingredient                              Known    Anticipated    IARC Category
-------------------------------------   -----    -----------    -------------
Chloroacetic Acid (79-11-8)              No          No            None
```

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12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material is not expected to evaporate significantly. When released into water, this material is expected to readily biodegrade. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. Because of low vapor pressure, significant amounts of this material are not expected to exist in the atmosphere.
Environmental Toxicity:
No information found.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: CHLOROACETIC ACID, SOLID
Hazard Class: 6.1, 8
UN/NA: UN1751
Packing Group: II
Information reported for product/size: 500G

International (Water, I.M.O.)

Proper Shipping Name: CHLOROACETIC ACID, SOLID

Hazard Class: 6.1, 8
UN/NA: UN1751
Packing Group: II
Information reported for product/size: 500G

International (Air, I.C.A.O.)

Proper Shipping Name: CHLOROACETIC ACID, SOLID
Hazard Class: 6.1, 8
UN/NA: UN1751
Packing Group: II
Information reported for product/size: 500G

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15. Regulatory Information

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  --------\Chemical Inventory Status - Part 1\---------------------------------
  Ingredient                                        TSCA  EC   Japan  Australia
  ----------------------------------------------  ----  ---  -----  ---------
  Chloroacetic Acid (79-11-8)                        Yes  Yes   Yes
Yes

  --------\Chemical Inventory Status - Part 2\---------------------------------
                                                            --Canada--
  Ingredient                                        Korea  DSL   NDSL  Phil.
  ----------------------------------------------  -----  ---   ----  -----
  Chloroacetic Acid (79-11-8)                        Yes   Yes   No     Yes

  --------\Federal, State & International Regulations - Part 1\----------------
                                            -SARA 302-    ------SARA 313------
  Ingredient                                RQ    TPQ     List  Chemical Catg.
  ----------------------------------------  ---   -----   ----  --------------
  Chloroacetic Acid (79-11-8)               100   100*    Yes        No

  --------\Federal, State & International Regulations - Part 2\----------------
                                                         -RCRA-    -TSCA-
  Ingredient                                CERCLA     261.33     8(d)
  ----------------------------------------  ------     ------    ------
  Chloroacetic Acid (79-11-8)               100        No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: No          (Pure / Solid)
```

Australian Hazchem Code: 2R
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **1** Reactivity: **0**
Label Hazard Warning:
DANGER! CORROSIVE. CAUSES BURNS TO ANY AREA OF CONTACT. MAY BE FATAL IF SWALLOWED OR INHALED.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe dust.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
In all cases call a physician immediately. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 3.
Disclaimer:
****
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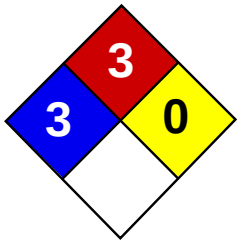
****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)



Health	3
Fire	3
Reactivity	0
Personal Protection	

Material Safety Data Sheet
Ethylenediamine MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ethylenediamine

Catalog Codes: SLE2005, SLE1237

CAS#: 107-15-3

RTECS: KH8575000

TSCA: TSCA 8(b) inventory: Ethylenediamine

CI#: Not available.

Synonym: 1,2-Diaminoethane

Chemical Formula: C2H8N2

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Ethylenediamine	107-15-3	100

Toxicological Data on Ingredients: Ethylenediamine: ORAL (LD50): Acute: 500 mg/kg [Rat]. 470 mg/kg [Guinea pig]. DERMAL (LD50): Acute: 750 mg/kg [Rabbit]. VAPOR (LC50): Acute: 424.3 ppm 4 hour(s) [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Extremely hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. Very hazardous in case of skin contact (sensitizer). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Extremely hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant), of ingestion, of inhalation. Very hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, liver, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation.

Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs. Repeated or prolonged inhalation of vapors may lead to chronic respiratory irritation.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cold water may be used. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 385°C (725°F)

Flash Points: CLOSED CUP: 34°C (93.2°F).

Flammable Limits: LOWER: 4.2%

Products of Combustion: These products are carbon oxides (CO, CO2), nitrogen oxides (NO, NO2...).

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Flammable liquid. Corrosive liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep container dry. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Never add water to this product In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 10 (ppm) TWA: 25 (mg/m3) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Clear viscous liquid.)

Odor: Ammoniacal.

Taste: Not available.

Molecular Weight: 60.1 g/mole

Color: Yellow.

pH (1% soln/water): Not available.

Boiling Point: 117.2°C (243°F)

Melting Point: 8.5°C (47.3°F)

Critical Temperature: Not available.

Specific Gravity: 0.8995 (Water = 1)

Vapor Pressure: 10.7 mm of Hg (@ 20°C)

Vapor Density: 2.07 (Air = 1)

Volatility: 100% (v/v).

Odor Threshold: 10.2 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 470 mg/kg [Guinea pig]. Acute dermal toxicity (LD50): 750 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 424.3 ppm 4 hour(s) [Mouse].

Chronic Effects on Humans: The substance is toxic to kidneys, lungs, liver, mucous membranes.

Other Toxic Effects on Humans:
Extremely hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, of inhalation. Very hazardous in case of skin contact (sensitizer).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the original product.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 8: Corrosive liquid.

Identification: : Ethylenediamine : UN1604 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Ethylenediamine Massachusetts RTK: Ethylenediamine TSCA 8(b) inventory: Ethylenediamine SARA 302/304/311/312 extremely hazardous substances: Ethylenediamine CERCLA: Hazardous substances.: Ethylenediamine

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R10- Flammable. R21/22- Harmful in contact with skin and if swallowed. R35- Causes severe burns. R43- May cause sensitization by skin contact.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 3

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:29 PM

Last Updated: 11/06/2008 12:00 PM

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MSDS Number: **F1616** * * * * * *Effective Date:* ***05/19/08*** * * * * * *Supercedes:* ***08/16/05***

MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

FERROUS AMMONIUM SULFATE

1. Product Identification

Synonyms: Ammonium iron (II) sulfate (2:1:2); ammonium ferrous sulfate; ferrous ammonium sulfate, hexahydrate
CAS No.: 10045-89-3 Anhydrous; (7783-85-9 Hexahydrate)
Molecular Weight: 392.13
Chemical Formula: Fe(NH4)2(SO4)2 6H2O
Product Codes:
J.T. Baker: 2054
Mallinckrodt: 5064

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Ferrous Ammonium Sulfate	10045-89-3	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. HARMFUL IF SWALLOWED OR INHALED.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:
Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath.
Ingestion:
Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea. Low toxicity in small quantities but larger dosages may cause nausea, vomiting, diarrhea, and black stool. Pink urine discoloration is a strong indicator of iron poisoning. Liver damage, coma, and death from iron poisoning has been recorded.
Skin Contact:
Causes irritation to skin. Symptoms include redness, itching, and pain.
Eye Contact:
Causes irritation, redness, and pain.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention.

---

5. Fire Fighting Measures

Fire:

Not considered to be a fire hazard. Irritating and toxic ammonia gas may form in fires.
Explosion:
Not considered to be an explosion hazard. Sealed containers may rupture when heated.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
Use protective clothing and breathing equipment appropriate for the surrounding fire.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. Small amounts of residue may be flushed to sewer with plenty of water. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

---

7. Handling and Storage

Keep in a tightly closed light-resistant container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-ACGIH Threshold Limit Value (TLV):
1 mg/m3 (TWA) soluble iron salt as Fe
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator (NIOSH type N95 or better filters) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye

wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
Pale blue-green crystals.
Odor:
Odorless.
Solubility:
26.9 g/100cc water @ 20C (68F)
Specific Gravity:
1.86
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
Not applicable.
Melting Point:
100 - 110C (212 - 230F)
Vapor Density (Air=1):
> 1.0
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Slowly oxidizes in moist air.
Hazardous Decomposition Products:
May emit ammonia, oxides of sulfur, oxides of nitrogen, and oxides of carbon.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Sulfuric acid
Conditions to Avoid:
Heat, light, moisture.

---

11. Toxicological Information

Oral rat LD50: 3250 mg/kg

```
--------\Cancer Lists\-------------------------------------------------------
                                        ---NTP Carcinogen---
```

Ingredient	Known	Anticipated	IARC Category
Ferrous Ammonium Sulfate (10045-89-3)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Ferrous Ammonium Sulfate (10045-89-3)	Yes	Yes	No	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Ferrous Ammonium Sulfate (10045-89-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Ferrous Ammonium Sulfate (10045-89-3)	No	No	No	No

```
--------\Federal, State & International Regulations - Part 2\----------------
                                                        -RCRA-    -TSCA-
Ingredient                                   CERCLA     261.33     8(d)
----------------------------------------- ------     ------    ------
Ferrous Ammonium Sulfate (10045-89-3)      1000       No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: No   Fire: No  Pressure: No
Reactivity: No          (Pure / Solid)
```

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **2** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
WARNING! CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. HARMFUL IF SWALLOWED OR INHALED.
Label Precautions:
Avoid breathing dust.
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
Keep container closed.
Use only with adequate ventilation.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:
No Changes.
Disclaimer:
****
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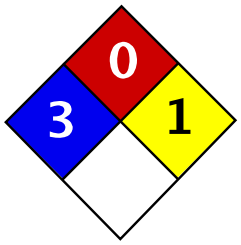
****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)



Health	3
Fire	0
Reactivity	1
Personal Protection	

Material Safety Data Sheet
Hydrochloric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrochloric acid

Catalog Codes: SLH1462, SLH3154

CAS#: Mixture.

RTECS: MW4025000

TSCA: TSCA 8(b) inventory: Hydrochloric acid

CI#: Not applicable.

Synonym: Hydrochloric Acid; Muriatic Acid

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Hydrogen chloride	7647-01-0	20-38
Water	7732-18-5	62-80

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer).
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid].
MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.
Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Non combustible.
Calcium carbide reacts with hydrogen chloride gas with incandescence.
Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine.
Rubidium acetylene carbides burns with slightly warm hydrochloric acid.
Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved.
Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammble gas.
Cesium acetylene carbide burns hydrogen chloride gas.
Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute.
Reacts with most metals to produce flammable Hydrodgen gas.

Special Remarks on Explosion Hazards:
Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgClO + CCl4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4 , Vinyl acetate.
Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid.
Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture.
May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
CEIL: 5 (ppm) from OSHA (PEL) [United States]
CEIL: 7 (mg/m3) from OSHA (PEL) [United States]
CEIL: 5 from NIOSH
CEIL: 7 (mg/m3) from NIOSH
TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)]
TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point:
108.58 C @ 760 mm Hg (for 20.22% HCl in water)
83 C @ 760 mm Hg (for 31% HCl in water)
50.5 C (for 37% HCl in water)

Melting Point:
-62.25°C (-80°F) (20.69% HCl in water)
-46.2 C (31.24% HCl in water)
-25.4 C (39.17% HCl in water)

Critical Temperature: Not available.

Specific Gravity:
1.1- 1.19 (Water = 1)
1.10 (20%and 22% HCl solutions)
1.12 (24% HCl solution)
1.15 (29.57% HCl solution)
1.16 (32% HCl solution)
1.19 (37% and 38%HCl solutions)

Vapor Pressure: 16 kPa (@ 20°C) average

Vapor Density: 1.267 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 to 10 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, water

Incompatibility with various substances:
Highly reactive with metals.
Reactive with oxidizing agents, organic materials, alkalis, water.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316).
Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts with water especially when water is added to the product.
Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C.
Sodium reacts very violently with gaseous hydrogen chloride.
Calcium phosphide and hydrochloric acid undergo very energetic reaction.
It reacts with oxidizers releasing chlorine gas.
Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates.
Reacts with most metals to produce flammable Hydrogen gas.
Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid(increase in temperature and pressure)
Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid.
Adsorption of Hydrochloric Acid onto silicon dioxide results in exothmeric reaction.
Hydrogen chloride causes aldehydes and epoxides to violently polymerize.
Hydrogen chloride or Hydrochloric Acid in contact with the folloiwng can cause explosion or ignition on contact or

Special Remarks on Corrosivity:
Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinium, tantalum, silver, and certain alloys are exceptions).
It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys.
No corrosivity data on zinc, steel.
Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
Acute oral toxicity (LD50): 900 mg/kg [Rabbit].
Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse].
Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid].
May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin,

eyes, Circulatory System, teeth.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, .
Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Doses (LDL/LCL)
LDL [Man] -Route: Oral; 2857 ug/kg
LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M
LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (fetoxicity).
May affect genetic material.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects:
Skin: Corrosive. Causes severe skin irritation and burns.
Eyes: Corrosive. Causes severe eye irritation/conjuntivitis, burns, corneal necrosis.
Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and larryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well has headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure,
occur, particularly if exposure is prolonged. May affect the liver.
Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomitting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophogeal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis).
Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel.
Chronic Potential Health Effects:
dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Hydrochloric acid
Illinois toxic substances disclosure to employee act: Hydrochloric acid
Illinois chemical safety act: Hydrochloric acid
New York release reporting list: Hydrochloric acid
Rhode Island RTK hazardous substances: Hydrochloric acid
Pennsylvania RTK: Hydrochloric acid
Minnesota: Hydrochloric acid
Massachusetts RTK: Hydrochloric acid
Massachusetts spill list: Hydrochloric acid
New Jersey: Hydrochloric acid
New Jersey spill list: Hydrochloric acid
Louisiana RTK reporting list: Hydrochloric acid
Louisiana spill reporting: Hydrochloric acid
California Director's List of Hazardous Substances: Hydrochloric acid
TSCA 8(b) inventory: Hydrochloric acid
TSCA 4(a) proposed test rules: Hydrochloric acid
SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid
SARA 313 toxic chemical notification and release reporting: Hydrochloric acid
CERCLA: Hazardous substances.: Hydrochloric acid: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
CLASS E: Corrosive liquid.

DSCL (EEC):
R34- Causes burns.
R37- Irritating to respiratory system.
S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves.
Full suit.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Face shield.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
-SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
-Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 05:45 PM

Last Updated: 09/14/2009 10:34 AM

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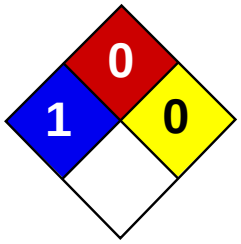

Health	1
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Magnesium carbonate, USP MSDS

Section 1: Chemical Product and Company Identification

Product Name: Magnesium carbonate, USP

Catalog Codes: SLM2539, SLM1765

CAS#: 23389-33-5 or (non-USP 546-93-0)

RTECS: Not available.

TSCA: TSCA 8(b) inventory: No products were found.

CI#: Not available.

Synonym: Carbonate magnesium, Hydromagnesite, Magnesium carbonate, Magnesium(II) carbonate, Magnesite.

Chemical Name: Magnesium Carbonate

Chemical Formula: MgCO3

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Magnesium carbonate	23389-33-5 or 546-93-0	100

Toxicological Data on Ingredients: Not applicable.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to cardiovascular system. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions: Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystals solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 84.3 g/mole

Color: White.

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: Decomposition temperature: 662°C (1223.6°F)

Critical Temperature: Not available.

Specific Gravity: 2.958 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water. Soluble in dilute acids with effervescence. Insoluble in alcohol. Imparts slight alkaline reaction to water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans: May cause damage to the following organs: cardiovascular system.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Nuisance dust. Skin: May cause skin irritation. Low hazard for usual industrial handling. Eyes: May cause eye irritation. Inhalation: May cause respiratory tract irritation. Ingestion: May cause gastrointestinal tract irritation. Excess exposure may cause central nervous system depression and cardiac disturbances The toxicological properties of this substance have not been fully investigated.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations: No products were found.

Other Regulations: Not available.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
This product is not classified according to the EU regulations. S22- Do not breathe dust. S24/25- Avoid contact with skin and eyes.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:00 PM

Last Updated: 11/06/2008 12:00 PM

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MSDS Number: **M0793** * * * * * *Effective Date:* ***05/26/09*** * * * * * *Supercedes:* ***08/17/06***

MSDS **Material Safety Data Sheet**

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

MANGANESE SULFATE

1. Product Identification

Synonyms: Manganous sulfate, monohydrate; sulfuric acid, manganese (2+) salt (1:1), monohydrate; Manganese (II) sulfate, monohydrate
CAS No.: 7785-87-7 (Anhydrous) 10034-96-5 (Monohydrate)
Molecular Weight: 169.02
Chemical Formula: MnSO4 H2O
Product Codes:
J.T. Baker: 2550, 2552
Mallinckrodt: 2147, 6097, 6192, 6200, 7780

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Manganese(II) Sulfate (1:1)	7785-87-7	98 - 100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. AFFECTS LUNGS, CENTRAL NERVOUS SYSTEM, BLOOD AND KIDNEYS. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:
Inhalation can cause a flu-like illness (metal fume fever). This 24- to 48-hour illness is characterized by chills, fever, aching muscles, dryness in the mouth and throat and headache. May irritate the respiratory tract. May increase the incidence of upper respiratory infections (pneumonia). Absorption of inorganic manganese salts through the lungs is poor but may occur in chronic poisoning.
Ingestion:
May cause abdominal pain and nausea. Although they are poorly absorbed through the intestines, inorganic manganese salts may produce hypoglycemia and decreased calcium blood levels should absorption occur.
Skin Contact:
May cause irritation with redness and pain.
Eye Contact:
May cause irritation, redness and pain.
Chronic Exposure:
Chronic manganese poisoning can result from excessive inhalation and ingestion exposure and involves impairment of the central nervous system. Early symptoms include sluggishness, sleepiness, and weakness in the legs. Advanced cases have shown fixed facial expression, emotional disturbances, spastic gait, and falling. Illness closely resembles Parkinson's Disease. Kidney effects, blood changes and manganese psychosis also may occur as a result of chronic exposure. Chronic inhalation exposure can cause lung damage.
Aggravation of Pre-existing Conditions:
Persons with impaired respiratory function, psychiatric or neurological disturbances, and nutritional deficiencies may be more susceptible to the effect of this substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention if irritation develops.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get

medical attention if irritation persists.

---

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

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7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
5 mg/m3 Ceiling for manganese compounds as Mn

- ACGIH Threshold Limit Value (TLV):
0.2 mg/m3 (TWA) for manganese, elemental and inorganic compounds as Mn
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator

(NIOSH type N95 or better filters) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear protective gloves and clean body-covering clothing.
Eye Protection:
Safety glasses. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Pale pink granular powder.
Odor:
Odorless.
Solubility:
Soluble in 1 part water.
Density:
2.95
pH:
No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
850C (1562F) Decomposes.
Melting Point:
700C (1292F) Loses all water @ 400-500C
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Oxides of sulfur and the contained metal.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Powdered metals, strong oxidizers.
Conditions to Avoid:
Incompatibles.

11. Toxicological Information

Toxicological Data:
Oral rat LD50: 2150 mg/kg. Investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
For manganese metal:
May damage the reproductive system. Has shown teratogenic effects in laboratory animals.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Manganese(II) Sulfate (1:1) (7785-87-7)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Manganese(II) Sulfate (1:1) (7785-87-7)	Yes	Yes	Yes	Yes

```
  --------\Chemical Inventory Status - Part 2\--------------------------------
                                                          --Canada--
  Ingredient                                        Korea  DSL   NDSL  Phil.
  ------------------------------------------------  -----  ---   ----  -----
  Manganese(II) Sulfate (1:1) (7785-87-7)            Yes   Yes   No
Yes

  --------\Federal, State & International Regulations - Part 1\----------------
                                              -SARA 302-    ------SARA 313------
  Ingredient                                  RQ    TPQ     List  Chemical Catg.
  ----------------------------------------  ---   -----   ----  --------------
  Manganese(II) Sulfate (1:1) (7785-87-7)    No    No      No    Manganese co

  --------\Federal, State & International Regulations - Part 2\----------------
                                                         -RCRA-    -TSCA-
  Ingredient                                  CERCLA     261.33     8(d)
  ----------------------------------------  ------     ------    ------
  Manganese(II) Sulfate (1:1) (7785-87-7)    1          No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: No          (Pure / Solid)
```

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **2** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED OR INHALED. AFFECTS LUNGS, CENTRAL NERVOUS SYSTEM, BLOOD AND KIDNEYS. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.
Label Precautions:
Wash thoroughly after handling.
Avoid contact with eyes, skin and clothing.
Avoid breathing dust.
Keep container closed.
Use only with adequate ventilation.
Label First Aid:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:

No Changes.

Disclaimer:

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Material Safety Data Sheet
Instant FAME/Instant Anaerobe Methods
Methanol

SECTION 1 – CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MSDS Name: Methanol
MSDS Preparation Date: 06/19/2009
Synonyms or Generic ID for Methanol: Carbinol; Methyl alcohol; Methyl hydroxide; Monohydroxymethane; Wood alcohol; Wood naptha; Wood spirits; Columbian spirits; Methanol.
Chemical Family: Methanol Family
Formula: CH_3OH
Molecular Weight: N/A
PIN (UN#/ NA#): UN1230
Company Identification:
Microbial ID.
125 Sandy Drive
Newark, DE 19713
For Information, call: (800)276-8068, (302)737-4297
For Domestic CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

SECTION 2 – COMPOSITION, INFORMATION ON INGREDIENTS

67-56-1	Methanol	<99%	200-659-6	Irritant, Flammable

NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

State: Liquid	Appearance: colorless	Odor: Alcohol-like, weak odor
Boiling Point: 64.7°C@760mmHg	pH: Not available	Specific Gravity: 7910g/cm3@20°C
Vapor Pressure (mm Hg): 128mmHg @20°C	Vapor Density (AIR=1): 1.11	
Flash Point: 12°C	Solubility in Water: miscible	

SECTION 3 – HAZARDS IDENTIFICATION

Appearance: Colorless liquid, Flash Point: 12°C, 53.6°F.

Danger! Poison! May be fatal or cause blindness if swallowed. Vapor harmful. **Flammable liquid and vapor.** Harmful if swallowed, inhaled, or absorbed through the skin. Causes eye, skin, and respiratory tract irritation. May cause central nervous system depression. Cannot be made non-poisonous.
Target Organs: Eyes, nervous system, optic nerve.

Potential Health Effects
Eye: May cause painful sensitization to light. Methanol is a mild to moderate eye irritant. Inhalation, ingestion or skin absorption of methanol can cause significant disturbance in vision, including blindness.
Skin: Causes moderate skin irritation. May be absorbed through the skin in harmful amounts. Prolonged and or repeated contact may cause defatting of skin and dermatitis. Methanol can be absorbed through the skin, producing systemic effects that include visual disturbances.
Ingestion: May be fatal or cause blindness if swallowed. Aspiration hazard. Cannot be made non-poisonous. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause systematic toxicity with acidosis. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma, and possible death due to failed respiratory failure. May cause cardiopulmonary system effects.

Inhalation: Methanol is toxic and can very readily form extremely high vapor concentrations at room temperature. Inhalation is the most common route of occupational exposure. At first, methanol causes CNS depression with nausea, headache, vomiting, dizziness and incoordination. A time period with no obvious symptoms follows (typically 8-24 hrs). This latent period is followed by metabolic acidosis and severe visual effects which may include reduced reactivity and/or increased sensitivity to light, blurred, doubl and/or snowy vision, and blindness. Depending on the severity of exposure and the promptness of treatment, survivors may recover completely or may have permanent blindness, vision disturbances and/or nervous system effects.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Chronic exposure may cause effects similar to those of acute exposure. Methanol is only very slowly eliminated from the body. Because of this slow elimination, methanol should be regarded as a cumulative poison. Though a single exposure may cause no effect, daily exposures may result in the accumulation of a harmful amount. Methanol has produced fetotoxicity in rats and teratogenicity in mice exposed by inhalation to high concentrations that did not produce significant maternal toxicity.

SECTION 4 – FIRST AID MEASURES

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Effects may be delayed.
Antidote: Ethanol may inhibit methanol metabolism.

SECTION 5 – FIRE FIGHTING MEASURES

General Information: Ethanol may inhibit methanol metabolism. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. Water may be ineffective. For large fires, use water spray, fog or alcohol-resistant foam. Do NOT use straight streams of water.
Flash Point: 12 deg C (53.60 deg F)
Autoignition Temperature: 455 deg C (851.00 deg F)
Explosion Limits, Lower:6.0 vol %
Upper: 31.00 vol %
NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

SECTION 6 – ACCIDENTAL RELEASE MEASURES

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Use water spray to disperse the gas/vapor. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as sawdust. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

SECTION 7-HANDLING AND STORAGE

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Do not ingest or inhale. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid use in confined spaces.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area. Keep containers tightly closed.

SECTION 8 – EXPOSURE CONTROL/ PERSONAL PROTECTION

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Chemical Name	ACGIH	NIOSH	OSHA – Final PELs
Methanol	200 ppm TWA; 250 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous route	200 ppm TWA; 260 mg/m3 TWA 6000 ppm IDLH	200 ppm TWA; 260 mg/m3 TWA

OSHA Vacated PELs: Methanol: 200 ppm TWA; 260 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear butyl rubber gloves, apron, and/or clothing.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Clear liquid
Appearance: clear, colorless - APHA: 10 max
Odor: alcohol-like - weak odor
pH: Not available.
Vapor Pressure: 128 mm Hg @ 20 deg C
Vapor Density: 1.11 (Air=1)
Evaporation Rate:5.2 (Ether=1)
Viscosity: 0.55 cP 20 deg C
Boiling Point: 64.7 deg C @ 760 mmHg
Freezing/Melting Point:-98 deg C
Decomposition Temperature: Not available.
Solubility: miscible
Specific Gravity/Density:.7910 g/cm3 @ 20°C
Molecular Formula:CH4O
Molecular Weight:32.04

SECTON 10 – STABILITY AND REACTIVITY

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: High temperatures, ignition sources, confined spaces.
Incompatibilities with Other Materials: Oxidizing agents, reducing agents, acids, alkali metals, potassium, sodium, metals as powders (e.g. hafnium, raney nickel), acid anhydrides, acid chlorides, powdered aluminum, powdered magnesium.
Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, formaldehyde.
Hazardous Polymerization: Will not occur.

SECTION 11 – TOXICOLOGICAL INFORMATION

RTECS#:
CAS# 67-56-1: PC1400000
LD50/LC50:
CAS# 67-56-1:

Draize test, rabbit, eye: 40 mg Moderate;
Draize test, rabbit, eye: 100 mg/24H Moderate;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, rabbit: LC50 = 81000 mg/m3/14H;
Inhalation, rat: LC50 = 64000 ppm/4H;
Oral, mouse: LD50 = 7300 mg/kg;
Oral, rabbit: LD50 = 14200 mg/kg;
Oral, rat: LD50 = 5600 mg/kg;
Skin, rabbit: LD50 = 15800 mg/kg;

Human LDLo Oral: 143 mg/kg; Human LDLo Oral: 428 mg/kg; Human TCLo Inhalation; 300 ppm caused visual field changes & headache; Monkey LDLo Skin: 393 mg/kg. Methanol is significantly less toxic to most experimental animals than humans, because most animal species metabolize methanol differently. Non-primate species do not ordinarily show symptoms of metabolic acidosis or the visual effects which have been observed in primates and humans.
Carcinogenicity:
CAS# 67-56-1: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: There is no human information available. Methanol is considered to be a potential developmental hazard based on animal data. In animal experiments, methanol has caused fetotoxic or teratogenic effects without maternal toxicity.
Reproductive Effects: See actual entry in RTECS for complete information.
Mutagenicity: See actual entry in RTECS for complete information.
Neurotoxicity: ACGIH cites neuropathy, vision and CNS under TLV basis.

SECTION 12 – ECOLOGICAL INFORMATION

Ecotoxicity: Fish: Fathead Minnow: 29.4 g/L; 96 Hr; LC50 (unspecified)Fish: Goldfish: 250 ppm; 11 Hr; resulted in deathFish: Rainbow trout: 8000 mg/L; 48 Hr; LC50 (unspecified)Fish: Rainbow trout: LC50 = 13-68 mg/L; 96 Hr.; 12 degrees CFish: Fathead Minnow: LC50 = 29400 mg/L; 96 Hr.; 25 degrees C, pH 7.63Fish: Rainbow trout: LC50 = 8000 mg/L; 48 Hr.; UnspecifiedBacteria: Phytobacterium phosphoreum: EC50 = 51,000-320,000 mg/L; 30 minutes; Microtox test No data available.
Environmental: Dangerous to aquatic life in high concentrations. Aquatic toxicity rating: TLm 96>1000 ppm. May be dangerous if it enters water intakes. Methyl alcohol is expected to biodegrade in soil and water very rapidly. This product will show high soil mobility and will be degraded from the ambient atmosphere by the reaction with photochemically produced hyroxyl radicals with an estimated half-life of 17.8 days. Bioconcentration factor for fish (golden ide) < 10. Based on a log Kow of -0.77, the BCF value for methanol can be estimated to be 0.2.
Physical: No information available.
Other: No information available.

SECTION 13 – DISPOSAL CONSIDERATIONS

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 67-56-1: waste number U154 (Ignitable waste).

SECTION 14 – TRANSPORT INFORMATION

	US DOT	CANADA TDG
Shipping Name:	Methanol	Methanol
Hazard Class:	3	3
UN Number:	UN1230	UN1230
Packing Group:	II	II
Additional Information		Flash Point 12°C

SECTION 15 – REGULATORY INFORMATION

US FEDERAL

TSCA
CAS# 67-56-1 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 67-56-1: 5000 lb final RQ; 2270 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 67-56-1: immediate, fire.
Section 313
This material contains Methanol (CAS# 67-56-1, > 99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 67-56-1 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 67-56-1 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65
California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
T F
Risk Phrases:
R 11 Highly flammable.
R 23/24/25 Toxic by inhalation, in contact with skin and if swallowed.
R 39/23/24/25 Toxic : danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.

Safety Phrases:
S 16 Keep away from sources of ignition - No smoking.
S 36/37 Wear suitable protective clothing and gloves.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 7 Keep container tightly closed.

WGK (Water Danger/Protection)
CAS# 67-56-1: 1
Canada - DSL/NDSL
CAS# 67-56-1 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of B2, D1B, D2B.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
Canadian Ingredient Disclosure List
CAS# 67-56-1 is listed on the Canadian Ingredient Disclosure List.

SECTION 16 – Other Information

This Material Safety Data Sheet has been prepared in accordance with 29 CFR 1910.1200 and contains information believed to be accurate and complete at the date of preparation. The statements contained herein are offered for informational purposes only and are based upon technical data. MIDI Inc. believes them to be accurate but does not purport to be all-inclusive. The above-stated product is intended for use only by persons having the necessary technical skills and facilities for handling the product at their discretion and risk. Since conditions and manner of use are outside our control, we (MIDI Inc.) make no warranty of merchantability or any such warranty, express or implied with respect to information and we assume no liability resulting from the above product or its use. Users should make their own investigations to determine suitability of information and product for their particular purposes.

MSDS Number: **N3660** * * * * * *Effective Date:* ***11/18/09*** * * * * * *Supercedes:* ***11/07/08***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NITRIC ACID, 50-70%

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 50%; Nitric Acid 65%; nitric acid 69-70%
CAS No.: 7697-37-2
Molecular Weight: 63.01
Chemical Formula: HNO3
Product Codes:
J.T. Baker: 5371, 5796, 5801, 5826, 5856, 5876, 5896, 9597, 9598, 9600, 9601, 9602, 9603, 9604, 9606, 9607, 9608, 9610, 9616, 9617, 9670, 9761
Mallinckrodt: 1409, 2704, 2705, 2706, 2707, 2716, 6623, H862, H988, H993, H998, V077, V650

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	50 - 70%	Yes
Water	7732-18-5	30 - 50%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.
Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

---

4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.
Explosion:
Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.
Fire Extinguishing Media:
Water spray may be used to keep fire exposed containers cool. Do not get water inside container.
Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

---

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA), 4 ppm (STEL)
-ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Colorless to yellowish liquid.
Odor:
Suffocating, acrid.
Solubility:
Infinitely soluble.
Specific Gravity:
1.41
pH:
1.0 (0.1M solution)
% Volatiles by volume @ 21C (70F):
100 (as water and acid)
Boiling Point:
122C (252F)
Melting Point:
-42C (-44F)
Vapor Density (Air=1):
2-3
Vapor Pressure (mm Hg):
48 @ 20C (68F)
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.

Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Light and heat.

---

11. Toxicological Information

Nitric acid: Inhalation rat LC50: 244 ppm (NO2)/30M; Investigated as a mutagen, reproductive effector. Oral (human) LDLo: 430 mg/kg.

```
--------\Cancer Lists\-------------------------------------------------------
                                        ---NTP Carcinogen---
Ingredient                              Known    Anticipated    IARC Category
------------------------------------    -----    -----------    -------------
Nitric Acid (7697-37-2)                  No          No            None
Water (7732-18-5)                        No          No            None
```

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12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 6.5GL

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 6.5GL

International (Air, I.C.A.O.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II

Information reported for product/size:

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15. Regulatory Information

```
  --------\Chemical Inventory Status - Part 1\---------------------------------
  Ingredient                                        TSCA  EC   Japan  Australia
  ----------------------------------------------  ----  ---  -----  ---------
  Nitric Acid (7697-37-2)                            Yes  Yes   Yes
Yes
  Water (7732-18-5)                                  Yes  Yes   Yes
Yes

  --------\Chemical Inventory Status - Part 2\---------------------------------
                                                              --Canada--
  Ingredient                                        Korea  DSL   NDSL  Phil.
  ----------------------------------------------  -----  ---   ----  -----
  Nitric Acid (7697-37-2)                            Yes   Yes   No     Yes
  Water (7732-18-5)                                  Yes   Yes   No     Yes

  --------\Federal, State & International Regulations - Part 1\----------------
                                                -SARA 302-    ------SARA 313------
  Ingredient                                    RQ    TPQ     List  Chemical Catg.
  ----------------------------------------  ---   -----   ----  --------------
  Nitric Acid (7697-37-2)                   1000  1000    Yes        No
  Water (7732-18-5)                         No    No      No         No

  --------\Federal, State & International Regulations - Part 2\----------------
                                                          -RCRA-    -TSCA-
  Ingredient                                    CERCLA     261.33     8(d)
  ----------------------------------------  ------     ------    ------
  Nitric Acid (7697-37-2)                   1000       No         No
  Water (7732-18-5)                         No         No
```

No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

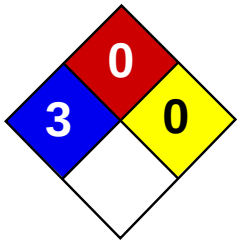
---

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0** Other: **Oxidizer**
Label Hazard Warning:
POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 14.
Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES

RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)



Health	3
Fire	0
Reactivity	0
Personal Protection	

Material Safety Data Sheet
Phosphoric acid, 85% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Phosphoric acid, 85%

Catalog Codes: SLP5569, SLP4555, SLP1732

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Phosphoric Acid; Water

CI#: Not available.

Synonym: Phosphoric Acid 85%; Phosphoric Acid; Orthophosphoric acid

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Phosphoric Acid	7664-38-2	85-88
Water	7732-18-5	12-15

Toxicological Data on Ingredients: Phosphoric Acid: ORAL (LD50): Acute: 1530 mg/kg [Rat]. DERMAL (LD50): Acute: 2740 mg/kg [Rabbit]. DUST (LC50): Acute: >850 mg/m 1 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, . Hazardous in case of skin contact (corrosive, permeator), of eye contact (corrosive). Slightly hazardous in case of inhalation (lung sensitizer). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, liver, skin, eyes, bone marrow. Repeated

or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Reacts with metals to liberate flammable hydrogen gas. Formation of flammable gases with aldehydes, cyanides, mercaptins, and sulfides.

Special Remarks on Explosion Hazards: Mixtures with nitromethane are explosive. (Phosphoric Acid)

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, combustible materials, metals, alkalis. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
Phosphoric Acid TWA: 1 STEL: 3 (mg/m3) from ACGIH (TLV) [United States] TWA: 1 STEL: 3 (mg/m3) from OSHA (PEL) [United States] TWA: 1 STEL: 3 (mg/m3) from NIOSH TWA: 1 STEL: 3 (mg/m3) [Mexico]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Syrupy liquid Viscous liquid.)

Odor: Odorless.

Taste: Acid.

Molecular Weight: Not applicable.

Color: Clear Colorless.

pH (1% soln/water): Acidic.

Boiling Point: 158°C (316.4°F)

Melting Point: 21°C (69.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.685 @ 25 C (Water = 1)

Vapor Pressure: 0.3 kPa (@ 20°C)

Vapor Density: 3.4 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:
Easily soluble in hot water. Soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, combustible materials, metals, alkalis.

Corrosivity:
Extremely corrosive in presence of copper, of stainless steel(304), of stainless steel(316). Highly corrosive in presence of aluminum. Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts with metals to liberate flammable hydrogen gas. Incompatible with sodium tetrahydroborate producing a violent exothermic reaction. Heat generated with: alcohols, glycols, aldehydes, amides, amines, azo-compounds, carbamates, caustics, esters, ketones, phenols and cresols, organophosphates, epoxides, combustible materials, unsaturated halides, organic peroxides. Formation of flammable gases, with aldehydes, cyanides, mercaptins, and sulfides. Formation of toxic fumes with cyanides, fluorides, halogenated organics, sulfides, and organic peroxides. Do not mix with solutions containing bleach or ammonia. Incompatible with nitromethane, chlorides + staiinless steel. (Phosphoric Acid)

Special Remarks on Corrosivity:
Minor corrosive effect on bronze. Severe corrosive effect on brass. Corrosive to ferrous metals and alloys.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 1530 mg/kg [Rat]. Acute dermal toxicity (LD50): 2740 mg/kg [Rabbit].

Chronic Effects on Humans: May cause damage to the following organs: blood, liver, skin, eyes, bone marrow.

Other Toxic Effects on Humans:
Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (irritant), of ingestion, . Hazardous in case of skin contact (corrosive, permeator), of eye contact (corrosive).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Corrosive and causes severe skin irritation and can cause severe skin burns. May affect behavior (somnolence or excitement) if absorbed through skin. Eyes: Corrosive. Liquid or vapor causes severe eye irritation and can cause severe eye burns leading to permanent corneal damage or chemical conjunctivitis. Ingestion: May be harmful if swallowed. Causes irritation and burns of the gastrointestinal (digestive) tract. Causes severe pain, nausea, vomiting, diarrhea hematemesis, gastrointestinal hemmorrhaging, and shock. May cause corrosion and permanent tissue destruction of the esophagus and digestive tract. May affect behavior and urinary system, liver (hepatocellular damage, hepatic enzymes increased), blood (blood dyscrasia). May also

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Phosphoric acid (Phosphoric Acid) UNNA: 1805 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Phosphoric Acid Illinois toxic substances disclosure to employee act: Phosphoric acid Illinois chemical safety act: Phosphoric acid New York release reporting list: Phosphoric acid Rhode Island RTK hazardous substances: Phosphoric acid Pennsylvania RTK: Phosphoric acid Minnesota: Phosphoric acid Massachusetts RTK: Phosphoric acid Massachusetts spill list: Phosphoric acid New Jersey: Phosphoric acid New Jersey spill list: Phosphoric acid Louisiana spill reporting: Phosphoric acid California Director's list of hazardous substances: Phosphoric acid TSCA 8(b) inventory: Phosphoric Acid; Water SARA 313 toxic chemical notification and release reporting: Phosphoric acid CERCLA: Hazardous substances.: Phosphoric acid: 5000 lbs. (2268 kg)

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive liquid.

DSCL (EEC):
R34- Causes burns. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:47 PM

Last Updated: 11/06/2008 12:00 PM

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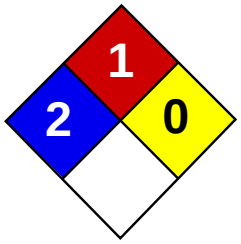

Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Potassium acetate MSDS

Section 1: Chemical Product and Company Identification

Product Name: Potassium acetate

Catalog Codes: SLP1285, SLP4909, SLP2083

CAS#: 127-08-2

RTECS: AJ3325000

TSCA: TSCA 8(b) inventory: Potassium acetate

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: CH3COOK

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Potassium acetate	127-08-2	100

Toxicological Data on Ingredients: Potassium acetate: ORAL (LD50): Acute: 3250 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of eye contact (irritant), of ingestion. Slightly hazardous in case of skin contact (irritant), of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cold water may be used. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Neutralize the residue with a dilute solution of acetic acid. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Avoid contact with eyes Wear suitable protective clothing If ingested, seek medical advice immediately and show the container or the label.

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 98.14 g/mole

Color: Not available.

pH (1% soln/water): 10 [Basic.]

Boiling Point: Decomposes.

Melting Point: 292°C (557.6°F)

Critical Temperature: Not available.

Specific Gravity: 1.57 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 3250 mg/kg [Rat].

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans:
Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant), of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations: TSCA 8(b) inventory: Potassium acetate

Other Regulations: Not available..

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC): R36- Irritating to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:48 PM

Last Updated: 11/06/2008 12:00 PM

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MSDS Number: **P5631** * * * * * *Effective Date:* ***09/16/09*** * * * * * *Supercedes:* ***08/02/07***

MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

POTASSIUM CHLORIDE

1. Product Identification

Synonyms: Potassium monochloride
CAS No.: 7447-40-7
Molecular Weight: 74.55
Chemical Formula: KCl
Product Codes:
J.T. Baker: 3040, 3044, 3045, 3046, 3052, 4001
Mallinckrodt: 0865, 0890, 3279, 3610, 3619, 3925, 4251, 4858, 4910, 5480, 6156, 6205, 6230, 6275, 6307, 6335, 6363, 6788, 6801, 6838, 6841, 6842, 6845, 6849, 6851, 6858, 6867, 7207, 7535, 7590, 7618, 7769, V483

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Potassium Chloride	7447-40-7	100%	Yes

3. Hazards Identification

Emergency Overview

CAUTION! MAY BE HARMFUL IF SWALLOWED. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:
Inhalation of high concentrations of dust may cause nasal or lung irritation.
Ingestion:
Large quantities can produce gastrointestinal irritation and vomiting. May produce weakness and circulatory problems. May affect heart. In severe cases, ingestion may be fatal.
Skin Contact:
Contact may cause irritation or rash, particularly with moist skin.
Eye Contact:
Potassium chloride is moderate eye irritant. Redness, tearing, possible abrasion can occur.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
Persons with impaired kidney function may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician.
Skin Contact:
Remove any contaminated clothing. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.
Eye Contact:
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Call a physician if irritation persists.

---

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:

Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust.

---

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
None established.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
For conditions of use where exposure to dust or mist is apparent and engineering controls are not feasible, a particulate respirator (NIOSH type N95 or better filters) may be worn. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear protective gloves and clean body-covering clothing.
Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
White crystals or powder.

Odor:
Odorless.
Solubility:
28.1 g/100g of water @ 0C.
Density:
1.987
pH:
ca. 7 Saturated aq. sl. @ 15C
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
1500C (2732F) Sublimes.
Melting Point:
772C (1422F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Oxides of the contained metal and halogen, possibly also free, or ionic halogen.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Bromine trifluoride; potassium permanganate plus sulfuric acid.
Conditions to Avoid:
No information found.

---

11. Toxicological Information

Oral rat LD50: 2600 mg/kg; irritation eye rabbit (standard Draize): 500 mg/24 hr mild; investigated as a mutagen.

```
--------\Cancer Lists\-------------------------------------------------------
                                        ---NTP Carcinogen---
Ingredient                              Known    Anticipated    IARC Category
------------------------------------    -----    -----------    -------------
Potassium Chloride (7447-40-7)           No          No            None
```

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12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Not regulated.

---

15. Regulatory Information

```
  --------\Chemical Inventory Status - Part 1\---------------------------------
  Ingredient                                        TSCA  EC   Japan  Australia
  ----------------------------------------------  ----  ---  -----  ---------
  Potassium Chloride (7447-40-7)                     Yes  Yes   Yes
Yes

  --------\Chemical Inventory Status - Part 2\---------------------------------
                                                             --Canada--
  Ingredient                                        Korea  DSL   NDSL  Phil.
  ----------------------------------------------  -----  ---   ----  -----
  Potassium Chloride (7447-40-7)                     Yes   Yes   No     Yes

  --------\Federal, State & International Regulations - Part 1\----------------
                                              -SARA 302-    ------SARA 313------
  Ingredient                                  RQ    TPQ     List  Chemical Catg.
  ----------------------------------------  ---   -----   ----  --------------
  Potassium Chloride (7447-40-7)              No    No      No         No

  --------\Federal, State & International Regulations - Part 2\----------------
                                                         -RCRA-    -TSCA-
  Ingredient                                  CERCLA     261.33     8(d)
  ----------------------------------------  ------     ------    ------
  Potassium Chloride (7447-40-7)              No         No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: No   Fire: No  Pressure: No
Reactivity: No          (Pure / Solid)
```

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **1** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
CAUTION! MAY BE HARMFUL IF SWALLOWED. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.
Label Precautions:
Avoid breathing dust.
Keep container closed.
Use with adequate ventilation.
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. If irritation develops call a physician. If inhaled, remove to fresh air. Get medical attention for any breathing difficulty.
Product Use:
Laboratory Reagent.
Revision Information:
No Changes.
Disclaimer:
****
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****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **P5884** * * * * * *Effective Date:* ***09/01/09*** * * * * * *Supercedes:* ***02/01/07***

MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

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Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

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POTASSIUM HYDROXIDE

1. Product Identification

Synonyms: Caustic potash; potassium hydrate
CAS No.: 1310-58-3
Molecular Weight: 56.11
Chemical Formula: KOH
Product Codes:
J.T. Baker: 3140, 3141, 3146, 3150, 3152, 5685
Mallinckrodt: 6964, 6976, 6984, 7704, 7815

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Potassium Hydroxide	1310-58-3	85 - 90%	Yes
Water	7732-18-5	10 - 15%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. CAUSES SEVERE BURNS TO SKIN, EYES, RESPIRATORY TRACT, AND GASTROINTESTINAL TRACT. MATERIAL IS EXTREMELY DESTRUCTIVE TO ALL BODY TISSUES. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White Stripe (Store Separately)

Potential Health Effects

Inhalation:
Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on the severity of exposure. Symptoms may include coughing, sneezing, damage to the nasal or respiratory tract. High concentrations can cause lung damage.
Ingestion:
Toxic! Swallowing may cause severe burns of mouth, throat and stomach. Other symptoms may include vomiting, diarrhea. Severe scarring of tissue and death may result. Estimated lethal dose: 5 grams.
Skin Contact:
Corrosive! Contact with skin can cause irritation or severe burns and scarring with greater exposures.
Eye Contact:
Highly Corrosive! Causes irritation of eyes with tearing, redness, swelling. Greater exposures cause severe burns with possible blindness resulting.
Chronic Exposure:
Prolonged contact with dilute solutions or dust of potassium hydroxide has a destructive effect on tissue.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

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4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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5. Fire Fighting Measures

Fire:
Not combustible, but contact with water or moisture may generate enough heat to ignite combustibles.
Explosion:
Can react with chemically reactive metals such as aluminum, zinc, magnesium, copper, etc. to release hydrogen gas which can form explosive mixtures with air.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
Solution process causes formation of corrosive mists. Hot or molten material can react violently with water. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Do not flush caustic residues to the sewer. Residues from spills can be diluted with water, neutralized with dilute acid such as acetic, hydrochloric or sulfuric. Absorb neutralized caustic residue on clay, vermiculite or other inert substance and package in a suitable container for disposal.
US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRACIT®-2 or BuCAIM® caustic neutralizers are recommended for spills of solutions of this product.

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7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Protect from moisture. Addition to water releases heat which can result in violent boiling and spattering. Always add slowly and in small amounts. Never use hot water. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
2 mg/m3 Ceiling
- ACGIH Threshold Limit Value (TLV):
2 mg/m3 Ceiling

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator (NIOSH type N95 or better filters) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
White deliquescent solid
Odor:
Odorless.
Solubility:
52.8% in water @ 20C (68F)
Specific Gravity:
2.04
pH:
13.5 (0.1 molar solution)
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
1320C (2408F)
Melting Point:
360C (680F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
1.0 @ 714C (1317F)
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Carbon monoxide when reacting with carbohydrates, and hydrogen gas when reacting with aluminum, zinc and tin. Thermal oxidation can produce toxic fumes of potassium oxide (K2O).
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Contact with water, acids, flammable liquids and organic halogen compounds, especially trichloroethylene, may cause fire or explosion. Contact with nitromethane and other similar nitro compounds cause formation of shock sensitive salts. Contact with metals such as aluminum, tin and zinc causes formation of flammable hydrogen gas.
Conditions to Avoid:
Heat, moisture, incompatibles.

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11. Toxicological Information

For potassium hydroxide: Oral rat LD50: 273 mg/kg; Investigated as a mutagen. Skin Irritation Data (std Draize, 50 mg/24 H): Human, Severe; Rabbit, Severe. Eye Irritation Data(Rabbit, non-std test,1 mg/24 H, rinse): Moderate.

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--------\Cancer Lists\-------------------------------------------------------
                                        ---NTP Carcinogen---
Ingredient                              Known    Anticipated    IARC Category
-------------------------------------   -----    -----------    -------------
Potassium Hydroxide (1310-58-3)          No          No            None
Water (7732-18-5)                        No          No            None
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12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
Potassium Hydroxide: TLm: 80 ppm/Mosquito fish/ 24 hr./ Fresh water

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: POTASSIUM HYDROXIDE, SOLID
Hazard Class: 8
UN/NA: UN1813
Packing Group: II
Information reported for product/size: 110LB

International (Water, I.M.O.)

Proper Shipping Name: POTASSIUM HYDROXIDE, SOLID
Hazard Class: 8
UN/NA: UN1813
Packing Group: II
Information reported for product/size: 110LB

International (Air, I.C.A.O.)

Proper Shipping Name: POTASSIUM HYDROXIDE, SOLID
Hazard Class: 8
UN/NA: UN1813
Packing Group: II
Information reported for product/size: 110LB

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15. Regulatory Information

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  --------\Chemical Inventory Status - Part 1\---------------------------------
  Ingredient                                        TSCA  EC   Japan  Australia
  ----------------------------------------------  ----  ---  -----  ---------
  Potassium Hydroxide (1310-58-3)                    Yes  Yes   Yes
Yes
  Water (7732-18-5)                                  Yes  Yes   Yes
Yes

  --------\Chemical Inventory Status - Part 2\---------------------------------
                                                              --Canada--
  Ingredient                                        Korea  DSL   NDSL  Phil.
  ----------------------------------------------  -----  ---   ----  -----
  Potassium Hydroxide (1310-58-3)                    Yes   Yes   No     Yes
  Water (7732-18-5)                                  Yes   Yes   No     Yes

  --------\Federal, State & International Regulations - Part 1\----------------
                                              -SARA 302-    ------SARA 313------
  Ingredient                                  RQ    TPQ     List  Chemical Catg.
  ----------------------------------------  ---   -----   ----  --------------
  Potassium Hydroxide (1310-58-3)             No    No      No         No
  Water (7732-18-5)                           No    No      No         No

  --------\Federal, State & International Regulations - Part 2\----------------
                                                          -RCRA-    -TSCA-
  Ingredient                                  CERCLA     261.33     8(d)
  ----------------------------------------  ------     ------    ------
  Potassium Hydroxide (1310-58-3)             1000       No         No
  Water (7732-18-5)                           No         No
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No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: Yes (Mixture / Solid)

Australian Hazchem Code: 2R
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **1**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. CAUSES SEVERE BURNS TO SKIN, EYES, RESPIRATORY TRACT, AND GASTROINTESTINAL TRACT. MATERIAL IS EXTREMELY DESTRUCTIVE TO ALL BODY TISSUES. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe dust.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
No Changes.
Disclaimer:
****
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****
Prepared by: Environmental Health & Safety

Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **P5906** * * * * * *Effective Date:* ***02/03/09*** * * * * * *Supercedes:* ***11/09/06***

MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

POTASSIUM IODIDE

1. Product Identification

Synonyms: Potide; hydriodic acid, potassium salt; Iodic acid, potassium salt
CAS No.: 7681-11-0
Molecular Weight: 166.0
Chemical Formula: KI
Product Codes:
J.T. Baker: 3162, 3163, 3164, 3165, 3167, 3168
Mallinckrodt: 1103, 1112, 1113, 1115, 1117, 1123, 1127, 1200, 1220, 6334, 6336

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Potassium Iodide	7681-11-0	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

CAUTION! MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:
May cause irritation to the respiratory tract. Symptoms may include coughing and shortness of breath.
Ingestion:
Large oral doses may cause irritation to the gastrointestinal tract.
Skin Contact:
May cause irritation with redness and pain.
Eye Contact:
May cause irritation, redness and pain.
Chronic Exposure:
Chronic ingestion of iodides may produce "iodism," which may be manifested by skin rash, running nose, headache and irritation of mucous membranes. Weakness, anemia, loss of weight, and general depression may also occur.
Aggravation of Pre-existing Conditions:
No information found.

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4. First Aid Measures

Inhalation:
Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention if irritation develops.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical attention if irritation persists.

---

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

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6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

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7. Handling and Storage

Keep in a tightly closed light-resistant container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Prolonged storage is not recommended because of possible degradation problems, including yellowing of the potassium iodide product. Always inspect the potassium iodide's color and overall quality before use. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

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8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-ACGIH (TWA) for Iodides:
0.01 ppm for inhalable fraction and vapor.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
For conditions of use where exposure to dust or mist is apparent and engineering controls are not feasible, a particulate respirator (NIOSH type N95 or better filters) may be worn. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Gloves and lab coat, apron or coveralls.
Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

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9. Physical and Chemical Properties

Appearance:
White crystals.

Odor:
Odorless.
Solubility:
140 grams/100 gm in water.
Density:
3.1
pH:
7-9
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
1330C (2426F)
Melting Point:
680C (1256F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
1 @ 745C (1373F)
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. On long exposure to air becomes yellow due to release of iodine.
Hazardous Decomposition Products:
Oxides of the contained metal and halogen, possibly also free, or ionic halogen.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Diazonium salts; diisopropyl peroxydicarbonate; oxidants; bromine and chlorine trifluorides; fluorine perchlorate; calomel (mercurous chloride); potassium chlorate; metallic salts; tartaric and other acids.
Conditions to Avoid:
Air, moisture, light and incompatibles.

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11. Toxicological Information

Investigated as a mutagen, reproductive effector.

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--------\Cancer Lists\-------------------------------------------------------
                                        ---NTP Carcinogen---
Ingredient                              Known    Anticipated    IARC Category
------------------------------------    -----    -----------    -------------
Potassium Iodide (7681-11-0)             No          No            None
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12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

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13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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14. Transport Information

Not regulated.

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15. Regulatory Information

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  --------\Chemical Inventory Status - Part 1\---------------------------------
  Ingredient                                        TSCA  EC   Japan  Australia
  ----------------------------------------------  ----  ---  -----  ---------
  Potassium Iodide (7681-11-0)                       Yes  Yes   Yes
Yes

  --------\Chemical Inventory Status - Part 2\---------------------------------
                                                             --Canada--
  Ingredient                                        Korea  DSL   NDSL  Phil.
  ----------------------------------------------  -----  ---   ----  -----
  Potassium Iodide (7681-11-0)                       Yes   Yes   No     Yes

  --------\Federal, State & International Regulations - Part 1\----------------
                                                -SARA 302-    ------SARA 313------
  Ingredient                                    RQ    TPQ     List  Chemical Catg.
  ----------------------------------------  ---   -----   ----  --------------
  Potassium Iodide (7681-11-0)              No    No      No         No

  --------\Federal, State & International Regulations - Part 2\----------------
                                                             -RCRA-    -TSCA-
  Ingredient                                    CERCLA     261.33     8(d)
  ----------------------------------------  ------     ------    ------
  Potassium Iodide (7681-11-0)              No         No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: No          (Pure / Solid)
```
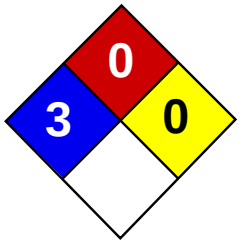

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **1** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
CAUTION! MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.
Label Precautions:
Avoid contact with eyes, skin and clothing.
Avoid breathing dust.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists. If inhaled, remove to fresh air. Get medical attention for any breathing difficulty.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)



Health	3
Fire	0
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
Sodium bisulfate MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium bisulfate

Catalog Codes: SLS2104, SLS4258

CAS#: 7681-38-1

RTECS: VZ1860000

TSCA: TSCA 8(b) inventory: Sodium bisulfate

CI#: Not available.

Synonym: GBS; Nitre cake; Sodium acid sulfate; Sodium pyrosulfate; Sodium hydrogen sulfate; Sulfuric acid, monosodium salt.

Chemical Name: Sodium Bisulfate

Chemical Formula: NaHSO4

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium bisulfate	7681-38-1	100

Toxicological Data on Ingredients: Sodium bisulfate: ORAL (LD50): Acute: 2800 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator). The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Corrosive solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Granular solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 120.6 g/mole

Color: Off-white.

pH (1% soln/water): Not available.

Boiling Point: Not available.

Melting Point: 157.22°C (315°F)

Critical Temperature: Not available.

Specific Gravity: 2.435 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:

Easily soluble in hot water. Soluble in cold water. Soluble in 2 parts cold water. Soluble in 1 part boiling water. Decomposed by alcohol into sodium sulfate and free H_2SO_4.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, moisture

Incompatibility with various substances: Reactive with oxidizing agents, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Do not mix with liquid chlorine bleach (hypochlorites), ammonia cleansers or similar products, or alcohols. Hygroscopic; keep container tightly closed.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 2800 mg/kg [Rat].

Chronic Effects on Humans: MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (corrosive, permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May affect genetic material (mutagenic)

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Can cause severe skin irritation or burns. Eyes: Can cause severe irritation or burns of the eyes. Inhalation: It is destructive to the mucous membranes of the upper respiratory tract. Causes irritation and chemical burns to the respiratory tract with burning pain in the nose and throat, coughing , wheezing, shortness of breath, and pulmonary edema. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Ingestion: Causes gastrointestinal tract irritation and burns. Symptoms may include nausea and vomiting. May cause severe and permanent damage to the digestive tract. Chronic Potential Health Effects: Repeated exposure may cause erosion of teeth, lung irritation, bronchitis, persistant coughing,

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Corrosive Solid, n.o.s.(Sodium Bisulfate) UNNA: 1759 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Sodium bisulfate New Jersey: Sodium bisulfate TSCA 8(b) inventory: Sodium bisulfate

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive solid.

DSCL (EEC):
R34- Causes burns. R41- Risk of serious damage to eyes. S24/25- Avoid contact with skin and eyes. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S36/37/39- Wear suitable protective clothing, gloves and eye/face protection.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:27 PM

Last Updated: 11/06/2008 12:00 PM

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MSDS Number: **S4034** * * * * * *Effective Date:* ***09/08/09*** * * * * * *Supercedes:* ***05/04/07***

MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SODIUM HYDROXIDE

1. Product Identification

Synonyms: Caustic soda; lye; sodium hydroxide solid; sodium hydrate
CAS No.: 1310-73-2
Molecular Weight: 40.00
Chemical Formula: NaOH
Product Codes:
J.T. Baker: 1508, 3717, 3718, 3721, 3722, 3723, 3728, 3734, 3736, 5045, 5565
Mallinckrodt: 7001, 7680, 7708, 7712, 7772, 7798

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Hydroxide	1310-73-2	99 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES BURNS TO ANY AREA OF CONTACT. REACTS WITH WATER, ACIDS AND OTHER MATERIALS.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White Stripe (Store Separately)

Potential Health Effects

Inhalation:
Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on severity of exposure. Symptoms may include sneezing, sore throat or runny nose. Severe pneumonitis may occur.
Ingestion:
Corrosive! Swallowing may cause severe burns of mouth, throat, and stomach. Severe scarring of tissue and death may result. Symptoms may include bleeding, vomiting, diarrhea, fall in blood pressure. Damage may appear days after exposure.
Skin Contact:
Corrosive! Contact with skin can cause irritation or severe burns and scarring with greater exposures.
Eye Contact:
Corrosive! Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent impairment of vision, even blindness.
Chronic Exposure:
Prolonged contact with dilute solutions or dust has a destructive effect upon tissue.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician, immediately. Wash clothing before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
Perform endoscopy in all cases of suspected sodium hydroxide ingestion. In cases of severe esophageal corrosion, the use of therapeutic doses of steroids should be considered. General supportive measures with continual monitoring of

gas exchange, acid-base balance, electrolytes, and fluid intake are also required.

---

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard. Hot or molten material can react violently with water.
Can react with certain metals, such as aluminum, to generate flammable hydrogen gas.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Adding water to caustic solution generates large amounts of heat.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Do not flush caustic residues to the sewer. Residues from spills can be diluted with water, neutralized with dilute acid such as acetic, hydrochloric or sulfuric. Absorb neutralized caustic residue on clay, vermiculite or other inert substance and package in a suitable container for disposal.
US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

---

7. Handling and Storage

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Always add the caustic to water while stirring; never the reverse. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product. Do not store with aluminum or magnesium. Do not mix with acids or organic materials.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
2 mg/m3 Ceiling
- ACGIH Threshold Limit Value (TLV):
2 mg/m3 Ceiling
Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator (NIOSH type N95 or better filters) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator.

WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:

White, deliquescent pellets or flakes.

Odor:

Odorless.

Solubility:

111 g/100 g of water.

Specific Gravity:

2.13

pH:

13 - 14 (0.5% soln.)

% Volatiles by volume @ 21C (70F):

0

Boiling Point:

1390C (2534F)

Melting Point:

318C (604F)

Vapor Density (Air=1):

> 1.0

Vapor Pressure (mm Hg):

Negligible.

Evaporation Rate (BuAc=1):

No information found.

---

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage. Very hygroscopic. Can slowly pick up moisture from air and react

with carbon dioxide from air to form sodium carbonate.
Hazardous Decomposition Products:
Sodium oxide. Decomposition by reaction with certain metals releases flammable and explosive hydrogen gas.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Sodium hydroxide in contact with acids and organic halogen compounds, especially trichloroethylene, may causes violent reactions. Contact with nitromethane and other similar nitro compounds causes formation of shock-sensitive salts. Contact with metals such as aluminum, magnesium, tin, and zinc cause formation of flammable hydrogen gas. Sodium hydroxide, even in fairly dilute solution, reacts readily with various sugars to produce carbon monoxide. Precautions should be taken including monitoring the tank atmosphere for carbon monoxide to ensure safety of personnel before vessel entry.
Conditions to Avoid:
Moisture, dusting and incompatibles.

---

11. Toxicological Information

Irritation data: skin, rabbit: 500 mg/24H severe; eye rabbit: 50 ug/24H severe; investigated as a mutagen.

```
--------\Cancer Lists\-------------------------------------------------------
                                      ---NTP Carcinogen---
Ingredient                            Known    Anticipated    IARC Category
-------------------------------------  -----    -----------    -------------
Sodium Hydroxide (1310-73-2)           No          No            None
```

---

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: SODIUM HYDROXIDE, SOLID
Hazard Class: 8
UN/NA: UN1823
Packing Group: II
Information reported for product/size: 300LB

International (Water, I.M.O.)

Proper Shipping Name: SODIUM HYDROXIDE, SOLID
Hazard Class: 8
UN/NA: UN1823
Packing Group: II
Information reported for product/size: 300LB

---

15. Regulatory Information

```
  --------\Chemical Inventory Status - Part 1\---------------------------------
  Ingredient                                        TSCA  EC   Japan  Australia
  ----------------------------------------------  ----  ---  -----  ---------
  Sodium Hydroxide (1310-73-2)                       Yes  Yes   Yes
Yes

  --------\Chemical Inventory Status - Part 2\---------------------------------
                                                            --Canada--
  Ingredient                                        Korea  DSL   NDSL  Phil.
  ----------------------------------------------  -----  ---   ----  -----
  Sodium Hydroxide (1310-73-2)                       Yes   Yes   No     Yes

  --------\Federal, State & International Regulations - Part 1\----------------
                                              -SARA 302-    ------SARA 313------
  Ingredient                                  RQ    TPQ     List  Chemical Catg.
  ----------------------------------------  ---   -----   ----  --------------
  Sodium Hydroxide (1310-73-2)                No    No      No         No

  --------\Federal, State & International Regulations - Part 2\----------------
                                                         -RCRA-    -TSCA-
  Ingredient                                  CERCLA     261.33     8(d)
  ----------------------------------------  ------     ------    ------
  Sodium Hydroxide (1310-73-2)                1000       No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: No   Fire: No  Pressure: No
Reactivity: Yes         (Pure / Solid)
```

Australian Hazchem Code: 2R
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **1**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. CAUSES BURNS TO ANY AREA OF CONTACT. REACTS WITH WATER, ACIDS AND OTHER MATERIALS.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe dust.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
No Changes.
Disclaimer:
****
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****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **S5066** * * * * * *Effective Date:* ***02/15/08*** * * * * * *Supercedes:* ***06/16/05***

MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SODIUM SULFITE

1. Product Identification

Synonyms: Sodium sulfite anhydrous; disodium sulfite; sulfurous acid, disodium salt; exsiccated sodium sulfite
CAS No.: 7757-83-7
Molecular Weight: 126.04
Chemical Formula: Na2SO3
Product Codes:
J.T. Baker: 3888, 3922
Mallinckrodt: 8056, 8064

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Sulfite	7757-83-7	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED. MAY CAUSE ALLERGIC REACTION AND BREATHING DIFFICULTIES. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Green (General Storage)

Potential Health Effects

Although only moderately toxic in large amounts, sulfites can pose risk to some asthmatics producing central nervous system depression, bronchoconstriction and anaphylaxis.

Inhalation:
Inhalation of dust may cause irritation to the mucous membranes of the upper respiratory tract. Use of bronchodilators preserved with sulfites can cause allergic reactions.
Ingestion:
May cause gastric irritation by the liberation of sulfurous acid. Large doses may result in circulatory disturbances, diarrhea, and central nervous system depression. Estimated fatal dose is 0.5 to > 5g/kg.
Skin Contact:
May cause irritation.
Eye Contact:
May cause irritation, redness and pain.
Chronic Exposure:
No information found.
Aggravation of Pre-existing Conditions:
Some individuals are said to be dangerously sensitive to minute amounts of sulfites in foods and some bronchodilator medicines preserved with sulfites. Symptoms may include broncho constriction, shock, gastrointestinal disturbances, angio edema, flushing, and tingling sensations.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
Remove any contaminated clothing. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

---

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard. If involved in a fire, can emit toxic fumes and irritating and corrosive gases.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

---

7. Handling and Storage

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-ACGIH Threshold Limit Value (TLV):
5mg/m3 (TWA) for sodium bisulfite & for sodium metabisulfite, A4 Not classifiable as a human carcinogen.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a half facepiece particulate respirator (NIOSH type N95 or better filters) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest.. A full-face piece particulate respirator (NIOSH type N100 filters) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear protective gloves and clean body-covering clothing.
Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
White crystals.
Odor:
Odorless.
Solubility:
Soluble in ca. 3.2 parts water.
Specific Gravity:
2.6 @ 15.4C (60F)
pH:
ca. 9
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
Not applicable.
Melting Point:
No information found.
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Heat and moisture contribute to instability. May air-oxidize.
Hazardous Decomposition Products:
Burning may produce sulfur oxides.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Acids, strong oxidizers, high temperatures.
Conditions to Avoid:
Heat and moisture.

11. Toxicological Information

Oral mouse LD50: 820 mg/kg. Investigated as a tumorigen and mutagen.

```
--------\Cancer Lists\-------------------------------------------------------
                                        ---NTP Carcinogen---
Ingredient                              Known    Anticipated    IARC Category
```

Sodium Sulfite (7757-83-7)	No	No	3

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Sodium Sulfite (7757-83-7)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Sodium Sulfite (7757-83-7)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Sodium Sulfite (7757-83-7)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)

```
 ----------------------------------------  ------     ------    ------
 Sodium Sulfite (7757-83-7)                 No         No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: No   Fire: No  Pressure: No
Reactivity: No          (Pure / Solid)
```

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **2** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED. MAY CAUSE ALLERGIC REACTION AND BREATHING DIFFICULTIES. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.
Label Precautions:
Avoid breathing dust.
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
Keep container closed.
Use with adequate ventilation.
For Reagent and Technical Grades: Not For Food Use.For TAC Grades: Do not use in meats or in foods recognized as a source of Vitamin B-1, nor in fruits or vegetables to be served or sold raw to consumers or to be presented to consumers as fresh.
Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. If inhaled, remove to fresh air. Get medical attention for any breathing difficulty. In all cases call a physician.
Product Use:
Laboratory Reagent.
Revision Information:
No Changes.
Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **S5230** * * * * * *Effective Date:* ***09/16/09*** * * * * * *Supercedes:* ***08/02/07***

MSDS **Material Safety Data Sheet**

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SODIUM THIOSULFATE

1. Product Identification

Synonyms: Sodium thiosulfate, pentahydrate; thiosulfuric acid, disodium salt, pentahydrate
CAS No.: 7772-98-7 (Anhydrous) 10102-17-7 (Pentahydrate)
Molecular Weight: 248.17
Chemical Formula: Na2S2O3.5H2O
Product Codes:
J.T. Baker: 3945, 3946, 3951
Mallinckrodt: 7763, 7802, 8100

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Thiosulfate	7772-98-7	100%	Yes

3. Hazards Identification

Emergency Overview

CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; PROPER GLOVES
Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:
May cause irritation to the respiratory tract. Symptoms may include coughing and shortness of breath.
Ingestion:
Low level of toxicity by ingestion. Diarrhea may occur by ingestion of large quantities.
Skin Contact:
Irritation may occur from prolonged skin contact.
Eye Contact:
Contact may cause mechanical irritation.
Chronic Exposure:
Chronic exposure may cause skin effects.
Aggravation of Pre-existing Conditions:
No information found.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. Get medical attention for any breathing difficulty.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Wash exposed area with soap and water. Get medical advice if irritation develops.
Eye Contact:
Wash thoroughly with running water. Get medical advice if irritation develops.

---

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:

Use protective clothing and breathing equipment appropriate for the surrounding fire.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

---

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
None established.
Ventilation System:
In general, dilution ventilation is a satisfactory health hazard control for this substance. However, if conditions of use create discomfort to the worker, a local exhaust system should be considered.
Personal Respirators (NIOSH Approved):
For conditions of use where exposure to dust or mist is apparent and engineering controls are not feasible, a particulate respirator (NIOSH type N95 or better filters) may be worn. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear protective gloves and clean body-covering clothing.
Eye Protection:
Safety glasses. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Monoclinic, colorless crystals.
Odor:
Odorless.
Solubility:
79g/100 ml water @ 4C (39F)
Density:
1.75
pH:

No information found.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
> 100C (> 212F)
Melting Point:
48C (118F) Loses water @ 100C (212F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Stability limited in solution.
Hazardous Decomposition Products:
Oxides of sulfur and hydrogen sulfide.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Sodium nitrate, halogens, and oxidizing agents. Reacts with acids to release sulfur dioxide.
Conditions to Avoid:
Incompatibles.

---

11. Toxicological Information

No LD50/LC50 information found relating to normal routes of occupational exposure.

```
--------\Cancer Lists\-------------------------------------------------------
                                        ---NTP Carcinogen---
Ingredient                              Known    Anticipated    IARC Category
------------------------------------    -----    -----------    -------------
Sodium Thiosulfate (7772-98-7)           No          No            None
```

---

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Not regulated.

---

15. Regulatory Information

```
  --------\Chemical Inventory Status - Part 1\---------------------------------
  Ingredient                                        TSCA  EC   Japan  Australia
  ----------------------------------------------  ----  ---  -----  ---------
  Sodium Thiosulfate (7772-98-7)                   Yes  Yes   Yes
Yes

  --------\Chemical Inventory Status - Part 2\---------------------------------
                                                            --Canada--
  Ingredient                                        Korea  DSL   NDSL  Phil.
  ----------------------------------------------  -----  ---   ----  -----
  Sodium Thiosulfate (7772-98-7)                   Yes   Yes   No     Yes

  --------\Federal, State & International Regulations - Part 1\----------------
                                            -SARA 302-    ------SARA 313------
  Ingredient                                RQ    TPQ     List  Chemical Catg.
  ----------------------------------------  ---   -----   ----  --------------
  Sodium Thiosulfate (7772-98-7)            No    No      No         No

  --------\Federal, State & International Regulations - Part 2\----------------
                                                         -RCRA-    -TSCA-
  Ingredient                                CERCLA     261.33     8(d)
  ----------------------------------------  ------     ------    ------
  Sodium Thiosulfate (7772-98-7)            No         No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: No   Fire: No  Pressure: No
Reactivity: No          (Pure / Solid)
```

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **1** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
CAUTION! MAY BE HARMFUL IF SWALLOWED OR INHALED. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT.
Label Precautions:
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
Avoid breathing dust.
Keep container closed.
Use with adequate ventilation.
Label First Aid:
If inhaled, remove to fresh air. Get medical attention for any breathing difficulty. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists. If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person.
Product Use:
Laboratory Reagent.
Revision Information:
No Changes.
Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **S8234** * * * * * *Effective Date:* ***09/23/09*** * * * * * *Supercedes:* ***11/09/07***

MSDS **Material Safety Data Sheet**

From: **Mallinckrodt Baker, Inc.**
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SULFURIC ACID, 52 - 100 %

1. Product Identification

Synonyms: Oil of vitriol; Babcock acid; sulphuric acid
CAS No.: 7664-93-9
Molecular Weight: 98.08
Chemical Formula: H2SO4 in H2O
Product Codes:
J.T. Baker: 5030, 5137, 5374, 5802, 5815, 5858, 5859, 5868, 5889, 5897, 5961, 5971, 5997, 6163, 6902, 9671, 9673, 9674, 9675, 9676, 9679, 9680, 9681, 9682, 9684, 9687, 9690, 9691, 9693, 9694, 9697
Mallinckrodt: 21201, 2468, 2876, 2878, 2879, 2900, 2904, 3780, 4222, 5524, 5557, H644, H850, H976, H996, V651, XL003

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sulfuric Acid	7664-93-9	52 - 100%	Yes
Water	7732-18-5	0 - 48%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. May cause lung edema, a medical emergency.
Ingestion:
Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow ingestion or skin contact. Circulatory shock is often the immediate cause of death.
Skin Contact:
Corrosive. Symptoms of redness, pain, and severe burn can occur. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow skin contact or ingestion. Circulatory shock is often the immediate cause of death.
Eye Contact:
Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
Chronic Exposure:
Long-term exposure to mist or vapors may cause damage to teeth. Chronic exposure to mists containing sulfuric acid is a cancer hazard.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
Ingestion:
DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated

clothing and shoes. Wash clothing before reuse. Excess acid on skin can be neutralized with a 2% solution of bicarbonate of soda. Call a physician immediately.

Eye Contact:

Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately.

---

5. Fire Fighting Measures

Fire:

Concentrated material is a strong dehydrating agent. Reacts with organic materials and may cause ignition of finely divided materials on contact.

Explosion:

Contact with most metals causes formation of flammable and explosive hydrogen gas.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Do not use water on material. However, water spray may be used to keep fire exposed containers cool.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving this material. Stay away from sealed containers.

---

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

---

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, always add the acid to water; never add water to the acid. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Sulfuric Acid:
- OSHA Permissible Exposure Limit (PEL) -
1 mg/m3 (TWA)
- ACGIH Threshold Limit Value (TLV) -
0.2 mg/m3(T) (TWA) for sulfuric acid - A2 Suspected Human Carcinogen for sulfuric acid contained in strong inorganic mists.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with an acid gas cartridge and particulate filter (NIOSH type N100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P particulate filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

---

9. Physical and Chemical Properties

Appearance:
Clear oily liquid.

Odor:
Odorless.

Solubility:
Miscible with water, liberates much heat.

Specific Gravity:
1.84 (98%), 1.40 (50%), 1.07 (10%)

pH:
1 N solution (ca. 5% w/w) = 0.3; 0.1 N solution (ca. 0.5% w/w) = 1.2; 0.01 N solution (ca. 0.05% w/w) = 2.1.

% Volatiles by volume @ 21C (70F):
No information found.

Boiling Point:
ca. 290C (ca. 554F) (decomposes at 340C)

Melting Point:
3C (100%), -32C (93%), -38C (78%), -64C (65%).

Vapor Density (Air=1):
3.4

Vapor Pressure (mm Hg):
1 @ 145.8C (295F)

Evaporation Rate (BuAc=1):

No information found.

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Concentrated solutions react violently with water, spattering and liberating heat.
Hazardous Decomposition Products:
Toxic fumes of oxides of sulfur when heated to decomposition. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas, and with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Water, potassium chlorate, potassium perchlorate, potassium permanganate, sodium, lithium, bases, organic material, halogens, metal acetylides, oxides and hydrides, metals (yields hydrogen gas), strong oxidizing and reducing agents and many other reactive substances.
Conditions to Avoid:
Heat, moisture, incompatibles.

---

11. Toxicological Information

Toxicological Data:
Oral rat LD50: 2140 mg/kg; inhalation rat LC50: 510 mg/m3/2H; standard Draize, eye rabbit, 250 ug (severe); investigated as a tumorigen, mutagen, reproductive effector.
Carcinogenicity:
Cancer Status: The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mists containing sulfuric acid" as a known human carcinogen, (IARC category 1). This classification applies only to mists containing sulfuric acid and not to sulfuric acid or sulfuric acid solutions.

```
--------\Cancer Lists\-------------------------------------------------------
                                        ---NTP Carcinogen---
Ingredient                              Known    Anticipated    IARC Category
------------------------------------    -----    -----------    -------------
Sulfuric Acid (7664-93-9)                No          No            None
Water (7732-18-5)                        No          No            None
```

---

12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released into the air, this material may be removed from the atmosphere to a moderate extent by dry deposition.
Environmental Toxicity:
LC50 Flounder 100 to 330 mg/l/48 hr aerated water/Conditions of bioassay not specified; LC50 Shrimp 80 to 90 mg/l/48 hr aerated water /Conditions of bioassay not specified; LC50 Prawn 42.5 ppm/48 hr salt water /Conditions of bioassay not specified.

This material may be toxic to aquatic life.

---

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

---

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: SULFURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830
Packing Group: II
Information reported for product/size: 440LB

International (Water, I.M.O.)

Proper Shipping Name: SULFURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830
Packing Group: II
Information reported for product/size: 440LB

---

15. Regulatory Information

```
  --------\Chemical Inventory Status - Part 1\---------------------------------
  Ingredient                                        TSCA  EC   Japan  Australia
  ------------------------------------------------  ----  ---  -----  ---------
  Sulfuric Acid (7664-93-9)                          Yes  Yes   Yes
Yes
  Water (7732-18-5)                                  Yes  Yes   Yes
Yes

  --------\Chemical Inventory Status - Part 2\---------------------------------
                                                             --Canada--
  Ingredient                                        Korea  DSL   NDSL  Phil.
  ------------------------------------------------  -----  ---   ----  -----
  Sulfuric Acid (7664-93-9)                          Yes   Yes   No     Yes
  Water (7732-18-5)                                  Yes   Yes   No     Yes

  --------\Federal, State & International Regulations - Part 1\----------------
                                                -SARA 302-    ------SARA 313------
  Ingredient                                    RQ    TPQ     List  Chemical Catg.
```

```
  ----------------------------------------  ---   -----   ----  --------------
  Sulfuric Acid (7664-93-9)                 1000  1000    Yes        No
  Water (7732-18-5)                         No    No      No         No

  --------\Federal, State & International Regulations - Part 2\----------------
                                                         -RCRA-    -TSCA-
  Ingredient                                CERCLA     261.33     8(d)
  ----------------------------------------  ------     ------    ------
  Sulfuric Acid (7664-93-9)                 1000       No         No
  Water (7732-18-5)                         No         No
No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  Yes
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: Yes         (Pure / Liquid)
```

Australian Hazchem Code: 2P
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **2** Other: **Water reactive**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Do not contact with water.
Label First Aid:
In all cases call a physician immediately. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use. Excess acid on skin can be neutralized with a 2% bicarbonate of soda solution. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Product Use:
Laboratory Reagent.
Revision Information:
No Changes.
Disclaimer:
****

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****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Material Safety Data Sheet

Zinc acetate solutions

ACC# 75299

Section 1 - Chemical Product and Company Identification

MSDS Name: Zinc acetate solutions
Catalog Numbers: LC27080, LC27100
Synonyms:
Company Identification:
Labchem Inc.
200 William Pitt Way
Pittsburgh, PA 15238
For information, call: 412-826-5230
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
5970-45-6	Zinc acetate, dihydrate	10-22	unlisted
7732-18-5	Water	balance	231-791-2

Hazard Symbols: None listed.
Risk Phrases: None listed.

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless. Caution! May cause eye and skin irritation.
Target Organs: None known.

Potential Health Effects
Eye: May cause eye irritation.
Skin: May cause skin irritation.
Ingestion: Ingestion can result in nausea, vomiting, gastric irritation.
Inhalation: May cause respiratory tract irritation.
Chronic: Prolonged ingestion of dry zinc acetate may result in liver damage.

Section 4 - First Aid Measures

Eyes: Not available.
Skin: Not available.
Ingestion: Not available.
Inhalation: Not available.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Firefighting Measures

General Information: Negligible fire and explosion hazard when exposed to heat or flame. Move container if possible, avoid breathing vapors or dust.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spills with absorbent (vermiculite, sand, fuller's earth) and place in plastic bags for later disposal. May be neutralized with slaked lime, limestone, or sodium bicarbonate to a pH 7.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Avoid breathing dust, vapor, mist, or gas.
Storage: Store capped at room temperature. Protect from heat and incompatibles.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Provide local exhaust or general dilution ventilation.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Zinc acetate, dihydrate	none listed	none listed	none listed
Water	none listed	none listed	none listed

OSHA Vacated PELs: Zinc acetate, dihydrate: No OSHA Vacated PELs are listed for this chemical. Water: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Do not wear contact lenses when working with chemicals. An eye wash fountain should be available in the immediate work area. Wear splash-proof safety goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Not required for normal use. Firefighting-- any self-contained breathing

apparatus with full facepiece operated in pressure-demand mode.

Section 9 - Physical and Chemical Properties

Physical State: Clear liquid
Appearance: colorless
Odor: slight acetic
pH: acidic
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate:Not available.
Viscosity: Not available.
Boiling Point: Not available.
Freezing/Melting Point:Not available.
Decomposition Temperature:Not available.
Autoignition Temperature: Not available.
Flash Point: Not available.
NFPA Rating: Not published.
Explosion Limits, Lower:Not available.
Upper: Not available.
Solubility: Soluble.
Specific Gravity/Density:1.0
Molecular Formula:Not available.
Molecular Weight:Not available.

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, excess heat, sparks, open flames.
Incompatibilities with Other Materials: Strong oxidizing agents, excessive heat.
Hazardous Decomposition Products: Toxic fumes of zinc oxide, acrid smoke and fumes.
Hazardous Polymerization: Has not been reported

Section 11 - Toxicological Information

RTECS#:
CAS# 5970-45-6 unlisted.
CAS# 7732-18-5 unlisted.
LD50/LC50:
CAS# 5970-45-6:
Oral, mouse: LD50 = 287 mg/kg;
Oral, rat: LD50 = 794 mg/kg;

CAS# 7732-18-5:
Oral, rat: LD50 = >90 mL/kg;

Carcinogenicity:
CAS# 5970-45-6: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA. CAS# 7732-18-5: Not

listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology: Zinc acetate is an eye, mucous membrane, and skin irritant.
Teratogenicity: No data available.
Reproductive Effects: No data available.
Neurotoxicity: No data available.
Mutagenicity: No data available.
Other Studies: No data available.

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	No information available.				No information available.
Hazard Class:					
UN Number:					
Packing Group:					

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 5970-45-6 is not listed on the TSCA inventory. It is for research and development use only.
CAS# 7732-18-5 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.

Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

Section 302 (RQ)
None of the chemicals in this material have an RQ.
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 5970-45-6: acute.
Section 313
This material contains Zinc acetate, dihydrate (listed as ** undefined **), 10 22%, (CAS# 5970-45-6) which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 5970-45-6 is not present on state lists from CA, PA, MN, MA, FL, or NJ.
CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.
California No Significant Risk Level: None of the chemicals in this product are listed.
European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols:
Not available.
Risk Phrases:

Safety Phrases:

WGK (Water Danger/Protection)
CAS# 5970-45-6: No information available.
CAS# 7732-18-5: No information available.
Canada
Canada
CAS# 7732-18-5 is listed on Canada's DSL List. CAS# 7732-18-5 is listed on Canada's DSL List.

WHMIS: Not available.
CAS# 5970-45-6 is not listed on Canada's Ingredient Disclosure List.
CAS# 7732-18-5 is not listed on Canada's Ingredient Disclosure List.
Exposure Limits
CAS# 5970-45-6 (listed as ** undefined **): OEL-ARAB Republic of Egypt
:TWA 0.1 mg/m3

Section 16 - Additional Information

MSDS Creation Date: 2/14/1998

Revision #1 Date: 12/06/2000

Information in this MSDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc. assumes no liability resulting from the use of this MSDS. The user must determine suitability of this information for his application.

ATTACHMENT A-5

Jacobs Health, Safety, and Environmental Procedures

(Available at JNET and provided on CD)

HSEP 1.2 Project HSE Management
HSEP 1.3 Hazard Communication
HSEP 1.4 HSE Survey Checklist
HSEP 1.4 Office HSE Management
HSEP 1.5 Health, Safety, and Environmental Program Implementation Responsibilities
HSEP 2.1 Zero Incident Process
HSEP 2.2 Safety Evaluation Report
HSEP 2.6 Job Site Notices and Posting Requirements
HSEP 2.7 Work Permits
HSEP 2.8 Hazard Warnings
HSEP 2.9 Att A – Subcontractor HSE
HSEP 2.9 Att A – Subcontractor Requirements
HSEP 2.11 Emergency Response Action Plan
HSEP 2.12 Hazard Assessment Safety Plan of Action (HASAP)
HSEP 2.16 Safe Plan of Action
HSEP 2.16f2 SPA Assessment Card
HSEP 2.17 Safety Observation Report
HSEP 2.18 Behavioral SOR Process
HSEP 2.22 Hazard Analysis
HSEP 3.1 Health and Safety Training
HSEP 4.1 Medical Monitoring Program
HSEP 4.4 First Aid Program
HSEP 5.1 Accidents and Incidents Investigation and Reporting
HSEP 5.2 Vehicle Accidents
HSEP 5.3 HES Performance Metrics
HSEP 7.2 Confined Space
HSEP 7.3.2 Site Control
HSEP 7.3.3 Utility Clearance
HSEP 7.3.7 Emergency Planning and Response
HSEP 7.4 Working Around Wild Animals

EXHIBIT A-5
HSEPs (Continued)

HSEP 8.3 Excavating, Equipment Use and Operator Qualifications
HSEP 8.4 Excavations
HSEP 8.7 Underground Storage Tank Removal
HSEP 8.9 Drilling in VOC Contaminated Soil
HSEP 8.10 Drilling and Drill Rig Safety
HSEP 9.1 Asbestos Exposure Protection
HSEP 9.2 Asbestos Avoidance
HSEP 11.2 Bloodborne Pathogen Exposure Control Program
HSEP 11.4 Cold Stress Control
HSEP 11.5 Heat Stress Control
HSEP 11.6 Occupational Noise
HSEP 11.7 Spill Containment
HSEP 11.9 Decontamination
HSEP 12.1 Health Hazard Evaluation
HSEP 12.2 Personal Air Monitoring
HSEP 13.1 Personal Protective Equipment
HSEP 13.2 PPE for Environmental Activities
HSEP 13.3 Head Protection
HSEP 13.4 Hand Protection
HSEP 13.5 Foot Protection
HSEP 13.6 Eye and Face Protection
HSEP 13.8 Fall Prevention and Protection
HSEP 13.9 Respiratory Protection Program
HSEP 14.1 Emergency Evacuation
HSEP 14.2 Earthquake
HSEP 14.3 Hurricanes and Typhoons
HSEP 14.4 Remote Site Emergency Preparedness
HSEP 15.1 Lockout and Tagout
HSEP 18.4 Small Tools and Equipment
HSEP 20.1 Fire Prevention
HSEP 21.2 Motor Vehicle Safety
HSEP 21.2f1 Safe Plan of Action Form
HSEP 21.2f2 Vehicle Rental and Driving SPA Form
HSEP 21.3 Travel to Remote and Difficult Locations

JACOBS

HSE Procedure		Document No: HSEP 1.2	Page: 1 of 23
Project Health, Safety, and Environment Management		Supersedes: HSEP 1.2	Revision: 1 Issue Date: 30 June 05
Issuing Department: Corporate HSE	Approval: Susan.Kiesling@Jacobs.com	Previous Rev. & Issue Date: Rev. 0, 13 Aug 03	Effective Date: 30 June 05

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1.0 PURPOSE AND SCOPE

The purpose of this Health, Safety, and Environment Procedure (HSEP) is to establish consistent methods, responsibilities, and requirements for implementing and executing the Health, Safety, and Environment management process during field operations. This HSEP applies to all Jacobs operations and subsidiaries and to each of their employees.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

Accident	Any unplanned, undesirable event, which disrupts work activity.
Construction Industry Institute (CII)	The Construction Industry Institute is an organization of owners and contractors, whose goal is to improve total quality, cost-effectiveness, and safety in the construction industry through research and implementation.
Facility Siting Analysis	A formal documented process to assess the physical (crane, motor vehicle, electrical, etc.), chemical, and explosive hazards in order to determine a safe location for a structure that will be occupied by people.
Focus Project	A project, which has been designated from the onset to receive special attention and focus from Operations and HSE based upon experience, nature of hazards or work processes, or other factors, which suggest the potential for increased risk.

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HASAP	The Hazard Assessment and Safety Action Plan is a project-specific plan that defines the necessary elements needed to accomplish field activities in a safe and environmentally sound manner. It is developed jointly among operations, HSE, and the client. It identifies potential HSE hazards (through risk assessment) and appropriate control measures, including strategies and methods, and provides a "roadmap" for the HSE management of the work. It is signed by the appropriate parties as documentation of hazard assessment, planning, and agreement to the plan. It may have various other titles as appropriate for the work and the location, such as "Health, Safety, and Environmental Plan" or "Health and Safety Plan." Refer to HSEP 2.12, HASAP.
Hazard Communication	The process for 1) assessing the potential health and safety risks associated with hazardous materials/substances found or used on the job site, 2) developing necessary protective measures for handling, use, and storage of such materials/substances, and 3) communicating the potential risks and required protective measures to affected workers. The risks and protective measures are communicated via labeling, placarding, Material Safety Data Sheets, and training.
HAZOP Study	Hazard & Operability is a review, independent of the project, undertaken to examine the proposed design in sufficient detail to identify potential deviations from normal operating status that could result in a hazard or operability problem.
HSE File	The HSE file is a record of information for the client (and others who might be responsible for the structure in the future) of key health, safety, and environmental risks that must be managed during maintenance, repair, construction, or demolition work.
Incidents & Dangerous Occurrences	Any event, which results in damage to equipment, property, or environment or has serious HSE implications, and that is reported internally or to appropriate regulatory agencies.
Modified Duty	The term refers to the placement of an employee, who has experienced a work-related injury or illness, in a job assignment that will allow him/her to work within the limits of a restriction recommended by a medical doctor.
Occupied Facilities	Facilities that serve as regular or routine accommodation for one or more workers, including, but not limited to, field offices, office trailers, lunch and break facilities, and equipment staging and storage facilities.
Personnel Demobilization Plan	A written plan to provide for an amiable separation between employee(s) and the Company, while maximizing HSE awareness to prevent injury, illnesses, or environmental incidents.
Property Damage	An incident involving damage to property or the environment.
Safe Plan of Action (SPA)	The Safe Plan of Action, also referred to as a Job Safety Analysis in some locations, is a task-driven planning document used to help ensure that every task receives proper HSE preparation before commencement of work. The entire crew assigned to perform the work develops the SPA with guidance from its supervisor.
Safety Evaluation Report (SER)	Standardized, comprehensive, and scored safety observation and audit process conducted by a corporate HSE professional independent of a project, which determines a project's compliance with applicable client, Jacobs, and regulatory HSE requirements.

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Safety Observation Reports (SOR)	Written documentation, resulting from an interactive process between observer and worker, of (1) at-risk or environmentally unsound behavior or condition, (2) determination of the direct cause of the behavior or condition, and (3) corrective actions taken to prevent recurrence. Safe or environmentally sound behavior may also be documented.
Start-up Package	A collection of HSE-related procedures, forms, posters, equipment, training modules and materials, and other supplies needed at start of project.
Target Project	A project, which warrants additional management attention, triggered during the project by results of an SER or audit, accident experience, nature of potential work hazards, or other appropriate factors. A Target Project typically follows the same process used for a Focus Project.
Task Safety Analysis (TSA)	A review of the SPA among the crew and supervisor to resolve HSE issues before work is continued or when there has been a change in crew, change in conditions, etc. A significant change in conditions triggers preparation of a new SPA.
Toolbox/Tailgate Safety Meeting(s)	Meetings conducted, usually on a daily or weekly basis, with and among the work crew, to review HSE topics or issues.

4.0 PROCEDURE

The field HSE management process generally consists of six phases:

- Pre-award Planning
- Engineering/Design and Procurement
- Premobilization/Transition
- Field Mobilization and Start-up
- Field Activities
- Demobilization/Closeout

4.1. Pre-Award Planning Phase

HSE planning starts during the pre-award phase of any project. During this phase, potential projects are evaluated for health, safety, and environmental risks and requirements to determine resources and budget for input to the proposal.

- HSE Management supports operations and provides the necessary information to complete any client HSE questionnaires. A file of the data provided shall be maintained in the proposal file.
- An on-site hazard/safety risk assessment of the client's HSE program, site safety, geographical and environmental considerations, and the hazards inherent in the work shall be conducted, wherever possible, for potential projects that have a field component. Following the assessment, findings shall be documented in a project note, which will be submitted for proposal input along with recommendations on overall risks.

4.2. Engineering, Design, and Procurement Phase

On design projects, the hazards related to pre-construction field activities, construction, operation, and maintenance shall be assessed and a written HASAP prepared collaboratively among engineering/design, construction, specialty contractors, supply management, and client. Maintenance and operations are also involved as appropriate.

- Designers incorporate safe construction, installation, operation, and maintenance requirements into their design. Refer to HSEP 1.7, Design Safety; GSOP 200, Engineering

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and Design; and CII's Implementation Resource 101-2, Design for Construction Safety Toolbox.

- HAZOP studies are conducted as required. Refer to GSOP 200, Engineering and Design.
- HSE and Site Management visit the site, as required, and gather the necessary information to prepare a HASAP. Refer to HSEP 2.12. This plan may have various other titles as appropriate and required for the work, the client, and/or the location, such as "HSE Plan" or "Health and Safety Plan."
- HSE requirements are prepared and reviewed for inclusion within subcontracts and procurement documents. Refer to GSOP 400, Supply Management.
- Constructability reviews are conducted. Refer to GSOP 100, Project Management and Execution, and GSOP 200, Engineering and Design.
- Subcontractors are pre-qualified based on competence and HSE performance.
- Specific training required for engineering/design personnel is determined and conducted.
- Budgets are refined as impacted by information from the site visit, the HASAP, the client procedures and expectations, and the contract's requirements.

4.3. Premobilization and Transition Phase

This phase occurs before mobilizing for construction, maintenance, or operations activities, including those projects where we take over such field activities from previous contractors, i.e., transition.

If Jacobs was responsible for design, the HASAP from Phase 1 should be updated to include hazards identified during the design process. Next, procedures are developed to address specific requirements for the client, the site, and the work.

For construction, installation, or other field projects where Jacobs was not responsible for the design and for new operations or maintenance projects, a new HASAP must be prepared.

Specific activities, the details for which may be found in Jacobs HSEPs, include the following:

- Obtain approval of HASAP and project procedures from the HSE Department.
- Prepare start-up package.
- Begin development of the hazard communication process.
- Develop HSE training matrix and train key field personnel.
- Review subcontractor's HSE plan.
- Evaluate medical program and request medical and exposure records of personnel, as required.
- Identify the site HSE personnel.
- Prepare evacuation plan, as appropriate for the location.
- Evaluate project to determine whether it should be part of the Focus Program (Figure 1).
- Develop project HSE pre-startup, Focus Program Checklist (Figure 2), and/or Turnaround HSE Readiness Review, (Figure 3), as appropriate.
- Where required by client or regulation, develop an HSE File.
- Develop a personnel demobilization plan.

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4.4. Field Mobilization and Start-up Phase

During this phase, key management, supervisory personnel, and subcontractors are indoctrinated in requirements of the HASAP and are trained in the HSE process. Other key activities include:

- Review, revise, and maintain project pre-startup, turnaround, and/or focus checklist(s) as appropriate and, when required by client or regulation, the HSE File.
- Establish specific project roles and responsibilities for HSE.
- Initiate hiring process.
  - Define physical requirements and verify competency.
  - Schedule medical exams and drug tests, when required.
  - Review and file training records.
  - Conduct HSE orientation training, site-specific training, and HSE leadership training.
- Establish HSE protocols to be followed at the site.
  - Determine frequency of HSE meetings.
  - Determine composition of HSE committee.
  - Define HSE record keeping procedure.
  - Establish goals and site reporting procedures for all types of HSE audits, inspections, and observations.
  - Prepare and post emergency notification procedures, which state who to call in case of various emergencies.

For further details, refer to HSEP 1.6.

4.5. Field Activities Phase

During this phase, project related field activities have been initiated and are conducted on an on-going basis. Specific activities, the details for which may be found in appropriate HSEPs, include the following:

- Inspect equipment to assure good working condition, appropriateness of use, and best-practice safety features.
- Obtain and update work permits.
- Conduct SPAs, TSAs, toolbox/tailgate safety meetings, project safety meetings, and safety committee meetings.
- Conduct SERs, and take appropriate corrective action, as necessary
- Implement the Hazard Communication process.
- Continue to train new employees and refresh and/or retrain current employees.
- Establish SOR program and goals and conduct trend analysis.
- Conduct HSE audits, inspections, and observations and track data collected
- Evaluate safety data to assess whether the project is performing below expectations and should be defined as a Target Project.
- Collect and report injury, illness, and incident data.
- Implement modified duty program as necessary and appropriate.
- Perform drug and/or alcohol screens, medical monitoring, and exit physicals, when required.
- Monitor subcontractors/suppliers for adherence to project, and their own, HSE procedures.

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- Maintain medical, first aid, and personal protective equipment (PPE) supplies and equipment and other HSE equipment.
- Execute Personnel Demobilization Plan.

4.6. Demobilization and Close-out Phase

During this phase, project field activities are complete and the project is closed out. Specific activities, the details for which may be found in HSEPs, include the following:

- Archive HSE records, as appropriate.
- Review and document HSE lessons learned.
- Finalize and resolve claims.
- Finalize Personnel Demobilization Plan.
- Transfer HSE File to client, when required
- Write project and/or turn-around completion report, identifying HSE successes and failures.

4.7. Turnaround and/or Shutdown Work

Refer to the Turnaround HSE Readiness Review, Figure 3. For projects involving turnaround and/or shutdown work, the project manager shall assure that a Turnaround HSE Readiness Review has been conducted and that each program element has been classified as acceptable, needs improvement, unacceptable, or not applicable.

Corrective action(s) for any item(s) identified as “needs improvement” or “unacceptable” shall be stated in the comments/observations column.

The Review shall be retained with the project files.

4.8. HSE Work Phase Checklist

Although not necessarily an exhaustive checklist for all work phase components, the HSE Work Phase Checklist, Figure 4, serves as a helpful project planning aid.

5.0 REFERENCES AND RELATED DOCUMENTS

Global Quality System Glossary

GSOP 100, Project Management and Execution

GSOP 200, Engineering and Design

GSOP 400, Supply Management

HSEP 2.12, Hazard Assessment and Safety Action Plan

CII’s Implementation Resource 101-2, Design for Construction Safety Toolbox

6.0 RECORDS

All project-related HSE records shall be maintained as part of the project records in accordance with project procedures.

7.0 FIGURES

Focus Program

Focus Project Checklist

Turnaround HSE Readiness Review

HSE Work Phase Checklist

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Figure 1

Focus Program

The purpose of the Focus Program is to provide a method to ensure that all aspects of a field project that impact HSE receive the necessary attention and will result in successful HSE performance. Although many Company procedures address project safety, some field projects present unique challenges due to size, location, schedule, and/or other factors, which may require a high degree of involvement from company management and HSE from the outset.

The Focus Program provides a process for ensuring that this higher degree of involvement is obtained so that circumstances which could have a negative impact on performance are identified during the planning stage and are effectively addressed. The determination of whether the Focus Program is implemented for a particular field project will be made by upper management, based on responses to the Focus Project Checklist.

Focus Project Checklist

- The Focus Project Checklist (Figure 2) will be initiated by HSE and completed with input from Operations, Human Resources, and Risk Management.
- The checklist is developed before the planning team meeting so weaknesses can be identified and determination made as to whether the full Focus Program will be implemented.

Establish Planning Team

- The planning team is comprised of HSE, Human Resources, Operations, Design, Project Management, and an Executive Sponsor, who will chair team meetings.
- The team will review scope, projected work force, project duration, the HSE-to-personnel ratio, client requirements, Focus Project Checklist, training agenda, HSE budget, and past performance of site management personnel and will assist with HASAP development.
- The team will commit the time and resources to monitor and support the project's HSE effort.
- The team will sponsor a monthly meeting to review status of program and the HASAP and to ensure accountability. This meeting can be conducted in conjunction with the project review meeting.
- The team will develop corrective actions for areas of concern and include the corrective actions in the project HASAP.

Subcontractor Requirements

- The Subcontractor Safety Adherence Policy will be utilized.
- Safety Action Plans will be requested from each subcontractor.
- Subcontractors' HASAPs will be reviewed they are allowed to mobilize.

Hazard Assessment and Safety Action Plan

- The HASAP addresses elements of the Focus Project Checklist.
- The HSE training schedule must be well defined.
- A "buddy system" should be included.
- A project-specific demobilization plan will be established.

HSE Department's Responsibilities

- Initiate and complete Focus Project Checklist.
- Designate senior-level HSE manager to serve as primary HSE sponsor on Planning Team. This person should be a part of the monthly meetings.

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- The primary HSE Sponsor or Regional Manager and Site HSE will:
  - Meet with local OSHA office or equivalent before project start to develop a relationship and review the Jacobs HSE philosophy and process.
  - Meet with client representative to establish a working relationship and to review HASAP.
- HSE manager will audit compliance with HASAP on a monthly basis.
- HSE manager will spend first two or three weeks of mobilization assigned to project, assist with training, and coordinate efforts to ensure a smooth start up.
- There will be a monthly review meeting with Corporate HSE, Regional HSE Manager, and Site HSE Manager to determine status of program, incident trends, claims status, and areas of concern.
- Safety samplings will be performed by Corporate HSE on each project visit, or at least monthly, to determine the level of understanding of the HSE program by the workforce.
- Independent SERs will be conducted by two HSE managers not associated with the project on a schedule of:
  - First at 10 – 15% completion
  - Second at 25 – 30% completion
  - Then, as directed by the Planning Team
- Coordination of claims must start at the beginning of the project. The Claim Coordinator, Risk Management, adjuster, doctors, hospital personnel, and HSE Manager should meet to establish relationship and discuss modified duty and Company reporting practices.

Operations Responsibilities

- Accompany HSE Manager to meeting with the local OSHA officials or equivalent to express Company's safety commitment.
- Meet with HSE Manager and client representatives to establish HSE duties, responsibilities, and partnerships.
- Communicate to client our Company's commitment to HSE and demonstrate it through involvement and actions.
- Incorporate SPA and SOR tracking in other project tracking systems the same as cost, schedule, and productivity. The SPA and SOR tracking should become a measurement of project success and be reported to the team monthly.
- Establish leadership role for overall implementation of Focus Program and hold all parties accountable for completion of assigned elements.

HASAP for "Focus Program" Projects

Safety plan prepared by HSE & Operations incorporating:

- Review of job scope
- Review of Focus Project Checklist
- Review of client's safety requirements
- Review of permit procedures

Key elements to be included in HASAP:

- Supervising For Safety Training
- Foreman/General Foreman Training

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- Monthly Supervisor's Safety Meetings
- Safety Evaluation Reports (SERs)
- New Employees' Orientation
- Daily/Weekly Safety Meetings
- Safe Plans of Action
- New Employee Identification (Buddy System)
- Safety Observation Reports
- Formal Accident Investigation
- Fall Protection Audits
- Drug/Alcohol Screens (Pre-Employment, Post Accident, Random)
- Daily Surveys
- Safety Sampling
- Subcontractor Safety Adherence Policy
- Claims Management Assistance
- Incentive/Demobilization Plan

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Figure 2

Focus Project Checklist

1. Is this project workforce projected to be less than 200 employees?
   yes ___ no ___

2. Do we have a strong presence at the facility? (ongoing maintenance, capital projects, etc.)
   yes ___ no ___

3. Is the project location within 150 miles of a major JE office?
   yes ___ no ___

4. Have we had a favorable safety performance at this facility before?
   yes ___ no ___

5. Does the local labor market have highly trained skilled workers?
   yes ___ no ___

6. Is the weekly workers compensation benefit rate for disability less than $400.00 per week?
   yes ___ no ___

7. Will the majority of supervision and site management be existing Company personnel?
   yes ___ no ___

8. Did the last project conducted by this Site Manager produce excellent safety performance?
   yes ___ no ___

9. Will this project have an experienced Company HSE manager assigned to it?
   yes ___ no ___

10. Are there any other considerations that will challenge this project to produce an excellent safety performance?
    yes ___ no ___

If yes, list those considerations:

Responses of “No” to any of the 10 questions require a follow-up from Operations and HSE to address the negative response.

Responses of “No” to three or more questions trigger the Focus Program.

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Figure 3

Turnaround HSE Readiness Review

Project Name:	Jacobs Business Unit:
Project Location:	Date of Review:
Client's Name:	Project Number:

Mark each Program Element as **A** for Acceptable, **NI** for Needs Improvement, **U** for Unacceptable, or **NA** for Not Applicable.

Use items in Verification column to evaluate each Program Element. Provide comments and observations in last column.

Program Element	A	NI	U	NA	Verification	Comments/Observations
Historical HSE Performance						
Has historical safety performance been acceptable? Are metrics equal to or less than current company average?					First Aid Cases Motor Vehicle Accidents Recordable Injuries/Illnesses Lost Workday Cases Hours Worked TRIR LTIR	
Have corrective actions from previous incidents been implemented? How was information communicated to workforce?					Verify implementation of recommendations from previous incidents.	
Have lessons learned from previous turnarounds been implemented?					Review list and determine status.	
Have focus areas been identified and included in new hire orientation?					List focus areas from recent trends and analyses, such as hand injuries, foreign-body-to-eye injuries, fall protection, permit coordination, etc.	
Contract Requirements						
Is HSE responsibility clearly defined in the contract?					Confirm that Jacobs and client management are fully aligned on expectations, roles, and responsibilities regarding HSE management.	

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Program Element	A	NI	U	NA	Verification	Comments/Observations
Will Jacobs hire subs directly? If yes, complete section below entitled "Site Logistics and Facility Siting"					Complete section below entitled "Site Logistics and Facility Siting"	
Will Jacobs manage sub-contractors hired by Client?					Complete section below entitled "Site Logistics and Facility Siting"	
Will client or other contractors supervise Jacobs employees? Will Jacobs supervise other contractors/client employees?					Validate that process is in place and adequate. Are adequate indemnifications and/or hold harmless agreements in place?	
HSE Planning						
Is the Hazard Assessment and Safety Action Plan (HASAP) complete for the upcoming turnaround? Has it been reviewed, signed, and communicated to all affected parties?					Scope adequately identified? Training requirements? Site-specific HSE requirements? Detailed hazard assessment? Site logistics & facilities siting? Emergency information? Signed by management? Reviewed by all supervision, client, and subs, if applicable?	
Has the work scope been reviewed by HSE and staff to identify special training needs and high-risk work activities? Are appropriate risk mitigation plans and procedures in place?					Are plans needed for confined space entry, steel erection, first line breaks, critical lifts, crane operations, working on or near water, temporary facility placement, or energized work?	
Are HSE requirements included in the planning phase and issued in work packages?					Have planners reviewed scope w/HSE team? Has HSE team assisted planners with identifying pertinent HSE procedures? Have planners included procedures in work packages? Is supervision on site early enough to review and become familiar with work packages.	

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Program Element	A	NI	U	NA	Verification	Comments/Observations
Is there a procedure in place to ensure proper crew mix, i.e., new hires mixed with experienced workers?					Review plan. Are there systems for mentoring, new hire identification, etc.?	
HSE Training						
Will all Jacobs staff attend Leading Safety Excellence training?					Review HSE training matrix	
Has Site HSE orientation program been developed and has training schedule been outlined?					Review orientation package Review training matrix/schedule	
Have special skills and training requirements been identified?					Evaluate requirements for confined space entry, standby, mobile equipment operations, respirator fit testing, etc.	
Is there a process in place to ensure adequate indoctrination of supervisors to Jacobs philosophies and HSE requirements?					Review plan.	
Based on previous unfavorable HSE performance or, if this is a stand-alone type turnaround, should additional HSE training be considered?					Evaluate need for OSHA 10-hour course training, Jacobs hazard awareness training, and/or Level 1 supervisor training	
Has HSE process training for SPA, SOR, etc., been identified and scheduled?					Expectations defined by Site Manager? Staff clearly understands expectations? HSE to develop trends & analyses Results to be reviewed w/supervision & crafts?	
Have client's HSE training requirements been identified and has training been scheduled?					Permitting Atmospheric monitoring Excavations Scaffolding	

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Program Element	A	NI	U	NA	Verification	Comments/Observations
HSE Staffing						
Does staffing plan identify the appropriate number of Jacobs HSE professionals required to adequately perform all assigned responsibilities, i.e., orientations, regulatory training, PPE issuance, field activities oversight, daily meetings attendance, client interface, first aid and case management, etc.?					Recommend one Jacobs HSE Manager initially and one Jacobs HSE Supervisor per 100 craft workers thereafter. This requirement may vary depending on job scope, job geography, subcontract workforce, training needs, etc.	
On CM projects, does each subcontractor have a staffing plan, which identifies the appropriate number of qualified HSE professionals required for their respective scope of work?					Each subcontractor employing 35 or more workers, including lower-tier subs, must provide one full-time HSE professional. Additional HSE personnel are required for each additional 50 workers thereafter. Verify subcontractor staffing plans. Verify that each subcontractor HSE representative possesses the appropriate qualifications based upon project demands.	
HSE Processes						
Has the SPA process been implemented?					Review recently completed SPAs. Interview supervisors as to their responsibilities regarding SPA use. Has an SPA audit program been established?	
Has the Safety Observation Report and/or Safety Learning Observation process been implemented?					Review training documents. Review list of observers. Review recently completed SORs/SLOs. Review recent trends & analysis. Who is participating? Who is not participating?	
Will a Planned Inspection Process be implemented, which will involve HSE, Site					Review process: • Review inspection forms.	

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Program Element	A	NI	U	NA	Verification	Comments/Observations
Management, Supervision, and the crafts?					• Review schedule. • Review participants. • Review how the team will correct and document deficiencies as well as how they will provide feedback to the crafts.	
What is the plan for implementing a positive HSE recognition program?					Review process: • Criteria • Participation • Recognition • Communication	
When is the next SER scheduled?					When Who Note: SER must be conducted jointly by office HSE and operations managers.	
What is the current near-incident or non-injury incident reporting procedure?					Review process: • Form(s) • Client and inter-company communications • Corrective & preventative measures • Communications back to crafts	
Has the formal accident investigation process been fully implemented?					Review supervisor training requirements. Randomly interview supervisors as to their respective investigations responsibilities.	
Have all personnel been properly trained on incident reporting requirements?					Review orientation.	
What is the proposed process to track, trend, analyze, and communicate both leading and lagging HSE indicators?					Review daily toolbox topics. Review weekly HSE report format. Obtain feedback from crafts.	

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Program Element	A	NI	U	NA	Verification	Comments/Observations
Drug & Alcohol Policy						
Whose D&A policy will be utilized on this project? Client's or Jacobs'?					Confirm via contract whose policy to use.	
Has D&A training been scheduled for supervisors?					Confirm with Jacobs Occupational Health Services.	
Is D&A policy communicated or contained in new hire packages?					Verify with HR or office manager.	
Has a local company been identified for sample collection?					Confirm agency.	
Site Logistics and Facility Siting						
Has a lay down/staging area been identified that is secure, does not interfere with traffic, and is properly barricaded from pedestrians?					Verify via field walk.	
Will there be designated walkways for pedestrians to gain access to and from the work areas? Are the walkways protected by fencing or crowd barriers to restrict mobile equipment?					Verify via field walks.	
Is there a designated area for shipping & receiving of materials that would restrict vendors and delivery operators from driving into the site?					Verify via field walk.	
Have adequate parking facilities for workers been identified?					Verify via field walk.	
Have adequate break rooms, lunchrooms, toilet facilities, and hand washing stations been identified?					Verify via field walk that there are in fact enough facilities based on headcount.	
Is the training facility adequate to process the number of new hires anticipated?					Verify via field walk.	
Has AV equipment been ordered?					Verify via field walk.	
What is the security plan for controlling					Review plan.	

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Program Element	A	NI	U	NA	Verification	Comments/Observations
site access and accounting for people, tools, and equipment?						
What is the plan for transporting workers to the designated medical clinic for minor medical treatment, medical surveillance monitoring, and D&A testing?					Review plan.	
Have all occupied facilities that serve as regular or routine accommodations or gathering places for one or more workers, including, but not limited to, field office complexes, office trailers, lunch/break facilities, equipment staging, and storage areas, been appropriately located with respect to surrounding hazards?					Confirm that the client or facility owner has: • a facility siting analysis that considers adjacent facilities and process units, and neighboring facilities; • verified that the type of occupied facilities', location and orientation are appropriate with respect to the facility siting analysis; • a mechanism or procedure is in place that is adequate to warn personnel in occupied facilities of upset conditions in adjacent facilities and process units; • a method is in place to provide notification of startups and shutdowns in adjacent facilities and process units • a method is in place to provide notification of startups, shutdowns, and unit upsets of the neighboring facilities that present potential exposure to occupied facilities or work areas. Confirm that a facility siting analysis has been conducted (with or without the facility owner's participation) for locations where the client may not exercise active control of the site, such as uninhabited facilities, new or "Greenfield" construction sites, facilities on public property. Review the plan to vacate occupied facilities during startup and shutdown activities in adjacent facilities and process units when fire, explosion, or toxic chemical release potential is present.	

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Program Element	A	NI	U	NA	Verification	Comments/Observations
					Confirm that emergency evacuation maps and assembly point locations are posted in occupied facilities. Confirm that occupied facilities are not located within the bermed area of a storage tank. Confirm that plans for use of occupied facility within 500 feet of the battery limits of a process unit, flare system, or flammable, combustible, or toxic storage tank have been approved by Jacobs Regional and Field Services Group Vice Presidents and limited to use by direct project support personnel for activities that cannot be accommodated elsewhere.	
Subcontractor Safety Management						
Will the subcontractors contract directly with Jacobs or the client?					Verify via Jacobs/client contract.	
If contracted to Jacobs directly, has the project utilized, or will the project utilize, HSEP 2.9, Subcontractor Safety, and Attachment A to pre-qualify all contracting firms?					Verify with Procurement. Review completed HSEP 2.9, Subcontractor Safety, and Attachment A. Subcontractors must meet performance criteria before being issued a contract. Any exceptions to HSEP 2.9, Subcontractor Safety, and Attachment A require management approval.	
Has a subcontractor pre-qualification meeting been scheduled in order to communicate Jacobs HSE, policies, procedures, and expectations?					Review meeting notes.	
If contracted to Jacobs directly, have we included our Subcontractor Safety Performance Requirements and Subcontractor Attachment A in the contracts?					Verify with Procurement. Review subcontractor contracts.	

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Program Element	A	NI	U	NA	Verification	Comments/Observations
If Subcontractors are contracted directly to the client, will Jacobs have the authority and be held responsible for managing contractor safety?					Review Jacobs/client contract. Confirm expectations of client.	
If subs are contracted directly to client and Jacobs is the managing agent, are the clients' subcontractor safety requirements comparable or as stringent as Jacobs are?					Review contract language, preferably before contracts are issued. If HSE language does not meet Jacobs expectations, or if there are missing elements, suggest subcontractor safety management revisions by offering Jacobs processes.	
If subs are contracted directly to client, will Jacobs have any involvement in the subcontractor pre-qualification process?					Discuss with client. There may be a value in introducing HSEP 2.9, Subcontractor Safety, and Attachment A to client.	
Regardless of who holds the contracts, will Jacobs conduct a project kick-off meeting with subs in order to deliver site-specific policies, procedures, reporting requirements, expectations, etc?					Verify plan. When the kick-off meetings are scheduled, request attendance by members of home office management of all parties involved, not just site level. Obtain buy-in from the top.	
Regardless of who holds the contracts, will one uniform, all-inclusive HSE program be implemented across the board?					Review HASAP. Review project execution plan. Obtain verification from project management.	
Are all subcontractor managers and supervisors scheduled to attend Leading Safety Excellence training?					Review subcontractor HSE training matrix. Verify via Jacobs HSE professional.	
Medical & Emergency Management						
Does the client provide OCIP?					Verify in Jacobs/client contract.	
Has an occupational medical facility been identified, relations established?					Verify via Jacobs HSE professional or Risk Management Department.	
Is the occupational medical facility familiar with the project's drug & alcohol testing procedures?					Verify via Jacobs HSE professional.	

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Program Element	A	NI	U	NA	Verification	Comments/Observations
Who will be providing basic on-site first-aid treatment? Client, Jacobs, or independent 3rd party?					Verify via Jacobs HSE professional. There is value in having one common first aid facility onsite.	
What is the project's accident investigation process and what role will Jacobs play?					Verify via Jacobs HSE professional. Ensure that timely preventative & corrective action notices are communicated to workforce.	
Has a uniform emergency evacuation procedure been developed, complete with assembly points? Are sirens, horns, whistles, and verbal communication public address systems available in all critical process areas in which people occupy or frequent? What is the means used to conduct an accurate workforce headcount?					Review plan.	
Is emergency evacuation and contact info posted on bulletin boards and in occupied structures throughout the project?					Verify via field walks.	
Has the workforce been trained in the emergency evacuation procedures and have drills been scheduled?					Review HSE training matrix. Review emergency drill schedule and post drill critiques.	

Review Conducted By:

Team Leaders' Name Printed:	Signature:
Team Member's Name Printed:	Signature:
Team Member's Name Printed:	Signature:
Team Member's Name Printed:	Signature:

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Figure 4

HSE Work Phase Checklist

Although not necessarily an exhaustive checklist for all work phase components, this checklist does serve as a helpful project planning aid.

Mobilization Phase

	Yes	No	N/A
Have proper facilities been identified for new hire processing?	☐	☐	☐
Have resources been identified and contacted to assist with new hire processing?	☐	☐	☐
Have arrangements been made with local physician and/or clinic?	☐	☐	☐
Is local physician/clinic aware of our modified duty work program?	☐	☐	☐
Have we supplied the clinic(s) with our chain of custody and consent forms?	☐	☐	☐
Has local unions been contacted and advised of upcoming event/project?	☐	☐	☐
Have orientation schedules been set to accommodate workforce and time constraints?	☐	☐	☐
Are there adequate resources at the jobsite to conduct orientations and HSE training?	☐	☐	☐
Has a system been developed to order, distribute, and properly maintain PPE?	☐	☐	☐
Has the client reviewed and approved the use of our HSE training modules?	☐	☐	☐
Have we cross-referenced the client's safety standards with ours and meshed the two?	☐	☐	☐
Does client have any special requirements, e.g., training, injury reporting, PPE, etc.?	☐	☐	☐
Have emergency evacuation procedures been established, reviewed with site, and posted?	☐	☐	☐
Is Supervising for Safety training scheduled for all supervisors?	☐	☐	☐
Have SPA & SOR processes been reviewed with site mgmt.? In place? Ready for use?	☐	☐	☐
Is there a pre-approved (certified in some countries) medical facility available at the site? Are certifications current?	☐	☐	☐
Are there adequate first aid supplies available at the jobsite?	☐	☐	☐
Has the project work scope been reviewed by HSE to determine PPE requirements, special training needs, etc.?	☐	☐	☐
Have local vendors been identified and contacted regarding respiratory and breathing air equipment needs, training, fit testing, etc.?	☐	☐	☐
Will Jacobs have any subcontractors on the project? If so, have all requirements of HSEP 2.9 been addressed?	☐	☐	☐
Have we reviewed the subcontractors' pre-qualification documents?	☐	☐	☐
Have the subcontractors' safety kick-off meetings been scheduled?	☐	☐	☐
Is the preliminary HASAP complete? Has it been forwarded to Corporate HSE?	☐	☐	☐
Once the HASAP has been completed, signed-off, and sent to the jobsite, has it been reviewed with Site Management and Supervision?	☐	☐	☐
Has someone been identified and trained to clean, inspect, repair, maintain, and issue respiratory protection equipment, including breathing air?	☐	☐	☐
Have competent persons been designated for inspecting and for documenting inspections of safety harnesses, fire extinguishers, electrical tools, ladders, scaffolds, rigging, etc.?	☐	☐	☐
Have daily tailgate/toolbox safety meeting topics been identified and prepared?	☐	☐	☐

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	Yes	No	N/A
Has a safety incentive program been established? Are the criteria in writing? Has it been reviewed with site management and posted?	☐	☐	☐
Has Site Management discussed minimum HSE requirements with supervisors and subs?	☐	☐	☐
Will lead or asbestos abatement activities be conducted?	☐	☐	☐
Will employees need PFTs on this project?	☐	☐	☐
Will audiometric testing and/or medical surveillance be needed?	☐	☐	☐
Have all hazardous chemicals been identified, evaluated, and addressed in the HASAP? Have PPE requirements been specified?	☐	☐	☐
Will decontamination equipment, supplies, and training be needed?	☐	☐	☐
Are all vehicle operators properly licensed?	☐	☐	☐

Execution Phase

	Yes	No	N/A
Has the safety action plan for new hires been implemented?	☐	☐	☐
Are supervisors conducting daily tailgate/toolbox safety meetings?	☐	☐	☐
Are SPAs being developed by the entire crew prior to performing each task?	☐	☐	☐
Are supervisors conducting audits and SORs?	☐	☐	☐
Are safety meetings, SPAs, and SORs tracked by foreman/supervisor? Are tracking results being reviewed with site management?	☐	☐	☐
Is each member of the site HSE Department conducting documented daily field safety inspections?	☐	☐	☐
Are results of field safety inspections and their trends being reviewed with site management?	☐	☐	☐
Are all subcontractors complying with Jacobs and client HSE requirements?	☐	☐	☐
Are subcontractors being audited during field safety inspections? Are the results and trends being reviewed with Jacobs site management and appropriate subcontractor supervision?	☐	☐	☐
Are we effectively communicating with the prime contractor's HSE department?	☐	☐	☐
Are tool & equipment inspections conducted and documented, as required?	☐	☐	☐
Are trends being analyzed for all non-compliance HS&E issues?	☐	☐	☐
Is a member of the site HSE department attending daily planning and supervisor meetings?	☐	☐	☐
Is a competent person inspecting scaffolds prior to each shift?	☐	☐	☐
Are all mobile equipment operator qualifications current?	☐	☐	☐
Are daily mobile equipment inspections being performed and documented by the operator?	☐	☐	☐
Does the Jacobs HSE department participate in critical lift plan reviews?	☐	☐	☐
Have proper communications been established between confined space stand-by attendants and operations and with the plant rescue team?	☐	☐	☐
Is rescue equipment available and readily accessible at the jobsite?	☐	☐	☐
Are employees and subcontractors familiar with emergency evacuation procedures?	☐	☐	☐
Are all injury and non-injury incidents formally investigated and reviewed by Jacobs HSE,	☐	☐	☐

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	Yes	No	N/A
supervision, and site management?			

Demobilization Phase

	Yes	No	N/A
Are lay-off lists reviewed for employees working modified duty?	☐	☐	☐
Are exit interviews conducted with departing employees to identify injuries/illnesses?	☐	☐	☐
Is the safety incentive program included in the demobilization plan?	☐	☐	☐

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HSE Procedure		Document No: HSEP 1.3	Page: 1 of 11
Chemical Hazard Communication		Supersedes: HSEP 1.3	Revision: 3 Issue Date: 30 Aug 07
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1.0 PURPOSE AND SCOPE

The purpose of this Health, Safety, and Environment Procedure (HSEP) is to provide guidance to enable individual projects to establish and implement a site-specific Chemical Hazard Communication Program.

It also supports the hazard evaluation requirements for effective SPA development for activities involving potential chemical exposures.

This HSEP

- addresses applicable occupational health and safety standards,
- represents good workplace health and safety practices,
- is intended to comply with all country-specific chemical hazard communication related regulations, and
- applies to all Company projects.

All Jacobs offices and project sites where there are workplace chemicals will implement a site-specific Chemical Hazard Communication Program (CHCP).

To address hazards specific to individual Regions, a Region-specific Chemical Hazard Communication Work Instruction may be develop from this HSEP to address those issues.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

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3.0 DEFINITIONS

A Glossary of Terms Related to a Chemical Hazard Communication Programs appears in Figure 1. Some of these terms are used in this HSEP.

4.0 PROCEDURE

4.1. Purpose of Chemical Hazard Communication

The purpose of Chemical Hazard Communication is to communicate the hazards of workplace chemicals and communicate protective measures to control the hazards.

Chemical Hazard Communication is accomplished by:

- Maintaining a list of all workplace chemicals,
- Labeling workplace chemical containers,
- Maintaining chemical safety data sheets for the workplace chemicals,
- Implementing a training program to communicate the hazards of project chemicals and appropriate protective measures, and
- Supporting the effective completion of SPAs involving chemicals.

4.2. Written Chemical Hazard Communication Program

For each location where there are chemicals, a written CHCP shall be prepared.

Additionally, a list of the chemicals will be maintained and updated at least annually or when there are new chemicals introduced at the site.

At multi-employer job sites, a site-specific method shall be devised, which provides for sharing of chemical safety data sheets and other related chemical hazard information among all employers at the job site. This process shall be defined in the site's written CHCP. In the US, chemical safety data sheets are referred to as Material Safety Data Sheets (MSDSs).

Where personnel must travel between work places during a work shift (multi job sites), the written program may be maintained at a primary job site. If there is no primary job site, then the written CHCP should be sent with the workers.

4.3. Chemical Hazard Information

Collection of chemical hazard information is intended to provide input that leads to the completion of SPAs related to chemical hazards and to identify appropriate control methods.

All chemicals present in the project workplace shall be identified and inventoried, as prescribed in the paragraph in this HSEP entitled "Work Place Inventory."

Relevant chemical hazard references shall be assembled to provide ready access to physical, chemical, health hazard, personal protection guidance, emergency response information, and environmental control guidance.

Other information sources may also be used to provide readily useful information. Such sources include:

- Client hazardous material references, particularly for chemicals associated with their own processes and products.
- The NIOSH Pocket Guide to Chemical Hazards.

A streamlined format for collection of Hazardous Chemical Information to support preparation of SPAs is available in Figure 2.

This chemical hazard information supports the health hazard evaluation process, which helps to determine worker exposure monitoring and medical monitoring requirements. For details of this process, refer to HSEP 12.1, Health Hazard Evaluation.

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4.4. Labels

Labels and other forms of warnings are to be conspicuously placed on containers so the message is readily visible.

Labels shall be legible and in English. For non-English speaking employees, information will be presented in their language, as well.

The chemical manufacturer, importer, or distributor will label, tag, or mark the chemical container to identify the hazardous chemicals, provide appropriate hazard warnings, and provide name and address of the chemical manufacturer, importer, or responsible party.

There are multiple labeling systems currently in use, including the National Fire Protection Association (NFPA) 704M labeling system, the Hazardous Materials Information System (HMIS), the U.S. Department of Transportation labeling system, the United Nations Hazard Class Number system, and others. A description of these labeling systems can be found in Chemical Hazard Communication Program Labeling Systems, Figure 3.

4.5. Chemical Safety Data Sheets

Manufacturers are responsible for providing a chemical's:

- Physical hazards, such as flammability, combustibility, explosion, reaction, radioactivity; and
- Health hazards, such as irritation, corrosion, sensitization, or toxicity.

The Company relies on our clients for chemical, product, and process unit intermediate stream hazard information.

Chemical safety data sheets should be requested for chemicals and products purchased by the Company. Users rely on the evaluation performed by the chemical manufacturers or importers, who originate the chemical safety data sheet, for the accuracy of this information.

Chemical safety data sheets must be maintained at each project or location for each hazardous chemical. Chemical safety data sheets content will include:

- The chemical name and common name of all ingredients, which are physical or health hazards,
- The physical and/or chemical characteristics of the hazardous chemical, such as vapor pressure, flash point and fire hazard, explosion, reactivity, etc.
- The primary routes of entry,
- The Permissible Exposure Limit (PEL), Threshold Limit Value (TLV), and other exposure limits referenced by the manufacturer,
- Whether the hazardous chemical is listed in the National Toxicology Program Annual report on Carcinogens, in the International Agency for the Research on Cancer Monographs, or listed by OSHA,
- Applicable precautions for safe handling and use,
- Applicable engineering controls, work practices, or personal protective equipment control measures known to the manufacturer,
- Emergency and first aid procedures, and the
- Date the chemical safety data sheet was prepared and name, address, and telephone number of the manufacturer.

4.6. Work Place Inventory

An up-to-date hazardous chemical inventory must be maintained at the work location.

A convenient place to maintain this inventory list is with the chemical safety data sheet collection.

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4.7. State of California Proposition 65 and Related Requirements

The State of California has expanded chemical hazard communication scope requirements. These are applicable to any project work conducted in the State of California.

These requirements are presented in Figure 4, State of California Proposition 65 and Related Requirements.

4.8. Employee Information and Training

Before working with potentially hazardous materials, workers shall be informed of:

- operations in their work area where hazardous chemicals are present,
- the location of the written CHCP,
- the location of the list of hazardous chemicals, and
- the location of chemical safety data sheets and other hazardous material information sources used.

Personnel who will be working with potentially hazardous materials shall receive training that addresses:

- methods and observations to detect a hazardous chemical in the workplace,
- the physical and health hazards of the hazardous chemicals in the workplace,
- the measures employees can take to protect themselves,
- an explanation of the labeling system and chemical safety data sheets and other chemical information reference systems used, and
- chemical hazards associated with non-routine tasks, e.g., cleaning reactor vessels or water treatment systems, working on unlabeled pipes, process equipment.

Training must be sufficient for employees to effectively prepare SPAs involving the hazardous chemicals in their work area.

Retraining should be conducted annually and when a worker is assigned to a new area or department where potential chemical hazards are different or any time a new chemical is introduced to their work area.

4.8.1. Training Requirements for Specific Standards

Where chemical training is mandated by specific regulatory standards, the scope and frequency of the chemical or hazardous material specific training shall comply with the requirements of the standard.

4.8.2. Training Requirements for Highly Hazardous Chemicals

For highly hazardous chemicals, the chemical hazard communication training shall include:

- Specific work procedures required when potentially exposed to these chemicals.
- The fire, explosion, and toxic release hazard potential presented by these chemicals.
- Specific emergency response procedures for releases of these chemicals.

This is required in the US by the Process Safety Management standard, 29 CFR 1910.119.

4.8.3. Training Documentation

Chemical hazard communication training shall be documented and include the training date, location, project name, client name, scope of training topics, and names of personnel attending.

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A written quiz shall be administered to each employee to verify comprehension.

4.9. Trade Secrets

The chemical manufacturer is entitled to withhold specific chemical identity from the chemical safety data sheet.

For emergency or first aid treatment or non-emergency conditions, the chemical manufacturer must disclose the specific chemical identity to a health professional.

5.0 REFERENCES AND RELATED DOCUMENTS

29 CFR 1910.1200, Hazard Communication

29 CFR 1926.59, Hazard Communication

8 CCR 5194, Hazard Communication

29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals

The NIOSH Pocket Guide to Chemical Hazards

6.0 FIGURES

Glossary of Terms Related to a Chemical Hazard Communication Program

Hazardous Chemical Information

Chemical Hazard Communication Program Labeling Systems

State of California Proposition 65 and Related Requirements

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Figure 1

Glossary of Terms Related to a Chemical Hazard Communication Program

Acute	Severe, often dangerous conditions in which relatively rapid changes occur.
"C" or Ceiling	A description usually seen in connection with a published exposure limit. It refers to the concentration that should not be exceeded, even for an instant. It may be written as TLV-C or Threshold Limit Value - Ceiling. (See also Threshold Limit Value.)
Acute Exposure	An intense exposure over a relatively short period of time.
Asphyxiant	A chemical (gas or vapor) that can cause death or unconsciousness by suffocation. Simple asphyxiants, such as nitrogen, either use up or displace oxygen in the air. They become especially dangerous in confined or enclosed spaces. Chemical asphyxiants, such as carbon monoxide and hydrogen sulfide, interfere with the body's ability to absorb or transport oxygen to the tissues.
Boiling Point	The temperature at which the vapor pressure of a liquid equals atmospheric pressure or at which the liquid changes to a vapor. The boiling point is usually expressed in degrees Fahrenheit. If a flammable material has a low boiling point, it indicates a special fire hazard.
C.A.S. Number	Identifies a particular chemical by the Chemical Abstracts Service, a service of the American Chemical Society that indexes and compiles summaries of worldwide chemical literature called "Chemical Abstracts."
Carcinogen	A substance or physical agent that may cause cancer in animals or humans.
CC – Cubic Centimeter	A volumetric measurement, which, in the case of water, is also equal to one milliliter (ml).
Chemical	As broadly applied to the chemical industry, a naturally occurring substance or a compound produced by chemical reactions for either direct industrial and consumer use or for reaction with other chemicals.
Chemical Reaction	A change in the arrangement of atoms or molecules to yield substances of different composition and properties. (See Reactivity)
Chemical Safety Data Sheets	Content of a chemical safety data sheet is described in Paragraph 4.5 above. In the US, chemical safety data sheets are referred to as Material Safety Data Sheets (MSDSs).
Chemically Complex Project	A project, activity, or operations location that may present potentially elevated health or environmental risks based on the nature of the hazards involved (chemical, biological, or radiological), process complexity relative to these hazards, and scope of services. Such projects normally would include operations or maintenance or capital project services for specialty and bulk chemical, petrochemical, biopharmaceutical, radiological processes, aerospace, and hazardous waste operations.
Chronic	Persistent, prolonged, or repeated conditions
Chronic Exposure	A prolonged exposure occurring over a period of days, weeks, or years.
Combustible Liquid	According to the DOT and NFPA, combustible liquids are those having a flash point at or above 100º F (37.8 ºC). Combustible liquids do not ignite as easily as flammable liquids, however, combustible liquids can be ignited under certain circumstances and must be handled with caution. Substances, such as wood, paper, etc., are termed "ordinary combustibles."
Concentration	The amount of one substance mixed with, and in the presence of, another substance. For example, 5 parts (of acetone) per million (parts of air).

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Corrosive	A substance that, according to the DOT, causes visible destruction or permanent changes in human skin tissue at the site of contact.
Dermatitis	An inflammation or irritation of the skin.
Dyspnea	Shortness of breath; difficult or labored breathing.
Flammable Liquid	By DOT and NFPA, a flammable liquid is one that has a flash point below 100º F. (See Flash Point)
Flash Point	The lowest temperature at which a liquid gives off enough vapor to form an ignitable mixture and burn when a source of ignition (sparks, open flames, cigarettes, etc.) is present. Two tests are used to determine the flash point: open and closed cup. The test method is indicated on the chemical safety data sheet after the flash point.
Hazardous Material	Any substance or compound that may produce adverse effects on the health and safety of humans.
Highly Hazardous Chemicals	Chemicals, for which a release could result in toxic, fire, or explosion hazards, and which are present in sufficient quantities to result in catastrophic consequences.
Ingestion	Taking a substance into the body through the mouth as food, drink, medicine, or unknowingly as on contaminated hands or cigarettes, etc.
Inhalation	The breathing in of an airborne substance that may be in the form of gases, fumes, mists, vapors, dusts, or aerosols.
Irritant	A substance that produces an irritating effect when it contacts the skin, eyes, nose, or respiratory system.
Lower Explosive Limit (LEL)	(Also known as Lower Flammable Limit.) The lowest concentration of a substance that will produce a fire or flash when an ignition source (flame, spark, etc.) is present. It is expressed in percent of vapor or gas in the air by volume. Below the LEL or LFL, the air/contaminant mixture is theoretically too "lean" to burn. (See also UEL)
Odor Threshold	The minimum concentration of a substance at which a majority of test subjects can detect and identify the substance's characteristic odor.
Oxygen Deficiency	An atmosphere having less than the normal percentage of oxygen found in normal air. Normal air contains 20.8% oxygen at sea level.
Reactivity	A substance's propensity to under a chemical reaction or change that may result in effects, which can be dangerous, such as explosion, burning, or generation of corrosive or toxic emissions. Reaction initiators, such as heat, other chemicals, dropping, etc., will usually be specified as "Conditions to Avoid" when a chemical's reactivity is described in an chemical safety data sheet.
Time Weighted Average (TWA)	The average concentration, over a given work period, e.g., 8-hour workday, of a person's exposure to a chemical or a potentially harmful agent. The average is determined by sampling for the contaminant during the period of exposure.
Upper Explosive Limit (UEL)	The UEL, also known as Upper Flammable Limit, is the highest concentration of a mixture that will burn or explode when an ignition source is present. Theoretically, above this limit, the mixture is said to be too "rich" to support combustion. The airborne concentration range between the LEL and the UEL constitutes the flammable range or explosive range.

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Figure 2

Hazardous Chemical Information

Information related to chemical identification, personal air monitoring, training, and medical surveillance for all potentially hazardous chemicals on the project should be collected and recorded. Use additional sheets as needed to include all chemicals in the process.

Process/Task: **Date Reviewed:**

Chemical	Hazard	Hazard Level	Exposure Route	Identify Specific PPE	Air Monitoring	Training	Medical Surveillance	Comments, Unusual Issues

Hazard: Flammable (F), Combustible (C), Explosive (E), Reactive (R), Oxidizer (O), Corrosive (Corro), Radioactive (Radio), Primary or Secondary Irritant (I), Simple or Chemical Asphyxiant (Asphy), Anesthetic (Anes), Narcotic (Narco), Hepatotoxic or Nephrotoxic or Neurotoxic Systemic Poison (P), Sensitizer (Sens), Carcinogen (Carc), Mutagen (Muta), Teratogen (Terato)

Hazard Level: Low (L) ≤10% PEL, TLV, STEL, Ceiling, Peak, LEL; **Moderate** (Mod) >10% and < 100% PEL, TLV, STEL, Ceiling, Peak, LEL; **High** (H) ≥100% PEL, TLV, STEL, Ceiling, Peak, LEL. **Note:** Preplanning, management approval, and monitoring are required for all IDLH tasks.

Exposure Route: Inhalation (Inh), Ingestion (Ing), Skin Absorption (Abs), Skin or Eye Contact (Con)

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Personal Protective Equipment (PPE): Identify the specific PPE to be used based on chemicals and chemical concentrations expected.

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Figure 3

Chemical Hazard Communication Program Labeling Systems

There are multiple labeling systems currently in use, including the National Fire Protection Association (NFPA) 704M labeling system, the Hazardous Materials Information System (HMIS), the U.S. Department of Transportation labeling system, the United Nations Hazard Class Number system, and others.

A description of these labeling systems follows.

NFPA

The NFPA 704M system characterizes health, flammability, and chemical reactivity by severity from 0 to 4 on a diamond shaped diagram.

Zero refers to the absence of hazard, and 4 refers to the most potentially severe hazard associated with the material.

The hazard color code for health is blue, flammability is red, and reactivity is yellow.

NPCA HMIS

The National Paint & Coatings Association (NPCA) Hazardous Materials Information System (HMIS) uses standard labels to communicate hazards through the use of colors, numbers, letters of the alphabet, and symbols.

The HMIS is a five-part rectangle that provides identification of the chemical, acute health hazard, flammability, reactivity, personal protective equipment designations, and chronic health hazard information.

Chemical identity is conveyed by the chemical name and should be the same as the name on the chemical safety data sheet.

The acute health (blue), flammability (red), and reactivity (yellow) hazards are communicated by numerical ratings similar to the NFPA system.

An alphabetical designation is used to denote recommended personal protective equipment.

Chronic health hazards may be any abbreviated technique, such as an asterisk placed on the label to denote reference to the specific chemical safety data sheet, or the actual chronic information may be written on the label if space allows.

DOT

The U. S. Department of Transportation (DOT) developed a hazard classification labeling system to identify the relative hazard of hazardous materials being shipped.

The diamond shaped placards are color-coded and indicate the materials by class number, division number, or name.

United Nations Hazard Class System

The United Nations Hazard Class Number is a 1-through-9 numbering system describing the hazardous material.

This numbering system is found on the DOT placards.

Labels for Transfer Containers

When hazardous materials are transferred from one container to another, the new container will be marked appropriately with the hazard warning, including Proposition 65 warnings for chemicals used in California, if applicable (see below Figure 3).

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Figure 4

State of California Proposition 65 and Related Requirements

Chemicals known to the State of California, which cause cancer or reproductive toxicity listed under Title 22, Code of California Regulations (CCR) Section 12000, require a warning in compliance with CCR Title 22, Section 12601 (c) in workplaces in California and for work to be done in California.

Identifying Substances That May Be Encountered

Prior to projects to be conducted in California, the most current list of the following shall be reviewed to identify substances that may be encountered on the planned project.

- State of California, EPA, Office of Environmental Health Hazard Assessment, Chemicals Known to the State to Cause Cancer or Reproductive Toxicity, shall be reviewed. The list can be found in 22 CCR 12000 et. seq.
- The Director of Industrial Relations List, Title 8 CCR, Section 339
- 29 CFR 1910, Subpart Z, Toxic & Hazardous Substances, OSHA
- The American Conference of Governmental Industrial Hygienists Threshold Limit Values for Chemical Substances in the Work Environment.
- National Toxicology Program, Third Annual Report on Carcinogens 1 – 34.
- Chemical safety data sheets of reproductive toxicants or cancer producing substances.
- Prior to exposing any employee to any substance on the Proposition 65 list, all requirements of this procedure shall have been implemented.

Exposures Subject to Both Proposition 65 and Chemical Hazard Communication

Where exposures are subject to both Proposition 65 and Chemical Hazard Communication, compliance with Proposition 65 is the same as is required under the Hazard Communication Act. See 8 CCR § 5194(b)(6)(B).

Where exposures are subject only to Proposition 65, an employer can comply with either the Hazard Communication Act or 22 CCR § 12601. See 8 CCR § 5194(b)(6)(C).

Warnings

Clear and reasonable warning signs shall be posted in any area that may subject an individual to an exposure of any listed chemical that can cause cancer, birth defects, or other reproductive harm.

The language in the warning shall clearly state that the chemical in question is known to cause cancer, birth defects, or other reproductive harm.

Site-specific Hazard Assessment and Safety Action Plans shall address the requirements stated above.

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HSE Survey Checklist for US Project Offices and Trailers

(HSEP 1.4f3)

Program/Project: _____ City, State: _____

Program/Project Manager: _____ Number of employees: _____

Person conducting safety survey: _____ Date of survey: _____

For each question, place an 'X' in the appropriate box: "Yes", "No", or "N/A" (Not applicable).
For each non-compliant item, identify a "Corrective action", who is responsible for execution and completion of the action, and the due date. Corrective Actions are to be initiated and completed as soon as possible. If needed, attach a separate page for Corrective Actions.

	Description	Yes	No	N/A
A.	***Documentation***			
1.	OSHA and workers' compensation posters prominently posted?	_____	_____	_____
2.	At least one project employee completed First Aid and/or CPR training with a valid card?	_____	_____	_____
3.	Company HSEP Manual available (JNet)	_____	_____	_____
4.	Construction Safety Orders (CFR 1926 or state/Internet)	_____	_____	_____
5.	Safety is a topic covered during weekly progress/contractor mtgs.	_____	_____	_____
6.	Safety hazard notifications forms issued to contractors when safety infractions are not addressed.	_____	_____	_____
7.	OSHA Form 300 posted (Feb – Apr)	_____	_____	_____

Corrective action (Identify who is responsible, corrective action, and due date.):

_____

_____

_____

	Description	Yes	No	N/A
B.	***Slips, Trips, and Falls***			
1.	Interior walkways free of electrical, computer and phone cords, cables, plus debris?	_____	_____	_____
2.	No loose carpeting?	_____	_____	_____
3.	Warning signs & necessary, e.q., available to clean-up spills?	_____	_____	_____
4.	Mats placed inside main doors and in kitchen areas?	_____	_____	_____
5.	Non-skid wax used on floors?	_____	_____	_____

Corrective action (Identify who is responsible, corrective action, and due date.):

_____

_____

_____

	Description	Yes	No	N/A
C.	***Winter Weather***			
1.	Exterior walkways clear of snow and ice?	_____	_____	_____
2.	Sand and/or salt available, if needed?	_____	_____	_____

Corrective action (Identify who is responsible, corrective action, and due date.):

_____

_____

	Description	Yes	No	N/A
D.	***Fire Protection***			
1.	Appropriate number of fire extinguisher mounted?	_____	_____	_____
2.	Fire extinguishers shall be kept clear at all times?	_____	_____	_____
3.	Fire extinguishers serviced annually?	_____	_____	_____
4.	Emergency telephone numbers posted?	_____	_____	_____
5.	Emergency Evacuation Procedures/Plan developed & posted?	_____	_____	_____
6.	Fire drill conducted annually?	_____	_____	_____
7.	Offices do not have excessive storage of paper and/or drawings that could create a fire hazard?	_____	_____	_____
8.	Furniture always arranged to avoid contact with heaters?	_____	_____	_____
9.	Storage rooms are neat and orderly. Materials/equipment stored at least 18 inches below sprinkler heads?	_____	_____	_____

Corrective action (Identify who is responsible, corrective action, and due date.):

_____

_____

_____

_____

	Description	Yes	No	N/A
E.	**Tools and Equipment**			
1.	Paper cutters have finger guards, and are left in a closed position when not in use?	_____	_____	_____
2.	Wherever possible, filing cabinets are arranged side-by side and bolted together to prevent a cabinet from toppling forward when one of the high drawers is open?	_____	_____	_____
3.	Files and desks drawers are not left open?	_____	_____	_____
4.	Single file cabinets are secured to the wall, if possible?	_____	_____	_____
5.	Broken glass tops on desks removed?	_____	_____	_____
6.	Loose carpeting, flooring, and temporary electrical and phone lines either tacked or taped down?	_____	_____	_____
7.	First-aid cabinet available in office?	_____	_____	_____
8.	Extra hard hats and safety glasses are available for visitors?	_____	_____	_____
9.	Manual material handling hazards identified and an SPA developed to reduce the possibility of injury?	_____	_____	_____

Corrective action (Identify who is responsible, corrective action, and due date.):

_____

_____

_____

_____

	Description	Yes	No	N/A
F.	**Electrical**			
1.	Are electrical, telephones and computer lines and/or cords on the floor in aisle ways?	_____	_____	_____
2.	Are there any electrical outlets damaged and/or without a cover plate?	_____	_____	_____
3.	Are any electrical outlets overloaded? (Keep this in mind when using portable electric heaters)	_____	_____	_____
4.	Are all cords in good condition without worn or exposed wires?	_____	_____	_____
5.	Power strips or GFCI's are used when additional outlets are necessary?	_____	_____	_____
6.	Are metal ladders used in the office area?	_____	_____	_____

Corrective action (Identify who is responsible, corrective action, and due date.):

_____

_____

_____

	Description	Yes	No	N/A
G.	**Hazard Communication**			
1.	All flammable and combustible liquids kept in approved containers and stored in appropriate cabinets with contents labeled for identification?	_____	_____	_____
2.	Material Safety Data Sheets (MSDS) available for hazardous products stored in the office?	_____	_____	_____
3.	All employees and sub-consultants trained in Hazard Communications?	_____	_____	_____

Corrective action (Identify who is responsible, corrective action, and due date.):

_____

_____

_____

	Description	Yes	No	N/A
H.	**Office Trailers**			
1.	SPA developed prior to trailer being delivered?	_____	_____	_____
2.	Trailer is set-up on level firm ground or pad?	_____	_____	_____
3.	Trailer support blocking on at least all four corners?	_____	_____	_____
4.	Trailer is secured to the ground to prevent knock over?	_____	_____	_____
5.	Underground utilities identified prior to trailer staking?	_____	_____	_____
6.	Trailer electrical system is grounded?	_____	_____	_____
7.	Trailer electrical panel accessible and circuit breakers identified?	_____	_____	_____
8.	Trailer installation complies with local building, fire, electrical codes?	_____	_____	_____
9.	Adequate interior lighting available?	_____	_____	_____
10.	Doors and windows close and lock?	_____	_____	_____
11.	HVAC system filters changed regularly?	_____	_____	_____
12.	Hot water tank properly located and secured?	_____	_____	_____
13.	Stair landing level with the doorway?			

14. Stairs have handrails?	_____	_____	_____
15. Stairs are secured against accidental knock over?	_____	_____	_____
16. Stair steps are non-skid?	_____	_____	_____
17. Bottom stair landing is flat and level?	_____	_____	_____
18. Light available for stairs and door?	_____	_____	_____
19. Trailer used to conduct project related business only?	_____	_____	_____
20. No tall grass or debris near or under trailer?	_____	_____	_____
21. Trailer skirted (protect pipes, reduce grass/shrub growth, appearance, etc.)?	_____	_____	_____
22. Trailer is cleaned regularly?	_____	_____	_____
23. More than one unblocked doorway available to exit trailer?	_____	_____	_____
24. Two exits provided on opposite side of trailer (if two or more trailers wide)?			
25. All exits labeled (if two or more trailers wide)?	_____	_____	_____

Corrective action (Identify who is responsible, corrective action, and due date.):

_____

_____

_____

_____

_____

_____

The person conducting the monthly “Safety Checklist – Project Office and/or Trailer” survey, which includes the “Corrective Actions”, will write up the survey results and distribute to the Program Manager or Project Manager within 48 hours.

The Program Manager or Project Manager will review the checklist and status of the Corrective Actions with the Manager of Projects (MoP) during the first project review meeting (monthly MoP review) following the safety survey.

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HSE Procedure		Document No: HSEP 1.4	Page: 1 of 5
Office Health, Safety, and Environment Management		Supersedes: HSEP 1.4, Rev 0 HSEP 6.10, Rev 2	Revision: 1 Issue Date: 13 Apr 04
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1.0 PURPOSE AND SCOPE

The purpose of this Health, Safety, and Environment Procedure (HSEP) is to establish consistent methods and requirements for implementing the Company Health, Safety and Environment (HSE) process at all office locations.

This procedure applies to all Company offices, including field offices. Additional aspects of the HSE process for field offices are covered by HSEP 1.2, Project HSE Management.

2.0 DEFINITIONS

Accident/Incident Investigation Report	A written report, which provides in detail the "who, what, when, where, why, and how" in describing the occurrence of an accident or incident and the recommended action to prevent recurrence.
Accident/Incident	An unplanned, undesirable event, which disrupts work activity.
Emergency Response Action Plan (ERAP)	The office ERAP is a location-specific written plan that provides directions and guidelines for covered employees in response to a variety of emergency situations. Refer also to HSEP 2.11.
HSEPs	Health, Safety, and Environment Procedures are work instructions that provide the Company's standard safe, healthful, and environmentally sound work specifications.
Hazard Communication	The process for (1) assessing the potential health and safety risks associated with hazardous materials/substances found or used in the office, (2) developing necessary protective measures for handling, use and storage of such materials/substances, and (3) communicating the potential risks and required protective measures to affected workers. The risks and protective measures are communicated via labeling, placarding, Material Safety Data Sheets, and training. Refer also to HSEP 1.3.

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Office HSE Plan (OHSEP)	The Office Health, Safety, and Environment Plan is a written document developed jointly by operations management, HSE and the facility owner to ensure a healthy and environmentally sound workplace for all employees at that location.
Safe Plan of Action (SPA)	The Safe Plan of Action is a task-driven planning document used to help ensure that every task receives proper HSE preparation before commencement of work. An SPA identifies each step of the work activity, potential hazards for each step, and the safe plan to deal with the potential hazards. Refer also to HSEP 2.16.
Safety Evaluation Report (SER)	The Safety Evaluation Report (SER) is a management tool that evaluates the HSE process at a specified work location. Findings will identify effective process implementation, specific hazards, and issues of concern, and will provide a basis for strategies to improve HSE performance. Refer also to HSEP 2.2.
Safety Observation Reports (SOR)	The Safety Observation Report (SOR) process is designed to engage all workers in the observation of work in progress so that a maximum number of workers are involved in the HSE monitoring and observation process. Refer also to HSEP 2.17.

3.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

3.1. Office HSE Coordinator

Office HSE Coordinators serve as a liaison between the HSE department and the office employees to provide HSE resources, guidance and as a designated point-of-contact for HSE issues. Responsibilities of the Office HSE Coordinator include the following:

- Monitor and document the compliance status of the office with Company and regulatory agency HSE requirements by conducting regular HSE surveys and SERs and by using other appropriate methods. Results shall be provided to the Office Manager and the designated HSE Manager.
- Act as the primary point-of-contact and resource for office personnel in regard to HSE issues.
- In conjunction with the HSE Department, develop and implement an Office HSE Plan. (Refer to HSEP 1.4f1, Office HSE Plan Sample and Guidelines.)
- In conjunction with the HSE Department, develop and implement an Office Emergency Response Action Plan. (Refer to HSEP 2.11.)
- Collect, review, and track Safety Observation Reports (SOR).
- Make available blank SPA forms and review and retain copies of completed forms.
- Maintain material data safety sheets for all hazardous chemicals which may be used or stored in the office.
- Maintain safety awareness by distributing HSE alerts, update HSE bulletin boards, etc.
- Prepare and distribute a monthly report to the Office Manager and designated HSE Manager that includes information such as number of requests for HSE assistance, recommendations for special recognition for employees, number of SORs and SPAs submitted, etc.
- In conjunction with office management and the HSE Department, coordinate annual “Safety Day” activities.
- Identify and post the name and addresses of the nearest medical center and hospital, plus names and phone numbers for building security and HSE personnel.
- Maintain current First Aid/CPR certification and/or know who in the building is also trained.
- Maintain the First Aid cabinet or kit, including a log of treatment for each kit.

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- Ensure that injuries occurring in the office are given immediate medical attention.
- Ensure that accidents and incidents are promptly reported to the Office Manager and appropriate HSE Manager.
- Ensure that accident reports are completed and submitted in a timely manner.
- Encourage personnel to inform a co-worker, HR Manager, or the Office HSE Coordinator of personal health issues, e.g., diabetes, asthma, heart condition, seizures, that could require medical assistance while at work.
- Support the office manager and/or HR with their delivery of HSE orientation when new employees are assigned to the office.

3.2. Office Manager Responsibilities

Office Managers shall have the following responsibilities in conjunction with the Office HSE Coordinator Program.

- Nominate Office HSE Coordinator candidates for approval by the HSE Manager.
  - At least one Coordinator will be designated for every office.
  - Based on number of employees, office size, and dispersion of employees, multiple coordinators may be required.
  - After ensuring that the candidate is willing and able to perform the duties of an Office HSE Coordinator, the HSE Manager shall confirm the selected nominee(s).
- Provide the resources (including time and funding) needed by the Office HSE Coordinator for HSE-related duties.
- Notify the designated HSE Manager in advance of any action that will change the Office HSE Coordinator's ability to perform their HSE-related duties.
- Ensure that building owner or landlord provides and maintains adequate fire protection and other life safety equipment and systems, including regular inspections and certifications by third party agencies.

4.0 PROCEDURE

Each office will develop and maintain the following as part of the location-specific HSE Program.

- An Office Health, Safety, and Environment Plan (OHSEP);
- An Emergency Response Action Plan (ERAP);
- A completed chemical Hazard Communication Program Manual (Refer to HSEP 1.3) including MSDSs for all hazardous materials and chemicals at the facility, if any;
- Log of all office employee's injuries;
- First Aid register; and
- A written Bloodborne Pathogens Exposure Control Plan.

4.1. Office HSE Plan

Refer to HSEP 1.4f1, "OHSEP, Sample and Guidelines", for an example Office HSE Plan. An equivalent plan may be developed and must address the following, as a minimum:

- Office HSE goals,
- Office organization for HSE,
- Local implementation responsibilities,
- New employee orientation,
- HSE training requirements,
- Chemical hazard program (US facilities must have a location-specific written hazardous chemical program),

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- HSE meetings and communications,
- SER schedule,
- SPA program,
- SOR program,
- Disciplinary actions, relative to HSE program enforcement,
- Accident/incident reporting and investigation,
- Job site/field safety,
- Lifting and material handling,
- Ergonomics,
- Travel and motor vehicle safety,
- Office emergency procedures (medical, fire, bomb threat, civil unrest, facility security, workplace violence),
- Local medical facility location and information,
- Floor captains/wardens listing and duties, and
- Floor plans and evacuation routes.

Each employee will be trained in the elements of the OHSEP. Either a copy of the Plan will be provided to all employees or employees will be told where the OHSEP can be accessed.

4.2. Annual Plan Review

Content of the OHSEP will be reviewed by the office management team and re-approved annually to ensure its continuing suitability, adequacy, and effectiveness. The review shall include, as a minimum, an evaluation of:

- Results of SERs and HSE audits,
- Status of corrective and preventative actions,
- Follow-up actions from earlier management reviews, and
- Other building or organizational changes that can affect the OHSEP.

Annual targets to achieve continuous improvement, consistent with Company HSE policies and directives, shall be established. Development of the annual targets should address lessons learned and feedback from department managers, supervisors, and employees.

4.3. Training Of Office HSE Coordinators

The responsibilities and selection process for Office HSE Coordinators are defined in 3.1 and 3.2 above, respectively. Their training shall include completion of an HSE Coordinator's training program, provided by the HSE department, promptly upon assignment as an Office HSE Coordinator. The training program shall include the following topics:

- Overview of the HSE Process,
- HSE leadership,
- An understanding of the SPA and SOR process,
- Locating HSE Resources/Information on JNet,
- Accident Reporting Policies and Procedures,
- HSE training requirements, and
- The operating units' specific HSE program implementation plan.

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4.4. Office HSE Coordinator's Equipment

The Office HSE Coordinators should be given special equipment and materials to help them perform their responsibilities, such as:

- High visibility vest, armband, and/or ball-cap,
- A loud whistle,
- Flashlight, and
- HSE Department contact lists.

5.0 FIELD OFFICES AND OFFICE TRAILERS

Field offices are typically provided in temporary office trailers and present special HSE concerns. The following items outline the minimum requirements for such field office locations. Also, some helpful checklists are available as HSEP 1.4f2, Field Office and Office Trailer HSE Checklist, for all locations, and HSEP 1.4f3, HSE Survey Checklist for US Project Offices and Trailers, for operations in the US.

- SPA for trailer setup developed prior to trailer being delivered,
- Underground utilities identified prior to trailer staking,
- Set-up on level firm ground or pad, support blocking on at least four corners,
- Secured to the ground to prevent knock over,
- Electrical system is grounded and electrical panel circuit breakers labeled,
- Installation complies with local building, fire and electrical codes,
- Doors and windows close and lock,
- Hot water tank properly located and secured,
- Stair landing level with the doorway and has handrails,
- Stairs are secured against accidental knock over and steps are non-skid,
- Bottom stair landing is flat and level,
- Light provided for stairs and doorway,
- Trailer skirted to protect pipes, reduce plant growth and improve appearance,
- More than one unblocked doorway available to exit trailer, and
- Exits are labeled if two or more trailers wide.

6.0 HSE RECOGNITION AWARDS

The annual HSE Corporate Recognition Program includes a category for offices. Every office location is eligible for participation in this recognition program and is encouraged to submit an application if they have an innovative HSE process with excellent results.

Office locations are also encouraged to implement local HSE recognition programs.

7.0 TRAINING

An Office HSE training module is available from the corporate HSE department for use by qualified HSE personnel.

An Employee Guide to Office HSE handbook is also available to assist in this training and as a basic resource document for office employees.

8.0 RECORDS

Documentation of employee training, including attendance lists and testing results, shall be maintained by the office at which are they are assigned.

The office manager shall assure that logs and reports of first aid cases, medical treatment cases, and work-related recordable cases are maintained.

9.0 RELATED DOCUMENTS AND REFERENCES

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HSEP 1.4f1, Office HSE Plan Sample and Guidelines

HSEP 1.4f2, Field Office HSE Checklist

HSEP 1.4f3, HSE Survey Checklist for US Project Offices and Trailers

HSET 1.4, Office HSE Training

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HSE Procedure		Document No: HSEP 1.5	Page: 1 of 7
HSE Program Implementation Responsibilities		Supersedes: CHSP 1.5	Rev. 1
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1.0 PURPOSE AND SCOPE

This procedure establishes the general responsibilities for proper implementation of the Jacobs Health, Safety, and Environmental Procedures (HSEPs) common to all Company HSE procedures. Definitions for specific position descriptions are defined in this procedure.

This HSEP applies to all operations covered by the Company HSE Program including subcontractors. Further responsibilities for subcontractors can also be found in HSEP 2.9.

Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

2.0 DEFINITIONS

Contractors	Means other contractors and/or their employees who are *not* Jacobs' subcontractors or employees
Corporate HSE Department	Refers to the Jacobs Health, Safety, and Environment Department, typically referred to as "Corporate HSE" or "HSE," and includes the Vice President HSE and the staff of Senior HSE Managers, Managers of HSE, Industrial Hygiene Managers, and related HSE technical specialists.
Employee	Includes all individuals on the Jacobs payroll, regardless of position or title; does *not* include client's employees, subcontractors, or others who may be on the project site or office location.
Executive HSE Committee	A team of senior operations managers from across all Jacobs units worldwide, who meet several times each year. The primary purpose of this committee will be to provide recommendations and consultation to the HSE Department and senior management regarding programs, training, and policies and procedures, which will enhance awareness of HSE company-wide and support line management in achieving our goal of "zero incidents".

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Executive Management	The senior level management within each operating unit and their superiors, including Group Vice Presidents, Senior Vice Presidents, Executive Vice Presidents, President, and Chief Executive Officer.
HSE Manager	A full-time Jacobs staff employee, who provides HSE management to multiple projects/offices and provides supervision to multiple HSE Supervisors. This individual typically works out of a home office location or on major programs.
HSE Professional	This is a generic term that may be used to include any worker whose full-time job is the execution of HSE related tasks, e.g., Manager of HSE, HSE Supervisor, Safety Supervisor, etc.
Jacobs	Legally referred to as Jacobs Engineering Group Inc., the simple name "Jacobs" is typically used in written procedures and means all Company owned subsidiaries and divisions. Referred to as "the Company" within this collection of HSEP Procedures.
Project Manager	The Jacobs employee responsible for overall project execution including implementation of the project's HSE program. This Project Manager's office may or may not be located at the project site. In some circumstances, the Project Manger and the Site Manager is the same person.
Senior HSE Manager	A senior-level, full-time Jacobs staff employee, who provides management to multiple HSE Managers and reports to the Vice President HSE.
Site HSE Supervisor	A full-time Jacobs employee, who works at a single project or field site and whose full-time job involves HSE related tasks. It includes titles such as Project Safety Manager, Safety Coordinator, Safety Tech, Safety Superintendent, Site H&S Officer, etc.
Site Manager	The on-site Jacobs employee responsible for project execution and HSE program implementation. In some circumstances, the Project Manger and the Site Manager is the same person.
Senior Operations Management	The senior levels of management within each operating unit, including the Group Vice President and those management personnel above the site management level.
Subcontractor	Any person, partnership, or corporation, which has a contract with the Company and/or their subcontractor(s), to furnish labor, material, or equipment as part of the work.
Supervisor	Any employee whose primary responsibility is the direction of other employees, e.g., Superintendent, General Foreman, Foreman, Leadman.

3.0 HSE PROGRAM IMPLEMENTATION RESPONSIBILITIES

Jacobs advocates a strong accident prevention program because it prevents human suffering, damage to property and the environment. Superior HSE performance also directly contributes to improvement of morale, which in turn results in better productivity and quality.

All employees at all levels have the responsibility to actively participate in the HSE process and stop, or bring to the attention of management, any unsafe acts or conditions or any potentially harmful environmental practices. Imminent danger situations, e.g., exposure to falls from elevations, electrocution hazards, exposure to improperly protected excavations, etc., *must be corrected immediately.*

3.1. Executive Management HSE Responsibilities

Specific responsibilities of Executive Management include:

- Communicate your passion for HSE throughout the Company and at all times when representing the Company;

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- Hold direct reports accountable for HSE performance;
- Communicate Jacobs' HSE commitment and expectations to the client;
- Provide adequate resources to implement the Jacobs HSE process;
- Publicly recognize excellent HSE performance;
- Establish participation objectives for reports and self;
- Require participation in HSE training by management staff;
- Help identify and correct areas of weak performance;
- Ensure that HSE is a component of acquisition and growth planning; and
- Lead by example and keep HSE on your daily agenda.

3.2. Executive HSE Committee Responsibilities

The Executive HSE Committee shall:

- Establish long-term goals and objectives for the Jacobs HSE process;
- Share successful programs and techniques for HSE leadership with other senior management personnel;
- Identify areas for needed HSE focus and process improvement;
- Support HSE management team in creation of new or revised programs and procedures; and
- Set criteria for and implement annual President's HSE Excellence Award program.

3.3. Sales, Marketing, and Proposal Managers

Existing occupational health hazard, safety, and environmental information and documents are to be obtained from the client in the proposal and planning stages of a project.

Such information and documents include chemical inventory and chemical process data, personal exposure and monitoring data, and medical surveillance data.

This information is to be provided to the Jacobs HSE Manager.

Appropriate HSE personnel, equipment, and training requirements must be included in the proposal to accurately estimate the cost and provide correct project planning information.

3.4. Senior Operations Management HSE Responsibilities

Operations management is responsible for the health and safety of all personnel and facilities under their direction and the protection of the environment. This includes both office and field operations. Senior Operations Managers shall:

- Assure compliance with HSE policies and procedures;
- Provide adequate budget and resources for implementation of HSE process;
- Exercise accountability, as appropriate;
- Regularly attend and participate in HSE training sessions;
- Recognize good HSE performance by individuals and teams;
- Inform clients of the Company's HSE commitment;
- Establish and monitor HSE performance targets;
- Ensure HSE involvement in all phases of work;
- Coach others for continuous improvement;
- Participate in accident investigation processes;

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- Verify that subordinates are executing their responsibilities properly; and
- Verify that goals and objectives are being met.

3.5. Project Management/Site Management HSE Responsibilities

Project and Site Management shall:

- Understand Company HSE policies and procedures. Site management may, if the need arises and after consultation with the project/site HSE manager, apply more stringent HSE procedures than those found in HSE Manual;
- Effectively communicate and implement the Company's HSE policies and procedures;
- Generate the project-specific HASAP, in coordination with the responsible HSE Manager;
- Provide the resources necessary to maintain a safe and healthful work environment and ensure implementation of Company HSE policies and procedures;
- Establish program, project, and/or office goals for HSE performance and verify that they are being met;
- Assign clear responsibilities that are necessary to achieve the Company's HSE goals and objectives;
- Verify that subordinates are executing these responsibilities properly;
- Enforce HSE procedures and issue disciplinary actions, when required;
- Ensure that HSE deficiencies identified in audits and inspections are promptly corrected; and
- Coordinate with the client and other third parties on HSE matters.

3.6. Corporate Health, Safety, and Environment Managers' Responsibilities

Corporate HSE Managers shall:

- Assist management with their duty to implement all applicable HSE policies and procedures;
- Advise management and supervisory personnel in safe work practices and supply information required to comply with the applicable HSE policies and procedures;
- Assist project management in development of the Hazard Assessment Safety Action Plan (HASAP) and ensure it is updated as required;
- Ensure that required HSE records are maintained and submitted;
- Assist management in determining that employees are properly qualified and trained for job conditions;
- Inspect each project and/or office and reporting findings and recommendations to management;
- Develop, distribute, and maintain Corporate HSE procedures;
- Development, administer, and, in some cases, present HSE-related training modules;
- Review accident reports and recommend specific corrective measures;
- Recruit, interview, and hire all Company HSE professionals and ensure skills are appropriate for the assignment;
- Conduct annual performance reviews of HSE professionals (include input obtained from appropriate operations managers);
- Maintain statistics and metrics, determine performance trends, and prepare regular reports to senior management;

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- Provide direction, technical assistance, and career development planning for all Company HSE professionals; and
- Ensure that projects and offices are provided with appropriate resources, including qualified first-aid attendants, written technical HSE handbooks and similar materials, etc.

3.7. Site HSE Supervisors' Responsibilities

The Site HSE Supervisor reports administratively to site management and reports functionally to the appropriate Corporate HSE Manager.

The Site HSE Supervisor, as a member of the project's management staff, shall:

- Support and advise site management in their duty to implement Company and site-specific HSE policies and procedures;
- Assure the adequacy of site and client HSE procedures;
- Assess the work to determine compliance with HSE policies and procedures, promptly communicating concerns and recommendations to managers and/or supervisors for their action;
- Take immediate action on any imminent danger situations observed;
- Review and approve personal protective equipment, safety equipment, and first aid supplies;
- Educate management and supervision in the applicable HSE policies and procedures;
- Ensure HSE orientation of site employees and subcontractor personnel;
- Ensure prompt and adequate treatment for injured employees and subcontractor personnel;
- Ensure adequate investigation and analysis of accidents (non-injury and injury);
- Provide HSE information for the education of management, supervision, and employees concerning:
  - Accident analysis (cause, trends, results, and corrective action),
  - Analysis of inspection results and needed corrective actions,
  - Safe work procedures, and
  - HSE training requirements;
- Communicate and promote HSE excellence recognition programs;
- Ensure preparation, submittal, and/or maintenance of required HSE recordkeeping documentation, such as inspection reports, training records, SPAs, SORs, injury logs, accident investigation reports, etc.; and
- Provide HSE evaluations of employees and supervisors to management, as necessary.

3.8. Supervisor Responsibilities

Supervisors are accountable for the health and safety of those who they supervise.

Supervisors shall:

- Learn Company and project-specific HSE procedures;
- Implement the HSE program;
- Effectively communicate the Company's HSE goals, objectives, policies and procedures to each member of your work group;
- Establish an environment of "zero tolerance" for safety non-compliance and promote a positive atmosphere for HSE excellence;

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- Plan each task with HSE as an integral part, and conduct pre-job risk assessments of all work activities;
- Orient the worker with respect to:
  - The work group (the new worker),
  - The work area and hazards that my exist,
  - General and specific safety hazards,
  - Accident (non-injury and injury) reporting requirements, and
  - The employee's HSE responsibilities;
- Assign employees only to tasks for which they are trained and qualified;
- Monitor worker and work group performance for quality and safe work practices;
- Correct any deficiencies noted and educate the worker to improve work methods;
- Report and investigate all non-injury and injury incidents and
  - Secure incident scene,
  - Actively participate in the investigation, and
  - Implement corrective actions;
- Train the employees and work group in safe work procedures and
  - Lead daily safe work planning sessions (SPA),
  - Participate in safety meetings, and
  - Inform employees of potential health hazards;
- Assure good housekeeping at all times;
- Encourage crew members to actively participate in the HSE program; and
- Enforce Company and project HSE policies and procedures at all times.

3.9. Employee Responsibilities

Employee acceptance of the Company HSE procedures is the ultimate key to the success of the HSE program.

Employees and subcontractor employees shall:

- Comply with procedures established for his/her safety and health and for preservation of the environment;
- Assist management and supervision in positive development of their co-worker's attitudes toward HSE and workplace morale;
- Suggest improvements in methods or procedures that will prevent incidents and protect the environment;
- Stop, or bring to the attention of management, any unsafe acts or conditions and any potentially harmful environmental practices;
- Correct immediately any imminent danger situations, e.g., exposure to falls from elevations, electrocution hazards, exposure to improperly protected excavations, etc.;
- Notify their supervisor if they have an insufficient understanding
  - Of the task to be performed,
  - Of HSE procedures, and

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  - Of assigned safety equipment;

- Promptly report incidents or accidents involving personnel or property to your supervisor, no matter how minor;
- Learn the approved HSE safe practices that apply to your work and practice them at all times;
- Ask for assistance from a supervisor or the HSE department when you are unsure of a work or safety practice;
- Participate in and maintain an active interest in the HSE program;
- Be attentive to safety discussions that your supervisor may lead and request explanation of points that you do not understand;
- Never bypass the function of a safety device (Promptly report safety device malfunctions to your supervisor and flag the device immediately to warn others of the hazard.);
- Promptly report to your supervisor any potential work-related injury or illness, no matter how slight you might consider the injury to be;
- Never attempt to do a job alone when good judgment tells you assistance is needed;
- Inspect, use, and maintain personal protective equipment provided for you;
- Do not participate in clowning, scuffling, practical joking, or horseplay of any kind (Running on the job is prohibited.);
- Be cautious in walking or moving about the work area to avoid slipping, tripping, or falling (Be especially cautious when weather conditions create a potentially slippery walking surface.);
- Plan your work and try to anticipate any hazards you might encounter; and
- Observe safe practices off the job as well as on the job.

In addition to the requirements stated above, refer to the “Field Operations Employee Guide To Safety . . . Rules and Regulations” for HSE requirements related to employees engaged in field operations.

4.0 REFERENCES AND RELATED DOCUMENTS

Field Operations Employee Guide To Safety . . . Rules and Regulations

Corporate Health, Safety, and Environment Procedures Manual

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Zero Incident Process		Supersedes: HSEP 2.1	Rev. 2
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1.0 PURPOSE AND SCOPE

This Corporate Health, Safety, and Environment Procedure (HSEP) provides the minimum procedures to be implemented and followed on all projects. These tools along with our existing policies, procedures, programs and training systems will provide our best path toward achieving Zero Incidents.

This HSEP applies to all employees and subcontractors engaged in operations covered by the Company Health, Safety, and Environment Program.

2.0 RESPONSIBILITIES

General responsibilities for HSE procedures implementation are stated in HSEP 1.5. Additional responsibilities specific to this HSEP include the following.

2.1. Site Manager

The Site Manager shall become knowledgeable of the details of this procedure in order to ensure thorough implementation and maximum effectiveness. As with all elements of the Company's HSE process, Site Management's active involvement is a requirement.

2.2. Supervisor

All Supervisors have specific responsibilities, as defined the SPA/TSA, Formal Accident Investigation, and SOR programs contained in this Section. Supervisors shall be knowledgeable of these programs and actively drive the daily execution of this standard HSE process.

2.3. Employee

Each employee has personal responsibilities, as defined in the SPA/TSA and SOR programs contained in this Section. Employees shall be knowledgeable of their personal responsibilities and

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actively participate in these programs. Employee involvement and support of the HSE process is both a right and a responsibility.

2.4. Site HSE Supervisor

The Site HSE Supervisor shall ensure that each employee, including Site Management and Supervision, is educated in these standard HSE processes and their personal responsibilities contained therein. Site Safety shall also continuously monitor the effectiveness of these processes and inform Site Management and Corporate Health and Safety of these findings.

2.5. Corporate Health, Safety, and Environment

It is the responsibility of Corporate Health, Safety, and Environment to assist each project in the successful implementation of these standard HSE processes. Specifically, the HASAP shall be initiated by Corporate HSE and Management will be assisted in effective implementation of the other five tools.

3.0 DEFINITIONS

None

4.0 PROCEDURE

4.1. Hazard Assessment Safety Action Plan (HASAP)

The HASAP helps to ensure that HSE hazards are included in the planning stage of the project. The HASAP consists of eight elements:

- Introduction/Scope
- Manpower/Duration
- Safety Coverage
- Replacement Evaluation/Drug Screening
- Training Requirements
- Special Requirements
- Hazard Assessment
- Medical Care

Each of these eight elements is addressed in a brief narrative format with the exception of training requirements, special requirements, and hazard assessment. Specific details for these areas are determined from the scope of work and regulatory compliance demands.

The hazard assessment must be completed to identify what personal protective equipment (PPE) is required to safeguard employees during the performance of work.

The HASAP is a joint effort among operations, HSE, and the client (if possible) to identify the plan that will be used to accomplish a safe operation. The overall document is the roadmap for safe execution of the project and is signed by the appropriate parties as a certification of hazard assessment, planning, and agreement to the plan.

The primary benefit of the HASAP is to ensure that HSE issues are addressed prior to start of work so that no surprises or conflicts occur due to lack of planning. Since work scopes often change during the course of work, the HASAP is a living document that is to be changed accordingly to meet the hazards identified. It also serves as an excellent tool to identify and document regulatory compliance measures. The HASAP should always be a brief document and only reference the other aspects of the HSE program that will be used to address specific HSE issues.

For projects involving hazardous waste operations and for projects covered under prevailing hazardous waste regulations, a project Health and Safety Plan (HSP) shall be prepared in lieu of a HASAP. Refer to HSEP 7.3.1, Site-specific HSE Plans. A site-specific HSP contains all elements of the Jacobs HASAP.

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For international projects, the HASAP (or HSE Plan) shall address environmental requirements and other appropriate HSE requirements.

4.2. Safe Plan of Action and Task Safety Awareness

Although these two tools are actually separate, they complement each other.

4.2.1. The SPA

The Safe Plan of Action (SPA) is a task-driven control document to ensure that every task receives proper HSE planning prior to beginning work. The crew with guidance and participation from the Supervisor collaboratively develops the SPA.

Member of the team signs the SPA to indicate their participation, their understanding of the plan, and agreement to follow the plan.

The SPA also serves as a tool to identify specific PPE required and, when signed and dated by the Supervisors, becomes a documented hazard assessment plan that facilitates compliance with occupational safety and health regulations.

4.2.2. The TSA

The Supervisor identifies the work area and task to be performed and then leads the crew in performing a Task Hazard Assessment (TSA). The Task Hazard Assessment is specific to the work to be performed as opposed to the HASAP hazard assessment, which is general to the overall project.

The Task Hazard Assessment requires the Supervisor to solicit crew participation in identifying hazards and hazard control measures such as PPE, training requirement, permits, procedures, etc.

The TSA is a daily brief safety meeting associated with the task(s) that are scheduled for the crew during the workshift. These meetings generally take from 2 to 10 minutes and address the HSE measures specific to the tasks. In most instances, the TSA is a review of a previous SPA. TSA meetings shall be conducted at least daily and whenever a task presents a change of hazards from the previous tasks.

The SPA and TSA provide important benefits in several areas: a written safety plan for each task; requires participation of the crew in identifying hazards and control measures; serves as a certified Hazard Assessment Plan; and provides a post accident investigation tool in the event of an accident. The SPA also serves as a reference document for performing similar work in the future.

4.3. Formal Accident Investigations

In order to eliminate accidents, both injury and non-injury, it is important to perform a thorough, in-depth investigation when an accident occurs. In the event of an accident, immediate action taken to identify causes can be utilized to prevent recurrence of future accidents of a similar nature. When a first-aid type (or more serious) accident occurs, which is determined not to be an act of nature (i.e. bee sting, insect bite, windblown foreign body), a high level formal investigation must be conducted. Participants in the investigation process should be the Site Manager, the discipline Superintendent, second and first line Supervisor of the person(s) involved in the accident and the injured. Company HSE Representative(s) and client personnel may be included, depending on the specific circumstances. The investigation team should review the accident in a conference environment. All facts which are identified as leading to the accident should be documented and communicated throughout the jobsite via safety meetings, TSA meetings, etc.

During the investigation process, the SPA for the task should be examined to determine if lessons can be learned to prevent recurrence. The investigation is not a blame finding endeavor, rather a fact finding effort to eliminate occurrence of similar accidents in the future. This accident investigation process should not be limited to only first aid occurrence, but should be utilized in the event of non-injury accidents as well.

Multiple benefits are derived from the formal accident investigation process which include: Placing a high level of attention on what are often considered “minor” occurrences; allowing for assessment of the HSE program to identify and correct any deficiencies; communicating to employees the sincerity

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of the Company's goal towards Zero Incidents; and generally helping to prevent a potentially more severe accident from occurring. This process also allows Supervision to identify any deficiencies in HSE planning through the SPA.

Also reference HSEP 5.1, Accidents, Injuries and Illnesses, for additional procedures and the Accident Investigation Report Form required for all formal accident investigations.

4.4. Safety Observation Reports (SORs)

The SOR is a proactive tool designed to identify, document, and to ensure that unsafe acts and unsafe conditions in the work environment are continuously sought out by employees, Supervision, and HSE Personnel. HSE is everyone's responsibility, which requires that all site personnel continually strive to identify conditions, which may be detrimental to employee health and safety. Once identification of deficiencies or detriments are made, positive action must be taken to eliminate such deficiencies. The SOR is a report document, which allows any site employee to record observed HSE deficiencies and identify the cause so that corrective action can be taken. Some of the causes identified through the SOR process are lack of resources (time, material, personnel), lack of training, lack of belief, etc. Identifying such causes for deficiencies enables the Company to direct attention at eliminating the causes.

Supervisors are not the only ones involved in the SOR process. HSE personnel are continuously seeking unsafe acts and conditions. SORs allow HSE personnel to document their findings and address them with appropriate operations personnel for corrective action. Since HSE is a line management function and supervisory personnel as a rule outnumber HSE personnel, a definite correlation can be determined by measuring the number of Supervisor SORs and HSE Personnel SORs. When the number of HSE personnel SORs is greater than the Supervisor's, it can easily be determined that the outnumbered HSE Personnel are driving the HSE process and Supervision has not established the required level of "ownership" and daily involvement.

This measurement reveals that Supervisors may be lacking in training or belief in the HSE process. However, when the numbers are reversed on a 3:1 to 4:1 ratio of Supervisors SORs to HSE Personnel SORs, it indicates that ownership of the HSE program by Supervision has begun.

The SOR process benefits the overall HSE program by identifying unsafe acts and conditions on a continuous basis, thus allowing for corrective actions to be taken before an accident occurs. It also serves as an excellent tool for assessing the health and safety program, and incorporating improvements to strengthen any weaknesses observed. HSE program assessment is a requirement of OSHA and this tool allows for one of several compliance measures. One excellent indicator of the SOR, as mentioned above, is that it illustrates a level of ownership of the HSE program by employees and Supervision.

4.5. Safety Sampling Techniques

The Safety Sampling Technique presents a method of monitoring compliance to specific rules, regulations or standards for program assessment verification. The technique produces a percentage of compliance from 0% to 100% by measuring the total number of chances to comply divided into the number of non-compliance discrepancies observed. For instance, if 100 employees are in a position, which requires use of fall protection equipment and only 98 employees are in compliance, then 2% (or 2) of the employees are not in compliance. The technique can be used for compliance measurement for items such as Hazard Communication, Confined Space Entry, Lockout/Tagout, etc. Once the technique is finished for a particular compliance issue, corrective action must be taken based on results of findings.

Safety sampling is normally done by the HSE representatives at a specific location or project; however, someone familiar with the compliance requirements of a given issue can effectively administer the technique.

The primary benefit of safety sampling is to identify deficiencies in compliance so that positive actions to correct deficiencies can begin. The data accumulated from safety sampling allows the Company to virtually determine at what level of compliance the overall job, or the entire Company is, in regards to a given issue.

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4.6. Measurement and Data Accumulation

In order to determine the overall effectiveness of any program, some form of measurement or data accumulation must be conducted. Data can be accumulated for many HSE issues, e.g., OSHA Recordable Cases, workhours per accident, workhours per E-1, SER score. The 2nd, 4th, and 5th tools described in this HSEP provide a means of measuring, which can indicate program deficiencies practically to the exact area.

These tools allow determination of specific strengths or weaknesses on a project, as an operating group, or of the entire Company in general. Once clearly and specifically identified, effective corrective actions will be implemented that focus directly on the deficiency.

4.7. Training

Each employee must be trained and educated on their individual responsibilities contained in these six tools. The SPA/TSA process and the SOR process require each employee to receive formal training as well as on-the-job training, from their direct Supervisor.

5.0 REFERENCES & RELATED DOCUMENTS

HSEP 5.1, Accidents, Injuries, and Illnesses

6.0 FIGURES

Safe Plan of Action (SPA) Form
Safety Observation Report (SOR) Form

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Figure 1

Safe Plan Of Action

(HSEP 2.16f1)

Project No. _____

Job/Task _____ **Work Area** _____ **Date** _____

Steps of Task	Hazard/Reaction to Change	Safe Plan	Resources

Team Members' Signatures

_____ _____ _____ _____

_____ _____ _____ _____

_____ _____ _____ _____

The signature of the supervisor confirms the completion of the hazard assessment and Safe Plan of Action by the crew.

Supervisors Signature: _____ Date_____

Instructions: 1. Write name of job or task in space provided. 2. Conduct walk-through survey of work area. 3. Write the steps of the task in a safe sequence. 4. List all possible hazards involved in each step and reaction to change. 5. In the Safe Plan column, state actions that will be taken to prevent the hazards or injury from reaction to change. 6. In Resources column, list equipment, tools, etc. needed to do the job. 8. Ask each team member, who helped develop and will use this SPA, to sign in spaces provided. 9. Review the SPA at the end of the task for improvements.

Work shall stop when conditions change, the job changes, or a deficiency in the plan is discovered, and the current SPA will be modified or a new SPA created.

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Review checklist while completing front page of SPA. Check all that apply.

A new SPA is required if the job scope or work conditions change.

Required Permits	Hazards	Safe Plan
☐ Confined Space	☐ Overhead Utilities	☐ Power de-energization required ☐ Insulation blankets required ☐ Wire watcher required
☐ Critical Lift		☐ Required clearance distance = _____Ft. ☐ Safe work zone marked
☐ Hot Work	☐ Crane or other Lifting Equipment	☐ Signalman assigned ☐ Tag lines in use ☐ Area around crane barricaded
☐ Lock Out/Tag Out		☐ Lifting equipment inspected ☐ Personnel protected from overhead load
☐ Soil Disturbance (Over 12")	☐ Underground Utilities	☐ Reviewed as-builts ☐ Subsurface surveys ☐ Received dig permit
☐ Utility Clearance		☐ Required clearance distance = _____ Ft. ☐ Safe work zone Marked
Required PPE	☐ Electrical	☐ Lock Out/Tag Out/Try Out ☐ Permit required? ☐ Confirm that equipment is de-energized
☐ Hard Hat, Class C		☐ Reviewed electrical safety procedures
☐ Hard Hat, Class E *(Elect. Protect)*	☐ Excavations	☐ Permits ☐ Inspected prior to entering ☐ Proper sloping/shoring
☐ Ear Plugs/Ear Muffs		☐ Barricades provided ☐ Access/egress provided ☐ Protection from accumulated water
Eye Protection:	☐ Fire Hazard	☐ Hot Work Permit ☐ Fire Extinguishers ☐ Fire watch
☐ Safety Glasses		☐ Adjacent area protected ☐ Unnecessary flammable material removed
☐ Face Shield	☐ Vehicular Traffic or Heavy Equipment	☐ Traffic Barricades ☐ Cones ☐ Signs ☐ Flagmen ☐ Lane closure
☐ Chemical Goggles		☐ Communication with equipment operator
☐ Welding Hood	☐ Noise >85 dB	Hearing protection is required: ☐ Ear plugs ☐ Ear Muffs ☐ Both
Hand Protection:	☐ Hand & Power Tools:	☐ Inspect general cond. ☐ GFCI in use ☐ Identified PPE required for each tool
☐ Cut Resistant Gloves		☐ Reviewed safety requirements in operators manual(s) ☐ Guarding OK
☐ Welders Gloves	☐ Hand Hazards	List sharp tools, material, equipment: _____
☐ Nitrile Gloves		☐ PPE gloves, etc. ☐ Protected sharp edges as necessary
☐ Surgical Gloves	☐ Manual Lifting	☐ Reviewed proper lifting tech. ☐ Identified material requiring lifting equipment
☐ Rubber Gloves		☐ Hand protection required ☐ Back support belts
☐ Elect. Insulated Gloves	☐ Ladders	☐ Inspect general cond. before use ☐ Ladder inspected with in last quarter
☐ Arm Sleeves		☐ Ladder tied off or held ☐ Proper angle and placement ☐ Reviewed ladder safety
Foot Protection:	☐ Scaffolds	☐ Inspect general condition before use ☐ Tags in place ☐ Properly secured
☐ Sturdy Work Boots		☐ Toe boards used ☐ Footings adequate ☐ Materials properly stored on scaffold
☐ Safety Toe Boots	☐ Slips, Trips Falls	☐ Inspect for trip hazards ☐ Hazards marked ☐ Tools & material properly stored
☐ Rubber Boots		☐ Extension cords properly secured ☐ Work zone free of debris
☐ Rubber Boot Covers	☐ Pinch Points	List potential pinch points: _____
☐ Dielectric Footwear		☐ Working near operating equipment ☐ Hand/Body positioning
Respiratory. Protection:	☐ Working w/ Chemicals	☐ List specific chemicals involved and list hazards and precaution on front side. ☐ Reviewed MSDS ☐ Exposure Monitoring required ☐ Have proper containers and labels. ☐ Identified proper PPE (respirators, clothing, gloves, etc.)
☐ Dust Mask		
☐ Air Purifying Respirator	☐ Asbestos or Lead Paint Potential	☐ Areas to be worked may contain asbestos or lead paint ☐ Asbestos controls incorporated
☐ Supplied Air Respirator		☐ Lead based point controls in place ☐ Exposure monitoring conducted.
☐ SCBA	☐ Heat Stress Potential	☐ Heat stress monitoring (>85°) ☐ Liquids available ☐ Cool down periods
☐ Emergency Escape Respirator		☐ Sun Screen ☐ Reviewed Heat Stress symptoms
Special Clothing:	☐ Cold Stress Potential	☐ Proper clothing (i.e.. gloves, coat, coveralls) ☐ Wind chill <32°
		☐ Reviewed Cold Stress symptoms ☐ Warm up periods
☐ Tyvek ®	☐ Environmental	☐ Air emissions ☐ Water discharge ☐ Hazardous wastes ☐ Other wastes
☐ Poly Coated Tyvek ®		☐ Pollution prevention ☐ Waste minimization
☐ Fire Resistant Coveralls	☐ Natural or Site Hazards	☐ Weather ☐ Terrain ☐ Adjacent operations or processes ☐ Biological hazards
☐ Rain Suit		☐ Animals/reptiles/insects hazards
☐ Safety Vest	☐ Adjacent Work/Processes	☐ Notified them of our presents ☐ Other workers adjacent, above, or below.
Fall Protection:		☐ Coordinated with adjacent supervisor/customer/operator ☐ Need barriers between.
	☐ Barricades/covers	☐ Caution barricade tape required ☐ Danger barricade tape required ☐ Rigid railing required
☐ Harness		☐ Covers over opening ☐ Warning signs required
☐ Double Lanyard Required	**Additional Information:**	
☐ Anchorage Point Available		
☐ Additional Anchorage Connector Needed e.g. Cross Arm Strap, etc.		
☐ Retractable Device Needed		
☐ Horizontal Life Line System Req'd.		
☐ Fall Clearance Distance Adequate		
☐ Fall Rescue/Retrieval Plan Set Up		

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Figure 2

Safety Observation Report (SOR)

Date:_____ Time:_____

Person Submitting This Report:_____

Observation:_____

_____

_____

Action Taken:

Immediate Corrective Action:_____

Action to Prevent Recurrence:_____

Indirect Cause:_____

Corrective Action:_____

Commitment?_____

Further Action or Help Needed?_____

_____

_____

Signature:_____

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HSE Procedure		Document No: HSEP 2.2	Page: 1 of 12
Safety Evaluation Process		Supersedes: HSEP 2.2 Rev 3	Revision: 4 Issue Date: 28 Dec 07
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1.0 PURPOSE AND SCOPE

The Safety Evaluation Process is a core element of the Jacobs Health, Safety, and Environment (HSE) Program (ref. GSOP 350) and defines the approach for the evaluation of the HSE program for office and field locations. By continually evaluating our work environment, we can ensure that we are providing an environment that enables our people to work safely and go home healthy.

Findings from the evaluation will help identify effective program element implementation, specific hazards, and issues of concern, and will provide a basis for continuous improvement. In addition, the Safety Evaluation Process will help identify best practices that may be beneficial to other elements of the company.

The Safety Evaluation is intended to be comprehensive in scope and includes an evaluation of the implementation of all appropriate HSE plans, policies, and procedures, including company, client, and regulatory requirements.

This procedure is applicable to all work locations and projects where Jacobs employees, subcontractors, and other contractors perform work while implementing the Jacobs HSE Program. Hereafter, the term “site” is intended to refer to project location, work site, or office.

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The Safety Evaluation should be tailored to meet the specific needs and requirements of the site. Specifically, for agency projects and staff augmentation projects, not all aspects of the evaluation may be applicable. In those cases, the scoring form and actual conduct of the evaluation should be tailored to provide the maximum benefit to the site.

Activities of employees, subcontractors, and any other exposures that could pose risk to them or a liability for our client or for the Company shall be addressed in the evaluation. Concerns identified during the evaluation that are not within the contractual responsibility of the Company and that do not present an exposure to employees or subcontractors should be forwarded to the appropriate responsible party but are not included in the evaluation report.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

2.1. Senior Operations Management

The senior operations manager is responsible for:

- Ensuring that Safety Evaluations are scheduled at appropriate intervals,
- Identifying operations management representatives to serve as members of the evaluation team,
- Reviewing the findings of the evaluations conducted at their sites, and
- Ensuring proper focus on identification and implementation of effective improvement initiatives and completion of corrective actions.

2.2. Project/Office/Site Manager

The site manager is responsible for:

- Defining the schedule in the site safety plan (HASAP) for conducting Safety Evaluations,
- Providing necessary resources to support the evaluation, including escorts, documentation, PPE, etc.,
- Ensuring access to all HSE records and all work areas,
- Prompt correction of all hazards identified during the evaluation, and
- Developing a corrective action plan, when appropriate, based on the findings of the evaluation.

2.3. HSE Department

The HSE Department is responsible for:

- Recommending appropriate HSE personnel to serve on the evaluation team, including an HSE Lead and specific subject matter experts, where appropriate,
- Providing evaluator training to operations and HSE personnel,
- Reporting results to management in monthly HSE reports,
- Evaluating the findings to identify trends or common deficiencies, and
- Monitoring, evaluating, and improving the evaluation process, including ensuring that the evaluation categories are appropriate for the project/line of business/region, etc.

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2.4. Evaluation Team

The evaluation team shall consist of both operations and HSE personnel and is responsible for:

- Conducting the evaluation and objectively documenting findings,
- Suggesting and discussing possible corrective actions for deficiencies identified during the evaluation, and
- Completing and issuing the report in a timely manner.

2.5. Team Lead

One person shall serve as the evaluation team lead and be responsible for overall coordination of the Safety Evaluation Process. Typically, the Team Lead is the lead HSE person on the team. The detailed responsibilities of the Team Lead include:

- Coordinating and scheduling the evaluation with the responsible manager,
- Ensuring that an evaluation team of appropriate size and expertise is assembled to perform the evaluation,
- Providing the evaluation team with any necessary resources in advance of the evaluation, including, but not limited to, providing a copy of the location's previous evaluation report and site-specific HSE plan to all team members,
- Ensuring that team members have received evaluator training, and
- Distribution of the report.

2.6. HSE Lead

The evaluation team HSE Lead shall serve as the primary technical consultant to the team and responsible for:

- Recommending evaluation team members based on requisite expertise,
- Providing guidance on tailoring the Safety Evaluation to the site,
- Providing technical and procedural guidance during the evaluation and preparation of the report, and
- Providing consultation to the site to facilitate the identification of corrective actions.

3.0 DEFINITIONS

HSE Department	Refers to the Jacobs Health, Safety, and Environment Department, typically referred to as "HSE," and includes non-project personnel responsible for project or regional oversight.
Imminent Danger	Situations or conditions that could reasonably be expected to cause death or immediate serious physical harm to personnel or significant damage to property or the environment.
Evaluation Team Lead	A member of the operations or HSE management team, who has thorough knowledge of the Company HSE program, is trained in the use of this procedure, and who serves as the leader of the evaluation team.
Project/Office/Site Manager	The Jacobs employee responsible for overall project execution, including implementation of the project's or office's HSE program. In some cases, the Project Manager and the Site/Construction Manager may be the same person.
Site	Any location where Jacobs employees perform work, including offices, project sites, construction sites, operations sites, etc.

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Senior Operations Management	The senior levels of management within each operating unit, including the Group Vice President and those Operations management personnel above the site/office management level.

4.0 PROCEDURE

4.1. General Requirements

The Safety Evaluation process shall be implemented for all sites where Jacobs employees, subcontractors, and other contractors perform work while implementing the Jacobs HSE Program.

The evaluation shall be conducted by an Evaluation Team consisting of, at a minimum, one operations representative and one HSE representative.

The purpose of the evaluation shall be to:

- Evaluate the level of leadership engagement and management commitment in the site safety program,
- Evaluate the level of employee and worker engagement in the site safety program,
- Confirm that essential HSE program elements are implemented,
- Identify gaps between the site-specific HSE program and the Jacobs HSE program requirements,
- Ensure appropriate focus on hazard identification and implementation of effective controls,
- Assist in the identification of hazards not previously identified and to suggest controls for eliminating or mitigating those hazards,
- Identity opportunities for improvement and best practices, and
- Recommend necessary corrective actions.

Corrective actions identified as a result of the evaluation shall be implemented in a timely manner.

4.2. Scheduling the Evaluation

Newly established sites, including office locations, should have an initial Safety Evaluation scheduled during the early stages, typically within 30 days of occupancy or mobilization.

At a minimum, all sites shall be evaluated annually. Sites with field operations should be evaluated more frequently, typically on a bi-annual basis. In any case, more frequent evaluations may be deemed necessary based on various factors, including:

- Hazards and risk associated with the work activities,
- Complexity of the site and/or project,
- Major changes in scope,
- Performance on the site,
- Past performance with the particular client, subcontractor, or other contractors, and
- Experience of project or site team.

The schedule for evaluations shall be defined in the site-specific HSE plan (HASAP).

4.3. Staffing the Team

The Evaluation Team should be comprised of at least one operations management representative and one HSE representative. Typically, this would include those Operations and HSE management representatives responsible for oversight of the location being reviewed.

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Members of the management team for the site being evaluated should not serve as a member of the Evaluation Team. The evaluation team should include one person capable of providing a "cold eyes" review of the site.

Factors such as scope of the evaluation, workforce size, hazards, site geography, project complexity, etc., shall be considered when determining the size and make-up of the evaluation team.

4.4. Planning the Evaluation

Planning for the evaluation should be accomplished far enough in advance and should consider:

- Availability of potential Evaluation Team members,
- Availability of key project, site, or office personnel,
- Access to work areas (taking into consideration production schedules, outages, critical work activities, etc.),
- Security clearance/pass,
- Camera and/or special equipment use requirements,
- Site-specific training requirements,
- Travel logistics,
- Review of previous evaluations and the site-specific HSE plan, and
- Areas of concern identified by the site management team.

The actual on-site duration of the evaluation will depend on several factors, including size and complexity of the site, size of the workforce, scope of the work, and other factors. Some evaluations can be completed in one day, many require two days, while larger or more complex locations may require a week or more.

In all cases, the evaluation should focus on work areas where the majority of the workforce is actively engaged in performing tasks.

4.5. Conducting the Evaluation

4.5.1. Opening Meeting

An opening meeting will be conducted and chaired by the Team Lead. The meeting should be attended by site management personnel and other personnel participating in the evaluation.

The purpose of the opening meeting should be to discuss the following:

- Scope of the evaluation,
- Strategy for conducting the evaluation, including sequencing of the walkthroughs, program review, and worker interviews,
- Expectations of the site team during the evaluation,
- Areas of concern identified by the site management,
- Interaction with client and/or subcontractor employees,
- Team break-out to cover work areas in the time allotted (if appropriate),
- Site issues, including client issues, security, special hazards, or local requirements,
- Action items or open items from the previous evaluation,
- Detailed schedule, including the time and location of the closing meeting,

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- Scoring strategy, and
- Timing of preparation and distribution of the final report.

Open dialog regarding HSE program implementation issues is critical to the ultimate effectiveness of the evaluation. Therefore, participation by parties that could potentially distract from the goal of the evaluation should be avoided.

4.5.2. Work Area Walkthroughs

Work area walkthroughs shall be conducted by the evaluation team to assess site hazards and controls and to interact with the workers by observing the work in progress and engaging in informal conversation.

The purpose of the informal conversation shall be to assess the knowledge and understanding of the worker with regard to hazards, work control procedures and processes, safe work practices, HSE processes, and other aspects of the site safety program.

In addition, the informal conversation with workers will serve to assess leadership and employee engagement in the HSE program.

Work area walkthroughs may be performed by the evaluation team as a whole or by multiple sub-teams, particularly when the site is large and there is a need to cover more work areas.

4.5.3. Imminent Danger Situations

In the event of an imminent danger situation, the evaluation activities shall be suspended to ensure the situation is addressed appropriately, including informing the site manager. All personnel shall be removed from the hazard and the situation secured to prevent further exposure until the situation is remedied.

4.5.4. Worker Interviews

As part of the walkthrough portion of the evaluation, the evaluation team members will randomly select workers for informal one-on-one or small group interviews. Where possible the workers interviewed shall be a representative sample of the workforce.

The purpose of the interviews will be to assess leadership engagement and commitment, employee involvement, and knowledge and understanding of the site HSE program.

Personnel from various categories (helpers, craftsmen, technicians, foremen, supervisors) should be interviewed, including personnel from various units, departments, disciplines, crafts, etc.

Interview findings shall be treated in a confidential manner and the names of personnel interviewed shall not be included in the evaluator notes or in the final report.

4.5.5. Documentation Review

A documentation review shall be performed in order to assess compliance with requirements for standard postings, records, certifications, licenses, written programs, and other documents required by the company or by local regulation.

The document review guide in the Safety Evaluation Scoring Form spreadsheet, or a country-specific equivalent listing of required documentation, should be used as guidance when performing the document review.

4.5.6. Closing Meeting

At the conclusion of the site evaluation, a closing meeting shall be conducted with the site management team. The purpose of the closing meeting is to provide a summary of the evaluation highlighting positive findings, issues of concern, and potential corrective actions.

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In general, the following should be addressed in the closing meeting:

- Feedback regarding positive findings,
- Discussion regarding observed best practices,
- General summary of areas where corrective action will be required,
- Recommended follow-up for areas needing evaluation (gaps),
- Feedback from the site management team,
- Schedule for report distribution,
- Schedule for the next evaluation, and
- Post-Evaluation Survey.

4.6. Evaluation Categories

The site shall be evaluated in the following categories:

- Leadership engagement and management commitment,
- Employee involvement,
- Jacobs HSE program implementation,
- Work control procedures and processes, and
- Site hazards and controls.

Ideally, the evaluation should address all relevant evaluation categories and sub-categories. Due to work scope, hazards present, and other factors, it may be impractical or impossible to consider some sub-categories identified on the scoring form. Conversely, additional sub-categories may be required due to the work scope, hazards, and other factors specific to the project, line of business, or region.

Example questions and discussion topics provided in the Safety Evaluation Scoring Form spreadsheet should be used as guidance for the evaluation of the various categories.

4.7. Scoring the Evaluation

The Safety Evaluation shall be scored in the following five major categories:

- Leadership engagement,
- Employee involvement,
- HSE program implementation,
- Site hazards and controls, and
- Work control procedures and processes.

Scoring of the evaluation shall be a collaborative process and shall include input from the entire evaluation team. Using the input from the team, the Team Lead will develop a draft of the final report. The draft will be distributed to the team for review and comment. Ideally, the evaluation team will reach consensus on the content of the draft report, including the scoring of categories.

The evaluation shall be based on factual and objective findings and shall not include any subjective comments unless those comments have been thoroughly discussed with the evaluation team and the site team and are deemed to be constructive to the process.

The evaluation categories will be scored on a 0 to 100 point basis with equal weight given to each of the five evaluation categories.

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Categories A, B, and C will be evaluated based on an assessment of ten primary criteria, each of which will be scored on a 0 to 3 point basis. The score for each criterion will be based on discussions with site management, interviews and discussions with workers, and objective evidence from walkthroughs. Example questions and discussion topics are provided in the Safety Evaluation Scoring Form spreadsheet.

In determining the criterion score, the following guideline shall be used:

Score	Assessment Criteria Description
0	No evidence exists on which to base an assessment; Jacobs HSE program elements not implemented
1	Some evidence exists to support assessment; Jacobs program elements partially implemented or in initial or rudimentary stages
2	Consistent evidence exists to support assessment; Jacobs program elements implemented but not functioning at a high level
3	High degree of evidence exists to support assessment; Jacobs program element is fully implemented and functioning at a high level

In addition to scoring each criterion, comments should be documented and should include positive comments and opportunities for improvement.

For site hazards and controls, each sub-category will be evaluated based on hazards identified and effectiveness of controls implemented. Questions provided in the Safety Evaluation Scoring Form spreadsheet should be used as guidance during the evaluation.

For work control procedures, processes, and documentation, each sub-category will be evaluated based on the presence and effectiveness of the required work control procedures, compliance with applicable company procedures and local regulation, and the documentation of those procedures, as well as other required documentation (postings, signage, etc.). Questions provided in the Safety Evaluation Scoring Form spreadsheet should be used as guidance during the evaluation.

Sub-categories have been assigned a point value based on importance factor or potential severity. Deductions from the point value will be assessed for deficiencies identified during the evaluation. For each deficiency identified, an appropriate deduction will be made using the following as guidance:

- 2 point deduction for minor deficiencies
- 5 point deduction for moderate deficiencies
- 10 point deduction for serious deficiencies

The following risk assessment index, based on probability of occurrence of an incident and potential severity of outcome can be used as an aid in determining whether a particular deficiency is rated as minor, moderate, or serious.

Risk Assessment - Deduction Matrix

Probability \ Severity	1	2	3
1	2	2	5
2	2	5	10
3	5	10	10

Minor
Moderate
Serious

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For repeat or uncorrected findings from the previous evaluation, the deduction points for that category shall be raised to the next higher level, e.g., 2 to 5, 5 to 10, and 10 to 20.

In addition to the score, comments should be documented for each evaluation sub-category. Both positive and negative findings should be documented. Generally, the more information and comments provided to the site team, the more valuable the report will be in terms of affecting improvement at the project or site.

If a particular evaluation sub-category or portion of a category does not apply, it will be so indicated in the scoring form as “Not Applicable” or “N/A”. If a sub-category or part of a category is marked as N/A, it will not contribute to the total available points.

If a subcontractor is associated with an identified deficiency, it is helpful if the name of the subcontractor is provided along with the description of the deficiency.

For scoring purposes, the evaluation team may choose to either cite multiple findings of the same type (e.g., eye protection, respirators not in use, fire extinguishers, eye wash stations, emergency showers, emergency lighting), as individual deficiencies or as a single program deficiency. Typically, multiple individual deficiencies are scored as minor or moderate, whereas a single program deficiency reflecting multiple findings is often scored as moderate or serious.

Regardless of the number of deficiencies identified, the score for any single subcategory shall not be below zero.

4.8. Documenting the Evaluation

The Safety Evaluation shall be documented using the Safety Evaluation Scoring Form spreadsheet or by written report with the scoring form included as an attachment.

4.8.1. Report Content

The final report of the Safety Evaluation should, at a minimum, address the following:

- Summary information of the site evaluated, including brief description of the scope of work, type of project, size of workforce, approximate percentage complete, and other pertinent facts,
- Special circumstances or conditions associated with the site,
- Discussion of findings in each major evaluation category, including positive findings and deficiencies,
- Summary of evaluation, including points deducted for each deficiency, total points for each evaluation category, and total score,
- Best practices,
- Opportunities for improvement,
- Required actions, including corrective actions and necessary follow-up, and
- Format.

A recommended template for the written report is provided as Figure 1.

4.8.2. Distribution

The final report should be issued by the evaluation team within a week of the closing conference. The timing and the report distribution should be discussed during the closing meeting.

Distribution should include the site management team and the next two levels of operations and HSE management personnel.

The HSE Department shall also include Safety Evaluation results in monthly reports to senior management.

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4.8.3. Photography

Photographs illustrating unsafe conditions and best practices are encouraged. Approval to use a camera on the site or to use photographs should be obtained in advance due to potential security concerns.

5.0 IMPROVEMENT ACTIONS

5.1. Corrective Actions

The site manager is responsible for ensuring that all items requiring corrective action are addressed in a timely manner with an emphasis on correcting the primary causal factors rather than only correcting the deficiency identified.

The Corrective Action Plan shall be developed and submitted to the operations manager at the next level above the project/site or office manager and to the Team Lead in a timely manner, typically within seven calendar days of the receipt of the Safety Evaluation Report.

5.2. Post-Evaluation Survey

Following the evaluation, the site management teams shall complete the Post-Evaluation Survey (Figure 2) and submit it to the Team Lead.

The purpose of the survey is to improve the evaluation process by getting direct feedback regarding the perceived value of the evaluation to the site.

5.3. Follow-up Actions

Based on the results of the evaluation, the Evaluation Team may recommend follow-up actions, including but not limited to a follow-up Safety Evaluation (complete or partial) and corrective action review.

Findings that may warrant a follow-up evaluation, regardless of score, include:

- An unusually high number of deficiencies
- Deficiencies of a particularly serious nature (regardless of number)

The Evaluation Team will discuss the potential for follow-up actions with the site management team during the closing meeting. Any necessary follow-up actions will be identified in the final report.

6.0 TRAINING

All members of the evaluation team shall be trained in the Safety Evaluation process by a combination of formal training and informal on-the-job training. The formal training is provided in HSET 2.2, Safety Evaluation Process Training.

In addition, it is recommended that the site management team for the site being evaluated review or participate in the training and this HSEP in order to become familiar with the process.

7.0 RECORDS

The official copies of the Safety Evaluation Reports and associated documentation shall be maintained in the site files. HSE will also maintain copies of all reports generated by the Corporate HSE Department.

8.0 REFERENCES AND RELATED DOCUMENTS

Safety Evaluation Scoring Form

HSET 2.2, Safety Evaluation Process Training

9.0 FIGURES

Report Template

Post Evaluation Survey

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Figure 1

Report Template

Executive Summary

Provide a summary of the Safety Evaluation, including a description of the project or site evaluated and the location and date of the evaluation.

Provide a summary of the project, including pertinent information such as percent complete, summary of schedule status (ahead or behind schedule), site safety performance and achievements, and workhours to date for Jacobs, subcontractor, and contractor employees.

Provide an overall summary of the evaluation, including insight into the level of management engagement, employee involvement, and compliance the Jacobs HSE program.

Specific findings, including deficiencies, opportunities for improvement, and best practices are documented below.

Evaluation and Site Team

Identify the evaluation and site team, including names of the lead evaluation and site personnel.

Scope of Evaluation

Describe the scope of activities included in the evaluation by work type, location, and/or other means.

Identify the client for the project.

Describe the workforce on site at the time of the evaluation in terms of numbers and to whom they report.

Provide a summary of the overall scope of the evaluation in terms of evaluation categories identifying which categories were not fully evaluated and why (scope of work and scope of activities at the time of ht evaluation).

Scoring

Provide a scoring summary, including overall score and sub-scores for evaluation categories.

Summary of Evaluation Findings

Provide a summary of the evaluation findings highlighting the major positive and negative findings.

Detailed findings for each category are provided on the Safety Evaluation Scoring Form.

Best Practices Identified

Describe the best practices identified during the evaluation.

Opportunities for Improvement

Describe the opportunities for improvement.

Required Actions

Identify the required actions, including corrective actions and necessary follow-up actions.

Please respond to the evaluation team with your corrective action plan for any items noted as deficient in this report.

Distribution

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Figure 2

Post-Evaluation Survey

What were your expectations for this evaluation?

Were your expectations met? If no, describe how they were not met.

Was the Evaluation Team helpful? If not, describe how you think they could have been more helpful.

How did this evaluation help the project/site?

How would you suggest the evaluation process be improved?

Do you believe this evaluation format to be more valuable than the previous? Explain.

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HSE Procedure		Document No: HSEP 2.6	Page: 1 of 3
Job Site Notices and Posting Requirements		Supersedes: CHSP 2.6	Rev. 2
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1.0 PURPOSE AND SCOPE

This Corporate Health, Safety, and Environment Procedure (HSEP) provides the minimum procedures to be followed for posting required safety reference information in the workplace.

This HSEP applies to all employees and on-site contractors engaged in operations covered by the Company HSE Program.

2.0 RESPONSIBILITIES

General responsibilities for HSE procedures implementation are stated in HSEP 1.5. Additional responsibilities specific to this HSEP include the following.

3.0 DEFINITIONS

Access — The right and opportunity to examine and copy.

4.0 PROCEDURE

A copy of each notice described below must be posted at each work establishment. The notices should be prominently displayed, preferably on a bulletin board or at a location that would provide greatest exposure to employees.

4.1. "Health and Safety Protection on the Job" Poster

The OSHA poster entitled "Health and Safety Protection on the Job" shall be displayed and remain posted for the duration of the project.

4.2. Emergency Phone Number List

Post the list in conspicuous locations such as near the telephone and show current emergency numbers for medical assistance, fire/police, ambulance, and hospital.

4.3. Summary of Occupational Injuries

The OSHA Summary of Work-Related Injuries and Illnesses, OSHA Form 300A shall be completed, signed, and posted on an annual basis no later than February 1st and it should remain posted through April 30th. The document shall be kept on file for five years.

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4.4. Access To Employee Exposure and Medical Records Statement

A statement of Access To Employee Exposure and Medical Records (Figure 1) should be posted for the duration of the project.

4.5. Inspection and Storage

The Site HSE Supervisor shall make periodic inspections to ensure all required postings are present in the workplace.

Audits conducted by the Corporate HSE shall include an inspection for all required workplace postings.

5.0 REFERENCES & RELATED DOCUMENTS

29 CFR 1903.2, Posting of Notice, Availability of the Act

29 CFR 1904.2, Log and Summary of Occupational Injuries and Illnesses

29 CFR 1904.5, Annual Summary

29 CFR 1910.1020, Access to Employee Exposure and Medical Records

6.0 FIGURES

Access to Employee Exposure and Medical Records

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Figure 1

Access To Employee Exposure And Medical Records

Pursuant to the Occupational Safety and Health Administration Standard 29 CFR 1910.1020, the Company makes available to its employees:

- Employee exposure records relevant to exposure of toxic substances or harmful physical agents.
- Employee medical records pertaining to toxic substances and harmful physical agents.
- A copy of the 29 CFR 1910.1020 standard and its appendices and any other informational materials the standard.

Records required by OSHA Standards, other regulatory agencies, or by Company policies and procedures are maintained at various locations (jobsites, by Corporate Health, Safety, and Environment and by the Corporate Records Department).

These confidential records are available to the employee or his/her designated representative provided access conditions are met.

The person responsible for maintaining and providing access to the records at this worksite is:

_____,

Located at:

_____.

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HSE Procedure		Document No: HSEP 2.7	Page: 1 of 3
Work Permits		Supersedes: CHSP 2.7	Rev. 1
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1.0 PURPOSE AND SCOPE

Much of the work accomplished by the Company is within existing client operating facilities. Most clients have procedures at their operating plants to ensure that HSE precautions have been taken prior to commencement of work.

Safe work permits are issued by local operating personnel to control the work in operating areas and ensure that maintenance and/or construction personnel are aware of safe work practices.

Safe work permits are usually mandatory for the following operations:

- Line breaking
- Pump repairs
- Making tie-ins to existing equipment
- Working in hazardous areas
- Work on equipment used for corrosives
- Hydroblasting
- Flame or electric welding
- Electric power tools or motor
- Open flame devices
- Excavation
- Tank entry and/or lockout
- Vehicle entry into a hazardous area

2.0 RESPONSIBILITIES

General responsibilities for HSE procedures implementation are stated in HSEP 1.5. Additional responsibilities specific to this HSEP include the following.

2.1. Supervisors

Supervisors shall become thoroughly familiar with client requirements and procedure for obtaining work permits.

Supervisors shall ensure that affected employees are familiar with the requirements for work permits.

Supervisors shall coordinate all work with the client's operations representative ensuring that:

- A properly filled out work permit is issued,
- The hazards and limitations at the site are assessed,

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- A joint inspection of the area and positive definition of the work is accomplished, and
- All precautions are taken and safe practices are followed.

Upon issuance of the proper work permit by the client's operations representative, the supervisor shall sign the work permit verifying he/she has reviewed the permit and understands the limitations.

Upon receiving the permit, the supervisor has the responsibility to review the permit with his/her employees explaining the precautions and limitations of the proposed task. The employees shall also be instructed that work shall stop if changes in conditions occur.

The supervisor shall ensure that employees understand terms that may be used on a particular permit, which include: hot work, inert, safety-standby, toxic, purge, etc.

The supervisor shall make periodic inspections of employees permitted work activity. Safety Observation Reports (SORs) shall be used by the supervisor when safety deficiencies are observed.

2.2. Employees

It is the responsibility of all employees entering any client operating areas to obtain the proper authorization and appropriate work permit.

Employees must perform work within the scope/limitations outlined on the written work permit.

Employees must heed all permit warnings, precautions, and wear the required personal protective equipment.

Employees shall immediately stop work and notify supervision if any changes in job conditions take place.

3.0 DEFINITIONS

None

4.0 PROCEDURE

Before work begins the supervisor shall collaboratively develop a Safe Plan of Action with his/her employees and assure that they understand any potential hazards and the methods to eliminate or control the hazards.

4.1. Confined Space Entry

Confined space entry permits shall be issued when company employees are required to enter a confined space as defined in HSEP 7.2.

The confined space — even if vessels, pipe, etc., are clean and have never contained product — shall be tested for combustible gases, inadequate oxygen, or toxic atmospheres in accordance with HSEP 7.2. A confined space entry permit shall be issued on a daily basis.

After turnover of the equipment to the client, the client will issue their confined space entry permit when Jacobs employees are required to re-enter the confined space for any purpose.

4.2. Hot Work

A hot work permit shall be obtained before working in operating facilities when work involves welding, burning, grinding, or electrical.

4.3 Line Breaking

A line breaking permit is required before opening process lines or equipment containing materials that may pose a hazard to workers.

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5.0 TRAINING

All personnel working under a work permit system shall receive documented training on the work permit procedures prior to beginning this work activity.

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HSE Procedure		Document No: HSEP 2.8	Page: 1 of 3
Hazard Warnings		Supersedes: CHSP 2.8	Rev.
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1.0 PURPOSE AND SCOPE

This Corporate Health, Safety, and Environmental Procedure (HSEP) provides the minimum procedures to be followed when hazards are identified in the workplace, and there is no other specific HSEP from this Manual which specifies how to warn employees against those hazards.

This HSEP applies to all employees and on-site contractors engaged in operations covered by the Company Health, Safety, and Environment Program.

2.0 RESPONSIBILITIES

2.1. Site Management

Site Management must assume ownership and responsibility for implementation of the policy and procedures found in this HSEP.

2.2. Corporate Health, Safety, and Environment

Corporate Health, Safety, and Environment will assist Site Management with implementation and monitoring of compliance with this HSEP, as well as provide the expertise necessary to ensure the effectiveness of the overall HSE program.

3.0 DEFINITIONS

None

4.0 PROCEDURE

4.1. General

Hazard warnings may come in several different forms, which include signs, tags, permits, barricades, etc. The following are suggested hazard warnings that should be utilized.

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4.2. Barricade Tape

4.2.1. Yellow-Black (2")

Shall designate an area of "CAUTION" (hot work overhead, excavation, etc.)

Employees shall be allowed to move through an area marked with "CAUTION" marking, but only with knowledge of why the area is marked and with the approval of the individual(s) who erected the barricade.

Designed to alert employees to a hazard exposure.

4.2.2. Red (2")

Shall designate an area of "DANGER" (swing radius, work overhead, high noise, sand-blasting, hydro-testing, etc.).

Only authorized personnel shall enter a designated "DANGER" area. All others shall go around.

Denotes a high hazard or "DANGER" area.

4.2.3. Magenta-Yellow (2")

Shall designate a radiation area along with the required signals.

Employees shall not be allowed to enter this special controlled area unless authorized by the radiographic personnel.

Work Markings

Barricade tape with a working label may be used, but the color code should still apply.

4.3. Evaluation

The project shall be evaluated periodically for proper sign usage.

4.4. Tags

4.4.1. Use

Various tags/permits may be utilized during the course of a project with some being:

- Electrical lockout
- Danger
- Defective equipment
- Scaffold inspection

4.4.2. Electrical Lockout

Designates electrical equipment that has been taken out of service

Shall only be removed by the employee who installed the tag or his designee

4.4.3. Danger

Designates a hazard (valve open, etc.)

Shall only be removed by the employee who installed the tag or his designee

4.4.4. Defective equipment

Designates unsafe material or equipment (tools, scaffolds, ladders, etc.)

May be removed by the person repairing the defective tool or equipment

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4.4.5. Scaffold inspection

Designates that a scaffold is completed for use

Alterations to scaffold after initial construction require the placement of a new tag

Absence of the tag indicates that the scaffold shall not be used

The tag may also be used to designate scaffold ownership in the event no designated scaffold crew is used

4.5. Removal

The most important factor of all hazard warnings is that when the hazard no longer exists, the warning signal, sign, tag, or barricade tape shall be removed.

4.6. Inspection and Storage

Site Management shall ensure the jobsite is inspected and evaluated periodically for proper hazard warning device usage.

4.7. Training

A primary factor with any hazard warning is that all employees (including subcontractors, visitors, etc.) shall be educated as to the types of warnings and their definition.

All personnel shall be properly trained in accordance with this HSEP.

5.0 REFERENCES

29 CFR 1926.200, (Subpart G) Signs, Signals, and Barricades

29 CFR 1910.145, Specifications for Accident Prevention Signs and Tags

29 CFR 1910.96, Ionizing Radiation

29 CFR 1910.97, Non-Ionizing Radiation

ANSI Z53.1, Safety Color Coding for Marking Physical Hazards

6.0 FIGURES

None

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1.0 PURPOSE AND SCOPE

The goal of an accident and incident free job site can only be achieved through a cooperative effort by all contractors and workers on the entire project. This HSEP provides guidelines to be used when selecting subcontractors. It also provides HSE requirements to be implemented by subcontractors and their employees, who work on Company projects. It applies to subcontractors that have a contractual relationship with the Company and their lower-tier subcontractors.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

3.0 DEFINITIONS

Accident/Incident	An unplanned, undesirable event that disrupts work activity.
Attachment A	Refers to a document containing HSE Requirements for contractors, which is part of the contracts documents package that is generally referred to by HSE, the Contracts Management Group, and others as “Attachment A.”
Experience Modification Rating (EMR)	EMR is maintained exclusively by the insurance industry, is a comparison of the actual losses charged to an employer during the experience period with the losses that would be expected for an average employer reporting the same exposures in each classification. The published manual rate for each state is multiplied by the employer’s EMR to determine the premium rate paid by the employer. An EMR below 1.00 indicates that the employer will pay premiums below the manual rate. Calculating the EMR is often complex and different states have different rules that an insurance company must follow.
Contractor	Jacobs Engineering Group or the Jacobs operating group or subsidiary company named in this contract in which these Subcontractor HSE requirements are incorporated.
Contracts Management	CMG refers to the Jacobs Contracts Management Group and is sometimes use synonymously with the terms purchasing manager, subcontracts or

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Group (CMG)	procurement department, etc.
Safe Plan of Action (SPA)	A task-specific planning document used to help ensure that every task receives proper HSE assessment and planning. Also referred to as a Job Safety Analysis (JSA) in some locations.
Subcontractor	The party, including "subconsultants", defined in the subcontract with Contractor for which these subcontractor HSE Requirements are incorporated. Subcontractor HSE requirements shall extend to and govern Subcontractor's subcontractors, vendors, employees, and others under its direction or control.
Site/Project Management	The highest-ranking Contractor representative whose regular work location/office is at the project site.
Task Safety Awareness (TSA)	A review of the SPA among the crew and supervisor to discuss and resolve any HSE issues before work is continued, when there has been a break in the work schedule, change in work conditions, change in crew, etc.

4.0 HSE REQUIREMENTS

All prospective subcontractors shall be required to submit details of their recent HSE performance history as part of the bid evaluation process. Both the HSE Department and Operations management shall review this information as part of the formal evaluation and selection process.

All prospective subcontractors shall be provided a copy of Jacobs HSE requirements as part of the bid process. These requirements define Company HSE program elements and best practices and may exceed client or local regulatory agency rules and standards. Subcontractor requirements will also be thoroughly reviewed with subcontractor management representatives prior to their work beginning.

4.1. For Prospective Subcontractors in the US

HSE requirements for subcontractors, who will be evaluated for work in the US, are set forth in Attachment A, HSE Requirements for US Contractors, the project Hazard Assessment Safety Action Plan (HASAP), and Jacobs Health, Safety, and Environment Procedures (HSEPs). Attachment A will be appended to contracts made with subcontractors and subconsultants. The subcontractors shall be informed that Jacobs HSEPs are available upon request.

The Contracts Management Group (CMG) will require prospective subcontractors to complete the Subcontractor HSE Data Form (Exhibit 1 in Attachment A, HSE Requirements for US Contractors). The completed HSE Data Form will be forwarded to the HSE Department for evaluation.

The Contracts Management Group will classify subcontractors based on experience with the subcontractor on Jacobs projects and based on the review of Subcontractor HSE Data Form.

To facilitate the evaluation and classification, *either* the Jacobs Subcontractor Injury Performance Standard (JSIPS) *or* the Applicant Contractor HSE Rating Worksheet should be used by the HSE Department to determine appropriate classification.

- Jacobs Subcontractor Injury Performance Standard (JSIPS) is based on applicants' EMR and comparison of their incidence rates with the industry averages found in the North American Industry Classification System. This evaluation is typically performed by the Contracts Management Group with support from the HSE Department.
- Applicant Contractor HSE Rating Worksheet uses information provided by the applicant in the Subcontractor HSE Data Form, Exhibit 1, in Attachment A. This evaluation should be performed by the HSE Department.

If a client or contracting partner evaluation process is determined by Jacobs HSE to be equivalent to these pre-qualification processes, it may be used.

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4.2. For Prospective Subcontractors in Canada

HSE requirements for subcontractor, who will be evaluated for work in Canada, are set forth in Attachment A, HSE Requirements for Subcontractors in Canada.

4.2.1. The Contracts Management Group shall:

- Require prospective subcontractors to complete the Subcontractor Prequalification Evaluation Form for Canadian Operations.
- Require prospective subcontractors to complete the Pre-Qualification Document Checklist found in Attachment A, HSE Requirements for Subcontractors in Canada.
- Append Attachment A to contracts made with subcontractors and sub consultants.
- Forward the completed Subcontractor Prequalification Evaluation Form for Canadian Operations and accompanying documents to the HSE Department for evaluation.
- Retain all subcontractor documentation
- Maintain the subcontractor pre-qualification database.
- Forward all correspondence and requests for additional information or clarification to the subcontractor.
- Notify the subcontractor that they shall complete the Risk Mitigation Plan for Canadian Operations and submit it to Jacobs for evaluation and approval.
- Forward a copy of the successful applicants' Subcontractor Prequalification Evaluation Form for Canadian Operations including any accompanying documentation to the project/construction management.

4.2.2. The HSE Department will:

- Consider experience with the contractor on Jacobs projects.
- Use the Subcontractor Prequalification Evaluation Guidelines for Canadian Operations to evaluate each prospective subcontractor.
- Return the completed pre-qualification form to the Contracts Management Group for follow-up.
- Identify and notify the Contracts Management Group of any subcontractors requiring a Contractor Risk Mitigation Plan for Canadian Operations.
- Retain an electronic copy of all subcontractor evaluation forms.
- Review and approve, in conjunction with the Project/Construction department, all Risk Mitigation Plans.

4.2.3. Based on the evaluations, the HSE Department will classify each Subcontractor as either:

- Approved, based on the following criteria.
  - Meets Jacobs requirements for HSE performance, WCB ratings, and HSE management system.
- Conditionally Approved, based on the following criteria.
  - Performance and/or HSE management system does not meet all requirements.

  A Contractor Risk Mitigation Plan for Canadian Operations is required for all conditionally approved subcontractors.
- Unacceptable, based on the following criteria.
  - Subcontractor does not meet minimum HSE requirements.

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Subcontractors in this category can qualify to bid on future work providing they have a formal action plan in place and are showing improvement. Prior to qualifying, they must have approval of the Project/Construction Manager and Senior HSE Manager.

4.3. For Prospective Subcontractors in All Other Countries

For subcontractors in all other countries, the HSE Department will provide a document that defines Jacobs HSE requirements for subcontractors that incorporates appropriate local regulations, terms and expressions, titles, HSE performance expectations, etc.

The subcontractor HSE requirements document will be provided to the Jacobs Contracts Management Group to be appended to contracts made with subcontractors and subconsultants.

Based on experience with the subcontractor on Jacobs projects and on a review of information submitted by the subcontractor, the HSE department will utilize methods described in 4.1, as appropriate, to evaluate and classify applicant subcontractors as

- Acceptable — meets Jacobs requirements for HSE performance;
- Marginal — performance and/or HSE management program do not meet all HSE requirements; use of a marginal applicant requires a written HSE improvement plan from the applicant that is acceptable to both a Senior HSE Manager and Operations management. See Contractor Risk Mitigation Plan For Canadian Operations for a sample format; or
- Not acceptable — subcontractor does not meet minimum HSE requirements.

4.4. For Selected Subcontractors in All Countries

All provisions of Attachment A, HSE Requirements for US Contractors, the project HASAP, Jacobs HSEPs, and the provisions of the local, country/region-specific version shall be followed. If a conflict exists among those provisions, the most stringent will be followed.

4.4.1. Detailed HSE requirements shall be set forth in the contract and address the requirements of Attachment A. Among the provisions in the contract are the following key requirements.

- A Hazard Assessment Safety Action Plan, specific to their scope of work that has been generated by each subcontractor prior to mobilizing on the project. This Plan will be reviewed by the Company HSE Department representative.
- A project-specific emergency action plan in accordance with regulatory, client, and company requirements.
- Daily task-specific safety planning in the form of SPAs or JSAs.
- Participation by all subcontract personnel in Safety Observation Report (SOR) program.
- Completion of a Monthly Subcontractor Accident Statistics Report for each month in which they conduct work on the project.
- Responsibility for, and compliance with, all regulatory accident reporting and recordkeeping requirements for their employees.
- Prompt notification to Site Management of any accidents occurring on the project. Serious injuries, illnesses, or any accident involving a third party or a member of the public must be reported to Site Management immediately.
- Immediate notification to Site Management of any regulatory agencies' actions involving the subcontractor's work.

4.4.2. Before beginning work, selected subcontractors and their lower-tier subcontractors are to provide site management

- A copy of their HSE Program, and
- A copy of their Hazard Communication Program, if a US contractor.

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4.4.3. Attachment A shall be reviewed during kick-off meetings, readiness reviews, etc. so that subcontractor personnel are reminded of what is expected.

4.4.4. Site management shall monitor contractor compliance with HSE requirements throughout the contract's life. The Contracts Management Group shall be notified of any issues or outstanding performance with a specific contractor to feed into evaluation of prospective subcontractors for future projects.

5.0 REFERENCES AND RELATED DOCUMENTS

Attachment A, HSE Requirements for US Contractors

Jacobs Subcontractor Injury Performance Standard

Applicant Contractor HSE Rating Worksheet

Attachment A, HSE Requirements for Subcontractors in Canada

Subcontractor Prequalification Evaluation Form For Canadian Operations

Subcontractor Prequalification Evaluation Guidelines for Canadian Operations

Contractor Risk Mitigation Plan for Canadian Operations

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Attachment A

Jacobs
Health, Safety, and Environment Requirements
For US Subcontractors

Revision 8

October 2008

Health, Safety, and Environment Requirements For US Subcontractors

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1.0 SUBCONTRACTOR HEALTH, SAFETY AND ENVIRONMENT REQUIREMENTS

It is the policy of Jacobs, hereafter referred to as "Contractor", to select, contract with, and oversee Subcontractors with the same priority and emphasis on Health, Safety and Environment (HSE) protection as we practice for our own employees. It is a contractual requirement that Subcontractors comply with all applicable contractor, client, State, and Federal health, safety, and environmental regulations.

This Attachment specifies Contractor's HSE requirements that may exceed OSHA standards or the Subcontractors' normal HSE procedures. Subcontractors are responsible for reviewing and implementing the HSE requirements set forth in this Attachment, the Project Hazard Assessment and Safety Action Plan (HASAP), and Jacobs Health Safety and Environmental Procedures (HSEPs). Subcontractors are also responsible for ensuring that their lower tier subcontractors review and implement these HSE requirements.

2.0 DEFINITIONS

Accident/Incident	An unplanned, undesirable event that disrupts work activity.
Contractor	Jacobs Engineering Group or the Jacobs operating group or subsidiary company named in this contract in which these Subcontractor HSE requirements are incorporated.
Safe Plan of Action (SPA)	A task-specific planning document used to help ensure that every task receives proper HSE assessment and planning. Also referred to as a Job Safety Analysis (JSA) in some locations.
Subcontractor	The party, including "subconsultants", defined in the subcontract with Contractor for which these subcontractor Health, Safety, and Environmental Requirements are incorporated. Subcontractor Health, Safety, and Environmental Requirements shall extend to and govern Subcontractor's subcontractors, vendors, employees, and others under its direction or control.
Site/Project Management	The highest-ranking Contractor representative whose regular work location/office is at the project site.
Task Safety Awareness (TSA)	A review of the SPA among the crew and supervisor to discuss and resolve any HSE issues before work is continued, when there has been a break in the work schedule, change in work conditions, change in crew, etc.
Work	The total of the Subcontractor's responsibilities as set forth in the Subcontract Documents.

3.0 DOCUMENTATION AND REPORTING REQUIREMENTS

3.1. Before mobilizing to the project, the Subcontractor and its lower-tier subcontractors shall forward to the Contractor Site/Project Management a copy of their company's HSE Program.

3.2. Subcontractors must submit the information required by Exhibit 1, Subcontractor HSE Data Form, before award of subcontract, unless specifically exempted from this provision by the Contractor.

3.3. A project-specific HSE Plan or, in the case of hazardous waste operations, an HSP (see paragraph 3.4), must be generated by each Subcontractor mobilizing on the project. This plan must include a project-specific Emergency Response Action Plan in accordance with Contractor, Client, State, and Federal requirements.

3.4. If the project is regulated as a hazardous waste or emergency response operation, as defined in 29CFR 1926.65 or 29CFR 1910.120, then the Subcontractor has the choice of adopting the site Heath and Safety Plan (HSP) or developing a similar plan that is, at a minimum, equally protective and compliant. Subcontractor site personnel shall read and acknowledge by signature that they will comply with the applicable HSP.

3.5. Subcontractor shall furnish to the Contactor the names and qualifications of the Competent Persons and Qualified Persons, who may be required for their scope of work by the contractor's safety procedures and by Federal, State, or local regulations. Examples include Competent Persons and/or Qualified Persons for steel erection, excavation, scaffold erection, confined space entry, crane and rigging operations, annual crane inspections, fall protection, including horizontal lifeline systems,[1] etc.

3.6. Subcontractors are responsible for maintaining a First Aid Register (Exhibit 10) for all employee injuries and illness reported on the project.

3.7. Subcontractors must immediately inform the Contractor Site/Project Management of any OSHA, EPA, or other HSE regulatory agencies' inspections or other actions involving the Subcontractor's work.

3.8. Subcontractor employees must promptly report all potentially work-related incidents, injuries, or illnesses to their Supervisor or their Site HSE Representative.

3.9. Subcontractor must promptly report all potentially work-related incidents, injuries, or illnesses to the Contractor Site/Project Management or Contractor Site HSE Representative, after the appropriate level of medical assistance has been arranged.

3.10. Injuries, illnesses, or any incident involving a third party or a member of the general public must be promptly reported to the Site/Project Management.

3.11. Incidents involving potential exposures to hazardous materials and releases or spills of such materials must be promptly reported to the Site/Project Management.

3.12. Accident investigation reports for all Subcontractor accidents, injuries, and work-related illnesses shall be forwarded to the Site/Project Management within twenty-four hours of the occurrence.

3.13. Subcontractor employees are required to participate in documented, daily task-specific Safe Plans of Action (Exhibit 6) and regular Safety Observation Reports (Exhibit 7).

3.14. Subcontractors will conduct weekly HSE meetings, and signed copies of the meeting reports shall be made available to the Contractor upon request.

3.15. Subcontractors shall complete the Monthly Subcontractors Accident Statistics Report (Exhibit 2) for each month in which they conduct work on the project. These reports are due to the Contractor by the first business day of the month for the proceeding month.

4.0 HSE TRAINING/COMMUNICATION REQUIREMENTS

4.1. Subcontract employees must complete HSE training required by applicable Contractor, Client, State, and Federal HSE requirements. Such training may include, but is not limited to, a site-specific orientation and quiz provided by the Contractor, OSHA 10-Hour Construction Safety & Health Outreach Program, Safety Leadership Training for Supervisory Personnel, ergonomics training, and crane and rigging training. Documentation of all HSE training shall be maintained at the project site by the Subcontractor and provided to the Contractor upon request.

4.2. Workers involved with hazardous waste operations, as defined by 29 CFR 1910.120 or equivalent applicable State regulations, shall have met, prior to any field work activity or exposure, the training requirements of the standard. Certification of individual worker training shall be provided to Contractor prior to commencing work.

4.3. Subcontractors must certify that all operators of mobile equipment such as forklifts, cranes, aerial/boom lifts, buses, etc., have been trained and/or certified on the proper operation of the equipment. Mobile crane operators must be qualified on each crane (model, type, and rating) that they are assigned to operate through a testing and qualification procedure recognized by Contractor. Subcontractor will furnish qualified lift

[1] Added "horizontal lifeline systems," to paragraph 3.5.

supervisors that directly oversee the crane and associated rigging crews. Copies of their training and certification shall be maintained on the project site by the subcontractor and forwarded to the contractor upon request.

4.4. Subcontractors must establish a prompt and effective method of providing HSE communications such as HSE alerts, advisories, bulletins, regulatory updates, etc., to all site employees.

5.0 BASIC HSE REQUIREMENTS

The following HSE rules list Contractor's fundamental requirements for Subcontractor HSE. When there are multiple rules that may apply, the most stringent Contractor, Client, State, or Federal HSE regulations that govern the work shall be followed.

5.1. Each Subcontractor shall appoint an on-site HSE representative, who will attend regular Contractor HSE meetings and be responsible for implementation of the rules listed below, as well as other HSE rules determined, by the Contractor, to be necessary for the safe execution of the project. Subcontractors employing 35 or more workers, including their lower tier subcontract employees, must provide a full-time site HSE professional. Additional site HSE personnel are required for each additional 50 workers thereafter. Contractor shall determine appropriate qualifications for Subcontractor HSE personnel, based on project demands.

5.2. Hard hats (ANSI Z89.1 or equivalent) shall be worn at all times where overhead hazards exist (e.g. construction, environmental operations, operations or maintenance environment), regardless of the workers activities. This includes welders when using welding hoods.

5.3. Shirts with at least four-inch sleeves shall be worn at all times. No tank tops are allowed. Loose or frayed clothing, loose or hanging long hair, ties, rings, body jewelry, etc. shall not be worn around moving machinery or other areas where they may become tangled.

5.4. Hearing protection shall be worn when exposures exceed 85 DBA.

5.5. Hard-toe footwear (ASTM F2413, or equivalent) shall be worn by all workers when in the construction environment or in areas where there is a danger of foot injuries due to falling, rolling, or piercing objects or when employee's feet are exposed to electrical hazards.

5.6. Safety glasses with rigid side shields (ANSI Z87.1, or equivalent) shall be worn at all times when in the construction environment and in any area where eye hazards exist. This includes under welding hoods and for workers with prescription eye wear. Safety goggles may be worn over non-safety prescription eyewear.

5.7. Face shields must be worn in addition to safety glasses when grinding, chipping, jack hammering, and power sawing or when conducting other tasks that involve such face and/or eye hazards.

5.8. Gloves, appropriate for the hazard present, shall be worn when hands are exposed to absorption of harmful substances, cuts, abrasions, punctures, biological hazards, chemical burns, thermal burns, or harmful temperature extremes.

5.9. Subcontractor shall comply with the Contractor's 100% Fall Protection Policy. This policy states that "anytime employees are working from an unprotected elevation of six feet or more, fall protection must be used." Working as stated above means while traveling, stationary, or at anytime exposed to a fall from a surface not protected by approved handrails, guardrails or some other approved fall elimination device. Jacobs prohibits the use of positioning devices as the sole means of fall protection when working above six feet. Positioning device means a body belt or body harness system rigged to allow a worker to be supported on an elevated vertical surface, such as a wall, and work with both hands free.

5.10. The use of “passive” systems, such as safety nets, monitoring systems, or controlled access zones, as the sole means of fall protection when working above six feet, is prohibited. Jacobs prohibits the use of safety nets as an independent means of fall protection.

5.11. Workers in mechanical lifts, including scissor lifts, boom trucks, suspended or supported personnel baskets, articulating lifts, and other similar devices must use fall protection equipment at all times. Handrails on lifts may only be used for fall protection anchor points if approved by a Qualified Person. Such devices shall not be used as elevators to transport workers to different work locations.

5.12. All portable ladders must be clearly marked with the ladder owner’s name.

5.13. The safest means of worker access for overhead work (e.g., rolling scaffolds, mechanical lifts, platform ladders, etc.) shall be considered as alternatives to the use of portable ladders. If ladders are used, then the top of all straight and extension ladders shall be tied to a substantial anchor point before use; a second worker must hold the ladder until the tie-off is secure. And, if a worker’s feet are on or above the fifth rung of a stepladder, the top of the ladder must be tied to a substantial anchor or a second worker must hold the ladder throughout the task.

5.14. When ascending or descending a portable ladder, three-point contact is considered acceptable fall protection for fall exposures of less than 20 feet. When potential fall exposure exceeds 20 feet, personnel on ladders must be protected with a personal fall arrest system.

5.15. Decking sections shall be laid tightly and immediately secured upon placement to prevent accidental movement. During initial placement, decking sections shall be placed in such a manner to ensure full support by structural members and each piece shall be individually secured. Pre-installation or shake-out of multiple sections of decking using temporary methods of attachment, such as tack welding, is not allowed. The use of controlled decking zones is not allowed.

5.16. Work over or adjacent to water requires a specific safe work plan which must be approved by the Contractor before work begins. This includes, but is not limited to, rivers, lakes, canals, settlement ponds, and open tanks containing liquids. United States Coast Guard-approved Personal Flotation Devices (PFDs) must be worn when working over or adjacent to water. When working over water or adjacent to water without 100% fall protection, PFDs that will provide an unconscious user floatation in a face-up position must be used. Personnel shall not work over water alone.

5.17. Equipment and tools shall not be altered in any way to adapt it for a job for which the manufacturer does not intend it. The manufacturer of the equipment must approve any such adaptations or alterations to equipment in writing. Only trained and authorized persons shall operate machinery or equipment.

5.18. All hand-held power tools must be equipped with constant pressure switches that will automatically shut off power when the pressure (worker’s hand) is removed. Hand-held power tools with on/off or lock-on switches are not allowed.

5.19. Ground Fault Circuit Interrupters shall be used to protect all temporary electrical wiring and cord sets. The use of assured grounding (quarterly equipment inspections) in lieu of GFCIs is not an option.

5.20. Lock-out/tag-out procedures shall be followed to minimize the potential exposure of workers to hazardous energy. Hazardous pipelines or vessels will be isolated by using a double block and bleed system or by blanking. Every effort must be made to de-energize electrical equipment to be worked on and other electrical equipment in the area that may affect the work. If the equipment cannot be isolated or de-energized, written approval must be obtained from the Contractor’s Site Manager and Operations Manager before work proceeds. Only “Qualified Electricians” may work on energized or potentially

energized circuits. See 29 CFR 1910.332 for qualified electrician requirements. Jacobs considers equipment rated at 480 volts and above as "high voltage."

5.21. Subcontractor shall comply with the provisions of NFPA 70E, "Standard for Electrical Safety in the Workplace." Subcontractors shall ensure that their employees are trained in safe work practices, and that they are qualified, and that they are provided equipment, tools, and PPE that are specified in NFPA 70E.

5.22. Confined space entry work must follow a documented hazard assessment and safe work planning process, which must be submitted to the Contractor for review prior to entry.

5.23. High-visibility reflective safety apparel/vests (ANSI/ISEA 107, Class 2, or equivalent) must be worn by all personnel, who work on or near active highways, roads, or parking lots. Vests are also required for other work that places personnel, such as flaggers, riggers, survey crews, etc., near mobile equipment.[2]

Also, it is recommended that high visibility reflective safety apparel/vests be worn by all workers in the construction environment. The project-specific HASAP shall clearly define this PPE requirement.[3]

5.24. Motor vehicles and mobile equipment shall never be left running without an operator at the controls. Proper use of seatbelts by all occupants is mandatory. Motor vehicle operators are prohibited from using a mobile phone or two-way radio. This applies to both hands-free and non-hands-free devices. If the use of such a device by the motor vehicle operator is necessary, it is only allowed when the motor vehicle is stationary and in a safe location off the roadway. If required by the client, the use of two-way radios is allowed, provided that written approval by the relevant Jacobs Group Vice President is obtained and only while on a project location or within a client facility.

5.25. For movement of mobile equipment in congested areas, a designated flag-person shall be in full view of the operator and shall direct the movement. In some cases, multiple flag-persons may be required.[4]

5.26. The following are defined as "critical lifts" and require written approval from Contractor senior management. Mobile lifts:

- over 50 tons,
- exceeding 85% of the crane's capacity,
- involving more than one crane,
- of a non-rigid object,
- over active work areas,
- in active process facilities,
- over pipelines,
- near power lines or public property, or
- in confined or tight work areas.[5]

5.27. All outriggers on mobile cranes must be fully extended and fully deployed when the crane is used to lift or support a load. If, due to configuration or physical location, all outriggers cannot be fully deployed, calculations must be made from the "on-rubber" section of the

[2] Changed "motor vehicle" to "mobile equipment."
[3] New paragraph.
[4] New paragraph.
[5] Expanded list of examples of critical lifts.

load chart. On-rubber lifts and pick-and-carry operations require Contractor Site Manager's written approval.

5.28. Anti two-block devices that automatically disengage crane hoist/boom functions when the hook or block approaches the jib or boom tip are required on all cranes.

5.29. Multiple lift rigging (Christmas tree lifts) is not allowed without written approval by the Contractor's Senior HSE Manager and a written site-specific plan to prevent exposure to overhead loads during such lifts.

5.30. All skid-steer style loaders shall be fitted with a manufacturer-approved safety glass front door, front cage cover of equivalent effectiveness, or other device designed to keep the operator's hands and arms inside the protective cage. Operators are also required to use a manufacturer-approved shoulder harness.[6]

5.31. Smoking is allowed only in designated smoking areas that have been approved by Contractor.

6.0 CERTIFICATION, INSPECTIONS, AND REGULATORY AGENCY PERMITS

6.1. Certain operations may require a client and/or owner permit. Such activities may include but are not limited to hot work, confined space/vessel entry, excavations, asbestos abatement, lead abatement, etc. The Subcontractor representative shall ask Contractor Site/Project Management whether any parts of the Subcontractor's activities require a client and/or owner permit.

6.2. Some states and local authorities require permits for specific activities such as excavations, heavy lifts, asbestos/lead abatement, air permits, water permits, hazardous waste generation, etc. Subcontractors are responsible to secure and comply with these permits, unless Site/Project Management has delegated this responsibility to others in writing.

6.3. A third-party certified Competent Person shall make a thorough annual inspection of all cranes and powered hoisting equipment. Cranes assembled on site shall receive an annual inspection prior to being put into service. Documentation of all crane inspections shall be provided to the Contractor and must be maintained on site by the Subcontractor.

6.4. All scaffolding must be inspected and tagged by a Competent Person prior to initial use, before each work shift, and after any event that could affect its structural integrity. Suspended scaffolds must receive documented daily pre-use inspections. Untagged scaffolds must not be used.

6.5. Mobile equipment must receive daily pre-use inspections, which will be documented. Examples include forklifts, backhoes, personnel lifts/manlifts, etc.

7.0 HAZARDOUS CHEMICALS

7.1. Subcontractors shall include planning for environmental compliance in the preparation of their HSP or HSE Action Plan. Issues to be considered include but are not limited to release reporting, air permits, water permits, asbestos/lead permits or notifications, hazardous waste generation and related disposal procedures, spill mitigation and clean up methods, etc.

7.2. Subcontractor shall have a written Hazard Communication Program and comply with the requirements of that program. A copy of the program shall be forwarded to Site/Project Management prior to mobilization and a copy shall be in the possession of the Subcontractor on the site.

7.3. Any potentially hazardous material or chemical brought onto the site shall be accompanied by a Material Safety Data Sheet (MSDS). Copies of MSDSs shall be forwarded to the Site/Project Management before the product is brought onto the site.

[6] New paragraph.

Some sites, such as FDA regulated facilities, do not permit the use of chemicals that are not on a pre-approved list.

7.4. Small quantities (less than 10 gallons) of hazardous liquids, such as gasoline, diesel fuels, and solvents, brought onto the site shall be stored in a properly labeled safety container with a flame arrestor and self-closing lid.

7.5. Site/Project Management shall be notified before any chemical or material is used that could create foul smelling, noxious, or toxic vapors or gasses.

7.6. All accidents involving exposure to potentially hazardous materials and hazardous material releases (as defined by EPA-RCRA) must be immediately reported to the Contractor Site/Project Management. It is important to report all releases or exposures even though the incident may be considered minor or no adverse health effects or symptoms are apparent at the time.

8.0 RESPIRATORY PROTECTION

Subcontractors, who plan to use respirators as a part of their work operations, are required to forward to Site/Project Management a copy of their written Respiratory Protection Program. Refer to 29 CFR 1910.134.

9.0 HSE SURVEYS

Site/Project Management and the Contractor HSE Department shall conduct periodic HSE surveys of the site. Any HSE discrepancy observed shall be reported to the appropriate Subcontractor representative for immediate correction.

These HSE surveys do not relieve Subcontractors of their responsibility to self-inspect their work and equipment and to conduct their work in a safe and environmentally compliant manner.

10.0 PLANNING AND OBSERVATION PROCEDURES

In order to achieve the Contractor's goal of Zero Incidents, the following shall be implemented by the Subcontractor.

The SPA, the TSA, and the SOR process require each worker to receive on-the-job training from their direct Supervisor. Subcontractor employees shall also be trained and educated on their individual responsibilities contained in these tools by Contractor after mobilization.

10.1. Safe Plan of Action

The Safe Plan of Action (SPA) is developed by the crew assigned to perform the work with guidance from their Supervisor. (See Exhibit 6.) The Supervisor identifies the work area and task to be performed and then leads the crew in developing a Safe Plan of Action.

Creating the SPA requires the Supervisor to solicit crew participation in identifying hazards and hazard control measures such as PPE, training requirement, permits, procedures, etc.

Members of the team are required to sign the SPA document to indicate their participation, their understanding of the plan, and their agreement to follow the plan.

10.2. Task Safety Awareness

The Task Safety Awareness (TSA) meeting is a daily HSE briefing associated with the task(s) that are scheduled for the crew during the work shift.

These meetings generally take from two to ten minutes and address the HSE measures specific to the tasks.

TSA meetings shall be conducted at least daily and whenever a task presents a change of hazards from the previous tasks.

10.3. Safety Observation Reports

The Safety Observation Report (SOR), Exhibit 7, is a proactive process designed to identify and document HSE-related acts and conditions in the work environment. All Subcontractor's supervisors are required to participate in the SOR process by generating written SORs and turning them in to the Contractor Site/Project Management at least weekly.

The SOR allows any site worker to record observed proper or improper HSE practices and identifies the cause of any deficiencies so that corrective action can be taken.

11.0 ACCIDENT/INCIDENT INVESTIGATION

A formal accident investigation must be conducted when an accident occurs, including non-injury incidents, most first-aid type accidents, and environmental releases or spills.

11.1. In the event of a workplace accident, injury, or illness, the most important immediate actions are to provide medical assistance to those who may need it and to ensure the safety of others that may be affected or acting as emergency responders.

11.2. Securing the accident scene is essential to ensure an effective accident investigation. No materials or equipment shall be moved made until a review of the accident is completed, except when securing equipment or materials that could result in further injury.

11.3. Obtain witnesses' names, permanent addresses, and signed statements of their complete factual observations. (See Exhibit 9.)

11.4. All accident investigations must be documented using the Accident Investigation Report (Exhibit 8). All required reports should be completed and copies provided within 24 hours to the Contractor Site/Project Manager.

12.0 DRUGS, ALCOHOL, AND CONTRABAND

The Contractor strictly prohibits the use, sale, attempted sale, manufacture, possession, distribution, cultivation, transfer, or dispensing of any illicit substance. This includes the use or possession of prescription medications without a valid prescription.

Subcontractors shall implement a Drug, Alcohol, and Contraband Policy, including post incident testing, which meets the requirements of the Contractor's policy. Key elements of the Contractor's policy, except where prohibited by law, are:

- Pre-access/Pre-assignment testing current to within six months prior to initial assignment to work on the Contractor's project.
- Post-incident testing of any worker involved in a project-related workplace incident that results, or could have resulted, in
    - injury to any person requiring medical treatment beyond first aid,
    - any type of medical attention given by a third-party medical services provider (hospital, clinic, doctor, etc.),
    - a motor vehicle incident, or
    - property damage.

    Post-incident testing must be conducted as soon as possible after the incident occurs.
- Reasonable suspicion testing upon reasonable suspicion by Contractor or subcontractor management that a worker is under the influence of a prohibited substance. In such cases, worker(s) shall be immediately removed from the project and surrender their project credentials. Personnel so removed may only be allowed to return with a negative test result and written permission of the Contractor.

- Periodic random or unannounced testing for workers randomly selected or chosen by job classification or worksite. The percentage of the workforce, or the number of workers, selected for testing shall be specified on a project specific basis and stated in the project's Hazard Assessment Safety Action Plan.

Possession or use of alcohol in a Contractor-, client-, or subcontractor-provided vehicle is prohibited.

Any worker whose drug or alcohol test is positive will be removed from the project and required to surrender their project credentials.

Refusal to submit to drug or alcohol testing, or attempts to tamper with, adulterate, dilute, or otherwise tamper with a test sample will be treated the same as a positive test result.

Subcontractor shall adopt collection, chain-of-custody, and other related procedures consistent with sound industry practice.

The owner's (client's) drug and alcohol testing requirements may be more stringent than the Contractor minimums. If so, the owner's requirements shall be enforced.

If the Contractor suspects that a worker is in possession of illegal drugs, alcohol, or contraband, the Contractor may request the individual to submit to a search of his or her person, personal effects, vehicles, lockers, and baggage. The Contractor may also conduct random searches of individuals entering or leaving the work site. Any suspected contraband will be confiscated and may be turned over to law enforcement, as appropriate. If an individual is asked to submit to a search and refuses, that individual will be considered insubordinate, will surrender their project credentials, will be escorted off the job, and will not be allowed to return.

Contractor shall have the right to review the subcontractor's Drug, Alcohol, and Contraband Policy and to audit the subcontractor's implementation of their program at the jobsite.

Subcontractors shall comply with all applicable federal, state, and local alcohol and drug-related laws and regulations.

13.0 MEDICAL AND EXPOSURE MONITORING

Subcontractors involved with operations, such as those involving hazardous waste, asbestos or lead abatement, certain carcinogenic compounds, etc., shall describe their medical and exposure monitoring procedures and their proposed compliance methods in their HSE Action Plan or HSP.

Employees involved in these operations shall have met, prior to any fieldwork activity or exposure, the medical requirements of applicable regulations or standards, including, but not limited to, a baseline medical exam and periodic update exams, as required.

Employee medical requirements and limitations shall be considered prior to the use of certain types of PPE, such as respirators.

14.0 IMMINENT DANGER SITUATIONS

Upon discovery of any situation that may, in the opinion of the Contractor, reasonably be expected to cause serious physical harm, illness, death, or significant environmental damage, the Subcontractor Site/Project Management or HSE representative shall suspend the related work immediately. Work may resume only after the HSE concern(s) have been corrected, to the satisfaction of the Contractor. Examples of "imminent danger" situations may include, but are not limited to the following:

- Falls from elevations
- Excavations not properly sloped or shored
- Electrocution hazards
- Work activities posing injury hazards to the general public
- Operation of vehicles, machinery or heavy equipment in an unsafe manner

- Improper Lock Out/Tag Out procedures

In addition to the immediate suspension of work, the procedure for correction of imminent danger situations follows the "HSE Adherence Policy" set forth below.

15.0 HSE ADHERENCE POLICY

Subcontractors are required to comply with the applicable HSE requirements and regulations. The procedures below outline a three-step, progressively administered system to correct compliance problems. However, if in the opinion of the Contractor, non-compliance issues are considered to be severe, Subcontractors' contracts may be terminated at any time.

15.1. Action Level One

If a Subcontractor fails to comply with an applicable HSE standard, Site/Project Management will issue a written "Notice of HSE Non-Compliance" (Exhibit 3) to the Subcontractor's site representative. Site/Project Management will also forward a "Warning Letter for HSE Non-Compliance" (Exhibit 4) and a copy of the Notice of HSE Non-Compliance to the Subcontractor's President or Operations Manager. Copies of these documents shall be forwarded to the Jacobs Operations and HSE Managers.

15.2. Action Level Two

If item(s) of HSE non-compliance are not corrected by Action Level One, or if the Subcontractor repeatedly fails to comply with the applicable HSE regulations, the Site/Project Manager will issue a "Written Notice of Temporary Job Suspension" (Exhibit 5) to the Subcontractor. The Subcontractor's work may not resume until the Contractor Operations Manager and the Subcontractor's Division Manager or equivalent have met and the Subcontractor has proposed corrective actions that are acceptable to the Contractor. Actions that may be considered include, but are not limited to:

- Removal of certain Subcontractor personnel from the project,
- Alteration of the Subcontractor's job procedures, or
- Implementation of corrective action by the Contractor with back charges to the Subcontractor.

The Subcontractor shall not resume work until the Contractor's Operations Management accepts the proposed corrective actions. Contractor Operations Management will document and keep on file the meeting results in the form of meeting minutes.

15.3. Action Level Three

If Action Levels One and Two do not result in the Subcontractor's HSE performance being brought into compliance, subcontract termination may result. Contractor Operations Management may terminate the subcontract after verifying with the Site/Project Management that the HSE adherence procedure has been followed and after giving the Subcontractor applicable notice. Subcontractors that have a contract terminated in accordance with this procedure are ineligible to participate in future Contractor projects until they have implemented and demonstrated corrective actions to improve their deficiencies. Only written approval from the Contractor's Director of Operations can reinstate a Subcontractor's eligibility.

16.0 EXHIBITS

Exhibit 1, Subcontractor HSE Data Form

Exhibit 2, Monthly Subcontractor HSE Statistics Report

Exhibit 3, Notice of HSE Non-Compliance

Exhibit 4, Warning Letter for HSE Non-Compliance

Exhibit 5, Written Notice of Temporary Job Suspension

Exhibit 6, Safe Plan of Action

Exhibit 7, Safety Observation Report

Exhibit 8, Accident/Incident Investigation Report

Exhibit 9, Witness Statement

Exhibit 10, First Aid Register

Exhibit 1 — Subcontractor HSE Data Form

Provide HSE Performance History For Last Three Full Years

Enter Year	**20__**	**20__**	**20__**
Workers Compensation Experience Modification Rate (EMR)			
If self insured, provide employee work hours per claim			
Number of employee hours worked			
Number of fatalities (Column G on OSHA Form 300; provide explanation on separate sheet for each fatality)			
Number of cases involving days away from work (Column H on OSHA Form 300)			
Number of job transfer or restricted duty cases (Column I on OSHA Form 300)			
Number of "other recordable cases" (Column J on OSHA Form 300)			
Total of all cases above (fatalities, days away from work, transfers or restricted duty, and other recordable cases, i.e., the total of Columns G, H, I, and J)			
OSHA Incidence Rate (total recordable cases x 200,000/total work hours)			
Number of citations by OSHA and other HSE regulatory agencies (provide details for each on a separate sheet)			
Number of miles driven on company business			
Number of motor vehicle accidents			
Miles driven divided by number of vehicle accidents			

HSE Program

	Yes	**No**
Do you have a written hazard communication program?		
Do you have a written HSE program?		
Do you have a written drug and alcohol abuse prevention program, which includes pre-employment, reasonable suspicion, and post incident testing?		
Do you have a written respiratory protection program?		
Do you have a new employee orientation program? If yes, does it contain instructions on:		

	Yes	No
• Company HSE Policy		
• Company HSE Record		
• Company HSE Rules		
• Driving Safety		
• Electrical Safety		
• Fall Protection		
• Fire Protection		
• First Aid		
• Hazard Recognition		
• Hazard Reporting		
• Hearing Conservation		
• Housekeeping		
• HSE Meeting Attendance		
• Injury Reporting		
• Ladders and Stairway Safety		
• Lock-out/Tag-out		
• Personnel Protective Equipment		
• Personnel Protective Equipment		
• Toxic Substances		
• Trenching and Excavation		
Do you have a training program for newly hired or promoted first line supervisors? If yes, does it contain instructions on:		
• Accident Investigation		
• Emergency Procedures		
• First Aid Procedures		
• Hazard Recognition		
• HSE Supervision		
• Incident Reporting		
• New Employee Orientation		
• Safe Work Practices		
• Tailgate/Toolbox HSE Meetings		
Supervisor HSE meetings are conducted:		
• Weekly		
• Bi-weekly		

	Yes	No
• Monthly		
• Less often, as needed		
Do you conduct field HSE inspections of work in progress?		
If yes, who conducts the inspections? _____		
How often? _____		
Are accident reports circulated to your management?		
Is HSE a (documented) weighted factor in evaluating in the performance of:		
• Foreman		
• Supervisor		
• Management		
Does your firm hold "Toolbox" HSE Meetings? If yes, how often:		
• Weekly		
• Bi-weekly		
• Monthly		
• Less often, as needed		

HSE Staff

	Number
How many full time HSE professionals do you have on staff?	
How many full time industrial hygienists do you have on staff?	
How many full time physicians do you have on staff?	

Who is the most senior staff HSE professional at your company?		
Name:	Title:	Phone:
Who should we contact to discuss the details of the information contained in this document?		
Name:	Title:	Phone:

Exhibit 2— Monthly Subcontractor HSE Statistics Report

For Exhibit 2, provide either

- the Subcontractor Safety Statistics Monthly Report Blank Form, which is the preferred format, or
- if the subcontractor does not have electronic capabilities, provide the Monthly Subcontractor Accident Statistics Report, so that requested information can be obtained in paper form, and include here as Exhibit 2 to Attachment A.

Exhibit 3 — Notice of HSE Non-Compliance

To:

Site Representative for:

Your company has been found to be in non-compliance with one or more Federal, State, or Contractor HSE requirement(s), as specified below. This HSE non-compliance must be corrected immediately for your company to meet the requirements of your subcontract.

Item No.	Description of Non-compliance	Applicable HSE Requirement

Issued By (Project Manager or Site Manager Issuing Notice):

Name Printed:	Title:
Signature:	Date:

Received By (Subcontractor Representative Receiving Notice):

Name Printed:	Title:
Signature:	Date:

cc: Contractor Operations Manager
HSE Representative

Exhibit 4 — Warning Letter for HSE Non-Compliance

Project Name:

Project Number:

Your firm, _____,

has been found to be in violation of your contract by non-compliance with applicable Federal, State, or Contractor HSE requirements.

On _____ (date),

in accordance with the Contractor Subcontractor HSE Adherence Policy, your representative, _____ _____,

was given a Notice of HSE Non-Compliance (copy attached). This notice specifies areas where your company does not comply with Federal, State, or Contractor HSE requirements, and requests that these items be corrected immediately.

If they are not corrected, more stringent measures will be taken in accordance with Jacobs Subcontractor HSE Adherence Policy.

Your prompt attention to this matter will be appreciated.

Issued By (Project Manager or Site Manager Issuing Warning Letter):

Name Printed:	Title:
Signature:	Date:

Received By (Subcontractor Representative Receiving Warning Letter):

Name Printed:	Title:
Signature:	Date:

cc: Contractor Operations Manager
HSE Manager

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Exhibit 5 — Written Notice of Temporary Job Suspension

Your company, _____

while working on the _____

project has been notified of HSE performance deficiencies in accordance with Jacobs' Subcontractor HSE Adherence Policy.

Despite these written notifications requesting that immediate corrective action be taken to improve your HSE performance, improvement has not occurred.

Therefore, in accordance with Action Level Two of the Subcontractor HSE Adherence Policy, we are hereby notifying you that after securing your equipment, all job activities on the project named above are to cease.

Activities on this project may be resumed only after your company meets requirements set forth in the Subcontractor HSE Adherence Policy.

Issued By:

Name Printed:	Title:
Signature:	Date:

cc: Group Vice President
Operations Manager
HSE Manager

Exhibit 6 — Safe Plan of Action

Print side one and side two of the SPA form found in HSEP 2.16, Safe Plan of Action and include here as Exhibit 6. The SPA form is found in HSEP 2.16 as HSEP 2.16f1, Safe Plan of Action Form.

Exhibit 7 — Safety Observation Report

Print the SOR form found in HSEP 2.17, Safety Observation Reports and include here as Exhibit 7.

Exhibit 8 — Accident/Incident Investigation Report

Print the Accident/Incident Investigation Report form found in HSEP 5.1, Accidents and Incidents as Figure 2 and include here as Exhibit 8.

Exhibit 9 — Witness Statement

Print the Witness Statement form found in HSEP 5.1, Accidents and Incidents as Figure 4 and include here as Exhibit 9.

Exhibit 10 — First Aid Register

Print the First Aid Register form found in HSEP 5.1, Accidents and Incidents as Figure 6 and include here as Exhibit 10.

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HSE Procedure		Document No: HSEP 2.11	Page: 1 of 4
Emergency Response Action Plan		Supersedes: GSOP 352	Revision: 1 Issue Date: 8 Oct 09
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1.0 PURPOSE AND SCOPE

This Health, Safety, and Environment Procedure (HSEP) describe the requirement for all Jacobs locations, projects, and offices to prepare a local Emergency Response Action Plan (ERAP).

Management at each location, project, and office shall develop a tailored emergency response action plan and additional requirements as appropriate to geographic, local regulatory, and line of business variations.

An Emergency Response Action Plan, which has been tailored for local application(s), will provide direction and guidelines for covered employees in response to a variety of emergencies.

2.0 RESPONSIBILITIES

Specific Health, Safety, and Environment Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

2.1. Office Managers, Facility Managers, and Project Managers

Office, facility, and project managers are responsible for assuring compliance with this procedure and for assuring that the locally prepared ERAP is incorporated in Hazard Assessment Safety Action Plans and other planning documents, as appropriate.

2.2. Emergency Coordinator

The Emergency Coordinator shall assume ownership and responsibility for the requirements set forth in this procedure.

2.3. Employees

Employees are responsible for complying with this procedure, for learning and following the requirements of their local plan, and for notifying their supervisor or HSE Manager of any situation not adequately addressed by measures specified in their local ERAP.

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3.0 DEFINITIONS

An Emergency Situation	An emergency situation is a sudden or unexpected event, which can result in loss of life or significant injury, substantial property damage, significant interference with a process or business operation, or that jeopardizes the Company's positive image, or falls under close government or media scrutiny. Examples of emergencies include, but are not limited to fatality or multiple injuries; major incidents; collapse of a structure, a trench, a scaffold, etc.; explosion or fires; plant or process failure; natural disasters, such as hurricanes, earthquakes, tornadoes, floods, etc.; bomb threats; workplace violence; labor disputes, including strikes or lockouts; radiation release; kidnapping; terrorism; medical emergencies, e.g. seizures, cardiac arrest, chemical exposures, etc.; and environmental release.
ERAP	Emergency Response Action Plan

4.0 EMERGENCY RESPONSE ACTION PLAN

Management at each location, project, and office shall develop a locally tailored ERAP.

Emergencies vary in type and required response. The locally prepared ERAP should address such variations and provide necessary basic information and guidelines to effectively manage foreseeable emergencies.

The ERAP shall address both Jacobs and local requirements as appropriate to geographic, local regulatory, and line of business variations.

4.1. Global Requirements

The plan shall begin with Company-wide Emergency Response Action Plan requirements, which pertain to Jacobs global operations, such as the following.

4.1.1. Incident Notification, Internal

The nature and potential consequences of an incident will influence the extent of internal vertical notification. Minor medical injuries or illnesses and incidents involving only minor property damage or an environmental release that does not necessitate regulatory reporting may only require reporting to performance unit management. Performance unit management discretion determines requirement for further reporting. When in doubt, notify the next level supervisor/manager in your chain of command.

The locally prepared ERAP shall state the requirement that the employee and first line supervisor, to the extent appropriate for the severity of the incident, shall notify the next person in the chain, "skipping over" any unavailable manager, until the information reaches the appropriate Group Vice President.

The HSE Manager shall follow the same protocol up his/her chain, to the extent appropriate for the severity of the incident, until the information reaches the Senior Vice President for Quality & Safety.

The local facility, project, or office manager, with support from the HSE Manager, shall implement the Plan and shall secure the area of the incident, evacuate employees and give them guidance, involve the client, if needed, and assure that the corporate business development manager is notified, when appropriate.

HSEP 2.11 f2, Incident Notification, is a flowchart that identifies Company personnel, who should be involved in the notification process. The flowchart should be incorporated in the ERAP with names and phone numbers of the involved Company personnel entered in appropriate blanks. For many locations it would be appropriate to post the flow chart in the workplace.

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4.1.2. Incident Notification, External

Certain incidents will require notification of regulatory agencies or the client. Some incidents may involve the need for media interaction. Refer to Jacobs Global Policy Supplement, GPS1-105, Media Interaction, for directions and guidelines.

The locally prepared ERAP shall address other external reporting needs and issues and shall incorporate existing internal requirements for such, as set forth in Company policies and procedures.

4.1.3. Post-Incident Procedures

The ERAP shall refer to, and include, as appropriate, additional Jacobs post-incident work instructions, specifically HSEP 7.3.7 related to emergency planning and response at environmental projects and hazardous waste facilities.

4.2. Topics for Local Plan

Planning for some potential hazards or threats can only be done at the local level, due to the nature of potential hazards, organizational variations from one location to the next, etc. Accordingly, the locally prepared ERAP shall address those issues appropriate to geographic, local regulatory, and line of business variations.

Authors of locally prepared ERAPs are expected to utilize and draw on requirements set forth in the HSEPs.

4.3. Drafting the Emergency Response Action Plan

The locally prepared Emergency Response Action Plan shall address both the global and local requirements described above.

Emergency planning includes four steps:

- Establish a planning team
- Analyze capabilities and hazards
- Develop the plan
- Implement the plan

A model plan has been provided. See HSEP 2.11 f1, entitled "Model Emergency Response Action Plan."

The Incident Notification flow chart called for in HSEP 2.11 f1 is available as HSEP 2.11 f2. The flowchart provides titles of personnel involved in the notification process and their reporting responsibility. Each location (project/facility/office) should use this attachment to develop a list of resources (names/phone numbers) to contact during an emergency situation.

5.0 TRAINING

Potentially affected employees shall receive training in the content of the local Emergency Response Action Plan.

Affected employees shall be provided general awareness training and shall be briefed in basic required-action steps during initial orientation training.

Employees in leadership positions, for whom emergency action duties have been established, shall receive more extensive training, as appropriate.

Initial training shall be documented, and annual refresher training shall be conducted.

6.0 DRILLS & REHEARSALS

The ERAP is more likely to be properly implemented, and trained employees are more likely to perform effectively, when they have had the benefit of drills or "rehearsals."

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Frequency of drills or rehearsals, shall be determined by the appropriate local HSE and operations managers for the office, location, or project, but shall be no less than annually.

7.0 ANNUAL REVIEW

The office, facility, or project manager shall assure that the ERAP is reviewed and updated annually prior to annual refresher training.

8.0 REFERENCES AND RELATED DOCUMENTS

HSEP 2.11 f1, Model Emergency Response Action Plan

HSEP 2.11 f2, Incident Notification (Use as Table 2 in the ERAP)

Global Policy Supplement, GPS1-105, Media Interaction and Press Releases

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HSE Procedure		Document No: HSEP 2.12	Page: 1 of 6
Hazard Assessment and Safety Action Plan		Supersedes: HSEP 2.12	Revision: 7 Issue Date: 15 Feb 10
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1.0 PURPOSE AND SCOPE

The Hazard Assessment and Safety Action Plan (HASAP) is a core element of the Jacobs HSE Program (ref. GSOP 350) and defines the project-level HSE planning for projects and operations with field activities. The HASAP may also be referred to as the project or site safety plan. Project-level HSE planning should be accomplished as an integral part of the overall project planning process.

The primary goal of the HASAP is to identify hazards associated with project work activities and to identify controls to mitigate the risk associated with those hazards. In addition, the HASAP defines the HSE program elements required to accomplish field activities in a safe and environmentally sound manner and establishes the strategies and methods for their implementation.

This procedure applies to all company projects and operations with field activities performed by company personnel, subcontractors, or other contractors when Jacobs is implementing the HSE program. As of the effective date of this revision, this HASAP procedure applies to all new projects and operations and updates to existing HASAPs.

Refer to HSEP 1.4, Office HSE Management, for HSE planning related to the office environments.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

2.1. Project Manager

The Project Manager shall ensure that:

- The appropriate level of HSE planning and reviews are accomplished and that a HASAP or equivalent plan is developed for the project prior to the start of any field activities.
- The HASAP is reviewed during the project review process.

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- The appropriate resources, including expertise, are provided to complete the HSE planning appropriate for the project.
- The HASAP is used and updated throughout the life of the project.

For projects involving turnaround or shutdown work, the Project Manager shall assure that a Turnaround HSE Readiness Review (see HSEP 1.2) has been conducted and that each program element has been classified as acceptable, needs improvement, unacceptable, or not applicable.

2.2. HSE Manager

The HSE manager shall support the overall project HSE process and shall assist the Project Manager in the development of and implementation of the HASAP.

3.0 DEFINITIONS

Battery Limits	Physical boundary lines or plot limits for a process unit, enclosing all equipment and unit block valves or designated end-of-pipe runs where no block valves exist. The battery limits are generally considered to be that portion of the plant in which the actual processes are carried out as distinguished from storage buildings, offices, and other subordinate structures.
Facility Siting Analysis	A formal documented process to assess the physical (crane, motor vehicle, electrical, etc.), chemical, and explosive hazards in order to determine a safe location for an occupied facility.
Hazard Analysis	The process of hazard identification and risk assessment.
Occupied Facilities	Facilities that serve as regular or routine accommodation for one or more worker(s), including, but not limited to, field offices, office trailers, lunch and break facilities, and equipment staging and storage facilities.
Turnaround or Shutdown Work	Scheduled large-scale maintenance activity wherein a process system or an entire unit is taken off-stream for inspection, cleaning, comprehensive revamp, and/or renewal.

4.0 PROCEDURE

4.1. General Requirements

The following general requirements shall apply to project HSE planning and to the development and updating of all HASAPs, regardless of the method of documentation. The HASAP shall be:

- Completed prior to mobilization.
- A collaborative effort between operations and HSE personnel, and it shall delineate the plan that will be used to accomplish the work in a safe and environmentally sound manner.
- Written to reference applicable HSE procedures, regulations, standards, etc., but not to serve as a collection of these requirements.
- Reviewed and signed by the personnel specified in the HASAP as confirmation of hazard assessment, planning, and agreement to the plan.
- Reviewed and signed by the Designated Project Executive (DPE) or Manager of Projects (MOP) for the project. If there are significant exceptions to Jacobs requirements stated herein, then the HASAP will also require approval and signature of the Field Services or Regional Group Vice President, as appropriate.
- Reviewed, updated, and approved annually or more frequently depending on project specific factors such as a change in scope or phase of work activity (e.g., construction to

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start-up), identification of new hazards or controls, implementation of new HSE strategies and methods, or other significant changes.

Where appropriate, the HASAP shall address environmental requirements and other local HSE requirements.

4.2. HSE Planning Requirements

4.2.1. HSE Program Management Roles and Responsibilities

Definition of HSE program management roles and responsibilities may vary significantly from project to project depending on the scope of the project and the contractual relationships between involved parties. The HSE management roles and responsibilities associated with a particular project will influence the HSE program implemented for that project.

Two documents provide guidance for determination of the Jacobs project-specific HSE management roles and responsibilities. These documents are:

- Corporate directive Safety Management Roles and Responsibilities, January 2006 provides clarity and focus on areas of potential ambiguity with respect to HSE management roles and responsibilities. Irrespective of our strict contractual responsibility for safety, we must always be proactive in our safety leadership and take all appropriate actions mandated by our safety culture to first and foremost safeguard our workers.
- The Jacobs HSE Roles and Responsibilities Decision Tree, referenced in the corporate directive, provides guidance as to how we execute different types of work. The decision tree is an excellent tool for determining the position that should be taken with respect to safety responsibility and safety program implementation. The result of the decision tree should be clearly stated in the HASAP.

4.2.2. HSE Alignment

HSE planning shall incorporate a gap analysis among the client, Jacobs, subcontractors, and other contractor programs in order to achieve alignment so that a single, site-specific HSE program can be developed and implemented.

As determined by the Jacobs HSE Roles and Responsibilities Decision Tree, the Jacobs HSE program elements shall take precedence and be used as the basis for the site-specific program.

4.2.3. Hazard Identification and Risk Assessment

HSE planning shall focus on the identification of hazards associated with the project activities, assessment of the risk associated with those hazards, and the identification of controls to eliminate or mitigate the risk to ensure the work can be performed in a safe manner.

Persons knowledgeable in the specific work activities, including the hazards, controls, and appropriate work methods associated with those activities, shall be engaged in HSE planning.

In addition to input from knowledgeable personnel, include other resources, such as:

- Lessons learned from previous projects of similar scope and complexity
- Applicable HSE Alerts and Advisories
- Incident data
- Client/owner health and safety plan
- Client/owner provided procedures and work instructions

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The project team shall utilize a method for hazard identification and risk assessment that is appropriate for the project scope and hazards.

A disciplined method for hazard identification and risk assessment is defined in HSEP 2.22, Hazard Analysis.

4.2.4. Health Hazard Evaluation

For projects involving activities that may pose potential health or environmental risks due to the nature of the hazards (chemical, biological or radiological, or other), the process complexity relative to these hazards, and scope of services (e.g., first line maintenance work involving line breaks), a Health Hazard Evaluation (HHE) (ref. HSEP 12.1) shall be performed concurrent with preparation of the HASAP.

4.2.5. Hazards

The HASAP shall identify both the physical and the health hazards that will have potential to cause workplace injury, illness, and fatalities associated with the project. These hazards shall be a focus for various HSE program elements including but not limited to the SPA (ref. HSEP 2.16), SOR (ref. HSEP 2.17), and the SER (ref. HSEP 2.2).

The specific strategies for providing on-going focus to these hazards shall be identified in the HASAP.

4.2.6. Occupied Facility Location

HSE planning shall address the locations of occupied facilities to ensure that the hazards and risks to personnel are adequately addressed.

HSEP 7.7, Occupied Facility Siting, or similar process shall be used to guide and document the decision to locate occupied facilities in the hazard effect zone of explosive, flammable, combustible, toxic, or physical hazards and/or processes.

4.2.7. Turnaround/Shutdown Work

HSE planning for projects involving turnaround and/or shutdown work shall utilize the Turnaround HSE Readiness Review checklist in HSEP 1.2. This checklist shall serve as a guide for ensuring that HSE elements critical to turnaround/shutdown work have been considered.

4.2.8. Emergency Response Planning

Project specific emergency response planning shall be an element of the overall project HSE planning effort and shall follow the requirements of HSEP 2.11, Emergency Response Action Plan.

The emergency response plan shall be tailored to address appropriate geographic, local regulatory, and line of business variations and shall be documented in the HASAP or as a separate document referenced in the HASAP.

4.2.9. Project-Specific HSE Program

The HASAP shall define how each of the following core HSE program elements are to be implemented on the project:

- SPA, HSEP 2.16
- SOR, HSEP 2.17
- Accident and Incident Reporting and Investigation (HSEPs 5.1 and 5.2)
- SER, HSEP 2.2
- HSE Training, HSEP 3.1

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These core HSE elements shall be implemented in a manner that brings focus to the hazards and controls identified during the HSE planning process as well as in subsequent activity and task-level planning activities. Additional guidance on implementation of these core elements may be found in the specific HSEP for that element.

4.2.10. Project/Site-Specific Roles, Responsibilities, and Leadership Engagement

The HASAP shall define the specific roles and responsibilities for personnel at all levels. Specifically, the expectations for management and supervision engagement in the HSE program shall be defined, including the method for evaluating their engagement on a regular basis.

4.2.11. HSE Work Phase Checklist

The HSE Work Phase Checklist (ref. HSEP 1.2, Figure 4) can serve as a useful HSE planning tool as it provides a list of key HSE elements or issues by project work phase.

4.3. Documentation

The HASAP shall document the results of the HSE planning effort. The level of detail associated with the HASAP shall be appropriate for the scope and hazards of the project.

Regardless of the method of documentation, the Outline and Guide for HASAP Development, HSEP 2.12f1, should be used to help ensure that the topics and issues that apply to the project are considered. Additional topics, not covered in the outline and guide, shall be addressed as appropriate based on project-specific hazards, client requirements, or other factors.

All documents required to support the completion of the HASAP, such as the HHE or site specific procedures, etc, shall be linked electronically or clearly identified in the HASAP as an addendum document, with revised updates, and location.

For US projects involving hazardous waste operations and for US projects covered under prevailing hazardous waste regulations, a project Health and Safety Plan (HSP) shall be used as the means of documenting the project HSE plan. Refer to HSEP 7.3.1, Site Health, Safety, and Environment Plans. In addition to addressing the specific requirements for hazardous waste operations, the site-specific HSP shall also address all the elements of the HASAP.

4.4. Monitoring, Measuring, and Analysis

The project manager and HSE manager shall monitor the project HSE planning process via periodic project review meetings, project milestone meetings, project planning sessions (including interactive planning sessions), and other means as appropriate. This on-going monitoring shall help ensure that HSE planning is being considered in all phases of the project and that the planning is appropriate to the scope and hazards associated with the project.

The SER shall verify the completion, review, approval, and effective implementation of the HASAP and the project/site-specific HSE program.

4.5. Improvement

Feedback from various sources including the SOR, SER, client surveys, and other sources shall be used to improve the project HASAP.

Where appropriate, the project manager and HSE manager will revise the HASAP to incorporate new information such as unrecognized work scope, new or unrecognized hazards, changes in HSE process implementation and procedures, and other significant changes.

Where appropriate, these changes shall be communicated to the workforce via training or other appropriate means.

5.0 REFERENCES AND RELATED DOCUMENTS

HSEP 2.12f1, Outline and Guide for HASAP Development

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Corporate Directive Safety Management Roles and Responsibilities, January 2006

Jacobs HSE Roles and Responsibilities Decision Tree

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Safe Plan of Action		Supersedes: HSEP 2.16	Revision: 1 Issue Date: 17 Jul 06
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1.0 PURPOSE AND SCOPE

The SPA is a core element of the Jacobs HSE Program (ref. GSOP 350) and defines the approach and tools used to accomplish pre-task planning. Pre-task planning shall be performed for any activity or task that could reasonably present a risk of injury, illness, environmental, or property damage. Specifically, this procedure defines the expectations and requirements for the use of the Safe Plan of Action (SPA) as a primary element of pre-task planning.

The SPA shall be used prior to starting field or shop work tasks and higher risk, non-routine activities in the office or prior to operating equipment, including motor vehicles.

This procedure applies to all activities performed by company employees, subcontractors, or other contractors when Jacobs is implementing the HSE program.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

Management shall be responsible for ensuring that the necessary resources are available for effectively implementing pre-task planning.

Supervisors shall lead the development, implementation, and review of pre-task plans.

All workers engaged in activities requiring pre-task planning shall participate in pre-task planning at the appropriate level.

HSE personnel will facilitate implementation, monitoring, and training associated with pre-task planning, and work with management to ensure that the appropriate focus is placed on identifying hazards/risk potential and actions necessary to improve pre-task planning.

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3.0 DEFINITIONS

Activity	A set of interrelated tasks typically of longer duration involving multiple crews.
Job Hazard Analysis (JHA)	An activity-level pre-task plan, which helps integrate safe work practices into a particular activity to help ensure that the work is performed in a safe and effective manner. In some countries, the JHA may be referred to as a "Method Statement" or by some similar term.
Routine Task	A routine task is one, which the worker normally performs as part of the job function and for which the worker has been trained.
Safe Plan of Action (SPA)	A pre-task plan used to integrate safe work practices into a job or task and to help ensure that the work is performed in a safe and effective manner.
Task	A specific, well-defined portion of work of relatively predictable duration and typically consisting of multiple steps. A task may be performed by one or more workers.
Task Steps	Basic sequential elements of a task that accurately define the task in terms of obtaining resources required to perform the task, preparation of the work area, movement of materials, tools, and people to and from the work area, and completion of the task.

4.0 PROCEDURE

4.1. Levels of Pre-task Planning

4.1.1. Project Level — HASAP

Pre-task planning begins with project-level HSE planning and is documented in the Hazard Assessment and Safety Action Plan (HASAP).

The primary goal of project-level planning is to identify potential hazards associated with the project work activities and to identify controls to mitigate the risk associated with those hazards.

In addition, planning at the project level should define all the HSE program elements required to accomplish activities in a safe and environmentally sound manner. HSE planning also establishes the strategies and methods for implementation and management of the HSE elements.

4.1.2. Activity Level — Various Means and Methods

Pre-task planning is next completed at the activity level and is focused on identifying hazards associated with larger, interrelated tasks, typically executed over a longer duration and by multiple work groups or crews.

Planning at the activity level is typically accomplished in advance of the activity and should facilitate more effective planning at the task level.

There are numerous acceptable means and methods to accomplish activity-level planning. Examples include use of method statements, regular supervisor and project coordination meetings, interactive planning sessions, subcontractor and client meetings, pre-construction meetings, constructability reviews, JHAs, and other means that provide focus on hazard identification and mitigation controls.

4.1.3. Task Level — SPA

Planning at the task level is accomplished through the SPA. The SPA is the most effective means of identifying the hazards associated with daily work tasks and the controls necessary to execute the task in a safe manner.

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In any case, the level of planning shall be appropriate for the task or activity and shall consider:

- Hazards previously identified in the project or site safety plan (HASAP) and other pre-task plans, .e.g., JHA or Method Statement.
- Relevant procedures (including applicable Jacobs HSEPs) for identification of hazards and controls.
- Lessons learned from other tasks, activities, or projects including past incidents.
- Breaking the task into enough steps to adequately define the task.
- Identification of hazards related to adjacent activities, operations, and hazards that could affect the work.
- Identification of all foreseeable hazards and controls necessary to eliminate the hazard or reduce the risk.
- Utilization of multiple countermeasures or controls where appropriate to eliminate or reduce risk.
- Consideration of foreseeable change in the task as it progresses to completion.

4.2. General Planning Requirements

Pre-task planning is required prior to performing any activity or task that could reasonably present a risk of injury, illness, environmental, or property damage. In addition, the following are considered minimum requirements:

- The detailed plan for performing pre-task planning shall be documented in the project, site, or office-specific safety plan (ref. HSEPs 1.2, 1.4, and 2.12).
- Tasks shall be defined in terms of steps required to complete the task so that the hazards can be readily identified.
- The appropriate level of expertise shall be applied when planning each task in order to effectively identify and manage the risks associated with the task.
- Pre-task planning shall be implemented in a manner that focuses on hazard identification, hazard control, and group interaction.
- All personnel shall be involved in pre-task planning, including Jacobs employees and subcontractors. Employees of contractors, who are not directly contracted to Jacobs, should also be involved in pre-task planning when Jacobs is responsible for implementing the HSE program.
- A new SPA shall be developed for each task to ensure that the most current conditions are considered and to ensure that all personnel are involved in the planning for the task.
- The approach for implementing the SPA shall include a means for assessing and improving the quality and effectiveness of pre-task planning.

The pre-task plan shall include an SPA or equivalent method. It may also consist of one or more of the following:

- JHA – typically used for planning larger tasks or activities and for tasks that are performed on a routine or repeated basis (JHAs are typically developed by management and HSE personnel well in advance of the activity or task.);
- Detailed procedures and work instructions – typically used for routine tasks or operations where the order of execution is important; and
- Permit to work system – typically implemented for more hazardous tasks or activities (e.g., confined space entry, hot work, line break, etc.).

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The remainder of this HSEP focuses on the use of the SPA as the primary pre-task planning tool, however, the SPA may also be used for activity-level planning.

4.3. SPA Implementation Plan

Each project or site shall develop a plan for implementing the requirements of this HSEP and document the plan in the project/site HSE plan (HASAP). At a minimum, this plan shall define:

- The conditions under which an SPA is used (identify tasks that require the development of an SPA, when and where the SPA is completed, etc.).
- The detailed roles and responsibilities of management, supervision, workers, and HSE in all aspects of the SPA (development, review, approval, monitoring, and assessment).
- The project/site-specific requirements for SPA development.
- The project/site specific process for SPA assessment.
- The conditions under which work stoppage should occur, including changes in conditions, task, hazard, or other factors that could affect safe execution of the work.

The SPA shall be documented using HSEP 2.16f1 or a project-specific version of this form

The SPA assessment shall be performed using the SPA Assessment form, HSEP 2.16f2, or a project-specific version of this form.

The SPA Assessment form may be modified, as necessary, based on site-specific conditions, such as work scope, hazards present, and other factors.

When the Safety Observation Report (SOR), Behavioral Safety Observation Report (BSOR), and SPA are used together, the forms should be modified to ensure that the checklist categories are consistent to improve the effectiveness of their use.

4.4. SPA Development

The SPA shall be developed as a team by ***all*** the workers involved in the task.

Supervisors shall actively participate in the collaborative effort and shall provide leadership and guidance. Supervisors shall also provide the resources necessary to plan and execute the task.

In the case of subcontract employees, the SPA development activity should be attended by Jacobs management and supervision. The purpose of this attendance is to provide real time coaching on SPA development and hazard recognition to the workers.

The SPA shall identify:

- Steps Involved in Performing the Task
- Hazards and Reaction to Change
    - associated with task steps, including physical hazards, chemical hazards, etc.
    - created by adjacent work or processes, such as owner operations
    - related to co-occupancy of the same work area by others
    - caused by inappropriate reaction to foreseeable changes (changes in conditions, failures that may occur during the task, emergency events, etc.)
    - resulting from completing the task steps in the wrong order
- Safe Plan (controls to mitigate or eliminate the hazards identified)
- Resources
    - personal protective equipment
    - permits, procedures, training, tools, equipment, materials, etc.

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The controls identified in the SPA shall, to the extent possible, be selected based on the effectiveness of the controls to mitigate the risk associated with the hazards. Where possible the controls shall be selected based on the following order of effectiveness:

- Design or engineering change (eliminate or minimize the hazard, substitute materials, relocate hazard source, provide ventilation, designate site traffic patterns, etc.)
- Safety features (fuses, circuit breakers, ground fault circuit interrupters, mechanical stops or travel limiting devices, relief devices, etc.)
- Safety devices (barriers, guards, shields, personal protective equipment, gas and fire detection systems, etc.)
- Warning devices (audible and visual alarms, signs and postings, temporary signs and tapes (warning or danger tape) etc.)
- Administrative controls (procedures, work instructions, checklists, training, etc)

An SPA should be developed at the beginning of the work shift for each new task. The SPA must be reviewed and updated after any change in personnel, task or work scope, environmental conditions, or other factors that could affect the safe performance of the work. The focus of the SPA is on the relationship among the workers, the task, the tools, and the work environment. If any of these elements or their relationship changes, the SPA must be reevaluated.

For routine tasks that are performed on a repetitive basis, an SPA developed at the start of the task may be used for the duration of the task provided adequate consideration is given to changes that may affect the validity of the pre-task plan.

Unless prohibited by unusual conditions, the SPA shall be developed immediately prior to the start of the task and at the job location to maximize the opportunity to identify hazards and understand the work environment/conditions in which the task will be performed.

4.5. SPA Monitoring and Assessment

Management, supervision, workers, and HSE shall routinely monitor and assess the development and implementation of the SPA. The SPA Assessment shall be made using the SPA Assessment form or other means that achieves the same result. The criteria for monitoring and assessment should be defined in the project or site-specific HSE plan and should be based on:

- Relative risks and activities, (e.g., working at elevation, crane operations, lock out tag out work, work on live electrical components, confined space entry, etc.),
- Complexity of the task,
- Locations and varieties of tasks.

A representative sample of SPAs shall be routinely monitored and assessed during both development and the work-in-progress phases to ensure that:

- There is team interaction during the SPA development and buy-in to the plan,
- SPAs are being developed for tasks where required or appropriate,
- The quality of the SPA is appropriate for the work, and
- The work is being performed in accordance with the plan.

The sample size shall be determined by:

- The size of workforce,
- The level of experience in SPA development,
- The workforce turnover, and
- Other factors as deemed appropriate by the Management and HSE.

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4.5.1. SPA Development Assessment

The SPA Development Assessment shall be conducted as supervisors and workers begin pre-task planning. Person performing the assessment shall observe the workers and interact as necessary to assure all elements of a safe work plan are addressed.

The SPA Development Assessment may be performed by an individual or a group, depending on the complexity of the task, using the SPA Assessment form.

Information from the SPA development assessment should be used to provide feedback to the work group to improve the SPA.

4.5.2. SPA Work In Progress Assessment

The SPA Work In Progress Assessment shall include observation of the work being performed, noting both safe and unsafe or at-risk situations and the immediate corrective actions taken. Feedback shall be provided to the workers during the assessment.

The SPA Work In Progress portion of the form shall be completed while observing workers performing the task. Particular attention should be paid to how well the workers react to or manage changed conditions during the performance of the task.

4.6. Measurement and Improvement

Data from the SPA Assessment shall be collected, analyzed, and used to measure the quality and effectiveness of the SPA and pre-task planning. In addition, the data shall be used to identify specific improvement opportunities based on at-risk categories.

The following actions should be considered to maximize improvement.

- Completed SPAs should be used to train new workers and to re-train existing workers.
- The SPA should be reviewed with the workers at the end of the task or shift to identify improvements that can be implemented immediately.
- The observation of the SPA development phase or of work in progress should not be a data collection exercise, but rather a real time coaching, training, and mentoring event.
- Calculate and trend percent safe/at-risk for major categories on assessment checklist.

4.7. SPA Documentation Retention

The completed SPA document should be retained with site or office records in accordance with the field Hazard Assessment and Safety Action Plan (HSEP 2.12) or Office HSE Management plan (HSEP 1.4), respectively.

4.8. Training

Personnel required to perform pre-task planning shall be trained in the development of pre-task plans. Safe Plan of Action Training Presentations and Workbooks are available to HSE staff.

In addition, those personnel required to perform quality assessments of pre-task plans shall receive additional training on the SPA assessment process.

5.0 REFERENCES AND RELATED DOCUMENTS

GSOP 350, HSE Program

HSEP 1.2, Project HSE Management

HSEP 1.4, Office HSE Management

HSEP 2.12, Hazard Assessment and Safety Action Plan

HSEP 2.16f1, Safe Plan of Action Form

HSEP 2.16f2, SPA Assessment Form

HSEP 2.17, Safety Observation Report

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HSEP 2.18, Behavioral Safety Observation Report Process

Safe Plan of Action Training Presentations and Workbooks

SPA Revision Overview

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SPA Assessment Card
HSEP 2.16f2

Assessment

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SPA Assessment

☐ Individual Observation _____ Date: _____

☐ Group: _____

For an SPA Development Assessment, complete this side only.
For an SPA Work in Progress Assessment, complete both sides.

Was there group interaction in development?	Yes	No	N/A
Are task steps correct on SPA?	Yes	No	
Are hazards recognized on SPA?	Yes	No	
Are hazard controls identified on SPA?	Yes	No	
Do crew members understand their task?	Yes	No	
Changed conditions identified/reviewed?	Yes	No	N/A
Other (site-specific)	Yes	No	
Other (site-specific)	Yes	No	
Other (site-specific)	Yes	No	

FEEDBACK

Signature:

_____

Observation

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Safety Observation Checklist

Date: _____ Time: _____ Observer: _____

Crew: _____ Task: _____

Category	Safe	At Risk	Category	Safe	At Risk
1.0 PPE Correct	☐	☐	**5.0 Fall Protection**	☐	☐
1.1 Head protection	☐	☐	5.1 Trip hazard	☐	☐
1.2 Eye/Face protection	☐	☐	5.2 Fall arrest equip. use	☐	☐
1.3 Hand/Foot protection	☐	☐	5.3 Correct ladder use	☐	☐
1.4 Hearing protection	☐	☐	**6.0 Tool Use**	☐	☐
1.5 Clothing	☐	☐	6.1 Correct tool	☐	☐
1.6 Respirator	☐	☐	6.2 Used correctly	☐	☐
2.0 Manual Lifting	☐	☐	6.3 Material secured	☐	☐
2.1 Correct body position	☐	☐	6.4 Guards in place	☐	☐
2.2 Help for heavy items	☐	☐	6.5 GFCI used	☐	☐
2.3 Hand placement	☐	☐	**7.0 Equipment/Vehicle Use**	☐	☐
2.4 Weight known	☐	☐	7.1 Seat belt use	☐	☐
2.5 Use of equipment	☐	☐	7.2 Inspection	☐	☐
3.0 Line of Fire	☐	☐	7.3 Equip. used properly	☐	☐
3.1 Hand/Body position	☐	☐	7.4 Backing	☐	☐
3.2 Overhead hazards	☐	☐	**8.0 Adjacent Work**	☐	☐
3.3 Rotating equipment	☐	☐	8.1 Equipment startup	☐	☐
3.4 Eyes on work or path	☐	☐	8.2 Vehicle traffic	☐	☐
3.5 Pinch/Sharp edges identified & protected	☐	☐	8.3 Work scope known	☐	☐
			8.4 Excavations	☐	☐
4.0 Housekeeping	☐	☐	8.5 Crane/Hoist use	☐	☐
4.1 Trash/Debris	☐	☐	**9.0 Procedures**	☐	☐
4.2 Cord/lead control	☐	☐	9.1 Lockout/blinding	☐	☐
4.3 Protruding items	☐	☐	9.2 Confined space	☐	☐
4.4 Correct barricades	☐	☐	9.3 Other procedure	☐	☐
			10.0 Other	☐	☐

Item # What is positive or at risk? / Corrective action or commendation?

____ _____

____ _____

____ _____

____ _____

For printing, download printer-ready version of pocket card in PDF file posted on JNet as HSEP 2.16f3.

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HSE Procedure		Document No: HSEP 2.17	Page: 1 of 5
Safety Observation Report		Supersedes: HSEP 2.1	Revision: 1 Issue Date: 17 Feb 04
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1.0 PURPOSE AND SCOPE

The purpose of the Safety Observation Report (SOR) process is to engage all workers in the observation of work in progress so that a maximum number of workers, with diverse experiences and perspectives, are involved in the HSE monitoring and observation process.

Use of this process for identification of potential workplace hazards and unsafe actions of workers will minimize workplace injuries and illnesses and damage to the environment in both the field and the office.

This process also provides a method for identifying and documenting safe acts and safe workplace conditions.

Use of SORs by members of the workforce is a recognized Company best practice and is a requirement set forth in GSOP 350.

This HSEP applies to all employees, Company subcontractors, and workers engaged in operations covered by the Company's HSE Program.

2.0 RESPONSIBILITIES

Specific Health, Safety, and Environment Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

2.1. Site, Project, and Office Manager

The responsibilities of Site, Project, and Office Management are to seek opportunities to involve all employees in this process by:

- Providing HSE leadership by actively participating in the SOR process and conducting regular HSE observations,
- Discussing their observations in a positive constructive manner, and where necessary, agree on appropriate corrective actions,

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- Providing support for training in the SOR process,
- Participating in safety observation meetings and presentations, and
- Helping to design promotional and recognition programs to encourage SOR process quality and/or participation.

2.2. Supervisors

The responsibility of supervision is to:

- Actively participate in the SOR process by conducting regular HSE observations,
- Discuss all observations in a positive and constructive manner, and where necessary agree on appropriate corrective actions,
- Ensure that SORs are completed in a timely manner and promptly submitted, and
- Ensure completion of any required corrective action.

2.3. Employees

The responsibilities of employees are to:

- Conduct regular HSE observations of work in progress,
- Discuss observations in a positive and constructive manner and to agree on an appropriate corrective action, if unsafe acts or conditions are observed,
- Record their findings on the SOR form, and
- Submit the SOR to their supervisor or the HSE Department.

2.4. Site HSE Supervisor

The Site HSE Supervisor is responsible for:

- Providing training on the SOR process,
- Gathering and compiling SOR data,
- Generating reports and developing trends to provide feedback to employees and the project team, and
- Tracking and documenting completion of corrective actions.

3.0 PROCEDURE

The SOR (Figure 1) is a proactive process designed to identify, document, and change unsafe conditions and unsafe or at-risk behavior through supervisor and employee involvement.

This procedure incorporates employee involvement in the HSE observation process by reinforcing safe behavior, modifying unsafe behavior through training and data feedback, and assuring that corrective actions have been taken for any identified deficiencies.

The data gathered through this process is used as a leading indicator to improve the overall HSE program.

For those operations that have the necessary resources and want to take their SOR process to the next level, refer to HSEP 2.18, Behavioral Safety Observation Report Process.

3.1. Conducting HSE Observations

Observations may be conducted by individuals or teams of workers. Observers will monitor work in progress for safe or unsafe acts and safe or unsafe conditions.

Observations can include any number of workers for any length of time or workplace conditions.

Open and constructive communication between the observer(s) and worker(s) is an important feature of the SOR process. Unsafe acts and unsafe conditions should be discussed and resolved

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on the spot, if possible. Safe work practices should likewise be identified and positively reinforced through compliment and praise.

If imminent danger situations are encountered, work must be immediately stopped and workers removed from the hazard, the hazard abated, and a thorough investigation conducted.

Observations shall be recorded on the Safety Observation Report form.

Although signatures by those submitting SORs are important and typically required, the reports may be submitted anonymously.

Names of workers, who might be involved with unsafe acts or unsafe conditions, are not to be recorded in the SOR.

The causes for unsafe acts or unsafe conditions should be determined through discussion and analysis among worker(s) and observer(s) and recorded in the SOR. (See Figure 1.) Minor modifications of this SOR form to reflect local needs may be made with approval from Corporate HSE. Figure 1 can be printed full size or reduced in size and printed on card stock to fit in a shirt pocket for convenient use in the field.

The form shall be signed and dated by the person(s) conducting the observation.

SORs can be submitted to either the employee's supervisor or the HSE Department.

3.2. Analysis of Cause(s)

The HSE Department will gather and compile SOR data, generate reports, and develop trends to provide feedback to employees and the project team. This input facilitates development of special emphasis programs designed to highlight positive behaviors and work practices and to address the specific types of deficiencies observed.

Thorough identification of the causes of observed deficiencies facilitates remedial action.

3.2.1. Typically, direct causes identified through the SOR process, are due to

- Unsafe acts or
- Unsafe conditions.

3.2.2. Typically, indirect causes identified through the SOR process, are due to a

- Lack of training (knowledge, understanding, perception of risk),
- Lack of resources (time, material, personnel), and/or
- Lack of belief (confidence, commitment, or reinforcement by supervision)

combined with other factors, such as poor morale, peer pressure, inattention, etc.

3.2.3. Typically, basic/root causes identified through the SOR process, are due to an organizational failure to

- Plan,
- Direct,
- Organize, and/or
- Control

the human and material (tools, equipment, etc.) resources.

3.3. Documenting Corrective Actions

It is important that all deficiencies reported have documented corrective actions, the majority of which should be implemented at the time the observation is made.

Some corrective actions may require a period of time to resolve if, for instance, client involvement is required, equipment must be ordered, etc.; therefore, a log or record will be kept to document the final close-out or completion of such actions.

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SORs, complete with documentation that corrective measures have been taken, shall be retained by either the operating unit, the office, or the HSE Department.

3.4. Training

Proper "observer training" is required for effective implementation of the SOR process. Simply distributing and collecting SOR forms will provide minimal improvement in the HSE program. The HSE department will provide specialized training for prospective observers that will educate them in:

- The philosophies behind the process,
- Communication techniques that will provide for positive observer-worker interaction during the observation process,
- Identification of safe and at-risk actions and behaviors, and
- Identification of safe and unsafe workplace conditions.

4.0 FIGURES

Safety Observation Report

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Figure 1

Safety Observation Report

Date: Time: Supervisor of Observer:

Observation:

Was immediate corrective action taken? Yes ☐ No ☐

Describe Immediate Corrective Action:

Describe Action to Prevent Recurrence:

Describe Indirect Cause:

Lack of Training ☐ Lack of Belief ☐ Lack of Resources ☐

Describe Suggested/Recommended Corrective Action For Indirect Cause:

Observers

Name Printed: Signature:

Name Printed: Signature:

Name Printed: Signature:

Description and Verification of Corrective Action Taken To Address Indirect Cause:

Supervisor/Manager

Name Printed: Signature: Date Completed:

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HSE Procedure		Document No: HSEP 2.18	Page: 1 of 12
Behavioral Safety Observation Report Process		Supersedes: NA	Revision: 0 Issue Date: 6 May 05
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1.0 PURPOSE AND SCOPE

The Safety Observation Report (SOR) described in HSEP 2.17 is a required component of the Jacobs HSE Program for all locations and projects.

Although not a requirement of the Jacobs HSE Program, this HSEP for Behavioral Safety Observation Report (BSOR) offers a complementary process to the SOR. The BSOR focuses on behavioral safety concepts to increase employee involvement in the zero incident process.

It states the importance of employee involvement and provides procedures for involving employees in modifying behavior to work safely. It describes how to use leading indicators gathered in this process to manage safety.

This process is designed to be used after the required basic safety processes have been put in place and are working. It requires specialized training and an experienced facilitator.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

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2.1. Site/Facility Manager

The Site/Facilities Manager will:

- Identify the chairperson and initial members of the Safety Leadership Team with the help of the Facilitator;
- Serve as an active member of the Safety Leadership Team; coordinate with management, supervisory, and craft personnel to implement this process; and actively participate in the analysis (Plan, Do, Study, Act cycle), recommendations, and action plans to improve the site safety process and employee involvement;
- Participate as an observer at regularly established intervals as outlined by the Safety Leadership Team Implementation Plan;
- Provide positive recognition for those individuals who are contributing to the improvement of the safety process at all levels; and
- Seek additional opportunities to involve employees in the safety process by allowing them to:
  - Be the safety leader of the week and lead their work group's safety activities,
  - Participate in presentations at the weekly safety meetings,
  - Assist in developing Safe Plan of Actions (SPA),
  - Help design safety suggestion system,
  - Help design safety recognitions systems, and
  - Actively participate in the Plan, Do, Study, Act cycle.

2.2. Supervisors

Supervision will:

- Serve on the Safety Leadership Team as requested by the Safety Leadership Team;
- Actively participate as an observer;
- Encourage employees to participate in the BSOR process;
- Ensure that observations are completed in a timely manner and turned in daily; and
- Implement and ensure the ongoing function of any corrective actions or action plans.

2.3. Employees

Employees (including staff, teaming partners, and subcontractors) will:

- Serve on the Safety Leadership Team as requested by the Team;
- Serve as an observer; and
- Take part in all employee involvement processes for HSE including SPAs, weekly and daily safety meetings, problem solving for safety improvement, and implementation of safety improvements.

2.4. Facilitator

A Facilitator is responsible for mentoring management and the Safety Leadership Team in the BSOR process.

2.5. Chairperson for Safety Leadership Team

The Chairperson shall facilitate and coordinate Safety Leadership Team activities and assign committee member duties.

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2.6. Safety Leadership Team (SLT)

A Safety Leadership Team develops, organizes, implements, and operates the behavioral safety process, which includes the following responsibilities:

- Developing the site-specific charter for the team,
- Using perception surveys of the site on a regular basis to determine the safety culture,
- Developing and testing the BSOR Checklist (Figure 2),
- Training the observers,
- Reviewing and monitoring the observation process,
- Collecting and publishing the observation data, issues that are being worked on, improvements that have been made, and the successes,
- Operating the Plan, Do, Study, Act cycle,
- Obtaining management, supervision, and employee support for improvements,
- Ensuring that improvements are implemented and followed up on, and
- Making changes to the BSOR Checklist to deal with additional issues as they are discovered.

At locations where a Safety Committee is already functioning, it can become the Safety Leadership Team.

2.7. Site/Facility HSE Supervisor

The Site/Facility HSE Supervisor shall:

- Assist site management in the organization of the Safety Leadership Team,
- Use safety sampling to help the Safety Leadership Team validate their process on a regular basis, and
- Act as an advisor to the Safety Leadership Team.

2.8. HSE Department

The HSE Department will:

- Provide expertise to support the effectiveness of the employee safety involvement processes,
- Provide training and learning opportunities to BSOR Facilitators,
- Provide training programs for the management team and the Safety Leadership Team for the behavioral safety observation process, and
- Support the Safety Leadership Team.

3.0 DEFINITIONS

Antecedents	An event, which comes before behavior that triggers or starts a behavior. Antecedents generally affect behavior indirectly.
Behavioral Safety Observation Report Process	The behavior modification process involving documented observation of safe and at-risk behavior and site conditions, determination of the direct cause, and the corrective actions taken to prevent recurrence.
Behavioral Safety Observation Report Checklist	A checklist created by the SLT and employees to reinforce safe behavior and change at-risk behavior and site/facility conditions by targeting site-specific areas for improvement.
Consequence	A result, important effect, or outcome of a behavior that generally affects behavior directly.

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Facilitator	A person experienced in the BSOR process, who helps implement the process at a site/facility and mentors the SLT, management, staff, and employees in the process.
Observers	People trained to observe safe and at-risk behavior and site conditions and record observations by using a site-specific BSOR checklist.
Safe Behavior	The observable actions by each employee to work incident-free, be productive, meet quality expectations, and to look out for safety of other employees.
Safety Leadership Team	A site/facility BSOR committee composed of managers, supervisors, and employees, including teaming partners and subcontractors.
Safety Sampling	A technique of sampling, normally performed by HSE staff, of a specific component of a safety process to determine percent compliance by auditing the key elements of the process, e.g., sampling the SPA process.

4.0 PROCEDURE

4.1. Introduction

4.1.1. Objective

The objective of the Behavioral Safety Observation Report (BSOR) process is to find, record, and change at-risk behavior through employee involvement. It is both an external and an internal process.

Externally, employees work together to find and prevent at-risk behaviors in others, while internally they are preventing at-risk behaviors by preplanning and measuring their own activities.

4.1.2. Key to Success — Employee Involvement

The key to success in BSOR is employee involvement in process design/redesign and execution.

Employees should be given opportunities to be involved in the safety process at all levels. This includes being on the Safety Leadership Team; observing, collecting data and giving feedback to the person(s) observed; summation of the observation data, and trend analysis; problem solving to find root causes driving at-risk behaviors; plan development and implementation to remove barriers to safe behavior; and continued data collection to determine whether plans are working.

Employee involvement in incident prevention helps employees realize they have ownership of the safety process.

The BSOR process focuses on individual employees and their relationship to the hazard, and uses their knowledge and experience to create a safe workplace culture. It is a tool, which uses leading metrics and engages employees in the process of ensuring safe behavior before accidents occur.

4.1.3. Consequences

The BSOR process relies on the power of consequences. Consequences must be soon, certain, and positive in order to be effective. The consequences of a "possible" accident are generally not effective. Accidents are consequences that usually happen later, are uncertain, and are negative. The key to the BSOR process is to replace negative consequences with positive consequences, such as, positive observation feedback, positive feedback from supervisors for safe work, improved percent-safe ratings, pride in performance, and feelings of accomplishment for safety improvement are examples of positive consequences.

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4.1.4. Goal Oriented

The process is goal oriented. Each Safety Leadership Team sets its own goals for acceptable behavior. Then the Safety Leadership Team develops a plan to meet the goals, works the plan, and studies the results.

4.2. The Safety Leadership Team (SLT)

The Safety Leadership Team is to include managers, supervisors, and employees. At sites or facilities when teaming partners and/or subcontractors are involved, they should also have representation on the SLT.

The SLT works together to accomplish the following elements.

4.2.1. Establish a Charter

Establish a clear, site-specific charter to define safety objectives and expected outcomes of work.

4.2.2. Complete a Safety Perception Survey

The SLT surveys the facility or site on a regular basis to determine the current perception of safety at that location. The survey can be done through interviews with supervisors and employees and/or questionnaires. The survey should review both successes and failures of past and current programs.

The survey will assist the SLT to identify areas where they can make process improvements. Answering simple questions like, "What drives the safety effort here?" will assist the SLT in identifying areas for improving the overall safety effort. For example, if fear of discipline is all that drives the program, it will require additional effort to convince employees that observations will not be used to discipline them.

4.2.3. Develop the BSOR Implementation Plan

Implementation of behavioral safety techniques requires a plan and a schedule. Once the charter is developed, the SLT determines what is needed to meet the purpose(s) of the charter.

Each member of the team is given tasks for implementing the plan. Tasks should include helping with the training of supervision and observers, helping observers with their first observations, monitoring the observations to see that are accurate and complete, taking minutes of the meetings, reviewing and posting data, publishing and distributing the data, and implementing ideas that the team or employee work groups suggest.

4.2.4. Development of a BSOR Checklist

As a basis for the location-specific BSOR Checklist, the SLT should first create an inventory of at-risk behaviors by studying accident reports, SOR data, and safety sampling data, and use their own knowledge of at-risk behaviors to assist them in determining which ones are critical to their work site.

Statistical analysis of accidents can also be useful to the SLT in determining where efforts should be concentrated. Special causes and common causes should be considered separately in the statistical analysis so that efforts can be concentrated on making improvements that will affect the entire workforce.

A suggested list of general categories for the location-specific BSOR Checklist is:

- Personal protective equipment,
- Personal position (in the line of fire, body placement, etc.),
- Housekeeping,
- Following procedures,
- Tool use,

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- Hand protection,
- Fall protection, and
- Manual lifting.

The SLT should work on about five, but no more than eight, general categories at a time. The checklist should be changed as issues change or satisfactory levels of performance are reached in a given category or sub-category. The team and/or the employees and supervision for work area make this initial selection and recommend changes in their team meetings and/or safety meetings.

The safe behavior for each item on the list must be clearly defined and understood by the team and the observers. During the period of defining safe behaviors, there is an opportunity to get all the employees to buy in to the safe behavior by having them participate in the selection and definition process.

To ensure that the behaviors selected are observable — such that it is clear when observing a person's behavior whether it is safe or at-risk — the SLT should test the list for a few weeks before giving it to observers to use. Over time, the list should be updated with new items as different at-risk behaviors are found by the observers or the percent safe for a particular behavior reaches an acceptable range.

4.2.5. Inform All Employees

It is important to inform all employees at the site/facility of the purpose behind the BSOR process and the methods that will be used in the workplace before starting the actual observation process, to minimize the surprise and/or concern of those who are not otherwise involved in the process.

4.2.6. Predict Percent-Safe for Each Category

The SLT should make predictions of the current percent of safe behavior for each category. This should be done after the SLT implementation plan is finalized and prior to observers starting to collect data. Once collection of observation data begins, the SLT should compare this data against the predictions.

Whether the predictions are accurate or inaccurate, ask the question why. This helps the SLT to start thinking about why the site/facility is as safe or unsafe as it is and what should be done about it.

4.2.7. Manage the BSOR Process

Manage the BSOR process by assigning different SLT members to handle observer training, observer mentoring, data collection, and graphing; by taking meeting minutes, by managing implementation for various ideas; through communications to work site, etc.

The SLT should determine the goals for percent-safe behavior for each category. When behavior improvement goals are met in a category, new behavior categories should be selected to focus observations. The SLT will monitor the observation process and make changes where required. They should look at the number of observations per week, identify trends, and help implement changes to increase the percent safe behavior.

4.3. Observation Process

The following outlines the observation process.

4.3.1. Initiating the Process

At the beginning, between 5% and 10% of the work force should be trained to act as observers. Eventually, everyone should be trained as an observer.

Each observer should make at least one observation per day with a site goal of observing 150% to 200% of the workers per month for the typical site/facility. The minimum number of observations for any operation would be ten per week or one per observer for five days

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a week to have sufficient data to be statistically significant. Training is essential for all observers. Additional training in human relations and coaching is highly recommended.

New observers should be given enough time to work within the process, e.g., four to six weeks, so they can become good at it. It is most essential to rotate observers periodically so that everyone is given the opportunity to participate. When managers and supervisors function as observers, they shall not act as "supervisors" during the observation process, i.e., do not administer disciplinary action with those they observe.

4.3.2. Conducting Observations

Observations should take five to 15 minutes per observation. Before each observation, the observer should inform the employee(s) that they are going to be observed.

All observations are confidential. The name of the individual being observed will not be written on the observation form. The name of the person making the observation can appear on the form for statistical purposes as long as it does not inhibit the observers from being able to express openly their opinions. Generally, the SLT does not identify the observer by name in any report or published information other than making a record that the observer is or is not making observations. Observers have no power to discipline during an observation. They are to warn or stop behavior when an accident is imminent.

The observer should not be critical of the at-risk behavior. The observer should encourage compliance, but avoid finger pointing. The purpose of observation and feedback is to help the employee willingly comply.

The BSOR Checklist provides "safe" and "at-risk" check boxes. In order for a behavior to be marked as "safe", it must not have any deficiencies; otherwise, it must be marked as "at-risk". For each "at-risk" behavior, the observer must state, by category in the comment section of the form, what was observed to be at-risk.

When observers complete an observation they should inform the person being observed of the safe behaviors observed. Then the observer should share at-risk findings with the employee(s) and provide coaching, as appropriate.

Observers and employees should be informed of findings on a regular basis. The data will help them improve their observations, allow them to assist in solving safety problems discovered by the process, know solutions are being worked, and understand safety improvements being made through the process.

For recordkeeping purposes, permanent facilities and larger projects may want to develop checklists for specific work areas. Identifying a work area on the form could highlight behaviors that need to be addressed in one area but not in another. Thus, the SLT would study the differences in the work areas to help determine a solution for the specific area with the safety problem. The Plan, Do, Study, Act cycle described below should be used to help identify those differences.

Notes for Behavioral Safety Observation appear as Figure 2 (Back).

4.3.3. Disposition of Observation Forms

The observers should submit their observations on a daily basis.

The Safety Leadership Team will monitor the observations and recommend changes to the process as necessary to get the observations completed and to ensure quality observations.

4.4. Data Collection and Trending

Collect and total all observations on a weekly basis. If any item on the BSOR checklist is marked at-risk, the entire category should be marked at-risk.

The following data should be published on a weekly or monthly basis. On turnarounds, the data can be reviewed daily to react to rapidly changing workforce buildups and conditions.

- Number and percent of employees trained as observers,

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- Percent safe for each category listed,
- Total percent safe of all categories,
- Percent of observations vs the minimum requirement of one to two observation per employee on site per month, and
- Information on improvements that have been made.

The data system shall also be capable of collecting comments on behavior, so trends can be identified during the Plan, Do, Study, Act cycle. An embedded Sample Data Collection and Reporting Worksheet has been provided as Figure 1.

4.5. Plan, Do, Study, Act (PDSA) Cycle

The SLT should begin the Plan, Do, Study, Act cycle when they have enough data from the observations to study. Several weeks of observation should be sufficient. Part of the study cycle will be used to determine whether there is enough data and whether or not it is meaningful. Using data to drive safety improvement ensures that meaningful safety improvement takes place.

The SLT and the work groups should analyze the at-risk behaviors to identify the antecedents and consequences that are driving each behavior by asking, “Why do people perform at-risk behavior and what are the consequences of this behavior?”

The antecedents and consequences should be further analyzed to find the most powerful ones. The most powerful behavior consequences are the soon, certain, and positive ones. The SLT and work group should then determine what new antecedents and consequences should be put in place to change unsafe behavior to safe behavior. Fish bone diagramming may also be used to determine causes for at-risk behaviors or conditions.

The core of the process is to empower employees to make decisions to improve the percent safe behavior. Some of their ideas or suggestions may be antecedents such as additional training, improving work procedures, etc. Some of the ideas may be consequences such as better enforcement, improved positive feedback, and additional peer pressure.

Physical hazards, equipment deficiencies, and procedure problems will be some of the first items identified. As people gain confidence in the process, the SLT will move into solving behavioral and cultural issues.

Based on data collected, a plan for improvement should be developed. The SLT should predict the change in percent of safe behavior they expect and then implement the changes. During the implementation phase, allow sufficient time to evaluate the effect the changes have on the percent safe behavior. Some plans may actually lower percent safe behavior. Employees can gain experience using the process from their failures as well as their successes.

Monitor the percent safe behavior until it plateaus. Then develop a new Plan, Do, Study, Act cycle to run until you reach established goals. Generally, you should be working on improving several behavioral categories at a time.

Once goals are reached, select different behaviors to study and improve. Most goals will be for 100% safe behavior. But, there may be instances where a lesser goal may be appropriate.

5.0 TRAINING

Training and continued monitoring by a facilitator is critical to the process. It is also important that SLT assume training responsibilities from the facilitator as soon as they are able to. Facilitators and sample training materials are available from the HSE Department.

5.1. Safety Leadership Team and Site Management Training

BSOR training for the SLT and site management should include the basic eight-hour course on employee involvement, team building exercises, development of the charter, the behavioral checklist, the observation process, and the Plan, Do, Study, Act cycle.

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5.2. Site Supervisor and Observer Training

Training for the observers and site supervisors should include a review of the behavioral safety observation process and exercises outlining the observation process and use of the Behavioral Safety Observation Report Checklist. About 10% of the workforce should be trained before the process begins. The goal should be to eventually have everyone trained as an observer.

5.3. Site Introduction

Before formal observations begin, all employees at the site/facility should be informed about the process, the objective, and how data will be collected and used. It is up to the SLT to determine how and when this is to be done.

On small sites, all employees may be trained as observers from the beginning, which would also serve as the introduction. For large sites, members of the SLT should present an introduction of the process to employees prior to beginning the process.

6.0 REFERENCES AND RELATED DOCUMENTS

HSEP 2.17

7.0 FIGURES

Sample Data Collection And Reporting Worksheet

Sample Behavioral Safety Observation Report Checklist

Notes for Behavioral Safety Observation

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Figure 1

Sample Data Collection and Reporting Worksheet

"Behavior Data
2-09-04 rev 0.xls"

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Figure 2 (Front)

Sample Behavioral Safety Observation Report Checklist

Observer's Name: Location:

Task: Date:

When observing, ask: Is this person in a position where he/she could get hurt by one of the following?

	Safe	At Risk		Safe	At Risk
PPE			**Tools**		
Hard hat			Correct tool used and has current inspection		
Safety glasses w/side shields			Tool used correctly and with 2 hands if req'd.		
Appropriate footwear			Equipment/tool guards in place & functional		
Hearing Protection			Sufficient lighting for task being performed		
Hand Protection			Material secure while working on it		
Full Face Shields/Goggles			Aware of surroundings (people, equipment)		
			Protective/Containment screens used		
Procedures			**Are Employees In The Line Of Fire?**		
Is SPA adequate & being followed?			Protected from overhead hazards?		
Are hazards identified on SPA?			Have pinch points been mitigated?		
Is SPA updated & communicated?			Are others protected from work being done?		
Work Permits used/followed?			Is task in the "Line of Sight?"		
Is equipment used properly?			Are sharp edges protected?		
Is other procedure adequate?					
			Housekeeping		
Scaffolding & Barricade Use			Is general housekeeping adequate?		
Barricades used when required?			Trip hazards protected or removed?		
Barricade adequate/correct type?			Flammable material stored correctly?		
Barricade tags followed?			Cord/hose management?		
Scaffolding correct/used properly?					
			Fall Protection and Ladders Use		
Manual Lifting and Body Position			Holes properly covered?		
Knees bent/back straight?			Employee setup/tied off as required?		
Body position correct/not twisted?			Using ladder correctly?		
Help for bulky or heavy items?			Using stairs correctly?		
			Harness inspected w/current color code?		

Observer's Summary Comments

Safe Acts:

At-Risk Acts:

Feedback from Person(s) Observed:

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Figure 2 (Back)

Notes for Behavioral Safety Observation

Procedure

- Use defined checklist
- Conduct situational observation of work area
- Ask person you if you can observe them
- Observe employee(s) working
- Complete Behavioral Safety Observation Report
- Note safe behaviors
- Write actual behavior for each at-risk behavior
- Tell person(s) when observation is completed
- Explain positive findings to person(s) observed
- Provide guidance feedback to person(s) observed for at-risk behavior
- Note corrective actions taken
- Note recommendations (yours and person(s) observed) for equipment or procedure changes where appropriate
- Submit checklist for summarization

Tips

- Be careful not to startle the employee you are planning to observe when you ask them if you can observe them.
- Be polite. Remember the golden rule and treat everyone like you would like to be treated.
- If you do not know whether or not a situation is safe, consult with the employee(s) being observed. If you are still unsure you can discuss it with the supervisor or HSE department or submit question on your observation form.
- Never argue with the person being observed; simply agree to disagree and turn the issue over to the Safety Leadership Team by putting the issue on your form under the section for “Feedback From The Person(s) Being Observed.”
- If you observe an unsafe or good safe behavior that is not on the form, please note it on the form and discuss it with the employee. We want to learn about other behaviors that may help us or that may be causing us problems.

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1.0 PURPOSE AND SCOPE

This HSEP provides a disciplined method for hazard identification and risk assessment. Although this process is primarily intended for project-level planning to support development of the HASAP (ref. HSEP 2.12), the same principles apply to activity-level and task-level planning.

When appropriate, other means or methods for hazard analysis may be used, provided they provide results of similar quality.

The primary goal of the hazard analysis is to identify hazards that pose a potential threat of harm to assets to be protected; namely people, property, and the environment. A secondary goal is to provide an understanding of the risk remaining after hazard controls have been identified.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

2.1. Project Manager

The Project Manager shall ensure that the appropriate level of hazard analysis is performed and documented prior to the start of field work activities.

2.2. HSE Department

The HSE personnel shall support the project planning process and shall facilitate the hazard analysis process by:

- Performing and/or participating in the development of project-level hazard analyses
- Providing training in the hazard analysis process
- Reviewing project hazard analyses

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3.0 DEFINITIONS

Control	A measure taken to reduce the risk to an acceptable or manageable level by reducing either severity, probability, or both.
Credible	Capable of occurring with some reliability; realistic.
Hazard	Something that has the potential to cause harm (condition, situation, activity or characteristic)
Hazard Analysis	The process of hazard identification, risk assessment, and hazard control identification.
Incident Likelihood or Probability	Assessment of the likelihood or probability of occurrence of an incident over a prescribed exposure interval.
Incident Severity	Assessment of the most credible outcome of an incident based on human error, environmental conditions, design inadequacies, procedural deficiencies, or component/system failure.
Residual Risk	Risk that remains after controls are taken into consideration.
Risk	A measure of the likelihood or probability of a hazard-related incident occurring and the severity of harm or damage that could result. For the purpose of qualitatively assessing risk, it is defined as the product of severity of the incident outcome and the likelihood of occurrence.

4.0 PROCEDURE

4.1. Hazard Identification

All the foreseeable hazards associated with a particular activity or project should be identified. In addition to identifying top-level, generic hazards, the hazard analysis should strive to identify all credible hazards associated with the specific work activities to be performed on the project.

The hazard identification should consider:

- Lessons learned from previous projects
- HSE Alerts and Advisories
- Hazard checklists
- Hazard information contained in health and safety procedures (HSEPs)
- Health Hazard Evaluation (HSEP 12.1)
- All available energy sources, e.g., electrical, pneumatic, hydraulic, stored energy, etc.
- Hazards based on work activity by trade, craft, or discipline
- Hazards based on work activity by phase (mobilization, construction, start-up, commissioning, maintenance, shut-down, etc.)
- Consulting with knowledgeable persons
- Information in chemical hazard information sheets (e.g., MSDS)

Ideally, hazards should be described by hazard source, the mechanism by which the source brings about the harm, and the outcome that might result. The hazard source is the activity or condition that serves as the root of the hazard scenario.

4.2. Risk Assessment

The risk assessment may be either a qualitative or a quantitative assessment. In either case, the risk assessment should involve making

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- An assessment of the likelihood or probability of an incident occurring and
- An assessment of the worst credible outcome of the incident.

The Risk Assessment Matrix (Figure 1) will be used for assessing risk associated with the hazards identified.

In certain cases, when appropriate, a matrix of equivalent quality from another source may be used.

4.2.1. Using the Risk Assessment Matrix

The initial risk assessment should be made assuming that no controls are in place. Depending on the level of the initial risk, controls shall be identified to eliminate or lower the risk to an acceptable or manageable level. Through careful selection, the controls identified can reduce probability or severity or both. Controls should be selected based on their effectiveness in reducing risk, with particular emphasis placed on selection of controls that provide multiple layers of risk reduction.

Once the controls are identified, a final risk assessment shall be made to determine the level of residual risk. Residual risk is the risk that remains after taking into consideration any reduction in risk associated with implementation of controls.

4.2.2. Assessing Incident Likelihood or Probability

When available, quantitative values of probability should be used to assess risk. However, in most cases, qualitative ranges of frequency or likelihood of occurrence, as defined below, are typically used. See Figure 1.

- E - Frequent – likely to occur often; happens every day in the crew, operation, etc.
- D - Probable – likely to occur several times; happens periodically in the crew, operation, etc.
- C - Occasional – possible to occur sometime; happens during the course of a year
- B - Remote – unlikely but possible to occur; known to occur in the industry
- A - Improbable – so unlikely, it can be assumed occurrence may not be experienced; never known to occur in the industry

4.2.3. Assessing Incident Severity

Incident severity shall be assessed based on the worst credible outcome considering personnel injury or illness, property damage, environmental damage, and/or productivity and downtime. The severity levels for these outcomes are provided in the Risk Assessment Matrix (Figure 1). For personnel the severity levels are defined as:

- 1 – Injury requiring only first aid
- 2 – Injury requiring medical treatment beyond first aid (For example, OSHA Recordable or E-1)
- 3 – Injury resulting in days away from work
- 4 – Injury resulting in permanent partial disability
- 5 – Fatality or injury resulting in total permanent disability

4.2.4. Risk Zones

Using the risk assessment matrix, the risk zone shall be determined based on the severity level and frequency or likelihood of occurrence. The matrix defines three risk zones (high, medium, and low) and associated risk mitigation controls.

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- High (Red) – Work activity or operation is not permitted. Additional controls must be implemented to reduce risk to an acceptable or manageable level.
- Medium (Yellow) – Work or operation permitted with a time limited waiver endorsed by management. This means that there is management oversight and approval for specific work activities or operations that fall in the Yellow zone. Examples include critical lift plan, confined space entry permit, lock-out/tag-out procedures, containment zones for asbestos work, line break procedures, etc.
- Low (Blue) – Work or operation is permitted with implementation of core HSE program elements (HASAP, SPA, SOR, SER, appropriate training, etc.).

4.3. Hazard Control

Hazard controls shall be selected based on their effectiveness in eliminating or reducing risk. See table below. Administrative controls alone (e.g., procedures, work instructions, or training) shall not be relied on to reduce risk from the High Zone to the Low Zone.

Hierarchy of Effectiveness of Controls

Effectiveness	Type of Control	Examples	Effective at Reducing Risk by Reducing	
			Severity of Outcome	Probability or Likelihood of Occurrence
Highest	Design (engineering change)	Eliminate or minimize energy sources; change material to a less hazardous material	X	X
	Engineered safety features (active devices)	Redundant backup; safety interlocks; automatic prevention/correction devices		X
	Safety devices (passive devices)	Physical barriers, guards, and shields; mechanical stops or limiting devices	X	X
	Warning devices	Audible and visual alarms; signs and postings		X
Lowest	Administrative controls	Procedures and work instructions; checklists, training, and PPE		X

4.4. Hazard Analysis

The hazard analysis process is a collaborative effort involving personnel with the appropriate expertise to ensure that all credible hazards are identified and addressed.

The hazard analysis shall serve as a means for identifying hazards and assessing risk for project activities. When activities change or when new activities are identified, the hazard analysis should be updated. Improvements in hazard controls or in the project/site HSE program resulting from the updated hazard analysis shall be implemented in a timely and effective manner and shall be communicated to the project team.

The hazard analysis shall be documented as part of the appropriate HSE or project plan (HASAP). Figure 2 provides an example of a typical form used to document a hazard analysis.

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When performed, the hazard analysis should be periodically reviewed and updated to ensure that it is maintained current with the scope of the project and the hazards that exist on the site. Revisions to the hazard analysis resulting in changes in risk assessment, hazards, or controls shall be communicated to the project team and work force as appropriate.

The Safety Evaluation Report shall be the primary means for evaluating the hazard analysis process implemented for the project.

In addition, the hazard analysis process can be used to support design safety risk assessments, and various pre-task planning processes and tools including Job Hazard Analysis, Work Method Statements, and Safe Plans of Action.

5.0 REFERENCES AND RELATED DOCUMENTS

HSEP 1.5, HSE Program Implementation Roles and Responsibilities

HSEP 2.2, SER

HSEP 2.12, HASAP

HSEP 12.1, Health Hazard Evaluation

6.0 FIGURES

Figure 1, Risk Assessment Matrix

Figure 2, Hazard Analysis Worksheet

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Figure 1, Risk Assessment Matrix

Incident Severity					Incident Likelihood or Probability				
					Improbable	Remote	Occasional	Probable	Frequent
Productivity or Downtime	**Environment**	**Property**	**Personnel**	**Severity Level**	**A**	**B**	**C**	**D**	**E**
> 2 weeks	Permanent damage beyond project boundary	Total facility loss	Fatality or total permanent disability	5					
1 week to 2 weeks	Permanent damage within project boundary or reportable release beyond boundary	Damage to an entire facility or loss of multiple systems in a facility	Permanent partial disability	4				H	
> 1 day to < 1 week	Reportable release within project boundary with no permanent damage	Damage to an entire facility or multiple systems in a facility requiring repair or replacement	Days away	3					
½ day to 1 day	Release within project boundary below reporting quantity with clean-up by external source	Damage to a facility element or system requiring repair or replacement	OSHA Recordable or E-1	2		L	M		
< ½ day	Release within project boundary below reporting quantity with clean-up by internal source	Damage to a facility element or system requiring negligible or no repair	First aid	1					

Risk Mitigation Controls	**High (H)**	Operation not permitted; must implement controls to reduce risk to an acceptable or manageable level.	**Medium (M)**	Operation permitted with a time limited waiver endorsed by management.	**Low (L)**	Operation permitted with implementation of core HSE program elements.

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HAZARD ANALYSIS

Project Number:	Project:	Location:

Prepared By:	Date:	Reviewed By:	Date:

Ref. Number	Activity or Element	Hazard	Asset	Preliminary Risk Assessment			Control Type	Controls	Final Risk Assessment		
				H	M	L			H	M	L

Asset: **P** = Personnel, **F** = Facilities and equipment, **E** = Environment

Control Type: **D** = Design, **E** = Engineering control, **S** = Safety device, **W** = Warning device, **A** = Administrative control

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HSE Procedure		Document No: HSEP 3.1	Page: 1 of 3
HSE Training		Supersedes: HSEP 3.1	Revision: 2 Issue Date: 6 Dec 06
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1.0 PURPOSE AND SCOPE

This procedure provides HSE training recommendations and guidelines for employees engaged in operations covered by the Jacobs HSE Program. As appropriate for the project, and as specified in the project's HASAP, the HSE training described below may also apply to subcontractors.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

3.0 PROCEDURE

Managers and supervisors should assure that appropriate training in potential workplace physical, chemical, and other type hazards, the necessary control measures, and company procedures that address such hazards is provided

- To all new employees;
- To all employees given new job assignments for which training has not previously been received;
- When new substances, processes, procedures, or equipment are introduced to the workplace and represent a new hazard;
- When the manager or supervisor is made aware of a new or previously unrecognized hazard; and,
- For supervisors to familiarize themselves with the HSE hazards to which employees under their immediate direction and control may be exposed.

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3.1. Initial Assignment Orientation (Induction)

All employees and subcontractors should receive HSE orientation (induction) prior to job assignment. The orientation (induction) should, at a minimum, address the Jacobs HSE program, the company's HSE-related expectations, and any site-specific or project-specific HSE rules and procedures.

Contractor personnel and other workers should also receive HSE orientation (induction) prior to site or facility work assignment.

3.2. Selection of Job-specific Training Topics

Workers should receive job-specific HSE training that will be appropriate for their job assignment.

Operations and the Senior HSE Manager should utilize the HSE Training Guidelines by Job Function Matrix (HSEP 3.1f1) as a guideline to collaboratively develop a table that specifically defines the required HSE training appropriate for their project, office, job location, or operating group.

Workers should receive additional job-specific or site-specific HSE training, not mentioned in the matrix, which may be necessary based on the scope and nature of potential workplace physical or chemical hazards and local regulatory requirements.

Operations and the Senior HSE Manager are encouraged to review and update their locally developed training matrix on an annual basis.

3.3. Training Materials

Training materials should utilize and conform to Company identity style guides and format requirements.

Each training module should have a stated course objective and note pages to explain the intended message of the slides, as appropriate.

Personnel are encouraged to address both workplace and non-work related (home, recreation, etc.) safety and their benefits for promoting a consistent and continuous (24/7) safety culture.

Since the collection of HSE training programs and modules are regularly being updated, the reader is encouraged go to the JNet HSE Training folder for the most current training material. Your local HSE Manager can also assist in providing required training materials.

Details of class content and duration should be determined by the instructor based on site and facility-specific hazards, scope of the work, experience of the audience, etc., in order to achieve the training objectives.

3.4. Training Class Attendance Documentation

It is the responsibility of the supervisor to ensure that HSE training records are maintained for all training conducted. A training attendance roster should minimally reflect the

- Date of the training,
- Subject matter,
- Instructor's name,
- Media (classroom, e-learning, computer-based training, etc.), and

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- The attendee's
  - Name printed,
  - Signature,
  - Employee number or other unique identifier,
  - Affiliation/employer, and
  - Job title.

3.5. Training Instructors

HSE training should be presented by instructors qualified to present the subject matter, who have been approved by the company HSE Department.

3.6. Training Records Retention

Training records should be maintained for the duration of the project or three years from date of training.

The HSE Department should periodically monitor HSE training compliance and records retention through the SER and other evaluation processes.

3.7. Training Certificates

The issuance of a certificate, or an equivalent record upon training completion, is encouraged.

4.0 REFERENCES AND RELATED DOCUMENTS

HSEP 3.1f1, HSE Training Guidelines by Job Function Matrix

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1.0 PURPOSE AND SCOPE

This HSEP presents requirements for the medical surveillance program, physical examinations, and notification of results. Detailed descriptions of medical protocols and administrative procedures, and copies of all Company forms are given in Appendix A, Medical Monitoring Program Protocols and Administrative Procedures. A copy of 29 CFR 1910.120 and the medical surveillance portions of 29 CFR 1910.1001-1045, 1910.1001 and 1910.1027 are contained in Appendix B.

This HSEP applies to all employees assigned to hazardous waste site operations who are exposed to or are potentially exposed to hazardous substances or health hazards at or above the established exposure levels for those substances.

Employees exposed to specific hazardous materials will be evaluated on a case-by-case basis for inclusion in a medical surveillance program under the direction of the CHSEM with guidance by the CMC. All work activities covered by OSHA regulation will be conducted in accordance with the specific hazard's medical monitoring requirements as outlined in the respective OSHA standards. Hazardous materials not covered by OSHA shall be subject to requirements outlined by the CHSEM and CMC.

Procedures for employees exposed to or potentially exposed to lead and/or asbestos are contained within the scope of this HSEP and will not be evaluated on a case-by-case basis.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

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2.1. Corporate Health, Safety, and Environment Manager (CHSEM)

The Corporate Health, Safety, and Environment Manager (CHSEM) is responsible for overall management of the medical surveillance program. The CHSEM shall select the Corporate Medical Consultant (CMC) to provide guidance in establishing and maintaining the medical surveillance program, and shall be responsible for monitoring the overall implementation and effectiveness of the program.

2.2. Corporate Health, Safety, and Environment Administrator CHSEA)

The Corporate Health, Safety, and Environment Administrator (CHSEA), appointed by the CHSEM, is responsible for overall administration of the medical surveillance program. This includes selecting and establishing medical clinics, establishing medical protocol and administrative procedures in coordination with the Corporate Medical Consultant, managing the scheduling of physical examinations, maintaining a current database and confidential medical records system, notifying the employee's supervisor of any work restrictions as noted by the examining physician, and monitoring hazardous materials exposure information.

2.3. Corporate Medical Consultant (CMC)

The Corporate Medical Consultant (CMC), appointed by the CHSEM, is responsible for medical quality control review and medical auditing of the performance of the medical clinics and laboratories. The CMC may also be asked by the Corporate Health, Safety, and Environment Department to advise on additional testing, medical restrictions and abnormalities, emergency event consultation, new clinic selection, and new program medical protocol.

Program participants must agree to take a Baseline (Initial) examination, annual and post-exposure examinations, and a Baseline (Exit) examination upon termination of their enrollment in the program.

3.0 DEFINITIONS

Environmental Project Work	Projects that are primarily regulated by requirements set forth in 29 CFR 1910.120.

4.0 PROCEDURE

4.1. New Hires and New Participants

New participants to the medical monitoring program will be entered into the database by completion of the New Hire/Termination/Transfer (Appendix A). This form should be initiated by the local Health, Safety, and Environment Manager or Coordinator, and in some instances by the human resources representative.

Upon initial enrollment into the medical monitoring program each employee will receive a baseline (initial) examination, an interim or periodic examination each year thereafter, and a baseline (exit) examination upon terminating enrollment in the program.

The interim and periodic examinations are to be used for comparison with the baseline exam in order to detect any early indication of change in health status, whether work related or of a non-occupational origin. The interim exam will be given the year following the baseline exam and every other year thereafter. The periodic exam will be given the second year after the baseline exam and every other year thereafter.

Employees assigned to operations where they are exposed to or are potentially exposed to asbestos or lead at or above the established limits require *additional* testing. These additional requirements can be found in sections: lead, 7.3.1, 7.4.1.1, 7.4.2.1, 7.5.1; asbestos, 7.3.2, 7.4.1.2, 7.4.2.2. If the employee is currently enrolled in the medical monitoring program, the CMC will review the employee's last physical examination to ensure it is adequate and to order supplementary tests for any inadequacies.

4.2. Baseline (Initial) Examination

An initial or baseline exam is given to each participant prior to any work assignment involving potential exposure to hazardous materials. The exam is intended to determine that the employee

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will be able to perform their job without undue risk to themselves, fellow employees, or to the public and to provide a baseline against which future examinations can be measured.

The exam consists of a complete medical examination designed to establish baseline measurements and to screen for evidence of adverse effects of occupational exposure to toxic substances or health hazards. It includes a medical and occupational history review, a complete physical examination (including PA chest x-ray), basic blood and urine laboratory tests, and a physician's evaluation to determine the individual's fitness to perform field work. In addition, the exam shall assess the individual's ability to wear and use personal protective equipment. The results of the exam shall be reviewed by a physician qualified in the practice of occupational and industrial medicine to determine the individual's fitness to perform field work. The Corporate Health & Safety Department may request to include additional tests as necessary for specific anticipated exposures.

The Baseline (Initial) Examination will also include blood lead/zinc protoporphyrin determination if the employee has been exposed to lead at or above the permissible level for more than 30 days in any consecutive twelve months. If an employee has been exposed to lead at or above the level, blood lead/zinc protoporphyrin levels will be taken every two months for the first six months and every six months thereafter. At minimum, if precise exposure levels and timeframes are not known, blood lead zinc/protoporphyrin will be taken annually.

If the employee has been exposed to asbestos at or above the permissible exposure limit for a combined 30 days or more per year, the Baseline (Initial) Examination will also include Part 1, Initial Medical Questionnaire of the medical questionnaire contained within 29 CFR 1910.1001, appendix D.

4.3. Annual Examinations

Each individual shall receive an Interim Medical Review or a Periodic Medical Examination annually, alternating every other year.

4.3.1. Interim Medical Review

The Interim Medical Review includes an interim questionnaire, updated Hazardous Materials Exposure Summary (Appendix A), and laboratory analysis to compare to the Baseline (Initial) Examination. The physician may request approval from the Corporate Health, Safety, and Environment Department for special examination procedures or additional testing if he/she finds it necessary. The Interim Medical Review will be given the first year after the baseline exam and every other year thereafter.

The Interim Medical Review will also include a blood lead/zinc protoporphyrin test if the employee has been exposed to lead for at least 30 days in any consecutive twelve months.

Interim Medical Reviews will not be given to employees exposed to asbestos at or above the permissible limit for a combined 30 days or more per year. A Periodic Medical Review will be administered annually.

4.3.2. Periodic Medical Examination

The Periodic Medical Examination includes a thorough examination similar to the Baseline (Initial) Examination (section 7.2) but not including an EKG. Chest x-rays will be taken every five years (except in the case of asbestos exposure, see section 7.4.2 below). The Periodic Medical Examination will be given the second year after the Baseline (Initial) Examination and every other year thereafter. The examination will be performed as closely as possible to the anniversary of the baseline or Interim Medical Review and, if possible, at the same clinic or facility. If the examination is to be performed at a different facility, arrangements should be made to have the previous records transferred to the new examining location. The Periodic Medical Examination will also include:

- A blood lead zinc/protoporphyrin test if the employee has been exposed to lead for at least 30 days within any consecutive twelve months.

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- An annual PA chest x-ray for employees exposed to asbestos at or above the permissible limit for a combined 30 days or more per year. Additionally, the Periodic Medical Examination will also include Part 2, Periodic of the Medical Questionnaire contained within 29 CFR 1910.1001, appendix D.

4.4. Baseline (Exit) Examination

Upon termination of enrollment in the program, the employee must complete an Exit Examination whether or not the employee has completed any field work since his/her last exam.

The exam is identical to the Baseline (Initial) Examination except that it does not include the ability to wear a respirator test, or an EKG.

Exam requirement may be waived by the Corporate Health & Safety Department if the employee has completed a Baseline (Initial) or Periodic Examination within the preceding six months. If the employee refuses the Baseline (Exit) Examination, he must put the refusal in writing.

The Baseline (Exit) Examination will also include blood lead zinc/protoporphyrin tests if the employee has been exposed to lead for at least 30 days within any consecutive twelve months.

Upon completion of a Baseline (Initial), Interim, Periodic, or Exit Examination, a Physician's Examination Summary (Appendix A), completed by the examining physician, will be mailed to the Corporate Health & Safety Administrator within one week of the examination. The Physician's Examination Summary serves as formal documentation of the employee's fit for work status and medical field clearance.

A letter from the examining physician outlining the results of the examination will be sent to the patient's home address within two weeks. A copy of the laboratory results will be included.

4.5. Post Exposure Examinations

Following exposure to hazardous materials, a post exposure examination may be required. The examination may be requested by the exposed individual, the project/site manager or the manager of health, safety, and environment. The tests included in the post exposure examination will be determined by the nature of the exposure and may include all tests performed in the Baseline (Initial) Examination and additional tests as necessary. In most cases, additional testing to monitor tissue damage after an exposure will be established on a case-by-case basis and reviewed by the corporate medical consultant.

4.6. Access to Employee's Exposure and Medical Records

All employees enrolled in the medical surveillance program shall have access to their exposure and medical records as described in Occupational Safety and Health Standard 29 CFR 1910.20. Requests for exposure and medical records are to be made in writing and sent to the HSA.

5.0 REFERENCES

29 CFR 1910.120, Hazardous Waste Operations And Emergency Response; 29 CFR 1910.134, respiratory protection; 29 CFR 1910.1001-1045, toxic and hazardous substances,

NIOSH, OSHA, USCG, USEPA. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. U.S. Department of Health and Human Services, Public Health Services Centers, National Institute for Occupational Safety and Health, Washington, D.C.

ANSI. American National Standard for Respiratory Protection. ANSI Z88.6-1984. American National Standards Institute, New York, N.Y., 1984.

6.0 ATTACHMENTS

Contact the Corporate Health, Safety, and Environment Department for the Medical Monitoring Program Protocols and Administrative Procedures and OSHA Standards. Due to its size, this document has not been appended to this HSEP.

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HSE Procedure		Document No: HSEP 4.4	Page: 1 of 2
First Aid Program		Supersedes: NA	Revision: 1 Issue Date: 10 Nov 06
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1.0 PURPOSE AND SCOPE

The planning necessary to assure high quality emergency care is one of the building blocks of the company's commitment to provide a safe and healthful work environment. The purpose of this HSEP is to provide guidelines to ensure such an environment is provided.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

3.0 PROCEDURE

3.1. First Aid Procedures and Kits

Designated, properly-trained first-aid personnel must be available at all sites to provide assistance to those employees needing such care.

3.1.1. Contents and Accessibility

First aid supplies shall be easily accessible, when required.

On field projects, the contents of the first aid kit shall be placed in a weatherproof container with individual sealed packages for each type of item, and shall be checked before being sent out on each job and at least weekly on each job to ensure that the expended items are replaced.

Proper equipment for prompt transportation of an injured person to a physician or hospital, or a communication system for contacting necessary ambulance service, shall be provided.

In areas where 911 is not available, the telephone numbers of the physicians, hospitals, or ambulances shall be conspicuously posted.

Where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

Recommended first-aid kit contents vary by state and country. Follow local or country-specific requirements. Contact HSE or the Jacobs Occupational Health Services Department.

Prescription medicine shall never be made available in a company first-aid kit.

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The placement of first aid kits in leased and site vehicles is highly recommended.

3.1.2. In order to meet this objective, operations, project, or office managers shall:

- Ensure that an HSE Manager is given access to the work site to complete a site hazard assessment. This assessment is ideally completed prior to job start-up.
- Ensure that the work site establishes appropriate first-aid programs based on the site hazard assessment.
- Ensure that the work site has properly trained first-aid personnel available to provide assistance should help be needed.
- Ensure that a minimum of one person trained in basic first aid and cardiopulmonary resuscitation (CPR) is always on the premises during work hours.
- Ensure that the designated first-aid providers' certifications, training, and qualifications are maintained and current.

3.1.3. The Site HSE Manager or other qualified person will:

- Perform a site hazard assessment on each of the projects under his jurisdiction.
- Ensure that a roster of site medical personnel is maintained at the site.
- Ensure the site maintains information about, and directions to emergency facilities to which employees can be taken after first aid has been provided or if first aid is beyond the scope of first aid care.
- Provide guidance regarding qualifications and training of appropriate first aid personnel, supplies, personal protection equipment for first aid providers.
- Consult with a qualified medical advisor if the HSE Manager is unsure of any medical issues related to site hazards and/or the appropriateness of first aid for such.
- Ensure that the first aid program is reviewed and updated every two years.
- Review records of services rendered for adequacy and proper retention. This review should be done every two years in conjunction with the program review.
- Review the actual functioning of the first aid program which will include: updating qualifications of first aid personnel responders, updating and reviewing the contents and location of first aid kits and reviewing the location of installed protection, such as eye wash fountains.

3.1.4. The first-aid providers will be responsible for:

- Ensuring that their certifications, training, and qualifications are maintained and current.
- Providing first-aid to site personnel, when needed.

3.2. Training, Qualifications, and Certifications of First Aid Providers

The training, qualifications, and certifications of first-aid providers vary by location. Follow local or country-specific requirements. Contact HSE or the Jacobs Occupational Health Services Department.

3.3. Western Region

In Canada, the requirements for first aid and medical services, supplies, and facilities are regulated based on the industry, number of workers, hazards, and proximity to a medical facility.

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Canadian regulations identify the requirements for dealing with non-injury-related medical emergencies such as heart attacks and the supply of life saving and life support equipment when work is being conducted in remote locations.

Canadian regulations require emergency conveyance to the nearest medical facility. This often takes the form of an ambulance service contracted to an independent supplier or, in some cases, a helicopter service. The specific first aid and medical requirements for a project should be identified during development of the HASAP.

At maintenance projects, first aid and medical services are often supplied by the customer.

4.0 REFERENCES & RELATED DOCUMENTS

HSEP 1.5

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HSE Procedure		Document No: HSEP 5.1	Page: 1 of 14
Accidents and Incidents Investigation and Reporting		Supersedes: HSEP 5.1	Revision: 4 Issue Date: 3 Jan 06
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1.0 PURPOSE AND SCOPE

Reporting, investigating, and recording of all accidents, incidents, and illnesses are key steps in understanding and addressing root causes to prevent recurrence of incidents similar in nature, and detecting trends that may have broader implications. For this reason, it is imperative that all accidents, incidents, and illnesses be reported, investigated, and documented. This includes non-injury events, dangerous occurrences, and releases of Hazardous Chemicals and/or Radiological Materials.

This HSEP applies to accidents and incidents involving Jacobs employees and subcontractors.

For incidents involving motor vehicles, refer to HSEP 5.2.

2.0 RESPONSIBILITIES

General responsibilities for HSE procedures implementation are stated in HSEP 1.5. Additional responsibilities specific to this HSEP include the following.

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2.1. Site or Office Manager

The Site or Office Manager shall

- Report accidents and incidents to their operations manager and their field services manager, as appropriate.
- Organize and participate in accident investigations and engage appropriate resources and the Legal Department, as appropriate.
- Implement appropriate corrective actions into Jacobs work processes.
- Analyze HSE records to measure the effectiveness of preventive/follow-up actions and the ongoing HSE program.

2.2. Supervisors

For accidents, incidents, and illnesses involving their personnel, supervisors must:

- Promptly report them to the HSE representative and to the Site or Office Manager,
- Lead investigations, and
- Ensure that all records are completed in a timely fashion.

2.3. Employees

Employees must immediately report all work-related accidents, incidents, and illnesses to their supervisor or the HSE representative.

2.4. HSE Representative

The HSE representative shall:

- Report accidents and incidents to their HSE Manager, as required,
- Assist the Site or Office Manager in organization of investigations and participate in them,
- Assist Supervisors in reporting and recording all accidents, incidents, and illnesses,
- Identify appropriate HSE professional to support investigations, as appropriate (especially where the HSE Representative is not also an HSE professional),
- Establish and maintain all records required by this HSEP and regulatory agency recordkeeping requirements,
- Assist the Site or Office Manager in the analysis of records to measure the effectiveness of preventive and follow-up actions and the ongoing HSE program, and
- Keep the Regional HSE Manager apprised of accidents, incidents, and illnesses and recommend lessons learned as may be appropriate to other sites/offices.

3.0 DEFINITIONS

Definitions of terms used in this HSEP can be found in Incident and Accident Definitions by Type, Injury Status, and Incident Classification, which is posted on JNet.

An additional definition that is used in this HSEP, which does not appear in the JNet posting, is:.

Serious Incident	Incident resulting in a Days Away from Work (i.e. Lost Time) case and/or greater than USD 5,000 in damage.

4.0 PROCEDURE

In the event of a workplace incident involving injury or illness, the first priority is to provide the best assistance possible to employees, who may need it and to ensure the safety of others who may be affected or acting as emergency responders.

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Incidents, including non-injury or "near miss" events, which are potentially of E-1 or greater severity, and incidents that are potentially reportable to regulatory agencies, including environmental incidents, shall be promptly reported to the responsible:

- Operations Manager,
- Field Services Manager, if appropriate,
- Office Manager, if appropriate, and
- HSE Manager.

Such reports should be made promptly and directly, preferably by phone or in person.

4.1. Post-Incident Drug and/or Alcohol Testing

Except where prohibited by law, the Company will require employees, who are involved in a workplace incident, which results or could have resulted in an injury to a person (other than first aid) and/or property damage to submit, to a post incident test for drugs and/or alcohol as part of the investigation of such incidents. This same policy applies to our subcontractors, as appropriate.

It is the responsibility of the Office Manager or Site Manager, working with Human Resources and Legal, to establish the program for drug and alcohol testing for their location.

Questions that arise concerning possible prohibitions should be directed to the Human Resources and Legal Departments. Disciplinary action against an employee, who fails a drug or alcohol test, shall be coordinated by Human Resources with input from Operations and the Legal Department.

Drug testing is also governed by local regulations in many countries. Contact the company Human Resources and Legal Departments for assistance.

4.2. Accident/Incident Investigation

In order to eliminate incidents, both injury and non-injury, it is important to perform thorough investigations when accidents/incidents occur. Immediate action taken to identify causes can be utilized to prevent recurrence of future incidents of a similar nature. An accident/incident investigation is not for the purpose of fault-finding, but rather fact-finding. It is important that the approach reflects this purpose so that information is readily shared and the response effective.

Investigations must be conducted when an accident/incident occurs, including non-injury and first-aid-type incidents. Participants in the basic investigation process should include, at a minimum:

- The person(s) involved and/or injured in the incident.
- First- and second-line supervisors of the person(s) involved in the incident.
- Site manager or office manager.
- An HSE professional.
- Subject matter/discipline specialists, as appropriate
- Legal and Risk Management representatives, in the event of a Serious Incident.
- Other senior management, as appropriate

The investigation team should examine the accident/incident scene and review all facts pertaining to the incident in a conference environment.

The task-specific safe work plan (Safe Plan of Action and/or Job Safety Analysis) should be examined as part of the investigation process.

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4.3. Investigation Reports and Recordkeeping

4.3.1. Authorization for Medical Treatment

For employee injuries or illnesses that require treatment by a medical services provider, a company supervisor shall complete an Authorization for Medical Treatment form. A new form shall be sent with the employee upon each visit to the medical services provider. (See Figure 1 for a sample authorization form that can be tailored for local use.)

Ask the medical services provider to complete the disposition portion (lower half) of form.

Since form distribution varies by location, check with HSE for distribution in your area.

4.3.2. Internal Reporting

Details shall be entered in the online JSIMS Accident/Incident form.

In the event of a Serious Incident, the responsibility for report preparation may be assigned to another investigation team member and a member of the Legal Department must be consulted prior to documentation.

4.3.3. Injured Employee's Statement

Ask the employee with the illness or injury to complete an Injured Employee's Statement (Figure 2).

4.3.4. Witness Statement

The Witness Statement (Figure 3) shall be used to obtain a signed account from witnesses of their factual observations, as soon as reasonably appropriate after the incident.

Statements should be written by the witness, however, another person may record his/her dictation if so requested by the witness.

Statements should be taken and prepared in a confidential and non-threatening environment.

Append the Witness Statement to the Accident/Incident Investigation Report.

4.3.5. Accident Analysis

The supervisor of the injured employee shall assure that an Accident Analysis (Figure 4) is completed and submitted to the HSE representative and the Regional HSE Manager.

4.3.6. First Aid Register

The First Aid Register (Figure 5) is the primary project injury log and must be kept on-site at all times.

All injuries and/or illnesses (job related or personal) treated or reported (actual or alleged) shall be entered in the log, no matter how minor.

4.3.7. Employer's First Report of Injury (US Only)

For US operations, if the injury or illnesses results in lost time from work or in the need for off-site medical treatment, the HSE representative is responsible for immediately completing the Injury Call-In Form (printable/online)and then calling ESIS immediately at 877 329-0695 to report the injury. ESIS provides 24-hour call-in service for claims reporting.

4.4. Interface with Risk Management (for US Operations)

4.4.1. Workers' Compensation Claim Coordinator

If an injury results in lost time from work or the need for off-site medical treatment, the HSE representative is responsible for immediately notifying the appropriate Workers' Compensation Claim Coordinator with details about the injury.

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4.4.2. Documentation Checklist

The HSE representative or designee should use the Accident Investigation Documentation Checklist to ensure that all documents have been completed and submitted within 24 hours to the Workers' Compensation Claim Coordinator. If all forms are not available at the same time, send as many as are available and forward the remainder later.

4.4.3. Authorization to Release Medical Information

The injured worker will complete an Authorization to Release Medical Information and the HSE representative or designee will assure that the completed form is forwarded to the Risk Management Department to authorize the claim adjuster to obtain medical records.

4.5. Communication of Investigation Findings

A review of the incident facts, identified causes, and actions to prevent recurrence should be documented and communicated to employees. Office and project communications can take the form of safety meetings, Task Safety Analysis (TSA) meetings, etc. Findings should also be incorporated in future SPAs and task-specific safe work plans.

The incident investigation team is encouraged to provide lessons learned details and recurrence prevention recommendations to the Regional HSE manager for sharing, as appropriate.

4.6. Releases/Exposures Involving Hazardous Chemicals or Radiological Materials

In addition to the investigation process defined above, incidents involving potential exposure to hazardous materials, including incidents onsite, in the office, during company travel, and hazardous material releases in reportable quantities, as defined by local regulations, e.g., EPA-RCRA in the US, must be reported to a Senior HSE Manager.

Report all releases or exposures even though the incident may be considered minor or even though no adverse health effects or symptoms are apparent at the time.

Further procedures and notifications of regulatory agencies and clients shall be followed as defined in the site-specific Health, Safety, and Environment Plan (HSP) or HASAP.

A copy of the investigation report shall be placed in the medical file of any exposed or potentially exposed employees. Use of baseline testing should be evaluated promptly after any exposure.

The Site or Office Manager shall complete all other investigation and reporting requirements as outlined in this HSEP.

4.7. Recording Work-Related Injuries and Illnesses for Regulatory Purposes

Many local HSE regulatory agencies have incident reporting, recording, and posting requirements, which will be followed by company entities operating in those areas. The HSE Representative and/or Local HSE Manager shall ensuri compliance with these requirements.

4.7.1. Recordkeeping

For US operations, enter OSHA Recordable Cases within three days in the OSHA Form 300, the Log of Work-Related Injuries and Illnesses.

For US operations that are covered by MSHA, recordable cases shall be recorded on Form 7000-1, with copies sent to the designated MSHA offices within the 10th workday after learning of its occurrence.

Refer also to HSEP 5.3 for generation and maintenance of incident statistics.

4.7.2. Posting Requirements

For US operations, OSHA Form 300A, Summary of Work-Related Injuries and Illnesses, for the preceding year must be posted from February 1 to April 30.

When there were no injuries or illnesses during the year, zeros must be entered on the totals line, and the form posted.

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4.8. Serious or Fatal Accidents

Occasionally, serious accidents may occur at project sites or offices that involve company employees or third parties (contractor, client, member of the public, etc.) and may include events such as

- Serious personnel injury and/or illness,
- Significant equipment or structural damage,
- Significant vehicle incidents, and/or
- Significant threat or damage to the environment.

In such cases, the following requirements may apply.

4.8.1. Internal Notifications

In the event of a fatal or serious accident, an immediate telephone report shall be made by the Site or Office Manager to the Operations Manager **and** by the HSE representative to the Regional and Senior HSE Managers.

The Senior HSE Manager shall immediately notify the Vice President of HSE. The Operations Manager shall immediately notify the appropriate Group Vice President. These managers will notify the Legal Department and Risk Management and other senior company managers, as appropriate.

All notifications shall be made in person or via direct phone conversations, rather than by e-mail or voice messages.

4.8.2. Regulatory Agency Notifications

Any necessary notifications to local, state, or Federal agencies will be made by HSE.

For US operations, Fed-OSHA reporting requirements can be found in 29 CFR 1904.8.

4.8.3. Next of Kin Notification

Notification of the next of kin shall be coordinated through Human Resources.

Notification shall be made in person by a member of company management. If, in the event the employee's next of kin resides out of town or state, such notification should be coordinated through a local company office or a local law enforcement organization.

The Site or Office Manager should consider the need for help with immediate, short-term transportation, lodging, or similar assistance for the next-of-kin.

4.8.4. Accident Investigation

The accident scene shall be secured immediately. No movement of material or equipment shall be made until a review of the accident scene has been completed and documented. (Securing equipment or material, which could result in further injury or damage, may be done.)

A team comprised of representatives from HSE, Operations, and the Legal Department will conduct the investigation. The Legal Department will direct the investigation, including any resulting correspondence or other communication related to the accident in order to assure attorney-client privilege, as necessary.

Investigations shall include:

- Obtaining from witnesses signed statements of their complete and factual observations, as defined above. In the case of certain serious incidents, local law enforcement personnel may participate in, or conduct, collection of witness statements.
- Ensuring that adequate photographs are taken from several angles. Release of photographs shall be coordinated through the Legal Department.

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- Documentation management for all photos, measurements, statements, and handwritten notes, etc., in a single file. The Legal Department may designate the contents of this file as confidential, "Attorney – Client Privilege."

4.8.5. Media Relations

Some incidents may involve media interaction. Jacobs Global Policy Supplement, GPS1-105, Media Interaction, must be reviewed and followed before any media interactions.

4.8.6. Client Assurance

The client shall be assured that the company is professionally investigating the incident and will make the necessary program adjustments or recommendations to prevent recurrence.

4.9. Property Damage and Business Interruption Loss Notice

Submit to the Risk Management Department a Property Damage and Business Interruption Loss Notice Form to report Property Loss. A Notice is required if damage to company owned, leased, or rented property, machinery, or equipment, or if business interruption related to such damage is expected to exceed $25,000 US dollars.

4.10. Training

Supervisors must be trained in proper accident/incident investigation techniques and the recording and reporting requirements.

This training will be provided through the HSE Manager.

5.0 REFERENCES AND RELATED DOCUMENTS

29 CFR 1904, Recording and Reporting Occupational Injuries and Illnesses (US only)

US Department of Labor, Bureau of Labor Statistics, Recordkeeping Guidelines for Occupational Injuries and Illnesses (the "Blue Book", US only)

Workers' Compensation Claim Coordinator List (US only)

Accident Investigation Documentation Checklist (US only)

6.0 FIGURES

Authorization for Medical Treatment

Injured Employee's Statement

Witness Statement

Accident Analysis

First Aid Register

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Figure 1

Authorization for Medical Treatment

To: _____ Address: _____ Date: _____

This form, signed by our representative, is your authorization to render **initial** medical treatment only to:

_____
(Employee)

in accordance with the provisions of, and under the conditions prescribed by, the Workers' Compensation Act. Unless the case is an emergency, kindly obtain authorization for surgery, radical procedures, or hospitalization from the insurance carrier.

Fax this completed form to (*enter here the fax number for the local Jacobs Risk Management office point of contact*)

Send your bill and report to (*enter insurance carrier's mailing address and name of point-of-contact to whom the report and bill should be sent*)

_____
Authorized Jacobs Representative

Date of Injury _____ Location _____ Job No. _____

How injury occurred _____

_____

For Doctor's Use Only

Diagnosis of Injury: _____

Disposition of Patient: ☐ Occupational ☐ Non-Occupational ☐ Unable to determine

☐ Able to resume regular duties.

☐ Able to resume regular duties next workday.

☐ Able to resume restricted duties with the following limitations: _____

_____

☐ Unable to return to work; estimated length of disability: _____

Return for follow-up visit on _____ (Date)

Discharged from care on _____ (Date)

_____
(Doctor's Signature)

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Figure 2

Injured Employee's Statement

Date:

Name:

Title:

Employee ID or DEN:

Temporary Address:

Phone No:

Permanent Address:

Phone No:

Location At Time Of Accident:

Describe How The Accident Happened:

Signature

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Figure 3

Witness Statement

Please print or type.

Name:_____ Title:_____

Employee ID or DEN:_____Date:_____ Time:_____

Temporary Address:_____ Phone No._____

_____

Permanent Address:_____ Phone No._____

_____

Location at Time of Accident:_____

Describe, to the best of your knowledge, what happened just before, during, and just after the accident:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____
Signature

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Figure 4

Accident Analysis

Accidents result from a Direct Cause, Indirect Cause, and a Basic or Root Cause. These causes occur in the sequence shown below. Review the accident sequence. Check all factors that apply.

DIRECT CAUSE

Unsafe Act

- ☐ Improper use of tool/equipment
- ☐ Defective tool/equipment
- ☐ Failure to use proper PPE
- ☐ Improper body position
- ☐ Improper lifting/placing
- ☐ Removing guard
- ☐ Defeating safety device
- ☐ Servicing live equipment
- ☐ Horseplay
- ☐ Shortcut/Hurrying
- ☐ Other:

Unsafe Condition

- ☐ Flammable Atmosphere
- ☐ Oxygen rich/deficient
- ☐ Toxic Atmosphere
- ☐ Inadequate Illumination
- ☐ Poor housekeeping
- ☐ Congested work area
- ☐ Worn/defective tool
- ☐ Worn/defective equipment
- ☐ Ineffective guard or barricade
- ☐ Missing/lack of guarding
- ☐ Other:

INDIRECT CAUSE — Lack Of

Training

- ☐ No training
- ☐ Poor training
- ☐ Refresher needed
- ☐ Not understood
- ☐ Other:

Resources

- ☐ Time
- ☐ Tools
- ☐ Equipment
- ☐ Material
- ☐ Manpower
- ☐ Other:

Belief

- ☐ Poor morale
- ☐ Peer pressure
- ☐ Awareness
- ☐ Other:

BASIC CAUSE — Organizational Failure To

Plan

- ☐ SPA/JSA not done supervisor
- ☐ SPA/JSA inadequate
- ☐ PPE checklist not done
- ☐ PPE checklist inadequate
- ☐ Improper permit issued
- ☐ Other:

Direct

- ☐ TSA not done by supervisor
- ☐ Instructions not communicated
- ☐ Instructions not understood
- ☐ Improper instructions given
- ☐ Other:

Organize

- ☐ Resources not present (tools, personnel, etc.)
- ☐ Resources not proper (tools, personnel, etc.)
- ☐ Unsafe operating condition
- ☐ Other:

Control

- ☐ Task not conducted as planned
- ☐ Job progress not monitored
- ☐ Other:

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Figure 5

First Aid Register

Company:_____ Project Name/Number:_____

Jobsite Location:_____ Month/Year:_____

Site or Office Manager:_____ Page:_____ of _____

Date	Time	Name	Supervisor or Foreman	Type of Injury, Body Part, and Brief Description of Injury	Class*

***Class** - Classification: **FAV** - First Aid Visit **E-1** - Doctor's Visit **OSHA** - OSHA Recordable **Other:**

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JACOBS

HSE Procedure		Document No: HSEP 5.2	Page: 1 of 4
Vehicle Accidents		Supersedes: HSEP 5.2	Revision: 5 Issue Date: 3 Jan 06
Issuing Department: Corporate HSE	Approval: Susan.Kiesling@Jacobs.com	Previous Rev. Date: 19 May 04	Effective Date: 3 Jan 06

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1.0 PURPOSE AND SCOPE

This Health, Safety, and Environment Procedure (HSEP) provides the minimum procedures to be followed in the event of a vehicle accident involving a Company owned, rented, or leased vehicle or a personal vehicle used for Company business and to any other motor vehicle, e.g. personal or borrowed and “third party motor vehicles”, used by personnel engaged in Company business.

This procedure addresses all motorized vehicles.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

2.1. Management

The appropriate manager must review all Vehicle Accident Reports with the employee and supervisor involved.

2.2. Supervisor

Supervisors shall promptly report any vehicle incidents to the Site or Office Manager, HSE Manager, and Risk Management.

Supervisors of employees involved in vehicle accidents must investigate the accident and provide information for completion of the online JSIMS Accident/Incident form.

Incident details shall also be promptly submitted to the Risk Management department.

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2.3. Employee

Employees are responsible to promptly report all vehicle accidents to their supervisor or appropriate manager.

Employee drivers involved in vehicle accidents shall assist their supervisor or manager with completion of a Vehicle Accident Report.

2.4. Risk Management Department

The Risk Management Department makes available through JNet the necessary accident report forms, which are to be maintained in each vehicle covered by this HSEP.

3.0 DEFINITIONS

Definitions of terms used in this HSEP can be found in Incident and Accident Definitions by Type, Injury Status, and Incident Classification, which is posted on JNet.

Additional definitions that are used in this HSEP, which do not appear in the JNet posting, are as follows.

Fleet Management Group	The department within Jacobs that manages and supports motor vehicle and heavy equipment rental, leasing, maintenance, repair, and other similar activities in North America.
Occupational Health Services	The group within Jacobs Human Resources Department that provides Health Services support and advice and maintains a list of company-approved local collection facilities in the US for drug and alcohol testing. Phone number 225 922-3360.
Risk Management Department	The department within the Jacobs that manages underwriting, claims management, and other insurance-related functions and matters. Go to JNet and click on the Global Groups tab and then click the Risk Management tab for details.
Vehicle	Motorized vehicles, including cars, trucks, busses, all-terrain vehicles, golf carts, etc.
Vehicle Operators	Employees who have been authorized by the Company to operate a motorized vehicle on Company business.

4.0 PROCEDURE

4.1. Injuries

In the event of an injury resulting from a vehicle incident, the first priority is to provide the best assistance possible to personnel who may need it and to ensure the safety of others who may be affected or acting as emergency responders. Refer to HSEP 5.1, Accidents and Incidents, for steps to follow.

In addition, for US operations, if there is a Jacobs employee injured, refer to Workers' Compensation Claims Instructions and Forms - U.S. Only.

For non-U.S. locations, if there is a Jacobs employee injured as a result of the incident, promptly report the injury to the HSE Manager and Risk Management.

4.2. Vehicle Incident Reporting

Accident report forms shall be maintained in all vehicles owned, rented, leased by the Company, or personal vehicles utilized for Company business. Vehicle Accident Report & Instructions for US Operations are posted on JNet. Supervisors of employees involved in vehicle accidents must investigate the accident and complete the Risk Management department's Vehicle Accident Report with input from the person(s) involved in the incident and witnesses to the incident.

The report shall be distributed as follows:

- Project/Office Manager's File

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- Risk Management
- HSE Manager
- Fleet Management Group

Each incident will be investigated by an HSE representative in order to identify the cause(s) and to determine measures to be taken to prevent a similar recurrence.

If damage to Company owned, leased, or rented property, machinery or equipment, or business interruption related to such damage, is expected to exceed U.S. $25,000, complete the Risk Management department's Property Damage and Business Interruption Loss Notice form in addition to the standard Vehicle Accident Report.

Disciplinary action and/or retraining may be required for any employee involved in a vehicle accident.

4.3. Post-incident Actions

Vehicle operators shall be given instructions by their supervisor or an HSE representative on how to report an accident and what to do at the scene. Action includes:

- Stop at once to investigate.
- If necessary, have someone call for emergency medical services.
- Call the police if the incident occurs on public property.
- Do not admit liability, even if you feel you are at fault.
- Do not discuss the incident with anyone at the scene other than the police, and only answer questions asked by them.
- Copies of any statements or other documents signed or created by the employee must be forwarded to Legal Department and Risk Management.
- Do not move vehicle until cleared by the police, unless the vehicle creates a safety hazard or local ordinances require moving vehicles after an accident.
- If possible, obtain names, addresses, license numbers, and phone numbers of any witnesses and the parties to the accident.
- Promptly notify your supervisor after an incident and assist with completion of the Vehicle Accident Report.
- If you are contacted by individuals or entities outside of the company after an accident, notify the company Legal Department and Risk Management departments.

4.4. Post-incident Drug Testing

Except where prohibited by law, the Company will require employees who are involved in a workplace incident which results or could have resulted in an injury to a person (other than first aid) and/or property damage, to submit to a post incident test for drugs and/or alcohol as part of the investigation of such incidents. This same policy applies to our subcontractors, as appropriate.

It is the responsibility of the Office or Site Manager working in coordination with the Human Resources and Legal Departments, to establish the program for drug and alcohol testing for their location.

Any questions that arise concerning possible prohibitions should be directed to the Human Resources and Legal Departments. Disciplinary action against an employee, who fails a drug or alcohol test, shall be coordinated by Human Resources with input from Operations and the Legal Department.

Drug testing is also governed by local regulations in many countries. Contact the company Human Resources and Legal Departments for assistance.

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If results are positive, HR will notify Risk Management so that appropriate insurance follow-up arrangements can be made.

4.5. Post-incident Drug Testing Procedures for US Operations

4.5.1. Pre-selection of Local Drug Testing Collection Facilities

The Occupational Health Services (OHS) group (phone number 225 922-3360) maintains a list of company-approved local collection facilities in the US.

The local HSE Manager shall state the name, address, and phone number of the specified local collection facility in the project or office HASAP.

4.5.2. Testing After a Vehicle Incident

An employee, who has been involved in a motor vehicle incident, is responsible for immediately notifying his or her supervisor by phone or in person.

The employee or the supervisor shall also notify the Risk Management representative, 877 832-1721, and the local HSE Manager.

A Risk Management representative will, in turn, notify the designated Human Resources (HR) contact for the Operating unit. If the primary HR contact does not respond, a secondary HR contact will be notified.

The HR Manager will direct the employee to the designated collection facility and/or confirm that the post-incident specimens were promptly and properly collected.

4.5.3. Testing Notifications

The HR Manager will contact the OHS and advise them that a motor vehicle post-incident test has been initiated.

The HSE weekly summary shall list all MVAs that have been reported and confirm that alcohol (if required) and drug tests were conducted after each incident.

4.5.4. Test Results Notifications

OHS:

- Will promptly report test results to the appropriate HR Manager,
- Will track test results, and
- Will generate monthly and year-to-date statistics, which will become part of the monthly HSE Scoreboard report.

If results are positive, HR will notify Risk Management so that appropriate insurance follow-up arrangements can be made.

5.0 REFERENCES AND RELATED DOCUMENTS

HSEP 21.2, Motor Vehicle Safety

The following hyperlink takes the reader to a site that is maintained on JNet by the Risk Management Department.

Workers' Compensation Claims Instructions and Forms - U.S. Only.

Vehicle Accident Instructions

Vehicle Accident Report (U.S.)

Vehicle Accident Report (Canada)

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JACOBS

HSE Procedure		Document No: HSEP 5.3	Page: 1 of 5
HSE Performance Metrics		Supersedes: HSEP 5.3	Revision: 5 Issue Date: 19 Feb 07
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1.0 PURPOSE AND SCOPE

The purpose of this Health, Safety, and Environment Procedure (HSEP) is to establish the responsibilities and minimum requirements for collecting and reporting Company-required HSE performance metrics. This will provide management, at all organizational levels, indications of the effectiveness of the HSE program. HSE performance metrics facilitate the analysis of past and current practices. Results of analysis promote development of corrective measures and process improvement.

Requirements for client, local regulatory, or other statistics should be considered and addressed separately through local work instructions or project procedures.

This HSEP applies to all Jacobs operations and offices, subcontractors, and contractors engaged in operations covered by the Company HSE program.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

3.0 DEFINITIONS

Definitions of terms used in this HSEP can be found in Incident and Accident Definitions by Type, Injury Status, and Incident Classification, which is posted on JNet.

Additional definitions that are used in this HSEP, which do not appear in the JNet posting, are as follows.

Days Away From Work Case Rate (DAW Rate)	The number of calendar Days Away From Work Cases x 200,000 divided by workhours for period.
Days Away, Restricted, or Transfer (DART) Rate	Cases of days away from work, restricted workday, or transfer to another job x 200,000 divided by the workhours for period.
HSE Survey	An appraisal that identifies project HSE deficiencies observed by a Company HSE Manager. These surveys are conducted on jobs that are not self-perform projects or Jacobs direct sub-contractor sites. Unlike SERs, these surveys focus on HSE regulations and are not based on Jacobs HSE policies and procedures.

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Medical Aid	An injury that receives medical evaluation or treatment by a third party medical provider and is more severe than first aid but does not result in restricted days or days away from work.
Motor Vehicle Accidents per Million Miles Driven (MVAs/MMD)	The number of motor vehicle accidents x 1,000,000 divided by the number of miles driven.
Number of Days Away From Work	The number of calendar workdays, consecutive or otherwise, after the day on which the occupational injury or illness occurred, which the employee would have worked but could not because of a work-related injury or illness.
Number of Restricted Work Days	The number of calendar workdays, consecutive or otherwise, after the day on which the occupational injury or illness occurred, where the person involved was: (1) assigned to another job on a temporary basis; (2) working at regular job on less than full-time basis; (3) working at regular job but not able to perform all duties normally connected with it.
HSE Incident & Exposure Hour Categories	Jacobs Office — Jacobs coordinates and directs daily office work activities, e.g., Jacobs payroll, body shop, IT services, sub consultants, temporary personnel
	Jacobs Field — Jacobs coordinates and directs daily field work activities, e.g., Jacobs payroll, body shop, IT services, sub consultants, temporary personnel
	Jacobs Controlled Office Contractors — Jacobs direct office sub-contractors (Jacobs contract with a defined scope of work) **and** where Jacobs controls office work activities of contractors (client/other contract)
	Jacobs Controlled Field Contractors — Jacobs direct field sub-contractors (Jacobs contract with a defined scope of work) **and** where Jacobs controls field work activities of contractors (client/other contract)
	Other Contractors — Defined scope of work that the service is performed by an outside company not under Jacobs control
Severity Rating Index (SRI)	A measurement tool used to indicate the severity of E-1 cases according to the projected financial exposure to the company. This has previously been known as the Claim Severity Rating Index (CSRI).
Safety Observation Report (SOR)	This process provides a proactive method for observing, identifying, and documenting worker behavior and workplace conditions. Refer to HSEP 2.17.
Safety Evaluation Report (SER)	Inspection process that provides a comprehensive and proactive evaluation of HSE plans, policies, procedures, and requirements of the Company, the client, subcontractors, and applicable regulatory agencies. Both current and future work areas and activities are included in the scope of the evaluation. Refer to HSEP 2.2.
Total Recordable Incident Rate (TRIR)	The number of Recordable Cases x 200,000 divided by workhours for the period.
Workhours	Actual hours worked in an office, on a project, or at a job or location.

For HSE performance metrics, Jacobs has adopted the OSHA recordkeeping guidelines and US risk management E-1 and indemnity terminology.

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4.0 PROCEDURE

HSE performance shall be measured in all cases where Company personnel are performing the work. Additionally, HSE performance shall be measured for subcontractor personnel performing project-related work at a field site or in the Jacobs office. The HSE performance statistics reported for Company subcontractors include Recordable rates and Days Away From Work rates.

Where Jacobs is acting as a consultant for the client and control of the site rests with the client or another party, e.g., a general contractor, only Company personnel HSE performance will be recorded and reported for Company or regulatory purposes. However, if HSE performance statistics are available from the client or other responsible party, these should be reported separately from Company statistics.

All Company HSE performance statistics shall be separated into three categories: Field Operations, Office Operations, and Subcontractor.

4.1. HSE Performance Statistics

The following performance statistics shall be recorded and reported weekly, monthly, and year-to-date for all Company field and office operations.

4.1.1. Workhours per E-1 Case

This rate is generally an indicator of injury and/or illness frequency.

4.1.2. Workhours per Indemnity Case

This rate is a general indicator of injury and/or illness severity.

4.1.3. Total Recordable Incident Rate (TRIR)

This rate is generally an indicator of injury and/or illness frequency.

4.1.4. Days Away From Work Case (DAW) Rate

This rate is a general indicator of injury and/or illness severity.

4.1.5. Severity Rating Index (SRI)

This rate is calculated by the Jacobs Risk Management department and provides an indication of (financial) severity.

4.1.6. Motor Vehicle Accidents per Million Miles Driven (MVAs/MMD)

This rate is an indicator of incident frequency.

4.1.7. Environmental Incidents

This provides information about the type, quantity, and response to environmental incidents.

4.1.8. Non-injury Incidents

This provides a leading indicator of overall HSE performance.

4.1.9. HSE Training

HSE training is recorded and compared with project and office training requirements and targets. Refer to HSEP 3.1.

4.1.10. Safety Evaluation Reports (SERs) and HSE Surveys

4.1.11. Safety Observation Reports (SORs)

4.1.12. Other Performance Measurements

The following processes also include measurement of HSE performance.

- Client Expectation Survey

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- Client Surveys
- Award Fee Briefings

4.2. Report Frequency And Content

Details of HSE performance and statistics described above shall be reported according to the following regimen.

4.2.1. Verbal Reports — Immediate

Incidents involving fatality, injury, or non-injury incidents with serious potential consequences shall be immediately reported as set forth in HSEP 5.1.

4.2.2. HSE Weekly Summary

Each office or field operation shall submit to their respective HSE manager a weekly HSE summary that includes:

- E-1s,
- Indemnities,
- Recordable incidents,
- Days away from work cases,
- Subcontractor recordable incidents and days away from work cases, and
- Motor vehicle accidents.

Other serious HSE events and environment incidents are also reported in the weekly summary.

The HSE department compiles and distributes a consolidated weekly HSE report.

4.2.3. HSE Monthly Report

The HSE department compiles and distributes a monthly report that includes a monthly and year-to-date summary of HSE statistics presented by operating unit, region, field operation, and office. Statistics in this report should include:

- Workhours,
- E-1s,
- Indemnities,
- Recordable incidents,
- Days away from work cases,
- Subcontractor Recordable and Days Away From Work Cases, and
- Motor vehicle accidents.

This report also includes injury summaries for each employee E-1. Subcontractor incident rates and injury summaries are provided in the Subcontractor Safety Statistics section of this report.

Distribution of this report includes senior management, operations management, and HSE management.

4.2.4. Other HSE Statistical Reports

Other HSE performance reports may be generated at the regional, operating unit, or project level for evaluation of HSE program execution.

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4.3. Performance Assessment

Management at each organizational level shall review HSE performance for their area as provided in the reports and respond appropriately.

The primary objectives of HSE statistics reporting are to assess overall program performance, to identify areas of concern, to provide focus for program improvement, and to identify areas of excellence.

5.0 REFERENCES AND RELATED DOCUMENTS

Incident and Accident Definitions by Type, Injury Status, and Incident Classification
Injury, Illnesses, and Motor Vehicle Rate Formulas
Subcontractor Safety Statistics Monthly Report Blank Form

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JACOBS

HSE Procedure		Document No: HSEP 7.2	Page: 1 of 20
Confined Space Entry		Supersedes: HEP 7.2	Revision: 5 Issue Date: 15 Oct 09
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1.0 PURPOSE AND SCOPE

This Health, Safety, and Environment Procedure (HSEP) provides the minimum requirements for assessing the potential hazards of confined space entering and supporting confined space entry activities.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

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2.1. Project/Site Manager

The Project/Site Manager is responsible for assuring that confined spaces are evaluated by properly trained personnel and that the site-specific Hazard Assessment and Safety Action Plan (HASAP) or Health and Safety Plan (HSP) and an appropriate task-specific Safe Plan of Action (SPA) addresses confined space hazards and controls.

The Project/Site Manager may approve the completed entry permit form, in place of the HSE Supervisor and in addition to the Entry Supervisor, if trained as an Entry Supervisor.

2.2. Entry Supervisor

Entry Supervisors are responsible for ensuring acceptable entry conditions for a confined space entry, for authorizing entry using the confined space permit, overseeing entry operations, and for properly terminating the entry.

The Entry Supervisor may also serve as an attendant or entrant, as long as they are trained and equipped for each role. The duties of the Entry Supervisor may be passed from one individual to another during the course of an entry operation. When such occurs, the name of the departing Entry Supervisor shall be lined through on the Assessment and Permit form and the name of the incoming Entry Supervisor shall be added to the form.

Entry Supervisors shall address confined space hazards in the Confined Space Entry Assessment and Permit and SPA for each work activity or work location. Entry Supervisors shall assure that:

- Confined space hazards that may be faced during entry, including the mode, signs or symptoms, and consequences of the exposure are identified and assessed,
- A confined space permit is issued and followed,
- Employees are trained before being allowed to do any work involving a confined space,
- Employees have been issued and use the proper equipment,
- Rescue services are available and the means for summoning them are workable,
- Unauthorized individuals who enter or who attempt to enter the confined space during entry operations are removed,
- Entry operations remain consistent with terms of the entry permit and at intervals dictated by the hazards and operations and that acceptable entry conditions are maintained whenever responsibility for a confined space entry operation is transferred, and
- The entry is terminated and the permit is cancelled when the permit expires or hazards have changed.

2.3. Attendant

An attendant must be able to:

- Recognize the potential hazards that may be faced during entry, including the mode, signs or symptoms, behavioral effects, and consequences of an exposure;
- Maintain an accurate count of authorized entrants in the confined space (A sample sign-in and sign-out log form has been provided as Figure 11);
- Remain outside the space during entry operations and monitor only one confined space at a time until relieved by another attendant;
- Communicate with authorized entrants to monitor entrant status and to alert entrants of the need to evacuate the space;
- Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space and order the authorized entrants to evacuate the confined space immediately if any of the following conditions are detected:

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    - a prohibited condition,
    - effects of hazard exposure in an authorized entrant,
    - a situation outside the space that could endanger the authorized entrants, or
    - if the attendant cannot effectively and safely perform all the duties required.
  - Summon rescue and other emergency services as soon it is determined that entrants may need assistance to escape from confined space hazards;
  - Perform no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.
  - Take the following actions when unauthorized persons approach or enter a confined space while entry is underway:
    - Warn unauthorized persons that they must stay away from the confined space,
    - Advise the unauthorized persons that they must exit immediately if they have entered confined space, and
    - Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the confined space.

2.4. Entrant

An entrant must be able to:

- Recognize the hazards that may be faced during entry, including the mode, signs or symptoms, and consequences of an exposure;
- Properly use equipment associated with confined space activities;
- Communicate with the attendant monitoring entrant status and to assist the attendant to alert entrants of the need to evacuate the space;
- Alert the attendant whenever the entrant recognizes any warning sign or symptom of exposure to a dangerous situation, or the entrant detects a prohibited condition; and
- Exit from the confined space as quickly as possible whenever:
  - an order to evacuate is give by the attendant or the entry supervisor,
  - the entrant recognizes warning signs or symptoms of exposure to a dangerous situation,
  - the entrant detects a prohibited condition, or
  - an evacuation alarm is activated.

2.5. Site HSE Supervisor

The Site HSE Supervisor or site HSE professional shall ensure that appropriate and sufficient hazard controls are planned and used during confined space entry and that deficiencies identified during project/program evaluations are promptly corrected.

The Site HSE Supervisor shall review the potential hazards and the assessment and permit form and obtain approval from the HSE Manager for all entries involving non-routine chemical hazards or unusual and high-hazard potential entries.

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3.0 DEFINITIONS

Attendant	An individual stationed outside a confined space, one or more confined spaces, who monitors the authorized entrants and who performs all attendants' duties assigned in the confined space program.
Blanking or blinding	The absolute closure of a pipe, line, or duct by the fastening of a solid plate, such as a spectacle blind or a skillet blind that completely covers the bore and that is capable of withstanding the maximum pressure with no leakage beyond the plate.
Confined Space	Is large enough and so configured that • an employee can bodily enter and perform assigned work, and • has limited or restricted means for entry or exit, e.g., tanks, vessels, silos, storage bins, hoppers, vaults, and pits, and • is not designed for continuous employee occupancy.
Confined Space Entry	The action by which a person passes through an opening into a confined space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.
Dilution and/or General Ventilation	Dilution of contaminated air with uncontaminated air in a general area, room, or building for the purpose of health hazard or nuisance control. Dilution ventilation is not as satisfactory or effective for health hazard control as is local exhaust ventilation.
Entrant	An employee, who is authorized by the employer to enter a confined space.
Entry Supervisor	The person responsible for determining whether acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry when required. The person must also be able to operate test equipment for combustible gas, oxygen, and toxic gas levels and must be able to interpret test results. The person must also know how to implement effective control measures, e.g., blinding, blanking, ventilation, etc.
HSE Manager	A full-time Jacobs staff employee, who provides HSE management to multiple projects/offices and provides supervision to multiple HSE Supervisors. This individual typically works out of a home office location or on major programs. For the purposes of this HSEP, this HSE Manager must have industrial hygiene skills necessary for, and related to, confined space entry activities.
Immediately Dangerous to Life or Health (IDLH)	Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a confined space.
Isolation	The process by which a confined space is completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lock-out or tag-out of all sources of energy; or blocking or disconnecting all mechanical linkages.
Lower Explosive Limit (LEL)	The concentration of a gas below which the concentration of vapors is insufficient to support an explosion. This term is often used interchangeably with the term lower flammable limit (LFL).
Local Exhaust Ventilation	Removal of contaminated air from work zone by placement of the ventilation system intake directly over or around the point of emission.

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4.0 PROCEDURE

When there appears to be a need for work in a confined space, the hierarchy of HSE controls is as follows

- first, eliminate the exposure doing the work without entering the confined space,
- second, use engineering controls such as ventilation to eliminate or reduce the hazard,
- third, use administrative controls to minimize exposure, and,
- as a last resort, use personal protective equipment (PPE), such as respirators and protective clothing.

When confined entry is determined to be necessary, a process of pre-entry hazard assessment and hazard control, as described below, shall be utilized.

When working in confined or enclosed spaces where electrical hazards may exist, protective shields, protective barriers, or insulating materials shall be provided, as necessary.

4.1. Confined Space Entry Assessment and Permit Form

All confined space entries require thorough assessment and documented entry permitting through the use of the Confined Space Entry Assessment and Permit (HSEP 7.2f1).

The Confined Space Entry Assessment and Permit Form serve as:

- An Assessment (Section 1)

  An assessment is required to identify and evaluate the physical, chemical, biological, and radiological hazards associated with the confined space. A Health Hazard Evaluation (see HSEP 12.1), may be used to conduct this assessment. A specific control must be listed on the Confined Space Entry Assessment and Permit for each identified hazard.

  The hazards and controls indicated on the confined space entry permit must be addressed in the SPA for the work activity.

  This assessment for some work areas, which meet the definition of a confined space, may result in findings of no identified confined space hazard and, therefore, no need for an entry permit, trained entrants, standby personnel, etc. This will result in checks in the “No” or “NA” columns in the Assessment section of the form. This will serve as documentation of pre-entry hazard evaluation and authorization to proceed with entry after the completion of an SPA.

- A Permit (Section 2)

  The permit is applicable for one work shift and for only those entrants and attendants identified on the Confined Space Entry Assessment and Permit.

  A copy of the Confined Space Entry Assessment and Permit form must be posted or available near the confined space entry point.

- A Closure Record (Section 3)

  As a Closure Record for the entry, it must be signed and dated by the entry supervisor and all incidents, actions taken, and lesson learned must be recorded on the form.

If the facility or client requires the use of their own confined space entry permit, it must be equivalent to the Company Confined Space Entry Assessment and Permit.

To be considered equivalent, all the information required in Sections I, II, and III of the Confined Space Entry Assessment and Permit must be contained in the client’s/facility’s process. If deficiencies are identified in the client’s/facility’s form, the missing required information must be included to ensure proper evaluation of the hazards in the confined space and the necessary controls.

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Proper execution of the Confined Space Entry Assessment and Permit form shall include confirming that

- the appropriate entries have been made on the form,
- all the tests specified by the permit have been conducted,
- all procedures and equipment specified by the permit are in place, and
- the permit is approved and signed by a qualified Entry Supervisor before allowing entry.
- additional approval by an HSE Manager, or higher level, has been obtained in the case of entries involving non-routine chemical hazards or unusual and high-hazard potential entries.

4.2. Isolation and Access

Isolate the confined space by locking out energy sources and blanking or blinding pipelines or ducts to prevent materials or products from entering the space. Refer to HSEP 15.1.

Liquid transfer lines, tanks, and vessels are to be flushed with the appropriate media and purged prior to entry to eliminate chemical and atmospheric hazards.

Regardless of any pre-existing labels or postings, all unattended access points into the confined space must have appropriate warnings, such as “DANGER CONFINED SPACE — AUTHORIZED ENTRANTS ONLY”, to deter entry by unauthorized personnel.

Any conditions making it unsafe to remove an entrance cover shall be eliminated before the cover is removed.

When entrance covers are removed, the opening shall be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each worker from foreign objects entering the space.

4.3. Atmosphere

Based on the confined space entry assessment (see Paragraph 4.1) for spaces identified as having potential atmospheric hazards, before a worker enters, and continuously thereafter, the internal atmosphere shall be tested with a calibrated direct-reading instrument for oxygen content, for flammable gases and vapors, and for potential toxic air contaminants, in that order.

Continuous monitoring, with either fixed or portable instruments, will be used to quantitatively measure and continuously monitor atmospheric conditions in the confined space.

The following atmospheric conditions shall be maintained.

- Oxygen concentration of approximately 20.8%, with an acceptable range of 19.5% to 23.5%. At normal temperature and atmosphere, if oxygen levels are above or below 20.8%, identification of the cause of the oxygen enrichment or displacement is very important. Work shall be stopped, workers removed, and investigation into the cause for the oxygen enrichment or deficiency should be conducted prior to continuing the work.
- Combustible gas concentration readings of less than 1% of the LEL in the confined space. Work where concentrations exceed 1% of the LEL may only be conducted after development of special safe-work procedures and with the approval of HSE and the operations manager.
- Potential atmospheric contaminants at concentrations below their respective Permissible Exposure Limits (PELs) unless respiratory protection is used in accordance with the Site-Specific Respiratory Protection Program, HSEP 13.9f1 and provisions set forth in the HASAP.

For many common hazardous gases, such as carbon monoxide (CO), hydrogen sulfide (H_2S), and petroleum hydrocarbons, a continuous monitoring combustible gas meter or “four-gas meter” can be used for air testing.

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For volatile organic compounds (VOCs), a Photo Ionization Detector (PID) or a Flame Ionization Detector (FID), as appropriate for the air contaminants and the location to be tested, may be used to measure potentially harmful levels of VOCs.

Any decision to use grab sampling or methods other than continuous monitoring must be reviewed and approved by an industrial hygiene manger or a site HSE manager, if appropriately trained in industrial hygiene the recognition, assessment, and control of chemical hazards. Refer to HSEP 12.2, Personal Air Monitoring, for the requirements that must be followed, including the monitoring equipment that must be used.

Inert gases, including nitrogen and carbon dioxide, are often used to remove the hazards of combustible gases. When such inerting gases are used,

- the worker should wear supplied-air respiratory equipment and conduct a test of the atmosphere when first opening the confined space, and
- assure that inerting gases are flushed from the space and replaced by fresh air prior to entry.

Work in IDLH conditions should be avoided. When work in these environments is, however, absolutely necessary, the Project Manager shall appeal to the senior operations manager and Senior HSE Manager for written approval to proceed. Specific safe work procedures shall be prepared and approved by the Senior HSE Manager.

4.4. Ventilation

Local exhaust ventilation or simple dilution ventilation techniques are necessary when performing hot work or using chemicals or when chemical contaminants have been present. When planning ventilation or dilution as the respiratory hazard control, attention must be given to the actual location of the workers' breathing zone.

The recommended method for dilution and general air ventilation is to push air through the space instead of pulling air through the space.

The figures at the end of this HSEP present the theory of ventilation in confined spaces. Although no two confined spaces are quite the same, the principles described below will facilitate development of a ventilation plan that will minimize the reliance on respiratory protection.

4.5. Entry Activities and Hot Work

Burning, welding, and hot work in a confined space could generate harmful gases from the metal alloys, the surface coating of the material, or the process gases themselves and allow hazardous accumulation in the confined space.

Other activities such as the use of paints, solvents, and other hazardous chemicals could results in hazardous atmospheres. When these operations are conducted in a confined space, mechanical ventilation and/or respiratory protection equipment will be required.

Gas cylinders and welding machines must be located outside of the confined space and hose connections must be checked for leaks prior to entry and every time that hoses are disconnected for work breaks, lunches, or when personnel leave the area.

Specific information concerning cutting and welding is contained in HSEP 8.8, and should be referenced when planning hot work in a confined space.

When confined space entry work activities create additional hazards, such as those that would come from cleaning, welding, etc., a task-specific hazard analysis and plan shall also be completed and approved.

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4.6. Communication

Continuous communication between entrants, attendants, and the entry supervisor will be maintained for the duration of the entry. Continuous communication can include visual or verbal communication. A clear and distinct emergency evacuation signal will be established before the confined space entry to ensure that all personnel involved in the entry are aware of the signal.

A Confined Space Attendant will be positioned outside the confined space for the duration of the confined space operations and will maintain visual or verbal communication with the entrant(s) and shall not monitor more than one confined space at a time.

In the event an entrant becomes disabled or cannot leave the confined space, the attendant will immediately summon rescue and other emergency services. The Confined Space Attendant should then also notify the Entry Supervisor.

The Confined Space Attendant must have an air horn or some other reliable method for summoning assistance. The Attendant shall only attempt to extract personnel from the confined space if they can do so without entering the confined space.

A (Sample) Confined Space Authorized Entrants Sign-In and Sign-Out Log has been provided as Figure 11.

4.7. Personal Protective Equipment and Lighting

PPE including head, ear, eye, feet, skin, and respiratory system will be donned when a potential hazard exists.

When it is indicated on the entry permit that a dangerous or IDLH atmosphere or condition could develop, each entrant shall use a chest or full body harness with a retrieval line attached as described in the Emergency Rescue paragraph below.

Lighting equipment must be provided to enable workers to see well enough to work safely and to exit the space quickly in an emergency. Only explosion-proof, low-voltage (50 volt) lighting should be used for confined space work.

4.8. Emergency Rescue

A site-specific rescue plan must be developed for all confined space entries and must be covered in the SPA. Rescue teams must be trained in their responsibilities and the specifics of the confined space entry. Required resources must be available at the time of the entry. Coordinate emergency response with either the facility or local fire department.

Whenever it is indicated on the Confined Space Entry Assessment and Permit form that a dangerous or IDLH atmosphere or condition could develop, rescue teams must be present during the entry.

4.8.1. Non-entry Rescue

To facilitate non-entry rescue, retrieval systems or methods shall be used, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue. Retrieval systems shall meet the following requirements.

- Each entrant shall use a chest or full body harness with a retrieval line attached to a point, which presents a profile small enough for the successful removal of the entrant. Wristlets may be used in place of the chest or full body harness if it can be demonstrated that the use of the chest or body harness is infeasible or creates a greater hazard for the entrant.
- The other end of the retrieval line shall be attached to a mechanical device or fixed point outside the space in such a manner that rescue can begin as soon as the rescuer becomes aware that rescue is necessary. A mechanical device shall be available to retrieve personnel from vertical type spaces more than five-feet deep.

4.8.2. Designated Rescue Personnel

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Workers who have been designated to provide confined space rescue and emergency services shall be:

- Provided PPE needed to conduct confined space rescues safely and trained so that they are proficient in the use of that PPE;
- Trained to perform assigned rescue duties and establish a level of proficiency as an authorized entrant; and
- Trained in basic first-aid and CPR. (At least one member of the rescue team or service must hold a current certification in first aid and CPR.)

Rescue personnel shall practice making confined space rescues at least once every 12 months by means of simulated rescue operations in which they remove dummies, manikins, or persons from the actual confined spaces or from representative spaces. Representative spaces shall simulate the types of confined spaces from which rescue is to be performed with respect to opening size, configuration, and accessibility.

4.8.3. Emergency Rescue Service Providers

When emergency rescue services are provided by our client or an outside service, assure that the service has the ability to:

- Respond to a rescue summons in a timely manner, considering the hazard(s) identified;
- Rescue personnel from the particular space or types of confined spaces identified;
- Reach the victim(s) within a time frame that is appropriate for the hazard(s) identified; and
- Provide the necessary equipment and demonstrate proficiency in performing the rescue service.

The rescue team or service shall be informed of the hazards that they may confront when called on to perform rescue at the site.

The rescue team or service selected must be provided access to all confined spaces from which rescue may be necessary so that the rescue service can develop appropriate rescue plans and practice rescue operations. Evaluate rescue services no less than annually and maintain documentation in the project files.

4.9. Facility owners and Contractors

When an employer (facility owner) arranges to have employees of another employer (contractor) perform work that involves confined space entry, the facility owner shall:

- Inform the contractor that the workplace contains confined spaces and that confined space entry is allowed only through compliance with a confined space program meeting the requirements of this HSEP;
- Apprise the contractor of the elements, including the hazards identified and the facility owner's experience with the confined space, that make the space in question a confined space;
- Apprise the contractor of any precautions or procedures that the facility owner has implemented for the protection of workers in or near confined spaces where contractor personnel will be working;
- Coordinate entry operations with the contractor, when both facility owner personnel and contractor personnel will be working in or near confined spaces; and
- Develop and implement procedures to coordinate entry operations when employees of more than one employer are working simultaneously as authorized entrants in a permit

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space, so that employees of one employer do not endanger the employees of any other employer.

- Debrief the contractor at the conclusion of the entry operations regarding the confined space program followed and regarding any hazards confronted or created in confined spaces during entry operations.

In addition to complying with the confined space requirements that apply to all employers, each contractor, who is retained to perform confined space entry operations shall:

- Obtain any available information regarding confined space hazards and entry operations from the facility owner;
- Coordinate entry operations with the facility owner, when both facility owner personnel and contractor personnel will be working in or near confined spaces; and
- Inform the facility owner of the confined space program that the contractor will follow and of any hazards confronted or created in confined spaces, either through a debriefing or during the entry operation.

4.10. Sewer System Entries

Sewer entry differs from other confined space entries because there rarely exists any way to completely isolate the space and because the atmosphere may suddenly and unpredictably become lethally hazardous (toxic, flammable or explosive) from causes beyond the control of the entrant.

Entrants should be trained in the use of, and be equipped with, atmospheric monitoring equipment, which sounds an audible alarm, in addition to its visual readout.

The selected testing instrument should be carried and used by the entrant in sewer line work to monitor the atmosphere in the entrant's environment, and in advance of the entrant's direction of movement, to warn the entrant of any deterioration in atmospheric conditions. Where several entrants are working together in the same immediate location, one instrument, used by the lead entrant, is acceptable.

The work team should develop and maintain liaison with the local weather bureau and fire and emergency services in their area so that sewer work may be delayed or interrupted and entrants withdrawn, whenever sewer lines might be suddenly flooded by rain or fire suppression activities, or whenever flammable or other hazardous materials are released into sewers during emergencies by industrial or transportation accidents.

Entry into large bore sewers may require the use of special equipment. Equipment might include such items as escape self-contained breathing apparatus with at least 10-minute air supply, waterproof flashlights, boats and rafts, radios and rope stand-offs for pulling around bends and corners, as needed.

Evaluate the potential need for Hepatitis B or other employee health inoculations for employees exposed to sewage.

4.11. Training

Entrants, attendants, and entry supervisors shall be trained in their responsibilities as stated above:

- before being assigned confined space duties,
- whenever there is a change in assigned duties,
- whenever there is a change that presents a new hazard, and
- whenever there are deviations or inadequacies in the use of these procedures.

All confined space entry training must be documented. The documentation shall contain the employee's name and identification number, signature or initials of the trainer, and date of the training.

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4.12. Confined Space Entry Closure and Program Review

After the confined space entry has been completed or the permit has expired, the permit will be given to the Entry Supervisor for review and revision, if necessary.

The entry supervisor shall assure that all personnel, tools, and equipment have been removed from the confined space and it has been returned to pre-entry conditions, i.e., signs replaced, access doors closed, manhole covers closed, etc.

Each canceled entry permit shall be retained for at least one year to facilitate the review of the confined space entry program. This review shall occur annually. Each project shall maintain a record of this annual confined space program review. The review shall capture the following:

- Any problems encountered during an entry operation shall be noted on the permit .
- If any injuries or incidents occur during a confined space entry, the investigation report shall be retained as part of the review, including the record of completed corrective actions taken.
- A review of the emergency rescue services which shall include training, drills, rescue equipment inspection, response time, etc.
- Confirm the project HASAP captures this annual review and any findings, as appropriate

Upon completion the documented program review shall be submitted annually to the Corporate HSE representative for analysis. This representative is responsible for assessing findings and recommendations and submits a change request to the Corporate HSE Directors for proposed revisions to this procedure, as necessary.

For locations where the client/owner confined space entry process is utilized, the results of the annual review shall also be communicated to the client/owner.

If no entries are performed during a 12 month period, no review is necessary.

5.0 REFERENCES AND RELATED DOCUMENTS

“Field Guidelines For Temporary Ventilation Of Confined Spaces With An Emphasis On Hot work”, M. K. Harris, PhD, L. E. Booher, CIH, CSP, and Stephanie Carter, CIH, AIHA Press, 1996

29 CFR 1910.146, Permit-Required Confined Spaces

HSEP 7.2f1, Confined Space Entry Assessment and Permit Form

HSEP 8.5

HSEP 12.2

HSEP 13.9f1

HSEP 15.1

6.0 FIGURES

Pulling Versus Pushing For General Ventilation

Controlling Short Circuiting

Improper Installation Of Eductors/Air Movers Can Also Be A Source Of Short Circuiting

Effective Use of Dilution Ventilation Techniques

Design Air Flow To Take Advantage of Convection Forces

Proper Use Of Fans And Eductors/Air Movers When Used Together

Pressurized And Conditioned Make-up Air Assists Eductors

Control Sources of Make-up Air

Control of Make-up Air Pathway

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Proper Placement Of Local Capture Exhaust Trunks

(Sample) Confined Space Authorized Entrants Sign-In and Sign-Out Log

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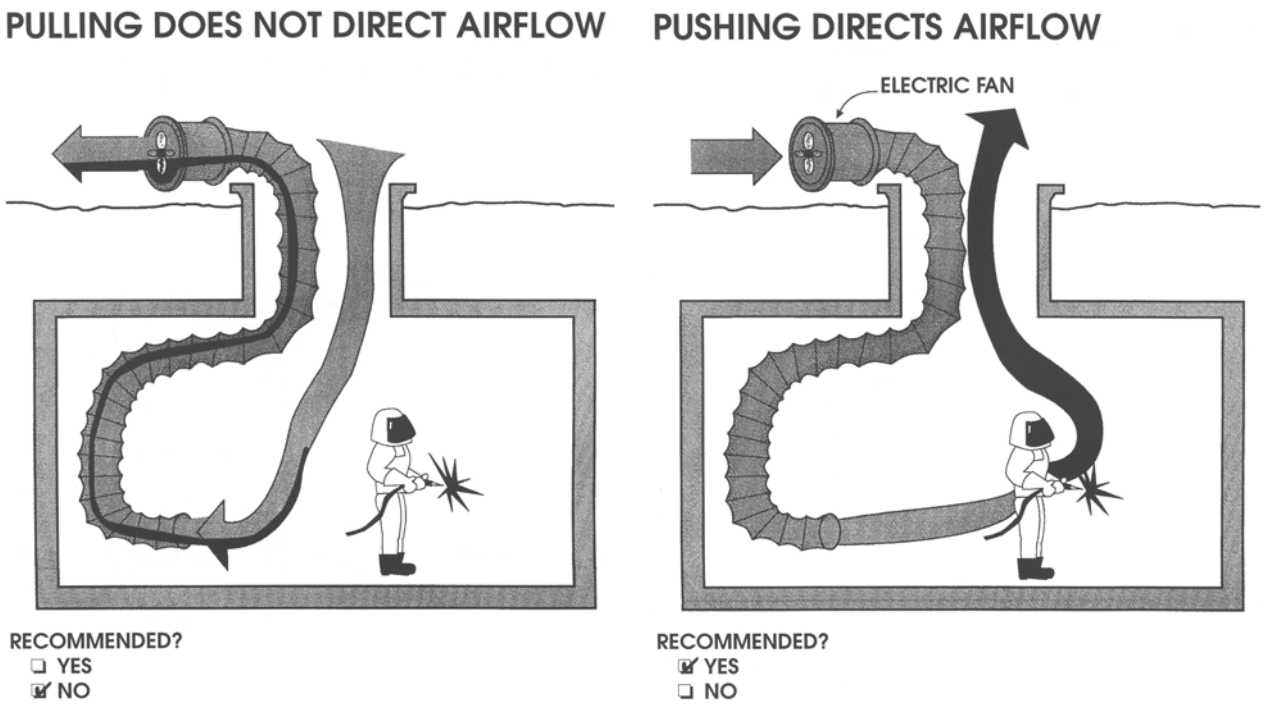
The figures that follow were taken from “Field Guidelines for Temporary Ventilation of Confined Spaces with ann Emphasis on Hot work”, M. K. Harris, PhD, L. E. Booher, CIH, CSP, and Stephanie Carter, CIH, AIHA Press, 1996.

These figures present the theory of ventilation in confined spaces. Although no two confined spaces are quite the same, the principles described below will facilitate development of a ventilation plan that will minimize the reliance on respiratory protection.

Figure 1

Pulling Versus Pushing For General Ventilation



Pushing air through a contaminated space is as acceptable as pulling air through a contaminated space, as long as the air entering the confined space is of good quality and is directed to the correct area. When air is pulled through a space, it sometimes “misses” the area of contamination and is not effective if the air’s pathway is not properly designed. Such situations can sometimes be overcome through the push method.

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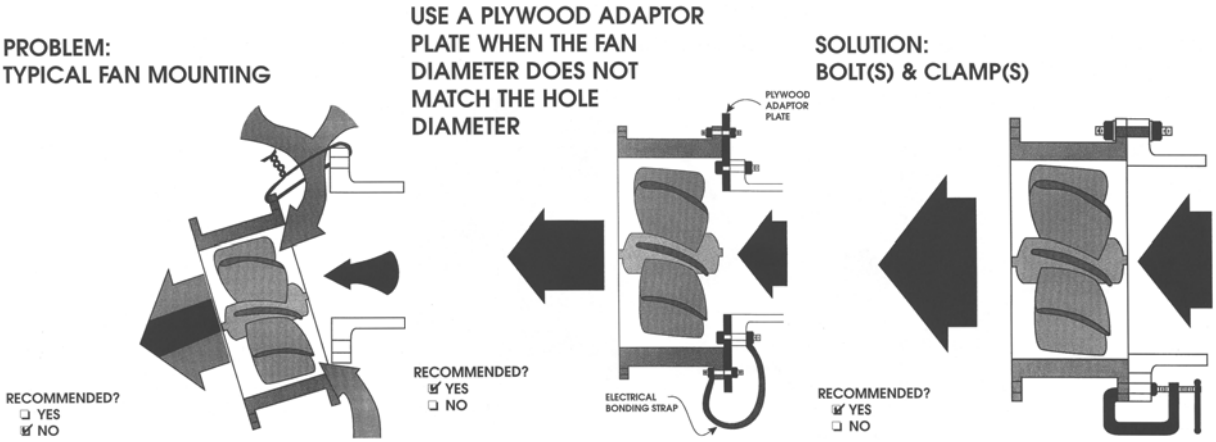
Figure 2

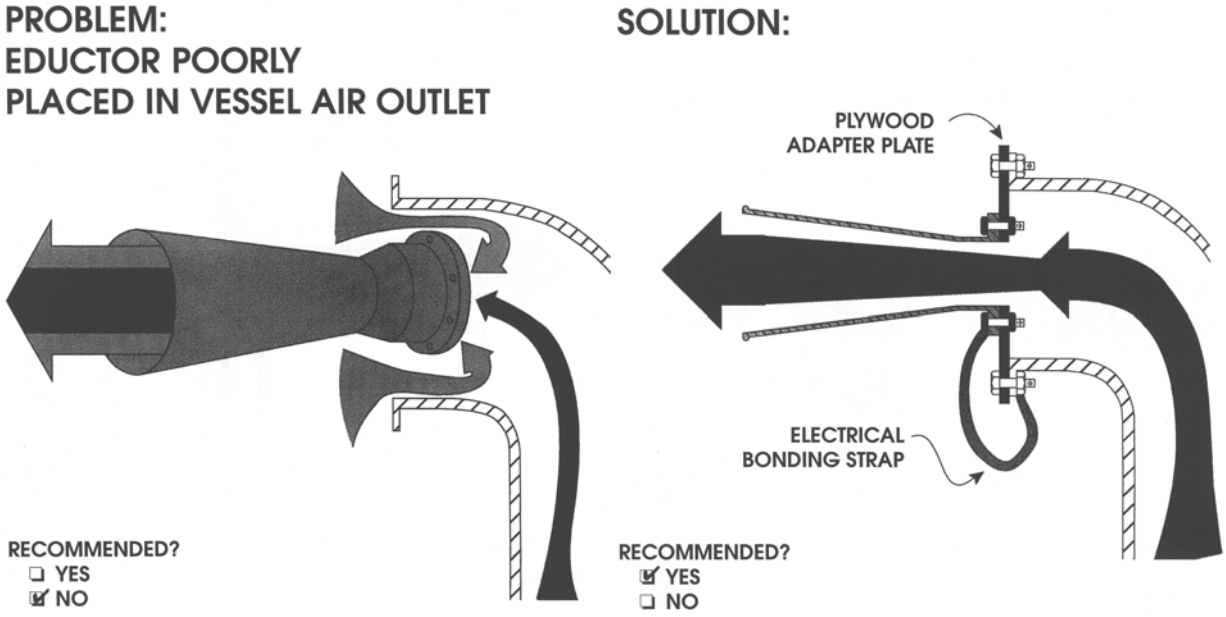
Controlling Short Circuiting



Short-circuited airflow can result when air passes through the gap between a fan and the entry way's flange rather than through the confined space as intended. A bolt and clamp and/or a plywood adapter plate can remedy the problem. Notice the essential electrical bonding strap to eliminate static electricity accumulation between the vessel and the air mover.

Figure 3

Improper Installation of Eductors/Air Movers Can Also Be A Source Of Short Circuiting



Eductors inserted in an opening without an attempt to control airflow result in short-circuiting and poor performance. Use of an adapter plate will eliminate the short-circuiting problem. Remember to use a bonding strap if non-conductive materials are used.

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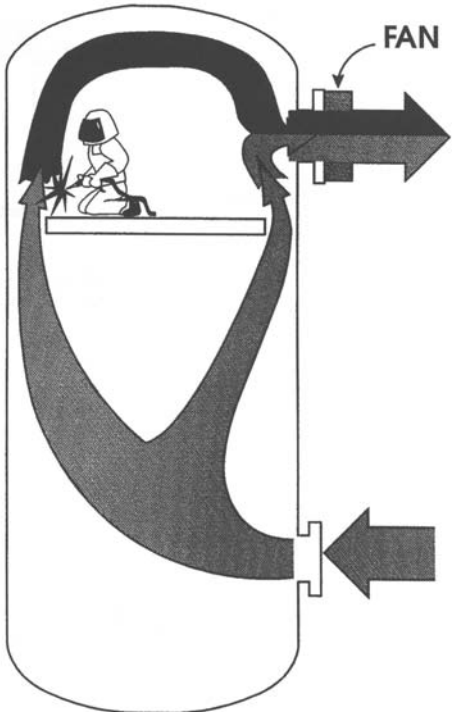
Figure 4

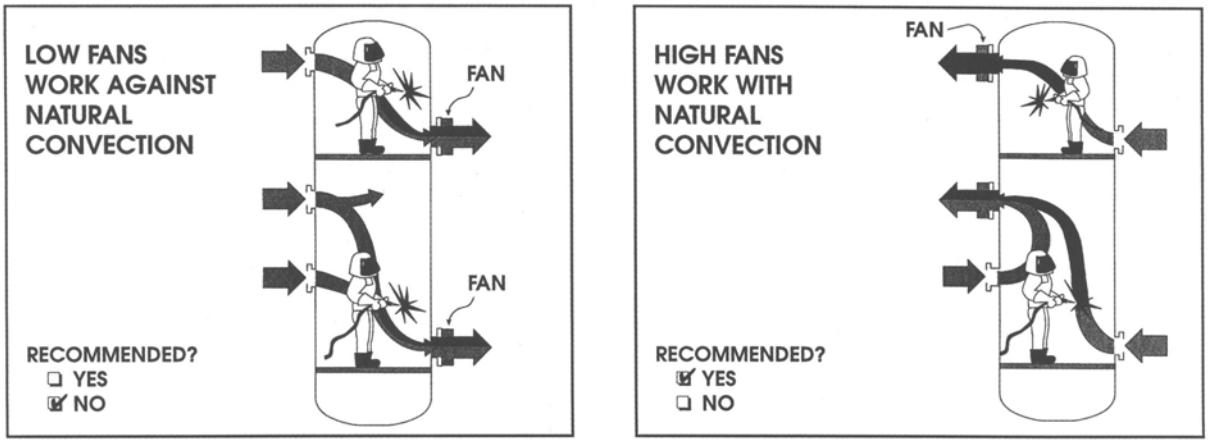
Effective Use of Dilution Ventilation Techniques



Example of dilution ventilation techniques through simple pull ventilation design. Push ventilation would probably be equally as effective in this case.

Figure 5

Design Air Flow To Take Advantage of Convection Forces



Exhausting air movers placed low in the confined space generally work against natural convection while higher positioned exhausting fans generally work with convection. When in doubt, stagnant areas can be visualized by using smoke tubes to trace the airflow patterns. Stagnant areas can sometimes be more effectively flushed as a result of the greater internal turbulence that is generally available through the push method that is not present when air is simply being pulled through a space.

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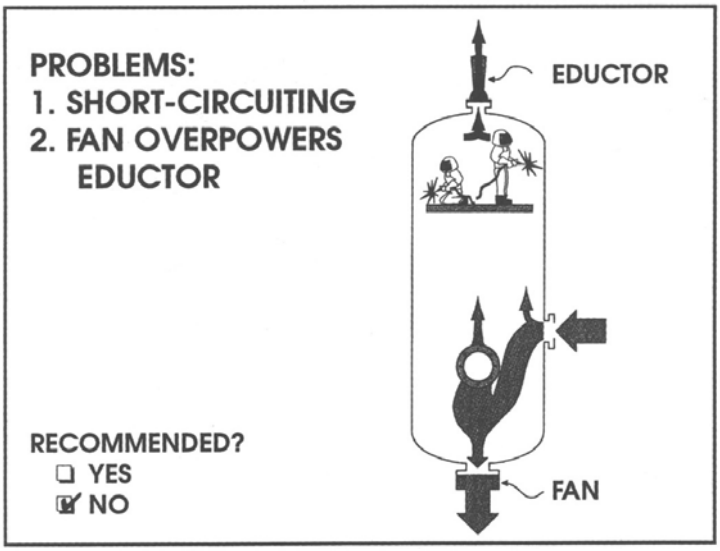
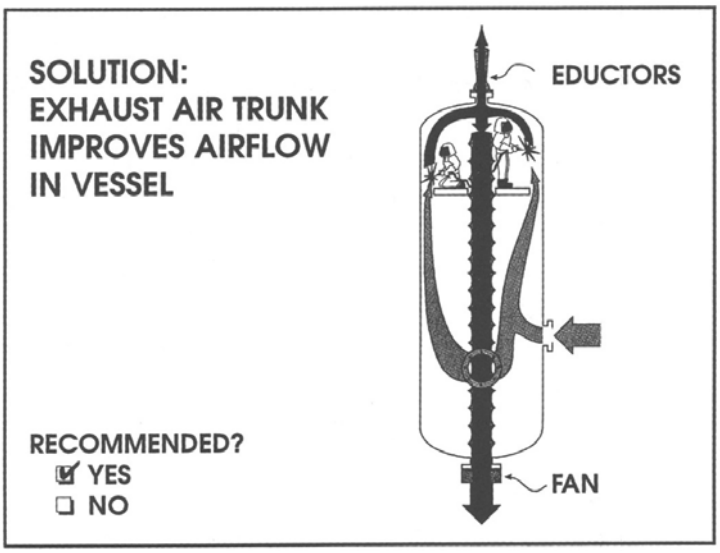
Figure 6

Proper Use of Fans And Eductors/Air Movers When Used Together





Eductors are less effective than fans at overcoming static pressure loads.

Consequently, airflow in a vessel can be short-circuited and result in little make-up air reaching the work area.

Installation of an exhaust trunk from the point of contaminant generation to the air mover can greatly improve both the capture and removal of contaminants and the intake of fresh air.

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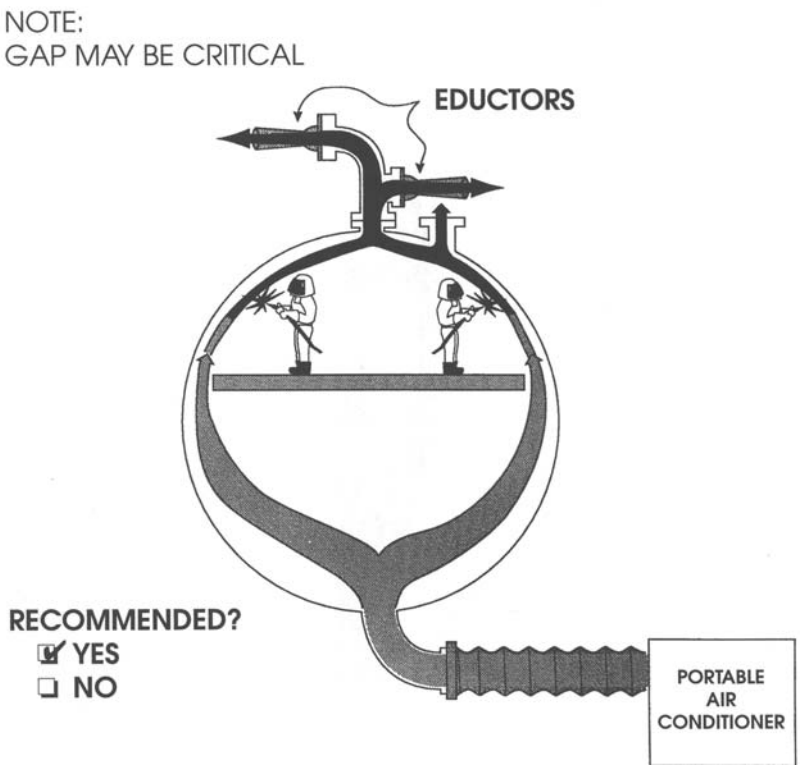
Figure 7

Pressurized and Conditioned Make-up Air Assists Eductors



Limited openings in spherical vessels usually result in limited sources of make-up air.

Insufficient make-up air will reduce the performance of mechanical ventilation.

One way to increase the amount of make-up air without increasing the number of openings is to blow the make-up air into the vessel with a fan or blower.

Figure 8

Control Sources of Make-up Air

In vessels with limited openings, such as spherical vessels, the make-up air openings and fan attachments openings may be close together and produce unfavorable air flow patterns.

If this is likely to occur, some make-up air openings can be blocked off to direct airflow to the correct places. Two plywood plugs can be inserted in the vertical lines exiting the top of the confined space to restrict make-up air intake and prevent short-circuiting, since the fans would have little effect on the airflow within the vessel.

Even with the upper lines plugged, much of the air entering the vessel through the manway is short-circuited and loops around and exits the confined space without passing the welder's breathing zone.

Although not ideal, this circulation pattern, along with naturally occurring convection, will generate airflow upward through the vessel.

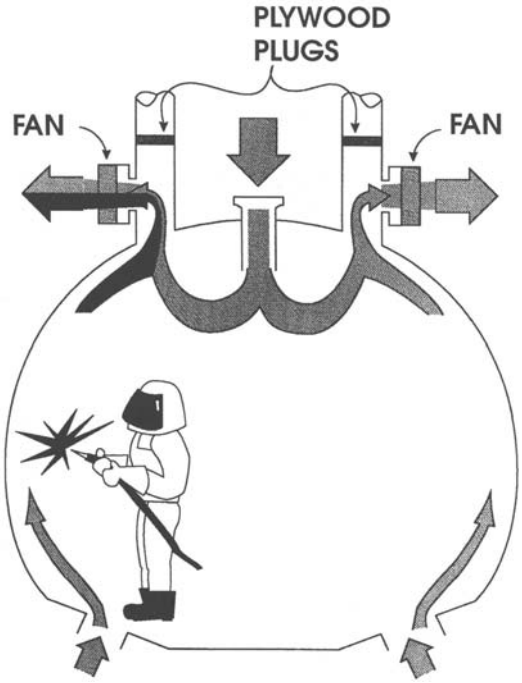


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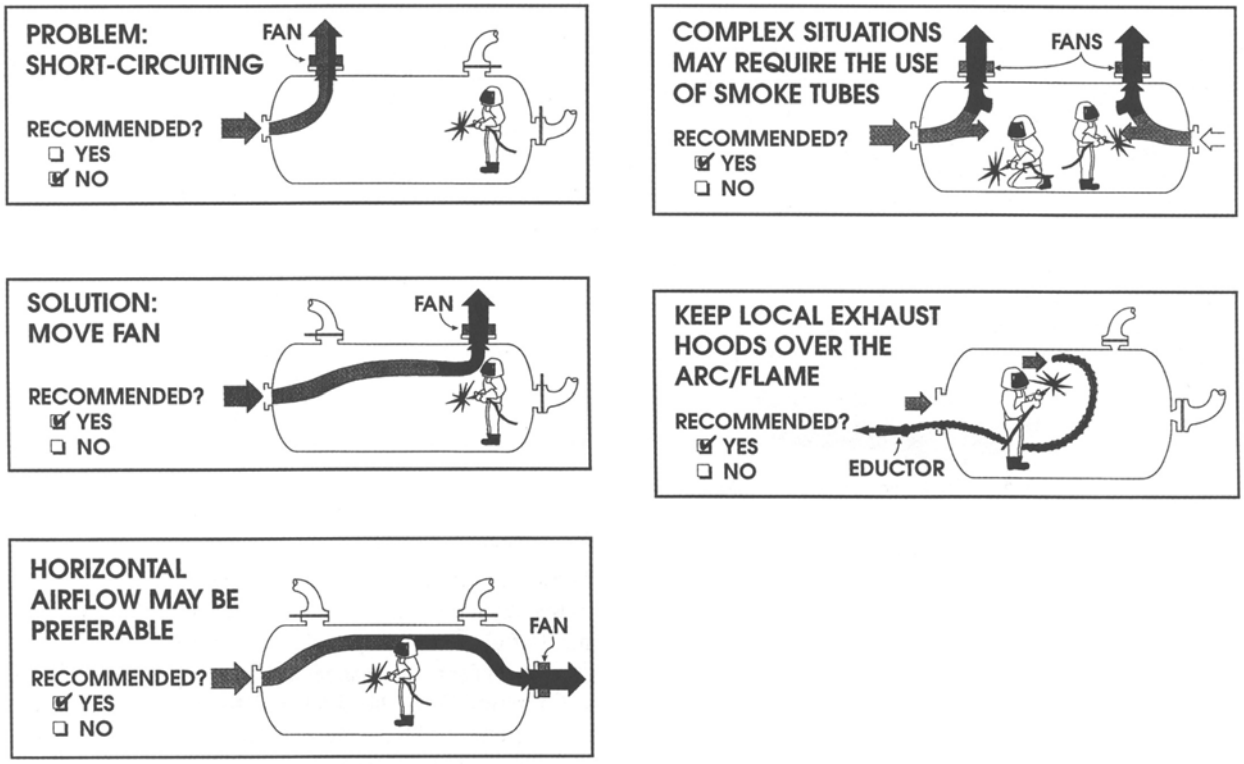
Figure 9

Control of Make-up Air Pathway



This example illustrates a common condition in horizontal confined spaces: only the lines attached to the left side of the vessel have been removed to allow the welder's access to the interior. This results in short-circuiting of the airflow in the vessel and limits effective ventilation to the left side of the vessel.

For welding on the right side, either local exhaust ventilation or supplied air respiratory protection is required. Mounting a fan above the area in which the work is to be conducted creates a more favorable airflow pattern.

When possible, arrange ventilation to minimize the extent to which dilution ventilation causes contaminated air to be drawn past the worker's breathing zone.

Breaking the flange at the end of the confined space opposite the make-up air opening and mounting a fan at that location creates a ventilation configuration that forces air to move throughout the length of the space, reducing the extent of "dead spots" unaffected by ventilation.

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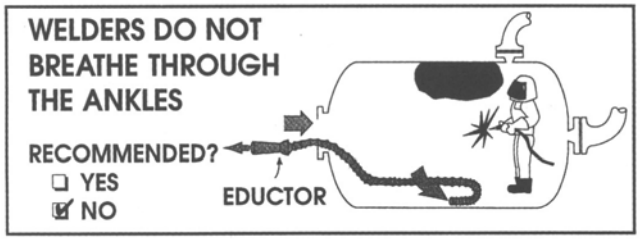
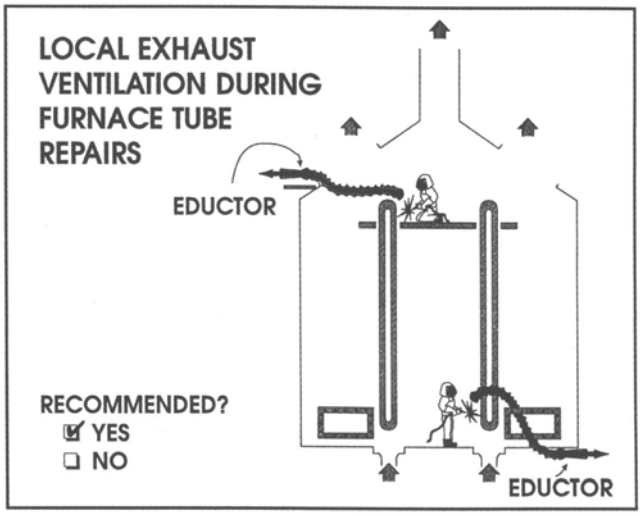
Figure 10

Proper Placement Of Local Capture Exhaust Trunks

Properly placed local-exhaust hoods connected to eductors/air movers via trunks can capture and remove most, if not all, contamination generated in the confined space. Local exhaust ventilation is the preferred and most effective method for contaminant control in confined space work.

Since local exhaust hoods can be awkward to move and position, there is a tendency for them to be left on the floor and the local exhaust only provides a false sense of protection. They may contribute to general dilution ventilation, but that contribution is likely to be minimal.





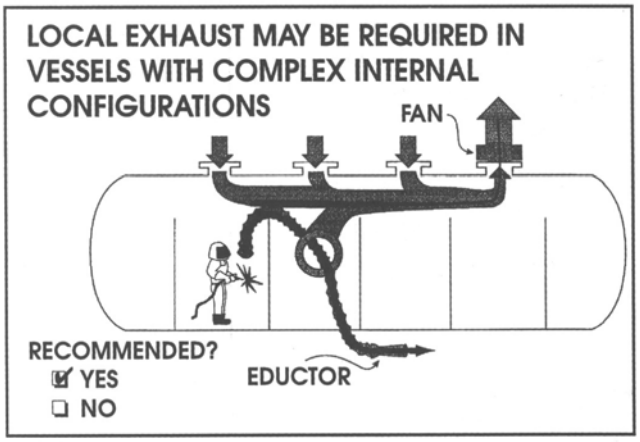


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Figure 11

Confined Space Authorized Entrants Sign-In and Sign-Out Log

Client:	Project:	Location:	Date:
Name/Description of Confined Space:		Entry Supervisor:	
Standby Attendant 1 Name (printed):		Standby Attendant 2 Name (printed):	

Entrant's Name Printed	**Entrant's Signature**	**Enter Time In and Out**											
		In	Out	In	Out	In	Out	In	Out	In	Out	In	Out

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HSE Procedure		Document No: HSEP 7.3.2	Page: 1 of 8
Site Control		Supersedes: CHSP 7.3.2	Rev. 2
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 1 Jun 97	Current Revision Date: 13 Aug 01

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1.0 PURPOSE AND SCOPE

This Corporate Health, Safety, and Environment Procedure (CHSEP) presents requirements for worksite entry and safe site work practices and the criteria for the establishment of contamination-control work zones for hazardous waste site work.

This CHSEP applies to all hazardous waste work sites and indicated sections dealing with safe work practices apply additionally to all work sites. Subcontractors may follow their company Health, Safety, and Environment (HSE) procedures but they must be consistent with these requirements and meet or exceed the requirements set forth in this CHSEP.

2.0 RESPONSIBILITIES

2.1. Project Health, Safety, and Environment Manager

The Project Health, Safety, and Environment Manager (HSEM) is responsible for assuring that the requirements of this section are incorporated in the site Health, Safety, and Environment Plan (HSEP) requirements.

2.2. Site Manager

The Site Manager (SM) shall also sign off on the HSEP & is responsible for implementation of this HSEP.

2.3. Program Health, Safety, and Environment Manager

The Program HHSE Manager (PHSEM) is responsible for evaluation of requests for any variances from requirements presented in this HSEP.

2.4. Site Health, Safety, and Environment Officer

The Site Health, Safety, and Environment Officer (HSEO) shall assure full compliance with the HSEP & report any deficiencies to the SM.

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3.0 DEFINITIONS

None

4.0 PROCEDURE

Attachment 1 contains the Basic Code of Safe Practices, which are applicable to all site work.

The following procedures will also be followed for work on hazardous waste sites.

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material are prohibited in any area designated as contaminated.
- Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, and any other activities.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, mud, or other discolored surfaces. Avoid kneeling on the ground and leaning, sitting, or placing equipment on drums, containers, vehicles, or on the ground.
- Entrance and exit must be planned and emergency escape routes delineated. Warning signals for site evacuation must be established.
- Personnel on site must use the “buddy” system when wearing respiratory protective equipment. As a minimum, a third person, suitably equipped as a safety backup, is required during initial entries.
- Personnel should practice unfamiliar operations prior to actual procedure.
- During continual operations, on site workers act as safety backup to each other. Off-site personnel provide emergency assistance. Communications using radios or other means must be maintained between initial entry members at all times. Emergency communications should be prearranged in case of radio failure, necessity for evacuation of site, or other reasons.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- Visual contact must be maintained between “pairs” on-site and safety personnel. Entry team members should remain close together to assist each other during emergencies.
- Wind indicators visible to all personnel should be strategically located throughout the site. Personnel and equipment in the contaminated area should be minimized, consistent with effective site operations.
- Work area for various operational activities must be established (see Section 7.4 below).
- Procedures for leaving a contaminated area must be planned and implemented prior to going on site. Work areas and decontamination procedures must be established based on prevailing site conditions.
- Continual practice and training must be provided in using personal protection equipment, especially the self-contained breathing apparatus and chemical-resistant protective clothing.
- Wearing personal protective equipment (PPE) puts a hazardous material worker at considerable risk of developing heat stress. During warm weather conditions, a heat stress control program must be implemented (see HSEP for heat stress).
- Cold injury (frostbite and hypothermia) and impaired ability to work are dangers at low temperatures and when the wind-chill factor is high. Procedures for cold stress monitoring and control are presented in the HSEP for cold stress.

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The site-specific HSEP must specify testing for site hazards and a task hazard analysis that presents a task breakdown of the scope of work and the H&S control procedures to be implemented for each task, which must be adhered to during site initiation.

The site HSEP presents air-monitoring requirements for known contaminants. This data, together with site logistics information and information related to prevailing weather conditions, helps dictate the initial entry airborne monitoring program.

Work zones for hazardous waste sites are to be established since activities required during hazardous waste site operations may contribute to the movement of contaminants from the site to otherwise unaffected areas. Personnel and equipment may carry contaminated material into clean areas. Materials may become airborne due to their volatility, or the disturbance of contaminated soil may cause them to become wind blown.

To minimize the transfer of hazardous substances from the site, contamination control procedures are needed. Two general methods are used: establishing site work zones (discussed here) and removing contaminants from people and equipment (see HSEPs for personnel and equipment decontamination). This information is to be detailed in the HSEP. Whenever possible, a site map depicting the work zones will be developed and included in the HSEP.

4.1. Control at the Site

Personnel or equipment from the site must control a site to reduce the possibility of exposure to contaminants and their transport. Exposure or movement of substances can be reduced or eliminated in a number of ways, including:

- Setting up security and physical barriers to exclude unnecessary personnel from the general area.
- Minimizing the number of personnel and equipment on site consistent with effective operations.
- Establishing work zones within the site.
- Establishing control points to regulate access to work zones.
- Conducting operations in a manner to reduce the exposure of personnel and equipment and to eliminate the potential for airborne dispersion.
- Implementing appropriate decontamination procedures.

4.2. Establishing Work Zones

One method of preventing or reducing the migration of contamination is to delineate zones on the site where prescribed operations occur. Access control points should limit movement of personnel and equipment between zones and onto the site. By these means, contamination would be expected to be contained within certain relatively small areas on the site and its potential for spread minimized. Three contiguous zones are recommended.

Zone 1: Exclusion

Zone 2: Contamination Reduction Zone

Zone 3: Support Zone

4.3. Zone 1—Exclusion Zone

The Exclusion Zone, the innermost of the three concentric areas, is the zone where contamination does or could occur. All people entering the Exclusion Zone must wear prescribed levels of protection. An entry and exit check point must be established at the periphery of the Exclusion Zone to regulate the flow of personnel and equipment into and out of the zone and to verify that the procedures established to enter and exit are followed.

The outer boundary of Zone 1, the Hotline, is initially established by visually surveying the immediate environs of the incident and determine where the hazardous substances involved are located; where any drainage, leached, or spilled material is; and whether any discolorations are

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visible. Guidance in determining the boundaries is also provided by data from the initial site survey indicating the presence of organic or inorganic vapor/gases or particulates in air, combustible gases, and radiation, or the results of water and soil sampling.

Additional factors that should be considered include the distances needed to prevent fire of an explosion from affecting personnel outside the zone, the physical area necessary to conduct site operations, and the potential for contaminants to be blown from the area. Once the Hotline has been determined, it should be well marked. During subsequent site operations, the boundary may be modified and adjusted as more information becomes available.

Sub Areas Within The Exclusion Zone

All personnel within the Exclusion Zone must wear the required level of protection. Personal protective equipment is designated based on site-specific conditions, including the type of work to be done and the hazards that might be encountered. Frequently with the Exclusion Zone, different levels of protection are justified. Sub areas are specified and conspicuously marked as to whether Level A, B, C, or D protection is required. The level of protection is determined by the measured concentration of substances in air, potential for contamination, and the known or suspected presence of highly toxic substances.

Different levels of protection in the Exclusion Zone might also be designated by job assignment. For example, collection samples from open containers might require Level B protection, while for walk-through ambient air monitoring; Level C protections might be sufficient. The assignment, when appropriate, of different levels of protection within the Exclusion Zone generally makes for a more flexible, effective, and less costly operation, while still maintaining a high degree of safety.

4.4. Zone 3—Support Zone

The Support Zone, the outermost part of the site, is considered a non-contaminated or clean area. Support equipment is located on the zone and traffic is restricted to authorized response personnel. Since normal work clothes are appropriate within this zone, potentially contaminated personnel clothing, equipment, and samples are not permitted, but are left in the Contamination Reduction Zone until they are decontaminated.

- Accessibility: topography; open space available; locations of highways, railroad tracks; or other limitations.
- Wind direction: preferably the support facilities should be located upwind of the Exclusion Zone. However, shifts in wind direction and other conditions may be such that an ideal location based on wind direction alone does not exist.
- Resources: adequate roads, power lines, water, and shelter

4.5. Zone 2—Contamination Reduction Zone

Between the Exclusion Zone and the Support Zone is the Contamination Reduction Zone, which provides a transition between contamination and clean zones. Zone 2 serves as a buffer to further reduce the probability of the clean zone becoming contaminated or being affected by other existing hazards. It provides additional assurance that the physical transfer of contaminating substances on people, equipment, or in the air is limited through a combination of decontamination, distance between Exclusion and Support Zones, air dilution, zone restrictions, and work functions.

Initially, the Contamination Reduction Zone is considered to be a non-contaminated area. At the boundary between the Exclusion and Contamination Reduction Zones, decontamination stations are established, one for personnel and one for heavy equipment. Depending on the size of the operation, more than two stations may be necessary. Exit from the Exclusion Zone is through a decontamination station.

As operations proceed, the area around the decontamination may become contaminated, but to a much lesser degree than the Exclusion Zone. On a relative basis, the amount of contaminants should decrease from the Hotline to the Support Zone due to the distance involved and the decontamination procedures used.

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The boundary between the Support Zone and the Contamination Control Line, separates the possibly low contamination area from the clean Support Zone. Access to the Contamination Reduction Zone from the Support Zone is through a control point. Personnel entering there would wear the prescribed personnel protective equipment, as required, for working in the Contamination Reduction Zone.

4.6. Other Considerations in Work Zone Definition

- **Modifications:** The use of a three-zone system, access control points, and exacting decontamination procedures provides a reasonable assurance against the translocation of contaminating substances. This site control system is based on a "worst case" situation. Less stringent site control and decontamination procedures may be utilized if more definitive information is available on the types of substances involved and hazards they present. This information can be obtained through air monitoring, instrument survey and sampling, and technical data concerning the characteristics and behavior of material present.
- **Area Dimension**: The distance between the Hotline, Contamination Control Line, and command post and the size and shape of each zone have to be based on conditions specific to each site. Considerable judgment is needed to assure that the distances between zone boundaries are large enough to allow room for the necessary operations, provide adequate distances to prevent the spread of contaminants, and eliminate the possibility of injury due to explosion or fire. Long-term operations would involve developing reasonable methods to determine if material is being transferred between zones and to assist in modifying site boundaries. The following criteria should be considered in establishing area dimensions and boundary distances:
  - Physical and topographical features of the site.
  - Weather conditions.
  - Field/laboratory measurements of air contaminants and environmental samples.
  - Air dispersion calculations.
  - Potential for explosion and flying debris.
  - Physical, chemical, toxicological, and other characteristics of the substances present.
  - Cleanup activities required.
  - Potential for fire.
  - Area needed to conduct operations.
  - Dimensions of contaminated area.
  - Potential for exposure.
- **Monitoring and Sampling:** To verify that the site control procedures are preventing the spread of contamination, a monitoring and sampling program should be established. The Support Zone should be periodically monitored for air contaminants using direct reading instruments and/or collecting air samples for particulate, gas, or vapor analysis. Analysis of soil samples collected in the most heavily traveled area would indicate contaminants being carried from the Exclusion Zone by personnel, equipment, or wind. Occasional swipe tests should be taken in trailers and other areas used by personnel.
- These same types of samples should be collected along with air monitored in the Contamination Reduction Zone. Increased concentrations in air or other environmental media may indicate a breakdown in control over the Contamination Reduction Corridor, ineffective decontamination procedures, or failure to restrict site access.

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5.0 REFERENCES

U.S. Army Corps of Engineers, Safety & Health Requirements Manual EM 385-1-1, Section 28. October 1992.

U.S. EPA, Standard Operating Safety Guides, November 1984.

NIOSH/OSHA/USCG/EPA. Occupational Safety & Health Guidance Manual for Hazardous Waste Site Activities, October 1985.

6.0 FIGURES

Basic Code of Safe Practices

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Figure 1

Basic Code of Safe Practices

Following is the Basic Code of Safe Practices that applies at all times to site. These safety rules are not inclusive, and all Federal and State safety regulations shall also be applicable. Where a conflict exists between a Federal, State, and/or other applicable safety rule, the more restrictive shall be in force on the job site.

This is a recommended format. It is general in nature and intended also as a basic for the preparation of a code of safe practices by subcontractors that fit his/her operation more exactly. As a minimum performance standard, they shall be adopted and enforced by any subcontractor performing work on Company projects.

- Hard hats shall be worn at all times in construction areas.
- Sleeved shirts shall be worn at all times.
- Long pants shall be worn at all times.
- Leather shoes be worn at all times in construction areas; no tennis or running shoes will be allowed.
- Adequate eye protection shall be worn when cutting, grinding, sawing or conducting any other activity that poses a potential eye hazard.
- Safety harness with lanyard shall be used at unprotected heights of more than 6’-0”; this includes working on a ladder when more than 6’-0” above the ground or floor. 100% tie off is required when unprotected more than 6’ above work surface.
- Hearing protection shall be worn when employees are exposed to noise levels requiring hearing protection as defined by Federal or State HSE standards.
- Illegal drugs, alcohol, firearms, or other dangerous substances shall not be allowed on the job site.
- Good housekeeping practices shall be maintained continually.
- When work is performed overhead, the subcontractor conducting such work shall erect a barricade. The barricade shall consist of caution or danger barricade tape and appropriate warning signs.
- All barricades shall be removed when not in use.
- Subcontractor employees shall be required to honor the barricades erected by other contractors on the job site.
- All persons shall follow these safe practices and rules, render every possible aid to safe operations and report all unsafe conditions or practices to the supervisor.
- Foremen shall assure that employees observe and obey every applicable Company, State, or Federal regulation and order as is necessary to the safe conduct of the work, and shall take such action as is necessary to obtain.
- All employees shall be given frequent accident prevention instruction. Instructions shall be given at least every five work days.
- Anyone known to be under the influence of drugs or intoxicating substance, which impair the employees ability to safely perform the assigned duties, shall not be allowed on the job while in that condition.
- Horseplay, scuffling, and other acts which tend to have an adverse influence on the safety or well being of the employees shall be prohibited.

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- Work shall be well planned and supervised to prevent injuries in the handling of materials and in working together with equipment.
- No one shall knowingly be permitted or required to work while the employee's ability or alertness is so impaired by fatigue, illness, or other causes that they might unnecessarily expose the employee or others to injury.
- Employees shall not enter manholes, underground vaults, chambers, tanks, silos or other similar spaces without a confined space entry permit being issued.
- Employees shall be instructed to ensure that all guards and other protective devices are proper and adjusted and shall report deficiencies promptly to the supervisor.
- Electric cords shall not be exposed to potential damage from vehicles.
- In locations where the use of a portable power tool is difficult, the tool shall be supported by means of a rope or similar support of adequate strength.
- Only trained and authorized persons shall operate machinery or equipment.
- Loose or frayed clothing, loose or hanging long hair, dangling ties, finger rings, etc., shall not be worn around moving machinery or other areas where they may become entangled.
- Machinery shall not be serviced, repaired, or adjusted while in operation, nor shall oiling of moving parts be attempted, except on equipment that is designed or fitted with safeguards to protect the person performing the work.
- Where appropriate, lockout procedures shall be used.
- Employees shall not work under vehicles supported by jacks or chain hoists without protective blocking that will prevent injury if jacks or hoists should fail.
- Air hoses shall not be disconnected at compressors until the hose line has been bled.
- Excavating, trenching, and shoring operations shall be supervised by a "competent person" (refer to OSHA and/or Company regulations during all stages of field activity).
- All excavations shall be visually inspected before entry or backfilling to ensure that it is safe.
- Excavating equipment shall not be operated near tops of cuts, banks, or cliffs if employees are working below.
- Tractors, bulldozers scrapers, and carryalls shall not operate where there is a possibility of overturning in dangerous areas like edges of deep fills, cut banks, and steep slopes.
- When loading where there is a probability of dangerous slides or movement of material, the wheels or treads of loading equipment, other than that riding on rails, should be turned in the direction which will facilitate escape in case of danger, except in a situation where this position of the wheels or treads would cause a greater operational hazard.
- Workers shall not handle or tamper with any electric equipment in a manner not within the scope of their duties, unless they have received instructions from a qualified, licensed electrician.
- All injuries shall be reported promptly to the foreman and the Prime Contractor so that arrangements can be made for medical or first aid treatment.
- No burning, welding, or other source of ignition shall be applied to any enclosed tank or vessel, even if there are some openings, until it has first been determined that no possibility of explosion exists and authority for the work is obtained from the foreman or superintendent.

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HSE Procedure		Document No: HSEP 7.3.3	Page: 1 of 6
Utility Clearance		Supersedes: HSEP 7.3.3	Rev. 3
Issuing Department: Corporate HSE	Approval: Susan.Kiesling@Jacobs.com	Previous Rev. Date: 26 Aug 02	Current Revision Date: 21 Aug 06

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1.0 PURPOSE AND SCOPE

To establish Health, Safety, and Environment (HSE) requirements to minimize, and to the extent possible, eliminate the risk to personnel and property from contact with buried or aboveground utility service lines.

This Work Instruction applies to all field activities where there could be contact with aboveground utilities or sub-surface utilities or related service lines.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

None

4.0 PROCEDURE

For work involving buried utilities and service lines:

- All three of the following Clearance Steps shall be utilized prior to drilling.
- Follow clearance Steps 1 and 2, in addition to the requirements set forth below for trenching and excavation, before any trenching or excavation work is done.

4.1. Clearance Step 1

Prior to field activities, appropriate property maps, blue lines, and/or as-builts will be examined in an effort to locate underground utility and service lines. Such reviews shall be supplemented by interviews of knowledgeable facility engineering and maintenance personnel.

During the project site walk, any discrepancies or new information regarding utility locations will be added to project maps.

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For projects on Federal land, facility-engineering personnel will be asked to provide utility clearance and sign off. The Site Manager shall obtain and submit proper facility utility service clearance request forms.

For projects within local government jurisdiction, the Site Manager shall request the services of the local utility locater service.

If the project occurs in a state or location, which has an agency that conducts utility clearances, they will be notified. The services of State Underground Service Alert (USA), DigAlert, or other appropriate service will be used. The utility locater service will assign a "ticket" number to your site, which shall be recorded. This ticket number is valid for a limited time.

4.2. Clearance Step 2

4.2.1. Sub-surface Survey

Following map reviews, personnel interviews, and use of locater services, one or more of the most appropriate of the following geophysical sub-surface survey methods shall be used to locate underground utility or service lines.

- Electromagnetic (EM) methods,
- Ground penetrating radar (GPR),
- Magnetic survey, and/or
- Pipe locator.

4.2.2. Finding Pipes and Other Objects via Metal Detection

Magnetic detection can be used to find the following:

- Iron, steel, and copper water lines
- Metal gas lines
- Surveying pins (property markers)
- Copper tracer wire
- Copper and aluminum electrical wires
- Steel cables
- Telephone and TV cables
- Aluminum conduit
- Any continuous metal pipe or line

For magnetic detection to work, the target must contain some iron or steel or have an electrical current flowing through it so that a magnetic detector can find it. Nonferrous objects or objects not carrying an electrical current, such as polyvinyl chloride or high-density polyethylene pipe, must be detected by other means.

The strongest signals come from the ends of an object, as this is where the magnetic fields of force tend to concentrate. Therefore, if an object is oriented vertically, it will produce a stronger signal than one oriented horizontally. This can make a relatively small object, such as a steel drum, easier to find than a long, cast-iron water main.

The same object buried horizontally will likely produce two weaker signals, one directly above each end—one signal being positive and one being negative. Cast-iron or steel water pipe laid end-to-end will produce a strong signal at each joint, even if the pipes are welded together. Magnetic detection of metal pipes often results in a series of peak signals designating the locations of welded end joints.

Electric cables must be energized to be detected magnetically.

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4.2.3. Ground-Penetrating Radar

Ground-penetrating radar (GPR) uses an electromagnetic (radio wave) antenna tuned to a frequency that can penetrate soils, rock, concrete, ice, and other common natural and manmade materials. Such capabilities make radar a prime technique in obtaining geotechnical information and evaluating hazardous-waste sites. As such, it is more suited for use outside of urban areas where natural conditions predominate. Furthermore, a GPR unit requires considerably more time to process than do simpler magnetic detection techniques.

GPR functions in a manner similar to standard aerial radar. A GPR determines subsurface conditions by sending pulses of high-frequency radio waves into the ground from a transmitter antenna located on the surface. Subsurface structures cause some of the wave energy to be reflected back to the surface, while the rest of the energy continues to penetrate deeper. The result is a series of radio "echoes" that delineate underground interfaces such as bedding, cementation, changes in moisture and clay content, voids, fractures, and intrusions as well as manmade objects.

Resolution of radar reflections can be increased by increasing the frequency of the radar waves transmitted into the ground.

GPR is best suited for determining a region's hydrogeology, which is its main function. Smaller manmade objects such as individual drums and utilities are harder for a GPR to delineate, though a sensitive unit can reveal their locations as part of a general survey.

4.2.4. Marking Utilities

The following color code is recommended for marking utility locations.

- white work location
- red electrical
- yellow gas or oil
- orange telephone
- blue water
- green sewer

4.3. Clearance Step 3

When earth drilling or borings are to be done, hand augering (not to be done with a power auger) will be done to a minimum of seven feet for all locations where there is a potential to impact buried utilities.

Prior to drilling, the hole shall be reamed by hand to a diameter of 120% of the drill bit to be used.

For soil gas surveys, the survey probe shall be placed as close as possible to the hand auger.

In cases where hand augers meet refusal at depths less than seven feet bgs, the following steps will be taken to ensure the cause of the refusal is not an underground utility.

- A geologist or other individual qualified to classify soil shall examine the substrate to ensure it appears to be native and/or undisturbed material.
- Two additional step-out hand-augered borings shall be drilled approximately two feet laterally from the original boring. The borings shall be located such that a right triangle is formed, with the original boring forming the apex of the 90-degree angle. If these borings also meet refusal at a similar depth to the first boring, and a qualified person determines the soil is native material, hand augering to the total depth of 7 feet will not be required.

4.4. Trenching and Excavations

Prior to groundbreaking, where trenching or excavating will be done, the soil must be probed with a magnetometer. (Magnetometers sense ferrous metallic objects, or iron-rich rock such as basalt, but give no information about objects such as fiberglass or concrete tanks.)

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To assist the equipment operator in locating any underground obstructions, a spotter will observe the excavation.

Additional requirements for trenching and excavating activities can be found in HSEPs on this subject.

4.5. Other Requirements

The Project Manager and HSE Manager will determine methods for utility clearance for horizontal and slant boring.

All uncovered utilities must be supported. If support is not required, so indicate under "Deviations From HSEP Approval", Paragraph 8, on the attached Utility Clearance form.

Utility lines shall be locked-out and/or tagged-out prior to repairs or modifications.

4.6. Above Ground Utility Lines

4.6.1. Working Near Above-Ground Power Lines

Minimum clearances for working in proximity to overhead power lines are

Nominal Voltage	Minimum Clearance
0 – 50 kV	10 ft. for any part of the crane or load
50 kV+	10 feet + 4 in for each 10 kV over 50 kV, or twice the length of the line insulator, but never less than 10 feet for any part of the crane or load

If it is necessary to work without the minimum clearance, the overhead line must be de-energized and grounded or re-routed by the utility company or a qualified electrician.

4.6.2. Equipment Transit

In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 feet for voltages less than 50 kV, and 10 feet for voltages over 50 kV, up to and including 345 kV, and 16 feet for voltages up to and including 750 kV.

For all other non-electrical utility lines, there must be a minimum of 1.5 feet vertical clearance. If the clearance is less than 1.5 feet, the lines must be rerouted or a spotter must assist the execution of this activity.

Refer also to HSEP 17.1, Mobile Cranes, and HSEP 19.4, Energized and Potentially Energized Electrical Equipment.

4.7. Approval

The attached Utility Clearance Permit must be completed and signed by the Site Manager or the Project Manager's designee prior to commencement of relevant site work.

The Project Manager after collaboration with the site HSE Officer or HSE Manager must approve deviations from this HSEP. Approval via telephone is acceptable in the event the Project Manager is not on site.

4.8. Existing Utility Repair

Prior to field work, locate the utility shut-offs. Obtain keys and/or tools (or arrange a means to promptly summon the contact person) to access the shut-offs.

Plan other appropriate steps necessary to reduce the emergency response time in the event of a damaged underground line incident, to limit property damage from the leak, and to minimize personnel exposure to a potentially hazardous environment.

When repairing existing utilities, refer to the HSEP for Lock-Out and Tag-Out. Repairs should be made only as directed by utility owners.

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5.0 REFERENCES

29 CFR 1926.650 –1926.652, Excavations

29 CFR 1910.333, Selection and Use of Work Practices in Sub-part S – Electrical

29 CFR 1926.955, Provisions for Preventing Accidents Due to Proximity to Overhead Lines

6.0 FIGURES

Utility Clearance Permit

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Figure 1

Utility Clearance Permit

Project: _____ Completed by: _____

Site Location: _____Date: _____

Reason for Clearance: _____

DESCRIPTION OF ACTIVITY	YES	NO	N/A	DATE	INITIALS
1. Review of Existing Maps					
2. Interviewed Personnel Familiar With Area?					
3. Above Ground Utilities					
a) marked on site maps					
b) necessary to lockout					
c) document procedures used to lockout or re-route					
4. Underground Utilities					
a) State Agency called: (specify)					
Ticket Number:					
b) State name of additional utility called:					
Ticket Number:					
c) Specify geophysical clearance method used:					
Done By:					
d) Utility locations marked with appropriate color code?					
Done By:					
e) Utilities marked on site map (please attach)					
Done By:					
5. Hand augering to _____ feet done by :					
6. Trench/Excavation probed by:					
a) Hand Clearance required:					
7. Clearance Approval Site Manager: Client Representative:					
8. Procedure Deviations Approval: Project Manager: HSE Manager:					

Describe Deviations: _____

_____

Justification: _____

_____

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HSE Procedure		Document No: HSEP 7.3.7	Page: 1 of 5
Emergency Planning and Response		Supersedes: CHSP 7.3.7	Rev.
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 1 Jun 97	Current Revision Date: 14 Aug 01

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1.0 PURPOSE AND SCOPE

This HSEP provides the requirements for written site emergency planning and emergency responses plans. Where clients have site-specific emergency response plans, the Company plan shall integrate the client plan and be consistent with it. Local, state or federal agencies may have existing plans which will need to be integrated with the Company's plan.

This HSEP applies to all environmental-type projects. The written site emergency plan shall be a part of the site-specific HSP.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

HSEO	Health, Safety, and Environment Officer
HSP	A written site-specific Health and Safety Plan, which is to be read and signed by all site personnel before beginning work.

4.0 PROCEDURE

4.1. Emergency Response Procedures

Emergency Response Procedures shall address all realistic emergency scenarios. If the client has site-specific emergency response procedures, they shall be included in this section.

4.1.1. Emergency Medical Treatment

The SM, HSEO, and at least one employee from each site work location shall be a designated emergency responder. Emergency responders must have active CPR, first aid and bloodborne pathogen control certification. The standard emergency medical response protocol is listed below:

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- If a medical emergency occurs, the designated emergency responder at the incident site shall assume charge until the HSEO or SM arrives to assume charge until an ambulance arrives, or until the injured person is admitted to the emergency room.
- The designated emergency responder will prevent further injury by taking the actions listed below:
- If certified, initiate first aid and CPR if needed. Refer to HSEP 11.2 for information on exposure to Bloodborne Pathogens.
- Call ambulance and hospital as appropriate.
- Determine whether decontamination will make injury worse. If yes, seek medical treatment immediately.
- Make certain the injured person is accompanied to the emergency room by at least one field team member with the same employer.
- Provide emergency personnel with a copy of the HSP.
- An Authorization for Medical Treatment Form shall be taken with the injured employee to the medical facility. The HSEO or SM completes the top portion of the form, and the doctor at the medical facility completes the bottom portion.

4.1.2. Transport to Medical Facility

In most cases, an ambulance will transport a seriously injured worker to the medical facility. However, if it becomes necessary to transport the worker, follow proper first-aid guidelines for moving an injured person.

Include a figure showing general site layout including location of the medical facility. Also include written directions to the medical facility including address, contact telephone number, travel time and distance.

4.2. Fire

On notification of a fire onsite, site personnel will assemble at the decontamination line. The fire department will be alerted, and personnel will move to a safe distance from the involved area. Personnel should try to extinguish small fires with the onsite fire extinguisher. In all cases the fire department should also be notified.

4.3. Personal Protective Equipment Failure

If any site worker experiences a failure or alteration of personal protective equipment (PPE), that person and his or her buddy will immediately leave the exclusion zone (EZ) through the decontamination line. The HSEO must be notified. Reentry will not be permitted until the equipment has been repaired or replaced.

4.4. Other Equipment Failure

If any other equipment onsite fails to operate properly, notify the HSEO, who will determine in conjunction with the SM the effect of this failure on the HSE of continuing operations onsite. If the failure affects the HSE of personnel or prevents completion of the work plan tasks, personnel will leave the EZ until the situation is evaluated and appropriate actions are taken.

4.5. Evacuation

If an evacuation is necessary, the steps below shall be followed:

- Personnel are to leave the work location (upwind) and assemble at a designated assembly point (if safe) after detecting the emergency signal for evacuation.
- If an emergency situation is of concern to local site personnel, notify the HSEO, who will notify client contact(s) of the emergency.

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- If appropriate and safe, the HSEO and a "buddy" are to remain at or near the sampling location after the location has been evacuated to assist local responders and advise them of the nature and location of the incident.
- The HSEO or emergency responder is to account for field team members at the assembly point.
- The SM is to complete an incident report as soon as possible after the occurrence.
- The HSEO or SM will document evacuation routes and assembly points during the employee health and safety briefing and daily tailgate meetings. Such locations shall minimize spread of contamination. Decontamination will be performed following evacuation to minimize the exposure of uncontaminated employees or equipment to contaminated employees or equipment.

4.6. Spill or Release Procedures

If spills occur, notify the HSEO and SM immediately. The HSEO or SM will be responsible for ensuring necessary notifications are given to the PHSEM and the client. The client and Company management will determine the strategy for notifying regulatory agencies.

Refer to HSP for spill containment for spill response procedures for small dry spills and small liquid.

4.7. Emergency Response Contacts

The plan shall list the following contacts with telephone numbers:

- Police, on facility and off facility as applicable
- Fire, on facility and off facility as applicable
- Ambulance, on facility and off facility as applicable
- Poison Control Center 800 458-5842
- CHEMTREC 800 424-9300
- Facility Contact(s)
- Hospital(s) or Medical Clinic(s)
- Company Emergency Medical Consultant:
- Agatha Corp. 513 421-3063

These phone numbers must be verified.

Emergency response contact protocols must be established and verified with the PM, PHSEM and client HSE contact. The telephone contact protocol must also establish the primary Company personnel responsible for emergency telephone contacts, normally the SM or HSEO.

4.8. Emergency Planning

The PHSEM, HSEO or SM shall perform the applicable emergency planning tasks prior to initiating field activities and coordinate emergency response with the facility and local emergency service providers as appropriate. Documentation of these planning results shall be maintained in the site files. These activities shall include:

- Evaluate and document capabilities and availability of local facility emergency response teams, if any.
- Verify local emergency contacts, hospital routes, evacuation routes, and assembly points.
- Notify appropriate emergency responders prior to site mobilization.
- Confirm and post emergency telephone numbers and route to hospital at each work location.

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- Post site map marked with location of emergency equipment and supplies at each work location.
- Drive and verify route(s) to hospitals(s). Ensure employees also drive the route to the hospital(s).
- Designate one vehicle as the emergency vehicle per work location; place a copy of the HSP, including the hospital directions and map, inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment and supplies.
- Establish emergency signals, evacuation routes, and on-site and off-site assembly points.
- Review emergency procedures for personnel injury.
- Reviews names and certification of on-site emergency response personnel.
- Review emergency response and post-emergency notification procedures.
- Rehearse the emergency response plan once, prior to site activities.
- Point out to field team members where emergency response equipment is located in the support area.
- Brief new workers on the emergency response plan.

4.8.1. Site First Aid and Emergency Response Supplies

Provision must be made for site first aid and emergency response supplies prior to project initiation. An inventory of these supplies must be maintained and readily available to field personnel. Basic supplies required for conducting fieldwork at hazardous waste sites include:

- First aid kit, normally a 10-unit first aid construction kit,
- Eye wash unit, must deliver at least 0.4 gpm for 15 minutes of drinking quality water,
- Oral or tympanic thermometer (optional),
- Sorbent material for spill clean up (optional),
- Fire extinguisher, A, B, C, with a 20 lb capacity minimum,
- One-way breathing shield for CPR,
- Blanket and/or stretcher,
- Water and electrolyte replenishers,
- Wind direction indicator,
- Two-way radio(s) or cellular phone,
- Outdoor thermometer,
- Water gel burn kit (where burn potential exists).

Supply requirements will vary depending on the hazard potential at individual site work locations.

If site work locations are distant, separate first aid and emergency response supplies must be provided for each work site. The HSEO must evaluate site logistics and hazard potential for each site location to determine supply needs.

Communication capability and vehicle access must be evaluated at each site location to assure that effective emergency response is available.

Exceptions to the above supply requirements are for field tasks in client facilities, which provide first aid and emergency response resources to Company employees. This is

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normally restricted to operating facilities and where work is performed in the operating portion of the facility. Prior to initiation of fieldwork, it must be explicitly documented that the client is providing this service and the HSEO must confirm that the capabilities are adequate to protect employees.

Also, these supply requirements are limited when field work is restricted to site oversight or preliminary assessment.

5.0 REFERENCES

29 CFR 1910.120

HSEP 5.1, Accident and Incidents

U.S. Army Corps of Engineers, Safety and Health Requirements Manual, EM 385-1-1

6.0 FIGURES

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HSE Procedure		Document No: HSEP 7.4	Page: 1 of 18
Working Safely Around Wild Animals		Supersedes: CHSP 7.4	Rev. Rev. 2
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1.0 PURPOSE AND SCOPE

This work instruction addresses encounters with bears and other wild animals and the controls necessary to minimize human injury, loss of property, and unnecessary loss of wildlife, while maintaining a safe work environment.

This work instruction applies to all employees who prepare Health, Safety, and Environmental Plans or perform fieldwork in environments in which wild animals may be encountered.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 WILD ANIMAL DEFENSE MEASURES

Procedures in this work instruction have been developed through interactions with Alaska Fish and Game Department and through bear and wild animal guide services providers.

These procedures are believed to provide the best actions to provide protection to our workers and limit company liability.

3.1. Basic Protection Requirements

Work teams in the field should work together in groups of four or more, whenever possible. Large numbers of humans present deterrence to wild animals.

When feasible, fieldwork activities should be scheduled around seasonal activity cycles of animals in the area. For example, to the extent possible, work activities should not be scheduled in seasonal breeding areas or in seasonal feeding areas, such as hillsides during berry season or near salmon streams during salmon runs.

When wild animal avoidance measures cannot be achieved through scheduling, all Jacobs and contractor personnel who may be involved with field activities, at which encounters with wild animals may result, will take the following steps and will be equipped and trained, as set forth below.

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3.1.1. Clear the Area

Evaluate and control the area before entry by

- Determining areas of recent sightings through local Fish and Game, state troopers, etc.;
- Conducting a site observation from an off-site elevated point, if possible;
- Conducting a controlled walkthrough in the area by a trained observer;
- Arranging briefing by a local specialist, e. g., Fish and Game, etc.; and
- Utilizing appropriate noisemakers.

3.1.2. Basic Equipment

Each employee in a field environment in which encounters with wild animals are possible—as determined by the Project Manager and the HSEM—will be provided, as a minimum:

- Noisemakers, such as air horns, bells, etc.; and
- Bear spray of not less than 16-ounce capacity (with holster), equivalent to capsicum pepper (red pepper extract), which is capable of spraying at least 15 feet.
  - Field crews may carry bear sprays without the need for client authorization. Law prohibits transport of such sprays in aircraft passenger compartments. Employees shall notify small plane pilots of placement of sprays in baggage. All packaging and shipment shall comply with applicable DoT regulations.
  - In order to avoid complications related to transport of hazardous materials, sprays must be locally purchased, if possible, and disposed properly after fieldwork completion. Sprays shall not be brought to a Jacobs fixed office but may be taken to a Jacobs field office.

At all times, employees shall know the whereabouts of noisemakers and sprays until they are returned.

3.1.3. Training

Each employee covered by this work instruction will be provided bear and wild animal awareness training before field assignment

- which will include hazards, precautions, and protection measures set forth in Attachments 1 – 3, as appropriate,
- with content which will have been approved by the HSEM, and
- which will be documented.

As a minimum, the training must include information related to:

- animal habitat,
- behavior patterns, including when wild animals are most active, etc.
- warning signs, such as tracks, bedding areas, scat, claw marks, offspring, paths, etc.,
- situations to avoid, such as work after dark, going into brush, etc.
- food storage procedures, and
- (at the jobsite) spray demonstration and safety instruction.

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A record of the training will be maintained at the job site and a copy will be filed by the HSEM in the employee's training records maintained in the program office.

3.2. Supplemental Protection

Professional site security services may be necessary in areas where significant possibility of injury from wildlife may exist. An evaluation of need for such supplemental protection will be made jointly by the Project Manager and the Health and Safety Manager.

Prospective bear and wild animal protection contractors shall provide to the HSEM, five days before providing such services, evidence of

- firearm safety course training and firearm proficiency and
- a minimum of three years experience as a bear guide or an assistant guide.

3.3. Firearms Used by Jacobs Employees or Contractor Employees

3.3.1. In some situations of significant potential hazard, the Project Manager and HSEM, after collaboration with the client, may authorize selected Jacobs employees or contractor employees to carry firearms.

3.3.2. Persons carrying firearms shall have attended a firearm safety training class administered by the Fish and Game Department, a local firearm range instructor, or other trainer approved by the HSEM.

- Training will be documented and records of training will be maintained on site.
- Training must include, as a minimum
  - shooting safety,
  - firearms handling safety, and
  - safe storage.

3.3.3. Firearms authorized for site use

- **will not** be carried with a round in the chamber unless extreme danger is present, such as when a bear has been sited in the immediate area, and
- **must** be unloaded and have a trigger lock installed and in use when not actively being used for protection to prevent unauthorized persons from using the firearm.

3.3.4. Some military installations and some clients require the approval of the base security force before allowing a firearm to be brought onto a military installation. In addition to base requirements, some clients require that their own approvals be obtained, as well.

The Project Manager must determine with sufficient lead-time whether firearm protection of employees from wild animals will be required. If such is determined to be necessary, the PjM must submit a request for authorization to the HSEM with sufficient lead-time to permit personnel training and other steps required prior to departure for the field.

3.3.5. All firearms and firearm-carrying personnel shall be registered and approved by the HSEM. Approvals will be maintained in the regional HSE office.

The project manager shall provide to the HSEM a description of the type of firearm, the caliber and serial number of the firearm, the ammunition to be used, and the qualification of the person(s) to be approved by the HSEM.

3.3.6. Approved Firearms

Firearms that are appropriate for protection against large animals include:

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- A 0.3-mangum ("300 magnum") or larger rifle, or
- A 12-guage shotgun with rifled slugs.
- Other firearms that may be authorized by the Jacobs HSE Manager. This authorization will be in writing and will be obtained before going to the field.

3.3.7. Ammunition

- The number of rounds and type of ammunition brought to job sites shall be registered with the on-site SSHO.
- When not in use, ammunition and firearms will be effectively secured/locked up in a vehicle, cabinet, etc.

4.0 PROCEDURE

Non-lethal methods of deterrence will be used before other options are exercised. In the case where immediate danger to an individual exists, the wild animal may have to be killed. Refer to local provisions of the Defense of Life or Property Regulation in your state. In Alaska, refer to 5 AAC 92.410.

An immediate report of such action will be made to the Jacobs HSEM. The individual who shot the animal will make the report. In the case of bears shot in the state of Alaska, a report will also be submitted to the Alaska Department of Fish and Game. The head and the hide must be salvaged and delivered the Alaska Department of Fish and Game.

5.0 REFERENCES

Alaska Administrative Code 5 AAC 92.230 and 5 AAC 92.410.

Alaska Department of Fish and Game, Division of Wildlife Conservation, Policy for Managing Bear and Human Conflicts in Alaska.

Safety in Bear Country, Alaska Department of Game and Fish, Division of Wildlife Conservation, Anchorage Alaska, Larry Van Daele.

Research by Dominic Domenici, U.S. Fish and Wildlife Services (Red vs. Lead Article, Field & Stream Magazine, January 2001) Vehicle safety.

Use extreme caution, particularly in darkness, when operating vehicles in areas where wild animals may be present. Collisions with large animals have been known to cause significant property damage and personal injuries to vehicle passengers, including fatalities.

6.0 FIGURES

Hazard and Precautions – Bear Safety
Hazards and Precautions – Moose, Elk, and Deer Safety
Hazards and Precautions – American Bison and Feral Wild Cattle Safety

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Figure 1

Hazards and Precautions – Bear Safety

From time to time, field projects may be conducted in locations where bears may be encountered. This directive draws on experiences and conditions for field work in the state of Alaska for the bulk of its technical information, precautions, and guidelines for all operations in which bears could be encountered. When bears may be present, we all have a responsibility to the bears and ourselves to behave in a rational and proper manner. The more bears are understood the less they will be feared. Bears are intelligent, wild animals that are potentially dangerous, and would rather be left alone. With this background, rational decisions about how to avoid bear encounters and how to properly address face-to-face encounters can be made.

Bear Life History

Although bears are creatures of habit, they are also intelligent, and each has its own personality. The way a bear reacts is often dictated by what it has learned from its mother, the experience it has had on its own, and the instincts nature has provided. So, like other intelligent animals, such as dogs, we can make general statements about bears, but few people can accurately predict their behavior.

The most important sense organ for a bear is his nose. They have an incredible sense of smell, and they seem to trust it more than any other sense. Hearing and sight are also important, but to a lesser degree. A bear's hearing is probably better than ours, but not as keen as a dog's hearing. Their sight is probably comparable to that of a human.

Both black and brown bears have similar life styles, although they do not usually get along with each other. Where both species occur in the same area, black bears tend to favor forested habitats while brown bears favor open areas. Since the likelihood of encountering a polar bear is remote, we will deal with only black and brown bears throughout the rest of this HSEP.

Bears are opportunists, relying on their intelligence and their senses to find food. They use different habitats throughout the year, depending on the availability of food and other necessities of life. The amount of area a bear covers in a given year is partially dependent on how far it has to go to satisfy these basic needs. In some areas, individual bears have home ranges of less than a square mile. In other areas, home ranges can encompass hundreds of square miles. Males usually range over larger areas than females.

In the spring, black and brown bears begin coming out of their dens. Males are usually the first bears to emerge, usually in April, and females with new cubs are usually the last, sometimes as late as late June. When bears emerge from their dens, they are lethargic for the first few days, frequently sleeping near their dens and not eating. When they do start eating, they seek carrion (dead moose, caribou, sea mammals, deer, etc.), roots, and emerging vegetation. In coastal areas, beaches become travel corridors as bears seek these foods.

In early summer, bears continue to eat new grasses and forage as they develop in higher elevations. Moose and caribou calves are also important foods where they are available.

In areas where they are available, salmon are the most important food to bears from June through September. This period is one of the few times that bears are found in large groups, and it is the time that most people see bears. Bears often travel, eat, and sleep along streams for weeks at a time.

Other summer foods for bears include salmonberries, grasses, forbs, ground squirrels, and occasionally, adult moose and caribou. When bears kill or scavenge large prey, they commonly cover the portions they cannot eat with sticks and duff. A bear may remain near a food cache for days and it will defend it from all intruders.

During the late summer and early fall, bears move inland and consume large amounts of blueberries, elderberries, soapberries, and other types of succulent fruits. As the seasons progress towards winter, a bear's diet becomes more varied. The last berries and salmon are sought, as are live and hunter-killed moose, deer, and caribou. This is the time that bears are adding final deposits of fat before their long winter naps.

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In October and November, bears move into their denning areas and begin preparing a suitable den. Black bears usually den in holes under large trees or rock outcrops, or in small natural cavities. Brown bears usually dig their dens in steep alpine areas. Dens are just large enough for the bears to squeeze into. Bears rarely eat, drink, urinate, or defecate while they are denning. They sleep deeply, but do not truly hibernate, and they can be awakened by loud noises or disturbances.

Cubs are born in the den, usually in January. Black bear cubs usually stay with their mothers for a year and a half, and brown bear cubs usually stay with their mothers for 2.5 to 3.5 years. Black bears are sexually mature at age 2 and brown bears are sexually mature at age 4 – 8. Mating season is in the spring (May or June) and both species are polygamous (multiple mates). Both black and brown bears can live for 25 – 30 years, although most live less than 20 years.

Bear and Human Interactions

Given the choice, most bears would prefer to be left alone, but they share their homes with other creatures, including humans, who intrude on virtually every aspect of the bear's life. Bears are normally tolerant of these activities, and if they can find a secure way to avoid them, they will.

Humans can help the bears make a graceful retreat and avoid many close encounters by letting them know we are coming. Walking in groups, talking, and wearing noise making devices, such as bear bells, all serve to warn a bear of your approach. Whenever possible, avoid hiking and camping in areas where bears are common, such as bear trails through heavy brush or along salmon streams. Keep an eye out for bears and bear signs. If you happen upon a dead animal, especially one that is covered with sticks and duff (a bear cache), immediately retreat the way you came, but do not run, and make a detour around the area. If you see a cub up a tree or a small bear walking by itself, immediately retreat and detour around the area. Like all young animals, cubs wander away from their mothers, but female bears are furiously protective when they believe their cubs are threatened.

Even if we do everything possible to avoid meeting a bear, sometimes bears come to us. Bears are both intelligent and opportunistic, and they express these qualities through their curiosity. This curiosity frequently brings them into "human habitat." When this happens, we often feel vulnerable, and the bear is sometimes viewed as a threat or nuisance.

In most cases, a curious bear will investigate a "human sign," perhaps test it out (chew on a raft, bite into some cans, etc.), and leave, never to return. If the bear was rewarded during his investigation by finding something to eat, it is hard to stop them from returning once they have been food-rewarded.

That is why we emphasize the importance of keeping human food and garbage away from bears. When in bear country, always think about the way you store, cook, and dispose of your food. **Never feed bears!** This is both illegal and foolish. Food should be stored in airtight containers, preferably away from living and sleeping areas. Garbage should be thoroughly incinerated as soon as possible. Fish and game should be cleaned well away from camp, and clothing that smells of fish and game should be stored away from sleeping areas. Menstruating women should take extra precautions to keep themselves as clean as possible, and soiled tampons and pads should be treated as another form of organic garbage.

Once a bear has obtained food from people, it may continue to frequent areas occupied by people. If a bear does not find food or garbage after the next few tries, it may give up and move back into a more natural feeding pattern. Occasionally, though, the bear will continue to seek human foods and can become a "problem bear." Some bears become bold enough to raid campsites and break into cabins to search for human food.

Shooting bears in the rump with cracker shells, flares, rubber bullets, and birdshot are common methods of "aversive conditioning." These are also very dangerous techniques, because they may seriously injure a bear if not done properly and/or they may cause a bear to attack the shooter.

Avoiding Bear Encounters When

- *The Bears see you but you do not know the bear is around.* Most bears avoid detection by people and will simply move away when they sense a human.
- *You see a bear and it does not know you are there.* Move away slowly. Avoid intercepting the bear if it is walking. If possible, detour around the bear. If the bear is close to you, stand where

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you are or back away slowly. Do not act threateningly toward the bear, it may know you are there but it has chosen to ignore you as long as you are not a threat.

- *You see the bear and the bear sees you.* Do not act threateningly, but let the bear know you are human. Wave your arms slowly, talk in a calm voice, and walk away slowly in a lateral direction, keeping an eye on the bear. Unless you are very close to a car or a building, never run from bears. In a bear's world, when something runs it is an open invitation to chase it. Like dogs, bears will chase a running object even if they have no previous intention of catching it. Bears can run as fast as a racehorse, so humans have little or no chance of outrunning a bear.
- *You see the bear, the bear sees you and stands on its hind legs.* This means that the bear is seeking more information. Bears stand on their hind legs to get a better look, or smell, at something they are uncertain of. It is your cue to help it figure out what you are. Help the bear by waving your arms slowly and talking to it. Standing is not a precursor to an attack. Bears do not attack on their hind legs. It is also important to remember that when a bear goes back down on all fours from a standing position, it may come towards you a few steps. This is normal, and probably not an aggressive act.
- *The bear sees you, recognizes you as a human, but continues to come towards you slowly.* This may mean several things, depending on the bear and the situation. It may mean that the bear does not see you as a threat, and just wants to get by you (especially if the bear is used to humans, as in a National Park); the bear wants to get food from you (if it has gotten food from people before); the bear wants to test your dominance (it views you as another bear); or if it is a black bear it may be stalking you as food (a rare occurrence). In all cases, your reaction should be to back off the trail very slowly, stand abreast if you are in a group, talk loudly, and/or use some sort of noise making device. If the bear continues to advance, you should stop. At this point, it is important to give the bear the message that if he continues to advance it will cost him. Continue to make loud noises and present a large visual image to the bear (standing abreast, open your coat). In bear language, bears assert themselves by showing their size. If an adult brown bear continues to come at you, climbing 20 feet or higher up a tree may also be an option if one is next to you (remember, never run from bears). Keep in mind, though, brown bear cubs and black bears can climb trees, and adult brown bears can reach 10 – 15 feet.
- *The bear recognizes you as a human and acts nervous or aggressive.* When bears are nervous or stressed they can be extremely dangerous. This is when it is important to try to understand what is going on in the bears mind. Nervous dogs bark and snarl. Nervous bears growl, woof, make popping sounds with their teeth, rock back and forth on their front legs, and often stand sideways to their opponent. A universal sign of a nervous bear is excessive salivation (sometimes it looks like they have white lips). When a bear shows any of these signs, stand where you are and talk in a calm voice. Do not try to imitate bear sounds, this may only serve to confuse and further agitate the bear. If you are in a group, stand abreast. If you have a firearm available, be prepared to use it.
- *The bear charges.* If all other signals fail, a bear will charge. Surprisingly, however, most bear charges are just another form of their language and they do not end up making contact. The vast majority of these are "bluff charges," that is, the bear stops before making contact with their opponent. There are many different types of bluff charges ranging from a loping uncertain gait to a full-blown charge. If a bear charges, stand still. If you have a firearm, take appropriate action, but remember, if a bear is wounded, a bluff charge may immediately turn into a real charge as the bear's mind shifts from an offensive mode to a defensive mode.
- *The bear attacks.* When all else fails, a bear may attack. Attacks may be preceded by all of the behaviors previously described or they may be sudden. Seemingly unprovoked attacks are often the result of a bear being surprised (and feeling threatened), a bear defending its food cache, or a female defending her cubs. When a bear attacks, it typically runs with its body low to the ground, legs are stiff, ears are flattened, hair on the nape of the neck is up, and the bear moves in a fast, determined way. Front paws are often used to knock the opponent down and jaws are used to subdue it.

After A Bear Encounter

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If a bear attacks you, your reaction depends on the type of bear that is attacking.

If it is a black bear, fight vigorously, for your life may depend on it. Black bears have been known to view humans as prey, and if you struggle with the attacking black bear, it will probably go elsewhere for its meal.

Brown bears are a completely different story. Brown bears attack because they feel threatened, and they will continue to press the attack until the threat has been neutralized. If you fight and struggle, the bear will continue to fight, and a human has little or no chance to defeat a brown bear in battle. Lie on your face and stomach, place your hands behind your neck, and lie still when you are attacked. A brown bear will no longer see you as a threat and may stop the attack.

Although it sounds foolish to play dead while being attacked by a bear, this has been proven to be the best way to survive a brown bear attack. It should be noted, however, that if you fall down and play dead before a bear actually makes contact, the bear may come over to determine what is going on.

Actual maulings by bears are very rare. Alaska has more bears than anywhere else in the world, and there are hundreds of thousands of people living, working, and playing in these bears' back yard. Yet, since 1900, there have only been an average of about two people per year mauled by bears in the state, and very few of those instances have resulted in death.

Types of Bears

The three most prevalent species of are bears are the black bear, the brown (grizzly) bear, and the polar bear. Each has a different life-style and somewhat different behavior pattern.

Black Bear

Identification

Black bears are the smallest and most abundant of the bear species in Alaska. They are five to six feet long and stand about two to three feet high at the shoulders. They weigh from 200 to 500 pounds. While they are most commonly black, other color phases include brown (cinnamon), and, rarely, gray (blue), and white. Muzzles are usually brown. Black bears can be distinguished from brown bears by:

- their head shape (a black bear's nose is straight in profile, a brown bear's is dished);
- their claws (black bear's claws are curved and smaller, brown bears are relatively straight and longer);
- their body shape (when standing, a black bear's rump seems to be higher than its shoulders; a brown bear's shoulders are usually higher than its rump); and
- by their ears (a black bear's ears are more prominent than a brown bear's ears).

Range in Alaska

Black bears live throughout Alaska, except on Kodiak Islands, the Alaska Peninsula, some islands, and the extreme northern and western portion of the state.

Typical Habitat

Black bears can occupy a wide range of habitats, but they seem to be most common in forested areas. Black bears are not uncommon in and around human settlements in Alaska.

Brown Bear

Identification

Brown and grizzly bears are the same species. They can be over eight feet long and stand five feet high at the shoulder. Weights are typically 600 to 800 pounds, but can reach 1500 pounds. Colors range from blonde to dark brown. Coastal bears (referred to as brown bears) are the largest land carnivores and are usually medium-to-dark brown in color. Interior bears (referred to as grizzly bears) are smaller and usually have light tips on their hair, giving them a grizzled appearance. A brown bear's muzzle is the same color as its body. Cubs frequently have a white collar around their neck

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and shoulders. The dished-face and large shoulder hump are distinguishing features of the brown bear.

Range in Alaska

Brown bears live throughout Alaska, except for the southern portion of the panhandle in southeastern Alaska, and on the Aleutians, and some other islands. Biologists estimate that there are from 30,000 and 45,000 brown bears in the state, and in most areas the numbers are stable. Highest densities occur on Admiralty Island, the Kodiak Islands, and the Alaska Peninsula.

Typical Habitat

Brown bears can, and do, use virtually every type of habitat. Although they are less common around human settlements than black bears, brown bears can live in close proximity to people.

Polar Bear

Identification

Polar bears are about the same size as coastal brown bears. Colors range from white to yellow. Black nose is prominent. Head shape is similar to that of a black bear, but their long tapering necks make polar bears' heads appear to be small in relation to their body size.

Range in Alaska

Polar bears are found in coastal Alaska and offshore waters from Bristol Bay to the Arctic. Ice conditions dictate local polar bear abundance.

Typical Habitat

Islands, coastlines, and waters near pack-ice and ice-floes, rarely occurring far inland, except for denning females, are typical habitat.

Firearms for Bear Protection

As a last resort, a bear may have to be shot. When this is the only option, it will likely be in a situation that has a sudden onset. Therefore, it is important that you are familiar and comfortable with whatever firearm you decide to carry. Remember that if you wound a bear, you make the situation worse.

There is an on-going debate as to what is the best firearm to use for protection from bears. The following are a few of the pros and cons for some of the more popular firearms:

Pistols

PROS - convenient to carry, always with the person, can be used in close quarters during an attack, rapid-fire is possible.

CONS - dangerous to humans (accidents), much practice is needed to be proficient; may not be powerful enough to stop a large bear.

Shotguns

PROS - can be loaded with a variety of projectiles, effective at close range in brushy situations, rapid-fire is possible, easy to use.

CONS - inaccurate and ineffective at medium to long range, heavy to carry, potentially dangerous to humans, may not be powerful enough to stop a large bear.

Rifles

PROS - very powerful calibers are available, accurate at both close and long range.

CONS - much practice required for accuracy in an emergency, range of bullet makes it dangerous to humans, heavy and awkward to carry, rapid fire is difficult with bolt action rifles.

There are different thoughts as to the best place to shoot a charging bear. In reality, a person usually has little time to contemplate shot placement in a true bear attack. If you have a choice, it is best to aim at the shoulder and chest area. Bear's skulls are thick and covered with large muscles, so head

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shots may not be effective. Once you have made the decision to shoot a bear, you have a responsibility to finish the job you have started. Keep firing until you are out of bullets or you are positive the bear is dead. A wounded bear can be dangerous to you and anyone else who comes into the area.

Bear Sprays

PROS - easy to carry and use, little risk of permanent damage to bears and humans, effective in many situations.

CONS - may change a false charge into a real charge, ineffective at ranges greater than 20 feet, ineffective in windy conditions, dangerous if accidentally discharged in a closed area such as an aircraft cockpit.

Regardless of the firearm you choose, it is imperative that you realize that the most effective tool you have against an attacking bear is your brain. Although bears are intelligent animals, we are smarter and can often think our way out of a bad situation if we try. We must never let the firearm we carry become a replacement for common sense.

Laws Concerning Bear/Human Interactions In Alaska

There are two regulations governing bear and human interactions in Alaska.

The first, ACC 92.230, prohibits feeding bears or leaving garbage that attracts them. The other, 5 ACC 92.410, sets guidelines for taking a bear in defense of your life or property (DLP).

These DLP provisions specifically state that a bear cannot be killed legally if the problem is caused by the improper disposal of garbage or some other attractive nuisance, or if it is brought about by harassment or provocation of the animal or an unreasonable invasion of its habitat.

The regulation also defines what is considered “property.” If a bear is killed under the DLP provisions, the hide and skull are the property of the state and must be turned over to Fish and Game as soon as possible.

The person who shot the bear is also required to submit a written incident report with 15 days. (Obtain a paper copy of this attachment through Corporate Health, Safety, and Environment.)

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Figure 2

Hazards and Precautions – Moose, Elk, and Deer

From time to time, field projects may be conducted in locations where dangerous wildlife may be encountered. This attachment addresses Moose, Elk, and Deer and draws on experiences and conditions for fieldwork in the state of Alaska for the bulk of its technical information, precautions, and guidelines for all operations in which the big game species could be encountered.

We all have a responsibility to the wild life and ourselves to behave in a rational and proper manner at all times. The more these species are understood, the easier it will be for us to avoid contact with them thus preventing injury to ourselves and to the animals themselves. All of Alaska big game species are unpredictable and can be dangerous under certain conditions. It is up to all of us to understand this and learn as much as possible so we can work safely while in their domain.

Moose

Moose (Alces alces) are the world's largest members of the deer family. The Alaska race is the largest of all the moose. Moose are generally associated with northern forest in North America, Europe, and Russia. In Alaska, they occur in suitable habitat from the Stikine River in the Panhandle to the Colville River on the Arctic Slope, and as far south on the Alaska Peninsula as Herendeen bay. They are most abundant in recently burned areas that contain willow and birch shrubs, on timberline plateaus, and along the major rivers of South-central and interior Alaska.

General Description

Moose are long-legged and heavy-bodied with a drooping nose, with a "bell" or dewlap under the chin, and a small tail. Their color ranges from golden brown to almost black, depending on the season and the age of the animal. The hair of newborn calves is generally red-brown, fading to a lighter rust color within a few weeks. Newborn calves weigh 28 to 35 pounds and within five months grow to over 300 pounds. Males in prime condition weigh from 1,200 to 1,600 pounds. Adult females weigh 800 to 1,300 pounds. Only the bull has antlers.

Life History

Cow moose generally breed at 28 months, though some may breed as young as 16 months. Calves are born anytime from mid-May to early June. Cows give birth to twins 15 to 75 percent of the time, and triplets may occur once in every 1,000 births. The incidence of twinning is directly related to range conditions. A cow moose defends her newborn calf vigorously. Calves begin taking solid food a few days after birth. They are weaned in the fall at the time the mother is breeding again. The maternal bond is generally maintained until calves are 12 months old at which time the mother aggressively chases her offspring from the immediate area just before she gives birth. By late October, adult males have exhausted their summer accumulation of fat and their desire for female company. Once again, they begin feeding. Antlers are shed as early as November, but mostly in December and January.

Food Habits

During fall and winter, moose consume large quantities of willow, birch, and aspen twigs. In some areas, moose actually establish a "hedge" or browse line six to eight feet above the ground by clipping most of the terminal shoots of favored food species. Spring is the time of grazing as well as browsing. Horsetail, pond weeds, and grasses. During summer, moose feed on vegetation in shallow ponds, forbs, and leaves of birch, willow, and aspen.

Movement

Most moose make seasonal movements to calving, rutting, and wintering areas. They travel from only a few miles to as many as 60 miles during these transitions.

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Working Safely Around Moose

Every year someone is injured by a moose and in some cases fatalities are caused by attacks from moose. Most cases of moose attack are from cows defending their calves and they are well equipped to do so. Cow moose attack with their front feet and sharp hooves; they can kill wolves and in some cases drive grizzly bears away from their offspring. Bull moose attack with their massive antlers and can do great damage in a short amount of time.

One should always be alert when working in moose country. If you encounter a moose, never approach too closely. Moose will generally declare their displeasure of your presence by lowering their ears and raising their hackles (the long hair on their neck and back). Immediately retreat if you see a moose displaying this behavior. If you are about to be attacked by a moose and there are trees present, stay behind the tree. A human can move around a tree faster than a moose can.

Use common sense. Avoid contact with any wild animal. Most have the ability injure a human. Never play dead if attacked by a moose. Put something substantial between you and the moose.

Roosevelt Elk

Roosevelt Elk are larger, slightly darker in color, and have shorter, less symmetrical yet more massive antlers than the Rocky Mountain Elk found east of the Cascade Mountains in Canada and the United States.

General Description

Elk are members of the deer family and share many physical traits with deer, moose, and caribou. They are much larger than deer, but not as large as moose, which occur in Alaska. Distinguishing features include a large yellowish rump patch, a grayish to brownish body, and dark brown legs and neck. Unlike some members of the deer family, both sexes have upper canine teeth. The males have antlers, which in prime bull are very large, sweeping gracefully back over the shoulders with spikes pointing forward. Alaska elk antlers have a tendency toward crowning, the formation of the three points at the end of each antler. Elk shed their antlers during the winter each year and grow new ones the following summer. The soft growing antler is covered with velvet, which is scraped off by rubbing and jousting after the antlers harden in the fall.

Bull elk on Afognak Island are estimated to weigh up to 1,300 pounds. Cow elk are similar in appearance to the bulls, but are smaller and have no antlers.

Life History

Elk calves are born in late May or early June when abundant food is available for the mother and the mild weather increases the calves' chances for survival. Birth usually occurs under the cover of dense spruce forest, hidden from predators and protected from the elements. Calves are born with protective coloration (light spotted areas on the back, which act as camouflage). A few days after giving birth, the mother joins other cow elk with calves. A single cow will often "baby-sit" with the calves while the remaining cows seek food. As summer progresses, elk bands move above timberline and feed on the alpine slopes where breezes keep biting insects at bay and young plants are highly nutritious. By July, the calves, although still nursing, begin feeding on succulent forbs.

Beginning in August, bands of elk congregate and form herds consisting of cows, calves, yearlings, and an occasional mature bull. Nearby, but separate from the heard mature bulls can be found. During September, the bulls join the main herds and mating activities (the rut) begin. Large herds are scenes of vigorous activity as mature bull challenge each other vocally, emitting a high-pitched whistle or bugle, an eerie but thrilling sound. Occasionally, pushing and shoving matches are initiated as the mature bull attempt to take advantage of the larger bull's preoccupation and run past them to win the favors of a female. By mid-October most breeding activities have ceased. Herds may begin to disperse into smaller bands as they move into wintering areas. Winter months are spent in lower valleys and in the dense spruce forest and small openings near the coastline searching for food.

Food

Elk are hardy animals whose large body size and herding tendencies require tremendous amounts of food. From late spring to early fall, with a wide variety of food available, elk are mainly grazers, using

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grasses, forbs, and other leafy vegetation. By late fall they become browsers, feeding on sprouts and branches of shrubs and trees.

Population

From the original eight transplanted animals, Afognak elk have expanded to about 1,200.

Working Safely Around Elk

Although elk are not as widely distributed as moose in Alaska, they are large and potentially dangerous when the bulls are in the rut and when you may be near cows with young calves. Follow the same precautions as set forth above for moose. Elk bulls have a tendency to be more aggressive during the rut (September & October) than either moose or deer, and caution should be used when working near bulls during this time of year. Aggressive cows with calves should be avoided as well, since they attack in the same manner as cow moose.

Sitka Black-Tailed Deer, Mule Deer, and White-Tailed Deer

The Sitka black-tailed deer is native to the wet coastal rain forest of Southeast Alaska and north coastal British Columbia. Transplants have expanded its range and established population now also exist near Yakutat, in Prince William Sound, as well as Kodiak, and Afognak, and Raspberry Islands.

General Description

The Sitka black tailed deer is smaller, stockier, and has a shorter face than other members of the black-tailed group. Fawns are born in early June and weigh six to eight pounds at birth. The average October live weight of adults is about 80 pounds for does and 120 pounds for bucks, although dressed weight bucks of over 200 pounds have been reported. The summer coat of reddish brown is replaced by dark brownish gray in winter. Antlers are dark brown with typical black tailed branching. Normal adult antler development is three points on each side. Average life span is about 10 years, but a few are known to have attained an age of at least 15.

Life History

Fawns are born in late spring. After the winter snow pack recedes, deer disperse; migratory deer move to high elevation alpine/sub-alpine habitats while resident deer remain at lower elevations throughout the forest. Summer and early fall are periods of active foraging as deer accumulate fat reserves, which will help them through the winter and early spring. With the first heavy frost, deer in the higher alpine and sub-alpine areas descend to the upper forest.

The breeding season (or rut) peaks during late November. Breeding bucks spend little time foraging and by late November have used up much of their fat reserve. Does, however, generally enter December in prime condition. Does breed during their second year of life and continue producing fawns annually until they are 10 or 12 years of age. Reproductive success decreases rapidly beyond 10 to 12 years and by age 15, which is probably the maximum life expectancy, reproduction has essentially ceased. Prime age does (5 to 10 years) typically produce two fawns annually.

Throughout the rest of the winter and early spring, deer are generally restricted to uneven-aged old growth forest below 1,500 feet in elevation. The old growth forest provides optimal winter habitat because the high broken canopy intercept much snow but still provides enough light for the growth of forage plants used by deer. During winter, the distribution of deer at various elevations is influenced by changing snow depth. During extreme snow accumulations, many deer congregate in heavily timbered stands at lower elevations, and some may even move into the beach. Spring is a critical period for deer, and if winters are deep and persistent, many deer die of starvation. As snow melts in mid to late spring, deer begin to disperse, and by late spring and early summer they start rebuilding some of the fat reserves lost during winter.

Home Range

Summer and winter home range areas vary from 30 to 1,200 acres and average about 200 acres for radio-collared deer on Admiralty Island. Migratory deer have larger annual home ranges than resident deer. The average distance between summer and winter home ranges is five miles for migratory deer and half a mile for resident deer. Movement of deer between watersheds appears to be minimal during winter.

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Food Habits

During summer, deer generally feed on herbaceous vegetation and the green leaves of shrubs. During winter, they are restricted to evergreen forbs and woody browse. When snow is not a problem, evergreen forbs such as bunchberry and trailing bramble are preferred. During periods of deep snow, woody browse such as blueberry, yellow cedar and hemlock, and arboreal lichens are used. Woody browse alone, however, is not an adequate diet and deer rapidly deplete their energy reserves when restricted to such forage.

Populations

Deer populations in Alaska are dynamic and fluctuate considerably with the severity of the winters. When winters are mild, deer numbers generally increase. Periodically, however, a severe winter will cause a major decline in the population. Deer have a high reproductive potential, and depressed populations normally recover rapidly. In some cases, however, predation may speed deer decline, as well as slow recovery to higher levels. The wolf, which occurs on the mainland and islands south of Frederick Sound, is considered the major predator of deer in Southeast Alaska. Both black and brown bears also prey on deer to some degree.

Working Safely Around Deer

The White-tailed deer found thought the eastern and western part of the United States have been known to attack people on many occasions. It is unknown whether Black-tailed deer have made any such attacks, but it is possible for someone to be injured by an irate buck in the breeding season (late fall). Deer are well equipped to injure humans. They are very fast. Bucks have sharp antlers and can clear amazingly high obstacles with graceful, arching leaps. They can run with remarkable speed, even in dense cover, and have excellent camouflage. When working in areas populated with deer, whether it be White-tailed, Black-tailed, or Mule deer, it is just common sense not to approach any large wild animal too closely. It is unlikely that an attack from a deer would be fatal but it is possible and serious injury is likely.

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Figure 3

Hazards and Precautions – American Bison and Feral Wild Cattle Safety

American Bison

American Bison (Bison), which shaped the lifestyle of the plains Indians and figured prominently in American history before they were brought to near extinction, were transplanted to Alaska from Montana in 1928. While bison were the most common large land mammal in Alaska thousands of years ago, all of Alaska's wild bison came from 20 animals released near Delta Junction. Natural emigration and transplants have now created additional herds at Copper River, Chitina River, and Farewell. Small domestic herds are located at Healy, Kodiak Island, and on Provo Island. There were approximately 700 wild bison in the state in mid-1985.

General Description

The bison is the largest native land mammal in North America. A full-grown bull stands six feet at the shoulder, is up to 10 feet long, and can weigh more than a ton. Full-grown cows are smaller, but have been known to weigh over 1,200 pounds. A bison's head and forequarters are massive and seem out of proportion to the smaller hind parts. Bison have vertebrae, which begins just ahead of the hips and reaches its maximum height above the front shoulder. From above the shoulder, the hump drops almost straight down to the neck.

The bison's horns curve upward. The horns of the bull are larger and heavier than the horns of the cow. As winter progresses, their coats change color and are much paler by spring. When the weather warms, the hair loosens and hangs in patches until it is completely shed and replaced with new hair by late spring. Hair on the chin resembles a goatee. Older animals tend to have more hair on their heads.

Life History

Most bison young are born in May, but calves are born from April to August or even later. Newly born calves have a reddish coat. They are able to stand when only 30 minutes old; within three hours of birth, they can run and kick their hind legs in the air. At about 6 days of age, calves start grazing. Their reddish-orange coat begins to darken at about 10 weeks, with the molt to dark brown complete about five weeks later.

Cows are sexually mature at two years of age and give birth to single calves twice in three years. The gestation period is approximately 270 days. On rare occasions, a mostly white or even albino calf has been born in the Delta herd, but none has reached maturity.

Bison in Alaska have been known to live to a relatively great age compared to other hoofed animals (ungulates). One tagged bull killed in the Copper River area was over 20 years old.

Bison are migratory animals by nature. Alaska's wild bison do not remain in single herds, but scatter alone or in-groups ranging up to 50 animals or more. In the Delta Junction area, they move far up the Delta River in early spring to secluded meadows where they calve. Around August they travel back downstream, eventually moving on the Delta Junction Bison Range, and finally in late fall, onto farms where they remain throughout the winter. Here they sometimes cause damage to unharvested crops. Alaska's other wild bison herds also have seasonal movement patterns. Bison move slowly while feeding and appear to be quite clumsy. This is pure deception, for when pursued, the bison is fleet of foot and has great endurance. A mature bull eventually captured at Delta Junction jumped a seven-foot log fence from a standing position.

Food Habits

Bison are grazing animals and in Alaska find only limited amounts of food along rivers, in recent burns, and sedge potholes. Their diet is made up mainly of various grasses and forbs like vetch, a favored summer food found on gravel bars. Sedges, silverberry, willow, and ground birch are also eaten.

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Working Safely Around Bison

When working in areas where bison are present, follow the same precautions as stated above for other large potentially dangerous wild animal. Generally, where bison are present there also will be moose and Brown (Grizzly) bears sharing the same area. Partially due to the relatively sparse population, bison injure fewer people than Brown Bears or moose.

Never approach bison and use caution when working near bison as they are unpredictable and can cover a lot of ground in a short amount of time. Bison can be found in timbered areas. If approached by a bison and you cannot make it to a vehicle, keep a large tree between you and the bison. You can move around the tree faster than the bison.

If a single bison or heard of bison approach you or your crew, retreat to your vehicle and leave the area. Do not attempt to “drive” the bison from your area while in your vehicle. Bison have no respect for cars and could charge and damage your vehicle and the occupants. The best way to avoid contact is to use your head and give the bison the right of way.

Feral or Wild Cattle

Feral or wild cattle are only found in a few remote locations in Alaska. A population exists on Sitkinak Island on the south end of Kodiak Island, Long Island, Harvester Island, and Chirikof Island. The same caution should be used when working in areas with a population of wild cattle that would be used when working around any of Alaska’s dangerous wildlife. Never approach too closely and if they begin to approach you, clear the area as fast as possible. If you arrive at your work site and there are wild cattle close by, stay in you vehicle and remain there until they leave the area.

If it is necessary to destroy a wild cow, you must notify the Department of Fish & Game. The same Defense of Life and Property (DLP) law that applies to big game species does not apply to wild domestic cattle, but you will be required to salvage the meat and make the report. Cattle reside on leased ground, and the owner of the leases must also be notified. It may also be necessary to compensate the landowner.

Wild Feral Cattle can be dangerous, and there are reports of injuries to people. Although they may look domestic cattle, they are wild and have no fear or respect for humans. Give them the right a way, use common sense, and maintain a safe distance when working where wild Feral Cattle inhabit the area.

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HSE Procedure		Document No: HSEP 8.3	Page: 1 of 12
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1.0 PURPOSE AND SCOPE

This HSEP provides the minimum procedures to be followed for the use of excavating equipment and for the qualification of excavation equipment operators. Additional guidelines for other types of "Heavy Equipment" operator qualifications can be found in Section 17.0 of the HSE Procedures Manual.

This HSEP applies to all employees and subcontractors covered by the Company Health, Safety, and Environment Program.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

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2.1. Site Manager

The Site Manager shall:

- Designate a Competent Person(s) using the procedure and form provided in HSEP 2.5 or personally conduct all excavation equipment operator qualification and inspection. For some non-US locations, the competent person may have to be an external supplier with the proper certificates based on relevant national legislation.
- Ensure that only approved equipment is used.
- Assign qualified persons to operate the excavating equipment.
- Maintain a list of qualified operators.
- Ensure that the proper equipment for the task is provided for the employees performing the work.

2.2. Managers and Supervisors

Managers and supervisors shall ensure that only qualified and authorized employees are assigned to work requiring the use of equipment covered by this HSEP.

Supervisors must monitor the work to ensure that equipment is operated in compliance with this HSEP, with manufacturers' recommendations, and with national, state, local, and client requirements.

2.3. Equipment Operators

Equipment operators are responsible for safe operation of the equipment, which they have been pre-qualified to operate, and must do so in accordance with training they have received, with all applicable Company HSEPs, and with manufacturers' instructions pertinent to the equipment that they will be operating.

Prior to using excavating equipment, the operator must review the operator's manual to assure a comprehensive understanding of the machine's controls and the procedures necessary for its safe operation.

Equipment operators must have the physical ability and knowledge to safely operate the equipment. Operators of equipment that can be used on public highways shall have a valid motor vehicle operator's license.

2.4. Site HSE Supervisor

The Site HSE Supervisor will maintain equipment operator qualification records and send a copy to the Human Resources Department.

3.0 DEFINITIONS

Back Hoe	A tractor mounted attachment for digging trenches and excavations.
Bulldozer	A track mounted machine with a front mounted blade designed for moving materials by pushing it from one place to another.
Bus	A multi-passenger vehicle designed to transport personnel.
Competent Person	One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them. For some non-US locations the competent person may have to be an external supplier with the proper certificates based on relevant national legislation.
Dump Trucks	A vehicle with a tilting body to facilitate unloading itself.
FOPS	Falling Object Protective Structures

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Front-end Loader	A machine with a bucket attachment designed for loading loose materials for transport.
ROPS	Roll Over Protective Structures mounted on equipment to protect the operator.
Scraper	Vehicles designed for removing soil by simultaneously scraping, loading, and transporting excavated materials.
Track Hoe	A track-mounted backhoe.
Tractor/Trailer Dump Bed	A trailer type vehicle, which has a tilting body to facilitate unloading itself and which is moved by an independent tractor or truck.

4.0 PROCEDURE

4.1. General Requirements for Excavating Equipment Use

Do not use equipment that is not in proper operating condition. Attach a "Danger — Do Not Use" tag to inoperable equipment, remove key from equipment, and give key to the supervisor when notifying him/her of the inoperable equipment.[1]

An Excavating Equipment Inspection Report (Figure 3) shall be completed by a designated Competent Person before each use.

Initial and monthly documented inspections of the equipment are required. It is recommended that

- the rental company be required to conduct the initial inspection, along with a Jacobs competent person, upon initial delivery to the site and
- conduct the monthly inspection of their equipment.[2]

Mobile equipment must be equipped with a fire extinguisher with a minimum rating of 2A -10BC.

When mounting or dismounting equipment, clean shoes and hands before climbing. Always use handrails, grab rails, and steps. Maintain a three-point contact with steps and handholds. Never jump on or off equipment. Never attempt to mount or dismount a moving machine. Do not use steering wheel or control levers as a handhold.

Passengers shall not be allowed on equipment unless seated in a manufacturer's installed seat and with the seat belt fastened.

Never use buckets, forks, or attachments as a work platform or personnel carrier.

The equipment must be equipped with all manufacturer-required safety devices, including:

- a functioning service brake and parking brake maintained in good working order and with
- a functioning audible back-up alarm that is distinguishable from surrounding noise.

All rubber-tired, self-propelled scrapers, rubber-tired front-end loaders, rubber-tired dozers, wheel-type agricultural and industrial tractors, crawler tractors, crawler-type loaders, and motor graders, with or without attachments, that are used in construction work shall be equipped with rollover protective structures (ROPS) and seat belts. This requirement does not apply to sideboom pipe laying tractors.

When a flag person is used, the equipment will not be moved unless the designated flag-person giving signals is in full view of the operator.[3]

[1] New requirement.
[2] This a recommendation to include vendor inspection for rental equipment.
[3] Expanded requirements for flag-person.

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For movement of mobile equipment in congested areas, a designated flag-person shall be in full view of the operator and shall direct the movement. In some cases, multiple flag-persons may be required.[4]

No one shall be allowed within the boom, bucket, or counterweight swing radius, when it is in operation. Barricades will be erected to keep workers from entering, as appropriate.[5]

In work environments where the enclosed mobile equipment and the use of personal protective equipment in hot weather could lead to heat stress issues, the equipment should be outfitted with cooling units, and personnel should be monitored for heat stress.[6]

The manufacturer must provide written approval for modifications, for use of attachments, or for equipment use for other than its intended purpose. Equipment capacities must be adjusted to accommodate the modifications or attachments.

4.2. General Requirements for Operators

It is the responsibility of the operator to read and understand the operators manual and the manufacturers' recommendations for each type and model of equipment to be operated and the requirements of this HSEP.

Complete an SPA (HSEP 2.16) before operating or moving excavating equipment[7]

The equipment must be inspected by the operator prior to each use. Do not use equipment that is not in proper operating condition or is not within the last monthly inspection period. Attach a "Danger — Do Not Use" tag to inoperable equipment and notify the supervisor. Remove key from the equipment.[8]

When so equipped, check the "operator presence/seat interlock" prior to starting equipment. Do not operate the equipment if the system is not functioning properly.

Operators must know the capacity and operating characteristics of the equipment to be operated.

The equipment must be attended at all times or attachments must be placed in the "transport lock position" or lowered to the ground.

The operator must check the work area for slopes, obstructions, potholes, etc. prior to beginning work. Check for overhead obstructions such as power lines, pipe racks, etc. and ensure proper clearances. See HSEP 7.3.3 and HSEP 17.1 for utility line clearance requirements.

Loads must be carried as low as possible to maintain stability of the equipment and operator visibility.

Operations are to be performed only from the operators control station.

When equipped with "roll over protective structures, the operator must wear seat belt at all times and keep their body (hands, arms, legs, head, etc.) inside the protected area.[9]

Never lift loads over people, occupied buildings, or operating equipment.

Use caution when handling objects such as round bales, poles, stumps, cylinders, sheets of plywood, etc. Lifting too high or rolling the bucket too far back could result in objects sliding down the loader arms and falling onto the operator's control station.

Obey posted speed limits. When operating on the jobsite, take it slow and easy. Give right of way to loaded machines and maintain a safe distance from other machines.

---

[4] Expanded requirements for flag-person.
[5] New requirement.
[6] New recommendation.
[7] An SPA for before equipment movement is essential.
[8] New requirement.
[9] New requirement.

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Avoid steep slopes or unstable surfaces. When operating on a slope, keep the load low and use extreme caution. Avoid sudden starts, stops, and turns when operating on inclines.

When moving mobile equipment, plan the move by evaluating road or ground conditions, overhead obstacles, traffic and congestion, and work adjacent to the travel path.[10]

Do not drive across slopes, rather, drive up and down the slope. Avoid making turns on inclines. If it is necessary, make turns wide and slowly with load carried low. When traveling up or down inclines, do so with loaded buckets facing uphill and empty buckets facing downhill.

When parking, select a place out of traffic areas. Select a level area whenever possible. When it is necessary to park on an incline, position the machine at right angles to the incline. Secure or lower buckets, blades, and attachments and set the parking brake. Shut down the machine and chock wheels. Cycle the controls to ensure all attachments are secure.

4.3. Transporting or Driving Excavating Equipment on Public Highways

When traveling on public roads, lock dual brake pedals together. Make sure all clearance flags, lights, and warning signs are in place and visible. Make sure the “Slow Moving Vehicle” emblem is visible to traffic approaching from the rear. Use escort vehicles, as required.

When loading or unloading the machine, select a level surface. Chock the transport vehicle to prevent movement. Keep trailer bed and ramps free of oils, mud, snow, ice, and debris. On articulated machines, attach the steering frame lock after loading and remove it before unloading. Chain and block the machine securely. Secure all attachments in the transport mode and lower buckets or blades. Cover or remove “Slow Moving Vehicle” emblems before transporting.

When loading trucks, ensure the driver of the truck is out of the cab and away from the work area before loading unless a falling object protection structure is provided over the operator.

Only the equipment operator and personnel trained and qualified to load equipment shall be allowed in the area during equipment loading or unloading.

Unless qualified as an operator of the specific type of equipment to be transported, the truck driver shall not be allowed to drive the equipment onto or off of the trailer.

4.4. General Requirements for Excavations

The location of underground utilities, i.e., electric, gas lines, water lines, etc. must be identified prior to beginning excavation. Follow all requirements of HSEP 7.3.3 for utility clearance.

Check with the supervisor or the facility owner for permit requirements. If unidentified encumbrances or utilities are struck, stop all work and notify the supervisor.

Precautions must be implemented to keep personnel out of excavations and at least 10 feet away from the equipment and its maximum boom and/or counterweight swing radius when operating. Accessible areas within the swing radius of the equipment are to be barricaded to prevent personnel from being struck or crushed.

Vehicles and excavating or materials handling equipment must not approach an excavation while employees are in the excavation.

When excavating, extreme caution should be utilized to avoid hazards caused by cave in, i.e., roll over, tipping, or objects falling from overhead. If equipped with such, use the machine stabilizers. Avoid dangers such as rock or earth slides, when working at the base of excavations, overhangs, or stockpiles. See HSEP 8.4 for additional requirements for working on or near excavations and trenches.

4.5. General Requirements for Fueling and Maintenance

Refueling and/or battery charging must only be done in well-ventilated and designated areas.

[10] New requirement.

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Shut down equipment before refueling. Sufficient time should be allowed for the engine to cool before refueling.[11]

Use approved fuel hose with embedded grounding and approved connections or attach a static ground from equipment to fuel transfer equipment to avoid fuel ignition due to static discharge.

Always ensure the availability of safety shower or eyewash facilities near fueling areas. Fire protection equipment must be readily available.

Starting aids, such as jumper cables or ether, may only be used with extreme caution and according to manufacturer's instructions. Always connect the ground cable last. The ground cable should be attached to the engine at a point away from the battery.

Only trained and authorized personnel are permitted to perform equipment maintenance. This includes inflating or changing tires and "jump starting." Control of the sudden release of hazardous energy must be implemented during service or maintenance.

Equipment towing should be avoided. If it is necessary, use a rigid tow bar and consult the manufacturer's requirements.

4.6. Excavating Equipment Operator Qualification Procedure

The qualification and training records will be kept in readily available files at the project site.

The site manager or the designated Competent Person:

- Shall, prior to skills testing, train the operators using the manufacturer's manual for the excavating equipment on which they are to be qualified.
- Shall evaluate the skills of each prospective operator of excavating equipment to ensure that they have the physical abilities and knowledge to safely operate the equipment they are being qualified on.
- Shall, after fulfilling these requirements, complete the Operator Qualification form (Figure 1.)

Operators of dump trucks, tractor/trailer trucks, buses, and any equipment that can be driven on a public roadway must also be licensed by the government/state to operate the vehicles on public roads or property.

Operators of the listed equipment must complete a Medical Evaluation For Equipment Operator's Fitness Determination, Figure 2, prior to being assigned work requiring the use of such equipment. The completed form is to be reviewed by the site manager and the site HSE supervisor. Occupational Health Services or a medical doctor shall resolve any concerns that might affect the ability of the prospective operator to safely operate the equipment.

4.7. Equipment Specific Precautions

4.7.1. Trencher

When operating a trencher, make sure the machine is ready for the job it must do. Use a digging boom of the right length with a tooth pattern appropriate to soil conditions. Keep guards, personnel restraints, and trench cleaner in proper adjustment in relation to the digging chain.

If the trencher is a riding model, operate the machine only from the operator's seat. The digging chain, auger, or wheel of the trencher can throw rock or debris a considerable distance. Use proper face and eye protection.

Never allow anyone in the trench while digging.

When beginning a new trench, set the digging boom down carefully with the chain moving slowly. The chain will tend to pull the machine. Be prepared to counteract the

[11] Clarification of text.

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pull. Dropping a rapidly moving digging chain to the ground can cause the trencher to move quickly and unexpectedly.

Ensure that you understand the stability of the trencher. Use caution when trenching on hillsides. Avoid the potential for roll over or tipping. Always try to dig with the trencher in a level position. Vibration will tend to make the trencher slip sideways down a slope. Thoroughly evaluate the potential hazards and design the job such that equipment will remain stable throughout the course of the job.

Avoid fences, walls, or other obstructions. If the tip of the digging boom makes contact with an obstacle, the machine can climb up and tip backwards onto the operator.

During digging, if the machine strikes an unforeseen encumbrance, begins to labor, or jams, then shut down the machine and inspect the worksite and the chain. Never attempt to free a stuck chain while the trencher is running.

Stop the engine before attempting to service the chain.

4.7.2. Backhoes and Trackhoes

Never operate backhoe controls from the ground. Always operate from the operators control station.

Use stabilizers. Apply enough pressure to the stabilizers to support the machine without raising the machine axles off the ground.

Never enter, or allow anyone to enter the backhoe pivot-point area or the swing radius of the boom. Maintain a clear zone of at least 10 feet beyond the maximum reach of the boom or counterweight.

Do not dig under the machine or stabilizers.

When operating on a slope, swing to the uphill side to dump the load, if possible. If downhill dumping is necessary, swing only as far as required to dump the load. Use extreme caution. Use stabilizers to support the machine.

When using the backhoe bucket for hoisting:

- Consult the manufacturer's manual for lifting capacity.
- Position the machine so that load lowering is done over the front or back of the machine, not the side.
- Always use stabilizers, and in soft soil place pads under each stabilizer.
- Ensure that the load is balanced and move slowly to maintain control of the load. Use tag lines.
- Never lift the load higher than necessary to clear obstacles.
- Lower the load as soon as the obstacle is cleared and never hoist loads over people.

4.7.3. Skid Steer Loaders

All skid-steer style loaders shall be fitted with a manufacturer-approved safety glass front door, front cage cover of equivalent effectiveness, or other device designed to keep the operator's hands and arms inside the protective cage. Operators are also required to use a manufacturer-approved shoulder harness.[12]

[12] New requirement.

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Skid steer loaders can tip quickly due to their short wheelbase and operating characteristics if the operator does not stay within the manufacturer operational limits.[13]

Operators must maintain complete control at all times and operate at a speed suitable to site conditions.

Operate the loader from the operator's compartment—never from the outside.[14]

Stay seated when operating the loader controls.[15]

Work with the seat belt fastened and the restraint bar in place.[16]

The operator must keep hands, arms, legs, and head inside the cab while operating the loader. [17]

Travel and turn with the bucket in the lowest position possible. Come to a complete stop before raising the bucket to dump.[18]

When changing direction, look both ways to ensure adequate clearance from personnel and equipment.

Extreme caution should be used when operating in and around excavations to avoid tipping. Always travel up and down slopes with the loaded bucket facing up the hill or the empty bucket facing down the hill.

Avoid sudden starts, stops, and turns to prevent tipping or striking other equipment or people. If the operator begins to lose control, he can return the controls to the neutral position and the machine will self stabilize.[19]

Attachments used with skid steer loaders must be approved by the manufacturer and used in accordance with manufacturer instructions. Equipment capacities must be adjusted to accommodate such attachments.

On loaders where the operator's seat and controls are between the lift arms and in front of the liftarm pivot points, and where the operators must enter and exit from the loader through the front of the machine and over the bucket, operators must use great care to avoid contact of foot or hand controls that may be activated and cause movement of the lift arms, bucket, or other attachment.

4.7.4. Compactors

Prior to using compaction equipment, the prospective operator must receive proper training and study the operator’s manual to ensure a comprehensive understanding of the machine operation and controls.

Operators are required to wear safety toe shoes and metatarsal guards while operating hand held compaction equipment. Other types of personal protective equipment may be required, e.g., hearing protection, respiratory protection, etc.

Caution must be exercised when working in or around excavations to avoid tipping or cave in. When in excavations four feet deep and greater, sides must be sloped or shored to prevent cave in. Shoring evaluation must consider the additional load, which may be imposed due to the compaction activity.

[13] New requirement.
[14] New requirement.
[15] New requirement.
[16] New requirement.
[17] New requirement.
[18] New requirement.
[19] New requirement.

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To minimize personnel exposure on steep slopes and exposures to excavation hazards in areas such as washouts or in excavations that are not shored or sloped, a remotely-controlled compactor should be used. Personnel shall stay clear of the equipment when in operation.[20]

4.7.5. Burial Plow Attachment

When transporting a burial plow attachment, raise the plow to its fully elevated position and engage the transport lock. For parking, the plow should be either locked in the transport position or lowered to the ground.

Know the location of underground utilities (refer to HSEP 7.3.3) and clear the area of all obstructions or bystanders before operating the machine.

When plowing on slopes, the machine's stability is increased due to the blade in the ground. Always enter or exit the ground slowly. Rapid entry or exit may cause the machine to tip.

4.7.6. Horizontal Boring Attachment

When using an underground boring attachment, you must receive proper training and study the operator's manual to learn the operation of machine controls and operational boring procedures.

Do not guide drill rod or pipe with hands, arms, feet, or other bodily contact. Use only guide tools as recommended by the manufacturer.

Keep bystanders and unauthorized personnel out of the work area and away from exposed drill rod or pipe.

Do not use excessive crowd (pushing) force on drill rod or pipe. Whipping action may result increasing the potential for accident or injury.

Never use fasteners or hardware other than that supplied by the manufacturer to retain drill rod or pipe connectors

Do not service drill rod or pipe while engine is running.

4.7.7. Rock Cutting Attachment

Prior to operating this equipment, the prospective operator must receive proper training and study the operator's manual to ensure a comprehensive understanding of the machine operation and controls.

Read and understand the danger, caution, and warning signs on the equipment prior to beginning work.

Rock cutting may require hearing and/or respiratory protection. Check with your supervisor to determine the proper personal protective equipment.

Keep all unauthorized personnel away from the work area.

4.7.8. Industrial/Agricultural Mower

Prior to operating this equipment, the prospective operator must receive proper training and study the operator's manual to ensure a comprehensive understanding of the machine operation and controls.

Ensure that chain, flexible, or solid deflector shields are in place on the front and rear of the mower deck and are in good repair. Do not operate with damaged or missing shields.

Check for broken, missing, bent, or severely worn blades.

[20] New requirement.

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Check work area for debris and foreign objects to avoid them being picked up and thrown out by the mower. Inspect for rough terrain, drop-offs, ditches, potholes, steep slopes, stumps, standing water, mud, soft soil, or slippery conditions.

Keep unauthorized personnel out of the work area. The mower may throw objects up to 300 feet.

Do not operate mower in transport position.

Avoid excessive ground speed for terrain conditions and sudden starts, stops, or turns.

Plan to mow downhill on steep slopes. Avoid over-speed of the power take off.

Ensure that required guards are in place.

Keep clear of rotating blades, parts, and drivelines.

5.0 REFERENCES AND RELATED DOCUMENTS

ANSI B30.5, Mobile and Locomotive Cranes

HSEPs 2.16, 7.3.3, 8.4, 17.1, 17.2, 17.4, 17.5, 17.9

6.0 FIGURES

Operator Qualification

Medical Evaluation For Equipment Operator's Fitness Determination

Excavating Equipment Inspection Report

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Figure 1

Operator Qualification

To HSE Department Date:

From (Site Manager):

Site Name and Location:

Through experience, training, and personal observation, the following are a Qualified Operator for the equipment indicated.

Name	Equipment

Site or Project Manager's	
Name Printed	Signature

Copies to Site HSE Department
Site Manager/Competent Person
Area or Regional HSE Manager

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Figure 2

Medical Evaluation For Equipment Operator's Fitness Determination

1. OPERATOR'S INFORMATION (Operator completes Sections 1 and 2)

Operator's Name (Last, First, Middle)	Social Security No.	Birth date (mm/dd/yy)	Age	☐ M ☐ F	☐ New Qualification ☐ Re-qualification
Address	City, State, Zip Code	Work Phone: ( ) Home Phone: ( )			Job Site:

2. HEALTH HISTORY

Yes No
- ☐ ☐ Any illness or injury in last 5 years?
- ☐ ☐ Head/Brain injuries, disorders or illnesses
- ☐ ☐ Seizures, epilepsy
  - ☐ Medication _____
- ☐ ☐ Eye disorders or impaired vision (except corrective lenses)
- ☐ ☐ Ear disorders, loss of hearing or balance
- ☐ ☐ Heart disease or heart attack, other cardiovascular condition
  - ☐ Medication _____
- ☐ ☐ Heart surgery (valve replacement/bypass, angioplasty, pacemaker)
- ☐ ☐ High blood pressure ☐ Medication_____
- ☐ ☐ Muscular disease
- ☐ ☐ Shortness of breath

Yes No
- ☐ ☐ Lung disease, emphysema, asthma, chronic bronchitis
- ☐ ☐ Kidney disease, dialysis
- ☐ ☐ Liver disease
- ☐ ☐ Digestive problems
- ☐ ☐ Diabetes or elevated blood sugar controlled by:
  - ☐ Diet
  - ☐ Pills
  - ☐ Insulin
- ☐ ☐ Nervous or psychiatric disorders, e.g., severe depression
  - ☐ Medication _____
- ☐ ☐ Loss of, or altered, consciousness

Yes No
- ☐ ☐ Fainting, dizziness
- ☐ ☐ Sleep disorders, pauses in breathing while asleep, daytime sleepiness
- ☐ ☐ Stroke or paralysis
- ☐ ☐ Missing or impaired hand, arm, foot, leg, finger, toe
- ☐ ☐ Spinal injury or disease
- ☐ ☐ Chronic low back pain
- ☐ ☐ Regular, frequent alcohol use
- ☐ ☐ Narcotic or habit forming drug use

For any YES answer, indicate onset date, diagnosis, treating physician's name and address, any current limitation. List all medications (including over-the-counter medications) used regularly or recently.

The above information is complete and true. I understand that inaccurate, false, or missing information may invalidate the medical evaluation and my status as a Qualified Equipment Operator.

Operator's Signature: Date:

3. VISION

ACUITY	UNCORRECTED	CORRECTED
Right Eye	20/	20/
Left Eye	20/	20/
Both Eyes	20/	20/

Vision of at least 20/30 Snellen in one eye and 20/50 in the other, with or without corrective lenses.

_____ Vision Screen Technician Signature

_____ Date

4. OCCUPATIONAL HEALTH SERVICES

- ☐ Qualified, no follow-up needed
- ☐ Referred to Dr. for follow-up (Name, Address, Phone)
- ☐ Qualified after follow-up
- ☐ Not qualified
- ☐ Qualified with the following restrictions

_____

_____

OHS Reviewer's Signature: Date:

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Figure 3

Excavating Equipment Inspection Report

Inspector's Name Printed:	Date:
Equipment Description:	Equipment Number:

Item Inspected	Good	Fair	Poor	N/A	Comments
Brakes & Steering					
Broken, Missing, Damaged Parts					
Chains/Digging Boom (Trenchers)					
Controls Functioning Properly					
Deflectors & Blades (Mowers)					
Engine Oil/Water/Battery					
Falling Object Prot. Structure					
Fire Extinguisher					
Gauges					
Guards/Shields					
Horn and Back Up Alarm					
Hydraulic Fluid Level/Leaks/Hoses					
Lights					
Mirrors					
Operator Presence/Seat Interlock					
Other Interlock Switches					
Roll Over Protective Structure					
Seat Belt					
Signs/Placards					
Tires					
Windshield/Glass/Wipers					

Comments:

Inspector's Signature:

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HSE Procedure		Document No: HSEP 8.4	Page: 1 of 9
Excavations		Supersedes: HSEP 8.4	Revision: 3 Issue Date: 29 Jul 05
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1.0 PURPOSE AND SCOPE

This Corporate Health, Safety, and Environment Procedure provides minimum procedures to be followed when employees are engaged in activities requiring entry into or work around excavations. It applies to all employees and subcontractors engaged in operations covered by the Company HSE Program.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

2.1. Site Management

Site Management is responsible for assuring the overall implementation and compliance with the Company's excavation HSEP. They must be familiar with the excavation HSEP and utilize expertise at their disposal to ensure employees are protected form excavation hazards.

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Site Management shall designate Competent Persons for trenching and excavation activities on-site, only after they have completed an appropriate course taught by the Corporate HSE Department, or some other recognized third party.

2.2. Site Supervision

Supervisors responsible for employees performing work covered by the Company's excavation HSEP must:

- Ensure that Competent Persons have been assigned to inspect the safety of excavations and monitor the work for any hazardous situations. Confirm each excavation job is properly evaluated and prepared with hazards being addressed ensuring employees are protected.
- Ensure employees are aware of any hazards associated with their work, and they are properly trained on this HSEP and any site-specific excavation procedures.
- Ensure that employees adhere to all excavation HSEP requirements and any established task requirements.
- Continuously monitor the work to assure compliance with this HSEP.

2.3. Competent Persons

Competent Persons assigned to excavation sites have the responsibility to:

- Train employees on the content of this procedure and ensure it is clearly understood.
- Evaluate whether the excavation is also a confined space.
- Perform documented daily inspections of excavations, the adjacent areas, and protective systems before the start of work each day and as necessary throughout the shift.
- Inspections shall additionally be made after every rainstorm or other hazard-increasing occurrence.
- Where evidence indicates a possible cave-in, failure of the protective system, or other hazardous condition, employees shall be removed until the proper precautions have been taken.

3.0 DEFINITIONS

Aluminum Hydraulic Shoring	A pre-engineered excavation shoring system comprised of aluminum hydraulic cylinders (cross braces) used in conjunction with vertical rails (uprights) or horizontal rails (wales).
Bell Bottom Pier Hole	A type of shaft or footing excavation, the bottom of which is made larger than the cross section above to form a belled shape.
Benching	A method of protecting employees from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels.
Cave-in	The separation of a mass of soil or rock material from the side of an excavation, or the loss of soil from under a trench shield or support system, and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, injure, or immobilize a person.
Competent Person	One who is capable of identifying existing and predictable hazards in the work environment and who has the authority to correct them. For purposes of a Competent Person for excavation activities, this person must receive training and designation through the Corporate Health, Safety, and Environment Department.

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Excavation	Any man made cut, cavity, trench, or depression in an earth surface, formed by earth removal.
Oxygen Deficient	Having an oxygen concentration of less than 19.5%.
Protective System	A method of protecting employees from cave-ins; from material that could fall or roll from an excavation face or into an excavation. Protective systems include: sloping systems, benching systems shoring systems and shield systems.
Ramp	An inclined walking or working surface that is used to gain access to one point from another, and is constructed from earth or from structural materials such as steel or wood.
Registered Professional Engineer	A person who is registered as a professional engineer in the state where the work is to be performed. However, a professional engineer, registered in any state is deemed appropriate when approving designs for pre-engineered or manufactured protective systems.
Shield	A structure that is able to withstand the forces imposed on it by a cave-in and thereby protect employees within the structures, or can be designed to be portable and moved along as work progresses.
Shoring	A structure such as a timber shoring system, or an aluminum hydraulic shoring system that supports the sides of an excavation and which is designed to prevent cave-ins.
Sloping	A method of protecting employees form cave-ins by excavating to form sides of an excavation that are inclined away from the excavation so as to prevent cave-ins. The angle of the slope varies with differences in soil type, environmental conditions and application of imposed loads.
Support System	A structure such as underpinning, bracing, or shoring which provides support to an adjacent structure, underground installation, or the sides of an excavation.
Trench	A narrow excavation, the depth of which normally exceeds the width (not more than 15 feet wide).

4.0 PROCEDURE

4.1. General Requirements

A proper permit must be issued before excavation work begins. This permit is typically issued by the facility owner or the client and is reviewed by a Jacobs HSE Department representative.

All employees shall be protected with personal protective equipment for the protection of head, eyes, respiratory organs, hands, feet, and other parts of the body as required.

In many instances, excavations are considered confined spaces (See HSEP 7.2.) If this is the case, all parts of both the excavation and the confined space entry procedures must be followed.

Physical barricades must be placed around all excavations.

Employees outside of excavations and exposed to vehicular traffic shall wear reflectorized or highly visible warning vests.

No person shall be permitted under loads handled by lifting or digging equipment.

No employees shall stand or work near a vehicle being loaded. Operators may remain in the enclosed cab of the vehicle.

All excavating work must have the prior approval of the area supervisor.

The possibility of flammable or toxic gases settling in low places of excavations must be assessed before entering excavations or doing hot work.

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Employees entering excavations five feet deep or greater must be protected by an adequate protective system, as described below, when a Competent Person determines the possibility of hazardous ground movement.

All surface objects that may present a hazard to employees by rolling or falling into an excavation shall be removed, or all excavations four feet or more in depth require a safe means of access and egress.

4.2. Underground Utility Clearance

Prior to opening an excavation, the location of utility installations that may be encountered shall be determined. All requirements of HSEP 7.3.3 related to underground utility clearance shall be followed.

As set forth in HSEP 7.3.3, utility companies or owners shall be contacted to establish the location of the underground utility installations. The location and depth shall be marked indicating the type of service.

While the excavation is open, underground installations shall be protected, supported, or removed to safeguard employees.

4.3. Access and Egress

A stairway, ladder, ramp, or other safe means of access and egress shall be located in excavations that are four feet or more in depth so as to require no more than 25 feet of lateral travel for employees.

Ladders must extend 36 inches above the point of support at the top of the excavation.

Structural ramps used solely by employees shall be designed by a Competent Person.

Structural ramps used by equipment shall be designed by a Competent Person qualified in structural design and shall be constructed accordingly.

4.4. Prohibited Task Health Hazard Conditions

No worker shall enter a work area where:

- Oxygen concentrations are less than 19.5% or greater than 23.5%, or
- Atmospheres are greater than 1% of the Lower Explosive Limit, or
- Atmospheres are potentially Immediately Dangerous to Life or Health (IDLH), or
- There is unprotected exposure to known human carcinogens, mutagens, or teratogens, or
- There is unprotected exposure to known chemical sensitizers.

When work in these environments seems to be absolutely necessary, the project manager shall appeal to the appropriate senior operations manager and senior HSE manager for written approval to proceed and for specific safe work procedures.

4.5. Work In Potentially Hazardous Atmospheres

Where oxygen deficiency or flammable or toxic atmospheres could exist, the air shall be tested before employees enter excavations.

Adequate precautions shall be taken to prevent employee exposure to oxygen deficiency or hazardous atmospheres. These precautions may include providing task modifications, ventilation, or, as a last resort, respiratory protection.

Periodic testing shall be conducted to ensure that potentially hazardous atmospheres remain safe.

Emergency rescue equipment, such as a self-contained breathing apparatus and a safety harness and lifeline shall be readily available where hazardous atmospheres exist or could develop. This equipment shall be maintained by a qualified attendant.

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Employees entering bell-bottom pier holes or similar deep and confined footing excavations shall wear a harness with a lifeline securely attached. The lifeline shall be individually attended at all times.

4.6. Water Accumulation

Employees shall not work in excavations in which water has accumulated, unless proper precautions have been taken.

Precautions include support or shield systems, water removal to control the level, and use of a safety harness and lifeline. When used, a Competent Person must monitor water removal equipment.

4.7. Stability of Adjacent Structures

Except in stable rock, excavation below the level or base of footing of any foundation or retaining wall shall not be permitted unless the wall is underpinned and other precautions have been taken to ensure the stability of the adjacent walls and the safety of employees involved in the work.

Shoring, bracing, or underpinning shall be inspected daily, or more often, as conditions warrant by a Competent Person. The protection shall be effectively maintained.

4.8. Protection of Employees from Loose Rock or Soil

Excavated or other material and equipment shall be maintained at a distance of at least two feet from the edge of excavations or behind retaining devices sufficient to prevent material or equipment from falling or rolling into the excavation.

If the operator of mobile equipment adjacent to or near the edge of an excavation does not have a clear view of the edge of the excavation, a warning system such as barricades, stop logs, or hand signals shall be used. If possible, the grade should be away from the excavation.

4.9. Fall Protection

Where employees or equipment are required or permitted to cross over excavations, walkways or bridges with standard guardrails shall be provided.

Adequate barricades providing physical protection shall be provided at all excavations. All wells, pits, shafts, etc., shall be barricaded or covered.

Upon completion of operations, temporary wells, pits, shafts, etc., shall be promptly and adequately back filled.

4.10. Soil Classification

Each soil and rock deposit shall be classified by a Competent Person as stable rock, type A, type B, or type C in accordance with the definitions set forth in 29 CFR 1926.652 (Appendix A) and documented on the Daily Trench and Excavation Inspection form (Figure 1).

The classification shall be based on at least one visual and at least one manual analysis. Such analysis shall be conducted by a Competent Person using tests described in 29 CFR 1926.652 (Appendix A).

4.11. Protective Systems

4.11.1. Sloping and Benching

A Registered Professional Engineer shall design sloping and benching systems for excavations greater than 20 feet deep.

For excavations 20 feet deep or less, one of the following options may be used:

- Option 1 - Excavations shall be sloped one-and-one-half horizontal to one vertical (34 degrees measured from the horizontal) unless you use Option 2, 3, or 4. Slopes shall be excavated to form configurations in accordance with slopes shown for Type C Soil in Appendix B, Maximum Allowable Slopes, of 29 CFR 1926.652.

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- Option 2 - Slopes and configurations for sloping and benching systems shall be determined in accordance with the provisions of Soil Classification, as set forth in this HSEP, and with Appendix B, Maximum Allowable Slopes, of 29 CFR 1926.652.
- Option 3 - Designs of sloping and benching systems shall be in accordance with tabulated data and charts identifying parameters, limits of use, and explanatory information as necessary. This data must be in written form on the jobsite and bearing the seal of the approving Registered Professional Engineer.

When excessive loads from stored material or equipment, operating equipment, or traffic are present, the Competent Person shall determine to what degree the slope must be reduced below the maximum allowable slope.

4.11.2. Support and Shield Systems (Shoring)

For excavations greater than 20 feet deep, a Registered Professional Engineer must design or approve any support/shield systems used.

For support and shield systems in excavations 20 feet or less in depth, one of the following options may be used.

- Option 1 - Designs for timber shoring shall be determined using tables C1.3 or C2.3 (29 CFR 1926.652 Appendix C) for soil type C. Designs for aluminum hydraulic shoring shall be in accordance with manufacturers data or 29 CFR 1926.652 (Appendix D).
- Option 2 - Designs for timber shoring shall be determined in accordance with the provisions, as set forth in this HSEP, of Soil Classification and in accordance with the provisions of Timber Shoring.
- Option 3 - Use of pre-fabricated support systems, such as aluminum hydraulic shoring or other protective systems drawn from manufacturers data, must be used in accordance with all specifications and limitations issued by the manufacturer.
- Option 4 - Designs of support, shield, or other protective systems must be in accordance with tabulated data and bear the seal of the approving Registered Professional Engineer.

4.11.3. Materials and Equipment

Materials and equipment used for protective systems shall be free from damage or defects that might impair their proper function. Manufactured materials and equipment shall be used in a manner that is consistent with the recommendations from the manufacturer. Damaged material or equipment shall be removed from use.

4.11.4. General Requirements for Shoring

Members of support systems shall be securely connected in order to prevent sliding, falling, kick outs, or other failure.

Support systems shall be installed and removed in a manner that protects employees from cave ins, collapses, or being struck by support members. Removal shall begin at and progress from the bottom of the excavation. Members shall be released slowly so that changes in the stability of the structure or excavation can be readily assessed.

Components of pre-fabricated systems must be supplied with the manufacturer's seal or identification markings. These markings must remain legible.

Excavation of material from no greater than two feet below the bottom of the support or shield systems is permitted if the system is designed to resist the forces of the full depth.

Employees shall not be allowed in excavations when shields are being installed, removed, or moved.

4.12. Timber Shoring

Timber shoring may be provided in excavations that do not exceed 20 feet as a means of protection from cave-ins.

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A Registered Professional Engineer must design timber shoring for excavations greater than 20 feet deep.

In order to use timber shoring, the soil type must first be determined by a Competent Person using the steps set forth in Soil Classification, as found in this HSEP.

There are six tables in 29 CFR 1926.652; Appendix C, two for each soil type. Minimum sizes of shoring members are specified for each soil type. Using the appropriate table, a selection of size and spacing of members can be made. Selection is based on trench depth and width and on spacing of the cross braces.

The members specified in the table are not adequate when:

- Stored material adjacent to the excavation exceeds the load imposed by a two-foot soil surcharge.
- When surcharge loads are present from equipment weighing in excess of 20,000 pounds.
- When vertical loads imposed on cross braces exceeds a 240-pound gravity load distributed on a one foot section of the center of the cross brace.

When any of these conditions exists, an alternate timber shoring or protective system shall be used.

4.13. Inspection and Storage

Designated Competent Persons shall make inspections of excavations, the adjacent areas, and protective systems before employees or equipment are allowed to enter an excavation, before the start of work each day, and as necessary throughout the shift, by using the Daily Trench/Excavation Inspection form found in Figure 1.

The designated Competent Person must determine whether the excavation is also a confined space and what additional requirements shall apply.

Inspections by Competent Persons shall additionally be made after every rainstorm or other event that has the potential to create or increase hazard(s).

Where there is evidence, which indicates a possible cave-in, failure of the protective system, or other potentially hazardous condition, employees shall be removed until the Competent Person can inspect the situation and proper precautions have been taken.

4.14. Training

Employees involved in trenching and excavations shall be properly trained in accordance with this HSEP.

Employee training shall be conducted and documented by Competent Persons.

Competent Persons shall be so designated by the Site Manager, only after completing an appropriate excavation and trenching course taught by Corporate HSE or other qualified subject matter specialist.

4.15. Environmental

The excavation of soil in an area of known or suspected contamination may require a permit from the local air quality management district. This permit, at a minimum, will likely require routine testing of the air over the soil for volatile organic compounds and/or other contaminants. For a large excavation project in an area of known contamination, the filing of a site-specific mitigation plan may be required.

If the concentration of volatile organic compounds emitted by the soil exceeds the regulatory action level, mitigation measures must be taken to control emissions and the district or agency must be notified. Potential mitigation measures include covering the soil pile with a tarp or spraying with water or vapor suppressant.

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Stockpiled soil that is contaminated must be kept covered to prevent emissions and the cover must be inspected daily. This soil must be moved to a regulated disposal site or treatment unit within 30 days of placement.

Excavation work may require a wet weather erosion control permit from regulators. The purpose of this permit is to prevent sediment runoff from impacting storm water quality. Best management practices include covering stockpiled soil, placement of sand bags in front of storm water inlets, and wash-down of trucks before they leave the site.

Deep excavations may encounter groundwater that must be removed from the pit. This water can be loaded with sediment and direct discharge to the street or storm drain may be prohibited. A filter sock on the end of the discharge hose may be used to filter out solids or the water may be pumped to a settling pit prior to discharge.

It is not always safe to assume that clear and odorless water is free from harmful contaminants. Testing of the water should be conducted if there is a concern. Removal of contaminants prior to discharge may be required. Common removal methods include air stripping, carbon treatment, and offsite disposal.

5.0 REFERENCES AND RELATED DOCUMENTS

29 CFR 1926 Subpart P, Excavations

HSET Training Program No. 021, Excavations

6.0 FIGURES

Daily Trench/Excavation Inspection

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Figure 1

Daily Trench/Excavation Inspection

Date: _____ Time: _____Site Name:_____

Excavation Location_____

Site Evaluation

_____ Surface encumbrances
_____ Underground installations
_____ Access and egress
_____ Exposure to vehicular traffic
_____ Exposure to falling loads
_____ Hazardous atmospheres
_____ % Oxygen (O_2)
_____ Warning system for mobile equipment
_____ Protection from water accumulation
_____ Stability of adjacent structures
_____ Employee protection - loose rock/soil
_____ Inspections
_____ Fall protection
_____ % of Lower Explosive Limit

Note: Atmospheres in excavations greater than four feet shall be tested for oxygen content and flammable gas concentrations prior to entry of personnel. Emergency rescue equipment shall be readily available.

Soil Classification

Soil classification shall be made based on the results of at least one visual, and one manual test.

_____ Stable rock _____ Type A _____ Type B _____ Type C

Visual Tests

Inspect worksite for:

_____ Fissured ground
_____ Layered soil
_____ Previously disturbed earth
_____ Seepage
_____ Vibration
_____ Poor drainage

Manual Tests

Analyze soil for:

_____ Plasticity
_____ Dry strength
_____ Thumb penetration
_____ Pocket penetrometer
_____ Sherevane
_____ Drying test

Protective Support Systems

Sloping & Benching

_____ Stable rock: 90 degrees
_____ Type A: 53 degrees
_____ Type B: 45 degrees
_____ Type C: 34 degrees

Shoring & Shielding

_____ Timber or hydraulic
_____ Trench boxes, trench shields
_____ Design using tabulated data
_____ RPE design

Additional Comments or Information:_____

_____

Inspection performed by: _____

Authorized Competent Person

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JACOBS

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1.0 PURPOSE AND SCOPE

The purpose of this HSEP is to provide guidance for the protection of personnel, property, and the environment during the removal or abandonment of underground storage tanks (USTs). It applies to Company employees and subcontractor personnel who are involved in work operations, which involve UST upgrades, removal, or abandonment in place.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

2.1. Project Manager

The Project Manager is responsible for the overall implementation of this HSEP. This responsibility includes initial planning, work activity completion, and documentation. In addition,

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the Project Manager is responsible for obtaining required local permits and providing the necessary personnel, equipment, and material resources to complete the work in accordance with this HSEP.

2.2. Site Manager

The Site Manager will supervise daily operations as related to UST removal or abandonment in place. This individual is responsible for implementation of the requirements of this HSEP and for obtaining the necessary site equipment, instruments, and other materials, which are needed to safely complete work operations.

2.3. Supervisors

The Supervisor is responsible for training and coordination with the Project Manager for assigning personnel to perform explosive atmosphere monitoring. The HSE Supervisor will verify that the monitoring equipment is in good working order and that it is properly calibrated, maintained, and operated and that appropriate documentation of work activities is carried out.

2.4. Site HSE Personnel

Site HSE personnel will be selected for each UST operation to function as, or ensure the presence of, a competent person(s) for excavation or confined space operations. These individuals will be responsible for frequent construction safety inspections of work operations to verify that safe work practices are being followed. HSE personnel are authorized to stop work activities until serious health or safety hazards are corrected. In addition, these individuals will perform or direct any required air monitoring prior to and during excavation or tank entry. These individuals will monitor and document tank purging or inerting activities.

3.0 DEFINITIONS

Cold Cutting	Refers to methods, which utilize a nonelectric or nonsparking metal cutting technique. Mechanical shears, pneumatic chisels or drill, and high-pressure water cutting equipment are examples of cold cutting techniques. Cold cutting provides a safety benefit for areas in which the presence of flammable vapors may be present.
Combustible Gas/0_2 Indicator (CGI)	Refers to an instrument, which is used for the measurement of airborne concentrations of flammable gases or vapors. These instruments provide a readout, in percent by volume, of the lower explosive limit (LEL) and the percentage oxygen content of the sampled atmosphere.
Competent Person	Refers to an individual, who is capable of identifying existing and predictable hazards associated with UST excavation and confined space entry and who has the authority to take prompt corrective measures to eliminate identified hazards.
Confined Space	Refers to a space, which can allow worker entry, has limited means of entry and exit, and is not designed for human occupancy.
Excavation	Refers to a man-made cut, cavity, trench, or depression in a soil surface formed by earth removal.
Explosive/Flammable Atmosphere	Refers to an atmospheric condition in which flammable vapors (such as fuel vapors) and oxygen are present in proportion that enable a fire or explosion to occur if the atmosphere is exposed to an ignition source.
Hot Work	Refers to any work which involves burning, welding, or similar fire-producing operations, including work that produces a source of ignition, such as drilling, grinding, abrasive blasting, etc.
Ignition Source	Refers to any open flame, spark, or other condition that is capable of igniting a flammable material or atmosphere.
Inerting	Refers to a method of reducing the hazard of an explosive atmosphere by using an inert gas such as carbon dioxide (CO_2) or nitrogen (N_2) to displace

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	the oxygen that is required to support combustion.
Lower Explosive Limit (LEL) or Lower Flammable Limit (LFL)	The LEL refers to the lowest concentration of a material that can physically ignite in the presence of an ignition source. It is expressed in percent of vapor or gas in the air by volume. At air concentrations below the LEL or LFL, the air contaminant mixture is theoretically too “lean” to burn.
Oxygen Deficient Atmosphere	Refers to an atmosphere that contains less than 19.5% oxygen by volume.
Permit-Required Confined Space	Refers to a confined space that has one or more of the following characteristics: • contains or has a potential to contain a hazardous atmosphere; • contains a material that has the potential for engulfing an entrant; • has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section; or • contains any other recognized serious safety or health hazard. Underground storage tanks by their nature are considered to be permit required confined spaces. HSEP 7.2 for confined space entry must be followed if personnel entry is required.

4.0 PROCEDURE

Personnel who are involved with the removal of USTs should be aware that these operations are generally impacted by a number of local, state, and federal regulations. These regulations may require various notifications, permits or contain other requirements for UST operations. For example, in many localities UST removal operations must be inspected by local fire department officials prior to the removal of the tank. In addition, the residual materials in the affected UST may be regulated as a hazardous waste by local, state, or federal agencies.

Steps associated with tank removal and closure include agency notification, permitting, isolation, excavation, hazardous material removal, tank cleaning, tank and associated piping removal, groundwater and/or soil testing for chemical contamination, backfilling, and post-closure notification (delisting).

UST abandonment in place or removal may expose workers to a number of safety and health hazards. These include those associated with excavation and trenching; confined space entry; exposure to flammable, toxic, or oxygen deficient atmospheres; hot work and cold cutting operations; slips, trips, and falls; material handling with cranes and rigging; and other hazards.

4.1. Personnel Requirements

4.1.1. Training, General

Personnel who are involved in UST field operations are required to satisfy the training requirements of the OSHA Hazardous Waste Operations standard (29 CFR 1910.120) or the applicable state statute.

This includes 40 hours of initial training and eight hours of annual refresher training.

Supervisors are required to complete an additional eight hours of training.

4.1.2. Site-Specific

A safety meeting will be held prior to the start of fieldwork to inform workers of the potential health and safety hazards and the methods that will be used to minimize the chance of worker injuries or illnesses.

Documentation of training activities and the related topics discussed shall be made and maintained in the project records.

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Tailgate safety meetings will be held prior to each day's work activities or as required by changes in the work environment.

The supervisor and the task team shall collaboratively prepare SPAs.

4.1.3. Medical

All site personnel must be enrolled in the Jacobs medical monitoring program.

4.1.4. Competent Person

A "Competent Person", as defined above, shall supervise UST operations because the work generally involves excavations and in some cases confined space entry.

HSE personnel will receive specific training in these and related health and safety concerns prior to serving in this capacity.

4.2. Preparation for Removal

Work planning and preparation are critical to the success of UST project operations. Preparation includes obtaining local permits, performing utility searches and a site inspection, and preparing planning documents such as a work plan and a health and safety plan (HSP).

A Tank Excavation Checklist is included as Figure 1. This form shall be completed prior to the start of work operations in order to assist with adequate preplanning and preparation.

4.2.1. Permits

UST operations generally require permits from local and state agencies such as fire departments, air quality management districts, and, in some cases, from state OSHA and/or EPA representatives and other local regulatory agencies.

Project work plans shall identify and satisfy project-permitting requirements prior to the start of work operations. The work plan should clearly specify the number of subsurface samples to be collected, sample location, and the specific tests to be employed.

The required permits shall be posted in the work area and copies maintained with other project files.

4.2.2. Utility Search

Prior to the start of other work operations project personnel shall complete overhead and underground utility search requirements as directed in HSEP 7.3.3.

4.2.3. Site Inspection

A site inspection shall be performed prior to the start of work operations. The size and location of all underground storage tanks, piping, vents, and manways shall be identified. When available, installation drawings shall be obtained from the tank owner or client.

Drawings should specify property lines, streets, and structure dimensions, etc. and should specify tank size, age, construction, and contents. This information is required in many cases as a part of the delisting process.

For tanks to be abandoned in place, a site assessment report, which indicates boring locations, depths, and chemical analytical data is also required. In some cases, it may be necessary to sample the tank contents if the tank contents are unknown or to verify that the tank contents have been correctly characterized. Liquid levels inside the tank should be noted and the presence of water and other contaminants checked.

4.2.4. Health and Safety Plan

Prior to the start of UST operations, a site-specific Health and Safety Plan (HSP) shall be developed as required by HSEP 7.3.1.

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4.2.5. Subcontractor Qualifications Check

Soil samples collected to confirm the presence or absence of contamination must be analyzed by a certified laboratory. A check should be made that the laboratory used holds active and correct certification for the work.

Some agencies may require a Marine Chemist to certify that a removed tank is clean prior to removal from the site. Qualifications of the Marine Chemist should be checked prior to award of the work.

4.3. Prohibited Task Health Hazard Conditions

No worker shall enter a work area where:

- Oxygen concentrations are less than 19.5% or greater than 23.5%, or
- Atmospheres are greater than 1% of the Lower Explosive Limit, or
- Atmospheres are potentially Immediately Dangerous to Life or Health (IDLH), or
- There is unprotected exposure to known human carcinogens, mutagens, or teratogens, or
- There is unprotected exposure to known chemical sensitizers.

When work in these environments seems to be absolutely necessary, the project manager shall appeal to the appropriate senior operations manager and senior HSE manager for written approval to proceed and for specific safe work procedures.

4.4. General Safety Requirements

4.4.1. Site Control

Areas in the vicinity of excavations, heavy equipment, or other work operations shall be isolated from surrounding areas through the use of barricades, caution tape, cones, etc., to delineate and secure the work area.

If work areas are located adjacent to sidewalks or roads, the use of temporary fencing may be required.

The project specific health and safety plan shall address the requirements for site control.

In some areas, if the excavation is left open overnight, temporary fencing and security personnel may also be required.

4.4.2. Fire and Explosion Control and Assessment Safe Practices

Fire prevention practices shall be observed during work operations:

- All vehicles and heavy equipment must be equipped with spark arrestors and fire extinguishers.
- No smoking shall be allowed in the vicinity of UST work operations; no smoking signs shall be posted, as required.
- Multi-purpose Type ABC fire extinguishers of adequate size shall be maintained within 75 feet of work areas where flammable or combustible materials are present.
- Potential sources of static electricity such as ventilation blowers, compressors, generators, vacuum trucks, etc. shall be bonded and/or grounded during transfer or other work with flammable/combustible liquids.
- Cold cutting or other “cold” work methods are preferred over hot cutting or hot work operations in order to minimize ignition sources. All “hot work” operations including the use of electrical hand tools or chisels shall require a hot work permit (HSEP 2.7) prior to the start of work. In addition, if burning or welding is conducted, a fire watch shall be posted. Note: some agencies or clients may not allow hot work, or some may require a specific hot work permit.
- When lighting is required in potentially hazardous environments fixtures shall be approved for the related environment.

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- When an electrical storm is in progress or threatening in the immediate area, all work shall cease and workers shall leave the area and move to a designated safe place.
- Pyrophoric Deposits—precautions shall be taken to prevent pyrophoric deposits (often found in tanks containing sour petroleum or petroleum products) from becoming an ignition source.
- If a compressor is used to pump air into a tank to provide ventilation it shall be equipped with filters to remove moisture, scale, rust and oil because moisture and particles in the air stream can generate electricity and become a source of static ignition.
- Periodic measurements of the oxygen and flammable vapor levels shall be made inside and in the immediate vicinity of USTs. Personnel exposure measurements to toxic air contaminants shall also be made with appropriate monitoring equipment as specified in the project HSP. Monitoring instruments shall be calibrated and maintained in accordance with HSEP 12.1.
- Placing workers inside a tank should only be allowed when there is no other way to conduct the work from outside the tank. All work conducted inside the tank shall be conducted under a Confined Space Entry permit.

4.4.3. Toxicity Assessment and Control

- Many USTs have contained various fuels or solvents. The HSP shall contain specific information related to the toxicity and symptoms of exposure for the materials, which are expected to be encountered. MSDSs for constituents of concern should be onsite.
- Many USTs have contained gasoline. Some grades of fuel contained tetra ethyl and tetra methyl lead as fuel additives. These organic lead materials are highly toxic in concentrated form and can be absorbed through intact skin.
- Bottom sludges of older tanks and oil-and-water separators may contain high concentrations of organic lead and, thus, are hazardous. Worker exposure to these sludges must be avoided.
- If entry into tanks that have contained leaded gasoline is anticipated, the procedures of API standard 2015, especially Section 4, shall be followed. Entry into these types of tanks will require the use of pressure demand full-facepiece respirators and whole-body skin protection. Any such activity shall be done only after review by a Company HSE professional and appropriate planning, permits, job design, and training have been completed.

4.4.4. Pressure Testing

In some cases, tanks may be pressure tested for leakage. This is generally the case during tank installation and subsequent inspections.

If pressure testing following installation is required, the tank manufacturer's recommendations must be followed. In general, tank pressure shall not exceed 3 – 5 psi. A pressure relief valve shall be installed prior to pressure testing with a maximum relief pressure of 6 psi.

Pressure testing conducted to verify the leak integrity of the tank should follow the procedures specified by the governing regulatory agency.

4.5. Heavy Equipment, Cranes, and Rigging

USTs are generally extracted from the ground with the use of a crane, backhoe, or other piece of heavy equipment. Equipment operators, lifting equipment, or other for equipment must meet the requirements of HSEPs 8.3, 17.1, and 17.6, respectively.

4.6. Excavations

Excavations are one of the most significant hazards associated with UST work. Excavation wall stability is of primary concern; hazardous areas must be sloped or shored prior to personnel entry. In order to minimize these hazards, excavation operations shall meet the requirements of HSEP 8.4. Excavation entries should be minimized.

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Adjacent structures, such as building foundations, utilities, sidewalks, retaining walls, etc., must be supported at all times.

4.7. Confined Space Entry

USTs shall be considered to be a permit-required confined space. The requirements for entry are found in HSEP 7.2. In many cases, entry into the UST excavation shall also require a confined space entry permit.

4.8. Work at Elevations

As a general practice, work that requires personnel to physically be on the top surface of the tank shall be performed prior to excavation of the soil along the tank sides. This includes any tank cleaning, atmospheric testing, inerting, or crane cable hookup to the tank lifting eyes. This work practice will help minimize elevated work and the associated fall hazard. HSEP 13.8 shall be followed for operations that may involve fall hazards.

4.9. Material Transfer

UST operations generally require the use of pumps, vacuum trucks, or other methods to move liquid material. In general, explosion proof equipment is required for this type of transfer. Pneumatic type pumps and vacuum trucks are preferred and must be properly bonded and grounded to minimize static electricity discharges.

The area must be secured to minimize exposure if flammable or explosive substances are being transferred. Equipment must have spark arrestors and a spill contingency plan must be in place.

4.10. Safety and Emergency Equipment

The HSP shall specify safety and emergency equipment that shall include items such as emergency medical and rescue equipment, fire extinguishers, eyewash, PPE, confined space entry/extraction equipment etc.

4.11. Tank Isolation and Content Removal

The sequence of UST removal or abandonment in place may vary for each project. The work plan for each project shall specify the critical work sequence. Tank isolation and content removal are generally performed first in the sequence of work operations.

4.11.1. Tank Excavation Checklist

Before any work, the “Tank Excavation Checklist” (Figure 1) shall be completed.

4.11.2. Tank Isolation

Prior to tank excavation, piping and electrical lines shall be disconnected and locked out as specified in HSEP 15.1.

4.11.3. Contents and Pipe Removal

The product contained in the tank shall be pumped out or otherwise drained from the tank prior to tank excavation.

The tank piping shall be completely uncovered and flushed, generally with a detergent and warm water rinse or other mixture, as outlined in the work plan, before it is disconnected from the tank and dispensers (if present). The piping can be removed from its trench, but should remain on site for inspection, if required.

The pipe trench should remain intact and otherwise undisturbed for inspection and soil sampling as required. If piping has not been sufficiently cleaned, it may require disposal as a hazardous waste, as applicable.

The vent line shall remain intact until inerting or purging is completed.

It should be noted that many spills of tank materials have occurred as piping is disconnected. For this reason, catch basins and plastic sheeting or other suitable secondary containment methods must be used to minimize spills.

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Low spots in the piping often hold a considerable amount of liquid and care shall be taken to completely empty the piping contents during removal.

Piping should be wrapped in plastic and placed inside or transported along with the removed tank.

After removing the tank contents and flushing the interior clean, some agencies may require the tank to be certified as clean by a licensed Marine Chemist.

4.12. Excavation and Backfill

Following isolation and product removal, the UST shall be carefully excavated. Typically, several soil samples will be collected at various depths beneath the tank to confirm that leakage has not occurred. Soil excavation and soil samples may be required for any area that shows signs of discoloration.

The work permit should specify some maximum amount of soil to be removed if suspected contamination is found. Local agencies may provide guidance as to how much soil they consider to be part of a routine UST removal. If the UST is known to be leaking, or if extensive subsurface contamination is found, then long-term remediation of the site may be required.

Once regulatory agencies approval has been received that the site is clean, the excavation shall be backfilled with clean fill material. Compaction of fill shall be in accordance with the project specifications.

4.13. Stockpile Management

Soil spoils from the excavation of tank, especially from the sides and bottom of the tank, may be contaminated with hazardous materials if leaks or spills have occurred in the vicinity of the tank. For this reason, the spoils from these areas of the tank shall be stored on plastic sheeting and covered with plastic or another suitable method of vapor control shall be used.

All spoils shall be kept a minimum of two feet from the excavation walls. Access to known or suspected contaminant materials must be carefully controlled.

4.14. Purging and Inerting

These methods are generally required by local codes to minimize the chance of fire or explosion when dealing with USTs. Both of these methods result in the venting of flammable vapors from the involved UST. For this reason, a vent stack shall be used to exhaust vapors at a minimum height of 12 feet above grade and 3 feet above any adjacent rooflines.

However, some air quality control agencies require a permit for this activity and they do not allow venting to atmosphere. Instead, ventilation is provided by an internal combustion engine with its air intake maintaining a negative pressure inside the tank. Any hydrocarbon emissions emitted by the tank are then combusted in the engine.

The work and venting area shall be kept free of ignition sources. Monitoring instruments shall be used to verify that the tank atmosphere is kept below 10% of the LEL or, when atmosphere inertion is used, below 5% oxygen by volume.

4.14.1. Purging

Flammable vapors shall be removed from the UST by purging or inerting. Purging shall be carried out as specified in API Publication 1604. Generally, mechanical ventilation is used to accomplish this task.

Purging is the preferred method for vapor-freeing the tank when personnel entry may be required. Purging shall be continued until the tank atmosphere is maintained at less than 1% of the LEL, but varies with the tank's last contents. In the case of gasoline, the LEL is 13,000 ppm, so 1% relates to approximately 130 ppm. Some of the constituents of gasoline have PELs less than 130 ppm, therefore additional purging or other forms of gas-freeing will be necessary before personnel entry. Coordinate such plans with an industrial hygienist and follow confined space entry requirements.

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4.14.2. Inerting

Inerting is the preferred method of removing explosive vapors from a tank if work operations will not involve personnel entry. An inert gas such as nitrogen (N_2) or carbon dioxide (CO_2) is introduced as specified in API Publication 1604.

Solid CO_2 (dry ice) can also be used by adding 15 pounds of crushed material for each 1,000 gallons of tank capacity (see API 1604). The hazards associated with handling dry ice shall be addressed in the HSP.

When inerting is used, oxygen levels shall be maintained to below 5% by volume.

4.15. Extraction and Disposal

The tank shall be carefully lifted, visually inspected for signs of leakage, and moved to a tank staging/cleaning area or loaded on a transport vehicle with its openings at the top. The staging area shall be covered with plastic in order to minimize secondary spills of tank contents.

Tanks should not be punctured or crushed during removal. Tanks that are to be staged shall be adequately blocked to prevent movement.

Following tank removal, sampling of the soil below the tank is usually required. The excavation shall be sloped, shored, or shielded and provided with exit ladders if personnel are required to enter the excavation.

It is generally better to use a hand auger and extension or a backhoe to obtain samples and thus minimize exposure of workers to the hazards of the excavation.

Prior to removal from the site a warning label shall be painted on each tank warning against certain types of reuse. API Publication 1604 shall be consulted for the requirements of warning labels.

Tank contents including sludge, cleaning solutions, and adjacent soils may be considered to be hazardous waste. A project specific waste disposal plan shall be developed and followed for dealing with waste generation. These materials shall not be disposed of until lab results are available. The Site Manager shall maintain chains of custody for samples, which are sent to the laboratory for analysis.

Tank disposal shall be documented with the use of the “Certificate of Disposal”, Figure 3, or via equivalent documentation provided by the subcontractor. Documents shall be retained with the project file.

4.16. Tank Transport

Following removal, tanks are generally transported to a disposal site or a metal recycling yard. The tank shall be secured to the transport truck or trailer with suitable strength chains or other tie downs to minimize tank movement.

All tank openings with the exception of a single vent (⅛ in. minimum) should be plugged or capped. If applicable, the tank shall be placarded and/or manifested in accordance with DOT and EPA regulations and other local requirements.

Other aspects of tank transport shall also comply with state and local requirements for road transportation.

4.17. Cleaning and Access

Depending upon local requirements, tank cleaning may be required prior to removal from the ground or following removal but prior to being transported from the site. Cleaning procedures shall be listed in the work plan and designed to remove product and residues from the tank, so that the tank can be disposed of as scrap material and/or transported from the site safely.

Generally, tank cleaning will involve triple rinsing the tank interior. In some cases, however, tank cleaning may not be required and the tank and its contents can be transported and disposed of as hazardous waste.

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Whenever possible, the tank should be cleaned from the outside without requiring personnel entry into the tank for cleaning. If this is not possible, the tank shall be cleaned to the greatest extent possible from the outside and then ventilated prior to personnel entry.

Permit confined space entry procedures shall be followed for all personnel entries. It should be noted that OSHA requires a permit if any part of the affected workers body must break the plane of entry. (See HSEP 7.2.)

The hazards and controls associated with tank cleaning must be identified in advance by project personnel and included in the HSP.

Tank openings may be required to permit access for tank cleaning. The number and location of access openings will be dependent upon the size of the tank access/egress required, and other factors. Access openings on tanks that require personnel entry shall be made as large as possible, however, the minimum dimensions shall be two ft. by two ft.

Tank cutting shall be done with cold cutting or pneumatic techniques unless hot techniques have been approved by HSE personnel. Both methods require that the tank atmosphere contain less than 10% of the LEL and less than 5% oxygen.

Careful purging, inertion, and monitoring of the tank atmosphere are required prior to and during cutting operations. If hot work is allowed, care shall be taken not to ignite any tank coatings or sludge, which may be present on the tank walls.

4.18. Tank Cleaning Certification

Cleaning operations shall be documented on a “Certificate of Cleanliness” , see Figure 2. Documentation shall be kept in the project file.

4.19. Emergency and Contingency

A project specific emergency and contingency plan shall be included in the HSP. The plan shall address potential emergencies and contingency procedures.

5.0 RELATED DOCUMENTS AND REFERENCES

American Petroleum Institute (API), “Safe Entry and Cleaning of Petroleum Storage Tanks,” Standard 2015, May 1994, API Washington D.C. 202-682-8375.

API, “Removal and Disposal of Used Underground Petroleum Storage Tanks,” Standard 1604, Second Edition, Dec. 1987, Amended 1988, API Washington D.C. 202-682-8375.

U.S. Army Corps of Engineers, Safety and Health Requirements Manual, October 1992.

6.0 FIGURES

Tank Excavation Checklist

Certificate of Cleanliness

Certificate of Tank Disposal

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Figure 1

Tank Excavation Checklist

Project Number _____

Location _____

Company Representative (competent person)_____

Subcontractor _____

Tank No. _____Date Installed _____ Capacity _____ Contents _____

Tank Material _____Estimated Weight _____

Construction _____

Dates of Removal: Begin _____End _____

Weather _____

Background Monitoring Levels: HN_u _____O_2 _____Explosimeter _____Hazmat Level A B C D _____

Instrument I.D. No. _____HN_u _____O_2/Explosimeter _____

UST Surface Covers Asphalt, Concrete, Grass, Soil, Gravel, Other _____

Tank Emptied _____ Liquid Disposal Site _____

Tank Contents Characterization_____

Hazard Precautions_____

Tank Cleaning Procedure _____

_____

_____

O_2 Reading Prior to Cleaning _____Post Cleaning _____

Explosimeter Reading _Prior to Cleaning:_____Post Cleaning: _____

Purging Procedure _____

_____

Inerting Procedure _____

Post Inerting O_2 Reading: _____Plastic Pad for Excavated Material: Yes ___ No _____

Post Inerting LEL Reading _____

Piping Removal _____

_____

Piping Condition _____

Confined Space Permits Required? _____

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LO/TO Required: _____ LO/TO Verified?: _____

Spill Containment Preparations in Place?_____

Tank Condition _____

_____

_____

_____

Spoils Pile Observation _____

_____

_____

_____

Sample #	Location (Piping/Tank)	Date	Time	Headspace Reading	Time

Type of Lift _____ Critical Lift Plan Attached? Yes _____ No _____

Tank Lifting Eyes or Lugs Inspected? Yes _____ No _____ Subcontractor Initial _____

Yes _____ No _____ Site Super Initial _____

Lift Rigging _____

_____

Rigging Inspected? Yes _____ No _____ Subcontractor Initial _____

Yes _____ No _____ Site Superintendent Initial _____

Work Load Verified? Yes _____ No _____ Subcontractor Initial _____

Yes _____ No _____ Site Superintendent Initial _____

Lift Equipment: _____

_____

Utility Clearance Obtained? Yes _____ No _____ Subcontractor Initial _____
(Buried & Overhead)

Yes _____ No _____ Site Superintendent Initial _____

Lift Equipment Inspected? Yes _____ No _____ Subcontractor Initial _____

Yes _____ No _____ Site Superintendent Initial _____

Lift Capacity Verified? Yes _____ No _____ Subcontractor Initial _____

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Yes _____ No _____ Site Superintendent Initial _____

Lift Area Defined? Yes _____ No _____ Subcontractor Initial _____

Yes _____ No _____ Site Superintendent Initial _____

Lift Area Cleared? Yes _____ No _____ Subcontractor Initial _____

Yes _____ No _____ Site Superintendent Initial _____

Proceed With Lift _____ Date _____
(Site Supervisor to Sign)

Time of Lift Start _____ Finish _____

Security and Safety Fence in Place? _____

Backfill Procedure/Date _____

Amount of Backfill Material/Observations _____

_____

Compaction Tests/Dates _____

_____

Photographs _____

Health and Safety Issues _____

_____

Date Tank Removed From Site _____

Tank Labels Required/Affixed _____

Explosimeter Reading Prior to Offsite Removal _____

Surface Report/Date/Procedure _____

_____

Site Secured/Return to Original Condition/Date _____

Site Manager _____ Date _____

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Figure 2

Certificate of Cleanliness

Job Number: _____ **UT Number:** _____

This is to certify that the tank described below has been cleaned by the method described below and is suitable for recycling and/or disposal as scrap metal.

1. TANK DESCRIPTION

Manufacturer I.D. or Serial No.: _____

Tank Size: _____ Gallons Material of Construction: _____

Tank Length: _____ Tank Diameter: _____

Last Known Product: _____

Tank Owner: _____

2. TANK CLEANING PROCEDURE — Check all that apply

- ☐ Contents Pumped Out
- ☐ Manual Scraping or Cleaning
- ☐ High Pressure Wash
- ☐ Steam
- ☐ Degreaser High Pressure Wash
- ☐ Tank Degreasing (<10% LEL)
- ☐ Visual Inspection
- ☐ Other

3. CERTIFICATION

I certify that I have personally cleaned or supervised the cleaning of the tank described above, per the criteria established in the current API publication number 2015 and that the tank described above is suitable for recycling as scrap metal or disposal in a sanitary landfill as special waste.

_____
Name

_____
Signature

_____
Address

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Figure 3

Certificate of Tank Disposal

Job Number: _____ UT Number: _____

This is to certify that the tank described below has been disposed of by the method described below and is not being re-used as a tank.

1. TANK DESCRIPTION

Manufacturer I.D. or Serial No.: _____

Tank Size: _____ Gallons Material of Construction: _____

Tank Length: _____ Tank Diameter: _____

Last Known Product: _____

Tank Owner: _____

2. STEEL TANK DISPOSAL METHOD

_____ Scrap Steel _____Cut into Quarters _____ Cut in Half

I/we certify that I/we have accepted the above-described steel tank, and that the tank will be further cut up and recycled or sold for meltdown stock only.

3. FIBERGLASS TANK DISPOSAL METHOD

_____ Crushed _____Disposed at Permitted Landfill

4. CERTIFICATION

I/we certify that I/we have accepted the above-described fiberglass tank for disposal in our permitted landfill.

_____
Acceptance Date

_____
Name of Disposal Company

_____
Destruction Date
(if available)

_____
Authorized Signature

_____
Address

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JACOBS

HSE Procedure		Document No: HSEP 8.8	Page: 1 of 9
Oxy-Fuel Cutting and Gas Welding and Electric Arc Welding		Supersedes: HSEP 8.8	Revision: 4 Issue Date: 15 Oct 08
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1.0 PURPOSE AND SCOPE

There are a number of inherent hazards involved with oxy-fuel cutting, heating, and welding operations. Proper safety procedures must be understood prior to the use of such equipment.

This HSEP applies to Jacobs employees and subcontractors engaged in operations covered by the company HSE program. Adherence to this HSEP will help to minimize hazards related to oxy-fuel cutting, heating, or welding activities and injuries or illnesses related to such activities.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

Acetylene	A gas at room temperature composed of two carbon atoms and two hydrogen atoms. Acetylene is stored in special cylinders, which have porous filler and are saturated with acetone. Acetylene gas becomes unstable when compressed above 15 psig.
Adequate Ventilation	Ventilation sufficient to assure that personnel exposure to concentrations of airborne contaminates are maintained below the allowable levels (TLVs and PELs) in accordance with the Company Respiratory Protection Program and

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	other Company procedures and governmental regulations.
Backfire	An explosion confined in the torch head and usually accompanied by a popping sound. It generally occurs when the heating tip is too close to the work. Loose connections, leaking hose, incorrect gas pressures, or anything that causes oxy-fuel gas starvation at the tip can cause a backfire.
Check Valve	A device to reduce the possibility of reverse flow of gases. Check valves are not intended to act as a fire stop.
Cracking the Cylinder Valve	Momentarily opening and closing the cylinder valve to dislodge any loose contaminant or debris that might be present.
Flashback	An explosion that progresses through the torch and gas supply equipment. It usually is accompanied by a whistling sound when gases mix and burn inside the torch head. Flashbacks can travel extremely fast, actually getting past a check valve. If this occurs, immediately close the oxygen torch valve.
Flashback Arrestor	A device designed to prevent a flashback from reaching upstream equipment and causing a fire or explosion. They are usually installed in the oxygen and fuel systems between the torch and hose.
Fume Plume	A clearly visible column of fume, which rises directly from the spot of welding or cutting. Avoid breathing metal fumes produced from molten metal.
MAPP Gas	A propane and acetylene blend, which serves as an alternative fuel gas, that can be used for the same operations as acetylene but it is more stable.
Mechanical Ventilation	Air movement, general area exhaust, local force, local capture, dilution ventilation, and local exhaust air movement achieved through use of mechanical systems.
Metal Fume Fever	Certain alloys and metals containing zinc compounds can produce symptoms of nausea, dizziness, or fever. Exposure to such contaminants should be prevented through the use of engineering controls, ventilation, or respiratory protection.
Natural Ventilation	Movement of air by natural means, e.g., not artificial or manufactured.
Propane	A flammable fuel gas that, in some cases, may be used as a fuel gas for cutting, welding, and burning operations, similar in use to acetylene.
Reverse Flow	Reverse flow of fuel gas can occur when the oxygen cylinder is low or empty. Fuel gas at a higher pressure than the oxygen can travel back through the oxygen equipment to mix with gas in the hose, regulator, and possibly the cylinder.
Rosebud	An oxy/gas fueled multi-port heating tip for heavy heating processes.
Ultraviolet Radiation	Injurious light radiation produced during arc welding, inert gas arc welding, or arc gouging and cutting that should be avoided by wearing clothing to protect the skin and the correct shade filter lenses for eye protection.

4.0 PROCEDURE

4.1. Protective Clothing

Employees shall protect themselves from sparks, flying slag, and bright flames at all times. Protective sleeves, aprons, and shoes should be worn to protect skin and clothing from sparks and slag. Keep all clothing and protective apparel free of oil and grease.

Adjust clothing where necessary to keep out flying sparks and slag. Sparks may lodge in rolled-up sleeves, in pockets of clothing, or in cuffs of trousers. Keep sleeves and collars buttoned when necessary to keep sparks and slag out. Low shoes with unprotected tops are not suitable

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for work where there is possibility of sparks or slag entering shoes. Clothing with synthetic fibers should not be worn unless it is fire resistant.

4.2. Protective Gloves

Torch operators and any helpers or employees in close proximity, who may be exposed to hot metal or slag during oxy-fuel cutting, heating, and welding operations, must wear suitable protective gloves to protect from heat, sparks, etc.

4.3. Ear Protection

Earmuffs or plugs, to prevent sparks from entering the ear canal, should be worn when overhead work is necessary or when circumstances require an employee to lie on his/her side or back.

4.4. Eye and Face Protection

Refer also to HSEP 13.6, Eye and Face Protection.

Approved burning goggles with flip up or burning shield (designed to meet ANSI Z-87.1 specifications in USA) shall be worn to provide employee protection from injurious light radiation. A number 5 lens shade is considered adequate for routine torch cutting activities. For arc welding activities, use a welding hood with a filter lens for protection from flash burns to the eyes and flying objects. Refer to HSEP 13.6 for additional information related to eye protection and selection guide for filter shades.

Safety glasses are to be worn under burning and welding shields and hoods. Weld hoods and burning goggles with flip-up dark lens and protective cover lens are recommended to give burner or welder additional face and eye protection during de-slagging and grinding operations.

4.5. Equipment Inspection

All oxy-fuel cutting, heating, and welding equipment shall be kept clean, in good repair, and must be inspected by the user prior to each use.

Any tools or equipment found to be defective shall not be used. Defective tools and equipment must immediately be properly repaired, replaced, or returned to the tool room or supervisor.

Inspect hoses carefully at least once every shift for leaks, wear, and loose connections.

Whenever a leak is suspected, and each time before equipment is pressurize, turn the cylinder valves to the on position and then back to the off position. Look for pressure loss on the high pressure gauge. If a leak is detected, locate the leak source and make necessary repairs.

4.6. Cylinder Use and Handling

Keep all gas cylinders in their upright position.

Secure cylinders to prevent falling.

Do not place cylinders beneath work, where sparks or slag could fall on top of them.

Cylinders shall not be hoisted using a sling or electric magnet.

Cylinders shall not be lifted by the valve protection cap.

Do not remove cylinders by their valves or use them for any purpose for which they were not designed.

Never use cylinders as rollers or supports.

Do not drop cylinders or handle them roughly.

Cylinders should not be taken into confined spaces.

When cylinders are transported by powered vehicles, they shall be secured in the vertical position.

Never allow cylinders to come contact live wires, third rails, or ground wires from electrical equipment.

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Slings or electric magnets shall not be used to move or lift cylinders.

When cylinders are to be transported on a cart built specifically for that purpose, they may be moved with the regulators installed provided the cylinder valve is closed during transport.

Always stand acetylene cylinders with valve end up. Acetylene cylinders should not be allowed to lie on their sides while being used or when in storage. When acetylene cylinders are carried in a horizontal position, they should be kept up right for 30 minutes prior to use to allow the acetone to stabilize within the cylinder.

Valve protection caps must be fitted when transporting cylinders.

Never tamper with fusible plugs. The fusible safety plugs, with which all acetylene cylinders are provided, act as safety releases when the cylinder is exposed to excessive temperatures. They melt at about the temperature of boiling water and release acetylene from the cylinder.

For liquid cylinders, the ring at the top of the liquid cylinder is designed to protect the plumbing and should not be used to handle or lift the liquid cylinder. Obtain proper lifting device from vender.

Do not use acetylene at operating pressures above 15 psig. This is the maximum working pressure allowed. Acetylene gas becomes unstable above 15 psig.

Do not allow an oxygen cylinder's pressure to fall below 25 to 50 psig. If the oxygen cylinder becomes empty, it will loose its positive pressure, and fuel gas may enter the oxygen equipment, which has the potential to produce an explosion.

4.7. Cylinder Storage

Cylinders may only be stored in defined locations.

Cylinders must be stored in a vertical (upright and valve end up) position.

Cylinders must be secured from falling, being knocked over, or damaged by passing or falling objects.

Cylinders shall be kept away from radiators, stoves, furnaces, or other sources of heat.

Empty cylinders, cylinders not in use, or cylinders in storage shall have their valves closed.

Valve protection caps shall always be in place and hand tight, except when cylinders are in use or connected for use.

Stored oxygen and fuel cylinders—full or empty—shall be separated by a minimum distance of 20 feet or by a 5' high non-combustible firewall with a rating of at least ½ hour fire rating.

Oxygen cylinders shall not be stored near highly combustible material, including oil and grease or any other substance where oxygen is likely to cause or accelerate a fire.

Inside of buildings, cylinders shall be stored in well-protected, well-ventilated, dry locations, at least 20' from highly combustible materials. No more than 2,000 cubic feet or 300 pounds of fuel gas may be stored inside a building.

Where cylinders are stored in the open, they should be protected from hot work operations and accumulations of ice and snow, from direct sun, and from localities where extreme temperatures prevail.

Refer also to HSEP 16.1, Compressed Gas Cylinder Storage.

4.8. Cylinder Valves

For cylinders without permanently attached valve handles always use special T-wrench or key for opening or closing the cylinder valve if equipped and keep wrenches used to open valves of gas cylinders in place.

Do not use a hammer or non-standard valve wrench to open oxygen or fuel gas cylinder valves.

Close the valve of the oxygen/fuel gas cylinder and release all pressure from the regulator before removing the regulator.

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Always close cylinder valves when work is finished.

Always close valves of empty cylinders, while in storage prior to return to the supplier.

Do not store tools or clothing atop any cylinder. Such can interfere with quick closure of the valve and can damage the fusible safety plugs. Never let this recessed top become filled with water when using the cylinder.

When opening a cylinder valve, the operator should stand “behind” the cylinder with the cylinder valve facing away from the operator.

For non-fuel gas cylinders, e. g., oxygen, the cylinder valve should be opened fully. Failure to open the valve completely may cause leaks around the valve packing because of the design of the valve.

For fuel gas cylinders (example: acetylene, MAPP Gas, Propane) open the valve approximately ¾ turn. Under no circumstances may the valve be opened more than 1 ½ turns. This is to allow for rapid closing should an emergency situation occur.

4.9. Regulators

Regulators shall be removed and valve protection caps shall be put in place hand tight when cylinders are not in use or when they are being transported.

Before attaching a pressure-reducing regulator, open the cylinder valve slightly at first to dislodge and blow out any debris that may be in the valve. Then turn the adjusting screw on the regulator counterclockwise to relieve pressure on the diaphragm. Next, attach gauges and open the cylinder valve slowly. If high pressure is released suddenly, it can damage the regulator and its pressure gauges. Stand to one side of the regulator front (gauge face) when opening the cylinder valve.

Set the regulators to the desired pressure and check the system for leaks. A “Quick” test of the gas system can be performed once the hoses and torch have been hooked up by closing the cylinder valves after pressurizing the system and observing the time required for the system to loose pressure. If you see the pressure regulators loose pressure, it indicates a leak. To completely test a system or isolate leaks, leak test solution should be used. Acetylene must never be operated at pressures greater than 15 psig.

Never adapt a regulator to a cylinder. If the fittings do not match, there is a reason and you either have the wrong cylinder or gas, or you have the wrong regulator.

4.10. Grease and Oil Hazards

Keep oxygen cylinders and fittings away from oil or grease. Oil or grease may ignite violently in presence of oxygen under pressure.

Keep oily or greasy substances must be away from cylinders, cylinder valves, couplings, regulators, hose, and apparatus.

Do not handle oxygen cylinders or related apparatus with oily hands or gloves.

Oxygen cylinders should not be handled on the same platform with oil or be placed in a position where oil or grease from overhead cranes or belts may fall upon them.

A jet of oxygen should never strike an oily surface, greasy clothes, or enter a fuel oil or storage tank that has contained flammable substances.

Never tamper with or attempt to repair oxygen cylinder valves. If trouble is experienced, notify the supplier.

Serious injury may easily result if oxygen is used as substitute for compressed air. Never use oxygen:

- In pneumatic tools
- In oil pre-heating burners
- To start internal combustion engines

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- To blow out pipelines
- To dust off clothing or work area
- To create pressure
- For ventilation
- To supply breathing air equipment

4.11. Oxy-Fuel Torches

Torches must be lit with a friction lighter or other approved device and not by matches, cigarette lighters, or from hot work.

As a minimum, flashback arrestors must be an integral part of the torch or be connected between both oxygen and fuel hose connections at the torch. When using a rosebud or very large cutting tip, it may be necessary to remove the flashback arrestor because of flow restrictions. Check manufacturer recommendations.

Reverse flow check valves should be attached to the outlet of both regulators.

When lighting a torch,

- Close the oxygen valve and purge the torch by depressing the handle;
- Open the acetylene (or other fuel gas) valve at the torch;
- Hold the torch facing away from the user and any flammable, combustible, and/or oxidizer, and depress the handle while placing the striker at the torch tip;
- Never light a torch while oxygen is being supplied to the torch;
- Once the fuel gas is lit, the oxygen valve can be open and correct flame can obtained by adjusting the mixing valve on the torch.

Remove torches and hoses from confined spaces when burning or heating operations are completed, during lunch, or at end of shift.

4.12. Hoses

Use only hoses and connections made especially for oxy-acetylene welding and cutting with ends firmly crimped to nipples.

Examine hoses carefully at least once every shift for leaks, wear, and loose connections.

Each time a cylinder valve is opened to pressurize a hose, immediately close the cylinder valve and observe the high pressure gauge to detect pressure loss. If pressure loss is detected, locate the leak source and make necessary and approved repairs.

Leaks in the hose at the nipple connection should be repaired at once by cutting off the hose a few inches from the end and remaking the connection. Leaks at other locations should be repaired by cutting off the damaged section and inserting a hose coupling as a splice.

Never repair a hose with tape. When hoses are taped together for convenience and to prevent tangling, not more than four out of 12 inches shall be covered by tape.

Do not use white lead, oil, grease, or other pipe fitting compounds for making joints.

Should a flashback occur, immediately turn off the oxygen and fuel gas valve at the torch and at the cylinders. If the hose is burned, discard that length of hose. Tag the torch out of service and have the torch inspected by a competent person prior to reuse.

Purge hose lines individually **every time** before lighting the torch. This will ensure that no oxy-fuel gas mixture is present in the hoses, which could cause an explosion.

Always protect hoses from damage or interference. Protect hoses from being trampled or run over.

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Avoid tangles and kinks. Place hoses so they will not be tripped over. Connections might be pulled off or the cylinders and equipment might be pulled over by a sudden strong tug on the hose.

Do not allow hoses to contact oil or grease.

Do not store hoses, regulators, or torches in gang boxes or storage bins where there is a potential for contact with oils, solvents or other flammable and combustible materials. These deteriorate the rubber and constitute a hazard with oxygen.

Protect hoses from flying sparks, hot slag, or other hot objects and open flames.

4.13. Procedure for Electric ARC Welding

Do not stand in water when using an arc-welder. As necessary, stand on a dry platform made of wood or other non-conductive material. Refer to HSEP 19.2, Electrical Grounding, for information regarding grounding of welding machines.

Do not dip electrode holders in water to cool them.

Keep your body insulated from the work and the electrode holder during welding operations.

Welder's helpers must wear filter lenses of the same grade as the welder.

Welders must wear safety glasses with side shields under their welding hood.

Only fully insulated electrode holders specifically designed for welding shall be used.

Electrodes or electrode stubs shall be removed from the electrode holder if left unattended. Unattended shall be defined as the welder being greater than four feet from the holder. The electrode on GTAW torches shall be trimmed back to the contact tip or removed when the gun is not in use or unattended.

Weld leads and electrode holders shall be places so that they cannot make electrical contact with persons, flammable liquids, or compressed gas cylinders.

There shall be a minimum of ten feet of unrepaired cables from the electrode holder to the first splice or connection.

4.14. General Precautions for Burners and Welders

Inspect all tools and equipment prior to their use. Worn or damaged hoses, welding leads, and other equipment with defects that might affect safe operation must be repaired prior to use or discarded.

Inspect the work area for flammable materials and move other personnel that are in the line of fire from the hot work operation.

Cutting and welding should only be performed in areas, which are designated or prepared to minimize fire risk. All movable fire hazards should be moved to a safe location of at least fifty feet from where hot work is to be performed. If it is not practical to remove fire hazards, then guards shall be used to confine the heat, sparks, and slag produced by hot work operations to protect the immovable fire hazards.

If the object to be welded or cut cannot readily be moved, all moveable fire hazards should be removed.

If the object to be welded or cut cannot be moved and if all the fire hazards cannot be removed, then guards shall be used to confine the heat, sparks, and slag, and to protect the immovable fire hazards.

For high hazard areas, the supervisor shall inspect the area. The supervisor shall also assure existence of adequate procedures (SPAs, etc.), permits, adequate protection, presence of fire extinguishing equipment, and presence of fire watch.

A trained fire watch shall be posted during the hot work operations and until at least ½ hour after completion of hot work. It may be necessary to wet-down areas of combustible ground cover,

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such as grass, shrubs, scaffold boards, etc., with water or to take other precautions prior to and during hot work.

Each welder or cutter should have at least one 10-pound, all-purpose (A, B, C) dry powder fire extinguisher at the spot where welding or cutting is being performed.

Ultraviolet light produced by cutting and arc-welding operations can create poisonous gasses in the presence of chlorinated solvents. Do not use chlorinated solvents in areas where cutting and welding is taking place.

Do not weld, cut, or grind drums, containers, piping, or hollow structures, which have contained toxic or flammable substance until they have been thoroughly cleaned or purged and tested with an oxygen/explosion (combustible gas) meter.

Welding, cutting, or grinding has the potential to create a hazardous atmosphere in the breathing zone of affected employees. If there is not adequate ventilation (natural or mechanical) or if the welder or burner cannot remove his/her head from the fume plume, he/she should wear an approved (NIOSH in USA) air-purifying respirator to protect against metal fumes.

Employees **must** wear an approved (NIOSH-approved in USA) air-purifying respirator to protect against metal fumes when welding, cutting, or grinding:

- Zinc metal and galvanized steel,
- Metal coated with lead or lead-based paint,
- Metal containing mercury, cadmium, chrome, or nickel, and
- Hard facing with manganese.

Always wear face shield with safety glasses or goggles when chipping or grinding.

Workers should avoid grinding overhead and in positions with little room between the grinder and body.

4.15. Personal Air Monitoring

Conduct regular tests to assure

- That oxygen concentrations remain between 19.5% and 23.5%,
- That combustible concentrations do not exceed 1% of the LEL, and
- That concentrations of toxics do not exceed TLVs or PELs.

To evaluate worker exposures to toxic metals, work tasks shall be evaluated to characterize personal exposures. For guidance, refer to

- HSEP 9.3, Hexavalent Chromium Exposure Protection - US Operations,
- HSEP 9.4, Lead Exposure Protection, and
- HSEP 12.2, Personal Air Monitoring.

Special attention should be given to potentially high hazard conditions, which include, for example:

- welding shield gases or burning gases in low areas, such as ditches, shallow trenches, excavations, etc.;
- in confined spaces, such as vessels, large pipes, exchangers;
- trenches of five-foot or greater depth; or
- tunnels.

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4.16. Fire Watchers

Fire watchers are required whenever welding or cutting is performed in locations where other than a minor fire might develop, or any of the following conditions exist:

- Appreciable combustible material, in building construction or contents, closer than 35 feet to the point of operation.
- Appreciable combustibles are more than 35 feet away but are easily ignited by sparks.
- Wall or floor openings within a 35-foot radius expose combustible material in adjacent areas including concealed spaces in walls or floors.
- Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation.

4.17. Environmental

Metal fumes from welding may need to be vented to a control device (fume filter) depending on the type of material being welded and the type of welding rod being used. Check the local regulations for specific requirements.

Some air quality control district agencies may require the number and type of welding rods used to be monitored and reported for compliance purposes.

4.18. Training

All Employees using oxy-fuel cutting, heating, or welding equipment shall be instructed in the proper use of equipment and the safety requirements outlined in this work instruction.

5.0 REFERENCES

29 CFR 1910.251 – 253, Oxy-Fuel Gas Welding and Cutting

29 CFR 1926.350, Gas Welding and Cutting

HSEP 13.6, Eye and Face Protection

HSEP 16.1, Compressed Gas Cylinder Storage

HSEP 19.2, Electrical Grounding

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HSE Procedure		Document No: HSEP 8.9	Page: 1 of 6
Drilling in VOC Contaminated Soil		Supersedes: HSEP 8.9	Revision: 3 Issue Date: 29 Jul 05
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PURPOSE AND SCOPE

This HSEP describes the process and equipment that should be used to monitor and control flammable atmospheres, which may develop during drilling operations. Explosive conditions may occur when drilling into an unsaturated soil area (vadose zone), which has become contaminated with volatile flammable materials.

When drilling in areas of suspected or known contamination, the use of Hollow Stem Auger (HSA) drilling equipment tends to enhance by soil aeration the possibility of flammable conditions within and around the immediate vicinity of the borehole. Flammable conditions may develop because augering creates a pathway for vapors to vent into the atmosphere.

This procedure applies to Company and Company subcontractor drilling operations and to the personnel who are involved in these operations. This procedure primarily addresses the use of HSA drilling methods. If alternate drilling methods are used, however, similar methods of monitoring and control shall be used.

RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

DEFINITIONS

Combustible Gas Indicator (CGI)	Refers to an instrument that is used for the measurement of airborne concentrations of flammable gases or vapors. These instruments provide percent of the lower explosive level (LEL). Such instruments usually also have the ability to measure the percent oxygen of the sampled atmosphere.
Explosive/Flammable Atmosphere	Refers to an atmospheric condition in which flammable vapors (such as fuel vapors) and oxygen are present in proportions that enable a fire or explosion to occur if the atmosphere is exposed to an ignition source.

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Ignition Source	Is any open flame, spark, or other condition which is capable of igniting a flammable material or atmosphere.
Inerting	Is a means of reducing the hazard of an explosive atmosphere by injecting an inert gas to displace the oxygen that is required to support combustion.
Lower Explosive Level (LEL) or Lower Flammable Level (LFL)	Refers to the lowest concentration of a material, which can be ignited in the presence of an ignition source. It is expressed in percent (by volume) of vapor or gas in the air. At air concentrations below the LEL or LFL, the air contaminant mixture is too “lean” to support combustion.
Upper Explosive Level (UEL) or Upper Flammable Level (UFL)	Refers to the highest concentration of a substance, which will burn or explode when an ignition source is present. It is expressed in percent (by volume) of vapor or gas in the air. Above the UEL or UEL, the mixture is too “rich” to support combustion.
HSA	Refers to hollow stem auger drilling equipment.
VOC	Refers to volatile organic compounds.

PROCEDURE

Drilling operations in VOC contaminated soils may generate flammable or explosive conditions in the immediate vicinity of the borehole and drill rig. Flammable vapors are liberated as the soil is disturbed by the action of HSA drilling and as cuttings are brought to the ground surface.

These atmospheric conditions can be a hazard, especially if exposed to an ignition source, such as spark caused by the drill bit encountering a rock or during welding operations.

The explosive atmosphere can be controlled by inerting, which is essentially the displacement of atmospheric oxygen, with nitrogen (N_2) or carbon dioxide (CO_2). Nitrogen is preferred in many instances, in part, because it is less likely to impact the sample quality when soil or soil gas samples are being collected. Nitrogen can poison the oxygen sensor.

1.1. Atmospheric Monitoring

When drilling in areas of real or potential VOC contamination, atmospheric monitoring for flammable gases shall be conducted on a continual basis.

If monitoring reveals the presence of combustible gases in excess of the action level, then the procedures outlined in the paragraph entitled “Controlling Explosive Atmospheres” shall be followed.

1.2. Monitoring Instrument and Calibration

The wellhead space shall be monitored with a combustible gas indicator (CGI) that is equipped with an oxygen sensor. Records shall be made of monitoring results.

Project personnel shall use a CGI/O_2 instrument that has been calibrated with pentane or hexane by following the manufacturer’s recommendations. Methane-calibrated instruments shall not be used for fuel or other VOC contaminated areas. Methane-calibrated instruments may not respond properly when used to detect fuels or other VOCs and may give unreliable readings.

1.3. Action Levels

Combustible gas concentrations of 10% of the LEL or greater require termination of drilling activities. The well shall be considered flammable, and the inerting procedures in the paragraph entitled “Controlling Explosive Atmospheres” shall be followed to minimize the possibility of a fire or explosion.

1.4. HSA Operations

Monitoring will be conducted at five-foot depth intervals or whenever an auger flight is added during hollow stem auger drilling. After the drill stem is disconnected, measurements shall be made 5 to 10 feet below ground surface and continue at 20 feet intervals until 5% of the LEL or less is reached.

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A sample line equipped with a weighted probe (brass or plastic) is recommended for CGI monitoring. Many instruments have a maximum capacity of less than 100' from which a sample can be drawn.

1.5. Controlling Explosive Atmospheres

In order to minimize the possibility of fire or explosion, boreholes or wells that exceed the action level of 10% of the LEL must be inerted. This process involves the introduction of nitrogen to displace the oxygen, which is required to support combustion. Monitoring with the CGI/O_2 monitor shall be continued during inerting activities in order to assess the progress of the operation. The steps outlined below shall be followed for borehole or well inertion.

Figure 1 contains a "Sample Equipment and Material List" of the required equipment for well inertion. Documentation shall be kept of well inerting activities.

Figure 2, Health & Safety Air Monitoring, is a direct-reading instrument form, which shall be used to make a permanent record of inerting operations. The inert gas flushing of the well can be expected to displace flammable vapors from the well. Sources of ignition in the vicinity of the borehole must be eliminated. All non-explosion-proof equipment in the vicinity of the borehole shall be turned off and or moved from the area. Smoking or other ignition sources shall be prohibited.

Secure the N_2 cylinder to a stable vertical structure, such as a pipe or post. Cylinders and regulators shall be bonded and grounded (minimum 3 feet grounding rod) to minimize the possibility of static discharge during well flushing and inerting.

Remove the protective cap and attach the regulator to the cylinder. Connect the regulator to a weighted nylon reinforced PVC or Tygon® tubing line of sufficient length to be lowered to within five feet of the bottom of the borehole or well.

After the bottom of the weighted line is in place, open the valve on the T-cylinder and adjust the regulator pressure to agitate the borehole atmosphere. Generally, this is around 40 pounds per square inch (psi). Inject nitrogen into the borehole. Oxygen readings generally drop to 5% or less at five feet below the ground surface.

The flow rate of the N_2 should be adjusted to maintain oxygen levels at 5% or less. After the well or borehole is flushed with nitrogen, the flow rate can generally be reduced to conserve nitrogen.

After oxygen levels stabilize, intermittent oxygen readings are recommended to preserve the instrument, since nitrogen has a tendency to degrade the meter's oxygen cell.

Oxygen readings are recommended at five-to-ten minute intervals after the borehole oxygen levels stabilize.

Caution: Percent-of-LEL readings can become inaccurate when O_2 levels fall below 16%.

1.6. Environmental

For field investigations of soil and groundwater contamination, not well installation, consider the use of a push-point rig. These rigs can push a hollow stem rod down about 100 feet or more and collect samples without generating cuttings or waste.

Inspect drill rigs for lube oil and hydraulic fluid leakage before allowing rig onto site. A leaking rig should not be allowed on site, since impacted soil due to leakage will require management.

Screen all drilling support materials, such as cleaning solvents, lubricants, and adhesives, for the presence of undesirable compounds. Materials that contain halogenated solvents should not be allowed onto the site, if such compounds are the chemicals of concern under investigation. Use of these materials can generate false positives in collected samples.

Plastic sheeting should be laid around the work area to prevent cuttings removed from the borehole from contaminating the area. Cuttings should be held in a covered roll-off bin or in closed open-top drums.

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Once finished, sampling of the cuttings should be conducted to determine the most appropriate means of disposal. For cuttings impacted with hydrocarbons, large facilities may have their own soil treatment units available. Offsite recycling of the soil might also be available.

2. REFERENCES

HSEP 7.3.3, Utility Clearance

Technical Guidance for Corrective Measures-Subsurface Gas, U.S. Department of Commerce, National Technical Information Services (NTIS), March 1985.

Field Screening Methods Catalog, User's Guide, United States Environmental Protection Agency, Office of Emergency and Remediation Responses, Washington, D.C. 207460, September 1988.

Company's - Installation Restoration Program, Castle AFB, OU-2 Groundwater Treatment Plan, February 1995.

Fire Protection Handbook, National Fire Protection Association, Quincy, Massachusetts 17th edition.

U.S. Army Corps of Engineers, Safety and Health Requirements Manual, October 1992.

29 CFR 1910.120.

3. FIGURES

Sample Equipment and Material List

Health & Safety Air Monitoring

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Figure 1

Sample Equipment and Material List

1. Combustible Gas and Oxygen Indicator (CGI/O_2).

   This instrument will be used to measure the percentage of the LEL and the oxygen content of the atmosphere at various depths within the borehole.

   The CGI will be equipped with a sample pump and a weighted sample line of appropriate length.

   Contact the site health and safety officer to ensure suitable instrumentation is chosen for the particular applications intended.

   An example of a suitable instrument is the MSA 360 or 361, which is available from a variety of vendors and instrument rental services.

2. Nitrogen Cylinders

   Arrange for nitrogen cylinders with an approximate 200 cu-ft capacity.

   The initial flush will generally require three well volumes.

   The volume can be reduced after the oxygen levels stabilize.

   Typical operations require 4 – 8 cylinders per well or borehole.

   Local vendors should be contacted about availability.

3. Two-Stage Regulator

   Arrange for a two-stage regulator with a range of 2,500 psi-to-ambient air pressure with a flow rate adjustable between 1 and 25 LPM.

4. Tubing

   Provide an appropriate length of 5/8-inch nylon reinforced PVC or Tygon® tubing or equivalent with a hose barb to fit regulator outlet.

5. Miscellaneous Materials

   Provide miscellaneous materials, such as hose clamps, hand tools, weight for tubing end, etc.

   An auxiliary line should be attached to the PVC tubing to minimize the chance of losing it in the well.

6. PPE

   With highly contaminated wells or boreholes, personnel protection may need to be upgraded to level C or level B. If this is the case, additional PPE will be required.

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Figure 2

Health & Safety Air Monitoring

Project Number:
Project Location:
Equipment Operated:
General Location Monitored:
Drill Rig Type & Number:

Date:
Activity Monitored:
Project Activity:
Number of Personnel at this Location:
Number of Personnel Affected by HSE Monitoring:

Time (24 hr clock	Specific Location Monitored (e.g. BZ borehole collar, background/upwind, perimeter/downwind, etc)	FID (ppm)	PID (ppm)	$\%O_2$ (%)	% LEL (%)	H_2S (ppm)	RAM (mg/m3	Other -------	SAMPLERS INITIALS

CALIBRATION RECORD

INSTRUMENT	SERIAL NUMBER	MFGR/ MODEL NO.	CALIBRATION STANDARD			CALIBRATION READINGS	
			LOT NO.	TYPE CAL GAS	STD (ppm)	INITIAL	DAY'S END
FID							
PID							
%02							
%LEL							
H2S							
RAM							

Monitor's Signature _____

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HSE Procedure		Document No: HSEP 9.1	Page: 1 of 9
Asbestos Exposure Protection		Supersedes: CHSP 9.1,9.2,9.3	Revision: 1 Issue Date: 30 Mar 04
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1.0 PURPOSE AND SCOPE

This Health, Safety, and Environment Procedure (HSEP) is intended to provide guidelines to protect the health and safety of Company employees, who may encounter asbestos-containing materials in their work environment.

This HSEP applies to all Company projects where asbestos surveys, asbestos air monitoring, abatement, asbestos project management, or asbestos consultation are part of the work activities.

This HSEP is a Company best practice that is modeled after and satisfies US OSHA regulations. Where Company activities are conducted in countries with more restrictive requirements, permissible exposure limits, etc., those more stringent procedures shall be followed.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

A Competent Person will be assigned to all asbestos work performed or managed by the Company. The Competent Person will be capable of identifying existing asbestos hazards in the workplace, selecting the appropriate control strategy for asbestos exposure, and taking prompt corrective action to eliminate the hazards.

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3.0 DEFINITIONS

Amended Water (Wetting Agent)	Water to which a surfactant has been added to increase the ability of the liquid to coat, penetrate, and stick to ACM.
Asbestos	Includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos and any of these minerals that has been chemically treated and/or altered. For purposes of this procedure, “asbestos” includes PACM listed below.
Asbestos Containing Material (ACM)	Any material containing more than one percent asbestos.
Asbestos Work	Any work with ACM as defined/covered by Asbestos Work Classes I through IV below.
Asbestos Work Classes	Class I – activities involving the removal of thermal system insulation and surfacing materials or presumed asbestos-containing materials (PACM). Class II – activities involving removal of asbestos-containing material which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos containing wall board, floor tile and sheeting, roofing and siding shingles, and construction mastics. Class III – repair and maintenance operations where ACM including thermal system insulation and surfacing material may be disturbed. Class IV – maintenance and custodial activities, during which employees contact ACM and PACM and activities involving clean-up of ACM and PACM waste and debris.
Bulk Sample	A process of collecting samples of ACM and/or PACM to be sent to a laboratory for analysis to determine whether or not the material contains asbestos, and if so, what types and percentages.
Competent Person	One who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, and who has the authority to take prompt corrective measures.
EPA	US Environmental Protection Agency
Excursion Limit	1.0 fiber per cubic centimeter (1.0 f/cc) averaged over a 30 minute period. This is the maximum concentration of airborne asbestos an employee may be exposed to during any 30 minute period of a work shift without the use of protective measures such as respirators or protective clothing.
Exposure Assessment	Air monitoring done to determine employee exposure to airborne asbestos, which is compared to the PEL and Excursion Limit.
High Efficiency Particulate Air (HEPA) Filter	A filter capable of trapping and retaining at least 99.97 of all mono-dispersed particles of 0.3 micrometers in diameter.
Negative Exposure Assessment	A demonstration by the employer that employee exposure during an activity is expected to be consistently below the PEL.
Permissible Exposure Limit (PEL)	0.1 fiber per cubic centimeter (0.1 f/cc) time weighted average (TWA) for an eight hour period. The maximum concentration of airborne asbestos an employee may be exposed to during an 8-hour work shift without the use of protective measures such as respirators or protective clothing.

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Presumed Asbestos Containing Material (PACM)	Materials suspected of containing asbestos that have not been positively identified as not containing asbestos. These are normally sprayed or troweled on materials in buildings and facilities constructed prior to 1980. These materials must be treated as asbestos-containing-material until they are determined to not contain asbestos.
Regulated Area	An area established to demarcate where Class I, II, and III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work accumulates, and any work area which exceeds, or where there is a reasonable possibility to exceed the Permissible Exposure Limit.
Surfacing Materials	Asbestos containing material sprayed or troweled on surfaces (walls, ceilings, structural members) for acoustical, decorative, or fireproofing purposes.
Thermal System Insulation	Insulation used to inhibit heat transfer or prevent condensation on pipes, boilers, tanks, ducts, and various other components of hot. This includes pipe lagging, pipe wrap, block, batt, and blanket insulation, cements and “muds” and a variety of other products.
Wetting Agent	See ”Amended Water” above.

4.0 PROCEDURE

4.1. Historic Use and Health Hazards

Asbestos is a mineral that is light weight, chemically resistant, has high tensile strength, and is an excellent thermal insulator.

Asbestos has been used in thermal system insulation on pipe, tanks, ducts, boilers, vents, elbows and fittings. Asbestos is used in surfacing material as acoustical plaster and fireproofing. Asbestos has been used in miscellaneous materials like gaskets, concrete, floor tile and mastic, caulking, roofing, siding shingles, electrical wiring, electrical boxes, brake shoes, transite pipe, and many other applications.

The problem with asbestos is that, when inhaled over time, there can be adverse heath effects including asbestosis, lung cancer, or mesothelioma.

4.2. Identification

Before performing maintenance, repair, renovation, or construction, the project management team should use objective data to determine whether ACM or PACM is present and will be impacted by the work to be performed. If asbestos will be disturbed by the work activity, then the asbestos is to be removed by a licensed and qualified asbestos abatement contractor.

A current asbestos survey should be used by the project management team to verify the presence of ACM. The survey should consist of a sample collection strategy and collection of bulk material samples from each homogeneous sampling area to objectively locate asbestos containing materials.

Homogeneous areas are uniform in color, texture, and date of installation. To identify asbestos in surfacing and miscellaneous materials, the EPA recommends nine bulk samples for each homogeneous sampling area. The minimum number of samples for sampling areas less than 1,000 ft^2 is three, for sampling areas between 1,000 ft^2 and 5,000 ft^2 is five, and for sampling areas greater than 5,000 ft^2 is seven. To identify asbestos in thermal system insulation, the minimum number of samples is three.

After sample collection, the bulk samples are analyzed by an appropriately certified or accredited laboratory. In the US, use a laboratory participating in the National Institute for Standards and Technology, National Voluntary Laboratory Accreditation Program.

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4.3. Abatement

4.3.1. Permissible Exposure Limit and Excursion Limit

No employee may be exposed to an airborne concentration of asbestos exceeding 0.1 fiber per cubic centimeter as an eight-hour time-weighted average or 1.0 fiber per cubic centimeter as a thirty minute excursion limit.

4.3.2. Regulated Areas

All Class I, II, and III asbestos work is to be conducted within regulated areas, demarcated to minimize the number of persons within the area and to protect persons outside the area from exposure to airborne asbestos.

The regulated area will be posted with appropriate signage and limited to authorized persons.

Respirators will be worn by those who enter the regulated area.

4.3.3. Exposure Assessment and Monitoring

Exposure monitoring will be performed to determine the airborne concentration of asbestos to which employees may be exposed. Breathing zone air sampling representative of eight-hour, time-weighted average and thirty-minute, short-term exposures of each employee in each work area will be collected.

A negative exposure assessment (NEA) is a process that is used to conclude that personal exposure is less than the permissible exposure limit and excursion limit.

The NEA may be demonstrated

- by using data indicating that asbestos will not be released in concentrations exceeding the permissible exposure limit and excursion limit or
- by using monitoring data from closely resembling workplace conditions or
- By using results of initial exposure monitoring of the current job.

Employees shall be provided the results of the exposure monitoring as soon as possible following receipt of the monitoring results. For US operations

- National Institute for Occupational Safety and Health (NIOSH) Method 7400, Phase Contrast Microscopy is used as the sampling and analytical method for personal exposure air monitoring and containment perimeter air monitoring.
- For schools K –12, the air monitoring clearance protocol in 40 CFR 763 is Transmission Electron Microscopy.

4.3.4. Methods of Compliance

The following engineering controls and work practices will be used for all asbestos abatement.

- Vacuum cleaners with HEPA filtration to collect debris,
- Wet methods,
- Prompt clean-up and disposal of waste, and
- Either
  - Hazard enclosure techniques,
  - Local exhaust ventilation with HEPA filtration, or
  - By isolating processes that produce asbestos dust and providing ventilation that moves the air away from the breathing zone.

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4.3.5. Class I Requirements

The following requirements pertain to all Class I jobs.

- Must be supervised by a competent person.
- A critical barrier shall be placed over all openings to the regulated area.
- A barrier or isolation methods shall be used which prevents the migration of airborne asbestos from the regulated area.
- Containment perimeter air monitoring will be performed to demonstrate clearance levels identified in 40 CFR 763 are maintained.
- Seal all HVAC systems in the regulated area with a double layer of six-mil plastic.
- Impermeable drop cloths shall be placed on surfaces beneath all removal activity.
- All objects within the regulated area will be covered with plastic sheeting and duct tape.
- The containment will be ventilated to move contaminated air away from the employees breathing zone toward a HEPA filtration device.
- A negative pressure enclosure shall be used, operating at a minimum -0.02 column inches of water pressure differential, verified by a manometer, and maintaining at least four air changes per hour.
- Smoke test the negative pressure enclosure for leaks before each shift.
- Deactivate electrical circuits in the enclosure unless ground fault circuit interrupters are used.
- Glove bags should be
  - Six mil plastic,
  - Smoke tested prior to use,
  - Used only once, and
  - Not used on a surface where the temperature exceeds 150 degrees Fahrenheit.
- A HEPA vacuum should be used to collapse the glove bag with a before disposal.
- At least two persons will perform the removal.

4.3.6. Class II Requirements

The following requirements pertain to all Class II jobs.

- Must be supervised by a competent person.
- Critical barriers shall be placed over all openings to the regulated area.
- A barrier or isolation methods shall be used to prevent migration of airborne asbestos from the regulated area. Containment perimeter air monitoring will be performed to demonstrate clearance levels identified in 40 CFR 763 are maintained.
- Impermeable drop cloths shall be placed on surfaces beneath all removal activity.
- Exposure control will consist of use of
  - Vacuum cleaners with HEPA filtration to collect debris,
  - Wet methods,
  - Prompt clean-up and disposal of waste,

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    - Local exhaust ventilation with HEPA filtration,
    - Enclosure or isolation of processes that produce asbestos dust, and
    - Ventilation that moves the air away from the breathing zone.
- Flooring Materials
    - When removing vinyl and asphalt flooring materials, do not sand the flooring or backing.
    - HEPA filter vacuum and metal floor tools shall be used to clean floors.
    - Wet and cut resilient sheeting during removal.
    - Adhesives and backing will be removed using wet methods.
    - Dry sweeping and mechanical chipping are prohibited.
    - Remove tile intact, if possible.
- Roofing
    - Remove roofing intact, if possible.
    - Use wet methods to remove materials that are not intact.
    - Continuously mist cutting machines.
    - Collect dust from power roof cutters with HEPA dust collector.
    - Do not throw debris from the roof to the ground.
    - Debris on the roof shall be kept wet, bagged, or wrapped in plastic sheeting.
    - Lower debris to the ground as soon as practical, no later than the end of the work shift.
    - Disable and isolate roof air intake vents.
- Cementitious-Asbestos-Containing Siding, Shingles, Or Transite Panels
    - Cutting, abrading, or breaking the materials is prohibited.
    - Materials shall be sprayed with amended water prior to removal.
    - Debris shall be wrapped in plastic sheeting and lowered to the ground.
- Gaskets
    - Deteriorated gaskets that cannot be removed intact shall be removed within a glove bag.
    - Scraping must be performed wet.

4.3.7. Class III Requirements

The following requirements pertain to all Class III jobs.

- Performed using wet methods.
- Performed using local exhaust ventilation.
- Use drop cloths and mini-enclosure or glove bag where the disturbance involves drilling, abrading, sanding, chipping, breaking, or sawing thermal system insulation or surfacing material.
- Use a negative pressure enclosure, operating at a minimum -0.02 column inches of water pressure differential, verified by a manometer.

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- Maintain at least four air changes per hour.
- Appropriately selected respirators shall be worn.

4.3.8. Class IV Requirements

The following requirements pertain to all Class IV jobs.

- Use vacuum cleaners with HEPA filtration to collect debris,
- Use wet methods,
- Use local exhaust ventilation,
- Appropriately selected respirators are to be worn when cleaning up debris and in regulated areas.

4.4. Respiratory Protection

Before a respirator is issued and donned, employees will participate in, and understand all elements of, the Company Site-specific Respiratory Protection Program, HSEP 13.9f1.

Appropriately selected respirators shall be worn

- during all Class I asbestos jobs,
- during all Class II work where the asbestos is not removed in a substantially intact state,
- during all Class II and III work, which is not performed using wet methods or there is no negative exposure assessment,
- during all Class II work where thermal system insulation or surfacing material is being disturbed,
- during all Class IV work in regulated areas where respirators are worn, and
- During all work where employees are exposed above the Permissible exposure Limit Time Weighted Average or Excursion Limit.

The following guidelines are to be used when selecting a respirator for asbestos work:

Asbestos Concentration	Respirator Required
≤ 1 f/cc (10 x PEL)	Half face-piece, air-purifying respirator other than a disposal respirator with P100 filters
≤ 5 f/cc (50 x PEL)	Full face-piece, air-purifying respirator with P100 filters
≤ 10 f/cc (100 x PEL)	Powered air-purifying respirator with P100 filters or supplied-air respirator operated in continuous flow mode
≤ 100 f/cc (1,000 x PEL)	Full face-piece, supplied-air respirator operated in pressure demand mode
> 100 f/cc (1,000 x PEL)	Full face-piece, supplied-air respirator operated in pressure demand mode, with auxiliary positive-pressure, self-contained breathing apparatus

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4.5. Protective Clothing

Full body coverall, head covering, gloves, and foot covering will be donned by employees performing asbestos related work.

The Competent Person will inspect work suits at least once per shift. Tears and rips shall be mended immediately or the work suit replaced.

Contaminated protective clothing will be disposed of as asbestos waste.

4.6. Hygiene Facilities

A three-stage decontamination unit will be used

- For all Class I asbestos work,
- For work involving over 25 linear feet of thermal system insulation or surfacing material, or
- For work involving over 10 square feet of thermal system insulation or surfacing material.

The decontamination unit will be connected to the regulated area and include

- An equipment room,
- A shower room, and
- Clean change room in series.

Entry and exit from the regulated area will be through the decontamination unit.

The decontamination sequence includes

- Removal of all contaminated protective equipment except the respirator in the equipment room,
- Then complete body shower during which the respirator is removed, and
- Then entering the clean change room to don personal clothing.

For Class I work and work that is less than 25 linear or 10 square feet of thermal system insulation or surfacing material, Class II, III and IV asbestos work, the three-stage decontamination sequence is recommended. During these classes of asbestos work, the management team should not permit employees to contaminate their personal clothing or remove contaminated personal clothing from the job site.

4.7. Communication of Hazards

Building or facility owners shall make known the presence, location, and quantity of asbestos in the facility to

- Prospective employers who are bidding for work,
- Employees of the owner,
- All employers on multi-employer worksites, and
- Tenants, who will work in or adjacent to areas where there are asbestos containing materials.

Warning signs with the legend " Danger, Asbestos, Cancer and Lung Disease Hazard, Authorized Personnel Only" shall be displayed at each regulated area entrance.

Labels stating "Danger, Contains Asbestos Fibers, Avoid Creating Dust, Cancer and Lung Disease Hazard" shall be affixed to waste containers and asbestos containing building materials to notify employees the materials contain asbestos.

A training program shall be implemented for all employees performing Class I, II, III, or IV asbestos work or employees exposed to concentrations exceeding the Permissible Exposure

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Limit. For US operations, the initial and annual training requirements are defined in EPA Model Accreditation Plan, 40 CFR 763.

4.8. Housekeeping

HEPA filtered vacuuming equipment will be used where vacuuming is performed.

Asbestos waste, debris, and contaminated clothing shall be labeled and sealed in impermeable bags or containers. Usually this means two labeled, clear, six-mil plastic bags.

Asbestos containing flooring material shall not be sanded, high-speed stripped (>300 rpm), or dry buffed.

4.9. Medical Surveillance

Medical surveillance shall be provided for employees who

- Perform Class I, II, or III work,
- Work with asbestos 30 days or more per year,
- Are exposed at or above the Permissible Exposure Limit, or
- Use a respirator on asbestos projects.

Medical surveillance exams will be conducted prior to respirator use or asbestos exposure and annually thereafter.

The medical surveillance examination will include

- A medical and work history,
- Completion of the medical questionnaire for respirator users,
- A physical examination,
- Chest roentgenogram (frequency determined by the physician),
- Pulmonary function test, and
- Any other tests deemed necessary by the physician.

The physician will provide a written opinion to the Company with the results of the examination which will include

- Any detected medical conditions that would place the employee at an increased risk of impairment from exposure to asbestos,
- Any recommended limitations, and
- A statement indicating that the physician has informed the employee of the results of the medical examination.

4.10. Recordkeeping

Exposure monitoring records will be maintained for thirty years.

Medical surveillance records will be maintained for the duration of the employee's employment plus thirty years.

Training records will be maintained one year past the last date of employment.

5.0 REFERENCES AND RELATED DOCUMENTS

29 CFR 1926.1101, Asbestos

29 CFR 1910.1001, Asbestos

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1.0 PURPOSE AND SCOPE

This HSEP sets forth the minimum procedures to be followed for drill rig operations and is intended to help ensure the health and safety of all personnel involved with, and working around, drill rig operations.

This HSEP applies to employees and on-site contractors engaged in operations covered by the Company HSEP program.

One or more of the subjects listed in the References and Related Documents section of this HSEP may also apply to drilling operations. Ensure that appropriate topics from the pertinent HSEPs are reviewed and followed.

This HSEP does not apply to pile driving or oil well drilling operations.

2.0 DEFINITIONS

Cable Tool Rig method of drilling is an old technique, still utilized primarily in the Northeast portion of the U.S. The technique is also known as percussion, churn-drilling, or spudding. Cable tool rigs operate by repeatedly lifting and dropping a string of down-hole tools.

Rotary Drilling utilizes a technique in which the drill pipe and attached bit are continuously turned against the face of the hole. A fluid in the form of air, water, mud (bentonite and water), polymer, or a combination of these is used to lift the cuttings to the surface, to cool and lubricate the bit, and to keep the hole open. As the rotary bit is advanced, the fluid is forced down the center of the drill rods and out of the bit.

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Reverse Circulation Drilling is essentially the same as rotary drilling, although, as the name implies, the fluid is forced down through an outer casing and back up to the surface through the drill stem to a cyclone.

Hollow-Stem Augers (HSA) are essentially a form of continuous flight augers in which the helices (flights) are welded around a hollow, tubular steel center. A cutting bit is on the lead auger. The auger is a conveyor that lifts cuttings to the surface by rotation of the auger.

Casing Hammer Drilling uses the principles of rotary drilling in combination with a hammer system that drives a welded casing to maintain an open bore hole.

Sonic Drilling is a relatively new technology. An extensive hydraulic system causes a counter-balanced device to articulate rapidly at the rate of typically 20,000 to 30,000 cycles per second. This oscillating energy is transferred to a drill stem forcing the rods into the ground.

Direct Push Technology is a hydraulic or pneumatic ram that forces the drill rod into the ground. The weight of the vehicle serves as the counter-weight for the ram system.

3.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

4.0 PROCEDURE

4.1. Technology Application

There are numerous drilling technologies commonly available on the market today such as, hollow-stem auger, air-rotary casing hammer, dual tube rotary, sonic rotary, and direct push technology.

Each drill rig has specific and various capabilities depending on the tools applied. For example, the same drill rig that was used for well installation via HSA can be used to drill structural footings with a bucket auger. Evaluate the work and apply the most appropriate technology.

Terminology can vary among manufacturers, consultants, drillers, geologists, and HSE professionals and regions of the country. Make terms clear and concise. It is important that the drilling team work from common terms to avoid any misunderstanding.

Site access must be considered in selecting the drilling technology. Access restrictions such as terrain, ecologically sensitive areas, utilities, overhead obstructions, airport flight lines, etc. may influence the strategy for the selection of the type of drill rig.

Sonic drill rigs should not be used where there is the potential for unexploded ordnance.

4.2. Subcontractor Selection

In the request for proposal (RFP) process, the Subcontractor Safety Questionnaire must be included. This document is used as a tool to advise management of historical safety performance of the prospective bidder.

Once proposals are received, review the safety questionnaire. By using safety performance, rate the proposals based on the information provided.

To minimize company liability, inclusion of Jacobs' general terms and conditions within the subcontract are mandatory.

The client may also have specific requirements, such as those specified in a Federal Contract by Federal Acquisition Regulations. Ensure such requirements are included in the driller's subcontract.

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The Jacobs Corporate HSE program and the Site-Specific Health and Safety Plan (HSP) must be referenced and/or included in the subcontract.

Subcontractors shall be required to follow HSEP 2.9, Subcontractor Safety.

4.3. Initial Inspection

A Competent Person shall be designated to inspect all machinery and equipment prior to the initial use on-site and on a weekly basis. Drill rig operators and helpers should perform routine inspections of the drilling equipment at least daily to ensure that the equipment is in safe operating condition. Defective equipment will be repaired before use or continuation of use.

A thorough, annual inspection of all hoisting equipment will be made by a Competent Person, who has been certified to perform an inspection by an outside, third-party agency. A record of the date and result of this inspection must be maintained.

Load lines should be checked routinely and thoroughly. The running line should be taken out of service if there are six randomly distributed broken wires on one lay or three broken wires in any one strand in one lay. The rope should be taken out of service, if there is wear of one-third of the original diameter, kinking, crushing, bird-caging, or any other distortion of the rope structure.

After decontamination at the site and before drilling can begin. The drill rig operator and the rig geologist or engineer must complete an initial inspection and the attached drill rig inspection form.

During the inspection, examine the number and placement of the “kill switch(es)” including which equipment is deactivated when the switch is engaged. The drill rig operator shall test the kill switch as part of the inspection.

All hydraulic, pneumatic, and discharge hoses must have adequate “whip checks”, safety wiring, and/or clamps, which have been properly applied to prevent injury in the event a fitting or hose breaks loose.

Inspect the welded attachment plates of the mast’s lifting ram for cracks and alignment of the rams. Wire rope clips (Crosby clips) should be matched to the size of the wire rope. Inspect for proper application of the clips.

Assure that the wire rope is wound about the winch drum without the rope crossing over itself. Misapplication will cause rapid wear of the rope. Ensure that at least one and one-half turns of rope remain (the width of the drum) while hoisting. The drum flange shall, at all times, extend a minimum of ½ inch over the top layer of rope.

Inspect the drill rig for system leaks. A spill control kit of sufficient size should be maintained on the rig.

Perform a visual inspection of the rigging, wire ropes, chains, hooks, clevises, swivels, etc. Use simple and inexpensive measuring gauges to ensure that wear is not excessive.

Wire rope clips (Crosby clips) should be matched to the size of the wire rope. Inspect for proper application of the clips.

All platforms and walkways shall have antiskid surfaces.

4.4. Drill Rig Safety

Rated load capacity charts, recommended operating speeds, special hazard warnings, and other essential information must be posted in a conspicuous location on drill rigs, hoists, and other equipment. Never exceed manufacturer’s recommendations. Never attempt to lift more than the rated capacity of any machine or its rigging.

Do not perform routine maintenance, fueling, or repairs while the equipment is in use.

Never allow anyone to ride the hook or the load.

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A fire extinguisher, rated at least 20 BC, must be available at all operator stations or cabs of drill rigs.

Safety latches are required on all hooks. Taglines must be used when handling loads.

Loads must not be swung over the heads of personnel in the area.

Outriggers must be extended fully to ensure the machine's full capacity.

Never leave a machine with a load suspended.

"Walking" of suspended loads should be avoided. Where necessary to do so, the following steps must be taken:

- Investigate the route to be followed for solid and level footing.
- Tie load to the frame of drill rigs or use tag lines.
- Follow manufacturer's recommendations.

Weight of the load must be established prior to lifting and must be within manufacturer's capacity charts. Check brakes and machine stability when load is only inches above the ground.

The drill rig operator must not attempt any lift if conditions are inadequate or hazardous.

Spreader bars, eye pads, personnel baskets, and lifting devices of all kinds will be evaluated and approved by the Site Manager.

4.5. Drill Rig Set-up Procedures

Ensure compliance with the utility clearance process prior to mobilizing the drill rig. Refer to HSEP 7.3.3.

Adequately prepare drill pad and stabilize rig to prevent rig turnover.

A firm, level foundation capable of supporting the load and drill rig shall be provided and maintained. Avoid areas where extensive fill is required to level the pad. Compaction is necessary if significant amounts of fill are needed.

Where there is surface contamination, use clean fill or gravel to cover areas of contamination and provide a level work area. Cover material may be considered contaminated at the conclusion of work in the area. The cost of remediation may be increased due to the increase in the quantity of contaminated materials to be treated. To minimize cost, rather than placing a material cover over contaminated surface materials, simply decontaminate the drill rig and associated equipment that may have become contaminated from contact with the contaminated ground surface before leaving the site. See HSEP 8.9 for additional precautions related to drilling in VOC contaminated soil.

Blocking-materials or mats under outriggers must be adequate to support the drill rig for the ground condition.

Establish an exclusion zone on all sides of the work area that is at least the height of the mast.

Have plastic sheeting of sufficient size available to provide coverage of the entire undercarriage of drill rig and support vehicles and equipment in the event of hydraulic fluid, fuel, or antifreeze releases. Keep plastic in place until necessary repairs can be made. Remove excess sheeting that could pose a slip hazard beyond the drill stand.

Regardless of the weight of the load, all lifts and sets must be performed with all hydraulic outriggers fully extended in order to level and stabilize the rig prior to drilling.

Pick-and-carry operations are allowed only when a firm level foundation, which will support the load and drill rig, is provided.

4.6. Drill Rig Work Near Overhead Electric Lines

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Any overhead line must be considered energized unless it is disconnected and physically grounded or temporarily taken out of service by a lock-out/tag-out method.

No part of motorized equipment, including the load, may be allowed to get closer to bare live circuits or apparatus than the distances indicated:

Nominal Voltage	Minimum Clearance
0 – 50 KV	20 ft., or one mast length; whichever is greater
50 KV+	20 ft. + 4 in. for every 10 KV over 50 KV or 1.5 mast lengths; whichever is greater

Warning flags or other suitable devices should be positioned to define the operating clearance distance to the power line, while adjacent to personnel or equipment.

When it becomes necessary for a mast or any part of the rig or similar equipment to be swung, worked, or moved (including transit between worksites) within the required clearances listed above, the work must be stopped immediately. The rigging superintendent, the site manager, Corporate HSE, and a client representative will decide which of the following steps must be taken.

- The line will be identified, de-energized, and properly tagged and locked out. The line must also be visibly grounded at the point of work.
- If the above is not possible, the following precautions must be taken.
  - Motorized equipment must be grounded to a permanent ground or a temporarily installed ground rod.
  - An observer must be stationed to warn the operator while the drill rig, boom, or load is in motion.
  - No one can be allowed to come in contact with the motorized equipment or load while the equipment is in motion. All tag lines must be constructed of non-conductive material.

Additional precautions which may be taken to avoid contact with the line include:

- Temporary insulation sleeves, which may be installed on the power line. (Note that there is also hazard involved in this procedure, and the use of temporary sleeves must be evaluated on a case-by-case basis.)
- Angle borings, and
- Warning flags or other suitable devices, which may be positioned to define the allowable operating radius of the equipment, while adjacent to personnel or equipment.

4.7. Equipment Operation – Angle Borings

Angle borings are typically used when a sample point cannot be accessed from a vertical position. Examples of these are:

- Under power lines
- Under building foundations,
- Under river channels, or
- Where extremely high levels of contamination pose a health or fire hazard for the drilling crew.

The approximate vertical depth is calculated based on the cosine of the angle of the boring and the angled length of the borehole.

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An angle of less than 30 degrees (measured between the ground surface and the mast) is usually not acceptable except for short drilling distances. This is due to the rotation of the auger causing the drill stem to "walk" away from the desired sample point, which can endanger personnel or cause equipment damage.

Although angle borings are useful, they can have difficulty in achieving the desired results, particularly in soils with cobbles or boulders. These obstructions can deflect the drill stem to an undesired position.

With these restrictions in mind, pay careful attention when drilling or angle boring under utilities or other known obstructions to prevent inadvertent contact.

4.8. Maintenance and Repairs

To ensure safe operations, the drill rig and ancillary equipment should receive routine maintenance in accordance with manufacturer's recommendations.

A lock-out/tag-out process is required prior to any maintenance activity or repair. When a drive head cannot be completely lowered to the drill table, the drive head should be properly blocked and supported.

The mast must be lowered when head works repairs are being performed. If this is impossible, follow fall protection practices.

Welding and cutting repairs on the drill rig pose flammability hazards and may cause high strength steel to be damaged. There should not be open flames within 35 feet of combustible materials such as diesel fuel tanks. If this distance cannot be maintained, place noncombustible welding mats over tanks or other combustibles to protect from sparks and hot slag. Protect hydraulic lines as well.

A qualified welder familiar with the weld grades, weld types, and material specified in the drill rig design should perform all welding on drill rigs or its components.

Machine guards must be utilized and maintained on the drill rig to protect personnel from belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, or other reciprocating, rotating, or other moving parts or equipment or other hazards.

Always replace guards after servicing the rig or equipment. When a pinch point cannot be guarded, paint the point bright yellow and post an appropriate warning sign.

4.9. Personal Protective Equipment

Personal Protective Equipment (PPE) should be viewed as the last line of defense against mechanical and chemical hazards. The use of PPE does not guarantee freedom from injury. In many cases, PPE mitigates, but does not eliminate, forces of impact, abrasion, etc.

In addition to chemical protective clothing that may be required for the site, all personnel must wear ANSI Z89.1, Type I hardhats, safety glasses with side shields or goggles, and ANSI Z41.1, class 75-rated impact resistant footwear. Bump hats, sport glasses, and tennis shoe style safety shoes are not acceptable.

Because of the noise levels typically associated with operation of a drill rig, hearing protection is required in the area.

4.10. Inclement Weather

Adverse weather conditions requiring immediate suspension of field activities are:

4.10.1. Wind Speeds

- When wind chill is not a factor, sustained wind speeds of 25 to 40 mph.
- Wind gusts of 35 to 45 mph.
- Tornado, hurricane, blizzard.

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4.10.2. Other Inclement Weather Conditions

- Freezing rain during hoist and cat-head activities.
- Moderate rain or snowfall of 0.11 to 0.3 inches per hour during hoisting activities.
- Wind Chill Factor of -24degrees Fahrenheit.

4.10.3. Thunderstorms and Lightning

A 30-minute stand down period is maintained from the last observed lighting to allow proper distance for the storm to pass.

Take shelter in buildings or hard top vehicles with the windows rolled up and away from trees, power lines, bodies of water, and the drill mast, etc.

If caught outside, place hands over ears and squat down with feet close together and flat on the ground. Always attempt to be lower than the highest object around but do not lie on the ground.

4.11. Well Construction Materials

Common well construction materials are graded sand, bentonite, and Portland cement. All these material contain varying amounts of crystalline silica. Minimize exposure by wetting the material, using respiratory protection, and by following the safe handling procedures in the manufacturer's instructions and in the Material Safety Data Sheets.

Packages of these materials range from 25 to 100 pounds. Use material handling equipment such as forklifts whenever possible. Practice good lifting techniques.

4.12. Environmental

For field investigations of soil and groundwater contamination, not well installation, consider the use of a push-point rig. These rigs can push a hollow stem rod down about 100 feet or more and collect samples without generating any cuttings or waste.

Inspect drill rigs for lube oil and hydraulic fluid leakage before allowing rig onto site. A leaking rig should not be allowed on site since any impacted soil due to leakage will require management.

Screen all drilling support materials such as cleaning solvents, lubricants, and adhesives for the presence of undesirable compounds. Materials that contain halogenated solvents should not be allowed onto the site if such compounds are the chemicals of concern under investigation. Use of these materials can generate false positives in collected samples.

Plastic sheeting should be laid down around the work area to prevent cuttings removed from the borehole from contaminating the area. Cuttings should be held in a covered roll-off bin or in closed open-top drums.

Once finished, sampling of the cuttings should be conducted to determine the most appropriate means of disposal. For cuttings impacted with hydrocarbons, large facilities may have their own soil treatment units available. Offsite recycling of the soil might also be available.

5.0 TRAINING & LICENSES

Drill rig operators shall be certified to operate the drill rig. A copy of their hydraulics license should be on file with the HSE representative prior to beginning work.

The drilling company should also provide evidence of a current drilling license/permit in the state the work is to be conducted.

Assure compliance with regulatory and client license and permit requirements.

Additional documentation may be required, such as employee training and physician written opinion reports for 29 CFR 1910.120 and 1926.65 work.

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6.0 REFERENCES AND RELATED DOCUMENTS

http://IADC.org, Web site for the International Association of Drilling Contractors

HSEP 2.9: Subcontractor Safety

HSEP 7.3.3: Utility Clearance

HSEP 7.3.5: Materials Handling, Related to Hazardous Waste Activities

HSEP 8.3: Equipment Operator Qualification

HSEP 8.8: Oxy-Fuel Cutting, Heating and Welding

HSEP 8.9: Drilling in VOC Contaminated Soil

HSEP 15.1: Lock-out/Tag-out

HSEP 16.0 series related to Maintenance and Storage Areas

HSEP 17.6: Rigging

29 CFR 1910.120, Hazardous Waste and Emergency Response Operations

29 CFR 1910.180, Crawler, Locomotive and Truck Cranes

7.0 FIGURES

Drill Rig Inspection Form

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Drill Rig Inspection

Date_____ Inspector_____

Rig # _____ Company_____

Rig Type_____ JE Oversight_____

	Drill Rig/Support Equipment	Yes	No	N/A	Repaired
1.	Are there obvious hose/connection leaks on rig?				
2.	Are hydraulic system safety shut offs in proper condition?				
3.	Are hand tools and power tools maintained in good repair?				
4.	Is there evidence of wearing or grooving of cathead to a depth greater than 1/8”, indicating replacement required?				
5.	Are casing hammer cables, shackles, and hammer rails in safe condition?				
6.	Are air and water hoses/connections in good repair; whip checks installed properly?				
7.	Is pumping equipment properly secured to rig?				
8.	Are pump pressure regulators set at approved PSI rating?				
9.	Is welding equipment properly secured to rig?				
10.	Are oxygen & acetylene bottles properly stored & labeled?				
11.	Are welding torches (gas) equipped with anti-flashback check valve between bottle regulator & torch manifold?				
12.	Are compressed air tanks regularly purged of excess moisture accumulation (air brakes)?				
13.	Are fossil fuels and flammable solvents stored/dispensed from approved safety cans? Properly labeled?				
14.	Are discharge hoses on dual type percussion rig properly restrained/barricaded against striking personnel?				
15.	Is Haz Mat spill control kit available/well stocked?				
16.	Are proper number and kinds of outrigger pads, blocking, cribbing on hand?				
17a.	Are kill switches operating? Initials of person who tested switches: _____				
17b.	Indicate how to activate kill switch.				
	Rigging/Material Handling Equipment				
18.	Is all material handling equipment used and maintained in accordance with 29 CFR 1926.251 and/or manufacturers recommendations?				
19.	Has all hoisting equipment been completely inspected for broken wires, crushing, bird-caging, or other damage?				
20.	Do all wire ropes have sufficient rated capacity for the hoisting equipment used and the lifts being performed?				
21.	Are correct number of wire rope clamps in use & installed?				
22.	Is a thimble installed in all hoisting eyes?				
23.	Do hooks have approved safety latch installed?				

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	Drill Rig/Support Equipment	Yes	No	N/A	Repaired
24.	Does hook rating match rated tonnage of winch?				
25.	List hoisting equipment inspected:				

Serial Number	Description

	Protective Systems/Equipment				
26.	Are all guards, etc. in place around pinch points, moving machinery etc. and in good repair?				
27.	Are mechanical pinch points on drilling rig properly labeled/color coded?				
28.	Is there adequate fall protection equipment available if climbing the mast is necessary?				
29.	If derrick platform is more than 4 ft. above grade, is it equipped with safety railing and toe boards as required?				
30.	Are signs stating caution/danger shock or electrocution hazard in place on the mast?				
31.	Is there a possibility for exhaust fumes from the drilling rig to accumulate and affect worker's health?				
32.	Is adequate lighting, in accordance with NFPA 70-1984, installed for night operations?				
33.	Are all workers wearing proper hard hats, safety boots, and safety glasses?				
34.	Are there an adequate number of fire extinguishers, portable eye wash(es), and first aid kit(s) on site?				
	Programs/Plans				
35.	Are assured grounding procedures for equipment and power tools being followed?				
36.	Are drillers following a "code of safe practices" developed by the contractor?				
37.	Is there a safe procedure in place for guiding drill rods or pipe sections into racks or onto transport vehicle?				
38.	Is a certified CPR/First Aid trained individual with the rig?				

Comments:

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HSE Procedure		Document No: HSEP 9.2	Page: 1 of 3
Asbestos Avoidance		Supersedes: CHSP 9.2	Revision: 1 Issue Date: 30 Mar 04
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1.0 PURPOSE AND SCOPE

This Health, Safety, and Environment Procedure (HSEP) provides guidelines to protect the health and safety of personnel, who may encounter asbestos containing materials in their work environment.

This HSEP applies to all Company projects where the presence of asbestos containing materials (ACM) is known or suspected and where personnel may encounter asbestos as part of their work activities.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

3.0 DEFINITIONS

Asbestos	Includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos and any of these minerals that has been chemically treated and/or altered.
Asbestos Containing Material (ACM)	Any material containing more than one percent asbestos.
Bulk Sample	A process of collecting samples of ACM and/or PACM to be sent to a laboratory for analysis to determine whether or not the material contains asbestos, and if so, what types and percentages.
Thermal System Insulation	Insulation used to inhibit heat transfer or prevent condensation on pipes, boilers, tanks, ducts, and various other components of hot. This includes pipe lagging, pipe wrap, block, batt, and blanket insulation, cements and “muds” and a variety of other products.

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4.0 PROCEDURE

4.1. Historic Use and Health Hazards

Asbestos is a mineral that is light weight, chemically resistant, has high tensile strength, and is an excellent thermal insulator.

Asbestos has been used in thermal system insulation on pipe, tanks, ducts, boilers, vents, elbows and fittings. Asbestos is used in surfacing material as acoustical plaster and fireproofing. Asbestos has been used in miscellaneous materials like gaskets, concrete, floor tile and mastic, caulking, roofing, siding shingles, electrical wiring, electrical boxes, brake shoes, transite pipe, and many other applications.

The problem with asbestos is that, when inhaled over time, there can be adverse heath effects including asbestosis, lung cancer, or mesothelioma.

4.2. Pre-task Planning

Before performing maintenance, repair, renovation, or construction work, the project management team should ask the building or facility owner to identify the location and extent of all ACM that may be impacted by Company work. For US operations, the regulatory bases for communicating asbestos hazards are

- 29 CFR 1910.1001 (j)(2),
- 29 CFR 1926.1101 (k)(2), and
- 40 CFR 61 subpart M.

The building or facility owner should have objective data identifying the location and extent of all asbestos containing materials. The asbestos containing material shall be appropriately labeled in accordance with local regulatory requirements.

If asbestos will be disturbed by the work activity, then the asbestos shall be removed by a licensed and qualified asbestos abatement contractor before Company work activities in the area are allowed to proceed.

4.3. Asbestos Identification

4.3.1. Request a Survey

If the building or facility owner has not identified the location and extent of asbestos-containing materials or provided a document indicating there is no asbestos in the facility or building that may be impacted by Company work, then the project management team shall request that an asbestos survey be completed by the building or facility owner.

4.3.2. Survey Guidelines

A current asbestos survey should be used by the project management team to verify the presence of ACM. The survey should consist of a sample collection strategy and collection of bulk material samples from each homogeneous sampling area to objectively locate asbestos containing materials.

Homogeneous areas are uniform in color, texture, and date of installation. To identify asbestos in surfacing and miscellaneous materials, the EPA recommends nine bulk samples for each homogeneous sampling area. The minimum number of samples for sampling areas less than 1,000 ft^2 is three, for sampling areas between 1,000 ft^2 and 5,000 ft^2 is five, and for sampling areas greater than 5,000 ft^2 is seven. To identify asbestos in thermal system insulation, the minimum number of samples is three.

After sample collection, the bulk samples are analyzed by an appropriately certified or accredited laboratory. In the US, use a laboratory participating in the National Institute for Standards and Technology, National Voluntary Laboratory Accreditation Program.

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Once the asbestos survey identifies the location and extent of asbestos-containing materials, and after the asbestos is labeled, the project management team will compare the asbestos locations with the Company work activity. If asbestos will be disturbed by this work activity, then the asbestos is to be removed by a licensed and qualified asbestos abatement contractor before Company work activities in the area are allowed to proceed.

4.4. Accidental Asbestos Exposure

In the event there is accidental exposure to an asbestos-containing material, the following procedure should be implemented.

- Remove personnel from the area where the accidental exposure occurred.
- Collect, wet, bag, and seal asbestos contaminated clothing and shoes. If bulk sampling data indicates an asbestos exposure occurred, dispose of the personal items as asbestos containing materials.
- Assure that the person accidentally exposed thoroughly showers at the project site.
- Arrange for a licensed asbestos inspector to collect bulk samples of the suspected asbestos containing material. Post-incident air monitoring following National Institute for Occupational Safety and Health Method 7400 may be attempted to characterize the suspected airborne asbestos exposure.
- Determine whether a chest x-ray is on file with the employee's medical records. If no chest film is available, arrange through the local medical facility to get a single, PA chest film. (This is only intended to provide a film for baseline purposes.)
- A notation should be included in the employee's personnel folder and in the medical record indicating the dates of the presumed asbestos exposure(s), that an x-ray film was made or a previous film determined to be available, and the location of the film.
- If possible, the x-ray film should be filed with the employee's Company medical records. If the film is kept at the x-ray facility, a copy should be forwarded for inclusion in the employee's Company medical file.
- Place in the employee’s file a complete incident investigation report that includes,
  - Results of ACM bulk sample analysis results,
  - Results of any air monitoring that may have been done,
  - An estimate of the duration of exposure, and
  - An estimate of the volume of the ACM that may have been disturbed.

5.0 REFERENCES AND RELATED DOCUMENTS

29 CFR 1910.1001, Asbestos

29 CFR 1926.1101, Asbestos

40 CRF 61 Subpart M, Asbestos NESHAP

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HSE Procedure		Document No: HSEP 11.2	Page: 1 of 13
Bloodborne Pathogen Exposure Control Program		Supersedes: HSEP 11.2	Rev. 4
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1.0 PURPOSE AND SCOPE

This Corporate Health, Safety, and Environment Procedure (HSEP) provides the minimum procedures to be followed when Company employees perform designated occupational health care responsibilities. See Section 9.2: Exposure Determination.

This HSEP applies to specified employees engaged in operations within the United States which are covered by the Company HSE Program.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

2.1. Occupational Health Services Department

The Corporate Occupational Health Services Department

- Shall be responsible for the development and annual review/revision of this HSEP,
- Shall coordinate follow-up actions, an exposure incident investigation, as well as proper documentation thereof, and
- Shall maintain a confidential medical record for each exposed employee.

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3.0 DEFINITIONS

Blood	human blood, human blood components, and products made from human blood.
Bloodborne Pathogens	pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).
Contaminated	the presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface.
Contaminated Sharps	any contaminated object that can penetrate the shin including, but not limited to (needles, scalpels, broken glass).
Decontamination	the use of physical or chemical means to remove, inactivate, or destroy bloodborne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use or disposal.
Exposure Incident	a specific eye, mouth, other mucous membrane, non-intact skin, or parenternal contact with blood or other potentially infectious materials that results from the performance of an employee's duties.
Hand washing Facilities	a facility providing an adequate supply of running potable water, soap and single use towels or hot air drying machines.
HBsAg	Hepatitis B surface antigen is a marker of infectivity. Its presence indicates either acute or chronic HBV infection.
anti-HBs	Antibody to hepatitis B surface antigen is a marker of immunity. Its presence indicates an immune response to HBV infection, an immune response to vaccination, or the presence of passively acquired antibody.
HBIG	Hepatitis B immune globulin (HBIG) is used to provide passive immunity to hepatitis B virus (HBV) infection for post exposure prophylaxis in individuals exposed to HBV or HBsAg-positive materials (e.g., blood, plasma, serum).
HBV	Hepatitis B Virus.
HIV	Human Immunodeficiency Virus.
Occupational Exposure	reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties.
Other Potentially Infectious Materials	the following human body fluids: vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids. Any unfixed tissue or organ (other than intact skin) from a human (living or dead). HIV-containing cell or tissue cultures, organ cultures, and HIV or HBV containing culture medium or other solutions; and blood, organs, or other tissues from experimental animals infected with HIV or HBV.
Parenternal	piercing mucous membranes or the skin barrier through such events as needle sticks, human bites, cuts, and abrasions.

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Sharps with engineered injury protection	a non-needle sharp or a needle device used for withdrawing body fluids, accessing a vein or artery, or administering medications or other fluids, with a built-in safety feature or mechanism that effectively reduces the risk of an exposure incident.
Source Individual	any individual, living or dead, whose blood or other potentially infectious materials may be a source of occupational exposure.
Universal Precautions	an approach to infection control. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other bloodborne pathogens.

4.0 PROCEDURE

4.1. Regulatory Background

The Jacobs exposure control program is intended to eliminate or minimize occupational exposure to bloodborne pathogens.

Health care workers are at an increased risk of communicable bloodborne and other diseases, including Hepatitis B Virus (HBV) and Human Immunodeficiency Virus (HIV) infections.

The standard is designed to reduce occupational exposure to human blood and certain body fluids and tissues that are potentially infectious for HBV, HIV, and other bloodborne pathogens.

4.2. Exposure Determination

Employees who have designated occupational exposure and health care responsibilities shall be included in the Company's Bloodborne Pathogens Exposure Control Plan.

Employees in this category include, but are not limited to, the following classifications:

- Physician
- Physician Assistant
- Nurse Practitioner
- Registered Nurse
- EMTs
- Paramedics
- Medical/Lab Technicians
- Biomedical service and repair technicians

Listed below are job classifications in which some employees may have occupational exposure.

- HSE Supervisor or Manager
- First Responders
- Occupational Health Services Administrator

Personal protective equipment shall be provided by the Company and worn by all employees that are considered at risk. However, exposure determination shall be made without regard to the use of personal protective equipment. The procedures that could result in potential exposure include:

- Venipunctures
- Administering parenteral medications or vaccines
- Emergency management of injuries
- Rescue Breathing / CPR

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- Urine Sample Collection
- Laboratory diagnostic screening procedures
- Any procedures involving exposure to blood or other potentially infectious materials.

The likely places of exposure to potentially infectious material include:

- The occupational health services treatment area
- Any injury emergency scene
- First aid treatment areas on job sites
- Diagnostic Screening/Testing Laboratories

4.3. Universal Precautions

Persons considered at risk shall follow universal precaution procedures. A summary of Universal Precautions for all Patients by Procedure is listed in Table 1.

All human blood and other potentially infectious materials possibly contaminated with blood, will be considered potentially infectious for HBV and HIV.

4.4. Hepatitis B Screening

All employees occupationally exposed shall receive training outlined in this document within 10 working days of initial assignment. HBV vaccination shall be offered to all employees considered to have occupational exposure, as part of their job duties. If the employee initially declines HBV vaccination, but at a later date, while still covered under this document, decides to accept the HBV vaccine, it shall be provided at that time.

Should a booster dose(s) be recommended at a future date, such booster dose(s) shall also be provided.

If an employee declines to accept vaccination when offered, he will sign the statement on the Hepatitis Declination Form (See Attachment 3).

An employee who has not received an immunization series with HBV vaccine or who has no detectable anti-HBs is considered susceptible to HBV infection. An HBV susceptible employee shall be offered Company provided Hepatitis B immunization series (HBV vaccine at zero, one, and six months) by a physician or health care provider chosen by the Company.

4.5. Incident Investigation

Exposure incidents must be reported immediately to the exposed employee's supervisor, who must then immediately report the exposure to the HSE Manager. The Company HSE Manager must contact the Occupational Health Services Department and promptly conduct an exposure incident investigation that documents the following information:

- The circumstance surrounding the exposure incident**.**
- The likely route(s) of entry.
- Engineering controls in place at the time of the incident.
- Work practice controls in place at the time of the incident.
- Personal protective equipment or clothing in use at the time of the incident.
- Any failures of the above controls at the time of the incident.
- Identification of the source individual.
- The exposed employee's training and vaccination records.

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4.6. Post-exposure Evaluation

If an employee has a parenteral or mucous-membrane exposure to blood or other potentially infectious materials, the route and circumstances of exposure should be identified and, if possible, the source material should be tested for the presence of HIV antibody and HBsAg after obtaining any necessary informed consent, using an accredited laboratory. The employee shall be counseled by a licensed physician regarding the risk of HBV/HIV infection and shall be advised to report and to seek medical evaluation of any acute exposure. All testing and counseling shall be undertaken with confidentiality and at no cost to the employee.

If the exposure source material is positive for HBsAg and/or HIV antibody or is not available for examination, the employee shall be re-tested six months and one year after the initial test. All testing and counseling shall be undertaken with confidentiality and at no cost to the employee.

If the exposure source material is negative for HBsAg or HIV antibody, the employee may be re-tested three months after the initial test. All testing and counseling shall be undertaken with confidentiality and at no cost to the employee.

Following a parenteral or mucous-membrane exposure to blood or another potentially infectious material, a Hepatitis B susceptible employee shall be referred to a licensed physician or health care provider chosen by the Company to receive a Company provided Hepatitis B immunization series. The employee shall be evaluated clinically and counseled by the physician regarding the risk of infection. If the exposure source material is positive for HBsAg or is not available for examination, the employee shall also be provided Hepatitis B immunization and Hepatitis B Immune Globulin if given within one week of the exposure. A summary of Hepatitis B Immunoprophylaxis measures is listed in Table 2. All testing and counseling shall be undertaken with confidentiality and at no cost to the employee.

If the source material is positive for HBsAg or is not available for examination, a previously immunized employee shall be counseled by a licensed physician regarding the infection. The employee shall be evaluated clinically, and tested for anti-HBs. If immunity is inadequate, the employee shall be offered one dose each of HBV vaccine and Immune Globulin by the Company physician. All testing and counseling will be undertaken with confidentiality and at no cost to the employee.

If the source material is negative for HBsAg, a previously immunized employee shall be counseled by a licensed physician regarding the risk of HBV infection and evaluated clinically.

For each post-exposure evaluation, the Company shall obtain and provide to the affected employee a written report concerning the physician's recommendations including; the employee's ability to receive Hepatitis B vaccine and medical conditions resulting from exposure to blood or other potentially infectious materials which require further evaluation or treatment, and specific findings and diagnosis. The Company shall provide the employee this report within (15) days of the completion of the physician's evaluation.

The Jacobs Occupational Health Services Department, Baton Rouge, Louisiana, shall maintain a confidential medical record for each exposed employee. The record shall include the employee's name and Social Security number, a copy of the employee's HBV vaccination records, information concerning the employee's ability to receive HBV vaccine, and information and data related to any HBV or HIV exposure. Also, the activity the worker was engaged in at the time of exposure, the extent to which appropriate work practices and protective equipment were used, and a description of the exposure source. This record shall be maintained for at least the duration of employment plus 30 years.

4.7. Other Immunizations

The Company supports the immunization of health care employees for non-bloodborne infectious diseases potentially communicable in the workplace.

The Company shall encourage all health care employees to remain current on tetanus-diphtheria toxoid for the initial series and every 10 years for a booster.

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The Company shall encourage appropriate immunizations for influenza, measles, and rubella for all health care employees.

4.8. Personal Protective Equipment

The Company shall be responsible for providing all necessary and appropriate personal protective equipment, including disposable latex gloves, protective clothing, and emergency ventilation equipment, and will assure that such equipment is readily accessible. An employee who needs special equipment, e.g., hypoallergenic gloves, should make that need known to his or her Supervisor so that such equipment can be made available.

When there is a potential for exposure to blood or other potentially infectious materials, the employee shall use the appropriate protective equipment such as, but not limited to, gloves, gowns, laboratory coats, protective clothing, face shields, masks, eye protection, resuscitation bags, or other ventilatory devices to form a protective barrier.

Masks and eye protection shall be worn whenever splashes, spray, droplets, or aerosols of blood or other potentially infectious materials may be generated and there is a potential for eye, nose, or mouth contamination.

Gloves shall be worn when the potential exists for the employee's hands to have direct skin contact with blood, other potentially infectious materials, mucous membranes, non-intact skin, and when handling items or surfaces soiled with blood or other potentially infectious materials.

Disposable single use gloves, such as surgical or examination gloves shall be replaced as soon as possible when visibly soiled, torn, punctured, or when their ability to function as a barrier is compromised. Disposable gloves shall never be washed or disinfected for reuse.

Utility gloves may be disinfected for reuse if the integrity of the glove is not compromised. However, they must be discarded if they are cracked, peeling, discolored, torn, punctured, or exhibiting any sign of deterioration.

Protective clothing may be either reusable or disposable, as long as it effectively prevents the pass-through of potentially contaminated body fluids. The Company shall arrange for the cleaning, laundering, or disposal of required Company provided personal protective equipment as needed. The Company shall also repair or replace required personal protective equipment as needed.

All contaminated personal protective equipment shall be removed immediately upon leaving the work area or as soon as possible and placed in an appropriately designated area for decontamination or disposal.

4.9. Work Practices

Employees shall wash their hands immediately or as soon as possible after removal of gloves or other personal protective equipment and after hand contact with blood or other potentially infectious materials.

If hand-washing facilities are not readily available, an appropriate antiseptic hand cleaner and clean cloth or paper towels shall be used. Hands shall be washed using soap and running water as soon as possible.

Used needles and other sharps shall be disposed of intact into properly labeled and designated puncture-proof containers. Contaminated needles and other sharps shall not be bent, re-capped, or removed. Shearing or breaking of contaminated needles is prohibited.

Eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses are prohibited in any work area where there is a potential for occupational exposure to blood or other potentially infectious materials. Food, drink or personal items shall not be stored in refrigerators, freezers, or cabinets where blood or other potentially infectious materials are stored or in other areas of possible contamination.

All procedures involving blood or other potentially infectious materials shall be performed in such a manner as to minimize splashing, spraying, and aerosolization of these substances.

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Mouth pipetting or suctioning is prohibited.

Specimens of blood or other potentially infectious materials must be put in leak proof bags for handling, storage, and transport.

4.10. Environmental Controls and Housekeeping

All medical treatment areas shall undergo periodic cleaning and disinfection of surfaces to maintain a clean and sanitary worksite. Janitorial personnel, who clean potentially contaminated work areas must under go training, be offered vaccines, etc. It shall be Company policy therefore, that all properly trained medical personnel will clean their own worksites, thereby limiting the total number of employees possibly exposed. Gloves shall be worn while cleaning work areas. These locations shall also maintain a written schedule documenting regular cleaning and method of decontamination.

An appropriate disinfectant along with a 10% bleach solution in water shall be used to clean and disinfect any environmental or working surface that has been contaminated with blood or other potentially infectious material.

Protective coverings, such as plastic wrap, aluminum foil, or imperiously-backed absorbent paper may be used to cover equipment and environmental surfaces. These coverings shall be removed and replaced at the end of the work shift or when they become contaminated.

Equipment which may become contaminated with blood or other potentially infectious materials shall be checked routinely and prior to servicing or shipping and shall be decontaminated as necessary.

All bins, pails, cans, and similar receptacles intended for reuse which have a potential for becoming contaminated with infectious materials shall be inspected, cleaned, and disinfected periodically and cleaned and disinfected immediately or as soon as possible upon visible contamination.

Broken glassware that may be contaminated shall not be picked up directly with the hands, but shall be picked up using mechanical means only.

The Company shall continue to fully implement the policy of safe handling of potentially infectious medical waste, including sharps and needles. Location specific procedures for disposal of medical waste shall be adopted as part of the Company's Bloodborne Infection Prevention Program. Manifest of potentially infectious medical waste shall be maintained by the generating department/location. Warning labels shall be affixed to all containers used to store or transport potentially infectious waste. The warning label shall include the BIOHAZARD legend. All medical waste shall be properly disposed of by an approved medical waste disposal company.

Contaminated laundry shall be bagged at the location where it was used and shall not be handled in patient-care areas.

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Table 1.

Universal Precautions for all Patients by Procedure.

PROCEDURE	PRECAUTION				
	Wash Hands	Use Gloves	Protective Clothing	Face Guard	Wear Eye Protection
Talking to patient	No	No	No	No	No
Adjusting Equipment	No	No	No	No	No
Examining patient with-out touching blood, body fluids, mucous membranes	Yes	No	No	No	No
Administering percutaneous vaccine	Yes	Yes	No	No	No
Examining patient including contact with blood, body fluids, mucous membranes	Yes	Yes	No	No	No
Drawing blood	Yes	Yes*	No	No	No
Urine sample collection	Yes	Yes	No	No	No
Handling Soiled Materials	Yes	Yes	Yes**	Yes**	No
Emergency situations with trauma	Yes	Yes	No	No	Yes
Potential of spurting blood	Yes	Yes	Yes	Yes	Yes
Diagnostic laboratory screening	Yes	Yes	Yes***	No	No

* Gloves shall always be available and may always be used. Gloves shall always be used when the employee has cuts, scratches, or other breaks in his or her skin or when there is a high likelihood that hand contamination may occur, e.g., the patient is uncooperative.

**Use protective clothing, mask, and eye wear if waste is very contaminated and splattering is likely.

*** Laboratory coats or other protective clothing shall be used at all times while performing diagnostic laboratory screening procedures.

Table 2.

Post-Exposure Hepatitis B Immunoprophylaxis by Source & Employee Hepatitis B Status

Employee Hepatitis B Status	Exposure Source	
	Positive or Unknown	Negative
Susceptible	HBV Vaccine Series	HBV Vaccine Series
	HBIG (within 1 week of exposure)	
Immune	Test for anti-HBs to confirm immunity. If not detected, one dose of HBV vaccine and one dose of HBIG.	

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All employees shall be offered clinical evaluation and counseling following exposure.

HBV = Hepatitis B Virus

anti-HBs = Antibody to hepatitis B surface antigen

HBIG = Hepatitis B Immune Globulin

4.11. Training and Recordkeeping

The Company shall provide training at the time of employment about bloodborne pathogens to all employees covered by this HSEP. All training required by this standard shall be conducted at no cost to the employee and during working hours. This training shall include all of the elements listed in the Bloodborne Pathogens Training Outline (See Figure 1).

The Company shall also conduct an annual in-service training program for all covered employees concerning the prevention of communicable diseases, emphasizing bloodborne diseases. Topics to be discussed include clinical and epidemiological information about infectious disease, specific measures to reduce the risks of exposure, Bloodborne Pathogens regulatory requirements, and the Company's Bloodborne Pathogens Exposure Control Plan. This training shall also include an opportunity for interactive questions and answers with the instructor.

A record of each training session, including the date and contents of the session, the name of the persons who conducted the training and names and Social Security numbers of employees who attended, shall be kept for three years.

An accurate record shall be maintained confidentially for each employee with occupational exposure. Training records will include the dates and contents of training and the names and job titles of persons attending. Training records shall be maintained for three years from the date of training and medical records shall be maintained for at least the duration of employment plus 30 years.

All records shall be made available upon request of employees and appropriate regulatory representatives for examination and copying. Medical records must have written consent of employee before released.

A sharps injury log shall be established for the recording of percutaneous injuries from contaminated sharps. The information in the sharps injury log shall be recorded and maintained in such a manner as to protect the confidentiality of the injured employee. The log shall contain, at a minimum:

- The type and brand of device involved,
- Department or work area where exposure incident occurred,
- Explanation of how incident occurred

The sharps injury log shall be maintained for five years.

5.0 REFERENCES

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6.0 FIGURES

Bloodborne Pathogen Exposure Control Training Outline

Hepatitis B Consent Form

Hepatitis B Vaccine Declination Form (Mandatory)

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Figure 1

Bloodborne Pathogen Exposure Control Training Outline

The training program must contain at least the following elements:

1. Employees must be given access to a copy of the relevant regulatory Bloodborne Pathogen Standard, and its contents must be explained to them.

2. There must be a general discussion of bloodborne diseases with special emphasis on the epidemiology, symptomatology, and modes of transmission of HIV and HBV.

3. There must be an explanation of the Company' Exposure Control Plan, and employees must be told how to obtain a copy of the written plan for their review.

4. An explanation of the methods of recognizing tasks and other activities that may involve exposure to blood or other potentially infectious materials.

5. An explanation of engineering and work-practice controls and PPE, and how these preventive measures will reduce the risk of exposure and the limitations of each of these methods to limit exposure.

6. Information must be made available on the types, proper use, location, removal, handling, decontamination, and disposal of PPE. Training also must be included to enable employees to select the appropriate PPE for a given task.

7. Information on the Hepatitis B vaccine, it's effect, HSE, method of administration, benefits, and that it will be offered free of charge to all employees that have occupational health care responsibilities.

8. Information on the appropriate actions to take, who to contact in an emergency involving blood or other potentially infectious material.

9. Appropriate actions to be taken in an exposure incident, including the method of reporting and the medical follow up that will be available.

10. Information on the post-exposure evaluation and follow-up that the employer is required to provide for the employee following an exposure incident.

11. An explanation of the BIOHAZARD labels and red bags.

12. The instructor will provide an interactive question and answer period.

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Figure 2

Hepatitis B Consent Form

In accordance with OSHA recommendations, Hepatitis B vaccine is offered to all company health care workers.

Hepatitis B Vaccine inoculation is recommended for all health care personnel who are or possibly will be at increased risk of infection with Hepatitis B Virus. Hepatitis B Virus is indicated for immunization against infection caused by all known subtypes of Hepatitis B Virus. The Vaccine will not prevent Hepatitis caused by other agents, such as Hepatitis A Virus, Non-A, Non-B Hepatitis Viruses, or other viruses known to infect the liver.

Hepatitis B Vaccine inoculation is generally well tolerated. No serious adverse reactions attributable to vaccination were reported during the course of clinical trials by the manufacturer. Adverse reactions are usually limited to some localized redness or soreness of the injection site. If you still have questions regarding the Vaccine, please discuss your concerns with the Occupational Health Services Department, HSE Department or your personal physician.

I have been given an opportunity to ask questions about the inoculation and risks involved. All my questions have been answered to my satisfaction. I have received, read, and understand the Company Bloodborne Pathogen Exposure Control Plan.

PLEASE CHECK THE BLANK INDICATING YOUR RESPONSE

_____ I would like to receive the Hepatitis B inoculations

Employee Signature: _____ Date:_____

SS#:_____

Witness: _____

Distribution: Original in Medical Record; Copy to Employee, Copy to HSE Department.

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Figure 3

Hepatitis B Vaccine Declination

(MANDATORY)

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to myself. However, I decline hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

I have been given an opportunity to ask questions about the inoculation and risks involved. All my questions have been answered to my satisfaction.

I have received, read, and understand the Company Bloodborne Pathogen Exposure Control Plan.

Employee Signature: _____ Date: _____

SS#: _____

Witness: _____ Date: _____

Distribution: Original in Medical Record; Copy to Employee, Copy to HSE Department.

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HSE Procedure		Document No: HSEP 11.4	Page: 1 of 5
Cold Stress Control		Supersedes: CHSP 11.4	Rev. 2
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1.0 PURPOSE AND SCOPE

This Corporate Health, Safety and Environment Procedure (HSEP) describes the procedures for cold stress monitoring of personnel engaged in field work activities.

This HSEP applies to all Company employees who perform field work in cold weather and who are at risk of developing cold stress.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

ECT Refers to equivalent chill temperature.

4.0 PROCEDURE

4.1. Hazards of Cold Environments

Frostbite and hypothermia are two types of cold injury, against which personnel must be protected during the performance of field activities. Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 100°F with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at -18°F (see Table entitled Cooling Power Of Wind On Exposed Flesh Expressed As Equivalent Temperature). As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 35°C (95°F). This must be taken as a sign of danger to the workers and exposure to cold should be immediately terminated for any workers when severe shivering becomes evident.

Since prolonged exposure to cold air, or to immersion in cold water at temperatures well above freezing, can lead to dangerous hypothermia, whole body protection must be provided.

Adequate insulating clothing to maintain core temperatures above 36°C (96.8°F) will be provided to workers. The equivalent chill temperature (see Table entitled Cooling Power Of Wind On Exposed Flesh Expressed As Equivalent Temperature) should be used when estimating the

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combined cooling effect of wind and low air temperatures on exposed skin or when determining clothing insulation requirements to maintain the deep body core temperature.

Core body temperatures of less than 96.8°F will very likely result in reduced mental alertness, reduction in rational decision-making, or loss of consciousness with the threat of fatal consequences. Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia.

4.2. Evaluation and Control

Environmental monitoring will be conducted when air temperatures are below 45ºF.

Workers with diseases or taking medication that interferes with normal body temperature regulation will be excluded from work when temperatures are 30ºF or below.

For exposed skin, continuous exposure should not be permitted when the air speed and temperature results in an equivalent chill temperature of -32°C (-25°F). Superficial or deep local tissue freezing will occur only at temperatures below -1°C (30°F) regardless of wind speed.

At air temperatures of 2°C (35.6°F) or less, it is imperative that workers who become immersed in water or whose clothing becomes wet be immediately provided a change of clothing and be treated for hypothermia.

Limits for properly clothed workers for periods of work at temperatures below freezing are shown in the table entitled Threshold Limit Values Work — Warm-up Schedule for Four-Hour Shift.

If available clothing does not give adequate protection to prevent hypothermia or frostbite, work shall be modified or suspended until adequate clothing is made available or until weather conditions improve.

If work is performed continuously in the cold at an equivalent chill temperature (ECT) or below -7°C (20°F), heated warming shelters (tents, trailers, etc.) shall be made available nearby and the workers should be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure.

The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria, are indications for immediate return to the shelter. When entering the heated shelter the outer layer of clothing shall be removed and the remainder of the clothing loosened to permit sweat evaporation or a change of dry work clothing provided.

A change of dry work clothing shall be provided as necessary to prevent workers from returning to their work with wet clothing. Dehydration, or the loss of body fluids, occurs insidiously in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of a diuretic and circulatory effect.

If workers are handling fluids which cool when they evaporate (gasoline, alcohol or cleaning fluids) precautions will be taken to avoid soaking clothing and skin contact.

For work practices at or below -12°C (100°F) ECT the following shall apply:

- The worker shall be under constant protective observation (buddy system or supervision).
- The work rate should not be so high as to cause heavy sweating that will result in wet clothing; if heavy work must be done, test periods must be taken in heated shelters and opportunity for changing into dry clothing shall be provided.
- New employees shall not be required to work full-time in cold in the first days until they become accustomed to the working conditions and required protective clothing.
- The work shall be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats shall not be used.

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- The workers shall be instructed in safety and health procedures. The training program shall include as a minimum instruction in:
  - Proper re-warming procedures and appropriate first aid treatment.
  - Proper clothing practices.
  - Proper eating and drinking habits.
  - Recognition of impending frostbite.
  - Recognition signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
  - Safe work practices.

5.0 REFERENCES

American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices

U.S. Army Corps of Engineering, Safety and Health Requirements Manual, October 1992

6.0 FIGURES

Cooling Power Of Wind On Exposed Flesh Expressed As Equivalent Temperature

Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift

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Figure 1

Cooling Power Of Wind On Exposed Flesh Expressed As Equivalent Temperature

(UNDER CALM CONDITIONS)

Estimated Wind Speed (in mph)	Actual Temperature Reading (F°)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (F°)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148

(Wind speeds greater than 40 mph have little additional effect	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security	INCREASING DANGER Danger from freezing of exposed flesh within one minute.	GREAT DANGER Flesh may freeze within 30 seconds.

Trenchfoot and immersion foot may occur at any point on this chart.

Source: American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1987-1988, Cincinnati, Ohio, 1987

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Figure 2

Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift

Air Temperature - Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx.)	°F	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work period	No. of Breaks	Max. Work Period	No. of Breaks
1. -26° to -28°	-15° to -19°	(Norm. Breaks)	1	(Norm. Breaks)	1	75 min.	2	55 min.	3	40 min.	4
2. -29° to -31°	-20° to -24°	(Norm. Breaks)	1	75 min	2	55 min	3	40 min	4	30 min	5
3. -32° to -34°	-25° to -29°	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
4. -35° to -37°	-30° to -34°	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
5. -38° to -39°	-35° to -39°	40 min	4	30 min	5	Non-emergency work should cease					
6. -40° to -42°	-40° to -44°	30 min	5	Non-emergency work should cease							
7. -43° & below	-45° & below	Non-emergency work should cease									

Notes:

1. Schedule applies to moderate to heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For light-to-moderate work (limited physical movement): apply the schedule one step lower. For example, at -30°F with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).

2. The following is suggested as a guide for estimating wind velocity if accurate information is not available:
   5mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.

Source: American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1990-1991, Cincinnati, Ohio, 1990.

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HSE Procedure		Document No: HSEP 11.5	Page: 1 of 6
Heat Stress Control		Supersedes: CHSP 11.5	Rev. 2
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1.0 PURPOSE AND SCOPE

This Corporate Health, Safety, and Environmental Procedure (HSEP) describes the procedures for heat stress monitoring of personnel engaged in field work activities.

This procedure applies to all employees who perform field work in hot weather and who are at risk of developing heat stress.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

Heat stress	Refers to heat-induced physiological stress
Wet Bulb Globe Temperature Index (WBGT)	Refers to a measure of environmental factors which most nearly correlate with deep body temperature and other physiological responses to heat.

4.0 PROCEDURE

4.1. Hazards of Hot Environments

Heat-induced physiological stress (heat stress) occurs when the body fails to maintain a normal body temperature. A number of physical reactions can occur ranging from mild (such as fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement) to fatal. Because the incidence of heat stress depends on a variety of factors, all workers, even those not wearing protective equipment, should be monitored.

For workers wearing permeable clothing (e.g., standard cotton or synthetic work clothes), follow the ACGIH Threshold Limit Value recommendations for suggested work and rest schedules listed in the table entitled Work-Rest Regimen (Figure 1). This work–rest schedule is determined by the Wet Bulb Globe Temperature Index (WBGT), a measure of environmental factors which most nearly correlate with deep body temperature and other physiological responses to heat. WBGT values are calculated by the following equations:

- Outdoors with solar load

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WBGT = 0.7 NWB + 0.2 GT + 0.1 DB

– Indoors or Outdoors with no solar load

WBGT = 0.7 NWB + 0.3 GT

where:

WBGT = Wet Bulb Globe Temperature

NWB = Natural Wet Bulb Temperature

DB = Dry-Bulb Temperature

GT = Globe Temperature

The determination of WBGT requires the use of a black globe thermometer, a natural (static) wet-bulb thermometer, and a dry-bulb thermometer. Commercially available instruments can be used for convenient measurement of WBGT.

For workers wearing semipermeable or impermeable encapsulating ensembles and/or levels of protection A, B, or C, the recommendations listed in the table entitled Work – Rest Regimen cannot be used. For these situations, workers should be monitored when the temperature in the work area is above 70°F (21°C).

To monitor these workers, measure:

- Heart rate.

  Count the radial pulse during a 30-second period as early as possible in the rest period.

  – If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.

  – If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.

- Oral temperature.

  Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).

  – If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period.

  – If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following work cycle by one-third.

  – Do not permit a worker to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6°F (38.1°C).

- Body water loss.

  Measure weight on a scale accurate to ±0.25 lb. at the beginning and end of each work day to see if enough fluids are being taken to prevent dehydration. Weights should be taken while the employee wears similar clothing or, ideally, is nude. The body water loss should not exceed 1.5 percent total body weight loss in a work day.

Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work. See the table entitled Suggested Frequency of

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Physiological Monitoring For Fit And Acclimatized Worker (Figure 2). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

4.2. Prevention

Proper training and preventative measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat injuries. One or more of the following recommendations will help reduce heat stress.

- Adjust work schedules
  - Modify work/rest schedules according to monitoring requirements.
  - Mandate work slowdowns as needed.
  - Rotate personnel: alternate job functions to minimize overstress or overexertion at one task.
  - Add additional personnel to work teams.
  - Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
- Maintain workers' body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, i.e., 8 fluid ounces (0.23 liters) of water must be ingested for approximately every 18 ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful.
  - Maintain water temperature at 50° to 60°F (10° to 15.6°C).
  - Provide small disposable cups that hold about 4 ounces (0.1 liter).
  - Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.
  - Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.
  - Weigh workers before and after work to determine if fluid replacement is adequate.
- Encourage workers to maintain an optimal level of physical fitness.
  - Acclimatize workers to site work conditions: temperature, protective clothing, and workload.
  - Urge workers to maintain normal weight levels.
- Wear long cotton underwear under chemical protective clothing. Cotton will aid in absorbing perspiration and will hold it close to the skin, which will provide the maximum amount of cooling from the limited evaporation that takes place underneath the chemical resistant clothing.
- Provide cooling devices to aid natural body heat exchange during prolonged work or severe heat exposure. Cooling devices include:
  - Field showers or hose-down areas to reduce body temperature and/or to cool off protective clothing.

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  - Cooling jackets, vests, or suits.

- Train workers to recognize and treat heat stress. As part of training, identify the signs and symptoms of heat stress, which appear below.
  - Heat Rash is caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Symptoms include a decreased ability to tolerate heat as well as being a nuisance.
  - Heat Cramps is caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs are muscle spasm and pain in the extremities and abdomen.
  - Heat Exhaustion is caused by increased stress on various organs to meet increased demands to cool the body. Signs are shallow breathing; pale, cool moist skin; profuse sweating; dizziness and lassitude; nausea; fainting.
  - Heat Stroke is the most severe form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Body must be cooled immediately to prevent severe injury and/or death. Competent medical help must be obtained immediately. Signs and symptoms are red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma.

5.0 REFERENCES

NIOSH/OSHA/USCG/EPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985

American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices

U. S. Army Corps of Engineers Safety and Health Requirements Manual, EMR 385-1-1, October 1992

6.0 FIGURES

Work – Rest Regimen

Suggested Frequency of Physiological Monitoring For Fit And Acclimatized Worker

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Figure 1

Work – Rest Regimen[1]

WBGT Temperature In Which Various Work Loads Are Performed, F°(C°)			
Work-Rest Regimen	Light[2]	Moderate[3]	Heavy[4]
Continuous Work Permitted	86.0 (30.0)	80.1 (26.7)	77.0 (25.0)
75% work 25% rest, each hour	87.1 (30.6)	82.4 (28.0)	78.6 (25.9)
50% work 50% rest, each hour	88.5 (31.4)	84.9 (29.4)	82.2 (27.9)
25% work 75% rest, each hour	90.0 (32.2)	88.0 (31.1)	86.0 (30.0)

Adapted from "Permissible Heat Exposure Threshold Limit Values" in Threshold Limit Values and Biological Exposure Indices for 1990-1991, American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio, 1990, p. 69.

2 Light work (up to 200 Kcal/hr or 800 Btu/hr): e.g., sitting or standing to control machines, performing light hand or arm work, etc.

3 Moderate work (200-300 Kcal/hr or 800-1400 Btu/hr): e.g., walking about with moderate lifting and pushing, etc.

4 Heavy work (350-500 Kcal/hr or 1400-2000 Btu/hr): e.g., sampling work, pick and shovel work, etc.

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Figure 2

Suggested Frequency Of Physiological Monitoring For Fit And Acclimatized Workers[5]

ADJUSTED TEMPERATURE[6]	NORMAL WORK ENSEMBLE[7]	IMPERMEABLE ENSEMBLE
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°.90°F (30.8°-322°C)	After each 60 minutes of work	After each 30 minutes of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 minutes of work	After each 50 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°.77.5°F (22.5°-25.3°C)	After each 150 minutes of work	After each 120 minutes of work

Source: *NIOSH/OSHA/USCG/EPA,* Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985, p. 8-22.

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5 For work levels of 250 kilocalories/hour.

6 Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = ta °F+ (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

7 A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

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HSE Procedure		Document No: HSEP 11.6	Page: 1 of 7
Occupational Hearing Protection		Supersedes: HSEP 11.6	Revision: 3 Issue Date: 15 Oct 08
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1.0 PURPOSE AND SCOPE

The purpose of this Health, Safety, and Environment Procedure (HSEP) is to minimize employee exposure to excessive noise in the work environment.

This HSEP applies to all employees and on-site contractors engaged in operations and/or work activities covered by the Company HSE Program and where there are sound levels at or above the action levels established in this HSEP.

The details of this HSEP address occupational health and safety standards in the United States and represent good workplace health and safety practices. If local occupational noise regulations exist for a non-US work location, they shall be followed.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

Action Level	85 dBA for an 8 hour TWA based on a 5 dBA exchange rate
Audiogram	Is a chart, graph, or table resulting from an audiometric test showing an individual's hearing threshold levels as a function of frequency. A baseline audiogram is one from which future audiograms are compared.
Decibels (dB)	Unit of measure of sound pressure level.
dBA	The sound pressure level reading in decibels made on the OSHA required A-weighted scale of a sound level meter on slow response.

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Exchange Rate	The relationship between intensity and dose. When the intensity of an exposure increases by 5 dBA, the dose doubles. OSHA uses a 5 dBA exchange rate. Other entities use exchange rates that generally range from 3 dBA to 5 dBA. For example, with an exchange rate of 5 dBA an 85 dBA exposure, the allowable exposure time is eight hours, while for a 90 dBA exposure, the allowable exposure time is four hours, etc.
Hertz (Hz)	Is a unit of measure of frequency, numerical equal to cycles per second.
High-level Noise Area	An area defined as over 85 dBA.
Noise Dosimeter	An instrument worn by employees that measures, records and then averages sound levels over a period of time, normally an entire work shift.
Noise Reduction Rating (NRR)	A rating in decibels of the relative protection given by a specific model of hearing protector, i.e., NRR=30, informs the potential user, this product will "hold out" approximately 30 decibels when worn according to instructions. The NRR must be adjusted to account for the noise frequency spectrum and work conditions (refer to ANSI S12.6-1997).
Sound Level Meter (SLM)	An instrument designed to measure sound levels in the workplace at a given point and time. There are four sound level meters by type: Type 0,1,2, and 3. Use at least a Type 2 SLM for noise assessments and dosimetry.
Standard Threshold Shift	Is a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2,000, 3,000, or 4,000 Hz in either ear.
Time Weighted Average (TWA)	An average noise exposure over a period of time, normally 8 hours per day.

4.0 PROCEDURE

4.1. Workplace Noise Assessment

All work areas with potential noise levels of 85 dBA or above shall have noise surveys conducted to document noise level during normal work operations. When there is a specific noise source above 85 dBA, the survey shall delineate the work area requiring hearing protection. Client-generated noise survey data may be utilized to augment the noise assessments.

Personnel, who regularly work in areas identified with noise levels at or above the Action Level, shall have full-shift noise dosimetry conducted. If work groups have essentially similar noise exposures, representative workers may be selected for dosimetry monitoring.

Noise survey equipment and dosimeters shall be calibrated and operated in conformance with the OSHA Technical Manual (or equivalent) and the manufacturer's instructions. Noise surveys and dosimetry results shall be documented on the forms presented in Figures 2 and 3, or their equivalent.

When there are changes in facility operating conditions and/or changes in scopes of work, which could result in changes in noise exposure, new noise exposure assessments of affected work areas and work groups, shall be conducted.

4.2. Approved Hearing Protection

In areas with noise levels above the Action Level, feasible, engineering, and administrative controls shall be instituted to reduce noise exposures to less than 85 dBA.

In high noise areas, where engineering and administrative controls are not feasible, hearing protection equipment, approved by the HSE Manager, must be worn.

Site management must establish and communicate to all affected employees those areas, jobs, and equipment requiring hearing protection. Examples of some potential high-level noise jobs and equipment are provided in Figure 1.

In those work areas where noise levels exceed 85 dBA, hearing protection is necessary, Site Management shall ensure that signs are posted that state:

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Caution

Hearing Protection Required

A variety of approved hearing protection devices, such as ear plugs or earmuffs, shall be made available to workers.

The hearing protective devices made available to workers shall provide effective noise reduction to a level below the Action Level. Noise Reduction Rating (NRR) is generally provided by the manufacturer with hearing protectors.

For jobs with full-shift noise exposures of greater than 90 dBA, an evaluation must be conducted to determine if two levels (e.g., ear muffs plus ear plugs) of hearing protection are required to reduce the noise exposure to less than 85 dBA. Although wearing both ear plugs and ear muffs does not double the noise reduction, there are some additional noise reduction benefits when using both.

The hearing protection selected shall be evaluated and determined to be effective for the specific noise environments in which the protectors will be used.

4.3. Audiometric Testing

An audiometric test is required when an employee's noise exposure equals or exceeds a TWA of 85 dBA (Action Level) during an eight-hour day.

Audiometric test shall be performed by, or under the direction of, a licensed or certified Audiologist or equivalent.

Audiometric tests will be provided at no cost to the worker.

A baseline audiogram shall be conducted prior to the first exposure at or above the Action Level.

At least annually after obtaining the baseline audiogram, a new audiogram for each employee exposed at or above an 8-hour time-weighted average of 85 decibels shall be obtained. Each employee's annual audiogram shall be compared to that employee's baseline audiogram to determine if the audiogram is valid and if a standard threshold shift has occurred.

Employees must have no significant noise exposure (occupationally or non-occupationally) for at least 14 hours preceding any audiometric test.

If any audiogram shows that an employee has a standard threshold shift (STS), use of hearing protection shall be re-evaluated and/or refitted and, if necessary, a medical evaluation may be required.

For US employees, if a comparison of the annual audiogram to the baseline audiogram indicates a standard threshold shift, the employee shall be informed of this fact in writing, within 21 days of the determination.

4.4. Documentation

4.4.1. All Locations

Workplace noise exposure data shall be maintained by the jobsite HSE representative and shall be retained for a minimum of two years, beyond the current year.

Individual employee's noise exposure monitoring results will be maintained along with audiometric test records in the affected employee's medical file.

Noise exposure training records will be maintained by the site HSE representative.

4.4.2. Documentation for US Projects, Except Construction

A copy of the OSHA Occupational Noise Exposure Standard, 29 CFR 1910.95, must be posted in the workplace and copies made available to employees

Audiometric testing records are considered to be part of an employee's medical record and shall be retained for the duration of employment plus 30 years.

These records will be made available to employees upon their request.

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4.5. Inspection and Storage

Workers must inspect their hearing protectors before use.

Hearing protectors found to be defective shall be repaired or replaced immediately.

Hearing protectors found to be soiled or unsanitary shall be cleaned or replaced before use.

Hearing protectors shall be stored in a manner, which protects them functionally and maintains them in a sanitary condition.

4.6. Training

Each employee included in the hearing conservation program will receive training upon hire and annually thereafter.

At a minimum, training topics must include:

- The effects of noise on hearing
- Hearing protectors, including selection, fitting, use, and care instructions.
- Audiometric testing, purpose, and procedures.
- Worksite tasks, areas, and equipment designated as “High Noise”, where hearing protection is required.

5.0 REFERENCES AND RELATED DOCUMENTS

29 CFR 1910.95, Occupational Noise Exposure

29 CFR 1926.52, Occupational Noise Exposure

29 CFR 1926.101, Hearing Protection

US Department of Labor, OSHA Technical Manual, Noise Monitors and Meters

ANSI S12.6-1997, American National Standards for Measuring the Real – Ear Attenuation of Hearing Protectors.

6.0 FIGURES

Common Jobs and Equipment Requiring Hearing Protection

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Figure 1

Common Jobs and Equipment Requiring Hearing Protection

The following list of equipment and task activities is often associated with high-level noise.

Chain Saw	Concrete Pumper
Chipping Hammers, Guns	Impact Wrench
Circular Saw	Ground Tamper
Concrete Corer & Saw	Drill Rigs
Forklift	Aircraft and Flight Line
Grinding	Front End Loader
Hydro-blasting	Concrete Cut-Off Saw
Pile Driving	Arc Gouging
Sand Blasting	Grout Pump
Sump Pump	Powder Actuated Tools
Table Saw	Cherry Picker
Welding Machine	Pavement Breaker
Well Development Rig	Compressor

This list is not all-inclusive and should only be used as a guide.

Actual sound pressure levels should be obtained. Operation of multiple noise sources in the same area, or reverberant noise (such as in a confined space), will result in higher noise levels.

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Figure 2

Sound Level Survey Documentation Form

Provide General Description Area In Which Sound Level Survey Was Conducted	**Date** *(YYMMDD)*	**Project Name**
	Job Location	**Project Number**
	Workplace Description or Unit Name	

Sound Level Meter	**Calibrator**	**Primary Noise Source**
Manufacturer	**Manufacturer**	
Model	**Model**	
Serial Number	**Serial Number**	**Secondary Noise Source**
Calibration Date	**Calibration Date**	

Wind Screen: Used ☐ Not Used ☐ Indoors ☐ Outdoors ☐

Sound Level Data					**Protection Required**		
Describe Location Surveyed or Sound Level Source Surveyed	**dBC**	**dBA**	**85 dBA Line (feet)**	**Exp. Durat-ion (min)**	**Plug or Muff**	**Plug and Muff**	**Plug, Muff, Time Limit**

Attach a diagram of area surveyed, indicating noise emission sources, locations measured, etc.

Noise dosimetry required? Yes ☐ No ☐ N/A ☐ **Is Shop on the HCP?** Yes ☐ No ☐

Surveyed by: _____ **Reviewed by:** _____
Print Name *Print Name*

Signature: _____ **Signature:** _____

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Figure 3

Noise Dosimetry Survey Form

Date Dosimetry Conducted:					
Office/Project & Location:					
Surveyor(s)/Technician(s) *(Print Name):*					
Type of Monitoring Conducted:	Personal ☐ Area ☐				
EMPLOYEE INFORMATION					
Name:		**ID #:**			
Job Title/Craft:					
Task(s) Assessed:					
Hearing PPE Utilized (Muff/Plug):					
Is employee in a Hearing Conservation Program:	Yes ☐ No ☐				
Other Employees/Similar Exposure Group Represented by this Data:					
DOSIMETER DATA					
Instrument Mfg.:		**Model:**		**Serial No.:**	
Calibrator Mfg.:		**Model:**		**Serial No.:**	
Calibrator Certification Date*(annual):*		**Battery Condition:**	Yes/Good ☐ No/Replace-Recharge ☐		
Pre-Cal Reading:		**Time On:**		**By** *(initial):*	
Post-Cal Reading:		**Time Off:**		**By** *(initial):*	
Total Run Time:		**Percent Dose:**		**L_{AVG}:**	**L_{MAX}:**
Exchange:	**5 dB**		**3 dB**		
TASK INFORMATION					
Specific Work/Task Details *(include SLM results here or in diagram)***:**					
Pre assignment dosimeter wearer instructions presented?	Yes ☐ No ☐				
Reason for Survey, How to wear, When to wear, What not to do, Not a typical recorder, Copy of results provided					
Comments:					
Attach Sketch of Assessment Area:					
SIGNATURES					
Surveyed by:	*Print Name*	**Reviewed by:**	*Print Name*		
Signature:		**Signature:**			
Date:		**Date:**			
CONCLUSIONS & RECOMMENDATIONS:					

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HSE Procedure		Document No: HSEP 11.7	Page: 1 of 5
Spill Containment		Supersedes: HSEP 11.7	Revision: 3 Issue Date: 29 Jul 05
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1.0 PURPOSE AND SCOPE

This HSEP applies to environmental field activities. Typical field projects generally pose a relatively minor danger for environmental damage from spills of hazardous materials. For projects, which present greater hazards, such as those that handle concentrated and/or large volumes of hazardous materials, a specialized and project-specific spill containment plan must be developed.

Many program components will be managed by the client or a site facility contract operations and maintenance organization. For this reason, the project procedures must outline the appropriate responsibilities for Company employees in relation to the responsible client personnel. In many cases, responsibilities such as reporting the spill to regulatory agencies will be handled entirely by client personnel.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 PROCEDURE

The hazard analysis in the site Health and Safety Plan (HSP) shall state potential spill hazards associated with each phase of the site's scope of work. For each spill hazard, methods to avoid spillage and spill response procedures will be presented.

Names of personnel for site-specific notifications, and their phone numbers, shall be provided.

Personal protective equipment, decontamination, and air monitoring procedures required for each spill response hazard shall be incorporated in the site HSP in the appropriate topical section.

3.1. Spill Response

If a spill of hazardous material occurs, the following actions will be taken:

- Notify the Site HSE Supervisor and Site Manager.
- Take immediate measures to control and contain the spill within site boundaries. It is especially important to protect water sources from contamination. For this reason drains,

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manholes, ditches into streams, etc. should be protected with dikes, dams, or other methods to minimize water contamination.

- Keep unnecessary personnel away, isolate the hazardous area, and deny entry to unauthorized personnel.
- Stay upwind and keep out of low-lying areas.
- Allow no flares, smoking, or flames in hazard area.
- Keep spilled liquids away from combustible materials, such as lumber, dry vegetation or trash, etc.
- Take necessary steps to clean up the spill and all contaminated material.

3.1.1. Small Dry Spill

Isolate the area immediately to minimize the tracking of dust into clean areas.

Don an appropriate respirator, gloves, and booties. Shovel the spilled material into a dry container and cover. Care should be taken to minimize dust generation. Do not hose-down the material into a sump. (An exception might be the spillage of a very toxic bioactive agent where dilution might be the best course of action. Plan ahead.)

Label the container according to the contents and remove to a designated staging area. Determine whether the material is still usable and, if so, use this material first.

With the bulk of the dry material collected and removed from the area, it may be suitable to now wash down the area to remove any dust. Methods for management of this wash water will depend on the material spilled.

Additional information on spills is contained in Figure 1.

3.1.2. Small Liquid Spill

As with dry powders, try to contain the liquid and collect it for future use. A sponge may help in soaking up the liquid and transferring it to a container.

Absorb the remaining liquid with vermiculite, sand, clean fill, or other noncombustible, absorbent material.

Place contaminated material in a container and label the contents prior to transporting to the designated staging area. Also, label the container of recovered liquid.

As a final step, it may be suitable to wash down the area so as to remove any remaining absorbent. Methods for management of this wash water will depend on the material spilled.

Additional information concerning spill control methods is contained in Figure 1.

3.2. Notification

In many cases spills may need to be reported to environmental or transportation regulatory agencies. Reporting procedures shall be developed on a project specific basis in cooperation with the appropriate client representatives and defined in the project HASAP.

In most cases, the client will choose to handle the required reports to outside agencies.

Each project-specific reporting procedure must include the name and emergency contact number for the client representative and alternate personnel.

3.3. Disposal

Disposal of waste generated as a result of a material spill shall be in accordance with project specific procedures.

Every effort shall be taken to prevent the mixing of incompatible wastes.

Disposal methods shall have client and regulatory agency approval prior to waste disposal.

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3.4. Incident Rehearsal

Field projects with routine or scheduled activities involving hazardous materials and an anticipated duration of greater than thirty days should conduct an emergency exercise, which includes a simulated hazardous material spill incident.

An evaluation of the effectiveness of the response shall be made by the site HSE professional.

Recommendations of this evaluation shall be incorporated in project procedures in order to improve the incident response efficiency during future events.

3.5. Spill Avoidance

Always store dry powders and liquids in appropriate containers and make sure that lids are on tight. Contents should be transferred to a new container if any sign of leakage is noticed.

Containers should be properly stored and away from high traffic areas. Bags should be held on pallets and the pallets kept away from the aisle way so as to avoid accidental puncture by forklift.

Proper dispensing equipment should be employed so as to prevent spillage and reduce excessive use.

4.0 REFERENCES

U.S. Army Corps of Engineers, Safety & Health Requirements Manual EM 385-1-1, Section 28. October 1992.

Title 29, Code of Federal Regulations, 1910.120

5.0 FIGURES

Spill Containment Techniques

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Figure 1

Spill Containment Techniques

1. Introduction

The selection of a good spill containment strategy is critical for the protection of people and the environment. In choosing the proper containment technique, several factors should be considered.

This provides basic information to assist with the development of adequate and project specific spill containment protocols for inclusion in the site HSP. As is generally the case, prevention is the best approach. For this reason emphasis should be given to the safe use and transportation of hazardous materials in order to prevent spills. For example, glass containers of solvents should be placed in approved carriers prior to use.

Pre-planning is also critical. Absorbent materials and clean up tools should be readily available in areas in which hazardous materials are handled.

2. Spill Movement

Spills may occur with materials in any of the primary states of matter: solid, liquid, or gas. The material may even be in a combination of these states of matter as is often the case with highly volatile solvents. Depending on the matter state of the spilled material and the characteristics of the spill location, a number of migration pathways are possible.

3. Containment Land

The complexity of spill containment increases dramatically if a body of water is affected. For this reason, land containment of the spill is important; priority should be given to preventing the spill from reaching a water source.

Water sources, including sewers, storm drains, ditches, streams, etc., must be protected. Contain the spill on land if possible.

<u>Covering</u>

Spills of solid materials can be contained by placing plastic sheeting over the spill area and securing it with sandbags. This prevents the material from being dispersed by wind prior to cleanup.

Ensure that static electricity build-up and discharge do not pose an explosion hazard.

<u>Vapor Knockdown or Suppression</u>

Flammable or toxic vapors being emitted from a spill can be "knocked down" or suppressed with application of a water or foam spray. Care must be taken to provide for containment of the vapor suppressant in these applications.

4. Land Containment Methods

- Dams — Dams of various sizes may be constructed of earth, clay, sandbags, water inflatable bags, boards, concrete, and many absorbent materials.
- Trenches — Trenching is often used in place of damming. The trenches are usually lined with plastic sheeting to form a collection area.
- Dikes — Permanent dikes are often found in storage facilities to aid in the containment of a large spills.

5. Containment by Trenching

Trenching is often advantageous if the spill occurs on the soil surface. Generally, this method provides a holding area and can minimize seepage into groundwater.

- Large trenches — machinery will be needed for construction

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- Small trenches — this method is often preferred because small trenches can be constructed with hand tools. The most common practice is to trench around the overturned or leaking container.

  Wind direction, type of material, geographical slope, condition of containers, and many other variables will dictate the location of the trenches.

6. Containment in Road Areas

A spill on a land surface near roads often warrants concern when near areas of water entries. Storm sewers, manholes, and gutters are a few such water entry possibilities.

Tarps, polyurethane foams, dirt dams, and other methods may be used to divert the product from these areas of concern.

7. Containment of Contaminated Groundwater

If a spilled material moves downward through the soil horizons and reaches the groundwater table, then it may be necessary to contain and recover the material as well as the contaminated water.

If groundwater is shallow, a possible solution might be an interrupter ditch. The backside of the ditch is lined with polyethylene sheeting material. The lined trench thus serves as a product/water separator. The groundwater is then allowed to continue in its movement.

If the contaminated area is large and slow moving, an open trench may not be the answer. A deflecting barrier is a structure which is more permanent than the interrupter ditch and moves the skimmed floating product to a recovery crock. The crock is an upright culvert with slits cut in the sides to allow the product to move inside and filter through the rocks or other media with which the separator is packed.

Deep groundwater recovery is accomplished by developing a hydraulic cone of depression, which is created by the use of significant groundwater pumping. By placing a well suction beneath the floating material and producing a funnel type of effect, the product is concentrated in a general area. A second product recovery well is placed in the area of material concentration in order to facilitate recovery.

8. Containment on Water

Four general ways are used to contain a material on water. These methods include booms, weirs, underflow dams, and physical barriers.

9. Small Stream and Ditch Containment

Most spills tend to end up in small runoff waterways. Some practical containment methods are: a board skimming device, earth dam and weir, wire fence filter boom, culvert weir, and an underflow dam. These methods are simple to construct and effective in small, moving waterways.

10. Containment of a Sinking Product

Containment of a sinking product is difficult due to the inability to visually monitor movement and location of the spill. Some methods of containment for a sinking product are dikes, dams, curtain barriers, air barriers, seines, and submersible barriers. These devices rely upon the concept of dividing the area of spilled material from the other water.

The selection of method is dependent upon the nature, viscosity, and other properties of the material. For example, seines may work better with one spilled material than with another.

11. Containment of a Soluble Product

When a material is water soluble, the containment of the entire water source is generally required. In many cases the existing controls such as locks, tide gates, and weirs may be used to contain the spill. If these are not available, dikes and dams may be constructed. A water soluble material is not easily separated from the water itself, and complete containment is a must.

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Decontamination		Supersedes: CHSP 11.9	Rev. 2
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1.0 PURPOSE AND SCOPE

In addition to good business health, safety, and environment practices, guidelines and standards for personnel and equipment decontamination can be found in various technical publications and references as well as Federal and state occupational health, safety, and environment regulations.

Guidelines from all such sources have been provided in the Section 11.9 series of HSEPs.

This series of HSEPs applies to all employees covered by the Company's Health, Safety, and Environment program who are involved in work with Hazardous Wastes.

2.0 REFERENCES

Refer to references in individual Section 11.9 series HSEPs.

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1.0 PURPOSE AND SCOPE

This Health Hazard Evaluation (HHE) procedure provides guidance in determining, documenting and prioritizing project level exposure monitoring, medical surveillance and training requirements for occupational health hazards.

An HHE is required at all locations where chemical hazards exist, including but not limited to refineries and chemical processing, packaging or handling facilities. For sites that use consumer use chemicals under routine conditions only, the HHE is required to state this. Under these conditions it is unlikely that industrial hygiene surveillance will be required.

The HHE is used to determine the need to conduct further industrial hygiene surveys and monitoring including integrated air sampling, noise dosimetry and other exposure assessments.

The HHE and Industrial Hygiene Surveillance Plan should be developed in conjunction with the project HASAP or HSP and can provide information in the preparation of SPAs and the hazard communication procedure, HSEP 1.3..

For chemically complex projects, client provided health hazard information shall be used to conduct an initial HHE during the preparation of the proposal. Once field activities begin, this initial HHE should be assessed by a Jacobs HSE professional with appropriate IH expertise and credentials and updated as required.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

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2.1. Project Manager

The Project Manager is responsible for assuring that the site-specific HASAP includes the project HHE, if applicable.

The Project Manager is also responsible for obtaining copies of historical client-specific or project-specific health and safety-related permits, environmental permits, and other work permits, which might contain useful health hazard related information.

2.2. Senior HSE Manager

The Senior HSE Manager is responsible for identifying chemically complex projects and coordination with Jacobs Sales and Business Development on new proposals involving chemically complex projects and projects involving regulated hazardous materials for input of HHE information.

2.3. Senior Industrial Hygiene Manager

The Senior Industrial Hygiene Manager provides technical support and guidance to the Regional HSE Manager in the development of the HHE. The Sr. IH Manager will also assist the Project Industrial Hygienist in development of the project level industrial hygiene surveillance plan to include; prioritizing monitoring, reporting findings, making recommendations for controls, tracking results and determining appropriate points to cease monitoring.

2.4. Regional HSE Manager

The Regional HSE Manager is responsible for the development of the HHE for new projects and for coordination with the Sr. Industrial Hygiene Manager in the preparation of the HHE on chemically complex projects and as needed on other projects.

The Regional HSE Manager is also responsible for ensuring routine review and consultation with the industrial hygiene manager is conducted and an industrial hygiene surveillance plan has been developed as necessary.

2.5. Project Industrial Hygienist

The Project Industrial Hygienist will coordinate with the Site HSE Supervisor and Industrial Hygiene Manager on implementing the IH surveillance plan. This will include performing worker monitoring, documentation of monitoring conditions and proper handling and control of samples

2.6. Site HSE Supervisor

The Site HSE Supervisor will implement the IH Surveillance Plan and will assist the Project Industrial Hygienist in worker monitoring. The Site HSE Supervisor will also utilize the findings and recommendations of worker monitoring to modify the HASAP or HSP and SPAs as necessary.

3.0 DEFINITIONS

Action Level (AL)	An airborne concentration of a contaminant, which is typically half the established exposure limit.
Chemically Complex Project	A project, activity, or operations location that may entail potentially elevated health or environmental risks based on the nature of the hazards involved (chemical, biological or radiological), process complexity relative to these hazards, and scope of services. Such projects normally would include operations or maintenance or capital project services for specialty and bulk chemical, petrochemical, biopharmaceutical, radiological processes, aerospace, and hazardous waste operations.
Exposure Modeling	The use of calculations, mass balance and other theoretical means to determine estimates of worker exposure. In some instances, exposure modeling can be used to establish the rationale for not requiring worker monitoring. It can also be used to prioritize monitoring sequences.

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Health Hazard	Physical, chemical, and biological stresses that may cause sickness, impaired health, significant discomfort, or inefficiency in workers.
Health Physicist	A professional health physicist with a degree in health physics and/or a Certified Health Physicist (CHP), who is certified by the American Board of Health Physics or equivalent for non-US operations.
Immediately Dangerous to Life or Health (IDLH)	Airborne exposure to a chemical in a concentration above which is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment.
Industrial Hygiene Surveillance Plan	A project level plan that is a key output of the Health Hazard Evaluation process. The plan will identify exposure groups, monitoring requirements by exposure group, monitoring sequence, timeframes and basic rationale when monitoring may be ceased. This plan can be used to estimate IH resources required to support a project and will be a key document reviewed during SERs associated with chemically complex projects.
Occupational Exposure Limit (OEL)	The OEL is the adopted exposure limit value to be used for exposure assessment. The OEL would typically be a PEL or TLV that is considered to be most protective of worker health under the conditions of exposure. Initially the OEL chosen will be the lowest number between Federal or state PELs or the TLV. If well characterized monitoring results fall between the most restrictive value and a less restrictive value, further evaluation will be warranted.
Other Health Hazard Terminology	Refer to HSEP 1.3, for hazard communication
Permissible Exposure Limit (PEL)	Regulatory limits developed by OSHA to indicate the maximum airborne concentration of a contaminant to which an employee may be exposed over the duration specified by the type of PEL assigned to that contaminant.
Project Industrial Hygienist	An individual possessing the skills, experience and education necessary to effectively identify, evaluate and recommend controls for project level health hazards. This individual should be recognized by the Senior Industrial Hygiene Manager as technically competent.
Recommended Exposure Limit (REL)	Issued by the National Institute of Occupational Safety and Health to aid in controlling hazards in the workplace. These limits are generally expressed as 8- or 10-hour TWAs for a 40-hour workweek and/or ceiling levels with time limits ranging from instantaneous to 120 minutes.
Senior Industrial Hygiene Manager	A professional industrial hygienist (CIH) certified by the American Board of Industrial Hygiene or equivalent for non-U.S. operations.
Threshold Limit Values (TLV)	A registered trademark for an exposure limit developed by the American Conference of Governmental Industrial Hygienists (ACGIH). These values are research based and peer reviewed with rationale provided in the *Documentation of the Threshold Limit Values and Biological Exposure Indices*.

4.0 PROCEDURE

4.1. Proposal Health Hazard Evaluation

A Senior HSE Manager, with support from an IH professional as needed, shall provide HHE input and estimates of IH support requirements during the contract proposal stage for a project. Also, where applicable, contract language must stipulate that historical personal exposure monitoring data and medical surveillance data shall be provided to the Company at contract award. This information should be made readily available to the Project Industrial Hygienist and used in the development of the project IH surveillance plan.

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4.2. Project Health Hazard Evaluation

For all applicable projects, an HHE shall be performed before site mobilization and concurrent with preparation of the HASAP. This evaluation will be used to develop the project IH surveillance plan and identify personnel resources required for carrying out the established plan.

The HHE scope shall include the physical, chemical, radiological, and biological health hazards. Physical health hazards include elevated noise and vibration exposures, repetitive motion work operations, ionizing and non-ionizing radiation exposures heat and cold stress and biological hazards include infectious disease agents.

The scope of the HHE shall include these elements.

4.2.1. Chemical Exposure Evaluation

Available process chemical information and facility air monitoring data relevant to the project scope of work shall be assembled and reviewed. This air monitoring data, including facility workplace area air monitoring networks and personal and area air monitoring data shall be reviewed to determine the extent of additional air monitoring, if any, will be included in the IH Surveillance Plan.

When conducting an HHE for chemically complex projects, the following is needed:

- Process chemistry including reactants
- Intermediates and end-products
- Process operating temperature and pressure
- Process hazard analysis
- Personal exposure monitoring data
- Medical surveillance data.

The Hazardous Chemical Information form, found as a figure in HSEP 1.3, Chemical Hazard Communication, should be used to assist with data collection and hazard assessment for chemically complex projects and is available, as an option, to be used in a similar manner for non-chemically complex projects.

The HHE should be summarized using the outline found at Figure 1 and included as an appendix to the project HASAP.

4.2.2. Regulated Materials

Where regulated materials are present in the scope of work, an HHE must be conducted on them. For reference, see **Figure 2** for a list of Hazardous Substances Requiring Specific Exposure Monitoring Protocols.

The HHE for specific regulated materials must address the scope of requirements for that material. As a minimum, this scope shall include:

- Allowable exposure limits,
- Exposure monitoring requirements,
- Methods of compliance for potential over exposure conditions,
- Medical surveillance program,
- Hazard communication, employee training requirements,
- Recordkeeping requirements, and
- Program review frequency.

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4.2.3. Radiation Exposure Monitoring Program

When ionizing radiation hazards are present, a health physicist (HP) shall prepare, in compliance with HSEP 10.1, a separate Radiological Protection Program, or equivalent, depending on country-specific requirements.

For minor radiation source issues, an HP shall provide input to the project HHE.

4.2.4. Biological Hazard Evaluation

For biological hazard evaluation, utilize:

- HSEP 11.1, Biological Hazard Control, which provides guidance on identification, evaluation, and control of biological hazards, and
- HSEP 11.2, Bloodborne Pathogen Control, which provides guidance on identification and evaluation of common bloodborne pathogen exposure hazards.

4.2.5. Noise Exposure Evaluation

Refer to HSEP 11.6, Occupational Noise, for assessing worker noise exposures and determining the need for audiometric surveillance and worker noise control.

4.2.6. Heat and Cold Stress Control

For work to be done in extreme temperatures, refer to:

- HSEP 11.4, Cold Stress Control, and
- HSEP 11.5, Heat Stress Control.

4.2.7. Repetitive Motion Work Operations

For work involving repetitive motion, refer to HSEP 11.8, Ergonomics, for evaluation and control procedures for field and office repetitive motion stress.

4.2.8. Medical Surveillance Program

An evaluation of the scope of project health hazards shall be used to provide input for the development of the project occupational medical program.

When a potential health hazard is identified, pre-placement and periodic medical surveillance shall be reviewed to verify that the engineering, administrative, or personal protective equipment controls are effective.

Medical surveillance summaries and identified restrictions shall be maintained in a common database so proper tracking, coordination and follow-up can be performed.

4.3. Industrial Hygiene Surveillance Plan

The IH Surveillance Plan will be included in the HHE. It will provide a breakdown of exposure groups identified for the defined scope of work and a summary of required and recommended worker monitoring to be performed including IH exposure assessments and medical monitoring requirements. When necessary, the plan will document the rationale for sampling / not sampling exposure groups by referencing exposure modeling utilized and historical information reviewed during development of the HHE as necessary.

The IH Surveillance Plan will be summarized using the attached format. This summary will include monitoring requirements and an estimated timeline for implementation. In some instances, regulatory requirements will apply to the monitoring schedule and will be noted as such on the summary. This summary sheet will be reviewed during subsequent SERs for adequate implementation.

The IH Surveillance Plan should address

- Which exposure groups require IH monitoring and medical surveillance
- Specific substances or agents to be monitored,

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- The OELs to be used to evaluate results
- The statistical basis to continue or cease monitoring
- Specific medical testing/protocol to be implemented

See HSEP 12.2 for requirements related to specific personal and area air monitoring procedures.

Results for all IH monitoring shall be maintained in a common database in order to minimize whenever possible, duplication of sampling similar / common tasks. The database can also be utilized to maintain ready access to IH information and to provide historical preservation of information per regulatory requirements.

4.4. Implementation

After the HHE is completed, the results will be documented in the project HASAP and used in the development of task-specific SPAs and worker training.

The Industrial Hygiene Surveillance section of the HHE will be utilized by the Site HSE Supervisor to conduct and coordinate appropriate monitoring. In instances when there is a Project Industrial Hygienist assigned full time to the program, the Project IH will be responsible for implementing the IH Surveillance Plan as required.

Reports for each round of IH monitoring should be written following the basic format outlined in HSEP 12.2.

The project HHE should be used in conjunction with chemical hazard communication training in order to provide focus on health hazards, particularly for the development of task SPAs.

The HHE also provides process input to support the medical monitoring and training requirements of substance-specific regulatory standards.

If new health hazards are identified during the course of the project, the HHE and all associated programs impacted by the changes shall be updated as well. These include the HASAP, SPAs, IH Surveillance Plan, worker training and medical monitoring.

4.5. Control of High Health Hazard Tasks

If the HHE identifies work conditions such as the following, the exposure must first be mitigated or work shall not be performed.

- Oxygen concentrations less than 19.5% or greater than 23.5%, or
- Atmospheres greater than 1% of the Lower Explosive Limit, or
- Atmospheres that are >50% of Immediately Dangerous to Life or Health (IDLH) concentrations, or
- Work with sensitizers or known human carcinogens, mutagens, or teratogens without process isolation or fully encapsulating personal protection, or
- Work with highly infectious biological agents without process isolation.

If work in these environments is necessary, the Project Manager shall appeal to the appropriate senior operations manager and Senior HSE Manager for written approval to proceed and for specific safe work procedures.

5.0 REFERENCES

HSEP 1.3, Chemical Hazard Communication

HSEP 12.2, Personal Air Monitoring

6.0 FIGURES

Health Hazard Evaluation Outline

Hazardous Substances Requiring Specific Exposure Monitoring Protocols

Industrial Hygiene Surveillance Plan Summary

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Figure 1

Health Hazard Evaluation Outline

Section 1
Process Summary - include key areas or sections within each process.

Section 2
Staffing Information - include shift durations, length of project, number of personnel on site.

Section 3
Identification of Exposure Groups.
This can be any logical grouping, but consistency should be used throughout the groupings. For example don't group by process in one area and trade in another. It should also include supervisory personnel working in the field. An estimated count of personnel in each group should be included.

Typically for craft workers, exposure groupings can be made by trade, however if one group of personnel only work on one process it may be useful to break the groupings down further; (e.g. welders process 1; pipe fitters process 2).

Section 4
Discussion of health hazards identified and assumptions used in exposure assessment. For each exposure group, evaluation should include conclusion on the need (or lack of need) for field monitoring.

This should address the following for each exposure group:

- Which require IH monitoring and medical surveillance
- Specific substances or agents to be monitored,
- The OELs to be used to evaluate results
- The statistical basis to continue or cease monitoring
- Specific medical testing/protocol to be implemented

The plan should be summarized on the table found in attachment 3 or a similar summary format be used for easy reference and tracking.

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Figure 2

Hazardous Substances Requiring Specific Exposure Monitoring Protocols

This list contains regulated materials for which there are specific worker exposure monitoring requirements. These chemicals and hazardous substances may be found in the scope company projects, but this does not necessarily represent an inclusive list, and other/additional regulatory standards may apply in some locations.

- 1, 3-butadiene
- acrylonitrile
- asbestos
- benzene
- cadmium
- calcium arsenate
- cotton dust
- ethylene oxide
- ethyleneimine
- formaldehyde
- hazardous waste operations
- hexavalent chromium
- inorganic arsenic
- lead
- methylene chloride
- methylenedianiline
- vinyl chloride

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Figure 3

IH Surveillance Plan Summary

Site Name:

Exposure Group:

Task:

1. Contaminant or Agent	2. Exposure Probability	3. Health Effect Rating	4. Uncertainty Rating	5. Risk Rating	6. Month /Yr to Monitor or Monitored	7. Applicable OEL and Range of Results	8. Control Strategy Implemented
Benzene	*1*	*5*	*0*	*0*	N/A	0.5 ppm - 8 hr TWA	
Methyl Ethyl Ketone	*3*	*1*	*1*	*3*	3Q FY10	200 ppm - 8 hr TWA	
Lead	*2*	*5*	*2*	*20*	1Q FY10	0.05 mg/m^3 - 8 hr TWA	
Noise	*4*	*3*	*0*	*0*	N/A	85 dBA - 8 hr TWA	

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Instructions to Complete IH Surveillance Plan Summary

Note: One or more of these pages will be completed for each exposure group identified in the HHE.

Enter the name of the site and exposure group at the top of the table. If the exposure group is tasked based, enter the name of the task.

1. List each contaminant or agent for that exposure group in column 1. Do not enter trade names, acronyms or product names. As an example do not list "carbon steel welding rods" as a contaminant.
2. List the exposure probability in column 2. Use the following scale to identify exposure probability:
   - 1 for exposures up to 10% of the OEL
   - 2 for exposures from 10% - 50% of the OEL
   - 3 for exposures from 50% to 100% of the OEL
   - 4 for exposures greater than 100% of the OEL
3. Enter the health effect rating in column 3 using the following scale:
   - 1 for agents posing reversible effects from chronic or acute exposures
   - 3 for agents posing irreversible health effects from chronic exposures
   - 5 for substances which have been identified by the ACGIH as A1 carcinogens, those substances listed in 29 FCR 1910.1001 – 1910.1052 and those substances which pose life threatening or disabling effects with acute exposure.
4. In column 4 list the uncertainty rating as follows:
   - 0 for well characterized exposures
   - 1 for uncharacterized exposures
   - 2 for highly variable, uncharacterized exposures
5. Overall risk rating is determined by multiplying columns 2 x 3 x 4. Enter the product in column 5.
6. In column 6 list the date sampling is expected to be completed. Contaminants with the highest values in column 5 should be sampled first as these are expected to pose the greatest health risk to our personnel. In some instances, regulatory requirements drive an exposure assessment to be conducted within a specified period of time.
7. In column 7 list the applicable OEL used to evaluate exposures and the range of results received for that contaminant.
8. In column 8 state whether a control strategy was implemented and if the strategy was engineering, administrative or personal protective equipment (PPE).

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HSE Procedure		Document No: HSEP 12.2	Page: 1 of 13
Personal Air Monitoring		Supersedes: HSEP 12.2	Revision: 2 Issue Date: 15 Oct 08
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1.0 PURPOSE AND SCOPE

The primary purpose of this HSEP is to provide effective and efficient sampling strategies to characterize working exposures to support preparation of task Safe Plans of Action (SPA).

Personal air and dermal monitoring shall be conducted, when such exposure hazards are expected:

- to identify physical, chemical, and biological hazards,
- to evaluate the hazards,
- to institute control measures to prevent harmful exposures in our workplaces, and
- to document the evaluation process.

This HSEP is an integral element of the Health Hazard Evaluation process, HSEP 12.1.

This HSE procedure applies to employees and subcontractors engaged in operations covered by the company HSE program.

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2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

2.1. Project Management

Historic health hazard documents are to be obtained from the customer for projects where there are health hazards, prior to or during contract negotiations with the customer.

Such documents may include chemical process data, personal exposure data, personal monitoring data, and medical surveillance data. These documents are to be provided to the Jacobs HSE Manager for review. They shall be maintained on-site as part of the health hazard documents file.

2.2. Industrial Hygiene Manager

The Industrial Hygiene Manager will assist Site Management with implementation of this HSEP and will provide training in air monitoring techniques as well as health hazard evaluation and control options, when requested.

3.0 DEFINITIONS

Breathing Zone Sample (BZ)	An air sample collected in the breathing area near the nose of a worker to assess his or her exposure to airborne contaminants.
National Institute for Occupational Safety and Health (NIOSH)	The US technical support and research institute that recommends to OSHA, for subsequent promulgation, safe worker exposure limits, e.g., PELs, RELs, for a number of potential health hazards.
Permissible Exposure Limits (PELs)	Limits developed by OSHA to indicate the maximum airborne concentration of a contaminant to which an employee may be exposed over the duration specified by the type of PEL assigned to that contaminant.
Action Level (AL)	An airborne concentration of a contaminant calculated as an 8-hour time-weighted average, which triggers response activities by the employer.
Recommended Exposure Limits (RELs)	Issued by NIOSH to aid in controlling hazards in the workplace. These limits are generally expressed as 8- or 10-hour TWAs for a 40-hour workweek and/or ceiling levels with time limits ranging from instantaneous to 120 minutes.
Skin Notation (Skin)	Refers to the potential significant contribution to the overall exposure by the cutaneous route, including mucous membranes and the eyes, either by contact with the vapors or by direct contact with the substance. There are approximately 95 PELs with skin notations. Refer to www.osha-slc.gov/SLTC/dermalexposure/index.html.
Threshold Limit Value (TLV)	A registered trademark for an exposure limit developed by the American Conference of Governmental Industrial Hygienists (ACGIH). TLVs may be stated as a time-weighted average (TLV-TWA), a Short-Term Exposure Limit (TLV-STEL), or a Threshold Limit Value Ceiling (TLV-C).
Threshold Limit Value & Time-Weighted Average (TLV-TWA)	A concentration for a conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect.

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Threshold Limit Value Short Term Exposure Limit (TLV-STEL)	A concentration to which it is believed that workers can be exposed continuously for a short period of time without suffering from irritation, chronic, or irreversible tissue damage or narcosis of sufficient degree to increase the likelihood of accidental injury, impair self-rescue, or materially reduce work efficiency, and provided that the daily TLV-TWA is not exceeded. It is not a separate independent exposure limit; rather, it supplements the time-weighted average (TWA) limit where there are recognized acute effects from a substance whose toxic effects are primarily of a chronic nature. A STEL is a 15-minute TWA exposure, which should not be exceeded at any time during a workday even if the 8-hour TWA is within the TLV-TWA. Exposures above the TLV-TWA up to the STEL should not be longer than 15 minutes and should not occur more than four times per day. There should be at least 60 minutes between successive exposures in this range.
Threshold Limit Value Ceiling (TLV-C)	The ceiling concentration that should not be exceeded during any part of the working exposure. If instantaneous monitoring is not feasible, then the TLV-C can be assessed by sampling over a period that should not exceed 15 minutes, except for those substances that may cause immediate irritation when exposures are short.

4.0 PROCEDURE

4.1. Identify the Contaminants for Each Task

4.1.1. Evaluate Exposure Potential

Evaluate the potential for employee exposure by observing work practices and screening before conducting any air sampling.

Raw materials, intermediates, end products, flow diagrams, process diagrams, equipment labeling, data sheets, and process engineering are sources of information to identify specific contaminants.

Enter task-specific contaminant data on the Chemical Hazard Identification worksheet, Figure 2, or equivalent.

4.1.2. Obtain Historic Data

Obtain instantaneous and integrated personal sampling data generated by Jacobs, our customer, partners, or subcontractors that characterizes our employees' potential exposure.

If the historic data is representative of our employees' potential exposure, additional personal sampling may not be necessary.

4.1.3. Contaminant Screening

Instantaneous monitors are used as a screening tool to evaluate:

- Exposures to substances with high permissible exposure limits (PELs) in relatively dust-free atmospheres, e.g., ferric oxide and aluminum oxide;
- Intermittent processes involving substances without short-term exposure limits (STELs);
- Engineering controls, work practices, or isolation of process;
- Substances that have ceiling exposure limits. There are validated direct-reading sampling devices available specifically for these substances.

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Examples of instantaneous monitoring instruments that may be used as screening devices include

- bellows and piston pumps with colorimetric and length-of-stain detector tubes,
- diffusion tubes,
- photoionization and flame ionization instruments, and
- single and multiple gas instruments.

Manufacturer's operating instructions must be followed when operating these instruments.

4.2. Monitoring Methods

Monitoring is a continuing program including observation, measurement, and judgment to recognize potential health hazards and determine the adequacy of protection. Four types of monitoring are used in occupational health surveillance. These include personal, environmental, biological, and medical. The focus target of this procedure is personal monitoring.

Inhalation is the predominant industrial route of chemical entry into the body. Dermal and ingestion routes are significant for a number of chemicals. For example, a fifteen-minute exposure of the hands and forearms to liquid glycol ethers will result in a dose to the body in excess of the eight-hour inhalation dose at their recommended air exposure limits.

Biological monitoring for the urinary metabolites is used to estimate absorption via skin and lungs.

Refer to the OSHA Technical Manual, Section ll, Chapter 2, Sampling For Surface Contamination www.osha-slc.gov/dts/osta/otm/otm_ii/otm_ii_2.html.

When there is potential significant contribution to the overall exposure by the cutaneous route, biological monitoring should be considered to determine the contribution of exposure through the dermal route to the total dose. The use of a skin designation is intended as an alert that air sampling alone is insufficient to accurately quantify exposure and that measures to prevent significant cutaneous absorption may be required. Threshold Limit Values and Biological Exposure Indices can be located www.acgih.org.

Monitoring techniques to evaluate potential inhalation follow.

4.2.1. Where to Sample

Personal breathing zone samples are collected to evaluate a worker's exposure.

4.2.2. What to Sample

Each task is evaluated to identify the specific physical, chemical, or biological contaminants our employees may be exposed.

The task analysis may be performed as part of the Safe Plan of Action, Activity Hazard Analysis, Job Safety Analysis, or other task specific analysis.

The Chemical Hazard Identification worksheet, Figure 2 provides a means to cross reference chemicals, synonyms, and chemical abstract numbers.

4.2.3. Whom to Sample

Sampling the most highly exposed employee is traditional industrial hygiene practice. The simplest procedure to determine the maximum risk employee is to observe and select the employee, who is closest to the source of the air contaminant being generated.

Individual differences in work habits of different workers can have profound effects on the levels of exposure.

Whether we sample 25% of the work force, or all employees exposed, the objective is to characterize the hazard associated with a specific task.

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4.2.4. When to Sample

Temperature differences due to seasonal changes, changes in air currents, working in an atmosphere where the air is conditioned, different shifts, changes in work practice by the employee, and variation in emission rate of the contaminants all are to be considered.

4.2.5. How Long to Sample

The volume of air sampled and the duration of sampling is based on the sensitivity of the analytical procedure or direct reading instrument, the estimated air concentration, and the regulatory or suggested standard of the particular contaminant.

Duration of the sampling period should represent some identifiable period of time, usually a complete cycle of an operation.

4.2.6. How Many Samples to Collect

A single sample or multiple samples may be necessary to accurately define a daily, time-weighted-average exposure for a worker, who performs a number of tasks during the shift.

Full-shift, time-weighted average, short-term exposure limits, ceiling limits, and peak concentrations for each physical, chemical, and biological contaminant must be considered.

4.3. Select the Sampling and Analytical Methods

The OSHA Index of Sampling and Analytical Methods and the NIOSH Manual of Analytical Methods identify the sampling media, flow rates, sample volumes, and analytical procedures for a number of contaminants.

The OSHA index is at www.osha-slc.gov/dts/sltc/methods/toc.html. NIOSH sampling and analytical methods can be accessed at www.cdc.gov/niosh/nmam/nmampub.html. This site also provides a link to the OSHA, EPA, ASTM and ISO sampling and analytical methods web sites.

4.4. Sample Collection

Assemble the sampling train and operate the pump for 5 to 10 minutes in the same environment the sampling is to occur to equilibrate the equipment. Do not connect the sampling media during the equilibration period.

Place the sampling equipment on the employee so that it does not interfere with work performance. Attach the collection device (filter cassette, charcoal tube, etc.) to the shirt collar or as close as practical to the nose and mouth of the employee, i.e., in a hemisphere forward of the shoulders with a radius of approximately six to nine inches. The inlet should always be in a downward vertical position to avoid gross contamination. Position the excess tubing so that it does not interfere with the work of the employee.

Calibrate the pump and record the starting time.

Observe the pump operation for a short time after starting to make sure it is operating correctly.

Record the information on Figure 1, the Air Monitoring Record or equivalent.

Radio frequency electromagnetic fields can interfere with the proper operation of industrial hygiene instruments. This interference is called electromagnetic susceptibility (EMS). Determine whether there is a potential for such interference. Likely sources of radio frequency interference are walkie-talkies, vehicles equipped with mobile radio transmitters, RF heat sealers, etc. If there is a potential for such interference, select sampling instruments that are properly rated for EMS to avoid faulty data or malfunction.

4.5. Monitoring

Check the sampling train regularly. More frequent checks may be necessary when heavy filter loading is possible. Verify the sampler is still assembled properly and that the hose has not become pinched or detached from the cassette or the pump. Note potential tampering—for filters,

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there may be symmetrical deposition of particulate on the filter, unexpected large particles, or other evidence with the sample or pump.

Periodically monitor/observe the employee during the workday to verify that sample integrity is maintained. Identify and document cyclical activities and work practices. When the employee leaves the work area for lunch or breaks in a clean, uncontaminated area, post-calibrate the sampling train, remove the sampling media, and continue pump operation. Document the post-calibration and stop time.

When the employee returns, calibrate the sampling train, begin sampling, record the start time and calibration. Turning off the pump during lunch is not recommended unless equilibration is performed.

Take detailed notes concerning visible airborne contaminants, work practices, potential interferences, movements, and other conditions to assist in determining appropriate engineering controls. Maps and/or sketches should be created. Include photographs with documentation when possible.

Prepare blank(s) during the sample period for each type of sample collected. One blank or 10% will suffice for up to 20 samples for any given analysis/sampling period, except asbestos, which requires a minimum of two field blanks. The blanks (charcoal tubes, filters, etc.) should be opened but not used to take samples. They should be handled in the same manner as any sampling media used in sampling air contaminants, with the exception that no air is drawn through them.

Before removing the pump at the end of the sample period, post-calibrate the sampling train.

Turn off the pump and record the ending time. Record the information on Figure 1, the Air Monitoring Record.

Remove the sampling media from the pump and seal tubes with caps and seal cassettes with inserts. Tape the media with a chain of custody seal.

4.6. Sample Handling Procedure

Appropriate sample handling techniques are necessary to protect the sample and maintain sample custody protocol requirements following collection. Sample handling includes custody, container/preservative type, transfer, storage, and disposal. Contact the AIHA-accredited analytical laboratory to determine the type of sampling media, sampling methods, chain of custody forms, and procedures to follow.

The laboratory will suggest appropriate sample containers, preservatives, and holding time. Preservation methods are generally limited to pH control, chemical addition, refrigeration, and protection from light. All samples and sample containers will be properly labeled.

A chain of custody record will always accompany samples. When transferring samples, both the individuals relinquishing and receiving the samples will sign, date, and note transference time on the chain of custody record. Samples are to be properly packaged for shipment and dispatched to the laboratory for analysis.

A designated laboratory sample custodian will accept custody of the samples and verify that the information on the sample label matches that on the chain of custody form. Laboratory personnel are responsible for the care and custody of samples from the time they are received through sample disposal.

Samples are generally retained by the laboratory for up to 30 days after the laboratory reports the data. Unless notified otherwise by the sample sender, most laboratories dispose of the remaining samples.

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4.7. Laboratory Analysis

Send the sampling media to an accredited laboratory for sample analysis. Use an American Industrial Hygiene Association (AIHA) accredited laboratory.

There are AIHA accredited laboratories that supply sampling media and analyze blanks at no cost for using their laboratory for the sample analyses.

AIHA accredited laboratories in the United States can be found at http://www.aiha.org/LaboratoryServices/html/labstate.htm and international AIHA accredited laboratories can be found at http://www.aiha.org/LaboratoryServices/html/foreign.htm.

4.8. The Industrial Hygiene Report

The industrial hygiene report should include the following components as a minimum

- The objective of the sampling strategy,
- The specific activities/tasks performed during the sampling,
- The sampling procedure and methods used,
- The chain of custody procedure and specific laboratory used,
- The results of the sampling strategy,
- An air sampling data sheet,
- Laboratory signed chain of custody,
- Laboratory results, and
- Corrective action to reduce exposure.

Before the industrial hygiene report is transmitted, it will be reviewed and approved by the Industrial Hygiene Manager.

4.9. Employee Notification

The Industrial Hygiene Report containing personal air monitoring results will be communicated to the employees participating in the sampling strategy no later than fifteen work days after receipt of the results from the laboratory, or as directed by the substance-specific OSHA (a US agency) standards. When a regulatory, industry or suggested limit exceedance is identified, employee notification will include the industrial hygiene report with a description of the correction action to be implemented to reduce the exposure and a schedule to complete the correction action.

When personal air monitoring is performed by other than Jacobs, the data and results are to be reviewed by the Industrial Hygiene Manager before being communicated to our employee. The intent of this review is to verify data quality and accuracy. The data and results are to be communicated in the Industrial Hygiene Report format.

The Industrial Hygiene Report is to be distributed to the employee, employee's supervisor, HSE Manager, and placed in the employee's training and medical record.

5.0 EQUIPMENT INSPECTION

All sampling equipment shall be kept clean, in good repair, and must be inspected by the user prior to each use.

6.0 CRITERIA FOR SAMPLING MEDIA

6.1. Detector Tubes

Each pump should be leak-tested before use.

Calibrate the detector tube pump for proper volume at least quarterly or after 100 tubes.

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6.2. Total Dust, Metal Fume, and Aerosol Samplers

Collect total dust on a pre-weighed, low-ash polyvinyl chloride (PVC) filter at a flow rate of about two liters per minute (L/min), depending on the rate required to prevent overloading.

Collect metal fumes on a 0.8-micron mixed cellulose ester (MCE) filter at a flow rate of approximately 1.5 L/min, not to exceed 2.0 L/min. Take care to avoid overloading the filter, as evidenced by any loose particulate.

Calibrate personal sampling pumps before and after each day of sampling, using a primary calibration device or the precision rotameter method that has been calibrated against a primary calibration device.

Use of precision rotameters for pump calibration should be avoided if at all possible. Tests have indicated measurement errors due to pump pulsations.

6.3. Respirable Dust Samplers

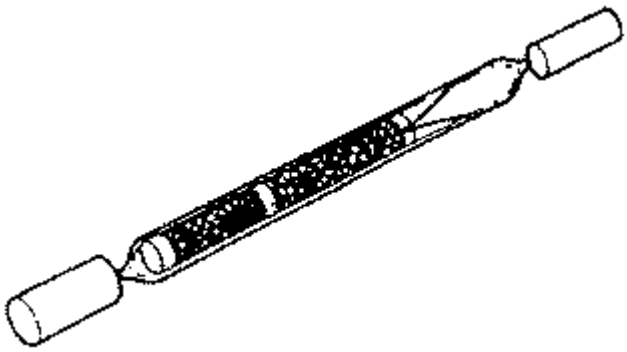
Collect respirable dust using a clean cyclone equipped with a pre-weighed low-ash polyvinyl chloride filter at a flow rate of 1.5 to 2.0 L/min. Collect silica only as a respirable dust, and, if possible, submit a bulk sample to the laboratory.

6.4. Solid Sorbent Tubes

Organic vapor and gas may be collected on activated charcoal, silica gel, or other adsorption tubes using low-flow pumps.

THE CHARCOAL OR "C"-TUBE WITH GLASS-SEALED END AND

NIOSH-APPROVED CAPS BEFORE SAMPLING



Immediately before sampling, break off the ends of the flame-sealed tube so as to provide an opening approximately half the internal diameter of the tube. Wear eye protection when breaking ends. Use tube holders, if available, to minimize the hazards of broken glass. Do not use the charging inlet or the exhaust outlet of the pump to break the ends of the tubes.

Use the smaller section of the tube as a back up and position it near the sampling pump. The tube shall be held or attached in an approximately vertical position with the inlet either up or down during sampling.

Draw the air to be sampled directly into the inlet of the tube. This air is not to be passed through any hose or tubing before entering the tube.

Cap the tube with the supplied plastic caps immediately after sampling and seal the tube as soon as possible. Do not ship tubes with bulk material.

6.5. Vapor Badges

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Passive-diffusion sorbent badges (also known as monitors) are useful for screening and compliance monitoring for certain chemical exposures especially vapors and gases. The major advantage is that no sampling pump is needed to collect the samples. Some badges have been validated for use in compliance. Specific sampling procedures for each type of badge are also supplied with the monitors. Interfering substances should be noted during sampling and recorded.

6.6. Asbestos

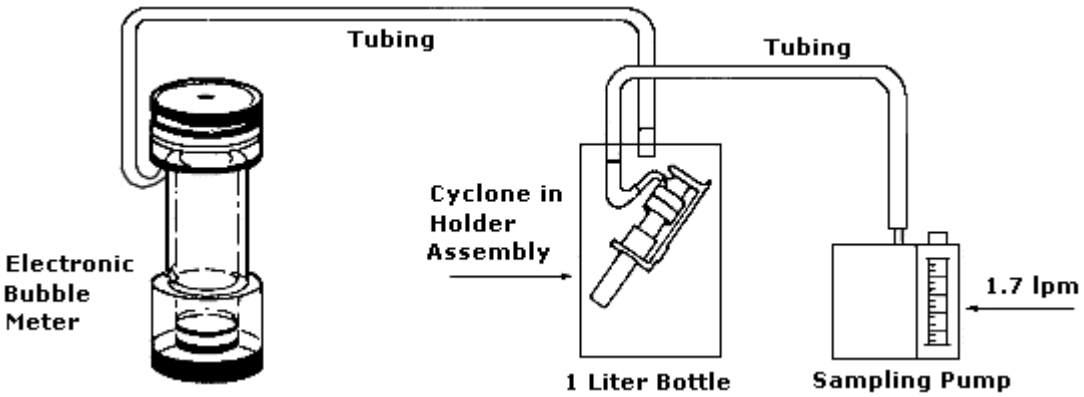
Collect asbestos on a 0.8-micrometer pore size, 25-mm diameter mixed cellulose ester filter with a back-up pad. Use a fully conductive cassette with conductive extension cowl.

Sample open face (the filter/cowl is open to the sampling environment; the extension cowl is in place but the cowl end piece is removed from the extension) in the worker's breathing zone. Verify the bottom joint (between the extension and the conical back piece) of the cassette is sealed tightly with a shrink band or electrical tape. Point the open face of the cassette down to minimize contamination.

Use a flow rate in the range of 0.5 to 5 L/min. One liter per minute is suggested for general sampling. Office environments allow flow rates of up to 5 L/min. Calibrate pump before and after sampling.

Review Jacobs HSEPs related to asbestos program, asbestos exposure protection, and protection equipment decontamination related to asbestos activities.

The cyclone or 25 mm asbestos cassette is calibrated by placing the sampler in a 1-liter vessel attached to a primary calibrator.



6.7. Sampling for Welding Fumes

When sampling for welding fumes, the filter cassette must be placed inside the welding helmet to obtain an accurate measurement of the employee's exposure.

The practice of placing the inlet of the sampling device inside of personal protective equipment for the face or eyes applies only to welding hoods. The inlet of the sampling device shall be placed outside other face or eye personal protective equipment, such as face shields for projectiles or chemical splashes.

VAPOR BADGE WITH CLOTHING CLIP.

Welding fume samples are normally taken using 37-mm filters and cassettes; however, if these cassettes will not fit inside the helmet, 25-mm filters and cassettes can be used. Care must be taken not to overload the 25-mm cassette when sampling.

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6.8. Equipment Preparation and Calibration

When a sampling train requires an unusual combination of sampling media, e.g., glass fiber filter preceding impinger, the same media and devices should be in line during calibration.

6.8.1. Electronic Bubble Meter Method

When using the electronic bubble meter method, allow the pump to run five minutes prior to voltage check and calibration.

Assemble the cassette filter holder, using the appropriate filter for the sampling method. Compress cassette by using a mechanical press or other means of applying pressure. Use shrink tape around cassette to cover joints and prevent leakage. If a cassette adaptor is used, care should be taken to ensure that it does not come in contact with back-up pad.

When calibrating with a bubble meter, cassette adaptors can cause moderate to severe pressure drop at high flow rates in the sampling train and affect the calibration result. If adaptors are used for sampling, they should also be used when calibrating.

Nylon adapters can restrict airflow due to plugging. Stainless-steel adapters are preferred.

Connect the collection device, tubing, pump, and calibration apparatus for the cassette or cyclone sampler.

Visually inspect all Tygon tubing connections.

Wet the inside of the electronic flow cell with the soap solution supplied by pushing on the button several times.

Turn on the pump and adjust the pump rotameter, if available, to the appropriate flow rate.

Press the button on the electronic bubble meter. Visually capture a single bubble and electronically time the bubble. The accompanying printer will automatically record the calibration reading in liters per minute.

Repeat the step until two readings are within 2%.

If necessary, adjust the pump while it is still running.

Repeat the procedures described above for all pumps to be used for sampling. The same cassette and filter may be used for calibrations involving the same sampling method.

6.8.2. Precision Rotameter Method

The precision rotameter is a secondary calibration device. If it is to be used in place of a primary device such as a bubble meter, take care to ensure that any error introduced will be minimal and noted.

Using precision rotameters for pump calibration should be avoided, if possible. Tests have indicated significant measurement errors due to pump pulsations. These pulsations are typically not observable by the user.

The precision rotameter may be used for calibrating the personal sampling pump in lieu of a bubble meter, provided it is:

Calibrated regularly, at least monthly, with an electronic bubble meter or a bubble meter.

Dissembled, cleaned as necessary, and recalibrated. It should be used with care to avoid dirt and dust contamination, which may affect the flow.

Not used at substantially different temperature and/or pressure from conditions present when the rotameter was calibrated against the primary source.

Used in such a way that the pressure drop across it is minimized.

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7.0 REFERENCES AND RELATED DOCUMENTS

Occupational Safety and Health Administration (OSHA) Index of Sampling and Analytical Methods

OSHA Technical Manual

National Institute for Occupational Safety and Health (NIOSH) Manual of Analytical Methods

References for chemical names, synonyms, and chemical abstract numbers can be found at http://www.cdc.gov/niosh/npg/npg.html and www.cdc.gov/niosh/81-123.html.

HSEP 12.1, Health Hazard Evaluation

HSEP 13.9 Respiratory Protection Program

8.0 FIGURES

Air Monitoring Record

Health Hazard Evaluation

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Figure 1

Air Monitoring Record

Employee Name: _____ Social Security Number: _____ Title: _____

Project Name: _____ Project Number: _____

Date Sampled: _____ Sampled By: _____

Sampling Method and Analyte: _____

Sample Type: Justification for Sampling: _____

_____ Personal-TWA _____ Blank _____

_____ Personal Peak _____ Bulk Does Sampling Represent Typical Exposure? _____

_____ Area _____ Other _____ Temperature: _____ Baro. Pressure: _____

_____ Source _____ Humidity: _____ Wind: _____

Collection Media:

_____ Charcoal Tube _____ Filter(Total) _____ Passive Dosimeter Collector Mfg: _____

_____ Silica Gel _____ Filter(Resp.) _____ Other: _____ Size/Type: _____

_____ Chromosorb _____ Impinger _____ Lot #: _____

Sample Pump: Mfg & Model#: _____ Serial #: _____

Calibrator: Type: _____ Mfg & Model #: _____ Serial #: _____

Calibration Date: _____ Calibrated By: _____

Sample Number	Time On	Time Off	Total Time	Pre Cal Flow Rate	Post Cal Flow Rate	Average Flow Rate	Sample Volume	Analytical Result	TWA

Descriptive Data: (Engineering controls or PPE used, work activities, sample interferences etc.)

_____

_____

_____

Date: _____ Signature: _____

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Figure 2

Health Hazard Evaluation						
Process or Task	**Chemical**	**Hazard**	**Hazard Level**	**Exposure Route**	**Identify Specific PPE**	**Comments, Unusual Issues**

Hazard: Flammable (F), Combustible (C), Explosive (E), Reactive (R), Oxidizer (O), Corrosive (Corro), Radioactive (Radio), Primary or Secondary Irritant (I), Simple or Chemical Asphyxiant (Asphy), Anesthetic (Anes), Narcotic (Narco), Hepatotoxic or Nephrotoxic or Neurotoxic Systemic Poison (P), Sensitizer (Sens), Carcinogen (Carc), Mutagen (Muta), Teratogen (Terato)

Hazard Level: Low(L) ≤10% PEL, TLV, STEL, Ceiling, Peak, LEL, Moderate(Mod)>10% and < 100% PEL, TLV, STEL, Ceiling, Peak, LEL, High(H) ≥100% PEL, TLV, STEL, Ceiling, Peak, LEL. **Note:** preplanning, management approval and monitoring required for all IDLH tasks.

Exposure Route: Inhalation (Inh), Ingestion (Ing), Skin Absorption (Abs), Skin or Eye Contact (Con)

Personal Protective Equipment (PPE): Identify the specific PPE to be donned based on chemicals and chemical concentrations expected.

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HSE Procedure		Document No: HSEP 13.1	Page: 1 of 4
Personal Protective Equipment		Supersedes: CHSP 13.1	Rev. 2
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 1 Jun 97	Current Revision Date: 29-Jul-01

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1.0 PURPOSE AND SCOPE

The purpose of this Corporate Health, Safety and Environment Procedure (HSEP) is to establish minimum requirements for assessing workplace hazards and establishing PPE requirements for those hazards.

This HSEP applies to all employees and on-site contractors engaged in operations covered by the Jacobs Health, Safety, and Environment Program.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

HASAP - Hazard Assessment Safety Action Plan	An eight item project specific safety plan outlining general areas of concern as determined from the scope of work identifies personal protective equipment and other safety procedures selected to safeguard employees during the performance of the work.
SPA - Safe Plan of Action	A task driven control document used to ensure that every task receives proper safety planning prior to beginning work. The SPA also serves as a tool to identify specific PPE required for the task. (May also be known as TSA, JSA, etc.)
TSA - Task Safety Awareness	A mini-safety meeting in which a work crew reviews the safety provisions of the SPA prior to a task or when conditions change.

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4.0 PROCEDURE

4.1. Personal Protective Equipment (PPE) General Requirements

PPE shall be provided, used, and maintained in a reliable and sanitary condition.

The design of all PPE utilized shall be approved Jacobs.

Where employees provide their own PPE, Site Management shall ensure its adequacy and meets all Jacobs/Client requirements.

Examples of PPE commonly provided by employees would be those of a personal nature which could be used away from the worksite, such as non-specialty safety glasses, safety shoes, and cold weather outer wear.

Damaged or defective PPE shall not be used.

The American National Standards Institute (ANSI) establishes design and performance criteria for most PPE utilized by employees. All PPE worn by employees shall meet any applicable ANSI standards.

4.2. Hazard Assessment Safety Action Plan (HASAP)

Each work location or major project activity shall complete a written Hazard Assessment Safety Action Plan (HASAP) (or equivalent) prior to starting work. See HSEP 2.1: Zero Accident Process for additional guidance and procedures for writing a HASAP.

The HASAP consists of eight (8) key elements addressed in a brief narrative format with the exception of items numbers (5) Training Requirements, (6) Special Requirements, and (7) Hazard Assessment. Specific details concerning these areas are determined from the scope of work and regulatory compliance demands. PPE required by the planned job task hazards will be listed in the HASAP.

4.3. Safe Plan of Action (SPA) and Task Safety Awareness (TSA)

The SPA/ TSA (or equivalent) shall be completed prior to beginning each identified job task. See HSEP 2.1 Zero Accident Process for additional information on SPAs and TSAs.

Although these two tools are actually separate, they are used to compliment each other. The SPA is a task driven control document used to ensure that every task receives proper safety planning prior to beginning work. It is conducted by the immediate supervisor (foreman) over the crew assigned to perform work. The supervisor writes in the work area and task to be performed and then leads the crew in performing a “task” hazard assessment. The task hazard assessment requires the supervisor to solicit crew participation in identifying hazards and hazard control measures such as PPE, training requirements, permits, procedures, etc. Each member of the team signs the SPA to indicate their understanding of the plan and agreement to follow the plan.

The SPA also serves as a tool to identify specific PPE required and when signed and dated by the supervisors, becomes a certified hazard assessment in compliance with OSHA regulations.

4.4. Inspection and Storage

Employees are required to inspect all PPE prior to use. Equipment that is defective or damaged shall not be used and immediately replaced.

Personal Protective Equipment shall be stored in a manner that will not adversely affect its integrity. PPE must be stored in a location that is free of harmful agents such as chemicals, particulates, sunlight, temperature extremes, excessive moisture or physical agents, such as sharp objects.

4.5. Training

Employee training on assigned PPE is required as a part of initial orientation and whenever new PPE is assigned to them. Employees must be trained on:

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- When to use the equipment,
- How to use the equipment,
- Limitations of the equipment, and
- Proper care, maintenance, useful life, and disposal of the equipment.

The employee must demonstrate their understanding of this training prior to being allowed to use the equipment.

The training must be documented with the employee's name, date of training, and person conducting the training. Figure 1 is available for this purpose.

Retraining is required if a lack of proficiency is observed or when new equipment is introduced, unless another frequency is dictated by specific Company policies found elsewhere in this manual, such as for hearing protection and respirators.

5.0 REFERENCES

29 CFR 1910.132, Personal Protective Equipment General Requirements

29 CFR 1926.95, Criteria for Personal Protective Equipment

6.0 FIGURES

Certification of PPE Training

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Figure 1

Certification of PPE Training

This is to certify that the personnel listed below understand the following elements of the training required for proper use of the identified personal protective equipment.

Training Elements:

When this PPE is necessary

How to don, doff, adjust, and wear PPE properly

Proper Care, Maintenance, Useful Life, Decontamination, and Disposal

Limitations of the PPE

Date of Training: _____ **Location:** _____

Instructor: _____

Identified PPE: _____

Employees Trained:

Name	**Social Security Number**
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	

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HSE Procedure		Document No: HSEP 13.2	Page: 1 of 14
Personal Protective Equipment Program For Environmental Activities		Supersedes: CHSP 13.2	Rev. 2
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 06 Jan 97	Current Revision Date: 28 Aug 01

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1.0 PURPOSE AND SCOPE

It is the policy of the Company that personal protective equipment be assigned where necessary to prevent illness or injury, and that the wearer is protected from injury that might come from incorrect use and/or malfunction of the PPE.

This Health, Safety, and Environment Procedure (HSEP) covers all employees working on environmental projects, and provides the minimum procedures for:

- Identifying situations when protecting workers from jobsite hazards requires the use of PPE rather than engineering or administrative controls;
- Selecting the appropriate PPE based on task requirements or limitations including durability, flexibility, environmental stressors, etc.; maintaining and storing PPE; training personnel on the purpose, use, care, fitting, inspection, and limitations of assigned PPE; selecting the appropriate PPE to protect against physical, chemical, biological or radiological hazards; decontaminating or disposing of PPE; anticipating and responding to PPE failure; and evaluating the effectiveness of the PPE program.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

This section has been intentionally left blank.

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4.0 PROCEDURE

4.1. PPE Specification

Perform a task hazard analysis as described in HSEP 7.3.1, Site Health, Safety, and Environmental Plan.

Refer to **Table 1** for a PPE specification worksheet. Completed worksheets must be maintained in the project files as documentation of hazard assessment for PPE specification.

PPE must be specified for each individual role in a task.

The project manager is responsible for ensuring the worksheet is completed for each task.

Assess physical, chemical, biological and radiological exposure hazards.

Identify regions of the body potentially impacted by site hazards while performing tasks in the scope of work. Regions of the body might include head, hands, feet, respiratory system, face, full body, ears/hearing, etc.

Identify task requirements or limitations, which affect PPE selection. Limitations might include heat stress, physical or psychological stress, impaired vision, limited mobility or impeded communication. Other task requirements may include durability, flexibility, duration of air supply, etc.

Designate required PPE where engineering or administrative controls may not be sufficient.

PPE selected for chemical protection must be made of material which is resistant to the chemical of concern in the concentrations anticipated.

Ensure that assigned PPE for each site activity is described in the site-specific health and safety plan.

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Table 1

Example PPE Specification Worksheet

Instructions:

(1) In column 1, identify task requirements or limitations which affect PPE selection.
(2) Check box for each body part potentially impacted by the hazards listed in columns 2-5.
(3) Specify PPE to be assigned for each box checked in columns 2-5.
(4) Where controls other than PPE will be assigned, write "other controls" in columns 2-5.
(5) Based on PPE assigned, denote EPA/OSHA level of protection (Refer to Attachment 4.)

Task:	**Limitations**	**Chemical**	**Physical**	**Radiological**	**Biological**
Head		☑ Tyvek hood	☑ Hard hat	❑	❑
Hands	Requires dexterity to grasp, durability for sharp objects	☑ Nitrile gloves	☑ Leather gloves	❑	☑ Other controls
Feet	Requires good traction in snow	☑ Rubber booties	☑ Hard-toed shoes, metatarsal protection	❑	❑
Respiratory		☑ Full-face APR, w/ appropriate cartridges if action level reached	❑	❑	❑
Eyes/Face		❑	☑ Face shield & safety glasses if full-face APR not in use.	❑	❑
Other:		☑ Hooded Tyvek, taped at wrist & ankles	☑ Fall protection using full-body harness	❑	❑
Other:		❑	❑	❑	☑ Snake chaps
Other:		❑	☑ hearing protection, NRR ≥ 22 dB	❑	❑

EPA/OSHA Level of Protection:	**Circle:** A, B, C, D, ***Modified D***	**Comments:**
Assessment Performed By:		**Date:**

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4.2. PPE Upgrade or Downgrade

Levels of protection will be upgraded or downgraded in response to site conditions. **Table 2** summarizes conditions that might require an upgrade or that may indicate that a downgrade is possible.

The (Health & Safety Officer) HSO will inform the PHSM of PPE downgraded or upgraded from initial requirement of the HSEP.

The HSO will notify the field team of PPE changes in a tailgate safety meeting.

Table 2
Reasons to Upgrade or Downgrade Level of Protection

• Upgrade	Downgrade
• Request of individual performing task with concurrence from HSO. • Change in work task that will increase contact or potential contact with hazardous materials. • Action levels described in HASP exceeded. New information indicating that situation is more hazardous than originally thought.	• New information indicating the situation is less hazardous than originally thought. • Change in site conditions that decreases the hazard. • Change in work task that will reduce contact with hazardous materials.

4.3. PPE Maintenance and Storage

PPE must be maintained in a sanitary and reliable condition.

The HSO and her/his designee is the only person authorized to perform maintenance or repair of PPE.

On a monthly basis, the HSO must inspect PPE which is stored for emergency use.

4.4. Training

It is Company policy that all personnel be trained in the selection, use, maintenance, and decontamination of PPE prior to use. Personnel must complete a minimum of 24 hours of supervised training in the field in each level of protection before an employee is considered competent to operate at that level of protection in the field without supervision.

The PM shall verify that employees are trained. in the topics listed below.

Purpose of PPE

- Personnel shall be instructed on the purpose of each piece of assigned PPE, including the hazards each piece of PPE was selected to protect against.
- Personnel shall also be instructed on the consequences of not using the PPE, or donning/doffing incorrectly.

Use and Care

- Personnel shall be instructed as to PPE assigned for each task.
- Personnel shall have hands-on training with assigned PPE and shall demonstrate an understanding of proper use, before being allowed to perform work requiring the use of PPE.
- Each piece of assigned PPE should be properly fitted to the employee. Where a variety of sizes are available, the size which maximizes wearer comfort, safety and ability to perform assigned duties shall be selected.
- PPE must be maintained as described in 7.3 above.

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- Refer to the following Company HSEP's
  - HSEP 13.11 PPE Donning/Doffing Level A Ensemble
  - HSEP 13.12 PPE Donning/Doffing Level B Ensemble
  - HSEP 13.13 PPE Donning/Doffing Level C Ensemble

Personnel shall be instructed on emergency procedures and self-rescue in the event of PPE failure.

4.4.1. Inspection

PPE must be inspected by the user prior to, periodically during, and after use.

Any damaged or defective PPE which may potentially inhibit safe operation of the PPE, must be taken out of use and reported to the HSO immediately.

4.4.2. Limitations

Personnel shall be instructed that no single combination of PPE is capable of protecting against all hazards. Personnel should understand the limits of protection for each piece of assigned PPE.

Use of PPE can itself create significant worker hazards, such as heat stress, physical and psychological stress, and impaired vision, mobility, and communication. Personnel should understand the hazards presented by the use of PPE.

Personnel shall also be instructed on the human factors influencing PPE performance.

4.4.3. PM will verify that employees have demonstrated an understanding of the training specified in 7.5.2 above.

4.4.4. Training will be repeated should changes in the workplace or assigned PPE render previous training obsolete, or should the employee demonstrate inadequacies in knowledge or use of assigned PPE.

4.5. Decontamination and Disposal of PPE

Contaminated PPE which cannot be decontaminated must be disposed of in a manner that protects employees from exposure to hazards.

Refer to the following HSEPs:

- Level A Decontamination
- Level B Decontamination
- Level C Decontamination
- Level D Decontamination
- Asbestos Decontamination

4.6. PPE Program Effectiveness

The HSO (Health and Safety Officer) and SM (Site Manager) shall perform inspections at a minimum on a weekly basis in order to verify the effectiveness of the assigned PPE.

The HSM, PHSM or designee shall perform inspections on a periodic basis.

Periodic monitoring must be implemented to verify that PPE limitations have not been exceeded. Examples of monitoring may include air monitoring for chemical or dust inhalation, exposure evaluation, heat stress monitoring or noise monitoring.

Where the assigned PPE is not adequate to protect the health and safety of the wearer, the HASP must be modified to incorporate adequate health and safety measures.

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5.0 REFERENCES

NIOSH/OSHA/USCG/EPA. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. October 1985.

U.S. Army Corps of Engineers, Safety and Health Requirements Manual, EM 385-1-1, October 1992.

U.S. Environmental Protection Agency, Standard Operating Safety Guides, November 1984.

U.S. Environmental Protection Agency, Guidance For the Selection of Chemical Protective Clothing. February 1987.

29 CFR 1910 Subpart I, Personal Protective Equipment.

29 CFR 1910.120, Hazardous Waste Operations and Emergency Response

HSEPs which address:

- PPE Donning/Doffing Level A Ensemble
- PPE Donning/Doffing Level B Ensemble
- PPE Donning/Doffing Level C Ensemble
- Respiratory Protection Program Inspection and Maintenance of Air Purifying Respirator
- Respiratory Protection Program SCBA Checkout Procedures
- Respiratory Protection Program Respirator Fit Test
- Eye Protection
- Head Protection
- Hearing Protection/Conservation
- Hand Protection
- Foot Protection
- Hair and Clothing
- Fall Protection

6.0 FIGURES

PPE Specification Worksheet

Toxicity Reference Materials

Protective Clothing Chemical Compatibility References

OSHA Defined “Levels of Protection”

Inspection Procedures For Certain Types of PPE

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Figure 1

PPE Specification Worksheet

Instructions:

(1) Identify task requirements or limitations which affect PPE selection in column 1.

(2) Check box for each body part potentially impacted by the hazards listed in columns 2-5.

(3) Specify PPE to be assigned for each box checked in columns 2-5.

(4) Where controls other than PPE will be assigned, write “other controls” in columns 2-5.

(5) Based on PPE assigned, denote EPA/OSHA level of protection (Refer to Attachment 4.)

Task:	**Column 1 Limitations**	**Column 2 Chemical**	**Column 3 Physical**	**Column 4 Radiological**	**Column 5 Biological**
Head		❑	❑	❑	❑
Hands		❑	❑	❑	❑
Feet		❑	❑	❑	❑
Respiratory		❑	❑	❑	❑
Eyes/Face		❑	❑	❑	❑
Other:		❑	❑	❑	❑
Other:		❑	❑	❑	❑
Other:		❑	❑	❑	❑

OSHA Level of Protection:	**Circle:** A, B, C, D, Modified D	**Comments:**
Assessment Performed By:		**Date:**

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Figure 2

Toxicity Reference Materials

ACGIH. Documentation of Threshold Limit Values (TLV), Annual Update, Cincinnati, OH. This is a useful reference for chemical hazard information.

EPA, Standard Operative safety Guides, November 1984. Presents skin hazard ratings on 350 chemicals known to be dermally active. The data is taken from the Oil and Hazardous Materials Technical Assistance System (OHMTADS).

N.I. Sax and R.J. Lewis, Dangerous Properties of Industrial Materials, Van Nostrand Reinhold Co., New York, N.Y. Extensive listing of chemicals with brief listing of toxicological data.

NIOSH, Pocket Guide to Chemical Hazards. Presents key industrial hygiene and medical surveillance information on 397 chemicals and compounds.

OSHA, 1910 Subpart Z, The OSHA Permissible Exposure Limits (PELs) include a skin listing for materials which present skin hazards by absorption.

Occupational Health Services, Inc. HAZARDLINE. Online computer generated system for chemical, toxicology, medical and regulatory data on an extensive inventory of chemicals. Printouts can also be selected in MSDS format.

Proctor, N.H. et al. Chemical Hazards of the Workplaces, J.P. Lippincott Co., Philadelphia, PA, 1988. Toxicological profiles for industrial chemicals with TLVs. Useful general reference.

Sittig, M., Handbook of Toxic and Hazardous Chemicals and Carcinogens. Covers 800 hazardous substances with useful industrial hygiene information.

U.S. Coast Guard. CHRIS Hazardous Chemical Data. Brief summary of chemical and toxicological property data. Mainly for emergency response.

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Figure 3

Protective Clothing Chemical Compatibility References

Krister Forsberg and S.Z. Mansdorf, Quick Selection Guide to Chemical Protective Clothing, Van Nostrand Reinhold, New York, 1993.

J.S. Johnson, and K.J. Anderson, Chemical Protective Clothing, Vols. II. American Industrial Hygiene Association, Fairfax, VA, 1990.

Schwope, Arthur, et al. Guidelines for the Selection of Chemical Protective Clothing, American Conference of Governmental Industrial Hygienists, Cincinnati, OH.

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Figure 4

OSHA Defined "Levels Of Protection"

In Appendix B to 29CFR1910.120, OSHA notes that combinations of PPE other than those described for Levels A, B, C, and D protection may be more appropriate and may be used to provide the proper level of protection. The following descriptions of levels of protection are based on 29CFR1910.120, (non-mandatory)Appendix B.

LEVEL A

To be selected when the greatest level of skin, respiratory, and eye protection is required. Level A protection should be used when:

- The hazardous substance has been identified and requires the highest level of protection of skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the skin;
- Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible; or
- Operations are being conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A have not yet been determined.

The following constitute Level A equipment; it may be used as appropriate:

- Positive pressure, full face-piece self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH).
- Totally-encapsulating chemical-protective suit.
- Coveralls (optional)
- Long underwear (optional)
- Gloves, outer, chemical-resistant.
- Gloves, inner, chemical-resistant.
- Boots, chemical-resistant, steel toe and shank.
- Hard hat (under suit).
- Disposable protective suit, gloves and boots (depending on suit construction, may be worn over totally-encapsulating suit).

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LEVEL B

The highest level of respiratory protection is necessary but a lesser level of skin protection is needed. Level B protection should be used when:

- The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection;
- The atmosphere contains less than 19.5 percent oxygen; or the presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.

Note: This involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.

The following constitute Level B equipment; it may be used as appropriate.

- Positive pressure, full face-piece self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA, approved by NIOSH.
- Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls).
- Coveralls (optional)
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant
- Boots, chemical-resistant, steel toe and shank
- Boot-covers, outer, chemical-resistant (disposable) (optional)
- Hard hat (under suit)(optional)
- Face shield (optional

LEVEL C

The concentration(s) and type(s) of airborne substances(s) is known and the criteria for using air purifying respirators are met. Level C protection should be used when:

- The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed though any exposed skin;
- The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants; and
- All criteria for the use of air-purifying respirators are met.

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The following constitute Level C equipment; it may be used as appropriate.

- Full-face or half-mask, air purifying respirators (MSHA/NIOSH approved)
- Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls)
- Coveralls (optional)
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant
- Boots, chemical-resistant, steel toe and shank (optional)
- Boot-covers, outer, chemical-resistant (disposable) (optional)
- Hard hat (optional)
- Escape mask (optional)
- A face shield (optional) should always be worn during all wet chemical handling.

LEVEL D

A work uniform affording minimal protection, used for nuisance contamination only. Level D protection should be used when:

- The atmosphere contains no known hazard; and
- Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

The following constitute Level D equipment; it may be used as appropriate.

- Coveralls
- Chemically resistant clothing(optional)
- Gloves, (chemical resistance is optional)
- Gloves, inner, chemical-resistant (optional)
- Boots, chemical-resistant, steel toe and shank (optional*)
- Boot-covers, outer, chemical-resistant (disposable) (optional)
- Hard hat (optional**)
- Safety glasses with side shields or chemical splash goggles (optional)
- Escape mask (optional)
- Face shield (optional
- Hearing protection (optional)

When there is skin exposure hazards but no airborne hazards, Modified Level D is used. The optional items above should be included for skin protection as necessary in addition to the basic Level D requirements.

*****depends on site requirements, since steel-toe work boots are mandatory on most Company job sites
******mandatory on most Company job sites, check requirements

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Figure 5

Inspection Procedures For Certain Types Of PPE

CLOTHING

Before Use:

- ❑ Determine that the clothing material is correct for the specified task at hand.
- ❑ Visually inspect for:
  - ☐ imperfect seams
  - ☐ non-uniform coatings
  - ☐ tears
  - ☐ malfunctioning closures
- ❑ Hold up to light and check for pinholes.
- ❑ Flex product:
  - ☐ observe for cracks
  - ☐ observe for other signs of shelf deterioration
- ❑ If the product has been used before, inspect inside and out for signs of chemical attack:
  - ☐ discoloration
  - ☐ swelling
  - ☐ stiffness

During the Work Task, Periodically Inspect For:

- ❑ Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind, however, that chemical permeation can occur without any visible effects.
- ❑ Closure failure
- ❑ Tears
- ❑ Punctures
- ❑ Seam discontinuities

GLOVES

Before Use:

- ❑ Pressurize glove to check for pinholes. Either blow into clean glove, then roll gauntlet towards fingers, or inflate glove and hold under water. In either case, no air should escape.
- ❑ Inspect material as describe in “Clothing” above.

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FULLY-ENCAPSULATING SUITS

Before Use:

- ❑ Check the operation of pressure relief valves.
- ❑ Inspect the fitting of wrists, ankles, and neck
- ❑ Inspect material as describe in “Clothing” above
- ❑ Check faceshield, if so equipped, for:
  - ☐ cracks
  - ☐ crazing
  - ☐ fogginess

RESPIRATORS

Refer to HSEP 13.9, Respiratory Protection Program

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Head Protection		Supersedes: CHSP 13.3	Rev. 3
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1.0 PURPOSE AND SCOPE

The purpose of this HSEP is to ensure the safety of employees when working in areas where there is a potential for injury to the head from falling objects and when in environments in which head protection is required. This HSEP provides the minimum requirements for employee head protection.

This HSEP applies to all employees and on-site contractors engaged in operations covered by the Company HSE Program.

2.0 RESPONSIBILITIES

General responsibilities for HSE Program implementation are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities that address duties specific to this topic are stated in this procedure.

3.0 DEFINITIONS

ANSI	American National Standards Institute
Class C (Conductive)	Helmets that are not intended to provide protection against electrical hazards.
Class E (Electrical)	Helmets intended to reduce the danger of contact with higher voltage conductors. Such helmets are proof-tested at 20,000 volts (phase to ground) but this is not intended to define the level of protection provided.
Class G (General)	Helmets intended to reduce the danger of contact with low voltage conductors. Such helmets are proof-tested at 2200 volts (phase to ground) but this is not intended to define the level of protection provided.
Type I	Helmets intended to reduce the force of impact resulting from a blow only to the top of the head.
Type II	Helmets intended to reduce the force of impact resulting from a blow to the top or the side of the head.

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4.0 PROCEDURE

4.1. Basic Head Protection

Workers shall wear approved hard hats when working in areas where there is a potential for injury to the head from falling objects and when in environments in which head protection is required.

Approved hard hats include protective helmets that meet ANSI Z89.1 standards (or equivalent) for Type I, or Type II, and Class G (General) or Class E (Electrical) only. Conductive (Class C) type helmets and bump caps are not approved head protection for general use. A good practice is to utilize protective helmets that provide electrical hazard protection.

Electrical workers and others who may be exposed to currents in excess of 2,000 volts shall be limited to Class E hard hats only.

Approved hard hats shall be the appropriate minimum head protection on all construction and maintenance projects and where ever known head hazards are present.

Hard hats shall be worn in conjunction with welding hoods as required in HSEP 13.6, Eye and Face Protection.

No employee shall routinely wear a hard hat backwards.

4.2. Color Coding

Color-coding of hard hats will be at the discretion of the individual project. An acceptable method of color-coding is application of colored tape; however, painting of hard hats is forbidden.

4.3. General Requirements

It shall be forbidden for employees to:

- Drill holes in the shell of the hard hat,
- Alter the shape of the hat or bill,
- Remove the suspension straps or cut/alter them in any way, and
- Paint hard hats.

Exceptionally long scalp hair may become caught in equipment or entangled and pulled into rotating equipment. Site management and supervision will assess all workplace hazards and may require long hair to be tucked away or underneath the hard hat. Long scalp hair must not interfere with the proper fit of the hard hat.

4.4. Inspection and Storage

Employees are required to inspect head protection prior to use to ensure that the equipment is in safe condition. Equipment that is defective or damaged shall not be used and immediately replaced. Inspect for:

- Dents,
- Cracks,
- Suspension connector cracks,
- Torn, loose, or worn suspension straps, and
- Cleanliness/sanitation. Head protection should be clean and not contaminated with oil, grease, chemicals, etc.

4.5. Training

Employee training on head protection is required as a part of initial orientation and whenever new forms of head protection are provided.

Refer to HSEP 13.1, Personal Protective Equipment, for additional information on training and refresher training requirements.

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Training documentation must include the employee's name, date of training, and the name of the person conducting the training.

5.0 REFERENCES

29 CFR 1910.135, Head Protection

29 CFR 1926.100, Head Protection

ANSI Z-89.1-2003, Personal Protective Helmets for Industrial Workers

6.0 FIGURES

None

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Hand Protection		Supersedes: CHSP 13.4	Rev. 2
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1.0 PURPOSE AND SCOPE

Practically every part of every job requires the use of the hands, and hand injuries are statistically one of the top injury categories. It is imperative these type hazards are recognized in our work planning processes and adequate hand protection be utilized by all affected employees to reduce the possibility of injury.

This Corporate Health, Safety, and Environment Procedure (HSEP) provides the minimum procedures to be followed when hand hazards are recognized on the job, and hand protection is selected and used to minimize the potential for hand injuries.

This HSEP applies to all employees and on-site contractors engaged in operations covered by the Jacobs HSE Program.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

None

4.0 PROCEDURE

4.1. General Requirements

Site Supervision shall inspect and insure that all manufacturers supplied guards on tools and equipment are in place and maintained appropriately to prevent hand injuries or employee contact with hazards.

Site Management shall establish an effective process of identifying specific hand injury hazards such as:

- Hazard Assessment Safety Action Plan (HASAP) or Health and Safety Plan (HSP)
- Safe Plan of Action (SPA)

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- Work Permitting Processes (Client)
- Follow-up actions from Safety Observation Reports (SORs) and accident investigations

From these processes, specific glove types must be established and communicated to employees for specific job tasks, materials /chemicals handling, tools and equipment.

Work stations and jobs should be designed to incorporate proper positions for tools, hands and work objects in a manner which minimizes the potential for injury.

Good housekeeping practices and personal cleanliness are also an important part of a preventive plan for hand protection. All worksites must have proper hand washing facilities.

Personal Protective Equipment (PPE) can help reduce the frequency and severity of hand and finger injury. Although fingers are harder to protect, they can be shielded from many common injuries. Personal protection is available in many forms.

Gloves are perhaps the most commonly used type of PPE. They provide protection to fingers, hands, and sometimes wrists and forearms. Ideally, gloves should be designed to protect against specific hazards of a job being performed. Types range from common canvas work gloves to highly specialized gloves used in specific industries such as high voltage rubber gloves for electricians.

4.2. Selection Guidelines for Hand Protection

There is no one glove that can provide protection against all potential hand hazards. It is important to select the most appropriate glove for a specific application and to determine how long it can be worn and whether it can be reused.

Performance characteristics of specific gloves can be obtained from glove manufacturers documentation. As long as performance characteristics are acceptable, it may be more cost effective to regularly change less expensive gloves rather than to re-use more expensive types of gloves. Other factors which may affect glove selections, include:

- Fit (Sizes)
- Dexterity needed (Thicker gloves may prevent using hands/fingers fully)
- Duration of use anticipated
- Frequency of use
- Degree of exposure to the hazard
- Durability of the glove for the task at hand
- Cost
- Color

4.3. Additional Guidance for Chemical Protection

Chemical properties such a toxics, corrosives or irritants, as well as local affects (area contacted) or systemic effects (absorbed through skin) must be determined prior to selecting gloves. The corresponding material safety data sheet (MSDS) can provide this information and possibly additional guidance for hand protection and other PPE.

Glove Manufacturers data should also be referenced for chemical resistance information.

If gloves are worn for chemical protection, requirements for proper disposal must be established and communicated to affected employees.

4.4. Other Types of Hand Protection Available

Mitts - Similar to gloves, but have a division for the thumb and one for fingers.

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Hand Pads - Protect the palm from cuts, friction, temperature or vibration.

Sleeves or Forearm cuffs - Provide extension of protection if needed for wrists and arms.

Finger Cots - Provide protection for a single finger or finger tip.

Thimbles - Used to protect the thumb and/or first two fingers.

Barrier Creams - A cream designed to protect against specific low or mild chemical hazards, the effects of excessive perspiration or to make clean-up easier when heavy soiling is eminent. Barrier creams can be used alone or with other forms of hand protection.

Repetitive motion hazards: Avoid wearing watches, bracelets, or tight clothing that hampers wrist circulation. Grasp objects with the whole hand if possible. Look for tools and keyboards designed to ease strain on the hand and wrists. Anti-Vibration Gloves, Palm Pads, and Glove Inserts are available for use with for use with jack hammers, chain saws, ground tampers, etc.

4.5. Equipment Inspection

Employees are required to inspect hand protection prior to use to ensure the equipment is in safe condition.

Hand protection, which is defective, worn, damaged or heavily contaminated shall not be used, and immediately replaced.

4.6. Training

Employee training on hand protection is required as a part of initial orientation, and whenever any new or special purpose hand protection is issued to employees to use. Follow-up training will be conducted during safety meetings and during the SPA/TSA process. Hand protection training shall include:

- Proper fitting and use
- Inspection
- Cleaning and proper storage; or disposal instructions
- Site and Task specific hand protection requirements.
- Refer to Section 13.1 Personal Protective Equipment Training requirements for additional information on required training elements, along with retraining and documentation requirements

Hand Protection training must be documented; Site Manager or his designee shall be responsible for maintaining this documentation.

In addition to maintaining documentation on the employees receiving hand protection training, documentation shall be maintained by Site Manager or his designee concerning the hand protection provided and its application.

5.0 REFERENCES

29 CFR 1910.138, Hand Protection

29 CFR 1910.132, Personal Protective Equipment

6.0 FIGURES

None

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1.0 PURPOSE AND SCOPE

Personnel shall wear protective footwear in areas where there is danger of foot injury due to exposure to electrical hazards, to falling or rolling objects, or to objects that can pierce the sole.

This Health, Safety, and Environment Procedure (HSEP) provides the minimum requirements to be followed for protective footwear selection, use, inspection, storage, and training.

This HSEP applies to company personnel, subsidiaries, and sub-contractors.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 PROCEDURE

3.1. Basic Foot and Toe Protection

Hard-toe footwear is required for personnel who perform job tasks in areas where there is a danger of foot injuries. Such tasks may occur during phases of construction or operation and may occur at, but not limited to, fab shops, maintenance shops, warehouses, tool rooms, insulation shops, paint and sandblast yards, process units, and laydown yards.

Only hard-toe footwear conforming to requirements set forth in government or national standards (ASTM F2412-05 and F2413-05 in US) shall be used.

All hard-toe footwear, except rubber boots, shall be constructed of leather, be of lace up design, and have a combined welting/upper height, which meets or exceeds 2” above the wearers ankle, and have a defined heel. The defined heel must be an original design by the manufacturer.

Sneakers and other hard-toe footwear designs that comply with government or national standards (ASTM F2412-05 and F2413-05 in US), but not those stated above, may be allowed on certain projects with if specifically identified in the project’s HASAP, including written approval by the Project Manager and responsible Area/Regional/Country HSE Manager.

Visitors, vendors, and employees of Jacobs or a subsidiary shall wear hard-toe protective footwear while in work areas where the possibly of foot or toe injury hazards exist.

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Engineering personnel, home office personnel, and other jobsite visitors shall follow the requirements set forth in this work instruction when they are in an area where the possibility of foot or toe injury hazards exist, regardless of the job or task they may be performing. If visitors are in job site areas where foot or toe injury hazards do not readily exist, such as the perimeter of a structure or an operating unit or building, the site manager shall determine whether protective footwear will be required for the visit.

3.2. Special-purpose Footwear

Special-purpose (crush resistant, chemical resistant, puncture resistant, and di-electric) footwear shall be used to provide protection from such hazards.

Site management shall assure that affected personnel use special-purpose footwear that is appropriate to the hazard. Such special-purpose footwear will be provided to the worker by the employer.

When chemical hazards are present, select footwear suitable for the chemicals involved by using MSDSs, manufacturer's guidelines, and other appropriate technical resources. Do not use standard rain boots for acid hazard protection.

3.3. Additional Foot and Leg Protection

Personnel who perform tasks, which expose them to potential foot and/or leg injury hazards, e. g., work involving jackhammers, ground tampers, etc., shall wear additional foot and leg protection, such as metatarsal and shin guards.

3.4. Inspection and Storage

Personnel shall be required to inspect foot protection prior to use to ensure that equipment is in good/safe condition and is free of snags, rips, tears, and holes.

Defective or damaged foot protection shall be promptly replaced.

3.5. Training

Training in basic foot protection and in special-purpose foot protection requirements shall be conducted during initial orientation and when there is a change in foot protection requirements.

Refer to HSEP 13.1, Personal Protective Equipment, for additional training and re-training requirements.

Training shall be documented and shall, at a minimum, provide name of personnel receiving the training, date of training, and name of person conducting the training.

4.0 REFERENCES

29 CFR 1910.136, Foot Protection

ASTM F2412-05 Standard Test Methods for Foot Protection

ASTM F2413-05 Standard Specification for Performance Requirements for Foot Protection

HSEP 13.1, Personal Protective Equipment

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1.0 PURPOSE AND SCOPE

The purpose of this Corporate Health, Safety, and Environment Procedure (HSEP) is to ensure the health and safety of employees who work in environments, which require the use of any eye and face protection. This HSEP provides the minimum procedures to be followed when eye or face protection is required.

This HSEP applies to all employees and on-site contractors engaged in operations covered by the Company Health, Safety, and Environment Program.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

ANSI	American National Standards Institute: an independent standards setting organization, which develops standards as a guide for manufacturer's, government agencies, employers, employees and consumers. For personal protective equipment, ANSI sets design and performance criteria.
ANSI Z-87.1 1989	This ANSI standard represents the latest set of design and performance specifications for eye and face protection. OSHA mandates eye and face protection used in occupational settings meet this standard. All protectors meeting this standard are marked with "Z-87" on each piece or component (temple bar, lens frame) along with a mark which identifies the manufacturer on each protective lens.

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Filter Lens	A protective lens (normally a shade of green) which is numbered to indicate its density or protection against various forms of light radiation. Higher numbers are denser/darker, and provide higher protection. Tinted or shaded lens with no number offer protection against visible light and glare, but offer little or no protection from harmful forms of light radiation.
Light Radiation	Non-visible forms of radiation (non-ionizing) capable of causing harm to the eyes/vision. Common sources include intense light sources, such as welding, cutting and sunlight.

4.0 GENERAL NOTES

Eye and face protection outlined in this policy refer to task user items. The same protection (i.e., face shield, goggles, burning goggles, etc.) as worn by the task performer should be considered as appropriate eye protection of the nearby worker.

4.1. Basic Eye Protection

As basic eye protection; safety glasses with rigid sideshields which comply with ANSI Z-87.1 1989 are considered minimum protection.

Basic eye protection shall be required on all construction and maintenance projects and any jobsite/work area where recognized eye hazards exist.

Basic eye protection may be required in work areas/job sites other than construction and maintenance as the hazards dictate.

Prescription eyewear shall also meet the same requirements as in the first paragraph of this section or the individual shall wear equivalent eye protection over their prescription lenses (i.e., ANSI Z-87.1 glasses or goggles).

4.2. Contact Lenses

The Company allows contact lens to be worn on jobsites in conjunction with basic or required eye protection.

Note: Many of our Clients have policies which prohibit the use of contacts on their sites. Based on this, it is the responsibility of Site Management to set and enforce a site contact lens policy if necessary.

Soft and gas permeable contact lens are currently allowed to be worn with respiratory protection. However, OSHA does not allow non-gas permeable / hard contact lens to be worn in conjunction with respiratory protection. This must be enforced by Site Management.

4.3. Goggles – General

Goggles should not be worn over basic eye protection (safety glasses) if possible, because the goggle-to-face seal will be diminished.

There are some cases where goggles must be worn over safety glasses such as for prescription lens wearers.

Goggles may be worn in conjunction with a faceshield.

4.4. Impact – Type Goggles

Impact type goggles shall meet ANSI Z-87.1, 1989 requirements and normally have direct ventilation to allow a good flow of air into the goggles which helps to prevent fogging of the lens.

Approved impact-type goggles shall be provided to ensure greater eye protection from flying particles. Tasks which may dictate the need for impact goggles include:

Chipping	Power Sawing
Scraping	Hammering

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Buffing	Grinding
Blowing	Pneumatic Tool Use

4.5. Chemical/Splash Resistant Goggles

Approved chemical/splash goggles shall meet ANSI Z-87.1, 1989 impact requirements and can have indirect (offset) vents to allow a flow of air, but prohibit the direct path of a projected liquid droplet from entering the goggle.

Chemical/Splash goggles should not be worn over basic safety glasses or prescription eyewear for recognized chemical/splash hazards due to the flange or seal of the goggle having to fit over the temple pieces of the glasses, which negates an effective seal.

Chemical/splash goggles shall be provided to ensure eye protection from hazards associated with the handling of chemicals. Hazardous chemical operations may include hazards from:

Irritants	Corrosives
Caustics	Acids
Toxics	Molten metal or tar

In the forms of dusts, mists, sprays, or splashes.

Reference the chemical MSDS information for additional guidance on PPE and eye/face protection recommendations specific to the handling/use of a particular chemical.

4.6. Faceshield

A faceshield which complies with ANSI Z-87.1, 1989 shall be worn to provide face protection to the employee from flying particles, splashes, or mist.

It must be noted that a face shield provides only protection to the face and eyes from direct impact objects, and additional eye protection must be worn in conjunction with a face shield.

Tasks which may dictate the use of a faceshield include:

Chipping	Power Sawing
Scraping	Grinding
Blowing	Pneumatic Tool Use
Hot Tar Work	Pouring of Irritants
Liquid Metal Work	Routering

4.7. Burning Goggles

Burning goggles shall be worn when an oxy-fuel torch is used for cutting or burning to provide employee protection from injurious light radiations.

A Number 5 lens shade is considered adequate for routine torch cutting activities.

4.8. Welding Hood

A welding hood with a filtered lens of Number 10 shade or darker shall be used to provide protection from injurious light radiations produced during electric arc welding.

Approved safety glasses with sideshields and hard hats shall be worn in conjunction with the welding hood to ensure protection from popping hot slag when the hood is raised and overhead work exposures.

A welding hood with a "flip-up" window and secondary clear lens shall be considered to provide greater protection to the welder.

Pipeliner hoods (pancakes) are strictly forbidden.

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4.9. Inspection and Storage

Employees are required to inspect eye and face protection prior to use to ensure the equipment is in safe condition.

Eye and face protection which is defective or damaged shall not be used and immediately replaced.

4.10. Training

Employee training on eye and face protection is required as a part of initial orientation, and whenever any new or special purpose equipment is issued to employees to use, and shall include:

- Proper fit and/or adjustment.
- Inspection
- Cleaning and proper storage
- Anti-fogging applications

Refer to HSEP 13.1, Personal Protective Equipment; training requirements for additional information on required training elements, along with retraining requirements.

The training must be documented with the employee's name, date of training and person conducting the training.

5.0 REFERENCES

29 CFR 1910.133, Eye and Face Protection

29 CFR 1926.102, Eye and Face Protection

ANSI Z-87.1 1989, American National Standard Practice for Occupational and Educational Eye and Face Protection

6.0 FIGURES

Eye and Face Protection Selection Guide

Filter Lenses for Protection Against Light Radiation

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Figure 1

Eye and Face Protection Selection Guide

Taken from 29 CFR 1910: Appendix B to Subpart I - Non-Mandatory Compliance Guidelines For Hazard Assessment and Personal Protective Equipment Selection

Source	Assessment of Hazard	Protection
IMPACT - Chipping, grinding, machining, masonry work, woodworking, sawing, drilling, chiseling, powered fastening, riveting, and sanding.	Flying fragments, objects, large chips, particles, sand, dirt, etc.	Spectacles with side protection, goggles, faceshieds. See notes (1), (3), (5), (6), (10). For severe exposure, use faceshield.
HEAT - Furnace operations, pouring, casting, hot dipping, and welding	Hot sparks	Faceshields, goggles, spectacles with side protection. For severe exposure use faceshield. See notes (1), (2), (3).
	Splash from molten metals	Faceshields worn over goggles. See notes (1), (2), (3).
	High temperature exposure	Screen faceshields, reflective faceshields. See notes (1), (2), (3).
CHEMICALS - Acid and chemicals handling	Splash	Goggles, eyecup and cover types. For severe exposure, use faceshield. See notes (3), (11).
	Irritating Mists	Special-purpose goggles.
DUSTS - Woodworking, buffing, general dusty conditions.	Nuisance dust	Goggles, eyecup and cover types See note (8).
LIGHT and/or RADIATION - Welding: Electric arc	Light radiation	Welding helmets or welding shields. Typical shades: 10-14 See notes (9), (12).
Welding: Gas	Light Radiation	Welding goggles or welding face-shield. Typical shades: gas welding 4-8, cutting 3-6, brazing 3-4. See note (9)
Cutting, Torch brazing, Torch soldering	Light Radiation	Spectacles or welding facesheild. Typical shades, 1.5-3 See notes (3), (9).
Glare	Poor vision	Spectacles with shaded or special purpose lenses, as suitable. See notes (9), (10).

See Page 2 for Notes

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Eye And Face Protection Selection Guide (Continued)

Notes to Eye and Face Protection Guidelines

(1) Care should be taken to recognize the possibility of multiple and simultaneous exposure to a variety of hazards. Adequate protection against the highest level of each of the hazards should be provided. Protective devices do not provide unlimited protection.

(2) Operations involving heat may also involve light radiation. As required by the standard, protection from both hazards must be provided.

(3) Faceshields should only be worn over primary eye protection (spectacles or goggles).

(4) As required by the standard, filter lenses must meet the requirements for shade designations in 1910.133 (a)(5). Tinted and shaded lenses are not filter lenses unless they are marked or identified as such.

(5) As required by the standard, persons whose vision requires the use of prescription (Rx) lenses must wear either protective devices fitted with prescription (Rx) lenses or protective devices designed to be worn over prescription (Rx) eyewear.

(6) Wearers of contact lenses must also wear appropriate eye and face protection devices in a hazardous environment. It should be recognized that dusty and/or chemical environments may represent an additional hazard to contact lens wearers.

(7) Caution should be exercised in the use of metal frame protective devices in electrical hazard areas.

(8) Atmospheric conditions and the restricted ventilation of the protector can cause lenses to fog. Frequent cleansing may be necessary.

(9) Welding helmets or faceshields should be used only over primary eye protection (spectacles or goggles).

(10) Non-sideshield spectacles are available for frontal protection only, but are not acceptable eye protection for the sources and operations listed for “impact”.

(11) Ventilation should be adequate, but well protected from splash entry. Eye and face protection should be designed and used so that it provides both adequate ventilation and protects the wearer from splash entry.

(12) Protection from light radiation is directly related to filter lens density. See note (4). Select the darkest shade that allows task performance.

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Figure 2

Filter Lenses for Protection Against Light Radiation

Taken from 29 CFR 1910.133

Operations Protective Shade	Electrode Size 1/32 in.	Arc Current	Minimum*
Shielded metal arc welding	Less than 3	Less than 60	7
	3-5	60-160	8
	5-8	160-250	10
	More than 8	250-550	11
Gas metal arc welding and flux cored arc welding		Less than 60	7
		60-160	10
		160-250	10
		250-500	10
Gas tungsten arc welding		Less than 50	8
		50-150	8
		150-500	10
Air carbon Arc cutting	(Light)	Less than 500	10
	(Heavy)	500-1000	11
Plasma arc welding		Less than 20	6
		20-100	8
		100-400	10
		400-800	11
Plasma arc cutting	(Light)**	Less than 300	8
	(Medium)**	300-400	9
	(Heavy)**	400-800	10
Torch brazing			3
Torch soldering			2
Carbon arc welding			14

Operations	Plate thickness - inches	Plate thickness - mm	Minimum*Protective Shade
Gas Welding:			
Light	Under 1/8	Under 3.2	4
Medium	1/8 to 1/2	3.2 to 12.7	5
Heavy	Over 1/2	Over 12.7	6
Oxygen cutting:			
Light	Under 1	Under 25	3
Medium	1 to 6	25 to 150	4
Heavy	Over 6	Over 150	5

* As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum. In oxyfuel gas welding or cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the (spectrum) operation.

** These values apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the workpiece.

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1.0 PURPOSE AND SCOPE

The purpose of this Corporate Health, Safety, and Environment Procedure (HSEP) is to establish minimum requirements for the use of fall prevention measures, fall arrest equipment, and systems to protect employees exposed to fall hazards.

This HSEP applies to all employees and subcontractors exposed to fall hazards, while working at the same level, at elevated levels, and near excavations.

Metric units used in this work instruction apply outside the United States and are not always exact English-to-Metric conversions.

2.0 RESPONSIBILITIES

General responsibilities for HSE procedures implementation are stated in HSEP 1.5. Additional responsibilities specific to this HSEP include the following.

2.1. Site Manager

The Site Managers shall:

- Designate the Competent Person(s) responsible for training and other specific duties outlined in this work instruction.

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- Designate the Qualified Person responsible for the specific duties outlined in this work instruction.
- Maintain a program for storing, inspecting, and procuring fall arrest equipment.
- Approve the use of safety nets, which are only permitted as a secondary means of fall arrest.
- Approve the use of warning line systems.

2.2. Supervisors

Supervisors shall:

- Ensure that workers have received proper training on fall hazard recognition, fall prevention measures, and the use of fall arrest equipment.
- Ensure visual and documented inspections of fall arrest equipment.
- Assure that provisions for prompt rescue of fallen employees are planned.
- Assure that fall arrest equipment is used in compliance with this work instruction including manufacturer and regulatory requirements.

2.3. Employees

Employees shall:

- Identify fall hazards associated with their work and ensure that such hazards are properly addressed.
- Know the uses and limitations of fall arrest equipment.
- Inspect fall arrest equipment prior to each use and remove any defective equipment from service.
- Comply with Jacobs 100% Fall Protection Policy.
- Remove from service any fall arrest equipment subjected to a fall.
- Immediately report both injury and non-injury falls to supervision.

2.4. Competent Persons

Competent Persons shall:

- Train the employees in:
    - The nature of fall hazards in the work area,
    - The correct procedures for using and erecting fall arrest systems,
    - The proper use of guardrail systems, personal fall arrest systems, etc,
    - The correct procedures for handling and storing equipment.
- Maintain the written documentation of the training provided.
- Supervise the installation and use of third-party manufactured fall arrest systems.

2.5. Qualified Person

Qualified Persons shall:

- Use their experience and educational background to design company-specific fall arrest systems.
- Supervise the installation and use of anchorages used for company-specific fall arrest systems, including horizontal lifelines.
- Maintain requirements as a Qualified Person in accordance with definition found below.

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3.0 DEFINITIONS

Anchorage	A secure point of attachment for lifelines (horizontal and vertical), lanyards, and retractable devices, which is independent of the means of supporting or suspending the work platform. Anchorage shall be capable of supporting 5,000 pounds (22 kN) per employee attached or shall be designed, installed, and used as follows: (1) as part of a complete fall arrest system that maintains a safety factor of at least two and (2) under the supervision of a Qualified Person. Anchorage must meet applicable local regulatory and manufacturer requirements.
Clearance Distance	The total fall distance required below the anchorage to ensure sufficient clearance to prevent collision with walking and working surface and other obstructions below. The total fall distance is vertically measured from the anchorage and includes a combination of free fall distance, deceleration distance, worker's height, and a safety factor of 2 feet.
Competent Person	One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.
Connecting Device	A retractable device (self-retracting lifeline), lanyard, anchorage connector, or other means to connect the full-body harness to the anchorage or lifeline to provide protected movement during an elevated work task.
Controlled Access Zones	An area in which certain work may be performed without the use of guardrail systems, personal fall arrest systems, or safety net system. Access to the zone is controlled and the work within the controlled access zone is to be performed by using a warning line system.
Deceleration Device (Shock Absorber)	Any device that serves to dissipate a substantial amount of fall arrest energy or otherwise limits the energy imposed on the body during fall arrest (1,800 pounds maximum (8kN)). This device elongates after activation and shall be considered in calculating clearance distances.
Deceleration Distance	The distance an employee falls after the lanyard or retractable device is activated and is measured from the point of activation to a complete stop. The maximum allowed deceleration distance for a lanyard is 42 inches, and for a retractable device (self-retracting lifelines) the maximum allowed deceleration distance is 2 feet.
Designated Area	A fall prevention system composed of a warning line and stanchions erected six feet or more from a fall hazard (unprotected roof edge). See Figure 1.
"D" Ring	An attachment point on the full-body harness for attaching a lanyard or other connecting device.
Fall Arrest System	Involves using fall arrest systems/equipment to control a fall once it has occurred. Fall arrest systems do not prevent the fall. Includes the proper anchorage, body support (harness), and connecting device interconnected and rigged to arrest free fall.
Fall Hazard Control	A means of providing *complete* and *continuous* protection for employees exposed to fall hazards. The means of protection include either fall prevention or fall arrest measures. Planning, training, and enforcement are key elements for controlling fall hazards.
Fall Prevention	Any means used to eliminate or prevent exposure to fall hazards including guardrail systems, aerial lifts, hole covers, completed scaffolds, and fall restraint.

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Fall Restraint System	A fall prevention system that prevents the user from falling any distance. The system is comprised of a full-body harness, along with an anchorage, connectors, and other necessary equipment. The system prevents and/or restrains the user from reaching the open edge of the structure or platform. Anchorage shall be capable of resisting 400 lbs. (1.82 kN) of force minimum (same as two times force required for a barricade/handrail) or two times the employee's weight, which ever is greater.
Fall Restraint Line	A line from a fixed anchorage to which an employee is secured in such a way as to prevent the employee from reaching an identified fall hazard.
Free Fall	Distance the D-ring travels from the onset of a fall to the time when the deceleration device is activated (excludes deceleration distance and any system elongation). Free fall shall be limited to six feet.
Guardrail System	A vertical & horizontal barrier erected along exposed edges of a floor opening, roof opening, wall opening, ramp, runway, scaffold, excavation, and other walking or working surface to prevent employee exposure to lower level falls. Constructed of a top rail, mid-rail and toeboard (when required). Material used includes: wood, wire rope, steel, or pipe (see Figure 1).
Harness	A personal fall arrest device, which is secured around the body, with a lanyard and/or other fall arrest device attached. It is designed to distribute fall arresting forces primarily over the buttocks and thighs and must meet applicable ANSI and other regulatory requirements.
Horizontal Lifeline (HLL) System	A horizontal lifeline system is a flexible cable or rope line strung horizontally and anchored at both ends. The HLL system serves as attachment for single or multiple users based on the application and design. HLL systems must be designed and installed under the supervision of a Qualified Person, as part of a complete personal fall arrest system.
Hole	A hole is a gap or void 2 inches or more in its least dimension in a floor, roof, or other walking/working surface. Holes must be properly barricaded or covered to prevent employees from tripping or stepping into them or falling through and to prevent tools, equipment, or material from falling through them to a lower level.
Lanyard	A connecting device used to attach a full-body harness to a lifeline or an anchorage point. Lanyards come in varying lengths and must contain a built-in shock absorber.
Leading Edge	The unprotected side and edge of a floor, platform, ramp, walkway or formwork for a floor or other walking/working surface such as a deck, which changes locations as an additional floor, roof, decking, or formwork sections are placed, formed, or constructed.
Lifeline	A flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline) or for connection at both ends to stretch horizontally (horizontal lifeline) and to which other components of a fall arrest system is attached.
Low Sloped Roof	A roof having a slope ratio of less than or equal to 4 to 12 (vertical to horizontal).

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Monitoring Systems	A passive safety system in which a Competent Person is assigned responsibility to recognize and warn unprotected employees of fall hazards. The Competent Person monitors work activities and exposures to fall hazards. This system permits work adjacent to openings, holes, and perimeter edges of floors, roofs, etc., without using fall arrest equipment. *Jacobs prohibits the use of monitoring systems as sole means of fall protection.*
Personal Fall Arrest System	A system used to arrest an employee in a fall from a working/walking level. It includes anchorage, connectors, a full-body harness, and may include a lanyard, deceleration device, lifeline, or suitable combination of these.
Positioning Device	A device rigged to a full-body harness and anchored to the work to allow an employee to be supported on an elevated, vertical surface such as a wall, column, formwork, and reinforcing steel (rebar), and to work with both hands free while leaning. *Jacobs prohibits the use of positioning devices as the sole means of fall arrest when working above 6 feet.*
Qualified Person	A person with a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience has successfully demonstrated the ability to solve or resolve problems related to fall protection.
Rope Grab	A device, which travels on a vertical lifeline, that automatically engages and locks on the lifeline in the event of a fall.
Safety Net	A passive fall arrest system designed to catch personnel, who fall from the perimeter of a building, bridge, roof, or any other unprotected work location. Nets typically extend out from and under unprotected work locations. They are comprised of mesh nets, including connectors, and other impact-absorbing components. *Jacobs prohibits the use of safety nets as an independent means of fall arrest.*
Self Retracting Lifeline (Retractable device)	A fall arrest device that automatically extends up and down, eliminating slack, as the worker moves. These units have a locking and/or braking mechanism, which senses and arrests free fall, within 2 feet of activation.
Snap Hook	A double-locking mechanism that is a self-closing, self-locking connector used for connecting lanyards and or devices to the full-body harness D-ring and to the anchorage. *Jacobs prohibits use of single-locking snap hooks.*
Swing Fall	A pendulum-like motion that results from moving horizontally too far away from the fixed overhead anchorage.
Toeboard	The lower protective barrier of the guardrail system that prevents material, and equipment from falling to a lower level. Toeboards must be designed to withstand 50 lbs. of force and be a minimum of 3½ inches high.
Unprotected Sides and Edges	Any side or edge, except at entrances to points of access for walking and/or working surfaces, such as a floor, roof, ramp, runway, where there is no wall or guardrail system at least 39 inches high.
Wall Opening	An opening of at least 30 inches high and 18 inches wide, in any wall or partition, such as a doorway or chute opening, through which employees may fall.

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Warning Line System	A barrier erected on the walking/working surface, such as a roof, to warn employees that they are approaching a fall hazard near the side or edge. Warning lines must be placed a minimum of six feet from the edge of a roof, floor, or walking/working surface. For mechanical equipment operations on roofs, see below for warning line distances from roof edges.

4.0 PROCEDURE

Anytime employees are potentially exposed to falls from elevation, fall prevention or fall arrest must be implemented. Such potential exposures include when traveling, stationary, or at anytime exposed to a fall from a surface not protected by approved handrails, guardrails, or some other approved fall arrest or restraint device.

At no time will workers be exposed to an unprotected elevation of six feet or more without effective fall arrest equipment. This distance is measured from the walking or working surface supporting the worker to the next lower surface onto which the worker may fall.

Additional requirement: In general industry settings, such as in completed buildings and in operating facilities, work near unprotected floors, platforms or leading edges four feet or more above the adjacent floor or ground requires fall arrest or restraint.

Details of the fall hazard elimination or control methods selected for the task shall be included in the SPA.

4.1. Fall Hazard Control

Personnel shall be prevented from falling or protected by a fall arrest system whenever the hazard of falls from elevation exists. This requirement applies to unprotected sides/edges, leading edges, hoist areas, holes, and floor openings, formwork, and reinforcing steel, excavations, roofing work, pre-cast concrete erection, and other walking/working surfaces not otherwise addressed. Regardless of height, unprotected open-sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment or hazards such as open tanks, vats, or pits shall require fall prevention or restraint.

4.1.1. Methods of Fall Prevention and Arrest

Fall hazard control shall be provided in the form of fall prevention systems, which includes guardrail systems, scaffolds, aerial lifts, barricades, and hole covers. Fall arrest measures include the use of personal fall arrest systems and safety nets, or similar means of fall arrest. Emphasis should also be placed on providing protection from falling objects and from slips and trips on the same level. The use of “Controlled Access Zones” is not permitted.

4.1.2. Planning

Prior to each phase of work, site supervision is responsible for planning fall prevention and fall arrest measures to protect employees from fall exposures.

This planning effort includes:

- Identifying potential fall hazards,
- Using design safety to eliminate or engineer out fall exposure,
- Determining the appropriate method of prevention or arrest,
- Supplying anchorage,
- Providing education, training, and enforcement, and
- Arranging for rescue and rescue equipment.

4.2. Hierarchy of Fall Hazard Control

Fall hazard control measures should be initiated in the following order.

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4.2.1. Fall Elimination

Eliminate work at elevation by:

- Performing work on the ground,
- Attaching guardrail prevention to forms and work platforms while on the ground,
- Attaching fall arrest systems to formwork, bridge steel, and other structural components before erection,
- Using ground release devices to disconnect rigging from the ground, or
- Maximizing the pre-assembly of formwork, structural steel, pipe, and other components.

4.2.2. Design Safety and Engineering Controls

"Design-out or Engineer-out" fall hazards by:

- Reviewing shop drawings and interacting with fabricators and material suppliers to design safety features into the structure, material, or equipment to be used. (See HSEP 17.8.)
- Maximizing use of prefabricated modular units.
- Adding stairways and platforms that can be used for access both during construction and maintenance operations.
- Designing elevated structures with connecting points to secure retractable devices and other anchorage connectors. For example, embeds can be added into concrete walls for anchorage points, and structural steel can be hole-punched to accommodate wire rope guardrail systems.
- Designing holes and/or attachment points for temporary guardrail systems, stanchions and self-retracting lifelines that can be attached on the ground and provide prevention or arrest for the first person to access elevation.

4.2.3. Fall Prevention

Prevent falls at elevation by using:

- Guardrail systems,
- Scaffolds,
- Aerial lifts,
- Skylight guarding,
- Fall restraint, and
- Hole/Floor covers.

4.2.4. Fall Arrest

Protect employees when they fall by the use of fall arrest systems.

Fall arrest systems/equipment used to arrest falling employees are the least desirable methods of protection because

- They only minimize the consequences of a fall rather than prevent its occurrence, and
- They rely on human behavior to prevent injury.

The use of fall arrest equipment, such as harnesses, lanyards, anchorage connectors, retractable devices, etc. must be planned in the work activity and used properly to reduce the risk of injury from falling.

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4.3. Fall Prevention Methods

Since fall *prevention* eliminates falls, it is preferred over fall *arrest* devices and is the first choice for eliminating fall hazards. Fall prevention methods are described below.

All fall accidents, serious incidents, or near accidents must be investigated and the fall protection requirements in the HASAP shall be updated, as appropriate.

Fall prevention methods are described as follows:

4.3.1. Proper Access

Providing safe access to and from work locations is the first step in preventing falls. This includes planning safe access/egress routes of travel and proper installation and use of:

- Ladders,
- Scaffolds,
- Stair Towers,
- Stairways,
- Ramps,
- Designating specific locations to access and egress work locations, and/or
- Backfilling around footers, slabs-on-grade, and other structures.

4.3.2. Guardrail Protection

Designate work locations requiring guardrail protection (See Figure 1). Include

- Elevated work platforms, such as on formwork,
- Scaffolds,
- Openings/holes in bridge decks, floors, roofs, or other unprotected surfaces,
- Unprotected sides of ramps/stairways/platforms,
- Leading edges,
- Edges of bridge surfaces, buildings, floors, roofs, and slabs,
- Ladderway floor openings,
- Exposed skylight openings,
- Pits and trap door openings that are left uncovered,
- Manhole floor openings, and
- Elevator shaft openings left unprotected.

4.4. Fall Prevention System Requirements

4.4.1. Guardrail Systems

Guardrail systems shall be so surfaced to prevent injury from punctures or lacerations and to prevent snagging of clothes.

The ends of top rails and mid-rails shall not overhang the terminal posts, except where such projection does not constitute a projection hazard.

Guardrail systems used around holes shall be erected on *all* unprotected sides and edges of holes.

Guardrail systems used on ramps and runways shall be erected along each unprotected side or edge

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Guardrail systems shall be used around holes, which are points of access, such as ladderways. Every ladderway floor opening or platform shall be guarded by a standard guardrail system including toeboards on all exposed sides, except at the entrance to the opening. The passage through the railing shall either be provided with a swing gate or barrier or offset such that a person cannot walk directly into the opening.

Guardrail installation should occur as work progresses — don't wait and then catch up,

Plan inspections for damage and proper construction and immediately replace damaged guardrails.

4.4.1.1. Top Rails

Top rail height must be 42 inches plus or minus 3 inches above the walking and/or working surface.

Guardrail systems shall be capable of withstanding, without failure a force of 200 pounds (890 N) applied within 2 inches of the top edge in any direction.

When the 200 pounds (890 N) is applied in a downward direction the top edge of the guardrail, it shall not deflect to a height less than 39 inches above the walking or working level.

4.4.1.2. Mid Rails

Midrails, screens, mesh, intermediate vertical members or equivalent intermediate structural members shall be installed between the top edge of the guardrail system and the walking/working and when there is no wall or parapet wall at least 21 inches high.

Midrails when used shall be installed at a location midway between the top edge of the guardrail system and the walking or working level.

Screens and mesh when used shall extend from the top rail to the walking/working level and along the complete opening between top rail supports.

Midrails, screens, mesh intermediate vertical members or equivalent structural members shall be shall be able to withstand a force of at least 150 pounds (666 N) applied in any direction.

Intermediate vertical members when used between posts shall not be more than 19 inches apart.

4.4.1.3. Protection from Falling Objects

Falling object protection is provided by toe boards, screens on guardrail systems, hole covers, tool tethering, barricades, and canopy structures.

Toeboards shall be:

- Erected along the edge of the overhead walking/working surface for a distance sufficient to protect employees below
- Capable of withstanding, without failure, a force of 50 pounds (222N) applied in any direction.
- A minimum of 3½ inches in vertical height.
- No more than ¼ inch above the walking and/or working surface.
- Solid or have openings not more than 1 inch in greatest dimension

Where tools, material, equipment are piled higher than the top edge of a toeboard, paneling or screening shall be erected from the walking/working surface to the top of the guardrail systems top or mid-rail for a distance sufficient to protect employees below.

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Barricade the area to which objects could fall, prohibit employees from entering the barricaded area, and keep objects that may fall far enough away from the edge or in a secure container.

Erect a canopy structure of sufficient strength and size to protect workers under a walking or working level.

4.4.2. Covers for Openings and Holes

All covers, including those covers located in roadways, shall be capable of supporting at least twice the weight of employees, equipment, and material that may be imposed on the cover at any one time.

Covers shall be secured to prevent accidental displacement by cleating the underside, tying the cover to grating, or other means to prevent accidental displacement.

Covers shall be color coded, or marked with the word “hole” or ”cover”.

Identify openings and holes. Holes are defined as a gap or void 2 inches or more in at least one dimension in a floor, roof, or walking, and working surface

Install protection as soon as an opening is created.

Immediately replace covers, which have been removed or damaged.

Perform regular inspection and proper maintenance.

Use fall arrest equipment when working near unprotected openings.

4.4.3. Elevating Equipment

Employees are required to be tied-off 100% of the time when operating

- Aerial lifts and scissor lifts, see HSEP 17.9, and
- Crane suspended personnel work platforms see HSEP 17.3. Their use is limited and governed by applicable regulations and should only be used as a last resort.

4.4.4. Housekeeping

Keep walking and working areas free of debris, material, and equipment.

Enforce daily clean up of work areas.

Provide a sufficient number of trash containers for clean up.

4.4.5. Fall Restraint System

A fall restraint system is a fall prevention system that prevents the user from falling any distance. The system is comprised of a full-body harness, along with an anchorage, connectors, and other necessary equipment. The system prevents and/or restrains the user from reaching the open edge of the structure or platform.

Anchorage for fall restraint shall be capable of resisting 400 lbs. (182kg) of force minimum or two times the employee’s weight, which ever is greater.

4.4.6. Excavations

Employees at the edge of excavations six feet or more in depth must be protected from falling by the use of guardrails, fences, or barricades.

Excavations, trenches, wells, pits, shafts, or similar excavations six feet or more in depth shall be protected by guardrail systems, barricades, fences, or covers.

4.4.7. Hoist Areas

Hoist areas six-foot or more in depth must be protected by guardrail or personal fall arrest systems.

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If guardrail systems or portions thereof must be removed to facilitate the hoisting operation, exposed workers shall be protected by a personal fall arrest system and the area shall be barricaded.

4.4.8. Dangerous Equipment

Regardless of elevation, employees working from elevated positions above dangerous equipment or conditions (machinery, electrical equipment, degreasing units, galvanizing tanks, vertical rebar, etc.) must be protected from falling onto the hazard by fall prevention methods, fall restraint systems, or equipment guards.

4.4.9. Ladders

4.4.9.1. General

Personnel working on or from ladders with their feet six feet or more above the ladder support surface shall be prevented or protected from falling by means of a personal fall arrest system.

When ascending or descending a portable ladder, three-point contact is considered acceptable fall protection for fall exposures of less than 20 feet. When potential fall exposure exceeds 20 feet, personnel on ladders must be protected with a personal fall arrest system.

If a unique situation arises when there is inadequate anchorage, HSE management shall be consulted for special evaluation and identification of alternative means of access, such as vertical lifts, rolling scaffolds, platform ladders, etc., and subsequent development of a task-specific SPA.

Refer to HSEP 18.3 for additional information related to ladder use.

4.4.9.2. Step Ladders

When working on a stepladder, if a worker's feet are on or above the fifth rung of a stepladder, the ladder shall be tied off or held by at least one other person.

When the worker's feet are above six feet of the ladder support surface, a personal fall arrest system is required.

Stepladders shall be tied off whenever possible.

4.4.9.3. Straight and Extension Ladders

Another worker shall hold all straight or extension ladders until the ladder can be tied off to something substantial.

4.4.9.4. Fixed Ladders, Including Scaffold Ladders

When the length of the climb is 20 feet or more, one of the following is required:

- Landing platform every 30 feet when cages, wells, or ladder climbing safety devices are provided.
- Landing platform every 20 feet if no cage, well, or ladder climb safety device is provided.
- Ladder climb safety devices can be used without platforms on towers, water tanks, and chimney ladders over 20 feet but not more than 150 feet in unbroken length.
- Ladder climb safety device shall be used with a harness, a connector that is no more than 9 inches in length between the attachment point on the harness and the point of attachment to the grab device, and a grab device compatible to the wire rope or rail used or with a harness and a self retracting lanyard anchored above the ladder.

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4.4.10. Roofing Work and Work on Roof-Top Equipment

Persons involved in roofing work must be protected by either a fall prevention or fall arrest system.

A designated area inside a warning line is acceptable fall prevention for roofing work and for performing work on equipment located on low-sloped roofs (slope 4 on 12 vertical to horizontal or less) as long as employees are not required to be within six feet of the edge or unprotected skylights, unless a monitoring system is provided, and the Site Manager approves. If work is required within six feet of the edge of the roof, then guardrails, fall restraint systems, or fall arrest must be provided and used. This does not include roof access and egress points.

A warning line system is not permitted as fall prevention means for work on steep roofs. Fall prevention or fall arrest is required at all times when performing work on equipment located on any roof other than a low-sloped roof.

Warning lines used for low-sloped roofing work shall:

- Be approved by the Site Manager.
- Be used in conjunction with a monitoring system.
- Be erected around all open sides of the work area.
- Not be less than six feet from the edge of the fall hazard. (When mechanical equipment is used, the warning line shall be ten feet from the edge that is perpendicular to the direction of mechanical equipment operation.)
- Be used to connect an access route to the work area by forming a path within two warning lines, e.g., access and egress points, material handling areas, storage areas, and hoisting areas.
- Consist of ropes, wires, or chains, and supporting stanchions erected as follows.
  - Be flagged at not more than six foot intervals with high-visibility materials,
  - Be rigged and supported in such a way that the top rail's highest point is no more than 39 inches and lowest point (including sag) is no less than 34 inches from the walking/working surface and the mid-rail shall be approximately midway between the top rail and the walking and working surface.
- Stanchions shall be capable of resisting, without tipping over, a force of at least 16 pounds (71 N) applied horizontally against the top of the stanchion in the direction of the roof edge.
- The rope, wire, or chain shall have a minimum tensile strength of 500 pounds (2.22 kN).
- The lines shall be attached to each stanchion in such a way that pulling in one section of the line will not result in slack being taken up in adjacent sections before the stanchion tips over.

No employee shall be allowed in the area between the roof edge and the warning line unless they are protected by a guardrail, fall restraint system, or personal fall arrest system.

4.4.11. Same-level Walking and Working Surfaces

Good housekeeping is the key to the prevention of same-level falls.

Usable and waste material must be stored in designated areas out of passageways and shall not be allowed to accumulate in the work area or around worktables, desks, threading machines, etc.

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Surfaces must be kept free of slipping hazards (grease, oil, chemicals, metal shavings, ice, water, etc.).

To prevent tripping hazards:

- Floor holes and openings shall be covered and secured.
- Electrical cords, welding leads, hoses, etc. must be elevated a minimum of seven feet overhead, lie flat and clear of doorways and walkways, or be relocated to create a clear path of access/egress.
- Tools and equipment must be located clear of travel paths on all walking and working surfaces and away from leading edges and unprotected openings.
- Maintain even and smooth floor surfaces or create an adequately marked, smooth transition through use of ramps, etc.
- Ramps or transitions that are not smooth or even require warning signs.

4.5. Fall Arrest Systems

The primary function of a fall arrest system is to minimize the consequences of a fall rather than prevent its occurrence. Fall arrest systems provide complete and continuous fall arrest protection while accessing and working at elevation.

A complete fall arrest system includes the proper anchorage, body support (harness), and connecting device (lanyards/lifelines) interconnected and properly rigged to arrest a free fall.

Fall arrest systems must be installed and used in accordance with the manufacturer's recommendations and under the supervision of a Qualified Person.

4.6. Fall Arrest Equipment Requirements

4.6.1. General Requirements

Only fall arrest equipment approved for use by the Company is permitted. Approved fall arrest equipment can be found via the JNet HSE Homepage at the Jacobs/Wilson alliance link.

Any equipment that is used as part of a fall arrest system, but could also be used for other activities, such as slings, chokers, carabiners, etc., must be tagged, identified, or otherwise controlled and used only as part of a fall arrest system. This equipment must be evaluated and approved by a Qualified Person before incorporating them as part of a fall arrest system.

In hot-work operations or those involving chemicals or other factors that could cause damage, fall arrest equipment must be designed and/or protected to avoid burning or deterioration.

All components of personal arrest, i.e., harnesses, lanyards, anchorage, lifelines, and connectors must meet the manufacturer and local regulatory requirements.

Employees reaching more than 10 inches below the level of the walking/working surface on which they are working shall be protected from falling by a personal fall arrest system.

4.6.2. Anchorage

Anchorage planning is the key to designing fall arrest systems. Anchorage requirements include:

- Strength – capable of supporting 5,000 pounds (22.2 kN) per employee or twice the anticipated force and designed by a Qualified Person.
- Independence – anchorages must be independent of the work platform, guardrail system, or surfaces/structures supporting employees.
- Location – anchorages should be located overhead to minimize free fall distance. Minimum height policy for most lanyard anchorage is shoulder level, and

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overhead anchorage locations for both retractable devices and rope grab lifelines. When anchorage is below shoulder level, a Qualified Person shall determine what changes if any need to be made to the fall arrest system such as shorter lanyards, additional shock absorbing capability, etc.

- Sufficient fall clearance – calculate the total fall distance to ensure anchorage height is sufficient to prevent collision with the ground. Also, ensure lateral movement from fixed anchorage does not create a swing fall hazard.
- Identification – anchorage points should be pre-planned and clearly identified to employees.

4.6.3. Full-body Harness

Full-body harnesses must also be worn and properly anchored when employees are working from aerial lifts, scissor lifts, suspended work platforms, suspended scaffolds, and similar equipment. Refer to HSEP 15.3 for exceptions when working over water.

Full-body harnesses must fit and be worn properly with the straps tucked so as not to be caught on equipment or otherwise cause a hazard. Chest straps must be worn between the chest and collarbone and the rear D-ring being worn between the shoulder blades.

Body belts are allowed for positioning only. They are not allowed for fall arrest.

4.6.4. Snaphooks

Only self-closing, self-locking snaphooks are allowed for fall arrest use.

Snaphooks must open and close properly and be fully closed around their anchorage point.

Locking mechanisms shall be functionally checked before each use.

4.6.5. Shock Absorbers (Deceleration Devices)

Shock absorbers

- Are a required component of an overall fall arrest system and
- Minimize loads experienced by anchorage and personnel.

4.6.6. Lanyards

Always use the shortest possible lanyard length.

Lanyards shall be anchored at a location to limit the free fall distance to no more than six feet.

Lanyards must be used with a shock absorber unless the fall distance is shortened enough to limit the fall force to 1,800 pounds.

Lanyards must be maintained free of knots.

No more than one employee may be attached to the same lanyard.

Dual or “Y” lanyards may be required to achieve 100% fall arrest in some work situations.

When not in use, the lanyard must be secured in a fashion as to not cause a tripping hazard or become entangled in equipment.

Lanyards may only be choked back on onto itself if the manufacturer allows it.

Flexible steel cable lanyards shall not be used by personnel performing work on or in close proximity to electrical equipment. A non-conductive lanyard must be used.

4.6.7. Positioning Devices

Positioning devices can only be used in combination with a fall arrest system when working 6 feet or more above a walking/working surface.

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Positioning devices shall be rigged such that an employee cannot free fall more than 2 feet.

Positioning devices shall be secured to an anchorage, which is capable of at least twice the potential impact load or 3,000 lbs (13.3 kN), whichever is greater.

All snap hooks used shall be locking type and shall be properly sized to attach to the member to which they are connected.

4.6.8. Retractable Devices and Self-Retracting Lifelines

Retractable devices are designed to arrest a fall within 2 feet.

Locking mechanism must be tested before each use.

Lifeline must be pulled out and inspected for cuts, fraying, or other signs of damage.

Use taglines to make the device accessible from the ground.

Taglines must be used to prevent the uncontrolled retraction of these devices.

Retractable devices should only be attached to overhead anchorage.

Retractable devices attached to fixed anchorage must be used with the wearer at less than a 45-degree angle from the device to reduce the hazards of a swing fall.

Only retractable devices bearing current manufacturer's certification shall be used.

4.6.9. Vertical Lifelines

Vertical lifelines may only be used by one employee at a time.

Vertical lifelines should be protected from sharp, abrasive edges.

Vertical lifelines must be equipped with a formed eye termination at one end for suspension from the anchorage point and must extend below the lowest level of travel.

The lower end must be either attached to a second anchor point or weighted to provide stability and tension.

Rope grab devices must be compatible with the type and size of rope or cable used and should remain above the shoulders of the user. Only non-trailing type rope grab devices shall be used for vertical lifelines constructed of steel cable.

Manufacturers will specify maximum lanyard length for use on their vertical lifelines—usually 3 feet.

Vertical lifelines used on rope grab systems require additional clearance distance considerations that include lifeline stretch.

4.6.10. Horizontal Lifeline Systems

Horizontal lifelines shall be designed, installed, and used under the supervision of a Qualified Person, as part of a complete personal fall arrest system, which

- Maintains a safety factor of at least two, or
- Is composed of a manufactured system and installed under the supervision of a Competent Person and used in compliance with all manufacturers' requirements.

Horizontal lifeline (HLL) systems require additional clearance distance considerations that include the lifeline deflection and elongation associated with cable sag during loading and the use of an in-line energy absorber when used.

Employees must be instructed how to install and use the HLL system.

Intermediate stanchions/posts should have a hands-free pass though feature which eliminates the need to disconnect.

Lifelines should be located overhead to minimize the fall distance and to provide sufficient fall clearance distance.

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In-line energy absorbers should be considered to minimize arresting forces on anchor points.

HLL's should be properly anchored and tensioned to designers' and manufacturers' specifications.

Only permit use by the number of employees designated by the design.

Retractable devices are preferred over lanyards to minimize fall distance.

Refer also to Use of Crosby Products for Horizontal Life Lines, A Technical Data Sheet, August 2001, provided by Crosby, which is posted on JNet in the HSE section.

4.6.11. Safety Nets

Safety nets may only be used as a supplemental means of fall arrest and not independently.

Site management must approve the use of safety nets.

Only nets designed by the manufacturer as fall arrest nets (personnel nets) may be used.

Nets must be installed in accordance with all manufacturers' requirements, as close to the work level as possible and no more than 30 feet below and extend outward.

Safety nets shall extend outward from the outermost projection of the work surface as follows:

Vertical distance from working level to horizontal plane of net	Minimum required horizontal distance of outer edge of net from the edge of the working surface
Up to 5 feet	8 feet
More than 5 feet up to 10 feet	10 feet
More than 10 feet	13 feet

Nets may have maximum 6" by 6" openings and must be either certified by a Qualified Person or pass a 400 lb. drop test prior to use, whenever relocated, after repair, and every six months if left in place.

A Competent Person must inspect nets in use at least weekly for wear, damage, and deterioration and document inspections.

4.6.12. Fall Distance

A fall arrest system must not allow for more than a six-foot free fall.

The fall arrest system must be used and secured in a fashion so that the user cannot contact the next lower level should a fall occur. This requires calculating a clearance distance that includes:

- Free fall distance,
- System elongation, e.g., vertical lifeline or in-line energy absorber,
- Deceleration distance of shock absorbers,
- Employee height,
- Deflection in horizontal life line (HLL) system, and
- A minimum safety factor of 2 feet.

4.7. Rescue

Site management must ensure that personnel can be promptly rescued or self-rescue themselves, should a fall occur. The availability of rescue personnel, aerial lifts, ladders, other rescue equipment or rescue services and response time should be evaluated prior to elevated work taking place.

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4.8. Equipment Storage

Fall arrest equipment must be stored in a clean dry location away from exposure to abrasive materials, cutting tools, equipment or materials, excessive heat, direct sunlight, and chemicals.

Full-body harnesses should be hung by the D-ring for storage.

4.9. Inspections

Fall arrest equipment must be inspected by the user prior to each use.

Site management shall designate a Competent Person to conduct inspections of jobsite fall arrest equipment. Inspections must be conducted at least quarterly, although monthly inspections are preferable. Inspection results must be documented. (See Figure 3 for a sample form.)

Some types of fall arrest equipment, such as self-retracting lifelines, require periodic re-certification by the manufacturer at scheduled intervals. The Competent Person must be familiar with these requirements and have a documented re-certification performed, as required.

The Competent Person shall utilize the specific fall arrest equipment manufacturer's inspection instructions and the following information to perform inspections.

4.9.1. Inspection of Harnesses, Lanyards, and Lifelines

Inspections shall evaluate:

Harnesses	**Lanyards and Lifelines**
Stitching	Frayed/Broken Strands
Rivets	Burns
Buckles	Cuts
Buckle Tabs	Tears
"D" Rings	Snap Hooks
Rust and Abrasion	Connectors
Burns, Cuts, Tears	Corrosion

Equipment found to be defective must be immediately removed from service, tagged as defective and repaired, or destroyed and replaced.

4.9.2. Inspection Markings

Fall arrest equipment, which has been satisfactorily inspected, shall be marked and/or color-coded with vinyl tape or some other secure means to designate current inspection.

Care should be used not to cover any equipment feature/component vital to inspection or performance, such as stitching, grommets, adjusting mechanisms, labels, etc., with the tape or marking means.

4.10. Training

Fall arrest system training must include the proper use, care, and limitations of fall arrest equipment prior to being allowed to use the equipment. A Competent Person must be designated to provide instruction.

Training must, at a minimum, address the following areas.

- Company fall arrest policy
- How to evaluate fall hazards
- Fall prevention measures
- Equipment use, care, and limitations
- Proper fitting and wearing of fall arrest equipment

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- Requirements and proper use of anchor points
- Inspection

Use training modules made available through the HSE Department and manufacturer specific information.

All fall protection training must be documented. Documentation must be signed and dated by the employee and instructor and maintained in the employee's safety training record.

Retraining is required when previous training is rendered obsolete due to

- Changes in the activity/workplace,
- Changes in the fall arrest equipment/system, or
- A demonstrated improper use or misunderstanding of fall arrest systems.

5.0 REFERENCES AND RELATED DOCUMENTS

Use of Crosby Products for Horizontal Life Lines, A Technical Data Sheet, August 2001, provided by Crosby, posted on JNet in the HSE section

29 CFR 1926.500 – 503, Fall Protection

29 CFR 1910.66, Appendix C, Personal Fall Arrest Systems

ANSI Z359.1, 1992, Fall Protection in General Industry

ANSI 1264.I 2002, Safety Requirements for Workplace Floor and Wall Openings, Stairs and Railing Systems

NIOSH, Worker Deaths By Falls, NIOSH (DHHS) Publication No. 2000-116

HSEP 17.3

HSEP 17.9

HSEP 18.3

6.0 FIGURES

Minimum Requirements for Fall Prevention Systems

Fall Arrest System Checklist

Fall Arrest Equipment Inspection Report

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Figure 1

Minimum Requirements for Fall Prevention Systems

GUARDRAILS

Must be surfaced in a way to prevent punctures, lacerations, and snags.

Top Rail

- Capable of supporting 200 lbs. of force applied in an outward or downward direction with less than 3 inches deflection with no permanent deformation
- Should be 42 inches high, but can be no less than 39 inches high and no more than 45 inches high

Mid Rail

- Capable of supporting 150 lbs. of force applied in an outward or downward direction with no permanent deformation
- Maximum opening of 19 inches between rails

Wood

- At least 2” by 4” toprail and at least 1” by 6” midrail
- Vertical uprights located on 8-foot maximum centers
- Minimum 1,500 psi construction grade lumber

Pipe

- 1.5” outside diameter on 8-foot maximum centers for vertical uprights

Steel

- 2” by 2” by ⅜ ” angle iron on 8-foot maximum centers for vertical uprights

Wire Rope

- ¼ ” diameter cable stretched taunt, less than 3 inch deflection, flagged at 6 ft. intervals with high visibility materials

TOEBOARDS

- Capable of supporting 50 lbs of force applied in an outward or downward direction
- 3½ inches high, minimum

RESTRAINT LINES

- Capable of 3,000 lb. tensile load
- Capable of supporting 400 lbs or twice the employees weight, whichever is greater
- Limit travel so no edges are reachable in any direction

DESIGNATED AREAS

- Use only if low sloped area (less than or equal to 4 on 12; vertical to horizontal)
- System must be erected six feet or more from the unprotected edge
- Access path with warning lines to ladders, storage areas, etc.
  - Stanchions — Capable of 16 lbs tipping strength horizontally
  - Line/Rope — Capable of 500 lbs break or tensile strength, between 34” and 39” above the work surface, flagged at six-foot intervals with high visibility materials.

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Figure 2

Fall Arrest System Checklist

ANCHORAGE POINTS

Do workers know appropriate anchorage points for each task that requires a fall arrest or restraint system?

Has the anticipated load/force at each anchorage point been determined by a Qualified Person?

Are all anchorage points capable of supporting at least 5,000 pounds (22.2 kN) per person attached, or is the complete fall arrest system designed by a Qualified Person and rated at a safety factor of at least two (twice the anticipated load/force)?

Are all anchorage points for body harnesses and lanyards located at shoulder height and are anchorage points for self-retracting devices located overhead or have appropriate provisions been made by the Qualified Person?

Are anchorage points independent of the working platform (e.g. guardrail systems)?

If the lifeline (vertical/horizontal), lanyard, or self-retracting device is not permanently attached to an anchorage point at the elevated work area, is the first worker up or the last worker down protected while climbing?

Is there sufficient clearance below the anchorage to avoid striking an object or the ground?

HARNESSES

Are full-body harnesses issued to all employees who may be exposed to fall hazards?

Are harnesses inspected regularly for wear, abrasion, broken stitching, and missing hardware?

Have workers been instructed how to wear, use, inspect, and store harnesses?

LANYARDS

Is the lanyard length as short as necessary and in no case greater than six feet?

Does the lanyard have a shock-absorbing feature?

Has the lanyard being used in a choker hitch been designed to choke back onto itself?

Is the anchorage point at back D ring level or higher?

RETRACTABLE DEVICE

Are workers properly trained to use a retractable device?

Is the retractable device under a regular maintenance and inspection program (e.g. cable damage, expiration date, etc.)?

Is the retractable device anchored overhead?

Does the locking mechanism work?

Is the retractable device cable accessible from the ground?

HORIZONTAL LIFELINES

Has the horizontal lifeline system been designed by a Qualified Person (e.g. fall arrest supplier or engineer)?

Have the anchorage points been designed to withstand twice the anticipated load?

Has the designer of the system approved the number of workers who will be using it?

Is an energy absorber required in the horizontal lifeline to reduce the anchorage loads?

Has the appropriate fall arrest system been selected to minimize free fall and fall arrest forces?

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Does the horizontal lifeline have the required initial tension and sag?

Has the clearance distance been calculated to ensure the employee doesn't strike a lower level?

Has the location and height of the lifeline been determined (shoulder level/overhead)?

Has the rigging hardware (shackles, turnbuckles, eyebolts, Crosby clips) at the anchorage connections been sized (2:1 safety factor) and installed correctly?

Is the horizontal lifeline free from signs of wear or abrasion?

Have all employees been instructed in the proper installation and use of the horizontal lifeline system?

VERTICAL LIFELINES

Does the lifeline have a minimum breaking strength of 5,000 pounds (22.2 kN)?

Is the lifeline protected from abrasive or cutting edges?

Are weights being used at the bottom of the lifeline to tension it properly?

Is the lifeline long enough to reach the ground and to prevent a rope grab from running off it?

ROPE GRAB DEVICES

Is the rope grab compatible with the lifeline (check with the fall arrest equipment/rope supplier)?

Is the rope grab in operational condition?

Is the rope grab equipped with a locking mechanism that prevents unintentional opening of the device and subsequent disengagement from the lifeline?

Is the rope grabs "up" direction marked properly so that the equipment can be attached to the line correctly?

Is the rope grab lanyard for trailing rope grab 3 feet maximum and shock absorbing?

OTHER CONSIDERATION

Does the clearance distance measured form the anchorage point include: a) free fall distance, b) length of lanyard/device, c) elongation of shock absorber, d) height of person, e) stretch in lifeline, f) sag and deflection during fall arrest, g) 2-foot safety factor?

Have pendulum-swing fall hazards been considered?

Have safe methods to rescue fallen workers been planned?

Is all of the fall-arrest equipment free of potential damage from concrete and welding operations, chemical corrosion, or sandblasting?

Are all components of the system compatible (e.g. is the retractable device approved for use on a horizontal lifeline, correct hook on lanyard for choker hitch)?

Have employees been properly trained in the following issues?

- Manufacturer's recommendations, restrictions, instructions, and warnings
- Location of appropriate anchorage points, and attachment techniques
- Problems associated with free fall and clearance distances, and the use, inspection, and maintenance of fall arrest equipment

Does a Competent Person perform training and are training records documented?

Have employees been instructed to remove fall arrest equipment/devices from service once a fall has been arrested?

Is the worker always protected when working at elevations above six feet?

Is a plan needed for tethering tools?

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Figure 3

Fall Arrest Equipment Inspection Report

Date:_____Color Code(s) For Year/Quarter:_____

Jobsite/Location:_____

Inspected By:_____

FULL BODY HARNESSES

Number Inspected:_____Number Pass:_____Number Failed:_____

LANYARDS

Number Inspected:_____Number Pass:_____Number Failed:_____

FALL ARREST COMPONENTS & HARDWARE: Anchorage Connectors, Caribiners, Slings, and Chokers

Type:_____No. Inspected:_____No. Pass:_____No. Failed:_____

Type:_____No. Inspected:_____No. Pass:_____No. Failed:_____

Type:_____No. Inspected:_____No. Pass:_____No. Failed:_____

PORTABLE FALL ARREST SYSTEMS: Retractables, Vertical Rope or Cable Grabs, and Horizontal Rope or Cable Lifelines

Type:_____No. Inspected:_____No. Pass:_____No. Failed:_____

Type:_____No. Inspected:_____No. Pass:_____No. Failed:_____

Type:_____No. Inspected:_____No. Pass:_____No. Failed:_____

FIXED FALL ARREST SYSTEMS: Fixed Cable, Rail, or Trolley Systems

System Identification:_____Pass:____Fail:____

System Identification:_____Pass:____Fail:____

System Identification:_____Pass:____Fail:____

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1.0 PURPOSE AND SCOPE

Jacobs employees and subcontractor employees shall be provided protection from occupational exposure where a potential hazard to dusts, fumes, mists, radionuclides, gases, vapors, biological airborne contaminants, or oxygen deficiency exists.

This Health, Safety, and Environment Procedure (HSEP) provides a strategy to be followed when respiratory hazards are encountered to protect our worker's health Details of site-specific program requirements are presented in the attachment to this procedure, HSEP 13.9f1.

Note that prior to the development of a site-specific respiratory program, a project health hazard evaluation (see HSEP 12.1) must be performed.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

2.1. Program Administrator

A Program Administrator shall be appointed for each Jacobs business region by the respective regional Senior HSE Manager.

Program Administrators must have specific training and experience in all aspects of respiratory program management. They are responsible for the administration of the Regional Respiratory Protection Programs and evaluation of the effectiveness of each site program.

2.2. HSE Manager

The HSE Manager shall collaborate with the Industrial Hygiene Manager and other personnel, as appropriate, to develop the site-specific Respiratory Protection Program and revise as needed.

2.3. Industrial Hygiene Manager

The Industrial Hygiene Manager, when requested for collaboration, will provide technical support in the development and evaluation of site-specific Respiratory Protection Programs.

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3.0 DEFINITIONS

Definitions related to the Respiratory Protection Program appear in HSEP 13.9f1, the model for a Site-specific Respiratory Protection Program.

4.0 PROCEDURE

4.1. Site-specific Respiratory Protection Program

A Site-specific Respiratory Protection Program shall be developed for each site at which respiratory protection is used by employees of the Company. Contractors, whose employees use respiratory protection, shall also develop and implement a Site-specific Respiratory Protection Program or agree in writing to follow the company program.

HSEP 13.9f1 shall be used as a template for preparation of a written Site-specific Respiratory Protection Program. This model program satisfies Federal OSHA's requirements for US operations. The site Health Hazard Evaluation (see HSEP 12.1) shall be used as input in the development of this program.

Client respiratory protection programs may be adopted if determined by the Program Administrator to meet the requirements of this Program. In such cases, program documentation must be created to clearly identify the client's program as the Company's site-specific written Respiratory Protection Program.

The Program Administrator shall review and approve the Site-specific Respiratory Protection Program.

4.2. Program Administration

The Program Administrator is responsible for the administration of the program and evaluation of the Program's effectiveness.

Site HSE Supervisors assist the Program Administrator with program management and with routine observations to verify program effectiveness.

4.3. Program Components

Respiratory Protection Program components include:

- Program administration,
- Medical evaluations of employees required to use respirators,
- Procedures for selecting respirators for use in the workplace,
- Fit testing procedures for tight-fitting respirators,
- Training of employees in the respiratory hazards to which they are potentially exposed during routine and emergency situations,
- Procedures for proper use of respirators in routine and reasonable foreseeable emergency situations,
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding and otherwise maintaining respirators,
- Procedures to verify adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators,
- Procedures for regularly evaluating the effectiveness of the program, and
- Means of documenting compliance with the program.

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4.4. Periodic Program Review

The written Site-specific Respiratory Protection Program shall be reviewed and updated at least annually or when there is a change in scope of work that potentially impacts worker exposure. (See HSEP 12.1, Health Hazard Evaluation.)

4.5. Program Effectiveness Evaluation

Program effectiveness observations should be documented through the use of Form A-5, Respiratory Protection Program Checklist, found in the Site-specific Respiratory Protection Site-specific Respiratory Protection Program.

Observation frequency shall be determined by the complexity of the site's Respiratory Protection Program.

Safety Observation Reports (SORs) and Safety Evaluation Reports (SERs) can also be used to document Program effectiveness.

The Site HSE Manager shall ensure that noted deficiencies are corrected as soon as possible.

5.0 REFERENCES AND RELATED DOCUMENTS

29 CFR 1910.134, Respiratory Protection

29 CFR 1926.103, Respiratory Protection

ANSI Z-88 1992, Respiratory Protection

HSEP 12.1, Health Hazard Evaluation

HSEP 13.9f1, Site-specific Respiratory Protection Program

HSET 13.9, Jacobs Respiratory Protection Training Program

NIOSH 42 CFR 84 and 30 CFR 11, Certified Respiratory Equipment

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Emergency Evacuation		Supersedes: CHSP 14.1	Rev. 2
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1.0 PURPOSE AND SCOPE

Written emergency evacuation procedures must be developed and communicated to ensure designated actions are taken by the Company and employees to ensure safety from fire and other emergencies.

This Health, Safety, and Environment Procedure (HSEP) provides the minimum procedures for each project or workplace to prepare an Emergency Evacuation Procedure to cope with emergencies (fire, explosion, toxic fumes, bomb threat, natural disasters, etc.) which could endanger personnel or property. Specifics as to signals, communications, evacuation routes, and assembly points must be developed locally, publicized, and coordinated with the operating departments.

This HSEP applies to all employees and on-site contractors working in all locations; administrative, construction, maintenance, or otherwise, and that they understand Emergency Evacuation Procedures which are specific to their work environment.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

3.1. Emergency Action Plan

A plan for workplace, or parts thereof, describing what procedures the Company and employees must take to ensure employee safety from fire or other emergencies.

3.2. Evacuation Route

The route that employees are directed to follow in the event they are required to evacuate the workplace or seek a designated assembly point (refuge area).

4.0 PROCEDURE

4.1. Organizing Emergency Evacuation Procedure

Use the attached form (Figure 1) to help organize your emergency evacuation procedure.

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The following items must be included in all emergency evacuation plans:

4.1.1. Signals and Alarms

- Type and frequency
- Action to take for each type
- Times, days alarms tested
- How to turn in an alarm

4.1.2. Evacuation routes

- Use of wind sock to determine routes
- Identify paths for existing operating areas
- Identify paths for existing construction areas
- Identify paths for existing office buildings

4.1.3. Assembly points

- Designate points for each area and/or each alarm type
- Assign one person to each assembly point to take "head count"
- Set up communications between each

Using these guidelines and the suggested Emergency Evacuation Procedure Form (Figure 1) should allow an efficient emergency plan. Contact the HSEP Department for any additional assistance required.

4.2. Training

Documented training on jobsite/workplace emergency evacuation plans must be given to all personnel on-site.

Initially, upon initial assignment of employees, when the plan is changed or when employees receive new emergency response duties.

Training shall be repeated periodically, as deemed appropriate by Site Management to ensure proper employee actions in an emergency.

5.0 FIGURES

Emergency/Evacuation Procedure

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Figure 1

Emergency/Evacuation Procedure

Job No.:_____ Location:_____

Coordinator:_____ Back-up:_____

EVACUATION ALARMS

TYPE	FOR AREA

"All Clear Signal":_____

Tested on:_____(day) _____(time)

ASSEMBLY POINTS	FOR AREA
1.	
2.	
3.	
4.	
5.	
6.	

Evacuation route maps on back (numbered to correspond to assembly points).

General Considerations:

1. This evacuation procedure must be widely publicized and posted throughout the project.
2. All personnel must know exactly what action to take in the event alarms sound other than on the test times.
3. One person must be assigned to each "assembly point" to make a "head count".
4. A monitor should gather all lists from assembly points and report to the Evacuation Coordinator.
5. No effort should be made to re-enter evacuated areas to locate missing persons until the "all clear" is sounded.
6. No person should leave the property unless told to by responsible authorities.

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Earthquake		Supersedes: CHSP 14.2	Rev.
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1.0 PURPOSE AND SCOPE

This Health, Safety, and Environment Procedure (HSEP) provides the minimum procedures to be followed in the event of an earthquake.

This HSEP applies to all employees and on-site contractors in identified work locations with operations covered by the Jacobs HSEP Program.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

3.0 DEFINITIONS

None

4.0 PROCEDURE

4.1. Basic Procedures to Follow During an Earthquake

Stay calm.

If you are inside a building, stand in a doorway or crouch under a desk or table and stay away from windows or glass partitions.

If you are outside, stand away from buildings, structures, trees, telephone and electric lines or poles.

If you are on the road, drive away from overpasses, underpasses, bridges, and tunnels. Stop in a safe area and stay in your vehicle.

4.2. Basic Procedures to Follow After an Earthquake

Check for injuries and provide first aid.

Check for safety problems in and around the area where you are located, i.e., gas, water and sewage line breaks, downed electric lines and breaks in electrical lines and breaks in electrical

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lines, building damage such as cracks in the walls, chimneys, foundations and prepare for aftershocks.

Contain all dangerous spills for cleanup.

Turn on the radio and listen for instructions from public safety.

Avoid using the telephone except for emergency purposes.

4.3. Earthquake Survival Equipment and Supplies

Portable radio with extra batteries

Flashlight with extra batteries

First aid kit with first aid book

Tools for turning off gas and water

Smoke detectors properly installed

Fire extinguishers

Bottled water

Canned and dried foods sufficient for a week supply per person

Portable stove such as butane (use only after determining there are no gas leaks)

Candles

Matches

Emergency telephone numbers (police, fire, doctor)

4.4. Inspection and Storage

Site Management, along with Corporate HSEP shall determine on a site basis the inspection and storage requirements for earthquake survival equipment and supplies.

4.5. Training

All personnel who work/reside in locations where the potential for exposure to earthquakes exist shall be properly trained in accordance with this HSEP.

Site Management, along with the Corporate HSEP shall determine on a site basis when training on this HSEP is appropriate.

5.0 REFERENCES

None

6.0 FIGURES

None

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HSE Procedure		Document No: HSEP 14.3	Page: 1 of 4
Hurricanes and Typhoons		Supersedes: CHSP 14.3	Rev. 2
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1.0 PURPOSE AND SCOPE

This Health, Safety, and Environment Procedure (HSEP) provides the minimum procedures to be followed when there is a threat of a hurricane or typhoon.

This HSEP applies to all employees and on-site contractors engaged in operations covered by the Jacobs HSEP Program.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

The Site/Project Manager or his designee (normally the Assistant Site/Project Manager) will coordinate with various Department Supervisors, who will execute the alert procedures in their assigned areas. This information, as to the approach and progress of the hurricane, will come from the Site/Project Manager, their assistant, or Corporate HSEP.

3.0 DEFINITIONS

Hurricane	A violent storm originating over tropical waters with winds near its center reaching 74 miles per hour (64 knots and higher). In the Northern Hemisphere, winds in hurricanes blow in a counterclockwise direction around its center and the size of the storm may range from 50 to 1000 miles in diameter. Not all hurricanes are alike. This creates over-confidence if you've been through a minimal hurricane and encounter a massive one.
Hurricane Center or Eye	The eye is the relatively calm area near the center of the storm. In this area, winds are often light and the sky may be only partly covered by clouds. Frequently the storm appears to have passed, then resumes as the eye passes over you.
Hurricane Force Winds	Hurricane force winds are winds of 74 miles per hour (64 knots) or higher.

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Hurricane Watch	A hurricane watch is an announcement issued by the US Weather Bureau to the public and all other interests via press, radio, and television broadcasts whenever a tropical storm or hurricane becomes a threat to a coastal area. The “Hurricane Watch” announcement is not a warning. It indicates that the hurricane is near enough that everyone in the area covered by the “watch” should listen for subsequent advisories and be ready to take precautionary action in case hurricane warnings are issued.
Gale Warning	When winds of 38 – 55 miles per hour (33 – 48 knots) are expected, a gale warning is added to the advisory message. By the time gales reach shore, all work must be complete or cease. Forty mph is the limiting condition for outside work and then only with difficulty.
Storm Warning	When winds of 55 – 74 miles per hour (48 – 64 knots) are expected, a storm warning is added to the advisory message. Gale and storm warnings indicate the coastal area to be affected by the warning, the time during which the warning will apply and the expected intensity of the disturbance. When gale or storm warnings are part of a tropical cyclone advisory, they may change to a hurricane warning if the storm continues along the coast.
Hurricane Warning	When hurricane conditions are expected within 24 hours, a hurricane warning is added to the advisory. Hurricane warnings identify coastal areas where winds of at least 74 miles per hour are expected to occur. A warning may also describe areas where dangerously high water or exceptionally high waves are forecast, even though winds may be less than hurricane force. When a hurricane warning is issued, all precautions should be taken immediately. Hurricane warnings are seldom issued more than 24 hours in advance. If the hurricane’s path is unusual or erratic, the warnings may be issued only a few hours before the beginning of hurricane conditions. Precautionary actions should begin as a hurricane warning is announced. NOTE: Water is forced ashore with a “storm surge” if the eye passes to the west of you. Conversely, tides fall if the eye moves over land to the east of your location. In the latter case, anticipate winds from the west, then from the north, then from the west.

4.0 PROCEDURE

In the event of a hurricane threat, a three-part alert procedure will be taken. The alert will be issued by the Site/Project Manager. The procedures listed in the following sections address hurricane threats. The same procedures shall apply to threats of typhoons.

4.1. Alert I – Condition Yellow

This alert will be issued when a hurricane is in the Gulf of Mexico. Action taken during the alert will consist of a job cleanup activity so that material policed up will not have to be returned to the field in the event the storm alert is removed. In general, this alert is to identify locations for securing objects, materials, etc., trash and loose materials cleanup, and a notice for supervisors to review the hurricane procedure.

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All departments will:

- Pick up all loose trash and unused material in all areas,
- Remove any unused scaffolding in all areas,
- Check all buildings for proper tie-down,
- Check and assist subcontractors in cleanup and tie-down, and
- Determine job shipping schedule for construction dock.

4.2. Alert II – Condition Orange

Steady movement of hurricane toward project. In general, action taken during this alert consists of securing equipment and materials which cannot be practically moved. This procedure will be terminated at any point if it appears that the project is no longer under threat by storm.

- Fill all gasoline and diesel tanks.
- Fill and/or secure all storage tanks.
- Locate and retain portable generating equipment.
- Secure all pumps and hoses. Make preparation for water removal.
- Review work and make arrangements for removal of equipment and materials from all areas.

4.3. Alert III – Condition Red

- Recheck anchors on all temporary buildings. Make a complete check to include subcontractors.
- Make final cleanup of construction and in plant areas.
- All trash barrels and portable toilets are to be grouped together and secured to stable objects.
- Water cans full of potable water are to be placed inside the warehouse.
- Welding machines, air compressors, etc., are to be grouped together and secured to stable objects. All leads, hoses, and torches are to be rolled up and secured. Welding machines placed on trailers are to be secured together and trailers anchored.
- All scaffolding is to be taken to the scaffold storage area and secured from movement. Group, secure and anchor down.
- Wooden pallets, forms, and wooden decks are to be secured and anchored.
- Trailers, floats, etc., are to be grouped at dispatch and secured from movement.
- All booms are to be lowered to a safe position.
- All light equipment is to be lined up with brakes set.
- Earthmoving equipment is to be left on high ground or in shops, along with pickups, flatbeds, buses, and all are to be secured with brakes set.
- All paint hoppers are to be tied down.
- All mats are to be tied together and anchored.
- All piling is to be grouped and secured against movement.
- All gang boxes grouped in areas are to be secured and anchored.
- Anchor all tanks, drums, and vessels that may be moved by high winds and water.
- Check that all underground piping is protected against floatation.

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- Where possible, construction drawings and records should be protected from water damage in case of roof or window damage or rising water by raising to desk top height.
- All vital records, payroll, cash payment journal, etc., will be secured in a safe place to avoid wind and water damage.
- Onsite vehicles are to be left with brakes set on high ground in the shop area.
- Ice house is to be secured with a full supply of ice on hand.
- Turn off all electrical power at main switches.
- Evacuate jobsite.
- Security coverage will be as directed by the Site/Project Manager.
- Notify Company/Operations Management when final stages are complete.

5.0 REFERENCES

None

6.0 FIGURES

None

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Remote Site Emergency Preparedness		Supersedes: CHSP 14.4	Rev. 2
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1.0 PURPOSE AND SCOPE

This Health, Safety, and Environment Procedure (HSEP) describes the process for identifying and controlling remote site location hazards. Project-specific remote site location hazards should be addressed in the site-specific health and safety plan (HSP),

Remote sites shall include the following:

- Locations where adequate emergency medical response capabilities are more than 30 minutes away, and
- Locations where the nearest available emergency response capabilities are not adequate.

This procedure applies to all employees covered by the HSEP Program, including all field operations involving potential exposures to hazardous substances at

- Uncontrolled hazardous waste sites,
- RCRA facilities,
- Locations where adequate emergency medical response capabilities are more than 30 minutes away, and
- Locations where the nearest available emergency response capabilities are not adequate.

2.0 RESPONSIBILITIES

Specific HSE Program implementation responsibilities are stated in HSEP 1.5. Additional management, staff, employee, and subcontractor responsibilities are stated in individual procedures that address responsibilities specific to the HSE topic.

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3.0 DEFINITIONS

HSM	Health, Safety, and Environment Manager
HSEP	Health, Safety, and Environment Procedure
EMT	Certified Emergency Medical Technician
ERP	Emergency Response Plan
HSM	Project Health and Safety Officer
HSO	Site Health and Safety Officer
HSP	Health, Safety, and Environment Plan
LPN	Licensed Practical Nurse
PjM	Project Manager
RN	Registered Nurse
SM	Site Manager

4.0 PROCEDURE

4.1. General Requirements

The site-specific ERP must specify control measures for all tasks that potentially involve significant acute injury or illness.

A site Emergency Response Plan (ERP), as part of the site-specific HSP, must be prepared, reviewed, and approved prior to initiation of field activities.

The Emergency Response Plan must incorporate the following elements.

- Pre-emergency planning,
- Personnel roles, lines of authority, and communication,
- Emergency recognition and prevention,
- Safe distances and places of refuge,
- Site security and control,
- Evacuation routes and procedures,
- Emergency decontamination procedures,
- Emergency medical treatment and first-aid,
- Emergency alerting and response procedures, and
- Procedures for critique of response and follow-up.

Refer to Attachment 1 for a checklist of ERP requirements. The Project Manager is responsible for ensuring that all requirements are met.

4.2. Emergency Medical and First-Aid Requirements

- Identify chemical, physical, biological, and radiological hazards associated with each task in the scope of work.
- Identify and evaluate emergency response capabilities of the nearest medical care facility.
- Evaluate medical care capabilities for each hazard specified.

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- For remote sites requiring a first-aid station or infirmary, the type of facilities and equipment shall be determined by the proximity and quality of available medical services, size of work force and shall be in accordance with the recommendation of a licensed physician.
- Prior to the start of work, arrangements shall be made for medical facilities and personnel to provide prompt attention to the injured and for consultation on occupational safety and health matters.
- An RN, a certified EMT, or an LPN, if the LPN is approved by a licensed physician, shall be assigned on a full-time basis to each installation requiring an infirmary.
- At least two persons at each project site must have standard first-aid and CPR training.
- First-aid kits on each project site must be adequate for hazards associated with each task in the scope of work. First-aid kits shall be 16-unit kits and shall comply with ANSI Z308-1, constructed of a weatherproof container and each item maintained sterile.
- Solicit and incorporate input from field supervision and site health, safety, and environment specialists for the Safe Plan of Action. Verify that all tasks associated with the scope of work have been identified and that the task's hazards and the controls associated with each task are identified and listed.
- When a new task is added to the scope of work, emergency medical care availability for hazards associated with that task must be evaluated. The HSEP and ERP must be modified to address the new task.
- Communication and transportation to effectively care for injured workers shall be arranged prior to beginning field activities.
- Telephone numbers of physicians, hospitals, emergency response facilities, and ambulances shall be posted and made available for all site personnel.
- First-aid attendants must hold current certification, which shall comply with corporate health, safety and environment policies and procedures, in first aid training from the American Red Cross or equivalent training that can be verified by documentary evidence.

4.3. Effectiveness of Emergency Response Plan

The HSO and SM shall perform inspections, at a minimum, on a weekly basis in order to verify the effectiveness of the ERP.

The HSM, HSM, or designee shall perform inspections on a periodic basis.

Where the requirements of the ERP are not adequate to protect the health, safety, and environment of employees, the public, and the environment, the ERP must be modified to incorporate adequate HSEP measures.

4.4. ERP Use and Availability

Copies of the ERP shall be located with the Site Health, Safety, and Environment Officer, HSEP Manager, Site Manager, and each field crew. A record copy of the ERP must be maintained in the project files.

Current copies of all emergency evacuation agreements and medical facility evaluations must be maintained at the project site.

The SM will assess onsite personnel familiarity with the requirements of the ERP. All field team members must sign that they have read, understood, and agree to comply with the plan. The employee certification page and the HSEP plan review form are to be filed with the copy of the plan in the project files.

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4.5. Emergency Response Program for Subcontractors

Subcontractors may choose to prepare their own ERP. Subcontractor ERPs should not conflict with the Jacobs ERP. Conflicts between ERPs must be resolved before field work begins.

4.6. Emergency Evacuation From a Remote Site

If the injury is severe enough to require removal of the employee for medical treatment, a radio dispatch will be sent to the nearest medical emergency response facility.

The EMT, if one has been assigned to the site, will determine the most appropriate evacuation method. Options include the following:

- Victim will be transported to the nearest primary care facility via fixed wing aircraft, helicopter or boat,
- EMT will be transported to the site,
- Victim will be transported to the nearest facility with EMT support,
- Dispatch dedicated helicopter with advanced cardiac life-support system medic to patient,
- Request help from United States Coast Guard, and
- Request help from medivac facilities at the nearest emergency facility or hospital.

4.7. Physical Qualifications of Employees

All persons shall be physically, medically, and emotionally qualified for performing the duties to which they are assigned. Some factors to be considered in making work assignments in remote locations are:

- Strength
- Endurance
- Agility
- Coordination
- Visual and hearing acuity

At no time while on duty may employees use or be under the influence of alcohol, narcotics, intoxicants, or similar mind-altering substances. (Refer to corporate policies and procedures on drug/alcohol control)

Operators of any equipment or vehicle shall be able to read and understand the sign, signals, and operating instructions in use.

Operators of equipment and motor vehicles, while on duty, shall not operate equipment or vehicles for a continuous period of more than 10 hours in any 24-hour period without at least 8 consecutive hours of rest.

4.8. Sanitation

Drinking Water

- Drinking water shall be supplied from sources approved by Federal, State, or local health authorities. Specific guidelines regarding chemical treatment of drinking water in remote locations should also be in accordance with Federal Safe Drinking Water Standards and State or local health authorities.
- Only approved potable water systems shall be sued for the distribution of drinking water.
- Drinking water shall be dispensed by means which prevent contamination between the consumer and source. Use of a common cup is prohibited.

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- Potable drinking water dispensers shall be designed, constructed, and serviced to ensure sanitary conditions and shall be capable of being closed. Containers shall be clearly marked as to their contents and shall not be used for other purposes. Water shall not be dipped from containers.

Toilets

- When sanitary facilities are not available, provisions for cleaning, servicing, and disposing of the sewage shall be in accordance with Federal, State, and local health regulations.

5.0 REFERENCES

U.S. Army Corps of Engineers, Safety and Health Requirements Manual, EM 385-2-1, October 1992.

U.S. Department of Energy, EM Limited Technical Standard: SAFT-0025, Health and Safety Plan Guidelines, February 1994.

U.S. Environmental Protection Agency, Standard Operating Safety Guides, November 1984.

29 CFR 1910.120 and 29 CFR 1926.65, Hazardous waste operations and emergency response.

29 CFR 1910.1200, Hazard communication.

6.0 FIGURES

Remote Site Emergency Response Plan Requirements

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Figure 1

Remote Site Emergency Response Plan Requirements

- [ ] Identify all tasks involved in project.
- [ ] Perform physical review of site.
- [ ] Identify and evaluate emergency response capabilities of nearest medical care facility.
- [ ] Identify emergency communication methods and contact numbers, e. g. radio, telephone, etc.
- [ ] Identify emergency evacuation methods, identify a primary and an alternative method. Make advanced arrangements for emergency evacuation, e. g. establish contracts, etc.
- [ ] Complete the ERP, assuring that the following topics are addressed:
  - [ ] Pre-emergency planning and coordination with outside parties
  - [ ] Personnel roles, lines of authority, training, and communication
  - [ ] Emergency recognition and prevention
  - [ ] Safe distances and places of refuge
  - [ ] Site security and control
  - [ ] Evacuation routes and procedures
  - [ ] Emergency decontamination
  - [ ] Emergency alerting and response procedures
  - [ ] Critique of response and follow-up
  - [ ] PPE and emergency equipment
- [ ] Obtain Emergency Response Plan approval.
- [ ] Distribute Emergency Response Plan.
- [ ] Provide ERP training during site orientation.
- [ ] Audit ERP effectiveness.

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HSE Procedure		Document No: HSEP 15.1	Page: 1 of 12
Lockout and Tagout		Supersedes: CHSP 15.1	Rev. 1
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1.0 PURPOSE AND SCOPE

The purpose of this Corporate Health, Safety, and Environment Procedure (HSEP) is to establish minimum procedures to ensure the safety and health of personnel who may work on any type of equipment capable of being energized or storing energy.

This HSEP applies to all employees and subcontractors, who may be required to work on this type of equipment or otherwise be exposed to the unexpected energization of this equipment.

2.0 RESPONSIBILITIES

General responsibilities for HSE procedures implementation are stated in HSEP 1.5. Additional responsibilities specific to this HSEP include the following.

2.1. Site Manager

The Site Manager shall verify that all requirements specified in this work instruction have been met prior to authorizing a supervisor to remove an authorized person's lockout device.

The Site Manager shall assure that annual and post-incident reviews, as defined below, have been performed.

The Site Manager shall maintain a spare or multiple spare keys for locks used in the lockout program in a safe, secure manner.

2.2. Site Supervision

It is the responsibility of each person, who supervises employees that perform work covered by this procedure, to:

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- Train employees in the recognition of hazardous energy sources and the method and means of isolating such sources.
- Monitor the work to verify compliance with this procedure.
- Ensure that adequate supplies of energy isolating devices and lockout devices, i.e., locks, tags, etc., are readily available.
- Confirm that each job is properly prepared by Operations and/or client personnel prior to implementing lockout and tagout procedures.
- Determine the best lockout method (individual or group) for each lockout and tagout operation.
- Supervise all group lockout activities.

3.0 DEFINITIONS

Affected Employee	A person whose job requires him/her to operate or use machines, equipment, or process on which service is being performed under the lockout and tagout program, or whose job requires him/her to work in an area where such service is performed.
Authorized Employee	A person who is authorized to lock out and tag out machines, equipment, or process in order to perform service or maintenance work on that machine, equipment, or process.
Electrical Plug and Connector Lockout Box	A box specifically designed to lock out electrical plug assemblies or, in the case of engine driven equipment, its battery cables.
Energy Sources	Electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other source.
Energy Isolation Device	A mechanical device that provides a positive means of control to prevent the transmission or release of energy. Examples of these devices include circuit breakers, disconnects, pins, blinds, blanks, valves, blocks, and double block and bleed. They do not include secondary controls such as start buttons or controls that regulate valves.
Group Lockbox	A box or similar device provided for the placement and safekeeping of keys used to secure energy isolation devices in a group lockout. Group lockboxes are generally clearly labeled as to their purpose, are tamper proof and are capable of being locked by one lockout lock or a multiple gang attachment.
Group Lockout	A procedure which provides a level of protection equivalent to that provided by a personal lockout or tagout device, when servicing and/or maintenance is performed by a crew, department, or other group.
Lockout	The placement of a lockout device—usually a lock—on an energy isolation device to ensure that the energy isolating device and the equipment being controlled may not be operated until the lockout device is removed.
Lockout Device	A device used to secure an energy isolation device in a particular position (valve handle covers, switch covers, or circuit breaker devices) in such a way that the position of the energy isolation device cannot be changed without the removal of the lock out device.
Point(s) of Protection	Point or place where a lockout device has been placed on an energy isolation device to protect employees from the hazardous release of energy.

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Specific Energy Control Procedure	A written procedure that details specific actions to be taken to control hazardous energy during servicing or maintenance. A specific lockout written procedure, a Safe Plan of Action or job safety analysis specific to the machine, equipment, or process being worked on are examples of acceptable specific energy control procedures.
Tagout	The placement of a tagout device—usually a tag—on an energy isolation device to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.
Verification	Verification (try-out) of machines, equipment, or processes to assure that energy sources have been isolated.

4.0 PROCEDURE

4.1. Specific Energy Control Procedure

Specific Energy Control Procedures must be developed in writing for each operation covered under the purpose and scope of this HSEP. These specific Energy Control Procedures must contain the following steps:

4.1.1. Step 1 — Preparing To Shut Down The Machine, Equipment, Or Process

Examples of Step 1 issues to be addressed follow.

- Identify all sources of energy and potential for stored and residual energy.
- Identify methods that will be used to isolate and lockout these energy sources.
- How will Operations or the client prepare the machine, equipment, or process for shutdown and servicing? Do process lines, pumps, or other equipment need to be drained and flushed to eliminate a chemical exposure?
- How will the affected persons be notified of the impending shut down of the machine, equipment, or process?
- How will the machine, equipment, or process be shut down?
- How will stored and/or residual energy be relieved, cooled, blocked, or isolated?
- How will all sources of energy to the machine, equipment, or process be isolated, locked, and tagged out?
- Identify the proper type and placement for locks, tags, and lockout devices at all points of protection where an energy isolation device is used.
- Determine if and where temporary blocking or supports will be needed and how to lock them in place.
- Will the individual or group lockout method be used for the lockout and/or tagout?

All of this information shall be placed in a written procedure specific to the operation, and this information will be conveyed to the personnel, who will perform the servicing and/or maintenance of the equipment.

4.1.2. Step 2 — Shutting Down The Machine and/or Equipment

Examples of issues to be addressed and actions to be taken include the following.

- Prior to shutting down the process and/or equipment, verify that the client is aware of and approves of the deactivation of the machine, equipment, or process. Obtain permits.
- Notify all affected persons that the machine, equipment, or process will be shut down and shall not be reactivated until further notice.

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- Shut down the machine, equipment, or process in accordance with the written plan.

4.1.3. Step 3 — Isolating The Machine, Equipment, Or Process From The Energy Sources

Examples of issues to be addressed and actions to be taken in this phase are the isolation of all electrical, mechanical, pneumatic, chemical, thermal, or other energy sources by the application of appropriate energy isolation devices, lockout devices, locks, and tags.

4.1.4. Step 4 — Applying The Lockout And Tagout Devices

Examples of issues to be addressed and actions to be taken in this phase follow.

- If using the individual lockout method, verify that all authorized persons place a lock and tag on each energy source.
- If using the group lockout method, the supervisor must place a lock and tag on each energy source, verify that the key for each lock is placed in the group lock box, and that the group lock box is secured by placing their lock and tag on the lock box. Then each individual involved with the locked out equipment shall apply a lock on the group lock box, including subcontractors.

4.1.5. Step 5 — Safely Releasing All Potentially Hazardous Stored Or Residual Energy

Examples of issues to be addressed and actions to be taken in this phase are:

- Placing temporary energy isolating devices or supports, as needed. The energy isolating devices shall be locked in place and clearly identify as to their purpose.
- Safely releasing any stored or residual electrical energy by a qualified electrician.
- Safely releasing any stored or residual hydraulic or pneumatic energy by removing and/or bleeding lines and equipment or utilizing another, equivalent safe method.
- Safely releasing any stored or residual thermal or chemical energy by draining and flushing lines, pumps, or other equipment that may contain chemicals, steam, hot water, etc.
- Safely releasing any mechanical energy by allowing the equipment to cycle, or other safe means.

4.1.6. Step 6 — Verifying (Trying Out) The Isolation Of The Machine, Equipment, or Process

Before starting the maintenance or servicing of the machine, equipment, or process, proper isolation must be verified. Examples of issues to be addressed and actions to be taken in this phase follow.

- A qualified electrician shall test all electrical conductors with an approved meter. The meter shall be tested on a known source, the locked out equipment is then tested, and afterwards the meter is tested on the known source again.
- Attempt to restart the equipment by pushing the start button, manual controls, etc., to verify that the machine, equipment, or process cannot be inadvertently started during servicing.
- If the machine, equipment, process, or a component thereof does start during the verification phase, stop the process and notify the supervisor. Additional steps shall be taken to identify, isolate, lockout, and tagout the energy source. If necessary, the Specific Energy Control Procedure shall be revised before work resumption.

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4.2. Energy Isolation

4.2.1. General Requirements

No attempt shall be made to operate equipment on which a lockout device has been placed.

No one shall remove another person's lockout device, except as described in 4.2.4.

Lockout devices must be inspected before each use to ensure they are working properly.

Locks for energy source isolation must have a means of identification that distinguishes them from any other locking device on the project. A particular color, shape, or size may be used as the means of identification. Locks should also be numbered.

A local HSE professional must approve lockout devices.

Lockout devices shall not be used for any other purpose other than to lockout equipment.

When a machine, equipment, or process must be isolated and locked out for a long period of time, periodic inspections should be performed to verify that locks and tags are still in place. The frequency of these inspections will vary depending upon the circumstances, e.g., inspect prior to each shift for an active operation or weekly for an inactive operation.

4.2.2. Locks

Locks used for isolating an energy source, shall not be used for any other purpose.

Locks used as part of an energy isolation device must be individually keyed. While in use, the key shall remain in the possession of the individual who placed the lock(s) or in the group lock box.

Spare keys for locks must be placed in a lock box in the possession of the Site Manager.

A Lockout Log (Figure 3) should be used to identify the location of locks while in use.

Locks must be durable and able to withstand the environment to which they are exposed.

4.2.3. Tags

Tags used in conjunction with lockout devices for the purpose of isolating an energy source shall be standardized in such a way as to serve as a prominent warning, e.g., DANGER — DO NOT OPERATE.

The tag must have spaces available for date, identification of energy source, and name of the individual placing the tag.

The construction, markings, and written information on the tag shall be such that deterioration will not occur when exposed to weather and/or corrosive environments.

Tags and tag attachment devices should not be re-used and are to be appropriately disposed after removal.

The means of attachment shall be

- Of a non-reusable type,
- Attachable by hand,
- Self-locking and non-releasable with a strength to withstand at least 50 pounds of pull, and
- Resistant to weather and corrosive environments.

4.2.4. Removal of Locks and Tags

Only the person who applied the lock and/or tag shall remove that lock and/or tag except as provided in this section.

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In cases where the person who applied the lock and/or tag is not available to remove it, the Site Manager may authorize the supervisor to remove the lock and/or tag only in accordance with the following procedure. This procedure should be used only as a last resort to remove a lockout.

- Step 1 – Verification that the person who applied the lock and/or tag is not present at the facility.
- Step 2 – Make all reasonable efforts to contact the person, who applied the lock and/or tag to inform him/her that the lock and/or tag will be removed.
- Step 3 – The supervisor must verify that the equipment that was locked out is safe to return to service. All personnel involved in the lock out are clear and no damage will occur when the equipment is restarted.
- Step 4 – The supervisor must document how all previous steps have been met. Documentation should be kept on file at the site.

  Once this has been done, the lock may be removed, but step five shall also be completed.
- Step 5 – Ensure that the person who applied the lock and/or tag is notified of the removal before he/she resumes work at the facility.

4.2.5 Tasks Involving Multiple Shifts

For tasks requiring lockout and/or tagout, which involve multiple shifts, the supervisor must ensure the continuity of the lockout and/or tagout as follows:

- The off going supervisor will remove his/her lock and tag only after the incoming supervisor has placed his lock and tag on the lock box.
- The incoming supervisor will ensure that the incoming craft workers verify isolation and place their locks and tags on the lock box.

4.3. Energy Isolation Methods

There are three methods of energy isolation: individual lockout, group lockout, and tagout only.

The method to be used in each situation will depend on

- The complexity of the system,
- The number of persons who will place locks,
- The number of locks to be placed to effectively lock out the machine, equipment, or process, and
- Whether or not the system is designed to accept a lock.

The supervisor shall determine which method is appropriate for each situation and will identify the method in Step 1 of the Specific Energy Control Procedures.

4.3.1. Individual Lockout Method

The individual lockout method is normally used when the number of persons and locks that will be required on energy isolation devices is small.

When using the individual lockout method, each person involved in the service or repair of the machine, equipment, or process shall:

- Place a lock on each appropriate energy isolation device.
- Place a completed tag on each lock.
- Remove his/her lockout devices and tags after verification that all of his/her
  - Work is completed,

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- Tools and materials are cleared, and
- Blocks or temporary energy isolation devices have been removed.

4.3.2. Group Lockout Method

The group lockout method is normally used when a larger number of persons or locks will be required to assure isolation of energy sources.

When using the group lockout method, the following procedure shall be used.

- The supervisor of the authorized employees shall place a single lockout device on each energy isolation device.
- The supervisor of the authorized employees places a single completed tag on each lockout device.
- The supervisor places the keys for the single lockout device in the group lockbox or equivalent device.
- Each authorized employee and the supervisor shall affix a lock and tag to the group lockout device, group lockbox, or equivalent device before he/she begins work, and shall remove those devices only when he/she completes work on the machine, equipment, or process being serviced or maintained.
- The supervisor shall ensure that all work of personnel under their supervision is completed, and that their personnel will no longer be affected by the lockout prior to removal of lockout devices and tags.
- The supervisor shall remove his/her lockout devices and tags after verification that all
  - Work is completed,
  - Tools and materials are cleared, and
  - Blocks or temporary energy isolation devices have been removed.

4.3.3. Tagout Only

The tagout-only method shall be used only when energy sources are not capable of being locked out. This should be very rare considering the variety of lock out devices available on the market.

Use of the tagout-only method requires approval of the Site Manager.

All other requirements of this work instruction apply.

When tagout systems are used, employees shall also be trained in the following limitations of tags:

- Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock and lockout device.
- When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated.
- Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.
- Tags and their means of attachment must be made of materials, which will withstand the environmental conditions encountered in the workplace.

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- Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.
- Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.

4.4. Start-up Procedures

Before lockout and energy isolation devices are removed and energy is restored to the machine, equipment, or process, the following steps shall be taken in order:

- Verify that machine and equipment components, guards, etc., have been replaced and are intact.
- Verify that all tools and materials such as screws, wrenches, nuts, bolts, rags, etc., have been removed from the machine, equipment, or process.
- Verify that all personnel are removed from the machine, equipment, or process and are safely positioned so that start-up will not expose them to hazardous energy sources.
- Remove the LOTO device
- Energize and proceed with testing
- De-energize & reapply control measures.

These steps should be documented by the site supervisor or site manager.

4.5. Shop Equipment

4.5.1. Specific procedures will be required for each piece of shop equipment unless all of the following exceptions are met.

- The machine or equipment has no potential for stored or residual energy or reaccumulation of stored energy after shut down which could endanger employees;
- The machine or equipment has a single energy source which can be readily identified and isolated;
- The isolation and locking out of that energy source will completely deenergize and deactivate the machine or equipment;
- The machine or equipment is isolated from that energy source and locked out during servicing or maintenance;
- A single lockout device will achieve a locked-out condition;
- The lockout device is under the exclusive control of the authorized employee performing the servicing or maintenance;
- The servicing or maintenance does not create hazards for other employees; and
- The employer, in utilizing this exception, has had no accidents involving the unexpected activation or reenergization of the machine or equipment during servicing or maintenance.

The shop manager shall review these procedures annually.

The procedures shall clearly and specifically outline the scope, purpose, authorization, rules, and techniques to be utilized for the control of hazardous energy, and the means to enforce compliance including, but not limited to, the following:

- A specific statement of the intended use of the procedure;
- Specific procedural steps for shutting down, isolating, blocking, and securing machines or equipment to control hazardous energy;

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- Specific procedural steps for the placement, removal, and transfer of lockout devices or tagout devices and the responsibility for them; and
- Specific requirements for testing a machine or equipment to determine and verify the effectiveness of lockout devices, tagout devices, and other energy control measures.

4.5.2. Locks out procedures, as provided elsewhere in this section, are not required for portable electric tools if all of the following conditions are met:

- The equipment must not produce or use any stored energy, for example a portable air compressor, a steam washer, or a chemical pump.
- The equipment can be and is unplugged and the plug remains under the exclusive control of the operator or it is placed in a lockout device and locked.
- The service on the tool is limited to changing bits, blades, or other such devices. The tool must be properly locked out if any maintenance or servicing is to take place.

4.5.3. Operators of shop equipment must de-energize and lock out their equipment to change tools, chucks, blades, and perform similar tasks. A power disconnect switch must be provided for this purpose at or near the equipment unless the equipment can be unplugged.

The activation of push-button or butterfly controls will not be solely relied upon for lockout.

4.6. Lockout and Tagout Program Review

Inspections shall be conducted to verify that the site's lockout and tagout program is effective.

A written review of lockout and tagout procedures shall be performed at least annually and/or after any incident involving lockout or tagout, in order to verify that the requirements of the procedure are being followed.

A designated employee, other than the one(s) utilizing the lockout and tagout procedure, shall perform the review.

The program review shall include an evaluation of employees' compliance with the lockout and tagout procedure.

The program review shall document the machine, equipment, or process on which the energy control procedure was being utilized, the date of the review, the employees included in the review, and the name of person performing the review. See Figure 1, Lockout and Tagout Program Review Report.

Safety Evaluation Reports and other written safety audits that include lockout and tagout program review may, in some cases, fulfill the program review requirements.

The Site Manager shall assure that annual and post-incident reviews have been performed.

4.7. Training

Authorized and affected personnel, who have operational control, must receive training in the contents of this work instruction and the relevant HSE training module prior to work involving lockout and tagout.

The training shall be conducted at least annually thereafter, anytime this work instruction is revised, and when a change in machinery, equipment, or process presents new potential hazards.

Training documentation will be maintained at the site and shall include copies of quizzes and the Lockout and Tagout Training Record, or equivalent. (See Figure 2.)

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4.8. Disciplinary Action

Due to the consequences of failure to comply with the directives set forth in this work instruction, disciplinary action, up to and including discharge, should be considered for any person:

- Who operates an energy source isolation device to which lockout devices and tags are attached or removes a lockout device or tag without authorization;
- Who works on an energy source without following this work instruction; or
- Who deviates from this work instruction.

5.0 REFERENCES AND RELATED DOCUMENTS

29 CFR 1910.147, The Control of Hazardous Energy, Lockout/Tagout

29 CFR 1926.417, Lockout and Tagging of Circuits

HSEP 8.5

HSEP 19.1

HSEP 19.4

6.0 FIGURES

Lockout and Tagout Program Review Report

Lockout and Tagout Training Record

Lockout Log

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Figure 1

Lockout and Tagout Program Review Report

Project Number:_____ Location:_____

Project:_____ Date:_____

INSPECTION

Machine, Equipment, or Process Inspected:_____

_____

_____

Employees Included In Inspection: _____ _____

_____ _____ _____

_____ _____ _____

Inspection Results:_____

_____

_____

Review of Incidents (involving lockout/tagout):_____

_____

_____

Conclusion and Findings:_____

_____

_____

_____

Annual Training Completed and Documented: Yes_____ No_____

Inspector:_____Signature:_____

Site Manager_____Signature:_____

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Figure 2

Lockout and Tagout Training Record

My signature indicates that I acknowledge that I have received training in the Lockout and Tagout HSEP 15.1 and that I fully understand the requirements of this work instruction. I agree to abide by these requirements. I understand that violation of these requirements may subject me to disciplinary action up to, and including, discharge.

Name Printed	Signature	Social Security No.	Date of Training

Name of instructor: _____

Attach a copy of the training module to this training attendance roster.

Maintain training roster and copy of training module with project records.

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Figure 3

Lockout Log

Date	Lock No.	Issued To	Task or Energy Source Isolated	Date Out	Date In

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1.0 PURPOSE AND SCOPE

This Corporate Health, Safety, and Environment Procedure (HSEP) provides the minimum procedures to be followed when employees utilize any of the small tools and equipment referenced in this Section.

This HSEP applies to all employees and subcontractors engaged in operations covered by the Company HSE Program.

2.0 RESPONSIBILITIES

General responsibilities for HSE procedures implementation and position descriptions are stated in HSEP 1.5. Additional responsibilities specific to this HSEP include the following.

2.1. Site Manager

Site Management shall be familiar with the policy and procedures stated in this HSEP, and ensure implementation of these requirements.

2.2. Supervisor

Supervisors responsible for employees performing work covered by this HSEP must:

- Ensure employees have been properly trained and can utilize small tools and equipment in a safe and proper manner.
- Continuously monitor the work to assure tools are being used properly and safely.

2.3. Employee

Employees must inspect each tool prior to use, and utilize them in accordance with the requirements of this HSEP, and instructions received from their Supervisor.

2.4. Site HSE Supervisor

The Site HSE Supervisor shall assist Site Management in compliance with this HSEP.

The Site HSE Supervisor shall monitor field activities for compliance with the requirements of this HSEP and keep Site Management informed of these monitoring results.

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3.0 DEFINITIONS

None

4.0 PROCEDURE

4.1. General Precautions

Never remove or interfere with the operation of any tool guard or safety features.

Always use the right tool for the right job.

When working with a hammer or other small tools, use the correct PPE, eg., gloves, eye protection, for the tool(s) being used.

Carrying tools in pockets is dangerous, especially if tools are sharp or pointed.

Do not use excessive pressure or force on any hand tool.

Metal measuring tapes, tapes having metal strands woven into fabric, brass bound rules, wire or metal bound hose, or rope with wire core shall not be used when working on or near energized electrical circuits or equipment.

Tools should neither be dropped nor thrown from place to place nor from person to person.

Tools that must be raised or lowered from one elevation to another shall be placed in an approved tool bucket or firmly attached to hand-line.

Homemade or jobmade tolls are not to be used. In the event a special tool is needed for a specific task, for which no such manufactured tool exists, proper engineering design, specifications, calculations and safety factors must be provided and management approval obtained prior to construction of such a tool.

4.2. Hand Tools

4.2.1. Screwdrivers

Use the right size and type screwdriver for the job.

Do not hold screwdriver work in palm of hand. The screwdriver may slip causing injury.

Screwdrivers should be filed properly to prevent slipping.

4.2.2. Hammers

Hammers must have a clear path for backswing, and the target area must be free from obstructions.

Hammers with “mushroomed” heads should never be used as they might glance off the target, or the damaged head may splinter and send metal fragments flying.

Never hold with your hand any object to be struck with a hammer by another worker. Hold the object with pliers or another tong-type device.

Wooden handles shall be kept free of splinters or cracks and kept tight in the tool.

4.2.3. Files

Do not use a file for a pry or hammer as it is brittle and breaks easily.

Files shall be fitted with wooden handles to protect workers from the pointed file end.

4.2.4. Pry Bars

Assure that bite of bar is secure under load by first applying a slight pressure.

Check your own balance before exerting full force.

A cheater bar shall not be used on pry bars.

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4.2.5. Wrenches

Wrenches should be pushed away from the body, if possible, to reduce the chance of the wrench slipping and striking the user in the face or body.

Adjustable (crescent) and combination wrenches should be snug on bolts and juts to avoid slipping.

Never use a wrench as a hammer or a hammer on a wrench that is not designed to be used as such.

Never use a cheater bar on a wrench or “double wrench” a nut. Use a hammer wrench or impact instead.

Wrenches shall not be used when jaws are sprung to the point that slippage occurs.

4.2.6. Chisels & Punches

Unsafe defects, include mushroomed heads, chipped points, and overtempered surfaces.

Do not use as pry bar, strike with hardened hammer, use one too short for hand safety, chip toward yourself or others, use without proper eye protection.

4.2.7. Drill Bits

Unsafe defects include worn or battered heads, overtempered, and dull cutting edges.

Do not use drill as a reamer (get a larger bit), use bit sharpened for drilling steel on brass or copper without removing the lip, or change bits without unplugging cord.

4.2.8. Knives

Unsafe defects include dull or nicked edges or point, no finger guard, loose or broken handle.

4.2.9. Shovels, Pick Axes and Axes

Unsafe defects include rough, loose, cracked, or split handles; dull or nicked edges, overtempered surfaces.

Do not use as a wedge, pry bar, or hammer.

4.3. Inspection and Storage

All tools shall be kept clean and must be inspected by the user prior to use.

Those tools found to be defective shall not be used. They must be properly repaired or replaced. Return them to the tool room or Supervisor.

If heads of striking tools become mushroomed or burred, have them dressed. If handles of tools are splintered, broken, or loose, have them replaced.

Tools must always be returned to their proper storage place and not left where they create a hazard or can become damaged.

4.4. Training

Supervisors shall ensure that all employees are trained in the safe and proper use of all hand tools and equipment used on their jobs.

At a minimum, Supervisors shall ensure that employees comply with the requirements set forth in this HSEP.

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HSE Procedure		Document No: HSEP 20.1	Page: 1 of 5
Fire Prevention		Supersedes: CHSP 20.1	Rev. 2
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1.0 PURPOSE AND SCOPE

This Corporate Health, Safety, and Environment Procedure (HSEP) provides the minimum procedures to be followed for fire prevention in the workplace, and is a key to ensuring the safety and health of employees.

This HSEP applies to all employees and subcontractors engaged in operations covered by the Company HSE Program.

2.0 RESPONSIBILITIES

General responsibilities for HSE procedures implementation and position descriptions are stated in HSEP 1.5. Additional responsibilities specific to this HSEP include the following.

2.1. Site Management

Site Management must assume ownership and responsibility for implementation of the policy and procedures found in this HSEP.

2.2. Supervision

Supervisors responsible for employees performing work covered by the Company's Fire Prevention HSEP must:

Continuously monitor the work to assure compliance with this HSEP.

Confirm each job has been properly evaluated for fire hazards, and these hazards have been properly eliminated or controlled.

Ensure employees are aware of any hazards associated with their work.

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2.3. Employee

Employees must comply with the provisions of this HSEP according to instructions and training received.

2.4. Site HSE Supervisor

The Site HSE Supervisor shall assist Site Management in compliance with this HSEP, as well as monitor field activity for compliance.

3.0 DEFINITIONS

None

4.0 PROCEDURE

4.1. General

All fires shall be reported immediately.

The prevention of fires is of utmost importance. Good housekeeping and equipment maintenance must be followed to keep fire hazards at a minimum.

Matches and cigarette lighters should not be carried into any area where an explosive atmosphere may be present.

Smoking must be confined to areas specifically designated.

Smoking is not permitted in the immediate vicinity of tank batteries, oil and gas wells, or in any area suspected or known to contain flammable vapors, regardless of whether or not a "no smoking" sign is displayed. Any area subject to contamination by flammable liquids or gas should be designated as a "no smoking area," and a sign to that effect should be displayed.

Before an open flame (such as a welding torch) is carried into a closed building or tank, a test should be made to detect the presence of gas using an approved combustible gas indicator.

The use of gasoline as a cleaning agent is strictly forbidden.

Oil or gasoline from leaks should be cleaned up and disposed of in a prescribed manner.

All leaks should be reported and repaired immediately, if practicable. If immediate repair is not possible, adequate warning signs must be posted and extra precaution against fires instituted.

In the event of a gas leak, all fires and engines should be shut down immediately.

When testing for gas leaks, use soap suds or approved leak detector fluid. Never use an open flame.

Since paint and insect sprays and most paint removers are usually flammable, their use near open flames or other sources of ignition must be avoided. Read the labels on the containers.

4.2. Classes of Fires

Class "A" fires are those that occur in ordinary materials such as wood, paper, rags, and rubbish. The quenching and cooling effects of water or of solutions containing large percentages of water are of first importance in extinguishing these fires.

Class "B" fires are those that occur in the vapor-air mixture over the surface of flammable liquids such as gasoline, oil, grease, paints and thinners. The limiting of air is of primary importance. Generally, regular dry chemical, multi-purpose dry chemical, carbon dioxide, and foam may be used depending on the circumstances of the fire. Solid streams of water are likely to spread the fire, but on large fires of this class, water fog nozzles prove effective.

Class "C" fires are those which occur in or near electrical equipment where non-conducting extinguishing agents shall be used. Dry chemical, carbon dioxide, compressed gas, or vaporizing liquid may be used. Foam or a solid stream of water should not be used because both are good conductors and can expose the operator to a severe shock hazard.

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Class "D" fires are those that occur in combustible metals such as magnesium, titanium, zirconium, lithium and sodium. Specialized techniques, extinguishing agents, and extinguishing equipment are needed to control and extinguish fires of this type. Normal extinguishing agents generally should not be used as there is a danger in most cases of increasing intensity of the fire because of a chemical reaction between some extinguishing agents and the burning metal.

4.3. Flammable Liquids (Flash Point 100° F or Less)

Flammable liquids such as gasoline, benzene, naphtha, and lacquer thinner must not be used for cleaning purposes.

Spills or overflow of flammable liquids should be avoided. However, in the event of spillage, immediate steps should be taken to clean up and minimize the danger of fire.

When liquids such as condensates, gasoline, and some crude oils are drawn into open metal containers, the open container must be grounded by means of either threaded connections or a bonding wire to the vessel or piping in order to prevent any possible ignition source from generation of static electricity.

With exceptions of gasoline and oil, the mixing of two or more flammable liquids is prohibited.

When pumping highly flammable liquids from one container to another, metallic contact should always be maintained between the two containers.

4.4. Good Housekeeping to Prevent Fires

Good housekeeping should be maintained at all work locations and in all vehicles.

Paper and other combustible materials should not be allowed to accumulate.

4.5. Safe Handling of Flammable & Combustible Materials

Never handle a flammable substance near a heat source or bring a heat source near a flammable substance.

Safe transfers of flammable liquids are made in an open, well ventilated area where the vapors will be diluted and dissipated by large quantities of fresh air. Make sure you have a bond between containers to eliminate static electricity.

Using funnels and spouted cans makes for a quick transfer and helps prevent dangerous spills.

Flammable and combustible liquid spills should be cleaned up immediately.

When refueling or lubricating machinery, be certain that it is shut down first. Pieces of machinery like exhaust pipes and bearings radiate heat, and electrical systems generate sparks that can ignite in an accidental spill. If fuel is dispensed from a fuel truck, the truck should be grounded to equipment being filled.

Be certain that an engine is supplied with the proper type of fuel and the fuel supply is shut off by a valve when the engine is not in use.

Never use gasoline as a solvent - it produces dangerous amounts of vapor. Always use a high flashpoint solvent or thinner for cleaning off paint, grease, or oil around equipment.

4.6. Proper Use of Fire Fighting Equipment

When fighting a fire with a standard portable fire extinguisher, use the following procedure in extinguishing the fire.

Always use the handle to carry an extinguisher. Walk at a rapid pace -- do not run to a fire.

Proceed to the upwind side of a fire. Stay well clear of the flames. When you are approximately 10 feet upwind of the near edge, stop and ready your extinguisher for discharge.

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Once your extinguisher is set for discharge, position yourself within eight feet of the near edge upwind of the fire. From this position, the air currents help carry the agent into the fire assuring maximum visibility and providing protection from the heat.

When discharging the extinguishing agent, aim your stream just short of the near edge at the base of the fire.

Apply the agent in a side-to-side sweeping action across the full width of the fire. Make sure each sweep of the extinguishing agent is slightly wider than the near or leading edge of fire.

Advance forward only as fast as the extinguishing action of your agent will permit. Do not outrun your protection. Do not raise your stream to chase the flame. Keep it down in front of the flame edge.

Stop short of the already extinguished fuel area. Do not become involved in the fire. Above all, maintain your side-to-side sweeping action until the fire is extinguished. Once the fire is out, stand by for a few minutes. Make sure there is no danger of a re-flash. Do not ever turn your back on an apparently extinguished fire.

4.7. Inspection and Storage

4.7.1. Inspection

Inspection and maintenance of all fire fighting equipment will be performed by a competent inspector. Records of inspection and maintenance must be maintained. The following general guidelines will be observed:

- Portable fire extinguishers shall be inspected at least monthly. At regular intervals, not more than one year apart, extinguishers shall be thoroughly examined and/or recharged or repaired to ensure operability and safety or replaced as needed. Each extinguisher shall have a durable tag securely attached to show the maintenance or recharge date and the initial or signature of the person performing the service.
- Fire extinguisher hose nozzles should be kept free of obstruction at all times.
- In areas where insects tend to nest in protected small areas, the nozzle should be covered with small cloth or plastic bag to keep it free of obstructions.
- A fire extinguisher that is empty, defective, or has been discharged should never be re-hung until it has been serviced or repaired. It is necessary that extinguishers operate at top efficiency the instant they are used. Fire extinguishers should be kept filled. Manufacturer's instructions for refilling and maintaining extinguishers must be followed.

Due diligence must be used in keeping sprinkler systems in good operating condition.

4.7.2. Storage

All flammable liquids/solvents should be kept in approved, properly labeled containers

Small quantities of flammable liquids such as gasoline and solvents should be handled, transported, dispensed and stored in approved, marked safety cans. Safety cans have self-closing caps, flame arrestors, and pressure relief vents. The contents must be properly labeled.

Cans of oil, kerosene, oily rags, waste, etc., must not be allowed near stoves or gas fires.

Gasoline, kerosene, or other flammable liquids must not be stored in glass containers.

Do not store flammable liquids in open containers.

Flammable and combustible materials such as oil or gasoline soaked rags/clothing, oily waste and shavings must not be left lying around or piled on the ground. Spontaneous combustion is likely to result and cause a fire. These materials must be stored in

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approved and covered metal containers. These containers should have self closing lids, and should be emptied daily to maintain the premises in a safe and sanitary condition.

Because of their convenient size, aerosol cans are often stored or set down in unsafe places. Keep in mind that all aerosol cans are pressurized and that this pressure increases when exposed to heat. If the can is overheated, it will explode like a hand grenade. Aerosol spray cans containing various commodities are typically labeled as flammable. If the product isn't flammable, the propellant usually is. Do not store pressurized aerosol flammable cans in non-approved storage containers.

Storage cabinets, rooms, or particular areas should be designated to store flammable liquids. Cabinets should be labeled:

"FLAMMABLE - KEEP FIRE AWAY".

Not more than 60 gallons of flammable, or 120 gallons of combustible liquid shall be shored in any one storage cabinet or container.

No more than 25 gallons of flammable liquids shall be stored outside an approved storage cabinet, unless a designated area has been provided which meets all regulatory requirements.

Dispensing drums should be equipped with special self-closing faucets and pressure vacuum relief vents. Also, a ground wire should be attached.

Large quantities of flammable liquids should be stored well away from the immediate work area.

Outside portable tank storage shall be located no closer than 25 feet from any building.

Fire fighting equipment is for fire use only and shall be kept in its designated place at all times when not in use.

All fire protection equipment must be located in designated areas that are clearly identified with appropriate markings. This equipment should be located in the vicinity of likely fire hazards, but it must be accessible to operating personnel. The number, type, and location of extinguishers must meet all applicable standards.

4.8. Training

All employees shall be properly trained in accordance with this HSEP.

Fire drills should be held at regular intervals to familiarize employees with the emergency/fire response procedures for the work site as well as the location and operation of fire extinguishing equipment.

Upon initial assignment and annually thereafter, all employees shall be instructed in the proper use of available fire fighting equipment. Those working at places where special precautions against fire must be taken are required to be so instructed.

5.0 REFERENCES

None

6.0 FIGURES

None

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HSE Procedure		Document No: HSEP 21.2	Page: 1 of 4
Motor Vehicle Safety		Supersedes: HSEP 21.2	Revision: 6 Issue Date: 9 Oct 09
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1.0 PURPOSE AND SCOPE

Through proper implementation of this procedure, it is intended that personal injury and property loss due to vehicle accidents will be minimized.

This Health, Safety, and Environment Procedure (HSEP) applies to employees (full-time, part-time, and agency), who operate motor vehicles owned, rented, or leased by the Company or its clients ("Company motor vehicles") and to any other motor vehicle, used by personnel engaged in Company business.

This procedure addresses operation of motorized over-the-road vehicles, i.e., cars, trucks, and vans, by Company authorized operators. All terrain vehicles, golf carts, and similar utility vehicles are not covered in this procedure.

Additional requirements may apply for operators of motor vehicles, such as busses used to transport passengers and vehicles designed to transport fuel or other materials regulated by governmental agencies.

2.0 RESPONSIBILITIES

Responsibility for implementing the procedure begins with the senior management of the Company and flows through all levels of management to the individual vehicle operator. However, it is the vehicle operator's responsibility to understand and comply with this procedure.

General responsibilities for HSE procedures implementation and position descriptions are stated in HSEP 1.5, HSE Program Implementation Responsibilities. Additional responsibilities specific to this HSEP include the following.

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2.1. Operations Manager

If an employee is to be assigned as a Designated Motor Vehicle Operator, the management for the responsible operating unit shall, at the time of employment or assignment obtain a photocopy of vehicle operator's drivers license.

2.2. Supervisor

It is the responsibility of the employee's immediate supervisor to ensure that the employee is properly qualified, as set forth in this procedure, before being allowed to operate a Company vehicle or a personal vehicle for use on Company business.

2.3. Motor Vehicle Operator

Each employee who has been authorized to operate a motor vehicle on Company business shall read and follow the instructions in this procedure.

3.0 DEFINITIONS

Authorized Passengers	Authorized passengers in Company Vehicles are limited to • Company employees or employees of all subsidiaries, • Consultants or subcontractors to the Company when on Company business, • Company clients or potential clients, Company vendors, and others on legitimate Company business. • The operator's immediate family and others, if authorized by their Manager.
Company Vehicle	Any motor vehicle that is owned, leased, rented, or otherwise provided by or through the Company.
Personal Vehicles	Any motor vehicle not provided by the Company that is used while engaged in Company business.
Motor Vehicle	Motor vehicle means motorized over-the-road vehicles, i.e., cars, trucks, and vans.
Designated Motor Vehicle Operator	Employees who are issued a Company vehicle for long-term use or those who are expected to routinely drive on Company business, whether driving Company-provided (including rental) or personal vehicles.

4.0 PROCEDURE

Motor vehicle accidents are recognized as a leading cause of work and non-work related serious injuries and fatalities. Therefore, the operation of motor vehicles must not be perceived as such a routine activity that practices focused on ensuring their safe operation and control are overlooked.

4.1. General Requirements

Company Vehicles are to be used for Company business only. The use of Company Vehicles for personal business is prohibited**.** In certain locations, written agreements may allow for personal use of Company Vehicles. Allow only Authorized Passengers to ride in Company Vehicles.

Motorcycles and non-production vehicles shall not be used on Company business without special approval by the Group Vice President and the Corporate HSE Department.

Operators that have been assigned a Company Vehicle shall assure that the vehicle is maintained in accordance with manufacturer's recommendations. Other Company Vehicles shall be properly maintained by the responsible operating unit in a condition that ensures safe performance. Maintenance of a Personal Vehicles is the responsibility of the employee. In the case of Personal Vehicles, the mileage reimbursement allowance includes costs associated with

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vehicle maintenance. Under no circumstance should anyone operate a motor vehicle if they believe it is not in safe working condition.

Any cargo being carried by a motor vehicle including equipment, materials, Company property, or personal property shall be properly secured by the motor vehicle operator at all times.

Motor vehicle operators must be familiar with and abide by all laws and regulations applicable to the operation of their vehicle, and should not drive motor vehicles in countries where they are unsure of or inexperienced in local driving rules and conditions.

The motor vehicle operator shall ensure that the vehicle they are operating has the appropriate vehicle registration and insurance coverage in place prior to driving. If using a Personal Vehicle, the motor vehicle operator shall assure that registration and insurance coverage required by the state/country in which the vehicle is registered are maintained. The Insurance Information Institute provides US automobile financial responsibility limits and enforcement by state.

4.2. Motor Vehicle Operators

A current, valid driver's license and/or other required certification for the type and class of motor vehicle to be operated must be held by the individual prior to their operating any vehicle on Company business. Motor vehicle operators must notify their supervisor immediately of any event that might change their driver's license status.

Personnel shall not operate a motor vehicle on Company business when they are in such a mentally or physically impaired condition that they are not able to properly operate the vehicle in a safe manner. This includes conditions such as operating a vehicle while under the influence of drugs, medicines, or alcohol, or when under conditions of extreme stress, fatigue, or any other physical or mental impairment that may hinder safe vehicle operation.

Employees with disabilities must have Company-approved accommodations prior to operating a motor vehicle on Company business.

4.2.1. Designated Motor Vehicle Operators Must

- Be in possession of, and show at time of issue of vehicle, a valid driver's license appropriate for the class of vehicle being operated. A photocopy of the Operator's driver's license shall be obtained and kept on file.
- Agree to participate in and complete a Company-provided or Company-approved defensive driving course.

4.2.2. Local Administration

Local operations managers are encouraged to also develop and implement procedures for

- Motor vehicle check-out, control, inspection, and maintenance as part of management of Company vehicles, and
- Verification of employee qualification to operate all vehicles used on Company business.

4.3. Vehicle Operator Disqualification

Revocation or suspension of driving privileges by the issuing authority, for any reason, shall disqualify an employee from operating a vehicle on Company business. Re-qualification shall require:

- Restoration of driving privilege by the issuing authority and
- Approval of appropriate Group or Senior Vice President.

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4.4. Seat Belts

Motor vehicle operators shall ensure that all passengers correctly use the seat belts and shoulder harnesses provided with the vehicle. Cargo vans used for transportation of personnel must be equipped with proper seats and seat belts.

4.5. Pre-trip Inspection and Planning

Prior to use of any motor vehicle on Company business, a pre-trip inspection should be conducted and an SPA should be prepared and retained with the vehicle during the trip.

Use HSEP 21.2f1, Blank Rental Vehicle SPA Form, to record and document your SPA.

HSEP 21.2f2, Sample Completed Rental Vehicle SPA Form can be use as a reference, but each SPA should tailored to the specific rental situation and equipment.

A printer-ready HSEP 21.2f3, Blank Motor Vehicle SPA Pocket Card version of the SPA is also available.

Refer to HSEP 2.16, Safe Plan of Action, for the Company's SPA procedure.

The operator should walk around the vehicle's exterior and look for potential safety hazards such as cracked windshields, missing mirrors, defective tires, and other vehicle damage or defects.

For Company vehicles and rental vehicles, exterior and/or interior defects should be reported.

Operators should familiarize themselves with interior features and controls and make appropriate adjustments, e.g., seat, mirrors, necessary to assure safe operation.

4.6. Operator Distractions

A major cause of motor vehicle accidents is distractions such as use of mobile phones, using and adjusting onboard and portable electronic devices, reading, eating, etc. Motor vehicle operators should avoid any activity or distraction that may prevent safe motor vehicle operation.

Motor vehicle operators are **prohibited from using a mobile phone, text messaging, SMS messaging or two-way radio,** whether it is Company-provided or personal, while operating a motor vehicle on Company business. This applies to both hands-free and non-hands-free devices. If the use of such a device by the motor vehicle operator is necessary, it is only allowed when the motor vehicle is stationary and in a safe location off the roadway.

If required by the client, the use of two-way radios is allowed; provided that written approval by the relevant Group Vice President is obtained and **only** while on a project location or within a client facility.

4.7. Accident Reporting

All accidents involving a Company or Personal Vehicle being used on Company business must be reported by the vehicle operator to their immediate supervisor and the HSE Department, ***no matter how minor the incident.***

For vehicle accident reporting, incident investigation, and other necessary requirements, please go to HSEP 5.2, Vehicle Accidents. Maintain with each Company Vehicle the accident documentation forms required in HSEP 5.2.

5.0 REFERENCES & RELATED DOCUMENTS

HSEP 21.2f1, Blank Rental Vehicle SPA Form

HSEP 21.2f2, Sample Completed Rental Vehicle SPA Form

HSEP 21.2f3, Blank Motor Vehicle SPA Pocket Card

HSEP 2.16, Safe Plan of Action

HSEP 5.2, Vehicle Accidents

Insurance Information Institute

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Safe Plan of Action

HSEP 21.2f1

Project No.: _____ **Job/Task:** Operation of motor vehicle on company business. **Date:** _____

Steps of Task	Potential Hazard	Safe Plan	Resources
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			

Signature of Driver: _____

Signature of Passenger(s): _____

1. Write name of job at top of form. 2. Write steps of task in a safe sequence. 3. In the Potential Hazards column, list all possible hazards involved with each step. 4. In the Safe Plan column, state actions that will be taken to eliminate the hazards. 5. In the Resources column, list necessary equipment, tools, etc. 6. Ask each person who helped develop and will use SPA to sign it.

Review SPA at the end of the task for improvements and submit to supervisor, as appropriate.

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Vehicle Rental and Driving Safe Plan of Action

HSEP 21.2f2

Job/Task: Operation of rental vehicle on company business

Steps of Task	Potential Hazard	Safe Plan	Resources
1 Store luggage in trunk. Secure loose material. Verify spare tire, jack, and tools.	Trunk lid may have been opened by others, creating hazard. Loose material in vehicle may strike occupants during an unanticipated driving incident.	Store luggage and material in trunk. Lift luggage with back in neutral position and prevent reaching too far with load. Assure presence of spare tire, jack, and tools. Check trunk lid to be sure closed.	Driver, spare tire, jack, tools
2 Check vehicle's body and tires. Check behind and around vehicle for obstacles.	Damage to vehicle that would affect its safe operation. Obstacles may not be visible from driver's position.	Walk around vehicle, check inflation and condition of tires, check for body defects, and check for obstructions behind and around vehicle. Pull forward; avoid backing when possible.	Driver
3 Examine windows and mirrors for visibility obstruction(s). Assure adequate window washer fluid.	Snow, ice, mud, etc. can obscure visibility.	Remove ice, snow, mud, etc. Drive only after fog, ice, snow, or mud is completely removed from windows and mirrors. Use ventilation system set to outside air versus recirculated air. Adjust temperature for comfort.	Driver, scraper, adequate supply of windshield washer fluid
4 Check functionality of headlights, turn signals, horn and emergency lights.	Inability to see in darkness. Inability to communicate intention to turn to other drivers.	Turn on headlights and emergency blinkers. Walk around vehicle to check for functionality.	Driver
5 Adjust seat, headrest and mirror(s).	Disruption to driver. Driver unable to see side and rear views properly. Driver not properly positioned for crash cushioning.	Adjust seat prior to starting vehicle. Be sure you are seated at least 10"-12" from steering wheel to allow air bags to deploy properly. Adjust headrest to be at least even to your ears. Adjust mirror(s) to eliminate blind spots prior to starting vehicle.	Driver
6 Buckle seat belts.	Unsecured driver or passenger(s)	Buckle seat belt(s) prior to starting vehicle	Seat belt
7 Identify switch for headlights, hi-beam dimmer, wind shield wipers, radio, etc.	Disruption to driver attempting to locate while driving	Locate and test switches. Adjust radio and air conditioning/heater prior to driving vehicle. Activate windshield wipers and wiper fluid switch to test for functionality.	Driver & vehicle manual
8 Turn off mobile phone or give to passenger to answer.	Distraction to driver	Driver use of cell phone prohibited. If no passenger to answer call, stop in a safe area to call.	Driver & passenger
9 Review map. Plan travel route.	Sudden lane changes can cause collisions. Reading map is distraction.	Review map and ask directions if needed. Memorize road names or numbers. Have a passenger read map. Utilize auditory GPS system.	Map & passenger
10 Start vehicle.	Vehicle moving while starting	Be sure foot is on the brake and vehicle is in park or neutral (std shift), then start vehicle.	Driver & passenger
11 Test brakes, steering, turning radius.	Accidents due to mishandling unfamiliar vehicle.	Test driver the vehicle in a parking lot or side street before entering highways. Familiarize yourself with the feel and handling of the vehicle. If possible, rent vehicles similar in size and handling to your own personal vehicle.	Driver
12 Follow defensive driving rules.	Other drivers not following the rules	Use three-second-following rule, look both ways before entering intersection, Adjust speed for weather, light and traffic conditions, etc.	Defensive driver training

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Travel to Remote and Difficult Locations		Supersedes: CHSP 21.3	Rev. 2
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1.0 PURPOSE AND SCOPE

This HSEP outlines the requirements that identify and control water, air, and ground transportation hazards and precautions involved with travel to and from remote sites.

Site-specific remote location transportation requirements shall be addressed in the job's site-specific health, safety, and environment plan (HSEP).

2.0 RESPONSIBILITIES

General responsibilities for HSE procedures implementation and position descriptions are stated in HSEP 1.5. Additional responsibilities specific to this HSEP include the following.

2.1. Corporate Health, Safety, and Environment Manager

The Corporate Health, Safety and Environment Manager (CHSEM) is responsible for issuing and maintaining this directive and for updating it through periodic review and amendment in accordance with regulatory and other appropriate updates and changes.

2.2. Project Manager

The Project Manager (PjM) is responsible for encouraging and enforcing compliance with this HSEP and for assuring that the HSP addresses the safety and regulatory compliance requirements as applicable.

2.3. Site Manager

The Site Manager, with support from the Site HSE Officer, is responsible for the on-site implementation of the HSEP.

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2.4. Employees

Employees are responsible for complying with this directive and with the site-specific HSEP and are responsible for notifying their supervisor or the HSEP Department of site hazards not adequately controlled by measures specified in the HSEP.

2.5. Contractor and Subcontractor Liaison Personnel

Contractor and subcontractor liaison personnel are responsible for submitting their site-specific HSEPs for approval to the PjM and for complying with the Company's site HSEP. Contractor and subcontractor management and employees are responsible for complying with all relevant provisions of this HSEP.

3.0 DEFINITIONS

ATV	All Terrain Vehicle
CFR	Code of Federal Regulations
CHSEM	Corporate Health, Safety, and Environment Manager
EEP	Emergency Evacuation Plan
EETP	Emergency Evacuation Transportation Plan
EMT	Emergency Medical Technician
FAA	Federal Aviation Administration
FAvR	Federal Aviation Regulations
FCC	Federal Communication Commission
HSEP	Health, Safety, and Environment Plan
NOAA	National Oceanic & Atmospheric Administration
PFD	Personal Flotation Device
PjM	Project Manager
SPA	Safe Plan of Action
USCG	United States Coast Guard

4.0 PROCEDURE

4.1. General Requirements

The site HSEP must identify all hazards, precautions, and control measures associated with transportation providers and modes of transportation that will be utilized in transportation of Company personnel to and from remote site locations.

An Emergency Evacuation Plan (EEP) or Safe Plan of Action (SPA) must identify those hazards associated with travel to remote and difficult locations and must be made a part of the site-specific HSEP. Evacuation hazards precautions will address specific transportation requirements that will be utilized at remote site locations. A site emergency response plan is required to be reviewed and approved prior to departure.

The emergency evacuation plan must identify and/or incorporate, as a minimum, the following elements:

- Pre-emergency planning and evacuation planning;
- Personnel roles, lines of authority, communication methods, and nearest evacuation site and emergency response facility;
- Over-water evacuation and survival procedures;
- Safe places for refuge;

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- Emergency medical treatment and field first aid;
- Evacuation routes and procedures identified with mode of transportation selected;
- Emergency alerting and response procedures;
- Procedures for critique and response and follow-up;
- Remote and wilderness area survival procedures;
- Identification and procurement of remote site survival equipment, both emergency and non-emergency backup plans for communications, supplies, transportation, survival equipment, etc., in the event the primary methods fail.

An emergency medical transportation plan must be provided. There must be a shared and/or common communications network in place prior to any work being performed at a remote location. Often, it is unlikely that a site will have immediate access to emergency medical transportation. Consequently, arrangements must be made with external agencies to provide transportation to medical facilities. If the injury is so severe as to require evacuation, the supervisor must notify the pre-designated medical dispatch service in order to receive direction regarding the most appropriate evacuation method.

In all emergency medical evacuation transportation cases, a call will be made to the U.S. Coast Guard, which often has access to a U. S. Army Medical Evacuation Unit. The emergency phone number for the response medical facility shall be placed in the emergency preparedness call notification list and shall be posted at all job sites.

Emergency Medical Transportation options include:

- Transport to the nearest community primary care facility via fixed wing aircraft, helicopter, or boat. Names, addresses and phone numbers of community primary facilities shall be listed, posted, and given to the work crew.
- Transport of physician and/or EMT to the site of the injured person.
- Dispatch of helicopter from land based facility with Advanced Cardiac Life Support Medic on board.
- Requesting evacuation by U.S. Coast Guard.
- Requesting support by medical evacuation facilities based in major hospitals nearest the work location.

4.2. Boat & Marine Vessel

All boats and marine vessels will comply with USCG and state regulations within United States Regulated Waters and Coastal Regions. Registration, certification, and maintenance in accordance with the standards of a comparable governing body of foreign or international authority may be substituted for those of the USCG for size and class if outside the United States and not prohibited by other regulations.

All boats and marine vessels that are regulated by the USCG or state authorities shall have current inspections and certificates issued by the USCG before being placed in service. Copies shall be posted in a public area on board the vessel. (See Figure 1.)

All marine on-board radio equipment will be in good working order and shall comply with FCC regulations, found in 46 CFR 184, Parts 502, 510, 602, and 610 for size and class and shall be of sufficient strength to maintain ship-to-shore communications at all times.

The boats and marine vessel operators shall have a valid USCG and state operators' license, certificates of insurance, and FCC station license and required communication permits. On such licenses and certificates shall be information consistent with the vessel size, class, and equipment to be operated.

All boats and marine vessels capable of carrying passengers shall have approved radar, navigational aides, and radio communication capabilities and shall comply with all applicable

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USCG and FCC regulations for size and class. Such vessels shall also have an operator, who is qualified to control such navigational aids.

Boats and marine vessels without navigational aids (radar) shall not travel at night with Company personnel on board.

Before being placed in service, all boats and marine vessels shall be determined to be in safe operating condition by the charter service provider. It will be the responsibility of the Site Manager and the HSO to inspect and document that the operating company has complied with USCG and state regulations.

Records of inspections shall be maintained by the charter service provider and made available to the HSO for verification. It is the responsibility of the HSO to ensure and make appropriate documentation that the operating company has complied with this requirement.

All operators, officers, and crew shall be in possession of current, valid USCG and state required licenses.

A USCG Radar Observers endorsement on licenses is required for all boats and marine vessels on radar-equipped vessels 8m (26 ft) or more in length. Endorsements must be issued from a USCG approved training facility.

Where a vessel may be endangered by weather, including sudden and locally severe weather, storms, high winds, hurricanes, and floods, plans shall be made by the captain of the vessel for removing or securing and evacuating personnel in emergencies. This plan shall be part of the Remote Site Emergency Preparedness plan and shall include at least the following:

- a description of the types of severe weather hazards the boat or marine vessel may potentially be exposed to and the steps which will be taken to guard against the hazards;
- procedures for response to marine emergencies such as fire, sinking, flooding, severe weather, man-overboard, and hazardous material incidents;
- the name and location of the nearest safe location and emergency evacuation site;
- USCG approved personal flotation devices (PFDs), types I, II, III, or V, shall be worn by all personnel on decks, regardless of other safety devices used. Type of PFD shall meet USCG and state requirements and regulations;
- monitoring (the vessel captain's responsibility) via ships radio and/or NOAA marine weather broadcasts and other local commercial weather forecasting services for weather and sea changes that might create a hazardous situation for Company employees on board;
- the written emergency procedure, which will allow each passenger to be instructed in the vessel's emergency signals, use of the proper PFD, and person overboard rescue procedures;
- when poor weather is predicted, cancellation, rerouting, or alternative transportation methods must be evaluated and the HSE officer must approve the transportation and departure.

The maximum number of people and weight that can safely be transported shall be posted on all boats and marine vessels, launches, motorboats, and skiffs. The number of people, including crew, shall not exceed the number of PFDs aboard or the maximum number of people or weight that can be safely transported.

Each boat and marine vessel shall have sufficient room, freeboard, and stability to safely carry the cargo and number of passengers allowed with consideration given to the weather and water conditions in which it will be operated.

The minimum number and rating of fire extinguishers which shall be carried on board all vessels shall be in compliance with USCG and state regulations for class and size.

All Company personnel going from boat to boat shall wear USCG Type III PFD or Type V suits or jackets.

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Outboard motorboats and skiffs shall meet the minimum flotation requirement of the USCG and state. A certification tag affixed to the hull is satisfactory evidence of compliance.

4.3. Fixed Wing Aircraft/Helicopter

All air transportation carriers (commercial and military) shall be registered, certified in the appropriate category, and maintained in accordance with the air worthiness standards of the Federal Aviation Administration (FAA). Registration, certification, and maintenance in accordance with the standards of a comparable governing body of foreign or international authority may be substituted for those of the FAA if used outside the United States, and not prohibited by other regulation.

All contract pilots or pilots of chartered aircraft shall hold at least a commercial pilot's certificate with instrument rating. All pilots of non-military aircraft shall possess ratings to comply with the FAA Regulation governing the aircraft and operations involved. Pilots should be greater than age 25 and possess at least 500 hours of flying experience and that all aircraft have twin engines for flights in Alaska.

All fixed wing aircraft shall be of twin engine configuration, shall be equipped with two-way radio communications and have the necessary survival equipment required by the regulatory agency having jurisdiction. (See Figure 2.)

All non-military flight operations shall be carried out in accordance with the FAA rules governing conduct for the specific operation, as found in: 14 CFR 133 (FAvR Part 133) - Rotocraft External-Load Operations; 14 CFR 135 (FAvR Part 135) - Air Taxi Operations and Commercial Operators of Small Aircraft; and 14 CFR 91 (FAvR Part 91) - General Operating and Flight Rules or other applicable regulations.

All military flight operations shall be conducted under appropriate DOT/DOD regulations.

No one will board or exit any aircraft unless directed by the pilot or authorized flight personnel.

All helicopters are required to operate in accordance with 14 CFR 91 & 14 CFR 135 (FAvR 91 & PAR 135) or other applicable regulations.

When traveling in Helicopters Type V Hybrid, flotation suits must be worn (Mustang Suit), or other regulated PFD shall be used, as required by local regulations.

PFDs are not required in fixed wing aircraft but sufficient PFDs must be carried on board.

Seat belts shall be worn at all times.

When entering or exiting a helicopter, always wait for the operator's or flight crews' signal. Never assume you have been seen.

When entering or exiting a helicopter, walk straight to it from the front or side; never from the rear. The invisible tail rotor can cause severe injury or death.

Always exit the helicopter on the down-slope side of the aircraft.

All flights must have and file a detailed flight plan and the pilot must follow that flight plan.

All aircraft must be equipped with emergency locating beacons as well as sufficient survival equipment for the crew and maximum number of passengers.

4.4. Motorized Vehicle

Every person operating a motor vehicle at a remote site shall possess a valid state driver's license and a permit for the equipment being operated.

Every person operating a motor vehicle at a remote site shall be certified in first aid and CPR.

All vehicles shall be determined to be in safe operating condition by the charter service provider prior to traveling to remote site locations. It will be the responsibility of the Site Manager, supported by the HSO, to document that the charter company has complied with this requirement.

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All remote site vehicles shall be equipped with a two way radio or cell phone, a type 1A-10BC fire extinguisher, and a 16-unit first-aid kit, which shall comply with 29 CFR 1910.151 and 1926.50 and be constructed of a weatherproof container.

All remote site vehicles transporting Company personnel shall not be stopped, parked, or left standing on any road, or adjacent thereto, or in any area in a manner as to endanger personnel, the vehicle, equipment or other vehicles using or passing that road or area.

Vehicles shall not be loaded in a manner which obscures the driver's view ahead or to either side or which interferes with the safe operation of the vehicle. The number of passengers and load shall not exceed the manufacturer's rating for said vehicle.

All tools and equipment shall be guarded, stowed, and secured when transported to remote sites.

No person will be permitted to ride with any part of their body outside of the vehicle. No person shall ride in or on any vehicle not intended by the manufacturer for passenger use.

All vehicles transporting personnel during cold or inclement weather shall be enclosed .

Vehicles transporting personnel shall not be moved until the driver has ascertained that all persons are seated, with seat belts in place, and that the rear endgates are in place or doors closed.

Boarding or disembarking any vehicle while it is in motion is prohibited.

All motor vehicles' engines or other spark or heat producing devices shall be shut down prior to and during fueling operations.

Prior to use, all remote site vehicles shall be inspected by a mechanic or competent site person and documented to be in safe operating condition.

All remote site vehicles shall be inspected, serviced, and repaired on a scheduled maintenance program. Such inspections and service shall be documented.

The principles of defensive driving shall be practiced at all times while the vehicle is in operation.

Seat belts shall be installed and worn at all times.

Vehicles may not be driven at speeds greater than the posted speed limit, or that which is safe for the conditions, with due regard for weather, terrain, and environmental conditions, width and character of the roadway, type of motor vehicle, and other existing conditions.

The operator must have the vehicle under control and be able to bring it to a safe and complete stop at all times.

Headlights shall be lighted from one-half hour before sunset to one-half hour after sunrise, during fog, smoke, rain, or other unfavorable atmospheric conditions, and at any other time when safe operation requires it or when there is not sufficient light for the vehicle to be seen or the operator to see the roadway.

Employees shall not be permitted to pass or stand between a towed and towing vehicle, except when the vehicle is safely parked, to hook or unhook.

There shall be no personal use of vehicles.

4.5. All Terrain Vehicles (ATVs)

Every ATV operator shall possess a valid state drivers license and shall have completed an ATV training course prior to operation of the vehicle.

Every person operating an ATV at a remote site shall be certified in first aid and CPR.

Prior to traveling to a remote site location all ATVs shall be inspected and determined to be in safe operating condition by the charter service provider. It will be the responsibility of the Site Manager, supported by the HSO, to document that the charter company has complied with the requirement.

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All ATVs shall be equipped with a two way radio or cell phone, a type 1A-10BC fire extinguisher, and a 16-unit first-aid kit, which shall comply with 29 CFR 1910.151 and 1926.50 and be constructed of a weatherproof container.

Gloves and an approved motorcycle helmet with full face shield or goggles shall be worn at all times while operating an ATV.

ATVs are to be used off-road only and may not be driven at speeds greater than the posted speed limit, or that speed which is safe for the conditions with due regard for weather, terrain and environmental conditions, width and character of the roadway and any other conditions that may exist.

ATVs shall be driven during daylight hours only.

Only ATVs with four or more wheels are permitted to be used at remote site locations.

Seat belts shall worn at all times during the operation of an ATV on vehicles equipped with such.

Passengers are prohibited on ATVs.

All ATVs shall be equipped with a warning signal device, such as a horn.

4.6. Insurance

See Figure 3, entitled Subcontractor Insurance and Indemnity.

All charger carriers and rental or leasing companies shall comply with the minimum insurance requirements described in standard Company contract provisions.

Marine insurance shall be verified in addition to the standard subcontract insurance provisions. Aircraft insurance shall be verified for all aircraft charters, in addition to all standard subcontract requirements. As a rough rule-of-thumb, for marine or aircraft chargers, there should be $1 million of marine and aircraft liability insurance for each passenger and crew seat on the craft.

In all cases, the Company should be named as additional insureds. Waivers of subrogation should be obtained.

When non-Company employees are being transported in equipment owned or operated by the Company, a waiver and a hold harmless and indemnity agreement should be obtained from each non-Company employee prior to being transported and from that passenger's employer.

At least one week prior to the use of any marine or air charter equipment service, rental, or lease, certificates of insurance shall be sent to Pasadena Corporate Risk Management or appropriate Corporate Legal Counsel for review and approval.

5.0 REFERENCES

U.S. Army Corps of Engineers, Safety and Health Requirements Manual, EM 385-1-1, September 1996.

U.S. Department of Transportation Federal Aviation Regulations, CFR Parts 91 & 135, November 1996.

U.S. Coast Guard Regulations for vessels carrying 6 to 150 passengers, 46 CFR, Parts 166-199.

U.S. Coast Guard Regulations for recreational boats carrying fewer than 6 passengers, 33 CFR, Parts 173-183.

Federal Communication Commission Regulations, CFR 184, Parts 502, 510, 602, 610 and 47 CFR part 80.

U.S. Department of Transportation, 40 CFR.

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6.0 FIGURES

Boat & Marine Vessel Inspection Requirements

Survival Items and Emergency Supplies Required By the State of Alaska To Be On Board Aircraft

Subcontractor Insurance and Indemnity

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Figure 1

Boat & Marine Vessel Inspection Requirements

	Inspection Item ***(Ensure all documents and records are current and posted as necessary)***	Regulation
	Certificate of Documentation or State Certificate of Registration 46 CFR part 67 current stamp or valid registration	46 CFR part 173
	Certificate of Inspection USCG	46 CFR 176.100
	Certificate of numbers and/or vessel documentation	33 CFR 173.21
	Licenses	46 CFR 185.402
	Operator has valid original USCG license on board	46 CFR 26.20.1
	FCC Station/Radiotelephony Certificate	46 CFR 184.502
	Emergency Broadcast Placard	46 CFR 184.506
	Inflatable Survival Craft Placard(s)	46 CFR 185.518
	Life Jacket Placard (s)	46 CFR 185.516
	Type I PFD for each person on board (check regulation for area)	46 CFR 25.25-5
	Each PFD equipped with light if operating more than 20 miles from shore	46 CFR 25.25.13
	Each PFD has 31 sq. in. reflective tape (both sides)	46 CFR 25.25.15
	Vessels 26 ft and longer at least one USCG approved ring buoy	46 CFR 25.25(d)
	Marine type UL or USCG approved portable fire extinguishers	46 CFR 25.30-20(a)
	<26 ft = one B-1	
	26 ft to <40 ft = 2 B-1/ 1 B-II	
	40 ft and > = 3 B-1 or 1 B-1 & 1 B-II	
	Emergency Check List	46 CFR 185.510
	Emergency Instructions Posted	46 CFR 26.03-2
	Safety Orientation must be conducted prior to underway	46 CFR 26.03-1
	Drill and Training Record(s)	46 CFR 185.520
	Current Up-To-Date Charts of Operating Area and Nautical Publications	46 CFR 184.420
	Compass Deviation Card	46 CFR 164.35(c)
	Drug Testing Program	46 CFR 16 subpart b
	Evidence of valid drug test program	46 CFR part 16
	Passenger Safety Orientation (185.506)	46 CFR 185 subpart e
	Lifesaving Equipment (ensure float free)	46 CFR 185.740
	Distress Signals (container marked “DISTRESS SIGNALS”)	46 CFR 185.614
	Ring Buoy (inspect condition, location & stowage, line & reflective tape)	46 CFR 180.70
	Life Jackets (ensure number)	46 CFR 180.71
	Life Jacket Lights (check batteries for expiration date & inspection)	46 CFR 180.75
	Survival Craft (inspect condition and installation of survival craft)	46 CFR 185.730
	Rescue Boat (if applicable)	46 CFR 180.210
	First Aid Kit	46 CFR 184.710
	Portable Fire Extinguishers	46 CFR 181 subpart e
	Fixed Fire Extinguishing System	46 CFR 181 subpart d

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Figure 2

Survival Items and Emergency Supplies Required By the State of Alaska To Be On Board Aircraft

- [ ] Food for each occupant to sustain life for two weeks
- [ ] One ax or hatchet
- [ ] One first aid kit
- [ ] One pistol or shotgun or rifle
- [ ] One small gill net and an assortment of tackle
- [ ] One knife
- [ ] Two small boxes of matches
- [ ] One mosquito head net for each occupant
- [ ] Two small signaling devices such as colored smoke and flare pistol
- [ ] Small stove and emergency water for 4
- [ ] Space blankets
- [ ] One pair of snowshoes second pair optional (winter only)
- [ ] One sleeping bag (optional one for each passenger)
- [ ] One wool blanket for each occupant

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Figure 3

Subcontractor Insurance and Indemnity

Insurance

A. Coverage

At Subcontractor's sole cost and expense, Subcontractor and its sub-subcontractors and their lower tier subcontractors shall maintain in full force and affect the following minimum insurance during the life of the Subcontract including the warranty/guarantee periods. The Subcontractor shall be responsible for determining if additional insurance is needed and such additional insurance shall be obtained by the Subcontractor at its own expense. The issuance or maintaining of insurance of any type by Subcontractor or Contractor shall not be deemed or construed to release, limit, waive or discharge Subcontractor from any and all of the obligations and risks imposed by the Subcontract upon Subcontractor, including any liability in excess of the insurance coverages required herein. Neither shall any forbearance nor omission by Contractor to require proof of insurance from Subcontractor before permitting Subcontractor to proceed or continue with the Work be deemed a waiver of Contractor's rights or Subcontractor's obligations regarding the provisions of insurance under the Subcontract. Said insurance shall include coverage for all operations, subcontract work, contractual obligations and product and completed operations. Certificates of Insurance, which comply with the requirements of the Subcontract Documents and are acceptable to Contractor, shall be delivered to Contractor prior to Subcontractor commencing any Work hereunder.

(i) Workers' Compensation consistent with the statutory requirements of the state where the work is to be performed. Employers' Liability with limits of: $1,000,000 each employee for bodily injury by accident, or by disease $2,000,000 per occurrence.

(ii) Commercial General Liability Insurance with bodily injury liability limits of at least $5,000,000.00 for each person and $5,000,000.00 aggregate.

(iii) Commercial General Liability Insurance with property damage liability limits of at least $5,000,000.00 for each accident and $5,000,000.00 aggregate.

(iv) Business Automobile Liability Insurance covering owned, non-owned or hired with bodily injury limits of at least $1,000,000.00 for each person and $5,000,000.00 for each accident and property damage liability limits of at least $5,000,000.00 for each accident.

(v) Plus such additional insurance as may be required by the Subcontract Documents, e.g. ocean cargo marine, all risk builder's risk, contractor's equipment, U.S. Longshoreman's and Harbor Workers' Compensation Act, the Jones Act.

Commercial General Liability Insurance and other liability insurance shall be maintained on an occurrence basis and may be arranged under a single policy for the full limits required or by a combination of underlying policies with the balance provided by an Excess or Umbrella Liability Policy. All exclusions shall be deleted.

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Such insurance shall provide Contractor the right to engage its own attorney for the purpose of defending any legal action against the Named Insured and the Additional Insureds and that Subcontractor shall indemnify the Additional Insureds for costs and expenses, including attorneys' fees incurred, arising out of, or incurred in the defense of such action.

B. Insurance Certificates

Before starting the Work, Subcontractor shall deliver to Contractor an original certificate which shows that the insurance set forth hereinabove is in effect, which provides for no less than thirty (30) days prior written notice to Contractor from the insurer of material changes, cancellation or non-renewal, and verifies compliance with the Subcontractor's insurance requirements and terms as set forth in these paragraphs A through D. The policies of insurance shall contain a provision expressly extending the coverage thereof to contractual liabilities assumed by said Subcontractor under the Subcontract, including, but not limited to, Subcontractor's indemnity and other obligations set forth in the Paragraph entitled Subcontractor's Indemnity hereinafter, and shall name Contractor, its parent, subsidiaries, divisions, and affiliated companies and its and their officers, directors, employees, agents, heirs, assigns, successors in interest, and representatives, and Owner as additional insureds (hereinafter the "Additional Insureds"). The original certificate shall be delivered to Contractor's Construction Superintendent at the job site, and duplicate certificates shall be mailed to Contractor at 251 South Lake Avenue, Pasadena, CA 91101-3063, Attention: Insurance Department and to Contractor's Purchasing Department. Subcontractor shall submit copies of the policies should Contractor request them. The insurance set forth in subparagraphs (ii), (iii) and (iv) (and, as applicable, (v)) in paragraph A above shall be occurrence policies, shall contain cross-liability endorsements and shall be primary to any insurance carried by Contractor or Owner which shall be excess or secondary but noncontributing insurance. Subcontractor's aggregate limits as set forth in paragraph A above shall be per job or location and shall be exclusively for this Work and shall not be used or depleted from occurrences or claims unrelated to the Work. Each policy of insurance obtained by Subcontractor shall provide that the insurer shall defend any suit against the Additional Insureds, even if such suit is frivolous or fraudulent. All renewal and/or replacement insurance shall comply with all the terms and conditions set forth in the Subcontract and the other Subcontract Documents. Insurance certificates for renewal and/or replacement insurance must comply with all requirements set forth in the Subcontract and the other Subcontract Documents and must be delivered to Contractor's Construction Superintendent and mailed as provided above, prior to expiration of the previous policy(ies).

C. Waiver of Subrogation

With respect to any insurance Subcontractor may maintain, including but not limited to that set forth herein, Subcontractor warrants that Subcontractor has the right to waive any and all rights of subrogation which Subcontractor's insurance carriers might have or claim against Contractor or Owner, their agents, servants, employees, officers, heirs, assigns, successors in interest and representatives in connection with the Work. Subcontractor hereby waives all such present and future rights of subrogation and agrees to defend and indemnify Contractor or Owner, their agents, servants, employees, officers and representatives in connection with the Work from all such subrogation claims. The Subcontractor shall require of its sub-subcontractors similar waivers as provided in this paragraph and in subparagraph (iii) of paragraph D below. Subcontractor's and its sub-subcontractors' policies shall provide such waivers by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly and whether or not the person or entity had an insurable interest in the property damaged or person injured.

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D. Insurance and Bonds

(i) Subcontractor shall procure, carry and maintain on all its operations hereunder the bonds and policies of insurance in the amounts specified in the Subcontract or in the other Subcontract Documents. The bonds and policies of insurance shall be in such form and shall be issued by such company or companies admitted to do business in the state where the Work is to be performed and as may be satisfactory to Contractor. In the event Subcontractor shall fail to properly provide such requested insurance or bonds, or fails to provide the certificates as set forth herein or otherwise fails to comply with the terms and conditions set forth in these paragraphs A through D, Contractor may purchase such coverage and charge the expense thereof to Subcontractor, or terminate the Subcontract for default pursuant to subparagraph A of Article 17 of the Subcontract General Terms and Conditions and relet the Work to another subcontractor and all Contractor's costs and expenses incurred thereby shall be paid by Subcontractor. Subcontractor shall defend, indemnify and hold the Indemnities hereunder harmless from and against any and all Claims arising out of or in connection with failure of Subcontractor to comply with the provisions of these paragraphs A through D. Any deductibles applicable to said insurance policies are payable by Subcontractor.

(ii) Subcontractor assumes the responsibility to verify whether Builder's Risk Insurance coverage is provided. Subcontractor shall procure and maintain equipment and property insurance if not so provided by Contractor or Owner for risks covered by a standard Builder's Risk policy and including work stored off-site or in transit. Subcontractor warrants that the cost of any such insurance is included in the Subcontract Lump Sum payable hereunder to the extent such insurance is not provided by Contractor or Owner.

(iii) Subcontractor hereby waives all rights against Contractor and the Owner, separate contractors and all other subcontractors for loss or damage to the extent the same is or would be covered by Builders Risk or any other property or equipment insurance, except such rights as they may have to the proceeds of such insurance. All Work covered by the Subcontract done at the site or in preparing or delivering materials or equipment, or any or all of them, to the site shall be at the risk of Subcontractor exclusively until the completed Work is accepted by Contractor.

Subcontractor's Indemnity

A. To the fullest extent permitted by law with respect to the Work covered by the Subcontract, Subcontractor agrees to defend, indemnify, save and hold harmless, the Owner, and Contractor, and all their affiliates, parents, subsidiaries, divisions, directors, officers, agents, heirs, assigns, successors in interest, representatives and employees ("Indemnitees"), from and against the following: All claims, liabilities, demands, damages, losses, costs and expenses, including reasonable attorneys' fees, awards, fines and judgments, in law or in equity, of every kind and nature whatsoever ("Claims"), arising by reason of personal injury, the death of or bodily injury to persons (including employees of Subcontractor), design defects (if design originated from Subcontractor), damages or destruction of property or the loss of use thereof, arising out of or alleged to have arisen out of in whole or in part by, or in connection with, Subcontractor's operations to be performed under the Subcontract, or, any act or omission of Subcontractor, its suppliers and sub-subcontractors, or anyone for whose acts it may be liable; and Subcontractor expressly so agrees that it assumes such indemnity obligation without limit and without regard to the cause or causes thereof and whether or not said liability, claim, demand, loss, cost or expense arises in whole or in part from the acts or omissions (including the joint or concurrent, active or passive negligence) of the Indemnitees, but excluding the sole and exclusive negligence or willful misconduct of the Indemnitees. This indemnification shall

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survive the Subcontract and be enforceable as a separate agreement. Such obligation shall not be construed to negate or abridge or otherwise reduce any other right or obligation of indemnification or contribution which would otherwise exist in favor of the Indemnitees. Subcontractor acknowledges that for the purposes of indemnification of the Indemnitees under this paragraph, Subcontractor waives any claimed right to assert any workers' compensation immunity against the Indemnitees in suits brought by Subcontractor's employees in which any of the Indemnitees is made a party. The indemnities set forth herein shall not be limited by the insurance requirements set forth above. The prevailing party in an action to enforce this indemnity provision shall be entitled to recover all attorneys' fees and costs incurred from the losing party.

B. With regard to all Claims against the Indemnitees and other contractors or subcontractors, or any of their agents or employees, by any employee of Subcontractor, anyone directly or indirectly employed by Subcontractor or anyone for whose acts Subcontractor may be liable, the indemnification obligation under paragraph A above shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for Subcontractor under worker's or workmen's compensation acts, disability benefit acts or other employee benefit acts.

C. In the event of injury to or death of any person or loss of or damage to property or the loss of use thereof, arising as described in subparagraphs (1) and/or (2) below, it shall be assumed, as between Contractor and Subcontractor and until it has been finally determined otherwise, that the Indemnitees are entitled to be defended and indemnified by Subcontractor pursuant to the provisions hereof; and, in such event, Subcontractor and its insurer, irrespective of any allegations in the pleadings, shall defend any lawsuit or litigation brought against any of the Indemnitees with respect to any such injury, death, loss or damage:

(1) where such injury, death, loss or damage occurred to any employee of Subcontractor or of its sub-subcontractors of any tier; or

(2) where such injury, death, loss, or damage occurred by reason of an event or condition at or near the project site during and in connection with or arising out of or relating to the performance of Subcontractor's Work.

The Indemnitees shall be entitled at their expense to retain their own attorneys to assist and monitor counsel hired by Subcontractor and its insurer to defend the Indemnitees pursuant hereto.

D. All indemnification provisions set forth in the Subcontract and the other Subcontract Documents shall extend to Claims occurring after the Subcontract is terminated as well as while it is in force.

E. All defense obligations of Subcontractor as provided in the Subcontract and the other Subcontract Documents shall be at Subcontractor's own cost, expense and risk for all Claims that may be brought or instituted by third persons, including, but not limited to, governmental agencies. Subcontractor shall pay and satisfy any judgment or decree that may be rendered against any or all of the Indemnitees arising out of any such Claim, and/or, reimburse the Indemnitees from any and all legal expense incurred by any of them in connection herewith or in enforcing any of the indemnities granted in the Subcontract and the other Subcontract Documents.

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ATTACHMENT A-6

Project-Specific Forms

Exhibit 1: Site Project Safety and Health Agreement Sign-off Sheet
Exhibit 2: Approval of Modifications
Exhibit 3: Visitor Check-in Log
Exhibit 4: Safety Observation Report
Exhibit 5: Personal Air Monitoring Record Form
Exhibit 6: Exposure Monitoring Log
Exhibit 7: Authorization for Medical Treatment
Exhibit 8: Daily Health and Safety Report
Exhibit 9: Welding/Brazing/Hot Work Permit
Exhibit 10: Health and Safety Calibration Log
Exhibit 11: Accident and Incidents Procedure and Report Forms (HSEP 5.1)
Exhibit 12: Vehicle Accidents (HSEP 5.2)
Exhibit 13: Rental Equipment Condition Report for Automobiles/Trucks
Exhibit 14: Standard Equipment Inspection Form
Exhibit 15: Hazardous Material Exposure and Field Activity Report
Exhibit 16: Site Tailgate Meeting and Exclusion Zone Entry Log
Exhibit 17: ERS Incident Reporting Process
Exhibit 18: Drug, Alcohol, and Contraband Policy (HSEP 5.303)
USAED Equipment Inspection Forms
USACE Accident Investigation Report (Form 3394)
USACE Immediate Report of Accident (Form 265-R)

Exhibit 1

SITE PROJECT SAFETY AND HEALTH AGREEMENT SIGN-OFF SHEET

Title	Signature	Date
Project Team:	**"I have read and agree to abide by this SSHP."**	

Exhibit 2

APPROVAL OF MODIFICATIONS

Change Number	Effective Date	Table Number Changed	Content of Change	Jacobs Approval TERC Health and Safety Manager and Project Manager	Client Approval

Exhibit 3

VISITOR CHECK-IN LOG

Project Name:	Project No.:	Date:

Name	Representing	Destination	Time (24-Hour)	
			In	Out

Exhibit 4

SAFETY OBSERVATION REPORT

Date: _____ **Time:** _____ **Originator:** _____

Project: _____ **Supervisor:** _____

Location: _____ **Action Person:** _____

Observation:

Check Box That Applies:

- ☐ Safe Behavior Observed (No Further Action Required) Proper Procedures Followed
- ☐ Unsafe Behavior
- ☐ Unsafe Condition

☐ If Non-compliance describe non-compliance below:

Corrective Action:

Further Action or Help Needed?

Action Person Signature:	Date Closed:	Action Person Notified: Yes/No

Exhibit 5

AIR MONITORING RECORD

Employee Name: _____ **Employee No.:** _____ **Company:** _____ **Title:** _____

Project Name: _____ **Project Number:** _____

Date Sampled: _____ **Sampled By:** _____

Sampling Method and Analyte: _____

Collection Media:

____ Charcoal Tube ____ Filter (Total) ____ Passive Dosimeter Collector Mfg: _____

____ Silica Gel ____ Filter (Resp.) ____ Other: _____ Size/Type: _____

____ Chromosorb ____ Impinger _____ Lot #: _____

Sample Type:

____ Personal - TWA ____ Blank Does Sampling Represent Typical Exposure? _____

____ Personal Peak ____ Bulk Temperature _____ Collector Mfg: _____

____ Area ____ Other _____ Humidity: _____ Wind: _____

____ Source _____

Activities During Sample Collection:

_____

_____

Sample Pump: Mfg & Model #: _____ Serial #: _____

Calibrator: Type: _____ Mfg & Model #: _____ Serial #: _____

Calibration Date: _____ Calibrated By: _____

Sample #	Time On	Time Off	Total Time	Pre Cal Flow Rate	Post Cal Flow Rate	Average Flow Rate	Sample Volume	Analytical Result	TWA

Descriptive Data: (Engineering controls or PPE used, work activities, sample interferences etc.)

_____

_____

Date: _____ Signature: _____

Send results to: File; Project Manager; H&S; Employee

Exhibit 6

EXPOSURE MONITORING LOG

Project Name:	Project No.	Date:

Location Monitored:	Atmospheric Conditions:
Activity Monitored:	
Site No.	

		Readings								
Time (24-Hour Clock)	**Background**	**Monitor (depth)**	**FID (ppm)**	**PID (ppm)**	**%O_2**	**%LEL**	**H_2S**	**Mini-Ram**	**Other**	**Samplers Initials**

Exhibit 7

AUTHORIZATION FOR MEDICAL TREATMENT

TO: Dr. _____ Address: _____ Date: _____

This form signed by our representative is your authority to render treatment to:

_____
(Employee)

in accordance with the provisions of and under the conditions prescribed by the Workers' Compensation Act. Unless the case is an emergency, kindly obtain authorization for surgery, radical procedures, or hospitalization from the insurance carrier. Send your bill and report to us at the address listed below.

_____
Authorized Representative

Date of Injury: _____ Location: _____ Job No. _____

How Injury Occurred: _____

Please complete and return by mail to the following address to ensure prompt payment of charges:

Risk Manager
1111 South Arroyo Parkway
Pasadena, CA 99105

FOR DOCTOR'S USE ONLY

Diagnosis of Injury: _____

Disposition of Patient:

____ Occupational ____ Non-Occupational ____ Unable to Determine

____ Able to resume regular duties

____ Able to resume regular duties next workday

____ Able to resume restricted duties with the following limitations: _____

_____

____ Unable to return to work, estimated length of disability: _____

Return for follow-up visit on _____(Date)

_____
Doctor's Signature

Exhibit 8

DAILY HEALTH AND SAFETY REPORT

Contract Number / Delivery Order Number: _____

Project Title: _____

Location: _____

Date: _____ **List Contractors/Organizations Present:** _____

WEATHER CONDITIONS			
Temp Low:		Temp Hi:	Comments:

Wind Speed: _____ Conditions: _____

Zero Accident Process

Safe Plans of Action in effect today: **Yes** ☐ **No** ☐

Total Project SPAs generated to date: _____

Were any Safety Observation Reports (SORs) generated today? (List Individually) **Yes** ☐ **No** ☐

Total SORs for today: _____ Total SORs since mobilization: _____

Health and Safety Inspections

Check any of the following inspections performed today:

- ☐ Heavy Equipment
- ☐ Hand Tools
- ☐ Site Office
- ☐ Drill Rig
- ☐ Misc. Electrical
- ☐ Excavation
- ☐ PPE
- ☐ Other
- ☐ Cranes
- ☐ Storage Areas
- ☐ Sanitation Facilities
- ☐ Monitoring Instruments
- ☐ Misc. Equipment
- ☐ Exclusion Zone
- ☐ Operations

List:

Observation/Comments made during the daily inspections :

Air Monitoring

Was air monitoring performed within the breathing zone today?	☐ **N/A**	☐ **Yes**	☐ **No**
Did the air monitoring results exceed the PEL?	☐ **N/A**	☐ **Yes**	☐ **No**
Have Air Samples Been Collected for Laboratory Analysis?		☐ **Yes**	☐ **No**

TYPE OF TEST (personal, area, perimeter)	**TEST METHOD/MATRIX**	**QUANTITY OF SAMPLES**

General Health and Safety

WORKER PROTECTION LEVELS THIS DATE: ☐ LEVEL A ☐ LEVEL B ☐ LEVEL C ☐ LEVEL D ☐ N/A

Was any work activity conducted within a confined space?		☐ **Yes**	☐ **No**
Was any work activity conducted within an area determined to be immediately dangerous to life and health?		☐ **Yes**	☐ **No**
Were approved decontamination procedures used on workers and equipment as required?	☐ **N/A**	☐ **Yes**	☐ **No**
Was a Safety Tailgate Meeting held this day? (See attached)		☐ **Yes**	☐ **No**
Was there any “Lost Time” accidents this day? (If YES, attach copy of completed accident report)		☐ **Yes**	☐ **No**
Was hazardous waste/materials released into the environment? (If YES, attach copy of spill report)		☐ **Yes**	☐ **No**

(SM) _____ Health and Safety _____

Date _____ Date _____

Exhibit 9

WELDING/BRAZING/HOT WORK PERMIT PERMIT #_____

Issued by: _____

Approved by SSHO: _____

Date Permit Issued: _____ Time Permit Issued: _____ Expiration Date: _____

Operation to be Performed: _____

Location of Operation: _____

Special Precautions:

TESTING				
Location of Testing	**Time**	**Percentage of LEL**	**Percentage of O_2**	**Initials**

CHECKLIST			
Item	**N/A**	**Yes**	**Initials of Inspector**
Surround equipment and operation safe for hot work			
Tank purged			
Extinguisher present			
No combustibles within 35 feet of operation or items protected by covers or removed from area			
No flammables within 50 feet			
Worker has proper protective equipment to perform function			
Safety blankets available			
Flammable gases greater than 10% present additional precaution needed to perform operation			
Fire watch required			
Welding unit inspected			
Adequate ventilation available			

The location where the work is to be performed has been examined, necessary precautions taken to provide for worker safety and for the area to be a fire safe environment for performing these functions. Permission is granted for the work to be performed.

Signature of SSHO performing inspection and issuing the permit:

I am fully qualified to perform this operation and understand my responsibilities outlined by the inspection just conducted.

Signature of welder/on scene supervisor performing operation:

Exhibit 10

HEALTH AND SAFETY INSTRUMENT CALIBRATION LOG

Date	Time	Instrument	MFG Model #	Serial #	Calibration Gas	Lot #	Concentration	BKG Counts	Span Setting	Initials

Exhibit 11

HSE Accident and Incidents Procedure and Report Forms

Incident Reporting Process

HS&E Procedure – Accidents and Incidents

Exhibit 11 (continued)

HSE Procedure		Document No: HSEP 5.1	Page:
Accidents and Incidents		Supersedes: CHSP 5.1 CHSP 5.1.1 CHSP 5.1.2 CHSP 5.1.3	Rev. 2
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 1 Jun 97	Current Revision Date: 9 May 03

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1.0 PURPOSE AND SCOPE

Investigations, reporting, and recording of all accidents, incidents, and illnesses is a key step in detecting trends and establishing measures to prevent recurrence. For this reason, it is imperative that all accidents, incidents, and illnesses be reported, investigated, and documented. This includes non-injury events and dangerous occurrences.

This HSEP applies to all employees and company subcontractors engaged in operations covered by the HSE Manual.

For incidents involving motor vehicles, refer to HSEP 5.2. For environmental incidents, refer to HSEP section 22.

2.0 RESPONSIBILITIES

General responsibilities for HSE procedures implementation are stated in HSEP 1.5. Additional responsibilities specific to this HSEP include the following.

2.1 SITE MANAGEMENT

Site Management shall organize accident investigations and actively participate in them, as required.

Site Management is responsible for analysis of safety records to measure the effectiveness of preventive/follow-up actions and the ongoing safety program.

2.2 SUPERVISION

For accidents, incidents, and illnesses involving their personnel, Supervisors must

- Promptly report them to the HSE Department and to Site Management,
- Lead investigations, and
- Ensure that all records are completed in a timely fashion.

2.3 EMPLOYEES

Employees must immediately report all accidents, incidents, and illnesses to their Supervisor or the HSE Department.

2.4 SITE HSE DEPARTMENT REPRESENTATIVE

The Site HSE Supervisor shall

- assist Site Management in organization of investigations and participate in them,
- assist Supervisors in properly reporting and recording all accidents, incidents, and illnesses,

- establish and maintain all records required by this HSEP and regulatory agency recordkeeping requirements, and
- assist Site Management in the analysis of records to measure the effectiveness of preventive and follow-up actions and the ongoing HSE program.

3.0 DEFINITIONS

Accidents and Incidents	An unplanned, undesirable event, which disrupts work activity. This includes events that did not result in injury or property damage, but could have.
First Aid	Any one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which does not require medical care. Such treatment and observation are considered first aid even though provided by a physician or a licensed healthcare professional.
Illness	Any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases, which may be caused by inhalation, absorption, ingestion, or direct contact.
Injury	Any injury such as a cut, fracture, sprain, amputation, etc., which results from a work incident or from a single instantaneous exposure in the work environment. It should be noted, conditions resulting form animal bites, such as insect or snakebites, and from one-time exposure to chemicals are considered to be injuries.

4.0 PROCEDURE

In the event of a workplace incident involving injury or illness, the first priority is to provide the best assistance possible to employees who may need it and to ensure the safety of others who may be affected or acting as emergency responders.

4.1 ACCIDENT/INCIDENT INVESTIGATION

In order to eliminate incidents, both injury and non-injury, it is important to perform thorough investigations when accidents/incidents occur. An accident/incident investigation is not a fault-finding endeavor, rather it is a fact-finding effort. Immediate action taken to identify causes can be utilized to prevent recurrence of future incidents of a similar nature.

Investigations must be conducted whenever an accident/incident occurs, including non-injury and first-aid-type incidents. Participants in the basic investigation process should include, at a minimum:

- The person(s) involved and/or injured in the incident.
- First- and second-line supervisors of the person(s) involved in the incident.
- Site Manager or office manager.
- The local HSE professional.

In the event of serious incidents, it may be appropriate to add Company management and/or subject matter/discipline specialists to the investigation team.

The investigation team should examine the accident/incident scene, if appropriate, and then review all facts pertaining to the incident in a conference environment.

The task-specific safe work plan (Safe Plan of Action) should be examined as part of the investigation process.

4.2 INVESTIGATION REPORTS AND RECORDKEEPING

4.2.1 Investigation Report

The Accident/Incident Investigation Report (Figure 1) shall be completed by the first line supervisor as soon as possible following the incident. In the event of a serious incident, the responsibility for report preparation may be assigned to another investigation team member.

The original of the Accident/Incident Investigation Report shall be maintained at the jobsite. A copy shall be sent to the appropriate HSE Manager.

4.2.2 Witness Statement

The Witness Statement (Figure 2) shall be used to obtain a signed statement from witnesses of their factual observations, as soon as reasonably appropriate after the incident.

Statements should be written by the witness, however, another person may record his/her dictation if so requested by the witness.

Statements should be taken and prepared in a confidential and non-threatening environment.

Append the Witness Statement to the Accident/Incident Investigation Report.

4.2.3 Authorization for Medical Treatment

For incidents that require medical evaluation or treatment of a Company employee, a Company supervisor shall complete an Authorization for Medical Treatment form. A new form shall be sent with the employee upon each visit to the medical services provider. (See Figure 3 for a sample authorization form that can be tailored for local use.)

Ask the medical services provider to complete the disposition portion (lower half) of the form.

Since form distribution varies by location, check with the Corporate HSE Department for distribution in your area.

4.2.4 Employer's First Report of Injury (US Only)

For US operations, an Employer's First Report of Injury (E-1) shall be completed for all injuries, which require referral to a physician for either evaluation or treatment. Contact your HSE Department to arrange for completion of the E-1.

This report and required accompanying reports must be promptly sent to HSE for review and forwarding to the Risk Management Department.

4.2.5 First Aid Register

The First Aid Register (Figure 4) is the primary project injury log and must be kept on-site at all times.

All injuries and/or illnesses (job related or personal) treated or reported (actual or alleged) shall be entered in the log, no matter how minor.

4.3 COMMUNICATION OF INVESTIGATION FINDINGS

A review of the incident facts, identified causes, and actions to prevent recurrence should be documented and communicated to employees. Office and jobsite communications can take the form of safety meetings, Task Safety Analysis (TSA) meetings, etc. Findings should also be incorporated in future SPAs and task-specific safe work plans.

For incident findings that may be of value to other locations, Corporate HSE will circulate lessons learned in the form of Safety Alerts, Safety Shorts, Lessons Learned, etc.

4.4 RELEASES & EMPLOYEE EXPOSURES INVOLVING HAZARDOUS CHEMICALS

Incidents involving potential exposure to hazardous materials, including incidents on-site, in the office, during Company travel, and hazardous material releases in (EPA-RCRA in US) reportable quantities, must be reported to a Senior HSE Manager.

Report all releases or exposures even though the incident may be considered minor or even though no adverse health effects or symptoms are apparent at the time.

Further procedures and notifications of regulatory agencies and clients shall be followed as defined in the site-specific Health, Safety, and Environment Plan (HSP) or HASAP.

A copy of the investigation report shall be placed in the affected employee(s) corporate medical file.

The Site or Office Manager shall complete all other investigation and reporting requirements as outlined in this HSEP.

4.5 RECORDING WORK-RELATED INJURIES & ILLNESSES FOR REGULATORY PURPOSES

Many local HSE regulatory agencies have incident reporting, recording, and posting requirements, which will be followed by all Company entities operating in those areas. The local HSE Manager is responsible for ensuring compliance with these requirements.

4.5.1 Recordkeeping

For US operations, enter OSHA Recordable Cases within three days in the OSHA Form 300, the Log of Work-Related Injuries and Illnesses.

For US operations that are covered by MSHA, recordable cases shall be recorded on Form 7000-1, with copies sent to the designated MSHA offices within the 10th workday after learning of its occurrence.

Refer also to HSEP 5.3 for generation and maintenance of incident statistics.

4.5.2 Posting Requirements

For US operations, OSHA Form 300A, Summary of Work-Related Injuries and Illnesses, for the preceding year must be posted from February 1 to April 30.

When there were no injuries or illnesses during the year, zeros must be entered on the totals line, and the form posted.

4.6 SERIOUS OR FATAL INCIDENTS

Occasionally, serious incidents may occur at project sites or offices that involve Company employees or third parties (contractor, client, member of the public, etc.) and may include events such as

- Serious personnel injury and/or illness,
- Significant vehicle incidents,
- Significant equipment or structural damage, and/or
- Significant threat or damage to the environment.

In such cases, the following requirements may apply.

4.6.1 Internal Notifications

In the event of a fatal or serious incident, an immediate telephone report shall be made by the Site or Office Manager or Project Manager or the Site HSE Supervisor to the Operations Manager and Senior HSE Manager.

The Senior HSE Manager shall immediately notify the Vice President of HSE. The Operations Manager shall immediately notify the Group Vice President. These managers will notify other senior Company managers, as appropriate.

All notifications shall be made in person or via direct phone conversations, rather than by e-mail or voice messages.

4.6.2 Regulatory Agency Notifications

Notification to local, state, and Federal agencies will be made by Corporate HSE, if necessary.

For US operations, Fed-OSHA reporting requirements can be found in 29 CFR 1904.8.

4.6.3 Next of Kin Notification

Notification of the next of kin shall be coordinated through Corporate HSE or HR.

Notification shall be made in person by a member of Company management. If, in the event the employee's next of kin resides out of town or state, such notification should be coordinated through a local Company office or a local law enforcement organization.

Local management should consider the need for help with immediate, short-term transportation, lodging, or similar assistance for the next-of-kin.

4.6.4 Accident Investigation

The incident scene shall be secured immediately. No movement of material or equipment shall be made until a review of the incident scene has been completed and documented. (Securing equipment or material, which could result in further injury, may be done.)

A team comprised of representatives from HSE, Operations, and Legal will conduct the investigation. The Legal Department will direct the investigation in order to assure attorney-client privilege, as necessary.

Investigations shall include:

1. Obtaining from witnesses signed statements of their complete and factual observations, as defined above. In the case of certain serious incidents, local law-enforcement personnel may participate in, or conduct, collection of witness statements.
2. Ensuring that adequate photographs are taken from several angles. Release of photographs shall be coordinated through the HSE Department with proper approval by the site owner or client and Company Legal Department.
3. Documentation management for all photos, measurements, statements, and handwritten notes, etc., in a single file. The HSE representative may designate the contents of this file as confidential, "Attorney – Client Privilege", as directed by the Corporate Legal Department.

4.6.5 Media Relations

Some incidents may involve media interaction. Refer to Jacobs Global Policy Supplement, GPS1-105, Media Interaction, for directions and guidelines.

4.6.6 Client Assurance

The client shall be assured that the Company is professionally investigating the incident and will make the necessary program adjustments or recommendations to prevent recurrence.

4.7 TRAINING

Supervisors must be trained in proper accident/incident investigation techniques and the recording and reporting requirements.

The Accident/Incident Investigation Report (Figure 1) must be issued and reviewed as part of this training.

5.0 REFERENCES

29 CFR 1904, Recording and Reporting Occupational Injuries and Illnesses

U.S. Department of Labor, Bureau of Labor Statistics, Record-keeping Guidelines for Occupational Injuries and Illnesses (the “Blue Book”)

Exhibit 11 (continued)

FIGURES

Accident/Incident Investigation Report

Witness Statement

Authorization For Medical Treatment

First Aid Register

Exhibit 11 (continued)

Figure 1 - Accident/Incident Investigation Report

Date of Accident/Incident:_____ Time of Incident:_____ Company:_____

Date of Investigation:_____ Project Number:_____ Client:_____

Location of Accident/Incident:_____

Did injury result? Yes/No _____, If yes, provide Employee Name(s):_____

S.S. No.:_____ Skill:_____Yrs. in this Skill:_____Yrs. with Company:_____

Describe Type of Injury:_____

Was property damaged ? Yes/No _____, Describe damage/owner:_____

_____

Is damaged property secured/maintained? Yes/No_____, Person Maintaining_____

Names of Witnesses/Coworkers (With Social Security No.):_____

_____

Weather / Wind Conditions:_____

List/Describe all personal protective equipment (PPE) in use by person exposed or injured:_____

_____

If Chemicals Involved:

Name(s) of Chemical(s) Encountered:_____

_____

Form of Chemicals (Solid, Liquid, Gas, Vapor, Dust, Mist Fume):_____

Describe Radiological Materials (if any):_____

Volume or Quantity Released:_____

Description of Accident/Incident:_____

_____

_____

_____

_____

Contributing Factors:_____

Exhibit 11 (continued)

_____

What **corrective actions** are being taken to prevent recurrence? Also list the person responsible for implementing and the target completion date for each item.

_____

_____

_____

Was an SPA/JSA developed for the task being performed? Yes/No_____, If yes, attach a copy.

Was a permit issued? Yes/No _____, If yes, attach a copy of the permit in effect at time of the incident.

Indirect cause: **Lack of**: Training____, Resources____, Belief____ (*explain)

_____

Basic cause: **Failure to**: Plan____, Direct____, Organize____, Control____(*explain)

_____

INVESTIGATION TEAM MEMBERS:

Injured / Involved:	_____ Name	_____ Signature
Supervisor:	_____ Name	_____ Signature
Site/Office Manager:	_____ Name	_____ Signature
HSE Professional:	_____ Name	_____ Signature
_____ Name (Others)	_____ Title	_____ Signature
_____ Name (Others)	_____ Title	_____ Signature

Client Representative(s) Contacted:_____

Agency Representative(s) Contacted:_____

* Attach additional sheets and supplemental data & information as necessary.

** Distribution: Original must be filed on-site; 1 copy must be sent promptly to the Corporate Health and Safety Department.

Exhibit 11 (continued)

Figure 2 - Witness Statement

Please print or type.

Name:_____ Title:_____

Social Security Number:_____Date:_____ Time:_____

Temporary Address:_____ Phone No._____

_____

Permanent Address:_____ Phone No._____

_____

Location at Time of Accident:_____

Describe, to the best of your knowledge, what happened just before, during, and just after the accident:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Signature

Exhibit 11 (continued)

Figure 3 - Authorization For Medical Treatment

To: _____ Address: _____ Date: _____

This form, signed by our representative, is your authorization to render **initial** medical treatment only to:

_____
(Employee)

in accordance with the provisions of, and under the conditions prescribed by, the Workers' Compensation Act. Unless the case is an emergency, kindly obtain authorization for surgery, radical procedures, or hospitalization from the insurance carrier.

Fax this completed form to (*enter here the fax number for the local Jacobs Risk Management office point of contact*)

Send your bill and report to (*enter insurance carrier's mailing address and name of point-of-contact to whom the report and bill should be sent*)

_____
Authorized Jacobs Representative

Date of Injury _____ Location _____ Job No. _____

How injury occurred _____

_____

For Doctor's Use Only

Diagnosis of Injury: _____

Disposition of Patient: ☐ Occupational ☐ Non-Occupational ☐ Unable to determine

☐ Able to resume regular duties.

☐ Able to resume regular duties next workday.

☐ Able to resume restricted duties with the following limitations: _____

_____

☐ Unable to return to work; estimated length of disability: _____

Return for follow-up visit on _____ (Date)

Discharged from care on _____ (Date)

_____
(Doctor's Signature)

Exhibit 11 (continued)

Figure 4 - First Aid Register

Company:_____

Project Name/Number:_____

Jobsite Location:_____

Month / Year:_____

Site or Office Manager:_____

Page: _____ of _____

Date	Time	Name	Supervisor Or Foreman	Type of Injury, Body Part, and Brief Description of Injury	Class*

***Class** - Classification: **FAV** - First Aid Visit **E-1** - Doctor's Visit **OSHA** - OSHA Recordable **Other:**

Exhibit 12

HSE Procedure – Vehicle Accidents

Exhibit 12

Work Instruction HSE Procedure		Document No: HSEP 5.2	Page: 5-25 of 3
Vehicle Accidents		Supersedes: HSEP 5.2	Rev. 3
Issuing Department: Corporate HSE	Approval: Mike.Coyle@Jacobs.com	Previous Rev. Date: 23 Aug 01	Current Revision Date: 1 Apr 03

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FIGURES

Figure 1 - Vehicle Accident Report

1.0 PURPOSE AND SCOPE

This Health, Safety, and Environment Procedure (HSEP) provides the minimum procedures to be followed in the event of a vehicle accident involving a Company owned or leased vehicle or a personal vehicle used for Company business and to any other motor vehicle, e.g. personal or borrowed and "third party motor vehicles", used by personnel engaged in Company business. This procedure addresses all motorized vehicles including cars, trucks, busses, all-terrain vehicles, golf carts, etc.

2.0 RESPONSIBILITIES

General responsibilities for HSE procedures implementation are stated in HSEP 1.5. Additional responsibilities specific to this HSEP include the following.

2.1 MANAGEMENT

Each Manager will ensure that Company Risk Management Department accident report forms are maintained in each Company vehicle under his/her control.

The appropriate manager must review all Vehicle Accident Reports with the employee and supervisor involved.

2.2 SUPERVISOR

Supervisors shall promptly report any vehicle incidents to operations management, HSE, and Corporate Risk Management.

Supervisors of employees involved in vehicle accidents must investigate the accident and complete the Vehicle Accident Report (Figure 1) with input from the person(s) involved in the incident and witnesses to the incident.

Copies of completed reports shall be promptly submitted to the Company Risk Management Department, to Corporate HSE, and to the office or operations program manager.

2.3 EMPLOYEE

Employees are responsible to promptly report all vehicle accidents to their supervisor or appropriate manager.

Employee drivers involved in vehicle accidents shall assist their supervisor or manager with completion of a Vehicle Accident Report.

2.4 CORPORATE RISK DEPARTMENT

The Corporate Risk Department distributes accident report forms, which are to be maintained in each vehicle covered by this HSEP.

2.5 HUMAN RESOURCES DEPARTMENT

The appropriate Human Resources Department will obtain a signed copy of the Motor Vehicle Operator Qualification form (HSEP 21.2) for each qualified operator.

3.0 DEFINITIONS

Qualified Operator	Personnel who been designated and authorized by the Company to operate motor vehicles on Company business.
Vehicle	Motorized vehicles, including cars, trucks, busses, all-terrain vehicles, golf carts, etc.

4.0 PROCEDURE REPORTING

Accident report forms shall be maintained in all vehicles owned, leased by the Company, or personal vehicles utilized for Company business. The forms are supplied by the Corporate Risk Management Department.

The form shall also be used in filing reports of accidents involving equipment vehicles (on-site or offsite) such as cherry pickers, backhoes, trucks, cars, etc.

Supervisors of employees involved in vehicle accidents must investigate the accident and complete the Vehicle Accident Report (Figure 1) with input from the person(s) involved in the incident and witnesses to the incident.

The report shall be distributed as follows:

- Corporate Health, Safety, and Environment
- Site or Manager's File
- Jacobs Vehicle Management Group
- Corporate Risk Management

Each incident will be investigated by a representative of the Corporate HSE Department in order to identify the cause and to determine measures to be taken to prevent a similar recurrence.

Disciplinary action and/or retraining may be required for any employee involved in a vehicle accident.

4.1 POST-INCIDENT ACTIONS

Vehicle operators shall be given instructions by their supervisor or an HSE representative on how to report an accident and what to do at the scene.

- Stop at once to investigate.
- If necessary, have someone call for emergency medical services.
- Call the police if the incident occurs on public property.
- Do not admit liability, even if you feel you are at fault.

- Do not discuss the incident with anyone at the scene other than the police, and only answer questions asked by them.
- Do not provide a written statement to anyone unless approved by Corporate Legal or Corporate Risk Management.
- Do not move vehicle until cleared by the police or unless local ordinances require moving vehicles after an accident.
- If possible, obtain names, addresses, license numbers, and phone numbers of any witnesses.
- Promptly notify your supervisor after an incident and assist with completion of the Vehicle Accident Report (Figure 1).
- Obtain from Risk Management an Automobile Loss Notice form and complete and submit to Risk Management.

5.0 REFERENCES

HSEP 21.2

Exhibit 12 (continued)

FIGURES

Vehicle Accident Report

Figure 1 - Vehicle Accident Report

Claim Reporting
Risk Management Dept.Toll Free: 877/832-1721 Phone: 832 351-7146 Fax: 832 351-7712

Company Name _____
Date of Accident _____Time of Accident _____
Location of Accident _____
Project No. _____ Vehicle No. _____

Company Vehicle
Driver _____ Date of Birth _____
Work Address: _____
Home Address: _____
Work Phone No. _____ Home Phone No. _____
Supervisor Name/Phone _____
Vehicle Owner _____ Make and Model _____
License No. _____ Vehicle Identification No. _____
Name(s) of Passengers: _____

Other Vehicle
Driver _____
Home Address of Driver _____
Work Phone No. _____ Home Phone No. _____
Driver's License No. (Including State) _____
Vehicle Owner _____ Make and Model_____
Relation of Driver to Owner _____
Insurance Company _____
Insurance Agent _____ Policy No. _____

Description of Accident
_____
_____
_____

Description of Damage To Vehicle
Company Vehicle: _____
Est. Repair Cost $_____ Where Vehicle Can Be Seen:_____

Other Vehicle: _____
Est. Repair Cost $_____ Where Vehicle Can Be Seen_____

Injuries/Witnesses

Company Vehicle: Name and Age of Injured ☐ Witnesses ☐ _____

_____

Relation to Driver of Company Vehicle _____

_____

Name of Investigating Officer:

_____

Badge No. _____Police Report Number _____Citations_____

Other Property Damage

Owner's Name, Address, and Phone No.

_____

_____

Describe Damage

_____

_____Report

submitted by _____ Date _____ _____

Diagram of Accident

Exhibit 13

RENTAL EQUIPMENT CONDITION REPORT FOR AUTOMOBILES/TRUCKS

CLIENT _____ PROJECT NO. _____

VEHICLE TYPE _____AGENCY RECEIVED FROM _____MAKE/MODEL _____ MILEAGE Out _____

MILEAGE In _____

"Yes or No" Where Appropriate "G" - New or in Good Condition "R" - Requires Repairs "N" - Items Not Applicable

BODY & INTERIOR

☐ Inspection Sticker _____ ☐ Upholstery _____

☐ License/Sticker_____ ☐ Heater/Defroster _____

☐ Door Locks _____ ☐ Air Conditioner _____

☐ Door Handles _____ ☐ Steering _____

☐ Lighting System _____ ☐ Floor Boards/Mats _____

☐ Body _____ ☐ Paint _____

ENGINE & OPERATING SYSTEMS

☐ Oil Level and Condition _____ ☐ Oil Leaks _____

☐ Operating Condition _____ ☐ Cooling System/Hoses _____

☐ Water Level/Anti-Freeze _____ ☐ Transmission _____

☐ Tire Condition/Lugs _____ ☐ Transmission Level/Condition _____

☐ Battery Condition __ _____ ☐ Corrosion/terminal Connections_____

☐ Tire Pressure _____ ☐ Lug Nuts_____ ☐ Fan/ Alternator_____ ☐ Belts _____

☐ Control Panel, Gauges _____ ☐ Spare Tire _____

☐ Jack, Tire Tool _____ ☐ Exhaust System _____

☐ Windshield Wipers _____ ☐ Brakes _____

☐ Windows, Windshield _____ ☐ Parking Brake _____

Exhibit 13 (continued)

REMARKS:
Initial Inspection By _____ Date _____

Exhibit 14

STANDARD EQUIPMENT INSPECTION FORM

Make	Type	Year of Manufacture	Date	Model	Serial No.	Hours	Employee ID	Inspector Name

Fill in appropriate boxes	Company Name		Engine	Attachment	Attachment
	Supervisor Name				

A. SERVICE CHECKS PRE-FIELD MOBILIZATION:

ITEM	*OK*	*AMT NEEDED*	ITEM	*OK*	*AMT ADDED*
Radiator & Freeze Protection			Batteries		
Transmission			Differential/Plan		
Final Drives			Tandems		
Engine			Fuel Level		
Hydraulic System			Drain Fuel Sediment		
Lubrication Points			Pivot Shaft		

B. EQUIPMENT INSPECTION PRE-FIELD MOBILIZATION

	CONDITION Bad/Good/ Excellent	*Attn Needed*	**Explanation**	*Corrected? (Y/N)*
Engine Compartment				
Radiator				
Fan & Shrouds				
Air Induction and Filter				
Belts Pulleys				
Exhaust & Rain Cap				
Battery & Cables				
Hydraulic Cylinders				
Operators Comp.				
Controls & Linkages				
Hoses & Lines				
Oil Leaks				
Fuel Leaks				
Coolant				
Fasteners				
Cracks				
Guards & Covers				
Cutting Edges				
Sprockets				
Rollers & Idlers				
Tracks or Tires				

Exhibit 14 (continued)

B. EQUIPMENT INSPECTION PRE-FIELD MOBILIZATION (continued)

	CONDITION Bad/Good/ Excellent	***Attn Needed***	**Explanation**	***Corrected? (Y/N)***
Engine				
Governor Control				
Trans Operation				
Trans Linkage				
Steering System				
Service Brakes				
Parking Brake				
Unusual Noise				
Gauges Operational				
Gauges Normal				
Backup Alarm				
Heater & Fan				
Switches				
Wipers & Washer				
Lights				
Horn				
Seat & Seat Belts				
Windows				
Doors				
General Appearance:				
Machine Damage:				

NOTES:

Exhibit 14 (continued)

NOTES (continued)**:**

Deficiencies noted: ☐ Yes ☐ No Explain: _____

Deficiencies fixed: ☐ Yes ☐ No Date: _____

Inspection 100% complete ☐ Yes ☐ No

Subcontractor Signature _____ Date all items passed inspection: _____

Jacobs Representative _____ Date: _____

Exhibit 15

HAZARDOUS MATERIAL EXPOSURE AND FIELD ACTIVITY REPORT

Employee's Office Location: Anchorage

For: _____Month Year

Name of Employee: _____

CHECK HERE FOR: ____"NO SITE VISITS"

PART I - SITE VISITS TO NON-EXCLUSION ZONES

SITE NAME/ LOCATION	ACTIVITY	DURATION OF SITE VISIT (HOURS)

PART II - SITE VISITS TO EXCLUSION ZONES (For additional room, use back of form)

SITE NAME/ LOCATION	ACTIVITY	CHEMICAL OR OTHER MATERIALS PRESENT	EXPOSSURE POTENTIAL (I.M.S.)	DURINGTION OF SITE VISIT HOURS	LEVEL OF PROTECTION USED

***I = Incidental** Potential for exposure is 1/10 or under the exposure limit level.
M = Moderate Potential for exposure is >1/10 up to, but not including, the exposure limit level.
S = Significant Potential for exposure at or above exposure limit level.

_____
EMPLOYEE SIGNATURE DATE

Return to: Cheri' Harris Jacobs Engineering, 4300 B Street, Suite 600, Anchorage, AK 99503 (907) 751-3449

Exhibit 16

SITE TAILGATE MEETING and EXCLUSION ZONE ENTRY LOG

Facility: _____ Conducted by: _____

Date: _____ Time: _____

Client: _____ Project Number: _____

Specific Location: _____

Type of Work: _____

Chemicals Brought to Site: _____

_____

MSDSs available: _____Yes _____No

HEALTH AND SAFETY TOPICS PRESENTED

Protective Clothing/Equipment: _____

_____

Chemical Hazards: _____

_____

Physical Hazard: _____

_____

Emergency Procedures: Apply First Aid and notify Health and Safety immediately _____

_____

Hospital/Clinic: _____

Address: _____

Special Equipment: _____

_____

Evacuation Route: _____

_____

ATTENDEES

Entered Exclusion Zone	Printed Name	Company	SS#	Signature
__Yes __No				
__Yes __No				
__Yes __No				
__Yes __No				
__Yes __No				
__Yes __No				
__Yes __No				

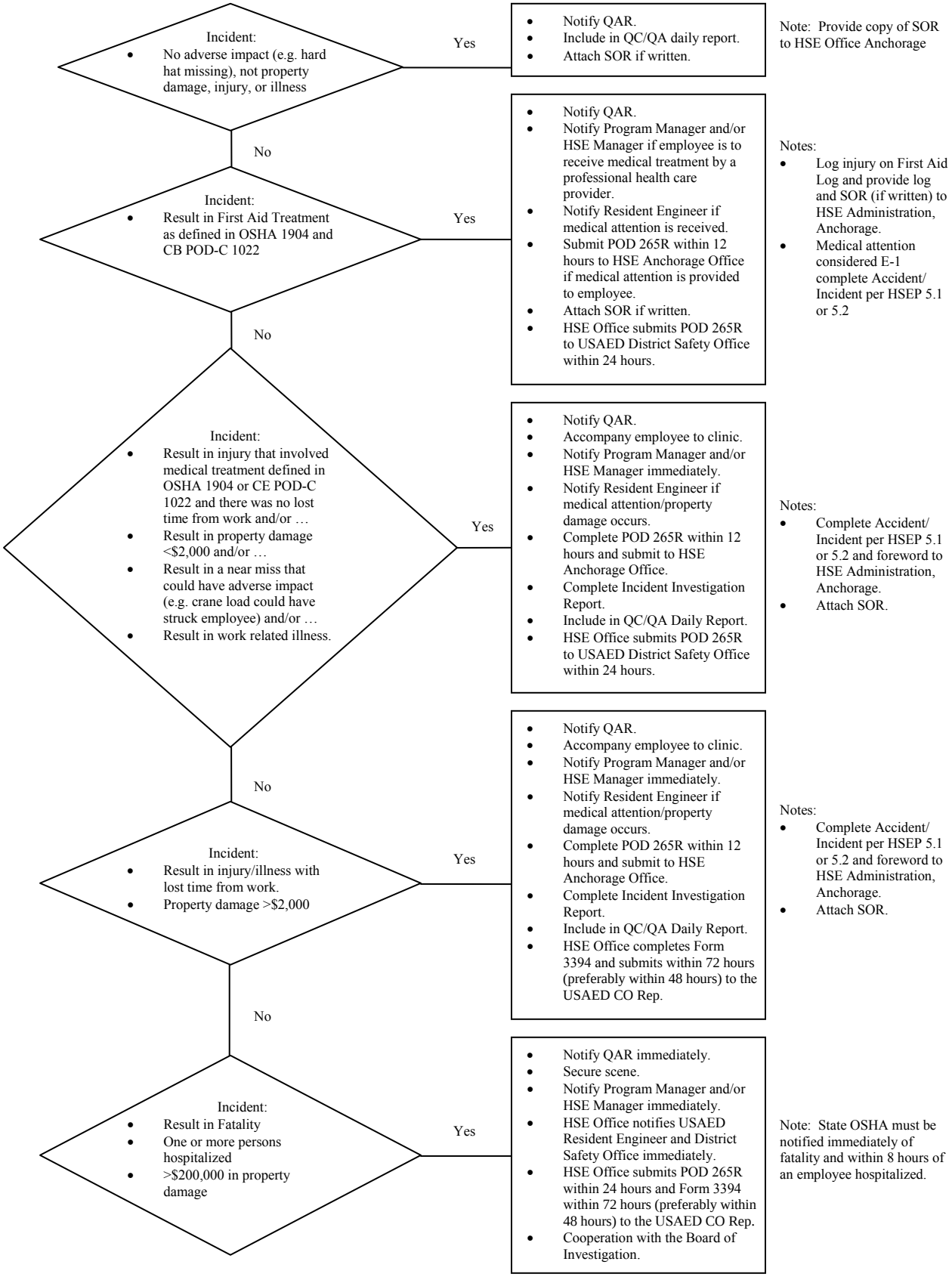
Exhibit 16 (continued)

ATTENDEES

Entered Exclusion Zone	Printed Name	Company	SS#	Signature
__Yes __No	_____	_____	_____	_____
__Yes __No	_____	_____	_____	_____
__Yes __No	_____	_____	_____	_____
__Yes __No	_____	_____	_____	_____
__Yes __No	_____	_____	_____	_____
__Yes __No	_____	_____	_____	_____
__Yes __No	_____	_____	_____	_____

Exhibit 17

ERS INCIDENT REPORTING FLOWCHART



Review checklist while completing front page of SPA. Check all that apply.

A new SPA is required if the job scope or work conditions change.

Required Permits	Hazards	Safe Plan
☐ Confined Space	☐ Overhead Utilities	☐ Power de-energization required ☐ Insulation blankets required ☐ Wire watcher required
☐ Critical Lift		☐ Required clearance distance = _____Ft. ☐ Safe work zone marked
☐ Hot Work	☐ Crane or other Lifting Equipment	☐ Signalman assigned ☐ Tag lines in use ☐ Area around crane barricaded
☐ Lock Out/Tag Out		☐ Lifting equipment inspected ☐ Personnel protected from overhead load
☐ Soil Disturbance (Over 12")	☐ Underground Utilities	☐ Reviewed as-builts ☐ Subsurface surveys ☐ Received dig permit
☐ Utility Clearance		☐ Required clearance distance = _____ Ft. ☐ Safe work zone Marked
Required PPE	☐ Electrical	☐ Lock Out/Tag Out/Try Out ☐ Permit required? ☐ Confirm that equipment is de-energized
☐ Hard Hat, Class C		☐ Reviewed electrical safety procedures
☐ Hard Hat, Class E *(Elect. Protect)*	☐ Excavations	☐ Permits ☐ Inspected prior to entering ☐ Proper sloping/shoring
☐ Ear Plugs/Ear Muffs		☐ Barricades provided ☐ Access/egress provided ☐ Protection from accumulated water
Eye Protection:	☐ Fire Hazard	☐ Hot Work Permit ☐ Fire Extinguishers ☐ Fire watch
☐ Safety Glasses		☐ Adjacent area protected ☐ Unnecessary flammable material removed
☐ Face Shield	☐ Vehicular Traffic or Heavy Equipment	☐ Traffic Barricades ☐ Cones ☐ Signs ☐ Flagmen ☐ Lane closure
☐ Chemical Goggles		☐ Communication with equipment operator
☐ Welding Hood	☐ Noise >85 dB	Hearing protection is required: ☐ Ear plugs ☐ Ear Muffs ☐ Both
Hand Protection:	☐ Hand & Power Tools:	☐ Inspect general cond. ☐ GFCI in use ☐ Identified PPE required for each tool
☐ Cut Resistant Gloves		☐ Reviewed safety requirements in operators manual(s) ☐ Guarding OK
☐ Welders Gloves	☐ Hand Hazards	List sharp tools, material, equipment: _____
☐ Nitrile Gloves		☐ PPE gloves, etc. ☐ Protected sharp edges as necessary
☐ Surgical Gloves	☐ Manual Lifting	☐ Reviewed proper lifting tech. ☐ Identified material requiring lifting equipment
☐ Rubber Gloves		☐ Hand protection required ☐ Back support belts
☐ Elect. Insulated Gloves	☐ Ladders	☐ Inspect general cond. before use ☐ Ladder inspected with in last quarter
☐ Arm Sleeves		☐ Ladder tied off or held ☐ Proper angle and placement ☐ Reviewed ladder safety
Foot Protection:	☐ Scaffolds	☐ Inspect general condition before use ☐ Tags in place ☐ Properly secured
☐ Sturdy Work Boots		☐ Toe boards used ☐ Footings adequate ☐ Materials properly stored on scaffold
☐ Safety Toe Boots	☐ Slips, Trips Falls	☐ Inspect for trip hazards ☐ Hazards marked ☐ Tools & material properly stored
☐ Rubber Boots		☐ Extension cords properly secured ☐ Work zone free of debris
☐ Rubber Boot Covers	☐ Pinch Points	List potential pinch points: _____
☐ Dielectric Footwear		☐ Working near operating equipment ☐ Hand/Body positioning
Respiratory. Protection:	☐ Working w/ Chemicals	☐ List specific chemicals involved and list hazards and precaution on front side.
☐ Dust Mask		☐ Reviewed MSDS ☐ Exposure Monitoring required ☐ Have proper containers and labels.
☐ Air Purifying Respirator		☐ Identified proper PPE (respirators, clothing, gloves, etc.)
☐ Supplied Air Respirator	☐ Asbestos or Lead Paint Potential	☐ Areas to be worked may contain asbestos or lead paint ☐ Asbestos controls incorporated
☐ SCBA		☐ Lead based point controls in place ☐ Exposure monitoring conducted.
☐ Emergency Escape Respirator	☐ Heat Stress Potential	☐ Heat stress monitoring (>85°) ☐ Liquids available ☐ Cool down periods
Special Clothing:		☐ Sun Screen ☐ Reviewed Heat Stress symptoms
	☐ Cold Stress Potential	☐ Proper clothing (i.e.. gloves, coat, coveralls) ☐ Wind chill <32°
☐ Tyvek ®		☐ Reviewed Cold Stress symptoms ☐ Warm up periods
☐ Poly Coated Tyvek ®	☐ Environmental	☐ Air emissions ☐ Water discharge ☐ Hazardous wastes ☐ Other wastes
☐ Fire Resistant Coveralls		☐ Pollution prevention ☐ Waste minimization
☐ Rain Suit	☐ Natural or Site Hazards	☐ Weather ☐ Terrain ☐ Adjacent operations or processes ☐ Biological hazards
☐ Safety Vest		☐ Animals/reptiles/insects hazards
Fall Protection:	☐ Adjacent Work/Processes	☐ Notified them of our presence ☐ Other workers adjacent, above, or below.
		☐ Coordinated with adjacent supervisor/customer/operator ☐ Need barriers between.
☐ Harness	☐ Barricades/covers	☐ Caution barricade tape required ☐ Danger barricade tape required ☐ Rigid railing required
		☐ Covers over opening ☐ Warning signs required
☐ Double Lanyard Required	**Additional Information:**	
☐ Anchorage Point Available		
☐ Additional Anchorage Connector Needed e.g. Cross Arm Strap, etc.		
☐ Retractable Device Needed		
☐ Horizontal Life Line System Req'd.		
☐ Fall Clearance Distance Adequate		
☐ Fall Rescue/Retrieval Plan Set Up		

Exhibit 18

JACOBS

Human Resources Policy		Document No: 5-303	Page: 1 of 9
Drug, Alcohol and Contraband Policy		Supersedes: 5-303	Rev. 5
Issuing Department: Human Resources	Approval: Patricia.summers@jacobs.com	Previous Rev. Date: 08/01/1999	Current Revision Date: **01/01/05**

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1.0 PURPOSE OF PROCEDURE

Jacobs Engineering Group Inc., its subsidiaries and affiliated companies (hereinafter, "the Company"), recognizes its responsibility to employ all necessary measures to ensure a safe and healthful working environment for employees, to protect and preserve our property and that of others, and to cooperate with our clients in our mutual efforts to provide safe and efficient operations while maintaining conditions conducive to attaining the highest possible work standards.

This responsibility, in a potentially dangerous industry, which demands comprehensive safety measures, extends not only to the protection and well being of our employees and job sites, but to our customers, the community, and general public as well. Our commitment to the protection of our employees, property and the public is evidenced by the implementation of programs and procedures, which ensure compliance with appropriate safety measures and all applicable laws and regulations.

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The current applicable version of this publication resides on Jacobs' Intranet. All copies are considered to be uncontrolled.

2.0 PROCESS OBJECTIVE

This Drug, Alcohol, & Contraband Policy sets out the Company's policy and procedures regarding: (i) the illegal use, sale, possession, transfer, or other misconduct involving drugs; (ii) the use and misuse of legal drugs; (iii) alcohol use and misuse; and (iv) the possession of illegal or contraband items, such as weapons and drug paraphernalia, prohibited by law or by Company policy.

3.0 SCOPE OF APPLICATION

This policy applies, without exception, to all employees, job applicants, and subcontractors working at a Company job site or at a customer's job site. Employees who are subject to federal drug and/or alcohol testing requirements (for example, U.S. Department of Defense, Energy, or Transportation drug- and alcohol-testing regulations) will be so notified and must comply with this policy and with the applicable policy implementing those regulations. Employees who are covered by a collective bargaining agreement may be subject to different terms and will be notified of any modifications to this policy.

4.0 PROCESS REQUIREMENTS

The Company strictly prohibits the unlawful use, sale, attempted sale, manufacture, possession, conveyance, purchase, attempted purchase, distribution, cultivation, transfer, or dispensing of any illicit substance, at any time and in any manner. This prohibition includes the use or possession of prescription medications for which the employee does not have a valid prescription.

4.1 ILLICIT DRUG USE

"Illicit substance" includes all drugs, narcotics, inhalants and intoxicants for which possession or misuse is made illegal under federal, state, or local law, and includes prescription medication for which the individual does not have a valid prescription. Prescription medication and over-the-counter drugs used in a manner inconsistent with prescription or dosing directions also are considered illicit drugs, as may be other chemical intoxicants used in a manner inconsistent with their intended purpose. Alcohol also is a drug subject to abuse, although its use and misuse is treated separately under this policy.

4.2 ALCOHOL USE AND MISUSE

The use or abuse of alcohol while on the job or in a Company vehicle is strictly prohibited. Management for such functions as dinners, conferences, award ceremonies and celebrations may authorize alcohol purchase or consumption. However, the use or abuse of alcohol off the job, which impairs performance on the job, is prohibited. Employees are prohibited from reporting to work with alcohol in their systems and from bringing any alcoholic beverage to the work location. A confirmed test result between 0.020 and 0.039 percent alcohol may result in a suspension of 24 hours. Prior to returning to work, a negative alcohol test must be obtained. A confirmed positive test showing the presence of 0.04 percent or more alcohol in an employee's system is a violation of this policy.

4.3 USE OF PRESCRIPTION MEDICATIONS

Employees who use prescription and/or over-the-counter medication, which could impair their ability to perform safely, are responsible for notifying their immediate supervisor or the Health Services Department so that steps can be taken to minimize the safety risks posed by such use. Any information about an employee's use of medication will be treated as confidential and shared with Company personnel on a need-to-know basis. It is each employee's responsibility to consult with his or her health-care provider and/or to review relevant dosing instructions to determine whether the use of that medication could lead to impairment. No medication containing alcohol should be used during or immediately before an individual's scheduled shift, unless by prescription. The Company reserves the rights to transfer, reassign, or, if necessary, place an employee on leave of absence if the employee may pose a safety risk while using medication.

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4.4 CONTRABAND

The Company also prohibits the use, possession, distribution, or sale of any drug paraphernalia, "look-alike" drugs, firearms, weapons, unauthorized explosives, stolen property, or other contraband while on Company business and/or at any job site or premises. "Contraband" is any item the use or possession of which is prohibited by law, Company policy, or work rules. Job sites and premises include all Company property, including Company-owned motor vehicles, Company quarters, Company parking lots, and any other location at which Company employees may work, including client job sites and premises.

5.0 SEARCHES

If the Company suspects that an employee or on-site contractor is in possession of illegal drugs, alcohol, or contraband in violation of this Policy, the Company may request the individual to submit to a search of his or her person, personal effects, vehicles, lockers, baggage, and Company quarters. In addition, the Company may periodically conduct searches of individuals entering or leaving work sites at random. By entering into or being present at a job site, while on Company time, or representing the Company in any way, an individual is deemed to have consented to such searches. If an individual is asked to submit to a search, and refuses, that individual will be considered insubordinate and will be escorted off the job site and disciplined, as appropriate.

Searches will be conducted by management personnel and may or may not be conducted in the presence of the person whose property or work area is searched. Any suspected contraband will be confiscated, and may be turned over to law enforcement as appropriate. The Company representative conducting the search will give any person whose property is confiscated a receipt for that property.

6.0 FEDERAL DRUG-FREE WORKPLACE ACT OF 1988

To fulfill its obligations under the Federal Drug-Free Workplace Act of 1988, the Company requires any employee working directly or indirectly on a Federal Government project who is convicted of any drug-related crime occurring in the workplace to notify the Company within five (5) days of the conviction. The Company is required to notify the government agencies with which it contracts within ten (10) days of any employee's conviction on such charges. Education regarding the dangers of illegal drug use and alcohol abuse will be provided as detailed in Section V, below. The Company will impose discipline for employees convicted of any offense involving illegal drugs, up to and including dismissal from employment.

7.0 EMPLOYEE ASSISTANCE

The Company encourages employees who believe they have a problem with alcohol or drugs, legal or illegal, to seek assistance. The Company offers employees access to its Employee Assistance Program (EAP), which can offer referral to appropriate services and rehabilitation programs that emphasize education, prevention, counseling, and treatment. Moreover, employees may be eligible for a leave of absence to participate in such a program. Employees may ask for an appointment with the EAP Coordinator assigned to your location, in writing or in person, by contacting the appropriate Human Resources representative or the Health Services Department. Each request for assistance will be treated as confidential, and only those persons with a "need to know" will be informed of an employee's request.

Although requests for assistance are confidential, entering such a program cannot absolve nor protect employees from the consequences of substandard work performance or policy violations. Therefore, it is the responsibility of each employee to seek assistance *before* the employee's alcohol- or drug-abuse problems lead to a violation of this or another Company policy justifying disciplinary action.

An employee's decision to seek help voluntarily will not be used as a basis for disciplinary action against the employee, although the employee may be transferred, given work restrictions, or placed on leave, as the Company deems appropriate, while the employee seeks assistance and/or until the employee is drug- and alcohol-free. An employee's decision to seek assistance under this policy will be considered voluntary *only* if the employee seeks assistance *prior* to being found in violation

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of this policy or being asked to take a drug and/or alcohol test.

Regardless of how an employee determines to seek assistance, a failure to successfully complete a recommended course of treatment to the Company's satisfaction will be grounds for termination.

All employees returning to employment following rehabilitation will be required to sign a Return-to-Work Agreement, which will include:

- An agreement that the employee will continue to participate in any follow-up treatment and/or counseling recommended by the treatment provider, to the provider and the Company's satisfaction;
- A requirement that the employee submit to unannounced follow-up testing, for a period of up to two (2) years as recommended by the employee's rehabilitation provider, to encourage and insure the employee remains drug and/or alcohol free;
- An agreement that a refusal to submit or a positive drug and/or alcohol test during this period shall be grounds for immediate dismissal; and
- An agreement that the employee understands that s/he must maintain an acceptable attendance and performance record, and must comply with all other Company policies at all times.

8.0 EDUCATION

As part of the Company's efforts to encourage employees to become or remain drug-free, information and training will be provided on an on-going basis, as the Company deems appropriate, regarding the effects of drug and alcohol abuse. The local Personnel Department will assist with employee and supervisory education and training regarding the dangers of drug and alcohol use in the workplace. Materials on drug and alcohol use will be made available to both employees and supervision. The Company will also provide periodic supervisory training to assist in identifying the behavioural and physiological signs of alcohol and drug use.

9.0 DRUG & ALCOHOL TESTING

In furtherance of its goal of ensuring a substance abuse free workplace, the Company has established the following drug and alcohol testing procedures for its employees and applicants for employment.

The Company may require employees and job applicants to submit urine, saliva, hair, blood, sweat, and/or breath samples for the purpose of checking for the presence of illicit drugs or alcohol, for both job applicants and employees, as defined in sections 9.1 and 9.2.

9.1 JOB APPLICANTS

All job applicants must take and pass a mandatory drug test as soon as practical following their acceptance of a conditional offer of employment, and prior to the actual time they commence employment with the Company. Applicants who apply to safety-sensitive positions at client projects may also be asked to agree to comply with the client's substance-abuse prevention rules, and will be notified of any such requirements at the time of the conditional offer of employment.

Job applicants who test positive for illicit drug use will not be hired.

Any applicant who tests positive for drugs may not re-apply for a position with the Company for at least six months.

A job applicant's refusal to submit to drug testing, or attempt to tamper with, substitute for, adulterate, dilute, or otherwise falsify a test sample will result in denial of employment.

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9.2 CURRENT EMPLOYEES

9.2.1 Reasonable Suspicion Testing

The Company may require employees to submit to drug and/or alcohol testing whenever Company management has information about an employee's conduct that would cause a reasonable person to believe that the employee is demonstrating signs of impairment due to alcohol or drugs, appears unfit for duty, or is otherwise in violation of this Policy.

9.2.2 Post-Incident Testing

The Company may ask employees who are involved in a workplace incident which results, or could have resulted in an injury to any person requiring medical attention (other than first aid), and/or property damage, to submit to post-incident tests for drugs and/or alcohol as part of the investigation of any such incident.

9.2.3 Unannounced Testing

Employees are subject to unannounced drug testing and those who work in safety-sensitive positions will be subject to unannounced alcohol testing, depending upon the nature of their assignment and responsibilities, as well as upon the drug- and alcohol-testing requirements of the Company's customers if the employees are to work on a customer's job site or project. Employees who are subject to this requirement will be so notified at the time they are conditionally offered employment with the Company or are offered a transfer to a position subject to such testing. Employees subject to testing may be selected at random or by other means, such as by job classification or work site.

9.2.4 Follow-Up Testing

Unannounced follow-up testing may be required as a condition of continued employment during and after an employee has participated in a treatment program for drug or alcohol abuse, as recommended by the employee's substance-abuse treatment provider and approved by the Company, for a period not to exceed two years.

9.2.5 Pre-Access/Pre-Assignment Testing

If an employee accepts a safety sensitive position or is transferred from one position or job site to another safety sensitive position or job site with different testing requirements, that employee may be required to take and pass a drug and/or alcohol screen before being allowed access to the job site.

9.2.6 Consequences of a "Positive" Test

An employee whose alcohol or drug test is positive, regardless of the reason for the test, is considered to be in violation of Company policy and will be subject to adverse employment action, up to and including termination. Termination will be the standard disciplinary action unless there is a collective bargaining agreement, statutory requirement or other legal prohibition to termination. Anyone terminated for violation of this policy may not re-apply for a position with the Company for a minimum of six months.

9.2.7 Refusing a Test

An employee or job applicant's refusal to submit to drug and/or alcohol testing will be considered insubordination and grounds for disciplinary action, up to and including termination. Attempts to tamper with, substitute, adulterate, dilute, or otherwise falsify a test sample are grounds for termination, and furthermore are punishable under criminal statutes in several states.

10.0 PROCEDURES FOR DRUG AND ALCOHOL TESTING

10.1 CONSENT

No alcohol test will be administered, sample collected, or drug test conducted on any sample without the written consent of the person to be tested. A person's refusal to submit to a proper test will be viewed as insubordination and will subject the employee to disciplinary action, up to and

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including termination. The Company will pay the costs of all drug and/or alcohol tests it requires of job applicants and employees.

10.2 COLLECTION AND CHAIN-OF-CUSTODY

Persons being tested will be asked to provide a test sample by the collection site person. Procedures for collection of urine specimens will allow for reasonable individual privacy, unless there is a reason to believe the individual may alter or substitute the specimen to be provided. Urine samples will be tested for temperature, and may be tested for adulterants or subject to other validation procedures, as appropriate. The collection site person and the person being tested will maintain chain-of-custody procedures at all times, and will follow the specimen collection procedures endorsed by the U.S. Department of Transportation for federally mandated testing.

10.3 TESTING METHODS

All urine samples will be screened using an immunoassay technique and all presumptive positive tests will be confirmed using gas chromatography/mass spectrometry (GC/MS) or other equally sensitive methodology. A certified laboratory will perform all confirmatory tests. The Company currently tests for cannabinoids (marijuana), cocaine metabolites, amphetamines (including methamphetamines), opiates, phencyclidine (PCP), and alcohol, and may test for other illicit drugs at its discretion or as required by a client or by federal regulations, in which case, employees will be advised of the substances for which the Company or the client may test. Typically, breath and/or saliva tests will be used to detect the presence of alcohol, and positive tests will be confirmed with a second breath test. An alcohol test will be considered positive if it shows the presence of 0.04 percent or more blood-alcohol content. Tests will seek information about the presence of drugs and alcohol in an individual's system, and will *not* test for any other medical condition.

10.4 NOTIFICATION

Any individual who tests positive for illicit drug use will be so notified by an independent Medical Review Officer ("MRO") (typically, a medical doctor with an expertise in toxicology), and given an opportunity to provide the MRO with any legitimate reasons he or she may have that would explain the positive alcohol or drug test.

If the individual provides an explanation acceptable to the MRO that the positive drug-test result is due to factors other than the consumption of alcohol or illicit drugs, the MRO will order the laboratory to disregard the positive test and will report the test as negative to the Company.

Individuals may request a copy of their own positive test result. In addition, an individual who tests positive for drugs may request that his or her positive urine sample be sent to an independent laboratory for a second confirmatory test, at the individual's expense, although the Company may suspend, transfer, or take other appropriate action against the individual pending the results of any such re-test.

All test results will be treated as confidential, and disseminated within the Company only on a need-to-know basis. Test results will not be released outside the Company without the written consent of the tested individual, except when necessary to defend an action in an administrative proceeding or court of law or otherwise required by a court of law.

10.5 COMPLIANCE WITH ALL APPLICABLE LAWS

The Company will implement this policy, including its drug and alcohol testing policy, in a manner that complies with relevant federal, state, and local law.

11.0 ATTACHMENTS

Return to Work Agreement

Consent

Employee Notification

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RETURN TO WORK AGREEMENT

DRUG, ALCOHOL AND CONTRABAND POLICY
POST REHABILITATION/TREATMENT/COUNSELING

As consideration for the Company granting the request for continued employment or re-employment, the following conditions shall prevail:

1. The Employee shall submit to the Company proof of his or her enrolment in an alcohol and/or abuse follow-up treatment, counselling or rehabilitation program. Proof of Employee's attendance at all required sessions must be submitted to the Company on a weekly basis. Attendance will be monitored closely.

2. For a period of two (2) years, the Employee agrees to voluntarily submit to testing for alcohol and/or illegal drugs on a random basis as requested by the Company. The Employee's failure of such test during this period or the Employee's refusal to submit to such testing shall be grounds for immediate termination.

3. The Employee must maintain an acceptable attendance and performance record and comply with all other Company policies upon his or her return to work. For a period of two (2) years, any absence by the Employee will require a written doctor's certificate detailing the reason for such absence. If such absence(s) is the result of alcohol and/or illegal drug use, the Employee will be terminated.

4. The costs of rehabilitation not covered by the group medical insurance plan of the Company shall be borne by the Employee.

5. Nothing in this Agreement alters your status with the Company. The Company desires your employment relationship with it to be successful.

6. Failure of the Employee to comply with all of the above conditions will result in the Employee's immediate termination.

I voluntarily agree to all of the above conditions and I sign this Agreement on my own free will, without duress.

Date	Applicant/Employee Signature
Witness Signature	Applicant/Employee Printed Name
Witness Printed Name	Applicant/Employee Social Security No.

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CONSENT

To Submit to Drug and/or Alcohol Testing
As a Condition of Employment with
Jacobs Engineering Group Inc.,
(its subsidiaries and affiliated companies hereinafter, "the Company")

I, _____, hereby consent and agree to drug and/or alcohol testing as a condition of consideration for employment and/or continued employment by the Company. I further acknowledge that I have been informed of, and have agreed to comply with the Company's Drug, Alcohol & Contraband Policy.

I understand that information regarding the test results may be used as grounds for adverse employment action, including denial of employment and/or termination of my employment with the Company.

I further understand and acknowledge that:

1. The Company will pay the cost of all required drug and/or alcohol tests;
2. The test results will be released to the Company and may be used by the Company in determining any adverse employment action that may be taken against me,
3. If the laboratory results of my drug and/or alcohol test indicate a "positive" result, I will have an opportunity to discuss and rebut that result by consulting with a Medical Review Officer; and to request a second confirmatory drug test on that sample, at my own expense; and that the Medical Review Officer will determine whether there is a legitimate medical explanation for any "positive" drug test and;
4. I have the right to refuse to submit to such testing; understanding, however, that my refusal to submit to, or to cooperate with such testing shall be considered a refusal to submit to testing subject to denial of employment or termination in accordance with the Company's Drug, Alcohol & Contraband Policy.

I agree that the Company has made no representations, inducements, or statements, other than those in writing, about the testing, and that I consent to be tested.

I hereby further certify that the Company has provided me with a copy of its Drug, Alcohol & Contraband Policy; that I have read and do understand that Policy; and that I agree to abide by the terms and conditions of the Policy.

_____	_____
Date	Applicant/Employee Signature
_____	_____
Witness Signature	Applicant/Employee Printed Name
_____	_____
Witness Printed Name	Applicant/Employee Social Security No.

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EMPLOYEE CERTIFICATION

Jacobs Engineering Group Inc.,
(Its subsidiaries and affiliated companies hereinafter, "the Company")

I hereby certify that the Company has provided me with a copy of its Drug, Alcohol & Contraband Policy; that I have read and understand the Policy; and that I agree to abide by the terms and conditions of the Policy. I do understand that nothing in this policy is intended to create a contract, and I agree that no such contract is created by this Policy.

_____	_____
Date	Employee Signature
_____	_____
Witness Signature	Employee Printed Name
_____	_____
Witness Printed Name	Employee Social Security No.

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SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

RIGGING AND WIRE ROPE CHECKLIST NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1 Has all defective rigging as specified in Appendix F been removed from service? (15.A.01)			
2 Is the hoist rope being wrapped around the load? (15.A.02)			
3 Are running lines located within 6'6" of ground or working level guarded? (15.A.03)			
4 When hoisting loads, is a positive latching device used? (15.A.05)			
5 Have hooks, shackles, rings, pads, etc. showing excessive wear or been bent, twisted, or damaged been removed from service? (15.A.06)			
6 When two wires are broken, rusty, or corrosion is found adjacent to a socket or end fitting, is the wire rope removed? (15.B.01) **Note:** Check end fittings on boom support, pendants. guy ropes, etc.)			
7 Is the clip attached to the live wire on wedge sockets? (15.B.04)			
8 Except for eye splices in ends of wire for wire rope slings, is wire rope used in hoisting, lowering, or pulling load one continuous piece without knot or splice? (15.B.07)			
9 Are wire rope clips used to splice wire rope? (15.B.09)			
10 Are only alloyed type chains used in rigging? (15.C.01)			
11 Are hooks, links, or fasteners made from bolts and rods used? (15.C.04)			
12 Is protection provided between the sling and sharp surfaces of the load to be lifted? (15.E.02)			
13 Are open hooks used in rigging to hoist loads? (15.F.07)			
14 Are shoulderless eye bolts loaded at an angle? (15.F.10)			

REMARKS:

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	FORMS, FALSEWORK AND CONRETE OPERATIONS NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Have the forms been planned and designed in accordance with pertinent provisions of **ACI Publication 34FR and ANSI A 10.97**? (27.B.02)			
2	Has the design of formwork and falsework been submitted for review to designated authority? (27.B.02)			
3	Is sufficient bracing provided to prevent buckling or displacement? (27.B.05)			
4	Is safe access to the operations provided? (21.A.01)			
5	Are portable ladders secured top and botton? (21.D.08)			
6	Do the portable ladders extend at least 3 feet above platform, roof, or landing? (21.D.01 (b))			
7	Do ramps, stairs, walkways have guard and intermediate rails complete with toe boards? (21.B.01)			
8	Are floor openings, ladderways, roof openings guarded with rails and intermediate rails? (21.A.05)			
9	Where inclined ramps exceed 1'/5', are transverse cleats provided? (21.F.01 and 21.F.04)			
10	Is overhead protection provided to prevent falling objects from striking workers or public? (05.A.12 and 05.D)			
12	Is a flagman provided when the point of operations is not in view of the operator? (08.B.03 and 08.B.04)			
13	Are blade guards provided for power screeds or concrete finishers? (27.A.04)			
14	Are vibrators, concrete finishers, portable electric tools properly grounded? (11.C.01 (b))			
15	Are protective clothes and equipment (boots, gloves, goggles, etc.) provided when pouring concrete? (05.A.01)			
16	Are good houskeeping practices enforced during construction? (14.C.01)			
16a	Tools, material, extension cords, hoses, and debris shall not cause tripping or other hazards. (14.C.04)			
16b	Protuding nails, rods, wires shall be removed, hammered down, or bent over. (14.C.08)			
17	Is shoring inspected prior to, during, and immediately after placement of concrete? (27.B.06)			
18.	During welding or cutting operations, is protection from arc flashes, sparks, slags, etc., provided? (10.A.04)			

REMARKS:

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	CRANE/DERRICK INSPECTION CHECKLIST NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Are the following documents with the crane at all times? (16.C.01)			
1a	Operating manual from the manufacturer for the specific crane being inspected.			
	(1) Any operator aids for which the crane is equipped?			
1b	Load rating chart for the crane which shall include:			
	(1) the crane make and model, serial number, and year of manufacturer			
	(2) load ratings for all crane operating configurations: including optional equipment			
	(3) wire rope type, size, and reeving; line pull, line speed and drum capacity			
	(4) operating limits in windy or cold conditions			
1c	Crane log book that shows operating hours, inspections, tests, maintenance & repair. **Note:** Has log been updated daily when crane is used, and is signed by operator & supervisor? **Note:** Mechanics shall sign after conducting maintenance or repairs.			
2	Does operator have certification that he meets operator qualification and training as stated in 16.C.04 and Appendix G?			
3	Has a hazard analysis for set-up and set-down procedures (mobilization, assembly, dismantling, etc.). (16.C.07)			
4	Are adequate clearances provided from electrical sources, fixed objects, and swing radius. (16.C.08)			
5	Is communications provided as required? (16.C.10)			
6	Has inspection been performed in accordance with 16.C.11 and Appendix H?			
7	Have performance load tests been in accordance with 16.C.12?			
8	Are tag lines used to control loads? (16.C.15)			
9	Is critical lift plan required? (16.C.17 and page 285)			
10	Are all environmental considerations of 16.C.18 being met?			
11	Is crane equipped with boom angle indicator, load indicating device, means to visually determine levelness, and anti-two block devices. (16.D.01)			
12	Are cable supported booms equipped with boom stops? (16.D.02)			
13	Are booms lowered to ground or secured when not in use? (16.D.07)			
14	Do all floating cranes and derricks meet the requirements of 16.F?			
15	Are all moving parts (gears, drums, shafts, belts, etc.) and all hot surfaces (exhaust lines, pipes, etc.) guarded? (16.B.03)			
16	Does the unit have a suitable fire extinguisher? (16.A.26) **NOTE:** Minimum 5 BC			

Remarks:

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	CRAWLER TRACTORS-DOZERS NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Are inspection records kept available as part of the project files? (16.A.01 (b))			
2	Has equipment been inspected and tested by a competent person and certified to be safe? (16.A.02 (a) (b))			
3	Are only designated qualified operators assigned to operate mechanized equipment? (16.A.04)			
4	Are sufficient lights provided for night operations? (16.A.11)			
5	Is the unit shut down before refueling? (16.A.14)			
6	Does the unit have a suitable fire extinguisher - 5 BC min.? (16.A.26)			
7	Is there an effective, working, reverse alarm? (16.B.01)			
8	Are moving parts, shafts, sprockets, belts, etc., guarded? (16.B.03 (a) and 16.B.07 and 16.B.13)			
9	Is protection against contact with hot surfaces, exhaust, etc., provided? (16.B.03 (b))			
10	Are all fuel tanks located in a manner to prevent spills or overflows from running onto engine exhaust or electrical equipment? (16.B.04)			
11	Are exhaust discharges from equipment so directed that they do not endanger persons or obstruct the view of the operator? (16.B.05)			
12	Are seat belts provided? (16.B.08)			
13	Is protection (grills, canopies, screens) provided to shield operator from falling or flying objects? (16.B.10 and 16.B.11)			
14	Is adequate roll over protection provided? (16.B.12)			

REMARKS:

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	DRAGLINE INSPECTION CHECKLIST NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Are the following documents with the crane at all times? (16.C.01)			
1a	Operating manual from the manufacturer for the specific crane being inspected.			
	(1) Any operator aids for which the crane is equipped?			
1b	Load rating chart for the crane which shall include:			
	(1) the crane make and model, serial number, and year of manufacturer			
	(2) load ratings for all crane operating configurations: including optional equipment			
	(3) wire rope type, size, and reeving; line pull, line speed and drum capacity			
	(4) operating limits in windy or cold conditions			
1c	Crane log book that shows operating hours, inspections, tests, maintenance & repair. **Note:** Has log been updated daily when crane is used, and is signed by operator & supervisor? **Note:** Mechanics shall sign after conducting maintenance or repairs.			
2	Does operator have certification that he meets operator qualification and training as stated in 16.C.04 and Appendix G?			
3	Has a hazard analysis for set-up and set-down procedures (mobilization, assembly, dismantling, etc.). (16.C.07)			
4	Are adequate clearances provided from electrical sources, fixed objects, and swing radius. (16.C.08)			
5	Has inspection been performed in accordance with 16.C.11 and Appendix H?			
6	Are cable supported booms equipped with boom stops? (16.D.02)			
7	Is boom lowered to ground or secured when not in use? (16.D.07)			
8	Are all moving parts (gears, drums, shafts, belts, etc.) and all hot surfaces (exhaust lines, pipes, etc.) guarded? (16.B.03)			
9	Does the unit have a suitable fire extinguisher? (16.A.26) **NOTE:** Minimum 5 BC			

REMARKS:

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	CLEARING, GRUBBING, AND SNAGGING NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Are adequate first aid kits provided? (03.A.03 and 06.D.01)			
2	Does each work group have two qualified first aid & CPR persons? (03.A.02)			
3	Where workers are exposed to water hazard, are life vests worn? (05.I.01)			
4	Is the following protective equipment provided and used when necessary? (05.A) Head Foot Eye Hand Leg chaps			
5	Have dozers and clearing equipment been provided with suitable protection for operators (canopies, grills, etc.) ? (16.B.10 and 16.B.11)			
6	Is rollover protection provided when necessary? (16.B.12)			
7	Are suitable fire extinguishers available? (16.A.26)			
8	When machines are idle, are dozier blades, crane booms, etc., lowered to the ground or deck? (16.A.09)			
9	When being fueled or serviced are the machines shut down? (16.A.08 , 14)			
10	Are operators qualified? (16.A.04)			
11	Is gasoline and other fuel stored and dispensed in a safe manner? (09.B)			
12	Are fuel tanks properly vented and identified as to contents? (09.B.01 , 12)			
13	Do fuel tanks above ground have UL listed auto-closing valve without a latch-open device? (09>b.29 (a))			
14	Is gasoline for power saws transported in safety cans or approved containers? (09.B.12)			
15	Where floating cranes or draglines are used in snagging, is the barge of sufficient size so as to be comparatively stable during operations? (16.F.03)			
16	Are lists of standard hand signals and load rating plates posted in view of the operator? (8.B.02 and 16.C.01) **NOTE:** All test & requirements for cranes, derricks, draglines are applicable.			
17	On barge-mounted cranes not secured to the deck, has the C.O.R. authorized a travel limit or barrier to prevent overtipping or instability? (16.F.06 and 16.A.20)			
18	Is safe access provided? (16.B.03 (e) and 26.B.01) **NOTE:** Riding on hooks, buckets, etc., is prohibited. (16.C.04)			
19	Is a properly equipped life boat available for operations over or near water? (05.J.01)			
20	Have power saws, hand axes, brush blades been inspected for safe operating condition and use? (13.A.02) **NOTE:** Unsafe tools shall be removed from service.			
21	Are moving parts and lines adequately guarded? (15.A.03 and 16.B.03)			
22	When burning is necessary on clearing contracts, are the prohibitions and requirements listed below followed: a. Approved by the Government representative. (09.A.13 (a)) b. Contact with proper authorities? (09.B.13) c. No burning during periods of high fire hazard. (09.A.13 (b)) d. Sufficient equipment & men available for fire control. (09.A.13 (c)) e. No flammable liquid with flash point below 100 F shall be used to kindle fires. (09.B.06)			
23	Are crane operators qualified and has the required training been done? (16.C.04)			

SAFETY INSPECTION FOR CONSTRUCTION ACTIVITY
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	BUILDING CONSTRUCTION NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Is safe access provided to all work areas? (21.A.01)			
2	Are guardrails, intermediate rails, and toe boards installed on ramps, steps, runways, scaffolds, and other working surfaces 6 feet or more in height? (21.B.01 and 30.A.07)			
3	Does the free-standing metal scaffold or tower working platform height exceed 3 times the smallest base dimension? (22.C.06)			
4	Does planking meet the requirements listed in 22.B.06?			
5	Are all planks on metal scaffolds cleated at both ends to prevent movement? (22.B.06)			
6	Are supporting members of scaffolds placed on unstable objects such as barrels, boxes, loose bricks, concrete blocks, etc.? **THIS IS A VIOLATION.** (22.B)			
7	Do rolling scaffolds have a positive locking device to prevent accidental movement? (22.C.06 (c))			
8	Are rolling scaffolds moved only from the base? (22.C.06 (c))			
9	Are safety nets used where scaffolds, catch platforms, or temporary floors are impractical? (21.C.10)			
10	Have the nets been tested and are they inspected daily? (05.G.01)			
11	Are safety belts and life lines furnished workers on structural steel erection, bins, hoppers, steep slopes, swinging scaffolds, etc? **NOTE:** Life lines shall be separately attached of attended. (21.C)			
12	Are portable ladders secured top and bottom so as to be stable? (21.D.08 (d))			
13	Do portable ladders have a safe pitch? (21.D.08 (b))			
14	Have guardrails been provided for all floors, roof holes and wall openings 4 feet above adjacent floor? (24.A.01 and 24.A)			
15	Are means provided to prevent tools, materials, etc. from falling when work is performed overhead? (13.A.04)			
16	When welding and torch work is being performed, is protection from arc flashes, slag, and heat provided? (10.A.04)			
17	Are ladders, stairways, & passageways kept clear of hoses, cables, & other equipment? (10.A.05)			
18	Are compressed gas cylinders secured in an upright position? (20.D.10)			
19	Is fire extinguishing equipment provided? (09.E.01-06 & 13.A.06-09 & 14.A.05)			
20	Are provisions made to prevent welding cables from being used near high tension wires? (10.E.08)			
21	Are provisions made to prevent welding leads from contacting metal parts of supporting suspended scaffolds? (10.E.09)			
22	Is welding equipment shutdown when not used or leads are unattended? (10.E.11)			
23	Are circular portable power saws equipped with automatic blade guards? (13.C.01 (a))			
24	Are personal protective devices and equipment provided and their use enforced? (05.A)			
25	Is all welding apparatus and equipment being inspected daily? (10.A.02 & 10.D.04)			
26	Are all fuel gas-oxygen units used in welding or cutting operations equipped with reverse-flow check valves installed between torch and hoses? (10.D.07 (b))			

27	Are oxygen/acetylene units permitted to be used with the acetylene regulator adjusted to permit a discharge of greater than 15 psig? (10.D.12) **THIS IS A VIOLATION.**			
28	Are safety lashings provided at quick make up connections between tool and hoses when using pressurized equipment? (20.A.16)			
29	Do manually operated air tools with flexible hoses have an automatic shut-off valve to prevent whipping and lashing? (20.A.15)			
30	Is the temporary wiring guarded, elevated, buried, or isolated so as to prevent contact? (11.D)			
31	Are wire guards provided for light bulbs? (11.O.06)			
32	Are all 120 volt, single phase, 15 & 20 ampere, receptacle outlet circuits which are not a part of the building's permanent wiring provided with ground fault circuit interrupters for personnel protection? (11.C.05)			
33	Are all flood and/or work lights grounded? (11.C.01 (c))			
34	Is a signal person provided when work area is hidden from equipment operators? (08.B.03)			
35	Are crawling boards, life lines, temporary decking, etc. furnished to prevent workmen on roofs from falling? (27.H.01)			
36	Is hoist lift or other approved means used to raise materials and tools to roofs over 16 feet high? (27.H.02)			

REMARKS:

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	CRAWLER MOUNTED BACKHOES, POWER SHOVELS, EXCAVATORS, FRONT-END LOADERS NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Is the unit equipped with a suitable fire extinguisher (5BC)? (16.A.26)			
2	Is a safe means of access to the cab provided (steps, grab bars, non-slip surfaces)? (16.B.03 (d))			
3	Is the operator protected against weather, falling or flying objects? (16.B.10 and 16.B.11)			
4	Are seat belts and adequate rollover protection provided where applicable? (16.B.08 & 16.B.12)			
5	Are sufficient lights provided for night operations? (16.A.11)			
6	Have brakes been tested and found satisfactory? (16.A.07 (d))			
7	Does the unit have an emergency brake system? (16.A.07 (d))			
8	Can the emergency system be activated from cab? (16.A.07 (d))			
9	Have air tanks been tested and certified? (20.A.01 (b) (c)			
10	Is an air pressure gage in working condition installed on the unit? (20.A.12)			
11	Does the air tank have an accessible drain valve? (20.B.18)			
12	Are the units equipped with windshield wipers, defrosting and defogging equipment that are in good operating condition? (16.A.07)(c)			
13	Is there an effective reverse signal where applicable? (16.B.01)			
14	Has the unit been inspected and certified mechanically safe by a qualified person before being placed in use? (16.A.01)			
15	Is the record of the test available? (16.A.01 (b))			
16	Are pressurized cylinders, actuating booms, outriggers, etc., equipped with pilot check valves? (20.A.17)			
17	Are only designated qualified operators being assigned to operate mechanized equipment? (16.A.04)			
18	Are fuel tanks located in a manner to prevent spills or overflows from running onto engine, exhause, or electrical equipment? (16.B.04)			
19	Are exhaust discharges from equipment so directed that they do not endanger persons or obstruct the view of the operator? (16.B.05)			

REMARKS:

SAFETY INSPECTION CHECKLIST FOR DREDGES
U.S. Army Engineer District, New Orleans

Date of Inspection:	
Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	If there are taps for non-portable water, are they identified? (02.A.07)(a)			
2	Are there the proper number of toilets, washbasins and showers? (02.B.02 (c))(02.C.03)			
3	Is water, soap, individual towels and metal covered waste cans provided in washrooms? (02.C)			
4	Do all mess facilities meet the requirements of (02.D.01)			
5	Is protection provided against insects, vermin, or stakes? (02.F.01)			
6	Are adequate means of communications and transportation to effectively care for disabled workers provided? **NOTE:** Name of doctor or clinic, address and telephone number should be on the job site. (03.A.01)			
7	Do the proper number of employees hold current first-aid & CPR certificated? **NOTE:** Check certificates to ascertain that they are current. (03.A.02)			
8	Are appropriate first-aid kits located in a readily accessible location and adequately stocked? (03.A.03)(03.B.)(03.B.02)			
9	Is eye protection available and of the correct type for the work involved? (05.B)			
10	Are ring buoys, lifelines and water lights in good condition and properly located? (05.I.03 (c) & 05.I.04)			
11	Is properly equipped life-saving skiff provided? (05.J)			
12	Are flammable items such as paint, turpentine, thinners, etc. properly stored? (09.B)(19.A.06.g)			
13	Is gasoline and other flammable liquids properly stored, dispensed and handled? (09.B.28)			
14	Is switchboard and transformer banks adequately protected and marked to keep unauthorized personnel out of the danger area? (11.A.02)(d)			
15	Is switchboard area provided with an insulated floor mat if necessary? (11.A.07)			
16	Is a positive means available to insure that machinery will not be operated while greasing or making repairs? (12.A.01)			
17	Are portable electric tools inspected and tested? (13.A.02)(a)(b)			
18	Are spuds, rotating machinery, hot pipes and moving cables guarded against accidental contact? (16.B.03)			
19	Is proper access provided for greasing sheaves on spuds, booms, and ladders? (16.B.03(d,e)			
20	Is a valid Coast Guard Certificate or Marine Survey available? (19.A.01 (a & b)			
21	Are the following drills held and logged at least monthly: (19.A.04 (d)) 1. Boat or abandon ship drill 2. Fire drill 3. Man overboard or rescue drill			
22	Is emergency lightning and power system inspected and operated monthly? (19.A.04 (g)			
23	Does the operator have a valid Coast Guard Certificate or correctly endorsed document? (19.A.02)(a)			

Proponent: (CEMVN-SS)

24	Does dredge have an approved hurricane plan for both crew and plant? (19.A.03)			
25	Are records of test, drills, system checks made in the station log? (19.A.04 (h)			
26	Are smoke alarms provided in all living quarters? (19.A.05 (h)			
27	Is there a shutoff valve at each end of the fuel line and are there arrangements for operating tank connection valve from outside engine compartment? (19.A.06 (b & c))			
28	Are tripping hazard, deck fittings, etc., painted yellow? (19.A.07 (i))			
29	Is convenient guarded access given to employees in cleaning out pump? (19.B.01)(a)			
30	Are guard rails provided on landings, stairs, and openings? (19.B.01)			
31	Are fire extinguishers of the proper type properly placed? (09.E) Type Capacity Location			
32	Are walkways clean, free from oil, grease, or smooth slick spots? (19.B.01 (b))			
33	When crews are quartered, are two ways of exit provided? (19.B.04 (b))			
34	Is pontoon line equipped with proper walkway and handrail, if applicable? (19.B.05)			
35	Do fired and unfired pressure vessels have proper certificate of inspection? Annual if fired, every 3 years if unfired? (20.A.01 & 20.A.02)			
36	Are acetylene, oxygen, and other compressed gas cylinders and equipment properly stored, used, and handled? (20.D.03 (d))			
37	Are safety belts and ladder climbing safety devices provided for the greasing of spud sheaves and changing spud pins? (21.C.01 & 21.G.09)			

REMARKS:

SAFETY INSPECTION CHECKLIST FOR COFE OWNED & OCCUPIED WORKSPACE
U.S. Army Engineer District, New Orleans

	Date of Inspection:
Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
	SANITATION - MEDICAL			
1	Are all outlets dispensing non-potable water posted "CAUTION-WATER UNFIT FOR DRINKING, WASHING, OR COOKING?" (02.A.07)			
2	Are paper cups dispensed from a sanitary container? (02.A.06)			
3	Are waste containers provided for used cups at each drinking fountain? (02.A.06)			
4	Is each washroom maintained in a sanitary condition and provided with water, soap, and individual means of drying? (02.C.02)			
5	Are 16 unit first-aid kits provided in each place of employment in the ratio 1 for each 25 persons or less? (03.A.03)			
	FIRE PREVENTION AND PROTECTION			
6	Are "NO SMOKING" signs posted and observed in all areas where flammable or combustible materials are stored? (09.B.02)			
7	Is there a proper fire extinguisher within 75 ft. of any point in the protected area? (09.B.03 (b))			
8	Are surveys being made at least annually in accordance with Para 09.A.01?			
9	Are all employees aware of the locations of all fire extinguishers and their proper use? (09.E.04)			
10	Have fire excavation routes been posted for each working area and the routes clearly marked with proper "EXIT" signs? (07.A.02)			
	ELECTRICAL			
11	Do electrical plugs and receptacles have the proper configuration for the circuit voltage and current? (15.A.11)			
12	Are all circuits properly protected against overload? (15.A.13)			
13	Aluminum conductors should not be connected to copper terminals, Are all connections tight and proper?			
14	Are adequate outlet receptacles provided so that there is no need for multiple outlet fixtures or extension cords?			
15	Are all electrical wires properly insulated with no bare wires visible?			
16	Are all fuse cabinets or circuit breaker boxes provided with a proper door that can be locked? (15.B.03)			
17	Are all 110-120V electrical outlets properly phased?			
18	Are all electrical receptacles in washroom of the grounding type and are those on 120 volt, single phase, 15 and 20 ampere circuits provided with ground fault circuit protection? (11.C.04)			
	PASSAGEWAYS AND ACCESS FACILITIES			
19	Are offices, workrooms, stairways, corridors, and passageways adequately lighted? (07.A)			

20	Does every flight of stairs having four or more risers also have a standard handrail? (21.B.08)			
21	Are all accessways kept clear of operating materials or debris that would obstruct passage or cause a tripping or slipping hazard? (21.A.01 (c))			
22	Are filing cabinet and desk drawers kept closed when not in actual use and then only one drawer opened at a time?			
23	Are carpets or rugs maintained so as to provide good protection against slips, trips, and falls?			
24	Are stepoffs from one level to another marked and guarded with a railing and adequately lighted?			
25	Are all telephone and electrical wires secured in a manner to prevent falls?			
26	Are all typewriter desks situated to prevent the moving carriage from entering aisle space?			
27	Have fire evacuation routes been posted for each work area and the routes clearly marked with the proper "EXIT" signs?			
	GENERAL			
28	Are office machines placed away from the edge of tables or desks on which they are used?			
29	Are files, bookcases, etc., placed so that they cannot be tipped over?			
30	Are proper stools provided to eliminate the necessity of using chairs or stools with casters for gaining extra height to retrieve items from high shelves, etc.?			
31	Are heavy or bulky materials stored at lower levels than lighter, easy to handle items?			
32	Are all office fans guarded, front and back, with not over ½-inch mesh to prevent fingers getting inside guard?			
33	Are pencils on desks stored with their points down?			
34	Have all spindle (spike) files been removed from service?			
35	Are chairs inspected regularly and broken ones removed from service?			
36	Is the Occupational Safety and Health Protection for Federal Employees posted in a prominent location? DD Form 2272			

REMARKS:

U.S. ARMY CORPS OF ENGINEERS - NEW ORLEANS DISTRICT
RESPIRATOR MEDICAL CLEARANCE

Name:	Date of Birth:
Crew:	Office Symbol:

PART I - TO BE FILLED OUT BY SUPERVISOR

A. CHECK TYPE OR TYPES OF RESPIRATOR(S) TO BE USED:

	Half-face Air-purifying cartridge		Full-face cartridge
	Full-face Powered Air-supply		Self-contained (Scott Air)

B. LEVEL OF WORK EFFORT (CHECK ONE):

	Light		Moderate
	Heavy		Strenuous

C. Extent of Usage:

	Daily		Weekly, average number hours per week
	Rarely -- or for emergency situations only		

D. SPECIAL WORK CONSIDERATIONS (CHECK ALL THAT APPLY):

	High Places		Protective Clothing
	Elevated Temperatures		Confined Spaces
	Hazardous Material		Other (Specify)
	Approximate weight of respirator equipment (pounds)		

Supervisor's Signature

PART II - TO BE FILLED OUT BY EMPLOYEE

Have you had, or do you now have any of the following	No	Yes	Examiner's Comments
Used a half-face respirator			
History of fainting spells or unconsciousness			
High blood pressure			
Fear of tight or enclosed places			
Sensation of smothering			
Dizziness			
Heat exhaustion or stroke			
Ruptured ear drum			
Contact lenses or glasses			

Proponent:CEMVD-SS

LMN Form 385-39-R
Jan 97

Dentures			
Facial scars which would restrict the fitting and or wearing of a respirator			
If you have any other problems which you feel might interfere with your ability to wear a respirator, please enter them here and mention them to the examiner.			Employee's Signature and date

PART III - TO BE FILLED OUT BY EXAMINER

A. I HAVE REVIEWED THE FOLLOWING INFORMATION:

	Review of Medical Examination performed on _____ (date); copy attached
	Review of Respirator Medical and other pertinent history questionnaires
	FEOH Laboratory Profile (where clinically indicated)
	Pulmonary Function Test (FVC and FEV 1)
	Other tests performed and reviewed
B.	I CERTIFY THAT, BASED ON THIS REVIEW, THE EMPLOYEE IS CLASSIFIED IN THE FOLLOWING REPIRATOR CATEGORY:
	No restrictions on respirator use
	Some specific-use restrictions
	No respirator use permitted

Restrictions:

Examiner:

Date:

SAFETY INSPECTION CHECK LIST FOR DIVING OPERATIONS
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS

Contract No:	**Contractor:**
Inspected By:	**Date of Dive:**

NOTE: Corps of Engineers General Safety Requirements (EM 385-1-1) references as shown in parentheses.	Yes	No
1 PERSONNEL CHECK		
Check with District Diving Coordinator to verify that all medical/first-aid/CPR paper work is in the Safety Office.		
Current medical examination for each diver - **must be within the last 12 months** (30.A.06)(a) (30.A.12)		
Diving or tending certification. (30.A.06)(b)		
Current First Aid certification. (renewed every 3 yrs.) (30.A.08)		
Current CPR certification. (renewed annually - 30.A.08)		
2 ADMINISTRATIVE CHECK		
Contractor Safe Practice Manual on site. (30.A.11)		
Has dive plan been developed and approved. (30.A.13)		
Has pre-dive briefing been performed with dive team. (30.A.14)		
If applicable, are decompression tables available.		
Have all valves, switches, controls, and equipment components been property locked out and/or tagged out. (30.A.13 (9)		
Has dive log been filled out for each dive. (30.A.17)		
3 EQUIPMENT CHECK		
A Air compressor (30.E)		
Air compressor tagged and tested every six months for:(30.E.05)		
Carbon Monoxide <20 PPM (30.E.05) (b) (1)		
Carbon Dioxide < +1,000 PPM (30.E.05) (b) (2)		
Oil mist <5 milligrams per cubic meter (30.E.05) (b) (3)		
Air shall not contain a level of hydrocarbons greater than 25 PPM (30.E.05) (b) (4)		
Is air intake located away from exhaust. (30.E.04)		
Does volume tank have check valve on the inlet side, a pressure gauge, a relief valve and a drain valve. (30.E.02)		
Does compressor have adequate capacity to deliver 4.5cfm actual to each diver. (30.E.03)		

Continued	Yes	No
B. Surface supplied air diving		
Is each diver continuously tended. (30.C.06) (a)		
Standby diver dressed out and readily available. (30.C.06) (d)		
Bail-out bottles fully charged and worn. (30.C.06) (e)		
Does the reserve breathing air supply have in-line capable of supporting the dive operation. (30.C.06) (f)		
Have all lights, special tools been tested (30.E.01) (30.E.13)		
Has voice communication systems been checked. (30.E.06) (h)		
Is safety harness with positive buckling device and an attachment point for the umbilical and a lifting point worn. (30.E.10) (b)		
Is approved first-aid kits at each dive site. (30.E.11) (a)		
Is portable oxygen supply available at dive site. (30.E.11) (b)		
Is litter or backboard with attached flotation on site. (30.E.11) (c)		
C. Breathing air supply hoses		
Have breathing hoses been tested to 1.5 times the working pressure. (30.E.06)(f)		
Is the umbilical marked at 10ft. increments to 100ft. from the diver end. (30.E.06)(c)		
Is a safety line of 3/8 in. synthetic material a part of each umbilical. (30.E.06)(e)		
4. Scuba Diving Operations		
CHECK WITH DISTRICT DIVING COORDINATOR BEFORE ANY SCUBA DIVING OPERATIONS		

Notes:

SMALL BOAT INSPECTION CHECKLIST
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Are periodic inspections & tests of all marine plant & equipment made to insure safe operating conditions? (19.A.01) d.			
2	Are marine plant and/or equipment found to be in unsafe condition, taken out of service and its use prohibited until unsafe conditions are corrected? (19.A.01) (f)			
3	Are all items of floating plant or associated equipment stored or placed beyond 20 feet or overhead transmission or distribution lines? (11.E.06)			
4	Was all marine plant & equipment put into use on the job inspected, tested and found to be in safe operating condition before initial use? (19.A.01) (c)			
5	Do inspection records maintained at the site become part of the official project file and made available to designated authorities? (19.A.01) (e)			
6	Is the maximum number of passengers that can be safely transported posted on all launches, motorboats and skiff? (19.C.02)(a)			
7	Does horsepower of engine meet hull specifications? ER385-1-91			
8	Is a signal device provided on the vessel to give signals required by applicable navigation rules? (19.A.05)(c)			
9	Are visual distress signaling devices (day and night) present and up to date?			
10	Is type and size of anchor and attached line suitable for size of boat?			
11	Are paddles and/or oars on board and in good condition?			
12	Is bilge pump and discharge (if so equipped) properly located and in good operating condition?			
13	Is a fully stocked First Aid kit of the proper size on board? (03.B)			
14	Are navigation lights working properly?			
15	Has a Type III/Type V or better USCG personal flotation device (PFD) been provided to all boat passengers and properly worn? (05.I.01)			
16	Are PFDs inspected for defects which would alter their buoyancy before and after each use? (05.I.02)			
17	Are defective PFDs or PFDs with less than 13 pounds buoyancy removed from service? (05.I.02)			
18	Are all PFDs equipped with retro-reflective tape meeting EM385-1-1, (05.I. 03)			
19	Is each boat equipped with at least one USCG approved life ring or ring buoy with at least 90 feet of " solid braid polypropylene line or equal attached? (05.I.04)			
20	Is the motorboat equipped with a kill switch?			
21	Are boat seats securely bolted to the boat deck?			
22	Are all launches and motorboats equipped with fire extinguishers of at least the size and rating(s) specified? (19.C.04)			
23	Are provisions made for preventing accumulation of fuel/oils on floors, decks and in bilges? (19.A.07)			
24	Are all carburetors on gasoline engines equipped with a backfire trap or flame arrestor? (19.A.06)			

Proponent: CEMVN-SS

25	Are fuel tank overflow, fill, and vent pipes so equipped that liquid or vapor cannot escape inside hull or cabin, and will flow overboard?			
26	Are automatic or remote controls provided where built-in fire extinguisher systems are installed? (19.C.04)			
27	Are boats powered by internal combustion engines, located within compartments or confined spaces, equipped with vent fans rated for Class I locations? (19.A.10)f. (1)			
28	Are ventilator intakes extended to a distance not more than one foot from the engine compartment bottom?			
29	**BOAT TRAILERING**			
a	Is the hitch secured to the tongue locking mechanism sound and non-binding?			
b	Are safety chains and hooks adequate for the size of the load?			
c	Are all lights (brake, turning and running) operating properly?			
d	Are tires in good condition (adequate tread, free of dry rot) and properly inflated?			
e	Are wheel bearings properly lubricated and is the proper torque on the wheel nut?			
f	Are caps and/or buddy bearings installed properly and functional?			
g	Are brakes (if equipped) working properly?			
h	Is the trailer tongue weight proper for the boat carried?			
i	Are rollers and/or bunks properly aligned and in good condition?			
j	Are trailer wheel bearing seals marine grade & do they seal properly to prevent seepage of water into bearings and races?			
k	Has the trailer's master cylinder been checked for proper level of fluid and are there any signs of brake fluid leakage?			
l	Has the trailer's wheel cylinders been inspected for signs of brake fluid leakage under dry conditions?			
m	Is the trailer suspension system adequate and capable of supporting the boat and other equipment loadings?			
n	Is the boat secured at bow and stern when trailered?			
o	Has a transom saver been installed for support of outboard motor skeg (foot)?			
p	Are trailer safety chains of a sufficient length to properly cradle the trailer tongue?			
30	**TOWING VEHICLE**			
a	Is the vehicle of adequate weight and power to safely tow the loaded boat and trailer?			
b	Is the hitch properly rated for the weight of the boat and trailer to be towed?			
c	Is the hitch secured to the frame (not bumper) of the vehicle?			
d	Is the ball on the hitch the proper size for the trailer to be towed?			
e	Is the ball securely attached to the tow bar?			
f	Is the remote braking mechanism operating properly			
g	Does the towing vehicle have adequately sized rear-view mirrors on both sides?			

h	Is rear suspension of towing vehicle sufficient & in condition to accept trailer tongue weight?			

ACCIDENT PREVENTION PROGRAM
ADMINISTRATIVE PLAN

1. Contractor	2. Contract Name & No.		3. Date
4. Project Superintendent	5. Shift/day	5a. Hours/shift	5b. Maximum employees/shift

6a. TRAINING - List subjects to be discussed with employees in safety indoctrination.

6b. TRAINING - List mandatory training and certifications which are applicable to this project (e.g., explosive actuated tools, confined space entry, crane operator, diver, vehicle operator, etc.)

7. Responsibility & Authority - Who is responsible for safety?
Project: Corporate: Line of Authority?

8. Who will conduct safety inspection?	8a. How	8b. When
9a. Is safety & health policy attached?	9b. Is safety program attached?	9c. Day & hour weekly safety meeting

10. How will subcontractor & supplies be controlled?	11. What are their safety responsibilities?

12. Who will report accidents, exposure data?

13. MEDICAL SUPPORT. Outline on-site medical support and off-site medical arrangements.

14. Outline procedures for conducting hazard assessments & written certification of PPE	Who?	When?	How?

15. Names of first aid attendants having certificates	Type of certificate & expiration date	Names of USCG licensed boat operators. Type license & expiration date.

On a separate sheet submit your proposed layout of temporary buildings and facilities (including subcontractors) and traffic patterns including access roads, haul roads, R.R.s. utilities, etc.

The _____ will pursue a positive program of training,, inspections
(Company)
and hazard control throughout the term of this contract. Mr./Ms. _____ has

the responsibility and authority for enforcing them.

_____ _____ _____ _____
Contractor's Signature Date C.O. or C.O.R. Signature Date

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	EXCAVATION AND EMBANKMENT OPERATONS NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	When operations are near highways; are danger, caution, traffic control signs and/or signal lights provided? (Section 08) See Table 8-1			
2	Are signal persons in reflectorized apparel provided to direct operations? (08.B.08)			
3	Does all moving equipment being operated at night have adequate head and tail lights? (16.A.07)(b) and 16.A.11)			
4	Are adequate brakes provided on mobile equipment? (16.A.07 (d))			
5	Do hauling units have emergency braking systems, operated from operator's position, that works automatically when regular brakes fail? (16.A.07 (d))			
6	Does maintenance or slow moving equipment have a flashing light to warn other traffic? (16.A.13)			
7	Where metal scaffold towers are used, are they properly secured, plumb, rigidly braced, and resting on solid foundations? (21.A.07)			
8	Where traffic or personnel cross pits or excavations do bridges have adequate guard rails? (21.B.01 and 21.F.02)			
9	Are adequate haul roads provided for hauling units? (21.I)			
10	What means are used to control dust? (21.I.10) (f)			
11	Are bracing, shoring, cribbing inspected daily and after rains? (25.A.02 (a)			
12	Are the sides of excavations shored up or cut to angle or repose? (25.A.03 (a) (25.C)			
13	Is ground water and surface water adequately controlled to prevent its entering the excavation? 25.A.06)(a)			
14	Is wire netting, rock bolts, fencing, etc. used to prevent rock falls? (25.A.07 (a)			
15	Have all stumps, boulders, or other materials that might slide or roll into an excavation been removed or barricaded? (25.A.07 (b)			
16	Is excavated material stored and retained at least 2ft. from the excavation's edge? Is it placed at a safe distance so as to prevent overloading on the face of the excavation? (25.A.07 (c)			
17	Where vehicular or haulage traffic is near excavation, are adequate stop logs provided so as to prevent equipment from falling into excavation? (25.A.08) (a)			
18	Is safe access into excavations provided? (25.B.05) **NOTE:** Ramps, stairs or mechanical man hoists shall be used for depths over 20ft. Properly placed and constructed ladders as well as ramps, stairs, or mechanical man hoists may be used up to 20ft.			
19	Are at least two means of exit provided workers in excavations? (25.B.05 (a))			
20	Are adequate guard rails, barricades, lights and warnings provided as well as safe access? (25.B)			
21	Remarks			

SAFETY INSPECTION CHECKLIST FOR MARINE EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	FUEL BARGES NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Is the Coast Guard Certificate of Inspection and all current inspections available? (19.A.01 (a))			
2	Are moving parts, hot pipes, etc., adequately guarded or screened from contact? (16.B.03 (a/b)			
3	Are all stumbling hazards such as deck fittings, obstructions, etc., identified by yellow paint? (19.A.07 (i))			
4	Are decks, steps, etc., provided with non-slip surfaces? (19.B.01 (b))			
5	Are guard rails, bulwarks, or taut cable guard lines provided to help prevent falls? (19.A.07 (h))			
6	Are adequate "Warning," "No Smoking," "No Open Lights," signs posted? (09.B.09, 19.A.06, 19.B.14)			
7	Do holds and deck tanks have gooose neck vents with flame screen or acceptable venting systems? (09.B.27)			
8	Are dispensing outlets from deck tanks equipped with an automatic-closing valve without a latch-open device? (09.B.27)			
9	Is the barge equipped with suitable adequate fire extinguishers? (09.B.03)			
10	Are properly equipped ring buoys and water lights in the required number provided? (05.A.04)			
11	Where intgernal combustion engines are used, are they covered with a well ventilated hood? (19.A.01 (a))			
12	Is a remote manual shut-off provided for deck pumps and engines? (19.A.01 (a))			
13	Are the carburetors on gasoline engines equipped with flame arrestors? **NOTE:** Air filters on down draft type are acceptable. (19.A.06 (f))			
14	Are drip pans with flame screens having an overboard drain or suction into the intake manifold provided on all but down draft carburetors? (19.A.06 (f))			
15	Is all deck cargo placed on dunNage? (19.A.07 (j))			
16	Is a licensed tankerman or officer used for fuel dispensing? (19.A.06 (h))			

REMARKS:

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	GENERATORS - FIXED AND PORTABLE NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Is the temporary wiring guarded, isolated by elevation, or buried so as to prevent accidental contact? (11.A.02)			
2	Are extension cords of the type listed by Underwriters Laboratories, Inc., for the purpose in which they are used? (11.A.03) See Table 11-1			
3	Are all switch boxes, receptacle boxes, metal cabinets, and temporary power lines marked to indicate the maximum operating voltage? (11.A.06)			
4	Are all circuits protected against overload? (11.B.01)			
5	Are disconnect boxes securely fastened to a surface and fitted with a cover? (11.B.02 (b)			
6	Does each fuse cabinet have close fitting doors that can be locked? (11.B.01 (e)			
7	Are all circuit breakers, switches, and fuses marked or labeled identifying the circuits or equipment supplied through them? (11.B.04)			
8	Are all switches, circuits breakers, fuse panels, or motor controllers that are located out-of-doors or in wet locations in a weatherproof enclosure or cabinet? (11.B.05)			
9	Are all circuits grounded? In accordance with the NEC (11.C.01)			
10	Has a sketch been submitted and accepted for the proposed temporary power distribution system? (11.D.01)			
11	Is the vertical clearance above walkways 10-15 ft or more for circuits carrying 600 volts or less? (11.D.03) See Table			
12	Are all wires insulated from their supports? (11.D.05)			
13	Are records of operational checks available? (16.A.01 (b))			
14	Is the unit shut down for servicing, fueling, etc? (16.A.14)			
15	Is the unit equipped with a suitable fire extinguisher (5 BC)? (16.A.26)			
16	Are exhaust systems protected from contact? (16.B.03 (b))			
17	Are fuel tanks located in a manner to prevent spills or overflows from running onto engine, exhaust, or electrical equipment? (16.B.04)			
18	Are exhaust discharges from equipment so directed that they do not endanger persons from exhaust fumes? (16.B.05)			

REMARKS

SAFETY INSPECTION FOR MARINE EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	LIFEBOAT AND LIFE SKIFFS NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Is a life saving skiff available where men are working over or near water? (05.J.01)			
2	Does the lifeboat have the following equipment? (05.J.04)			
	a. Four oars or equivalent means of propulsion. (Two if skiff is motor powered.)			
	b. Oar locks attached to oars or gunwales.			
	c. One ball pointed boat hook.			
	d. One ring buoy with 70 feet of 3/8 inch polypropylene or equivalent line attached.			
	e. Two personal flotation devices.			
3	Is a suitable motorboat provided where use of oars is impractical? (05.J.05)			
4	Is the life skiff kept afloat or is a means for instant safe launching provided? (05.J.03)			
5	Are trained persons kept at ready for launching and operating the life skiff? (05.J.02)			
6	Is the life boat used for other purposes than drills or emergencies? **THIS IS A VIOLATION.** (05.J.01)			
7	When a motor boat is used as a lifeboat, is it equipped with a compatible fire extinguisher? (19.C.03 (a))			
8	Is the maximum capacity of boat posted? (Capacity should be no less than 3.) (19.C.02(a)			
9	Does the boat meet the minimum flotation requirements of the USCG? (05.J.06 & 19.C.02)			
10	Does the horsepower of the motor conform with the capacity plate .			
11	Is the fuel supply hose in satisfactory condition?			
12	Is the hull in a good condition? (No obvious leaks.)			
13	Have floating plants found in unsafe condition taken out of service? 19.A.01(f)			
14	Is their an approved fire extinguisher on board? 19.C.03(a)			

Remarks

Proponent: (CELMN-SS)

SAFETY INSPECTION FOR CONSTRUCTION ACTIVITY
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	NIGHT OPERATIONS NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	General			
a	On construction contracts, is there a designated Contractor's representative on duty during night operations? FAR Clause			
b	Are weekly safety meetings being held for night-shift employees, by field supervisors or foremen? (01.B.03)(A)(B)			
c	Are regularly scheduled safety meetings being held (at least once a month) for night supervisors? (01.B.03 (a)			
d	Are there adequate communications and/or transportation available in the event of serious injury to personnel? (03.A.01)			
e	Is there two qualified first-aid and CPR attendant per shift on duty? (03.A.02)(a)			
f	Are fire, man-overboard & abandon-ship drills (as applicable) conducted at least monthly? (10.A.04 (d)) **NOTE:** These drills should first be conducted on the very first night shift?			
2	Lighting - Section 7 at Table 7-1			
a	Are haul roads properly marked for night work? (Section 7, Table 7-1)			
b	Is there adequate lighting in work areas, On decks and walkways? (07.A)			
c	Is there adequate lighting at crew boat loading area on floating plant? (07.A)			
d	Are all vechicles, construction equipment properly lighted? (16.A.11) (16.A.07)(b)			
3	Transportation to and from float plant			
a	Is boat equipped with sufficient number of life preservers? (05.I.01)(a,b,c,d,e)			
b	Are all vehicles and construction equipment properly lighted for night work? (18.A.02)			
c	If boat is less than 26 feet in length, has it been tested for flotation and stability, or does it carry BIA certification? (19.A.01)			
d	If more than 6 passengers are carried, or boat is greater than 26 feet in length, is vessel Coast Guard certified and operator licensed? (19.A.02)			
e	For boats of less than 26 feet in length, is operator experienced, and his name posted as a designated small boat operator? (19.A.02) (19.C.01)(c)			
f	Is weather deck of boat coated with non-skid material? (19.B.01)(b)			
g	Is there safe, easy access from boat to landing? (19.B.02)			
h	Do guard rails meet requirements of EM 385-1-1? (19.B.02)(c)			
i	Is the capacity of boat posted in accordance with EM 385-1-1? (19.C.02)(a)			

Remarks

SAFETY INSPECTION FOR CONSTRUCTION EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	PILE DRIVERS NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Is the width of the hull of floating drivers at least 45% of the height of the leads above water? (16.L.07 (2))			
2	If compressed air is used to activate hammer, have the air tanks been tested and certified? (20.C.05) Where steam is used, has the boiler been inspected and certified? (20.C.01-20.C.05)			
3	Are all boilers equipped with approved type water columns, gauge glass, and try cocks? (20.C.05)			
4	Is the boiler equipped with an approved blow-off valve? (20.C.06)			
5	Is insulation or guarding furnished for protection against hot surfaces, pipes, exhausts? (16.B.03)			
6	Are safety lashings provided on hose connections to jet pipes, hammers, pile ejectors? (16.L.05)			
7	When driving and handling steel piling is a closed shackle or other positive means used which will prevent pile from falling? (16.L.08)			
8	Is a stop block provided to prevent the hammer from being raised against the head block? (16.L.02 (d))			
9	Do the landings (platforms) have toe boards, guard rails? (16.L.02) **NOTE:** Landings or leads shall not be used for storage of any kind.			
10	Are swinging leads provided with fixed ladders? (16.L.02 a (1))			
11	Do "dogs" automatically disengage when load is relieved or drum rotated? (116.L.03) **THIS IS A VIOLATION.**			
12	Are non-slip surfaces provided for work areas, passageways, stairs, etc.? (19.B.01 (b))			
13	Is adequate protection provided against contact with winch drums, gears, cables, and moving parts? (16.B.03)			
14	Does the air compressor tank have an accessible drain at its lowest point? (20.B.18-20.B.23)			
15	Is the pressure gauge on the air-tank in good working condition? (20.A.12)			
16	Is the air-tank equipped with a sealed safety relief valve? (20.A.13 (c))			
17	Does discharge from blow-off valves (steam or air) create a hazard? (20.A.10)			
18	During fueling or servicing of compressor, is the motor stopped? (16.A.08)			
19	Is a properly equipped life saving skiff provided for floating driver or where work is over or near water? (05.J)			
20	Are sufficient work-vests available and used? (19.C.03)			
21	Are adequate fire extinguishers provided? (16.A.26) **NOTE:** 5 BC. MINIMUM			
22	Does at least one person in crew hold a valid first-aid certificate? (03.A.02)			
23	Are adequate first-aid kits provided? (03.A.03)			
24	Are cables, fittings, etc. in good condition? (15.A.06 and 15.F)			
25	Are unguarded running lines located within 6'6" of the ground or working level? (15.A.03)			
26	Are only designated qualified operators being assigned to operate mechanized equipment? (16.A.04)			

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

PORTABLE ELECTRIC HAND TOOLS

NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.

	Yes	No	N/A
1 Is personal protective equipment provided for eyes, hands, etc., and their use enforced? (05.A)			
2 Are flexible cords approved for that location? (11.A.03)			
3 Are flexible cords in continuous lengths without splices? (11.A.03 (c))			
4 Are portable and semi-portable electrical tools and equipment grounded by multiconductor cord and receptacle? (11.C.01 (b))			
5 Are tools grounded with multi-contact plug and receptacle? (11.C.01 (b))			
6 Are GFCI provided in all circuits using portable electric tools? (11.C.05)(a)(b)			
7 Are power hand tools inspected and tested? (13.A.02 (b))			
8 Are tools designed to accommodate guards supplied with them? (13.A.03)(a)			
9 When overhead work is being done, are means provided to prevent tools from falling? (13.A.04)			
10 Are only nonsparking tools used in locations where sources of ignition may cause a fire or explosion? (13.A.06)			
11 Safety guards shall be provided for all machines using an abrasive wheel. (13.B.01)			
12 Has a ring test been done on abrasive wheels before mounting? (13.B.06)			
13 Are circular saws equipped with guards that automatically enclose the blade? (13.C.01)			

REMARKS:

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT

U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	PORTABLE AIR COMPRESSORS NOTE: Corps of Engineers Safety and Health Requirements Manual (EM385-1-1) references are shown in parentheses.	Yes	No	N/A
1	Has inspection and performance test been completed. (20.A.01)			
2	Have the air tanks been tested and certified? (20.A.02)			
3	Are records of inspection and test available? (20.A.03)			
4	Does discharge from any valve create a hazard? (20.A.10)			
5	Is air pressure gauge in working order? (20.A.12)			
6	Is the tank equipped with a safety relief valve? (20.A.13)			
7	Is equipment that is subject to whipping or rotation if released provided with an automatic shut-off? (20.A.15)			
8	Are safety lashing provided at connections of tools and hose and all quick make-up connections of hose? (20.A.16)			
9	Will the compressor automatically shut off before discharge pressure exceeds the maximum working pressure? (20.B.08)			
10	Is the compressor located so that flammables, toxic vapors, gases, or dust will not be blown or drawn into intake? (20.B.09)			
11	No valve shall be installed on the air intake pipe of a compressor with an atmospheric intake. (20.B.10)			
12	Is the discharge piping from the compressor to the receiver as large as the discharge opening on the compressor? (20.B.11)			
13	Is there a convenient stop valve between the air tank and each stationary piece of equipment? (20.B.12)			
14	Are installation and location of air receivers as per 20.B.17?			
15	Does the air tank have an accessible drain valve? (20.B.18)			

16 REMARKS:

Proponent: (CELMN-SS)

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Contractor or Unit	Date of Inspection:
Contract No. or Activity	
Inspected by (Signature)	Witness (Signature)

POWER BENCH TOOLS

NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.

		Yes	No	N/A
1	Is eye, foot and other protective equipment, as needed, provided and use enforced? (05.B.01)			
2	Are adequate warning signs displayed? (08.A.01)			
3	Is the equipment always shutdown for adjustments and/or maintenance? (11.A.02)(a)(b)			
4	Is the power switch located so as to prevent accidental starting? (11.B.03)(b)			
5	Can the power be cut off without the operator having to leave his position? (13.C.01)			
6	Are the circular rip saws equipped with guards that automatically and completely enclose the cutting edges, anti-kickback devices, and splitters? (13.C.01 (a)			
7	Are electric powered tools properly grounded? (11.C.01 (b))			
8	Is a copy of manufacturer's instructions and recommendations maintained with the tool? (13.A.02 (a)			
9	Have the tools been inspected and tested prior to use? (13.A.02)(a)(b)			
10	Are the moving parts (shafts, beltdrives, spindles, etc.) safely guarded from accidental contact? (13.A.03)(b)			
11	Is personal protective equipment provided as outlines in section 6? (13.A.13)			
12	Are tool rests on power grinders more than distance from the wheel? (13.B.05)			
13	Are damaged grinding wheels, etc. in use? (13.B.06) **NOTE**-Violation -destroy defective parts.			
14	Are planer and jointer blades fully guarded? (13.C.01)(c)			
15	Are band saws fully enclosed except for blade at point of operation? (13.C.01 (d)			
16	Are radial arm power saws equipped with an automatic brake? (13.C.04)			
17	Is a limit stop provided to prevent leading edge of radial and swing saws from traveling beyond the edge of the table? (13.C.06)			
18	Is a block, pushstick or other safe means provided for operations near cutting edges? (13.C.08 (b))			
19	Are brushes provided for removal of sawdust, chips, etc.? (13.C.08 (d)			
20	Are lathes, metal saws, drills, etc. left unattended while still running? (13.C.08 (e) **NOTE:** This could occur when working with heavy steel plates or large shafts. If so, this is a violation.			
21	Is good housekeeping practiced? (14.C and 14.D.01)			

REMARKS:

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	RUBBER TIRED FARM TRACTORS, BACKHOES, FRONT END LOADERS NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Is protection (grills, canopies, screens) provided to shield operator from falling or flying objects? (16.B.10 and 16.B.11)			
2	Is adequate roll-over protection provided? (16.B.12)			
3	Are seat belts provided? (16.B.08)			
4	Are only designated qualified operators being assigned to operate mechanized equipment? (16.A.04)			
5	Does the unit have a suitable fire extinguisher? 5 BC (16.A.26)			
6	Is there an effective , working, reverse alarm? (16.B.01)			
7	Are moving parts, shafts, sprockets, belts, etc., guarded? (16.B.03 (a) and 16.B.07 and 16.B.13)			
8	Is protection against contact with hot surfaces, exhaust, etc., provided? (16.B.03 (6))			
9	Are all screens, guards, shields in place and effective? (16.B.03)			
10	Is a safe means of access to the cab provided (steps, grab bars, non-slip surfaces)? (16.B.03 (d))			
11	Are pressurized cylinders, outriggers, etc., equipped with a pilot check valve? (20.A.17)			
12	Are sufficient lights provided for night operators? (16.A.11)			
13	Are there initial inspections and scheduled inspections of the equipment at regular intervals? (16.A.02 (a) and (b))			
14	Are fuel tanks located in a manner to prevent spills or overflows from running onto engine exhaust or electrical equipment? (16.B.04)			
15	Are exhaust discharges from equipment so directed that they do not endanger persons or obstruct the view of the operator? (16.B.05)			
16	Has the equipment been inspected and tested by a competent person? (16.A.01)			
17	Are inspection records kept available as a part of the official project file? (16.A.01 (b))			

Remarks:

SAFETY INSPECTION FOR SKIFFS AND HULLS PROPELLED BY OUTBOARD MOTORS
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.

		Yes	No	N/A
1	Does the boat (when in use) have a Coast Guard approved dry chemical fire extinguisher with a rating of 5-B:C units? (19.C.04 (a))			
2	Does the boat meet the minimum floatation requirements of the USCG? (19.C.02)			
3	Is the maximum passenger capacity posted in a conspicuous manner? (19.C.03 (a))			
4	Does the horsepower of the motor conform with the capacity plate and if marine plant and equipment are unsafe are they prohibited from use until unsafe condition is corrected?			
5	Is each operator properly licensed? (19.A Table 19-1 (2))			
6	Is the condition of the fuel supply hose satisfactory? (19.A.01 (f))			
7	Is the hull in a satisfactory condition? (Any obvious leaks?) (19.A.01 (e))			
8	Does the buoyancy material show any evidence of deterioration or does it appear that some may have been removed? (Do air tanks appear sound and watertight?) (05.J.06 & 19.C.02)			
9	Is a Type-III or better USCG approved International Orange personal floatation device provided for all persons? (05.I)			
10	Is an efficient whistle or similar signaling device provided for use when the vessel is underway? (19.A.05 (c))			
11	Is adequate protection from the elements provided for all persons being transported by water? (19.A.05 (d))			
12	Is the boat equipped with a white stern light having a 32 point 2 mile visibility? (19.A.01 (f))			
13	Are the lights properly maintained, assuring that they can be shown between sunset and sunrise? (19.A.04 (f))			

REMARKS:

Proponent: (CELMN-SS)

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	SCRAPERS, MOTOR GRADERS, HEAVY HAULING UNITS NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Is the unit equipped with a suitable fire extinguisher (5 BC)? (16.A.26)			
2	Is a safe means of access to the cab provided (steps, grab bars, non-slip surfaces)? (16.B.03 (d))			
3	Is the operator protected against weather, falling or flying objects? (16.B.10 and 16.B.11)			
4	Are seat belts and adequate rollover protection provided where applicable? (16.B.08 & 16.B.12)			
5	Are adequate head and tail lights provided? (16.A.07 (b))			
6	Have brakes been tested and found satisfactory? (16.A.07 (d))			
7	Does the unit have an emergency brake system? (16.A.07 (d))			
8	Can the emergency system be activated from cab? (16.A.07 (d))			
9	Does the emergency brake work automatically when regular brakes fail? (16.A.07 (d))			
10	Have air tanks been tested and certified? (20.A.01 (b))			
11	Is an air pressure gage in working condition installed on the unit? (20.A.12)			
12	Does the air tank have an accessible drain valve? (20.B.17)			
13	Are the units equipped with windshield wipers, defrosting and defogging equipment that are in good operating condition? (16.A.07)			
14	Is there an effective reverse signal where applicable? (16.B.01)			
15	Has the unit been inspected and certified mechanically safe by a qualified person before being placed in use? (16.A.01)			
16	Is the record of the test available? (16.A.01 (b))			
17	Is the unit shut down for servicing, fueling, etc.? (16.A.14)			
18	Are only designated qualified operators being assigned to operate mechanized equipment? (16.A.04)			
19	Are fuel tanks located in a manner to prevent spills or overflows from running onto engine, exhaust or electrical equipment? (16.B.04)			
20	Are exhaust discharges from equipment so directed that they do not endanger persons or obstruct the view of the operator? (16.B.05)			
21	Are seats provided for each person required to ride on equipment? (16.A.07 (a))			

REMARKS:

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	STRUCTURAL STEEL ERECTION NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Are all required safety apparel and equipment furnished and use enforced? (Section 5)			
2	Is safe access provided to all work areas? (21.A.01) **NOTE:** Riding on hooks, buckets, material hoists, loads, etc. is prohibited. (16.C.14 and 16.K.11)			
3	Are stairways provided on all structures or work levels 20ft. or more in height? **NOTE:** Temporary stairways should be provided where permanent stairways are not installed concurrently with construction of each floor. (21.E.01)			
4	Are portable ladders secured top and bottom? (21.D.08 (d))			
5	Do the ladders extend at least 3ft. past the landing? (21.D.01 (b))			
6	Are floor or roof holes properly guarded with a securely anchored railing, intermediate rail and toe board? (24.A.01)			
7	Are safety nets being used where scaffolds, catch platforms, or temporary floors are impractical? (21.C.10)			
8	Are safety nets being inspected and debris removed daily as well as being tested regularly? (21.C.11 & 12 & 14)			
9	Are safety belts and life lines provided? (05.F)			
10	Are protective devices being used on roofing work which will protect workmen from slipping and falling and prevent workmen or the public on lower levels from being struck by falling objects? (27.H.01)			
11	Have all hoist towers been adequately inspected. (16.K.05)			
12	When electric powered hoist is used, has an automatic load-hold device been installed in case of power failure? (22.E.08)			
13	Are signal persons used when the operator cannot see the point of operations? (08.B.03)			
14	Is a standard signal system used? (16.C.10)			
15	Are tag lines or other means used to control loads? (14.A.06)			
16	Are the load rating plate and standard hand signal list attached to the hoisting equipment in view of the operator? (16.C.01)			
17	Have the hoisting equipment been inspected and tested? (16.A.01)			

REMARKS:

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

TEMPORARY ELECTRICAL WIRING NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1 Is the temporary wiring guarded, isolated by elevation, or buried so as to prevent accidental contact? (11.A.02)			
2 Are extension cords of the type listed by Underwriters Laboratories, Inc., for the purpose in which they are used? (11.A.03) See Table 11-1			
3 Are all switch boxes, receptacle boxes, metal cabinets, and temporary power lines marked to indicate the maximun operating voltage? (11.A.06)			
4 Are all circuits protected against overload? (11.B.01)			
5 Does each fuse cabinet have close fitting doors that can be locked? (11.B.01 (e)			
6 Are disconnect boxes securely fastened to a surface and fitted with a cover? (11.B.02 (b))			
7 Is the incoming service or supply circuit readily accessible? (11.B.03 (a)			
8 Are all circuit breakers, switches, fuses marked or labeled identifying the circuits or equipment supplied through them? (11.B.04)			
9 Are all switches, circuits breakers, fuse panels, or motor controllers that are located out-of-doors or in wet locations in a weatherproof enclosure or cabinet? (11.B.05)			
10 Are all circuits grounded? In accordance with the NEC. (11.C.01)			
11 Are ground fault circuit interrupters installed in circuits used by portable electric tools? (11.C.05)(a)(b)(c)(d)(e)(f)(g)			
12 Has a sketch been submitted and accepted for the proposed temporary power distribution system? (11.D.01)			
13 Is the vertical clearance above walkways 10-15 feet or more for circuits carrying 600 volts or less? (11.D.03)			
14 Do temporary light strings have lamp sockets and connections permanently molded to the hard service cord insulation? (11.D.04 (b)			
15 Are all wires insulated from their supports? (11.D.05)			
16 Are guards provided for bulbs on temporary lighting strings and extension cords? (11.D.06 (a)			
17 Are exposed empty light sockets or broken bulbs present? (11.D.06 (c)			
18 Is portable electric lighting used in confined wet and/or hazardous locations operated at a maximum of 12 volts? 11.D.06 (d)			
19 Is a plainly marked switch provided at the entrance to tanks or confined spaces where wiring is used? (11.D.07)			
20 Is any floating plant or equipment situated within 20 feet of an overhead transmission line? (11.E.06)			

REMARKS:

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Contractor or Unit	Date of Inspection:
Inspected by (Signature)	Contract No. or Activity
	Witness (Signature)

TREE WORK, MAINTENANCE OR REMOVAL OPERATIONS

NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.

		Yes	No	N/A
1	Are all chain saws in sound mechanical condition? (31.A.04)			
2	Are saws started more than 10 feet from fuel containers? (13.F.04)			
3	Are saws fueled while running or hot or near open flame? (13.F.04)			
4	Is eye, ear, hand, foot, or leg protection provided? (13.F.03)			
5	Is the chain saw used to cut above shoulder height? (13.F.06)			
6	Has the area been cleared of brush, felled trees, etc. prior to cutting? (13.D.01)			
7	Do all chain saws have an automatic chain brake or kickback device? (13.F.01)			
8	Is tree removal, trimming, or repair under the supervision of a qualified tree worker? (31.A.01)			
9	Are tree workers wearing saddles, safety belts, safety straps and/or lanyards? (31.B.02)			
10	Are tree workers carrying tools in their hands while climbing? (31.B.07)			
11	Are brush chippers operated and maintained in accordance with manufacturer's recommendations? (31.D.03)			
12	Are climber spurs of the tree climbing type? (31.B.01 (a))			
13	Are pole pruners, pole saws, and other similar tools equipped with wood or nonmetallic handles? (31.E.01 (a))			

REMARKS:

SAFETY INSPECTION CHECKLIST FOR TUGS, TENDERS, MOTORBOATS
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Name of Vessel (Identification)	Name of Operator (Captain)
Inspected by (Signature)	Witness (Signature)

	NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Is a valid Coast Guard certificate or Marine Survey available? (19.A.01 (a) (b))			
2	Does the boat operator have a valid Coast Guard certificate or correctly endorsed document? (19.A.02)			
3	Is emergency lighting and power system inspected monthly? (19.A.04 (f))			
4	Is an adequate whistle, horn, or warning device provided? (19.A.05 (c))			
5	Is the maximum passenger capacity posted? (19.C.03 (a))			
6	Is at least the number of life vests provided the same as the posted passenger capacity? (19.C.03 (b))			
7	When crew is quartered, are two ways of exit provided? (19.B.04 (b))			
8	Can doors be secured in either open or closed positions? (19.A.05 (i))			
9	Are railings or grab bars provided along the sides? (19.B.01 (c))			
10	Are stumbling hazards, deck fittings, etc. painted yellow? (19.A.07 (i))			
11	Are non-slip surfaces provided on ship's ladders, decks, and walks? (19.B.01 (b))			
12	On towing vessels, is an axe provided in an easily accessible location for freeing lines? (19.A.05 (b))			
13	Are controls, requiring operation in cases of emergency, to items such as (fire extinguishing system, power switches, safety & fuel valves, alarms, boiler stops) readily available and protected from accidental operation? (19.A.05 (e))			
14	Are try cocks or glass tube gauges on the fuel tanks? (19.A.06 (a)) **THIS IS A VIOLATION.**			
15	Is shut-off valve provided at both the tank and engine end of the fuel line? (19.A.06 (b) & (c))			
16	Can the shut-off valve at the tank be operated from outside the tank compartment? 19.A.06 (b))			
17	Are gasoline engine carburetors fitted with flame arresters? (19.A.06 (e))			
18	Is there a carburetor drip pan with flame screen that either empties overboard or is emptied by the intake manifold suction? **NOTE:** Not required on downdraft. (19.A.06 (f))			
19	Are shafts, gears, and moving parts adequately screened or guarded against contact? (16.B.03)			
20	Are hot pipes and surfaces insulated or screened? (16.B.03 (b))			
21	Have the air tanks been tested and certified? (20.A)			
22	When gasoline or L.P. gas power plant or equipment is used, is the vessel fitted with an automatic CO_2 system or the equivalent and one hand operated dry powder or CO_2 extinguisher? (19.C.04 (b))			
23	Are explosive proof exhaust fans provided to ventilate bilges when gasoline or L.P. gas is used? (19.A.10 (f))			
24	Are hand powered deck winches provided with self holding brakes? Are cranks and wheels with projecting spokes, pins, or knobs prohibited? (13.A.08)			
25	Is an adequate first-aid kit available? (03.A.03)			

26	Are at least two members of the crew on each watch qualified to administer first-aid and CPR? (03.A.02)			
27	Are properly fitted ring buoys and one water light provided? (05.I.03)			
28	Is a safe means to board and disembark provided? (19.B.02 (a))			
29	Is adequate protection from the elements provided for all persons being transported by water? (19.A.05 (d))			
30	Are the fuel fill pipe connections located outside the engine room? (19.A.06 (b))			
31	Are the fuel tanks vented directly to the atmosphere? (19.A.06 (h))			
32	Are the fuel vents and fill pipes provided with a catch basin having a capacity of at least 18 inches deep and having a capacity of at least 5 gallons? (Flush deck fill fitting being serviced with automatic back pressure shutoff nozzles are excluded.) (19.A.06 (h))			
33	Is the fuel transfer system designed to receive fuel by a fixed connection if an automatic back pressure shutoff nozzle is not used? (19.A.06 (h))			

REMARKS:

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Date of Inspection:

Contractor or Unit	Contract No. or Activity
Inspected by (Signature)	Witness (Signature)

	WELDER - WELDING OPERATIONS NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.	Yes	No	N/A
1	Does the welding unit have a compatible fire extinguisher? (10.C.01)			
2	When welding operations are near combustible materials, has written authorization been given by designated authority. (10.C.03 (c))			
3	Is the welding equipment inspected daily? (10.A.02)			
4	Are combustible materials screened from slag, heat and sparks? (10.C.) 05, 06			
5	Are workers and the public shielded from rays, flashes, sparks, molten metal and slag? (10.A.04)			
6	Are passageways, ladders, steps, etc. kept clear of hoses or cables? (10.A.05)			
7	Is the electric welding unit shutdown when leads are unattended? (10.E.11)			
8	Are non-current carrying parts of electric powered welders grounded? (10.E.04)			
9	Are splices, repaired insulation, etc., within 10 feet. of the rod holder? **THIS IS A VIOLATION.** Check for broken insulation--exposed wires. (10.E.03 (b))			
10	Are leads found in contact with metal parts supporting suspended scaffolds? **THIS IS A VIOLATION.** (10.E.09)			
11	Are leads placed near high tension wires? **THIS IS A VIOLATION.** (10.E.08)			
12	Are all torch valves and gas supply shut off when work is suspended? (10.D.05)			
13	When work is suspended; are hoses, torch, etc., removed from confined spaces? (10.D.06)			
14	When stored, in transit, or regulator is not in place; is the valve protected with cap? (20.D.07 (a) & (b))			
15	Are all compressed gas cylinders kept upright at all times, except when being hoisted? (20.D.10)			
16	Are upright cylinders secured against falling (20.D.08 & 20.D.10)			
17	Is the valve wrench or wheel in operating position when cylinder is in use? (20.D.11)			
18	Are cylinders stored in well ventilated locations? (20.D.03)			
19	Are oxygen cylinders in storage and fuel gases separated by a fire resistive wall or by a distance of 20 feet? (20.D.03 (d))			
20	Is oxygen used to blow dust out of clothes, hair, or to cool off with? **THIS IS A VIOLATION.** (20.B.05 (a) and 20.D.18)			
21	Are "No Smoking" signs posted around cylinder storage area? (20.D.03 (e) and 20.D.04)			
22	Is the pressure on the working side of the acetylene regulator greater than 15 psig? **THIS IS A VIOLATION.** (10.D.) 09			
23	Are proper measures being taken for fire control? (10.C.03)			
24	Are compressed gas cylinders separated from flammable or combustible material by at least 40 feet? (20.D.03 (c))			
25	Is all oxygen-fuel gas cutting or welding equipped with reverse-flow check valves between torch & hoses? (10.D.07 ( ))(a)			
26	Is personal protective equipment appropriate for the hazards encountered? (10.A.09)			
27	Are all pressure gauges and regulators in proper working order? (20.D.19)			
28	Is a pressure gauge provided on all pressurized equipment and systems? (20.A.12)			

SAFETY INSPECTION FOR MISCELLANEOUS EQUIPMENT
U.S. Army Engineer District, New Orleans

Contractor or Unit	Contract No. or Activity	Date of Inspection:
Inspected by (Signature)	Witness (Signature)	

WINCHES - HAND AND POWERED

NOTE: Safety and Health Requirements Manual (EM385-1-1) references in parentheses.

		Yes	No	N/A
1	Are hazardous moving parts adequately guarded? i.e. Gears, drums, fly wheels, piston arms, moving cables, spokes, knobs, projections on hand wheels. (16.B.03)			
2	Are exhaust pipes, steam pipes, hot surfaces insulated or guarded? (16.B.03 (b))			
3	Are the drums equipped with positive locking devices? (16.C.05)			
4	Are at least three full turns of cable retained on drums at all times? (16.C.09 (a))			
5	Is a signal person provided when necessary? (08.B.04)			
6	Is an inspection made of the cables at scheduled intervals? (15.A.01)			
7	Are cracked spokes, hubs or flanges in use? **This is a violation.** (15.F.04)			
8	When wedge socket type fastening is used on wire rope, is the short end clipped with a U-bolt? (15.B.04)			
9	On gasoline engine-powered winches, are the carburetors equipped with a back-fire trap or flame arrestor? (19.A.06 (e))			
10	Is the winch shut down - power off - for servicing and/or fueling? (16.A.08)			
11	Is a fuel shut-off valve located at both the tank and engine? (19.A.06 (b) and (c))			
12	Are fuel tanks placed so that overflow or spills will not fall into/on electrical equipment or the engines? (16.B.04)			
13	On floating plant gasoline-powered winches, do carburetors have drip pans fitted with flame screens provided with overboard discharge or emptied by suction from the intake manifold? Not required on down draft carburetors. (19.A.06 (f))			
14	Are cranks used on hand-powered winches or hoists without being provided with positive self-locking dogs? (13.A.08)			

REMARKS:

MOTOR VEHICLE INSPECTION (TRANSPORTING HAZARDOUS MATERIALS)

(Read Instructions before completing this form.)

This form applies to all vehicles which must be marked or placarded in accordance with Title 49 CFR.	1. GOVERNMENT BILL OF LADING/TRANSPORTATION CONTROL NUMBER

SECTION 1 - DOCUMENTATION	ORIGIN a.	DESTINATION b.
2. CARRIER/GOVERNMENT ORGANIZATION		
3. DATE/TIME OF INSPECTION		
4. LOCATION OF INSPECTION		
5. OPERATOR(S) NAME(S)		
6. OPERATOR(S) LICENSE NUMBER(S)		
7. MEDICAL EXAMINER'S CERTIFICATE*		

8. *(X if satisfactory at origin)*

a. MILITARY HAZMAT ENDORSEMENT		d. ERG OR EQUIVALENT COMMERCIAL:		YES		NO	
b. VALID LEASE*		e. DRIVER'S VEHICLE INSPECTION REPORT*					
c. ROUTE PLAN		f. COPY OF 49 CFR PART 397					

9. CVSA DECAL DISPLAYED ON COMMERCIAL EQUIPMENT*	YES	NO
a. TRUCK/TRACTOR		
b. TRAILER		

SECTION II - MECHANICAL INSPECTION

All items shall be checked on empty equipment prior to loading. Items with an asterisk shall be checked on all incoming loaded equipment.

10. TYPE OF VEHICLE(S)	11. VEHICLE NUMBER(S)

12. PART INSPECTED *(X as applicable)*	ORIGIN (1)		DESTINATION (2)			ORIGIN (1)		DESTINATION (2)		COMMENTS (3)
	SAT	UNSAT	SAT	UNSAT		SAT	UNSAT	SAT	UNSAT	
a. SPARE ELECTRICAL FUSES					k. EXHAUST SYSTEM					
b. HORN OPERATIVE					l. BRAKE SYSTEM*					
c. STEERING SYSTEM					m. SUSPENSION					
d. WINDSHIELD/WIPERS					n. COUPLING DEVICES					
e. MIRRORS					o. CARGO SPACE					
f. WARNING EQUIPMENT					p. LANDING GEAR*					
g. FIRE EXTINGUISHER*					q. TIRES, WHEELS, RIMS					
h. ELECTRICAL WIRING					r. TAILGATE/DOORS*					
i. LIGHTS AND REFLECTORS					s. TARPAULIN*					
j. FUEL SYSTEM*					t. OTHER *(Specify)*					

13. INSPECTION RESULTS *(X one)* ACCEPTED ☐ REJECTED ☐

(If rejected give reason under "Remarks". Equipment will be approved if deficiencies are corrected prior to loading.)

14. SATELLITE MOTOR SURVEILLANCE SYSTEM: *(X one)* ACCEPTED ☐ REJECTED ☐

15. REMARKS

16. INSPECTOR SIGNATURE *(Origin)*	17. INSPECTOR SIGNATURE *(Destination)*

SECTION III - POST LOADING INSPECTION

This section applies to Commercial and Government/Military vehicles. All items will be checked prior to release of loaded equipment and shall be checked on all incoming loaded equipment.

	ORIGIN (1)		DESTINATION (2)		COMMENTS (3)
	SAT	UNSAT	SAT	UNSAT	
18. LOADED IAW APPLICABLE SEGREGATION/COMPATIBILITY TABLE OF 49 CFR					
19. LOAD PROPERLY SECURED TO PREVENT MOVEMENT					
20. SEALS APPLIED TO CLOSED VEHICLE; TARPAULIN APPLIED ON OPEN EQUIPMENT					
21. PROPER PLACARDS APPLIED					
22. SHIPPING PAPERS/DD FORM 836 FOR GOVERNMENT VEHICLE SHIPMENTS					
23. COPY OF DD FORM 626 FOR DRIVER					
24. SHIPPED UNDER DOT EXEMPTION 868					

25. INSPECTOR SIGNATURE *(Origin)*	26. DRIVER(S) SIGNATURE *(Origin)*
27. INSPECTOR SIGNATURE *(Destination)*	28. DRIVER(S) SIGNATURE *(Destination)*

INSTRUCTIONS

SECTION I - DOCUMENTATION

General Instructions.

All items (2 through 9) will be checked at origin prior to loading. Items with an asterisk (*) apply to commercial operators or equipment only. Only Items 2 through 7 are required to be checked at destination.

Items 1 through 5. Self explanatory.

Item 6. Enter operator's Commercial Driver's License (CDL) number or Military OF-346 License Number. CDL and OF-346 must have the HAZMAT and other appropriate endorsements IAW Part 383.

Item 7. *Enter the expiration date listed on the Medical Examiner's Certificate.

Item 8.a. APPLIES TO MILITARY OPERATORS ONLY. Military Hazardous Materials Certification. In accordance with applicable service regulations, ensure operator has been certified to transport hazardous materials.

b. *Valid Lease. Shipper will ensure a copy of the appropriate contract of lease is carried in all leased vehicles and is available for inspection. (Defense Transportation Regulation (DTR) requirement.)

c. Route Plan. Prior to loading any Hazard Class/Division 1.1, 1.2, or 1.3 (Explosives) for shipment, ensure that the operator possesses a written route plan in accordance with 49 CFR Part 397. Route Plan requirements for Hazard Class 7 (Radioactive) materials are found in 49 CFR 397.101.

d. Emergency Response Guidebook (ERG) or Equivalent. Commercial operators must be in possession of an ERG or equivalent document. Shipper will provide applicable ERG page(s) to military operators.

e. *Driver's Vehicle Inspection Report. Review the operator's Vehicle Inspection Report. Ensure that there are no defects listed on the report that would affect the safe operation of the vehicle.

f. Copy of 49 CFR Part 397. Operators are required by regulation to have in their possession a copy of 49 CFR Part 397 (Hazardous Materials Driving and Parking Rules). If military operators do not possess this document, shipper may provide a copy to operator.

Item 9. *Commercial Vehicle Safety Alliance (CVSA) Decal. Check to see if equipment has a current CVSA decal and mark applicable box. Vehicles without CVSA, check documentation of the last vehicle periodic inspection.

SECTION II - MECHANICAL INSPECTION

General Instructions.

All items (12.a. through 12.t.) will be checked on all incoming empty equipment prior to loading. All UNSATISFACTORY conditions must be corrected prior to loading. Items with an asterisk (*) shall be checked on all incoming loaded equipment. Unsatisfactory conditions that would affect the safe off-loading of the equipment must be corrected prior to unloading.

SECTION II *(Continued)*

Item 12.a. Spare Electrical Fuses. Check to ensure that at least one spare fuse for each type of installed fuse is carried on the vehicle as a spare or vehicle is equipped with an overload protection device (circuit breaker). (49 CFR 393.95)

b. Horn Operative. Ensure that horn is securely mounted and of sufficient volume to serve purpose. (49 CFR 393.81)

c. Steering System. The steering wheel shall be secure and must not have any spokes cracked through or missing. The steering column must be securely fastened. Universal joints shall not be worn, faulty or repaired by welding. The steering gear box shall not have loose or missing mounting bolts or cracks in the gear box mounting brackets. The pitman arm on the steering gear output shaft shall not be loose. Steering wheel shall turn freely through the limit of travel in both directions. All components of a power steering system must be in operating condition. No parts shall be loose or broken. Belts shall not be frayed, cracked or slipping. The power steering system shall not be leaking. (49 CFR 396 Appendix G)

d. Windshield/Wipers. Inspect to ensure that windshield is free from breaks, cracks or defects that would make operation of the vehicle unsafe; that the view of the driver is not obscured and that the windshield wipers are operational and wiper blades are in serviceable condition. Defroster must be operative when conditions require. (49 CFR 393.60, 393.78 and 393.79)

e. Mirrors. Every vehicle must be equipped with two rear vision mirrors located so as to reflect to the driver a view of the highway to the rear along both sides of the vehicle. Mirrors shall not be cracked or dirty. (49 CFR 393.80)

f. Warning Equipment. Equipment must include three bidirectional emergency reflective triangles that conform to the requirements of FMVSS No. 125. FLAME PRODUCING DEVICES ARE PROHIBITED. (49 CFR 393.95)

g. Fire Extinguisher. Military vehicles must be equipped with two serviceable fire extinguishers with an Underwriters Laboratories rating of 10 BC or more. (Commercial motor vehicles must be equipped with one serviceable 10 BC Fire Extinguisher). Fire extinguisher(s) must be located so that it is readily accessible for use and securely mounted on the vehicle. The fire extinguisher must be designed, constructed and maintained to permit visual determination of whether it is fully charged. (49 CFR 393.95)

h. Electrical Wiring: Electrical wiring must be clean and properly secured. Insulation must not be frayed, cracked or otherwise in poor condition. There shall be no uninsulated wires, improper splices or connections. Wires and electrical fixtures inside the cargo area must be protected from the lading. (49 CFR 393.28, 393.32, 393.33)

INSTRUCTIONS

SECTION II *(Continued)*

i. Lights/Reflectors. (Head, tail, turn signal, brake, clearance, marker and identification lights, Emergency Flashers). Inspect to see that all lighting devices and reflectors required are operable, of proper color and properly mounted. Ensure that lights and reflectors are not obscured by dirt or grease or have broken lenses. High/Low beam switch must be operative. Emergency Flashers must be operative on both the front and rear of vehicle. (49 CFR 393)

j. Fuel System. Inspect fuel tank and lines to ensure that they are in serviceable condition, free from leaks, or evidence of leakage and securely mounted. Ensure that fuel tank filler cap is not missing. Examine cap for defective gasket or plugged vent. Inspect filler necks to see that they are in completely serviceable condition and not leaking at joints. (49 CFR 393.83 and 396 Appendix G)

k. Exhaust System. Exhaust system shall discharge to the atmosphere at a location to the rear of the cab or if the exhaust projects above the cab, at a location near the rear of the cab. Exhaust system shall not be leaking at a point forward of or directly below the driver compartment. No part of the exhaust system shall be located where it will burn, char or damage electrical wiring, fuel system or any other part of the vehicle. No part of the exhaust system shall be temporarily repaired with wrap or patches. (49 CFR 393.83 and 396 Appendix G)

l. Brake System (to include hand brakes, parking brakes and Low Air Warning devices). Check to ensure that brakes are operational and properly adjusted. Check for audible air leaks around air brake components and air lines. Check for fluid leaks, cracked or damaged lines in hydraulic brake systems. Ensure that parking brake is operational and properly adjusted. Low Air Warning devices must be operative. (49 CFR 396 Appendix G)

m. Suspension. Inspect for indications of misaligned, shifted or cracked springs, loosened shackles, missing bolts, spring hangers unsecured at frame and cracked or loose U-bolts. Inspect for any unsecured axle positioning parts, and sign of axle misalignment, broken torsion bar springs (if so equipped). (49 CFR 396 Appendix G)

n. Coupling Devices (Inspect without uncoupling). Fifth Wheels: Inspect for unsecured mounting to frame or any missing or damaged parts. Inspect for any visible space between upper and lower fifth wheel plates. Ensure that the locking jaws are around the shank and not the head of the kingpin. Ensure that the release lever is seated properly and safety latch is engaged. Pintle Hook, Drawbar, Towbar Eye and Tongue and Safety Devices: Inspect for unsecured mounting, cracks, missing or ineffective fasteners (welded repairs to pintle hook is prohibited). Ensure safety devices (chains, hooks, cables) are in serviceable condition and properly attached. (49 CFT 396 Appendix G)

o. Cargo Space. Inspect to ensure that cargo space is clean and free from exposed bolts, nuts, screws, nails or inwardly projecting parts that could damage the lading. Check floor to ensure it is tight and free from holes. Floor shall not be permeated with oil or other substances. (49 CFR 177.815(e)(1) and 398.94)

p. Landing Gear. Inspect to ensure that landing gear and assembly are in serviceable condition, correctly assembled, adequately lubricated and properly mounted.

SECTION II *(Continued)*

q. Tires, Wheels and Rims: Inspect to ensure that tires are properly inflated. Flat or leaking tires are unacceptable. Inspect tires for cuts, bruises, breaks and blisters. Tires with cuts that extend into the cord body are unacceptable. Thread depth shall not be less than: 4/32 inches for tires on a steering axle of a power unit, and 2/32 inches for all other tires. Mixing bias and radial on the steering axle is prohibited. Inspect wheels and rims for cracks, unseated locking rings, broken, loose, damaged or missing lug nuts or elongated stud holes. (49 CFR 396 Appendix G)

r. Tailgate/Doors. Inspect to see that all hinges are tight in body. Check for broken latches and safety chains. Doors must close securely. (49 CFR 177.835(h))

s. Tarpaulin. If shipment is made on open equipment, ensure that lading is properly covered with fire and water resistant tarpaulin. (49 CFR 177.835(h))

t. Other Unsatisfactory Condition. Note any other condition which would prohibit the vehicle from being loaded with hazardous materials.

Item 14. For AA&E and other shipments requiring satellite surveillance, ensure that the Satellite Motor Surveillance System is operable. Shipper will instruct the driver to send a "test" emergency message to DTTS by having the driver activate the "emergency (panic) button". Shipper will contact DTTS at 1-800-826-0794 to verify that test message was received. Message must be received by DTTS for system to be considered operational.

SECTION III - POST LOADING INSPECTION

General Instructions.

All items will be checked prior to the release of loaded equipment. Shipment will not be released until deficiencies are corrected. All items will be checked on incoming loaded equipment. Deficiencies will be reported in accordance with applicable service regulations.

Item 18. Check to ensure shipment is loaded in accordance with 49 CFR Part 177.848 and the applicable Segregation or Compatibility Table of 49 CFR 177.848.

Item 19. Check to ensure the load is secured from movement in accordance with applicable service outload drawings.

Item 20. Check to ensure seal(s) have been applied to closed equipment; fire and water resistant tarpaulin applied on open equipment.

Item 21. Check to ensure each transport vehicle has been properly placarded in accordance with 49 CFR Part 172 Subpart F.

Item 22. Check to ensure operator has been provided shipping papers that comply with 49 CFR Part 172 Subpart C. For shipments transported by Government vehicle, shipping paper will be DD Form 836.

Item 23. Ensure operator(s) sign DD Form 626, are given a copy and understand the hazards associated with the shipment.

Item 24. Applies to Commercial Shipments Only. If shipment is made under DOT Exemption 868, ensure that shipping papers are properly annotated and copy of Exemption 868 is with shipping papers.

SAFETY INSPECTION CHECKLIST FOR CONSTRUCTION EQUIPMENT

CONTRACTOR		CONTRACT NUMBER
TYPE OF EQUIPMENT	EQUIPMENT NUMBER	DATE OF INSPECTION

CORPS OF ENGINEERS SAFETY AND HEALTH REQUIREMENTS MANUAL, EM 385-1-1, REV OCT 84, REFERENCES ARE IN PARENTHESES.

INDICATE ANSWERS BY PLACING "X" IN PROPER COLUMN.	YES	NO	N/A
1. IS ENG FORM 3363 OR EQUIVALENT WARNING SIGN FOR HIGH-VOLTAGE LINES POSTED AT OPERATOR'S POSITION IN CRANE? (15.E.08)			
2. ARE BELTS, GEARS, SHAFTS, PULLEYS, SPROCKETS, SPINDLES, DRUMS, FLYWHEELS, CHAINS, OR OTHER RECIPROCATING OR ROTATING PARTS ADEQUATELY GUARDED? (18.B.03)			
3. ARE ALL HOT PIPES AND SURFACES EXPOSED TO ACCIDENTAL CONTACT SUITABLY GUARDED OR INSULATED? (18.B.04)			
4. ARE FUEL TANKS LOCATED SO THAT SPILLS OR OVERFLOWS WILL NOT COME IN CONTACT WITH ENGINE, EXHAUST, OR ELECTRICAL EQUIPMENT? (18.B.05)			
ARE EXHAUSTS AND DISCHARGES SO DIRECTED AS NOT TO ENDANGER WORKMEN OR OBSTRUCT VIEW OF OPERATOR? (18.B.06)			
6. ARE PLATFORMS, CATWALKS, STEPS, HANDHOLDS, AND GUARDRAILS PROVIDED TO ASSURE SAFE FOOTING AND ACCESSWAYS? (18.B.08)			
7. IS ADEQUATE PROTECTION FOR OPERATOR PROVIDED AGAINST THE ELEMENTS, FALLING OR FLYING OBJECTS, SWINGING LOADS, BACKLASH OR WINCH CABLES, AND SIMILAR HAZARDS? (18.B.18) (18.B.19) (18.B.11)			
8. ARE CRAWLER AND RUBBER TIRED TRACTORS, SELF-PROPELLED PNEUMATIC TIRED EARTH MOVERS, WATER TANK TRUCKS, BACKHOES, COMPACTORS, FRONT END LOADEPS (CRAWLER AND PNEUMATIC TIRE), GRADALLS, MOTOR GRADERS, POWERBELT EXCAVATORS, ROLLERS (TRACKED OR WHELLED), AND SCRAPERS (ALL TYPES), EQUIPPED WITH ROPES OF SUFFICIENT STRUCTURAL STRENGTH TO PROTECT THE OPERATOR IN THE EVENT OF ROLLOVER, AND SEATBELT FOR PROTECTION OF THE OPERATOR? (18.B.20)			
9. IF EQUIPMENT IS TO BE OPERATED ON HIGHWAYS, IS IT EQUIPPED WITH TURN SIGNALS, VISIBLE FROM THE FRONT AND REAR? (18.A.15)			
10. ARE POSITIVE STOPS OR LIMITING DEVICES PROVIDED FOR EQUIPMENT OPERATED ON RAILS, TRACKS, OR TROLLEYS? (18.A.16)			

.DICATE ANSWERS BY PLACING "X" IN PROPER COLUMN.	YES	NO	N/A
11. IS ALL OF THE GLASS WHICH IS INSTALLED IN THE OPERATOR'S COMPARTMENT SAFETY GLASS? (18.B.18) (18.C.15)			
12. IS A WARNING DEVICE OR SIGNALPERSON PROVIDED WHERE THERE IS DANGER TO PERSONS FROM MOVING EQUIPMENT, SWINGING LOADS, BUCKETS, BOOMS, ETC.? (18.B.15)			
13. IS HEAVY DUT HAULAGE EQUIPENT EQUIPPED WITH AN OPERABLE EMERGENCY BRAKING SYSTEM WHICH WILL AUTOMATICALLY STOP THE EQUIPMENT UPON FAILURE IN THE SERVICE BRAKE SYSTEM? CAN THIS SYSTEM ALSO BE OPERATED MANUALLY FROM THE OPERATOR'S POSITION? (18.A.22)			
14. IS THE CRANE EQUIPPED WITH A SHOCK-ABSORBING TYPE BOOM STOP? (CABLE STOPS ARE NOT ACCEPTABLE.) (18.C.19)			
15. IS ENG FORM 3364 OR A SIMILAR SAFE-LOAD-CAPACITY CHART FOR VARIOUS BOOM RADII POSTED IN THE CAB OF THE CRANE? IS THIS CHART APPLICABLE TO PRESENT BOOM LENGTH, COUNTER WEIGHT, ETC.? IS A BOOM ANGLE OR RADIUS INDICATOR WITHIN THE OPERATOR'S VIEW? (18.C.02) (18.E.08) (18.G.04)			
16. DO ALL POINTS REQUIRING LUBRICATION DURING OPERATION HAVE SUCH FITTINGS LOCATED OR GUARDED IN SUCH MANNER THAT PERSONNEL SERVICING THE EQUIPMENT ARE PROTECTED FROM INJURY? (18.A.18)			
17. DO ALL MODIFICATIONS, EXTENSIONS, REPLACEMENT PARTS, AND/OR REPAIRS TO EQUIPMENT MAINTAIN THE SAME FACTOR OF SAFETY AS THE ORIGINALLY DESIGNED EQUIPMENT? (18.A.33) (18.C.04)			
18. IS THE SWING RADIUS OF THE REAR OF ROTATING CRANES, TEMPORARILY OR PREMANENTLY MOUNTED, BARRICADED TO PREVENT EMPLOYEES FROM BEING STRUCK OR CRUSHED? (18.B.21)			
19. IS ADEQUATE CLEARANCE MAINTAINED BETWEEN MOVING AND ROTATING STRUCTURES OF THE CRANE AND FIXED OBJECTS TO PERMIT SAFE PASSAGE? (18.C.18)			
20. ARE ALL DRUMS ON LOAD HOISTING EQUIPMENT EQUIPPED WITH POSITIVE HOLD DEVICES? (18.C.05)			
21. IS THERE SUFFICIENT CABLE TO ALLOW TWO FULL WRAPS OF CABLE ON DRUMS AT ALL TIMES? (18.C.07)			
22. IS HOIST BRAKING EQUIPMENT CAPABLE OF STOPPING, LOWERING AND HOLDING A LOAD OF AT LEAST THE FULL TEST LOAD? (18.C.06)			
23. ARE TRAVELING CRANES EQUIPPED WITH A WARNING DEVICE WHICH WILL SOUND CONTINUOUSLY WHEN CRANE IS TRAVELING? (18.E.02)			

INDICATE ANSWERS BY PLACING "X" IN PROPER COLUMN.

	YES	NO	N/A
24. ARE ALL HOSE CONNECTIONS TO PILEDRIVER HAMMERS, PILE EJECTORS, AND JET PIPES EQUIPPED WITH A SAFETY LASHING MEETING REQUIREMENTS OF 18.J.03?			
25. ARE THE HANGING OR SWINGING PILEDRIVING LEADS EQUIPPED WITH A FIXED LADDER? (18.J.04)			
26. ARE FIXED PILEDRIVER LEADS EQUIPPED WITH DECKED LANDINGS HAVING GUARDRAILS, INTERMEDIATE RAILS, AND TOE BOARDS? ARE THE FIXED LEADS PROVIDED WITH A FIXED LADDER OR STAIRS FOR ACCESS TO LANDINGS AND HEAD BLOCKS? (18.J.05)			
27. ARE THE PILEDRIVER LEADS EQUIPPED WITH STOP BLOCKS TO PREVENT THE HAMMER FROM BEING RAISED AGAINST THE HEAD BLOCK? (18.J.07)			
28. ARE FIXED LADDERS MORE THAN 20 FEET IN HEIGHT ON PILEDRIVING LEADS PROVIDED WITH A LADDER CLIMBING DEVICE? (30.B.13) (30.B.14)			
29. ARE ALL WIRE ROPES OR CABLES IN GOOD OPERATING CONDITION? (17.C.01) (17.C.02) (17.C.03)			
30. ARE DRUMS, SHEAVES, AND PULLEYS SMOOTH AND FREE OF DEFECTS? (17.C.07)			
ARE WIRE ROPE SOCKETS, SPLICES, THIMBLES, AND CLIPS ADEQUATE AND PROPERLY APPLIED? (17.A.04) (17.C.03) (17.C.09) (17.C.10)			
32. ARE HOOKS, SHACKLES, RINGS, PAD EYES, AND OTHER FITTINGS IN GOOD CONDITION? (17.A.05)			
33. ARE RUNNING LINES OF HOISTING EQUIPMENT EXPOSED TO HAZARDOUS CONTACT ADEQUATELY GUARDED? (17.A.06)			
34. ARE FUELING CANS USED WITH THIS EQUIPMENT APPROVED TYPE SAFETY CANS? (12.D.39)			
35. PERFORMANCE TEST. PRIOR TO BEING PLACED IN OPERATION THE FOLLOWING CRANES AND DERRICKS WILL BE GIVEN A PERFORMANCE TEST TO DEMONSTRATE THE STRENGTH, STABILITY, CAPABILITY, AND ADEQUACY OF POWER, BRAKES, CLUTCHES, AND CONTROLS TO SAFELY MANEUVER THE SPECIFIED PERCENT OF THE MAXIMUM ANTICIPATED LOAD AT THE MAXIMUM BOOM RADIUS TO BE USED IN ACCOMPLISHING THE CURRENT CONTRACT OPERATIONS. THIS TEST WILL BE THE BASIS UPON WHICH THE EQUIPMENT IS RATED FOR THE CURRENT CONTRACT. PARTICULAR ATTENTION SHALL BE GIVEN THAT UNDER NO CIRCUMSTANCES WILL THE MAXIMUM ANTICIPATED LOAD USED FOR PERFORMANCE TEST LOAD EXCEED THE MANUFACTURER'S RATING. THE CONTRACTOR WILL PROVIDE THE TEST WEIGHTS.			
a. CRAWLER, TRUCK AND WHEEL MOUNTED CRANES 125% OF THE MAXIMUM ANTICIPATED LOAD. (18.C.01) (18.D.01)			

ICATE ANSWERS BY PLACING "X" IN PROPER COLUMN.

	YES	NO	N/A
b. PORTAL, HAMMERHEAD AND TOWER CRANES 125% OF THE MAXIMUM ANTICIPATED LOAD. (18.C.01) (18.E.01)			
c. PEDESTAL MOUNTED CRANES AND DERRICKS 125% OF THE MAXIMUM ANTICIPATED LOAD. (18.C.01) (18.F.02)			
d. FLOATING CRANES IN ACCORDANCE WITH THE FOLLOWING TABLE:			

SAGE WORKING LOAD	TEST LOAD
UP TO 20 TONS	125% OF WORKING LOAD
UP TO 50 TONS	WORKING LOAD PLUS 5 TONS
OVER 50 TONS	110% OF WORKING LOAD

(18.C.01) (18.G.05)

DATE: _____ WEIGHT OF TEST LOAD _____ TONS

LENGTH OF BOOM. MAXIMU RADIUS AT WHICH TEST PERFORMED:

_____ FEET _____ FEET

	YES	NO	N/A
ARE ADEQUATE FIRE EXTINGUISHERS INSTALLED ON THE EQUIPMENT, CHARGED, TAGGED, AND READY FOR USE, SUITABLY PLACED, AND DISTINCTLY MARKED, AND IS ACCESSIBILITY TO THEM UNOBSTRUCTED? (13.A.01) (13.A.02)			
37. ARE TRUCK AND CRAWLER MOUNTED CRANES MOUNTED ON BARGES SECURELY ATTACHED TO THE BARGE; OR ARE CONTROL BARRIERS PROVIDED TO PREVENT EQUIPMENT FROM RUNNING OFF BARGE WHERE BARGE STABILITY IS SUCH AS TO PERMIT LIMITED TRAVEL. (18.G.06)			
38. ARE ADEQUATE GUARDRAILS PROVIDED AROUND THE SKIPS OF PAVERS, CONCRETE MIXERS AND SIMILAR EQUIPMENT? GUARD IS REQUIRED FOR OPEN END OF SKIP. (18.B.07)			
39. ARE ALL MOTOR VEHICLES EQUIPPED AS FOLLOWS WHEN OPERATED BETWEEN SUNSET AND SUNRISE?			
a. DIRECTIONAL SIGNAL LIGHTS BOTH FRONT AND REAR?			
b. TWO HEADLIGHTS, ONE ON EACH SIDE; ONE RED TAILLIGHT AND ONE RED OR AMBER STOP LIGHTS ON EACH SIDE.			
c. THREE EMERGENCY FLARES, REFLECTIVE MARKERS, OR EQUIVALENT PORTABLE WARNING DEVICE. (19.A.06)			

CATE ANSWERS BY PLACING "X" IN PROPER COLUMN.

		YES	NO	N/A
40.	IS SERVICE OR MAINTENANCE EQUIPMENT, WHICH WILL BE PARKED OR MOVING SLOWER THAN NORMAL TRAFFIC ON HAUL ROADS AT NIGHT, EQUIPPED WITH A FLASING YELLOW LIGHT MOUNTED TO BE VISIBLE FROM ALL DIRECTIONS? (18.A.20)			
41.	ARE BRAKES ON WHEELED EQUIPMENT IN GOOD OPERATING CONDITION? (18.A.21) (19.A.03) (19.A.07) (19.A.08)			
42.	ARE WINDSHIELDS ON EQUIPMENT PROVIDED WITH WINDSHIELD WIPERS, AND DEFROSTING AND DEFOGGING DEVICES? (19.A.10) (19.A.11)			
43.	IS ALL GLASS INSTALLED IN CABS AND BODIES OF VEHICLES AND EQUIPMENT "SAFETY GLASS"? (19.A.15)			
44.	ARE TRUCKS AND SIMILAR EQUIPMENT EQUIPPED WITH SPEEDOMETERS, FUEL GAUGES, AND HORNS IN WORKING CONDITION? (19.A.09)			
45.	ARE RUNNING BOARDS AND STEPS OF VEHICLES PROVIDED WITH NONSLIP SURFACES? (19.A.14)			
46.	ARE DUMP BODIES PROVIDED WITH HINGED STRUTS OR OTHER SUITABLE DEVICES FOR LOCKING BODY IN RAISED POSITION? (19.A.20)			
.	ARE TAILGATE DUMPING DEVICES SO ARRANGED THAT OPERATOR WILL BE IN THE CLEAR WHILE DUMPING LOAD? (19.A.22)			
48.	IS ENGINE EQUIPPED WITH POWER-OPERATED STARTING DEVICE IN OPERATIVE CONDITION? (19.A.23)			
49.	IS AIR-PRESSURE GAUGE IN OPERATIVE CONDITION IN EQUIPMENT WITH AIR BRAKES? (21.A.10)			
50.	IS AIR TANK EQUIPPED WITH DRAIN VALVE IN AN ACCESSIBLE POSITION? (21.B.19) (21.B.24) (21.B.26)			
51.	ARE TOWING DEVICES STRUCTURALLY ADEQUATE AND PROPERLY MOUNTED? (19.A.17)			
52.	IF EQUIPMENT IS TO OPERATE ON AIRFIELD LANDING AREAS IS IT EQUIPPED WITH PROPER FLAGS? (10.D.07)			
53.	ARE CABLES FOR ELECTRICALLY POWERED EQUIPMENT IN GOOD CONDITION AND ARE INSULATED HOT STICKS AVAILABLE FOR HANDLING CABLES? (07.A.04) (15.A.02) 15.A.04) (15.A.09)			

U.S. ARMY ENGINEERS ALASKA DISTRICT SAFETY INSPECTION	Date: Correction:
Contractor or Office:	Contract or Activity:
Inspected By:	Site Inspector's Signature:

	Yes	No	REMARKS
1. Inspector has reviewed EM 385-1-1 & DIVR 385-1-1			
2. Policy statement with endorsements, man overboard, fire, abandon ship drills held monthly and documented.			
3. Copy of Accident Prevention Program, Job Hazard Analysis, Hurricane Protection Plan and Drug abuse program at site.			
4. Daily safety inspection performed and documented, equipment inspection checklist on hand and completed.			
5. Safety meeting held weekly and documented.			
6. Current first aid/CPR cardholder, Log of Accidents, Medical Surveillance, First-Aid kits, fire plan, emergency numbers & Emer. Response Plan posted. Written name of Safety/Fire coordinator.			
7. Accident reporting, timeliness, investigation, accident summary.			
8. Hazard Chemical Inventory/MSDS, haz/storage, annual training			
9. Doc. showing safety training/DDC/new employee indoctrination			
10. Const/safe: heavy equipment rigging, welding/cutting, tools, pressurized equipment & access facilities, ladders, scaffolding.			
11. Housekeep-sanitation, warning signs, matl/tool storage, tripping			
12. Fire protection, flammable/combustible storage, fuel handling			
13. Personal protective equipment issued/used, i.e., respirators, fall protection, rescue equipment, personnal flotation devices, protection for head, foot, eyes, face, hands, body.			
14. Electrical safety-i.e., battery charging, lockout/tagout, bonding, grounding, permanent & temporary wiring, overhead lines			

DEFICIENCIES NOTED:

(For Safety Staff only)	REPORT NO.	EROC CODE	**UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT** *(For Use of this Form See Help Menu and USACE Suppl to AR 385-40)*	**REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)**

1. ACCIDENT CLASSIFICATION

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT ☐ CIVILIAN ☐ MILITARY	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ CONTRACTOR	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ PUBLIC	☐ FATAL ☐ OTHER		☐	

2. PERSONAL DATA

a. Name *(Last, First, MI)*	b. AGE	c. SEX ☐ MALE ☐ FEMALE	d. SOCIAL SECURITY NUMBER	e. GRADE

f. JOB SERIES/TITLE	g. DUTY STATUS AT TIME OF ACCIDENT	h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
	☐ ON DUTY ☐ TDY ☐ OFF DUTY	☐ ARMY ACTIVE ☐ ARMY RESERVE ☐ VOLUNTEER ☐ PERMANENT ☐ FOREIGN NATIONAL ☐ SEASONAL ☐ TEMPORARY ☐ STUDENT ☐ OTHER *(Specify)*

3. GENERAL INFORMATION

a. DATE OF ACCIDENT *(month/day/year)*	b. TIME OF ACCIDENT *(Military time)* hrs	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME (1) PRIME: (2) SUBCONTRACTOR:
e. CONTRACT NUMBER ☐ CIVIL WORKS ☐ MILITARY ☐ OTHER *(Specify)*		f. TYPE OF CONTRACT ☐ CONSTRUCTION ☐ SERVICE ☐ A/E ☐ DREDGE ☐ OTHER *(Specify)*	g. HAZARDOUS/TOXIC WASTE ACTIVITY ☐ SUPERFUND ☐ DERP ☐ IRP ☐ OTHER *(Specify)*

4. CONSTRUCTION ACTIVITIES ONLY *(Fill in line and corresponding code number in box from list - see help menu)*

a. CONSTRUCTION ACTIVITY	(CODE) #	b. TYPE OF CONSTRUCTION EQUIPMENT	(CODE) #

5. INJURY/ILLNESS INFORMATION *(Include name on line and corresponding code number in box for items e, f & g - see help menu)*

a. SEVERITY OF ILLNESS/INJURY	(CODE) #	b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS RESTRICTED DUTY

e. BODY PART AFFECTED	(CODE)	g. TYPE AND SOURCE OF INJURY/ILLNESS	(CODE)
PRIMARY	#	TYPE	#
SECONDARY	#	SOURCE	#
f. NATURE OF ILLNESS/INJURY	#		

6. PUBLIC FATALITY *(Fill in line and correspondence code number in box - see help menu)*

a. ACTIVITY AT TIME OF ACCIDENT	(CODE) #	b. PERSONAL FLOATATION DEVICE USED? ☐ YES ☐ NO ☐ N/A

7. MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE	b. TYPE OF COLLISION	c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
☐ PICKUP/VAN ☐ AUTOMOBILE ☐ TRUCK ☐ OTHER *(Specify)*	☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END ☐ BROADSIDE ☐ ROLL OVER ☐ BACKING ☐ OTHER *(Specify)*	(1) FRONT SEAT			
		(2) REAR SEAT			

8. PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	b. OWNERSHIP	c. $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9. VESSEL/FLOATING PLANT ACCIDENT *(Fill in line and correspondence code number in box from list - see help menu)*

a. TYPE OF VESSEL/FLOATING PLANT	(CODE) #	b. TYPE OF COLLISION/MISHAP	(CODE) #

10. ACCIDENT DESCRIPTION *(Use additional paper, if necessary)*

11. CAUSAL FACTOR(S) *(Read Instruction Before Completing)*

a. (Explain YES answers in item 13)

	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?	☐	☐
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?	☐	☐
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	☐	☐

a. *(CONTINUED)*

	YES	NO
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident?	☐	☐
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?	☐	☐
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	☐	☐
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	☐	☐
DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident	☐	☐

b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?

☐ YES *(If yes, attach a copy.)* ☐ NO

12. TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?	b. TYPE OF TRAINING.	c. DATE OF MOST RECENT FORMAL TRAINING.
☐ YES ☐ NO	☐ CLASSROOM ☐ ON JOB	(Month) (Day) (Year)

13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES *(See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)*

a. DIRECT CAUSE

b. INDIRECT CAUSE(S)

14. ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).

DESCRIBE FULLY:

15. DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.

a. BEGINNING (Month/Day/Year)	b. ANTICIPATED COMPLETION (Month/Day/Year)		
c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT CORPS _____ CONTRACTOR _____	d. DATE *(Mo/Da/Yr)*	e. ORGANIZATION IDENTIFIER *(Div, Br, Sect)*	f. OFFICE SYMBOL

16. MANAGEMENT REVIEW *(1st)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

17. MANAGEMENT REVIEW *(2nd - Chief Operations, Construction, Engineering, etc.)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE	TITLE	DATE

18. SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW

a. ☐ CONCUR b. ☐ NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS

SIGNATURE	TITLE	DATE

19. COMMAND APPROVAL

COMMENTS

COMMANDER SIGNATURE	DATE

*U.S. GOVERNMENT PRINTING OFFICE: 1993-0-791-757

10.	ACCIDENT DESCRIPTION *(Continuation)*

13a.	DIRECT CAUSE *(Continuation)*

13b.	INDIRECT CAUSES *(Continuation)*

14.	ACTION(S) TAKEN, ANTICIPATED, OR RECOMMENDED TO ELIMINATE CAUSE(S) *(Continuation)*

CEPOD
IMMEDIATE REPORT OF ACCIDENT

SOHO USE ONLY
Date Rec'd: _____
Time Rec'd: _____

TO (COE office): _____ FROM: _____

1. Name of person reporting accident(print): _____ Phone No. _____

2. Accident Information (Check all that apply):

Property Damage	☐	Initial Report	☐	Contractor	☐	Fatality	☐
Injury	☐	Follow Up Report*	☐	Government	☐		
Illness	☐	Final Report	☐	Public	☐	Other (explain)	☐ _____

***A follow up report is due within 24 hours of any changes or additional information related to the accident (i.e., workers duty status)**

3. Contractor: _____ 3a. Contract Number: _____

4. Location of accident (be specific): _____

5a. Date of accident: _____ 5b. Time of accident: _____

5c. An explanation is required if this report is being submitted more than 24 hours after the accident occurred.

_____

6. Injured persons: Name: _____ Age: ____ Occupation: _____

7. What was the activity before the accident occurred? Describe the activity, as well as the tools, equipment, or material the employee was using (i.e., excavating with back hoe, electrical equipment installation, demolition of facility, erecting structural steel):

_____ Continued on page 2

8. What Happened? Tell how the injury, illness or property damage occurred (i.e., struck by, contacted by, cut by, strained by, fell from same or different level, stung by):.

_____ Continued on page 2

9. What was the injury, illness or property damage (i.e., contusion, bruise, muscle strain, fracture, respiratory, allergic reaction, skin disease, poisoning, collapsed boom crane, engine fire, damaged utilities)?:

_____

10. Is the injury or illness recordable as defined in OSHA 29 CFR Part 1904? (If yes an ENG Form 3394 must be completed and submitted within 10 days.) Note: An injury or illness is recordable if it results in death, days away from work, transfer to another job, restricted work, medical treatment beyond first aid, loss of consciousness or other significant illness. First aid treatment is clearly defined in OSHA 29 CFR part 1904. YES ☐ NO ☐

11. What medical treatment was required for the injury or illness (i.e. first aid, sutures, prescription medication, x-rays, cast)?

_____

12. If medical treatment was given away from the work site, where was it given? _____

13. Was employee hospitalized overnight as an in-patient? Yes ☐ No ☐ 14c. Estimated days hospitalized: ____

14a. Estimated days away from work: _____ 14b. Estimated Job Transfer or Restricted Days: _____

15. Did accident result in property damage? Yes ☐ No ☐ If yes, estimated property damage:

(If property damage is $2000 or greater an ENG Form 3394 must be completed and submitted

16. **Accident Board of Investigation Required: Yes ☐ No ☐ If yes, was immediate notification to the designated authorities made? The District Safety Office and Commander must be notified of all serious cases. Yes ☐ No ☐

**A board of investigation is required if the accident resulted in: a) a fatality, b) three or more people being admitted to a hospital, c) permanent total or partial disability, or d) property damage of $200,000 and greater.

17. Who investigated this accident (print name and title): _____

18a. Signature of person making report: _____ 18b. DATE SIGNED *(YYYYMMDD)* _____

19a. Title of person making report: _____ 19b. Phone: _____

CEPOD
IMMEDIATE REPORT OF ACCIDENT (cont.)

APPENDIX B

Field Sampling Plan

FINAL

FORT WAINWRIGHT
POST WIDE WORK PLAN

APPENDIX B
Field Sampling Plan

FORT WAINWRIGHT, ALASKA

MARCH 2011

U.S. Army Corps of Engineers, Alaska District
Environmental Remediation Services
Contract No. W911KB-06-D-0006
Task Order No. 20

Prepared by
Jacobs Engineering Group Inc.
4300 B Street, Suite 600
Anchorage, Alaska 99503

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Attachment B-6 PetroFlag™ Field Screening Procedures

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
bgs	below ground surface
CoC	chain-of-custody
DQO	data quality objective
DRO	diesel-range organics
EDB	1,2-dibromoethane (ethylene dibromide)
FSP	field sampling plan
FWA	Fort Wainwright, Alaska
GRO	gasoline-range organics
HCl	hydrochloric acid
ID	identification
IDW	investigation-derived waste
Jacobs	Jacobs Engineering Group Inc.
L	liter
MI	multi-increment
mL	milliliter
MS	matrix spike
MSD	matrix spike duplicate
NTU	nephelometric turbidity unit
PCB	polychlorinated biphenyl
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RRO	residual-range organics
SVOC	semivolatile organic compounds
TAT	turnaround time

ACRONYMS AND ABBREVIATIONS (Continued)

TBD	to be determined
TCLP	toxicity characteristic leaching procedure
TOC	total organic carbon
UVOST™	Ultraviolet Optical Screening Tool
VOA	volatile organic analysis
VOC	volatile organic compound
WMP	Waste Management Plan
XRF	X-ray fluorescence
°C	degrees Celsius

1.0 INTRODUCTION

This Field Sampling Plan (FSP) presents, in general terms, the requirements and procedures for conducting field activities at Fort Wainwright, Alaska (FWA). The work described herein will be performed by Jacobs Engineering Group Inc. (Jacobs) for the U.S. Army Engineer District, Alaska (USAED) under Environmental Restoration Services Contract No. W911KB-06-D-0006, Task Order Number 20 – Fort Wainwright Environmental Support. This FSP presents the sampling protocols and procedures that will be used to meet the data quality objectives (DQOs) presented in the site-specific work plan addendums, as well as sample collection, preservation, packaging, and laboratory analytical methods. Each site may vary due to individual site conditions. Site-specific work plan addendums will be created for each site requiring work under the contract.

Laboratory data quality requirements are presented in the Quality Assurance Plan and Procedures (QAPP) (Appendix C). Field forms are included in Attachment B-1 of this FSP.

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2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The following presents the roles of the personnel responsible for field sampling activities:

2.1 PROJECT CHEMIST

The Project Chemist fulfills the quality assurance (QA) role on field sampling efforts. The Project Chemist both supports and monitors performance of the sampling team and the analytical laboratory by carrying out the following tasks:

- Ensure DQOs are met through proper sample collection, preservation, and packaging methods.
- Ensure the analytical laboratory meets requirements of the QAPP (Appendix C).
- Ensure the analytical data meets the requirements of the QAPP (Appendix C).
- Report chain-of-custody (CoC) and laboratory performance information.
- Receive, check, archive, summarize, and retrieve laboratory data.
- Coordinate sample shipment and transportation.
- Provide the Field Samplers and the Project Manager with timely reporting of sample shipping and laboratory analytical data.

The Project Chemist will report to the Site Manager when working on site.

2.2 FIELD SAMPLER

The Field Sampler is responsible for determining the sample collection frequency, location, preservation, packaging and transportation, and analytical methods necessary to meet the DQOs presented in each site-specific work plan addendum. The Field Sampler will report to the Site Manger while working onsite. At a minimum, the Field Sampler will perform the following tasks:

- Collect and summarize field screening data.
- Determine location and depth at which to collect a sample based on field screening, visual, and olfactory observations.
- Collect, preserve, package, and transport samples.
- Ensure the integrity of CoC documentation.

- Review analytical results.
- Report deviations from this FSP to the Project Chemist and Site Manager.
- Record information associated with all of the above in a daily logbook.

Each Field Sampler that performs sampling for chemical analyses will either meet the Alaska Department of Environmental Conservation (ADEC) requirements of a Field Sampler, or be directly supervised by qualified personnel. Sampling personnel will also meet the Environmental Restoration Services requirements for approved sampling personnel, or be directly supervised by personnel that meet those requirements.

ADEC sampler qualifications and requirements can be found at the following web address:

<http://www.dec.state.ak.us/spar/csp/qp.asp>

3.0 ANALYTICAL SAMPLING ACTIVITIES

This FSP describes the requirements and procedures for all sampling activities conducted to provide environmental support for FWA. This document describes general techniques that will be used to accomplish the site-specific scope of work. General sampling procedures for solid, liquid, soil gas, and waste media are described in the following section. Specific site details will be addressed in a site-specific work plan addendum.

Specific analytical methods for the analyses to be performed are presented in the QAPP (Appendix C). Samples submitted for laboratory analysis will be packaged according to the guidelines in Section 6.6 of this FSP. Table B-3-1 of this FSP presents the container requirements, preservation requirements, and holding times for the analytical samples. Pre-cleaned sample containers certified analyte-free will be obtained from the laboratory. A summary of all analyses to be performed will be presented in site-specific work plan addendums.

Table B-3-1
Sample Containers, Preservatives, and Hold Times for Analytical Sampling

Parameter	Analytical Method	Container	Preservative	Maximum Holding Times
Soil and Sediment Samples				
Total Metals	SW6020/SW7471	One 8-ounce glass, Teflon-lined lid	None required per method, 4°C +/– 2°C (Hg Only)	180 days/28 days (Hg only)
GRO	AK101	One 4-ounce glass, Teflon-lined lid	Methanol, 4°C +/– 2°C	14 days
DRO/RRO	AK102/AK103	One 8-ounce glass, Teflon-lined lid	4°C +/– 2°C	14 days
SVOC	SW8270	One 8-ounce glass, Teflon-lined lid	4°C +/– 2°C	14 days
VOC	SW8260	One 4-ounce glass, Teflon-lined lid	Methanol, 4°C +/– 2°C	14 days
Low-level VOC	SW8260	Two 40 mL VOA vials	Sodium bisulfate, 4 °C +/- 2 °C	14 days to analysis
Herbicides	SW8151	One 8-ounce glass, Teflon-lined lid	4°C +/– 2°C	14 days
Pesticides	SW8081	One 4-ounce glass, Teflon-lined lid	4°C +/– 2°C	14 days

Table B-3-1
Sample Containers, Preservatives, and Hold Times for Analytical Sampling
(Continued)

Parameter	Analytical Method	Container	Preservative	Maximum Holding Times
PCB	SW8082	One 8-ounce glass Teflon-lined lid	4°C +/– 2°C	30 days to extraction, 40 days to analysis
Explosives	SW8321or SW8330	One 4-ounce glass Teflon-lined lid	4 °C +/- 2 °C	14 days to extraction, 40 days to analysis
Dioxins/Furans	SW8290	One 4-ounce glass Teflon-lined lid	4 °C +/- 2 °C, store in dark	30 days to extraction, 40 days to analysis
TOC	SW9060	One 4-ounce glass Teflon-lined lid	4°C +/– 2°C	28 days
TCLP	SW1311	Depends on requested analytical method	Depends on requested analytical method	Depends on requested analytical method
Surface Water and Groundwater Samples				
Total Metals	SW6020/7470	500-mL polyethylene bottle	Nitric acid	180 days/28 days
GRO	AK101	Three 40-mL VOA vials	HCL, zero headspace, 4°C +/– 2°C	14 days
DRO/RRO	AK102/103	Two 1-L amber glass bottles	HCl, 4°C +/– 2°C	14 days
SVOC	SW8270	Two 1-L amber glass bottles	4°C +/– 2°C	7 days
VOC	SW8260	Three 40-mL VOA vials	HCL, zero headspace, 4°C +/– 2°C	14 days
Herbicides	SW8151	Two 1-L amber glass bottles	4°C +/– 2°C	7 days
Pesticides	SW8081	Two 1-L amber glass bottles	4°C +/– 2°C	7 days
PCB	SW8082	Two 1-L amber glass bottles	4°C +/– 2°C	30 days to extraction, 40 days to analysis
Explosives	SW8321 or SW8330	Two 1-L amber glass bottles	4 °C +/- 2 °C	14 days to extraction, 40 days to analysis
Dioxins/Furans	SW8290	Two 1-L amber glass bottles	4 °C +/- 2 °C, store in dark	30 days to extraction, 40 days to analysis
EDB	504.1	Three 40-mL VOA vials	Sodium thiosulfate, zero headspace, 4°C	14 days

Table B-3-1
Sample Containers, Preservatives, and Hold Times for Analytical Sampling
(Continued)

Parameter	Analytical Method	Container	Preservative	Maximum Holding Times
			+/– 2°C	
Wipe Samples				
PCBs	SW8082	One 2-oz clear glass, TLC	Hexane, 4 ± 2° C	14 days
Soil Gas Samples				
VOCs	TO15	One 1-L summa canister or One 6-L summa canister	none	30 days

Notes:
For definitions, see the Acronyms and Abbreviations section.
Method version will be specified in the data generated for the project.
Sample containers are suggestions and can be substituted with containers adhering to method requirements.
Analytical volumes can be combined as long as laboratory volume requirements are met.
Percent moisture determination will be taken from the unpreserved container associated with the analytical parameters. If an unpreserved container is not being collected for an analytical method, it will need to be collected for the purposes of percent moisture alone.

All analytical samples will be collected and handled in accordance with four primary principles:

- Samples will be placed in clean sample containers.
- Samples will be collected with decontaminated or clean, disposable collection implements.
- Samples will be placed in pre-chilled coolers.
- Trip blanks for each cooler will accompany all volatiles samples.

3.1 SOLID MEDIA

Various sampling methods for solid media (soil, sediment, paint chip, and wipe sampling) are described in the following sections. The use of personal protective equipment (PPE), including safety glasses, proper gloves, and the appropriate clothing, is required when conducting sampling operations. The Site Safety and Health Plan (Appendix A) addresses the proper use of PPE.

3.1.1 Soil Sampling

There are three types of soil: surface, subsurface, and soil boring. All three types have the same soil-sampling protocols. Surface soil samples shall be collected, generally, at a depth of 0 to 2 feet below ground surface (bgs). If soil to be sampled is covered by standing water, the sampling point will be relocated to avoid collecting water-saturated samples.

Subsurface soil samples may be collected using a drill rig, a hand auger, or a shovel to a depth specified in the site-specific work plan addendum; however, the most likely method is a direct push drill rig. Using this method, boreholes for soil sampling will be drilled via direct-push using dual-tube tooling (Geoprobe® DT325 or similar) to permit continuous coring with no sloughing. This tooling consists of an outer casing with cutting shoe and an inner core barrel. As the combined assembly is driven into the soil, the cutting shoe extrudes the core into the barrel. At intervals of 4 or 5 feet, drilling is stopped and the full core barrel is withdrawn and replaced with an empty barrel. Because the outer casing remains in place, the borehole walls cannot slough to the bottom of the hole. DT325 tooling employs outer casing with an outside diameter of 3.25 inches and cuts core with a diameter of 1.80 inches, providing sufficient material for sampling (including duplicates and QA triplicate samples) and lithologic logging.

Soil boring samples are often collected based on field screening results and will be collected using a drill rig. If a drill rig is used to collect subsurface soil samples, a soil boring log will be completed (Attachment B-1). An analytical sample will be collected from the soil with the highest field screening result unless otherwise identified in the site-specific work plan addendum. Each sample will be collected using a new disposable sampling device or one that has been decontaminated.

If the boring will not be completed as a monitoring well, it will be abandoned by filling with bentonite grout or chips to approximately 1 foot below grade and then brought to grade using soil scraped from the nearby ground surface. All decontamination water and waste soil core will be disposed of as described in the Waste Management Plan (WMP) (Appendix E). If approved, drill cuttings will be placed back down the borehole from which they were removed

instead of bentonite grout. If the drill cuttings are not sufficient to fill the borehole, the additional area will be filled with bentonite grout.

Soil Sampling Protocols

Soil samples at each location will be collected in order of volatility, with the most volatile analytes collected first (e.g., volatile organic compounds [VOCs] and gasoline-range organics [GRO]). When sampling for VOCs by method SW8260B and GRO by method AK101, the following sampling and handling procedures shall be followed:

- Don new PPE (gloves, etc.) before starting sample collection.
- Verify that the 4-ounce container has a septumated lid and is identified as pretared.
- Verify that the tared weight of the sample jar is recorded on the jar and in the Field Sampler's logbook accompanying the sample collection information. Occasionally, a serial number is located on the tared container that corresponds to the weight of the container determined by the laboratory prior to shipment.
- **Do not place the label on the pretared containers.** Hand-enter sampling information on the existing laboratory label. Complete the sampling information on the container label, including the volume of excess methanol added.
- Add 25 to 50 grams of soil to the pretared container to provide an adequate volume to represent the site and ensure the maximum reporting limits are achievable. Place a minimum of 25 grams and a maximum of 50 grams of soil in the jar and add one volume of methanol (usually 25 milliliters provided by the laboratory in a separate vial). Wipe the rim of the sample jar of any soil to assure a good seal. If one volume does not completely cover the sample, additional methanol volume(s) will be added until the soil is completely submerged, and the total volume of methanol added will be noted on the CoC. **A minimum one-to-one soil-to-methanol ratio must be maintained to ensure the lowest possible detection limits.**
- Record all appropriate sample information in the field logbook.
- After addition of methanol to the soil, mark the bottom of the methanol meniscus. Initial and date the meniscus mark. This allows for inspection of methanol loss.
- Wrap the jar in bubble wrap and place into a resealable plastic bag (e.g., Ziploc®). Place any new or additional labels on the outside of the plastic bag.
- Place samples upright, to avoid methanol leaks, in a prechilled cooler immediately after sample collection. Upon return to the field office, samples will be refrigerated until packaged for shipping.
- Include methanol trip blanks for methanol-preserved soil samples analyzed by SW8260B and/or AK101. One trip blank shall accompany each cooler containing methanol-

preserved volatile samples with a minimum of one trip blank per every 20 methanol-preserved samples.

- Collect one duplicate sample for every 10 (or fewer) primary samples. In general, field duplicates will not be collected for waste characterization; however, if these are required, this requirement will be stated in the site-specific work plan addendum.
- Collect one matrix spike/matrix spike duplicate (MS/MSD) sample for each sample shipment/laboratory batch, or at a frequency of one per 20 samples per matrix, whichever is more. Denote MS/MSD samples on the CoC. MS/MSD samples may be collected for waste characterization unless adequate sample volume is unavailable or safety concerns impact sample collection.
- Include one temperature blank in each cooler.
- Pack and ship cooler as described in Section 6.6.

When collecting soil samples for methods other than VOCs or GRO, the following sampling and handling procedures shall be followed:

- Don new PPE (gloves, etc.) before starting sample collection.
- Set out appropriate sample containers for desired analyses.
- Uncover fresh soil and homogenize using disposable sampling equipment, such as a pie pan and plastic spoon (or equivalent) or a stainless steel bowl and spoon (or equivalent) that has been cleaned by wiping out with a paper towel (or equivalent) and decontaminated using a mixture of Alconox and deionized water, then rinsed with deionized water.
- Collect the soil sample in the appropriate sample jar.
- When the sample collection is complete, make sure all dirt is removed from the lip of the jar.
- Secure the jar lid.
- Label the jar with date, time, sampler name, sample identification, and requested analyses.
- Record all appropriate sample information in the field logbook.
- Place samples upright in a pre-chilled cooler immediately after sample collection. Upon return to the field office, samples will be refrigerated until packaged for shipping.
- Decontaminate or dispose of the sampling tool between sampling locations.
- Collect one duplicate sample for every 10 (or fewer) primary samples. This requirement does not apply to waste samples.
- Collect one MS/MSD sample for each sample shipment/laboratory batch, or at a frequency of one per 20 samples per matrix, whichever is more. Denote MS/MSD samples on the CoC. This requirement does not apply to waste samples.

- Include one temperature blank in each cooler.
- Pack and ship cooler as described in Section 6.6.

Table 3-1 presents the container requirements, preservation requirements, and holding times for the samples to be collected.

3.1.2 Sediment Sampling

Generally, surface water and sediment samples may be collocated. Surface water samples will be collected prior to sediment samples to minimize turbidity, and in a location just above the preferred sediment sample location (see Section 3.2.1). Sediment samples will be collected using either a clamshell auger or a stainless steel spoon.

Sediment samples at each location will be collected in order of volatility, with the most volatile analytes collected first (VOC, GRO, etc.). When sampling for VOCs by method SW8260B and GRO by method AK101, samples should be collected a depth of 0 to 6 inches bgs or 0 to 6 inches below the groundwater level, and the volatile soil sampling method in Section 3.1.1 will be followed.

When collecting sediment samples for methods other than VOCs or GRO, the following sampling and handling procedures will be followed:

- Don new PPE (gloves, etc.) before starting sample collection.
- Set out appropriate sample containers for desired analyses.
- Use decontaminated or disposable sampling equipment to collect sediment samples in appropriate sample containers. Collect sediment samples from a depth of 0 to 6 inches bgs or 0 to 6 inches below the groundwater level.
- Remove excess sediment from the lip of the container, and seal the container.
- Label the jar with the sample collection date, time, analyses requested, and sampler initials.
- Record all appropriate information in the field logbook.
- Place samples upright in a pre-chilled cooler immediately after sample collection. Upon return to the field office, samples will be refrigerated until packaged for shipping.

- Decontaminate or dispose of the sampling tool between sampling locations to avoid cross-contamination.
- Collect one duplicate sample for every 10 (or fewer) primary samples. This requirement does not apply to waste samples.
- Collect one MS/MSD sample for each sample shipment/laboratory batch, or at a frequency of one per 20 samples per matrix, whichever is more. Denote MS/MSD samples on the CoC. This requirement does not apply to waste samples.
- Include one temperature blank in each cooler.
- Pack and ship cooler as described in Section 6.6.

Table B-3-1 presents the container requirements, preservation requirements, and holding times for the samples to be collected.

3.1.3 Wipe Sampling

Wipe samples may be collected at some FWA sites. Wipe sampling consists of rubbing a hexane-moistened filter paper over a measured area of 100 square centimeters. The wipe will be placed in the appropriate container (Table B-3-1) and the lid closed tightly. The size of the wipe area will be identified on the CoC. The packaging and shipping procedures listed in Section 6.0 will be followed.

3.1.4 Paint Chip Sampling

Paint chip samples may be collected at FWA sites and analyzed for lead content. For sampling paint affixed to solid surface (interior painted surfaces), samplers will use a stainless steel spoon or scraper to manually scrape paint from a 1-inch by 1-inch square area, being careful not to removed the substrate with the sample. If toxicity characteristic leaching procedure (TCLP) is a required analysis, the sampling procedures will be included in the site-specific work plan addendum. Packing of the sample or multiple jars may be required to obtain the minimum sample mass required to meet analytical DQOs.

Excess paint chips will be removed from the lip of the container, and a lid will be used to seal the container. The sample collection date, time, and sampler's initials will be placed on the prepared label and CoC form.

3.2 LIQUID MEDIA

Various sample collection methods for liquid media (surface water and groundwater) are described in the following sections. The use of PPE, including safety glasses, proper gloves, and the appropriate clothing, is required when conducting sampling operations. Health and safety procedures are defined in the Site Safety and Health Plan (Appendix A).

3.2.1 Surface Water Sampling

Surface water samples can include samples from stormwater, lakes/ponds, or streams/rivers. Surface water samples will be collected using an unpreserved sample jar and transferring those contents into any other necessary preserved sampling jars unless otherwise specified in the site-specific work plan addendum. A pond sampler or dipper can also be used to minimize both the sampler's and the sample container's contact with the water body being sampled. Other sampling apparatuses include the weighted bottle sampler, the Bacon bomb sampler, the Kremmer sampler, and a peristaltic pump. For more information on these techniques, refer to the U.S. Army Corps of Engineers Engineering Manual 200-1-3, *Requirements for the Preparation of Sampling and Analysis Plans,* Section C-3. Collection of surface water samples for laboratory analysis shall proceed as follows:

- Collect samples according to volatility (VOCs first, GRO second, diesel-range organics [DRO] third, etc.) to minimize loss of contaminants.
- Fill the sample bottle slowly and continuously to the appropriate volume. Note that samples for volatile analyses (methods SW8260B and AK101) require the 40-milliliter vials be filled to zero headspace. Tighten the cap securely, tap, and invert the vial to inspect for bubbles.
- Collect samples directly into method-prescribed containers with appropriate preservatives (Table B-3-1).
- Secure the cap tightly and complete the sample label.
- Record all appropriate sample information in the field logbook.
- Wrap each sample container in bubble wrap and place into a resealable plastic bag.
- Place filled sample containers upright in a pre-chilled cooler along with the required trip blank if analyzing for volatiles (methods SW8260B and AK101).

Samples submitted for laboratory analysis will be packaged according to the guidelines in Section 6.0 of this FSP. Table B-3-1 presents the container requirements, preservation requirements, and holding times for the sample to be collected.

3.2.2 Groundwater Well Installation

Monitoring wells will be installed with a Geoprobe percussion hammer/direct-push rig, or equivalent. By using the direct-push method, no drill cuttings will be generated, eliminating the need to manage this potential waste stream. A 3.25-inch hollow rod will be pushed into the ground to a depth of approximately 5 feet below the groundwater table. Once the rod has been pushed to the appropriate depth, the pre-packed well screen and riser pipe will be connected and inserted into the 3.25-inch rod. Then the rod will be extracted, leaving the tip and well string in place.

As the rod is extracted, 10 to 20 silica sand will be used to fill the well annulus until there is sand 2 feet above the top of the screen. The remaining approximately 3 vertical feet of the well annulus will be filled with bentonite granules and hydrated. Wells will be completed as stick-ups, with the top of the well 2.5 to 3 feet above ground surface. A D-1 gravel pad will be placed on the ground surface surrounding the well to a thickness of approximately 6 inches. Locking top caps with combination locks will be installed on all wells. Wells will be developed and sampled in accordance with the FSP (Appendix B). Any deviations from this will be stated in the site-specific addendum.

3.2.3 Groundwater Well Development

If wells are to be installed at sites at FWA, the installation will be described in the site-specific work plan addendum. Well development will remove fine-grained material from the surrounding formation and facilitate natural groundwater movement through the well's screen slots. Well development shall be initiated no sooner than 48 hours after cement grouting is completed on a well and completed within 7 days of grouting. Development shall be performed using only mechanical surging, overpumping, or a combination thereof. Jacobs

shall maintain the well-development record (Attachment B-1). Development is complete when the following are achieved (USACE EM 1110-1-4000, 1998):

- The well water is clear to the unaided eye (evaluate at least a casing volume in a clean, white, 5-gallon bucket).
- Sediment thickness in the well is less than 1 percent of the measurement of the screen's length.
- A minimum of five times the volume of standing water in the well plus five times the volume of all added water and drilling fluid lost during drilling and installation of the well has been removed.
- Temperature, specific conductivity, pH, dissolved oxygen, redox potential, and turbidity readings – measured before, twice during, and twice after development operations – have stabilized (Table B-3-2).

Well development will proceed in the following manner:

- By means of an electronic water-level indicator, or other sufficient device, depth to groundwater and depth to well bottom will be measured to an accuracy of 0.01 feet. Datum gathered will be to the top of the north side of the well casing.
- Wells will be developed by alternating surge and purge cycles. At the beginning of development, a stainless steel surging rod will be lowered into the well and pulled back and forth, forcing water through the slots of the well screen.
- After surging, a minimum of five casing volumes will be removed from the well by means of a disposable bailer or a peristaltic pump. If the well purges dry, wait two hours to determine if the well recovers before adding water. If the well has not recovered to 80 percent of the original volume, potable water may be added as described in *Monitoring Well Guidance* (ADEC 2009c). A second surging cycle will be performed at least once during removal of purge volumes.
- At the end of development, the depth to groundwater and the depth to the well bottom will be measured, by means of an electronic water-level indicator or other sufficient device, to an accuracy of 0.01 foot. Datum gathered will be to the top of the north side of the well casing.

Water removed during development and testing operations shall be containerized and disposed of according to the WMP (Appendix E).

3.2.4 Groundwater Sampling

Groundwater sampling will occur no sooner than 24 hours after development has been completed. Groundwater sampling will proceed in the following manner:

- Record information pertaining to these steps on the Groundwater Sampling Data Sheet. (Attachment B-1) and in the field logbook.
- Don new PPE (gloves, etc.) before starting sample collection.
- By means of an electronic water-level indicator, measure depth to groundwater to an accuracy of 0.01 foot. Datum gathered will be to the top of the north side of the well casing.
- Prior to purging the well for sampling, carefully insert an electronic interface probe into the water column to detect phase-separated product. Note the existence of phase-separated product on the groundwater sampling data sheet. If phase-separated product exists, groundwater samples will not be collected.
- Purge a minimum of three well-casing volumes, using a new disposable bailer, decontaminated Teflon® or stainless steel bailer, a peristaltic pump, or a submersible pump and dedicated tubing, unless low-flow purging technique is used. If the well dries up before purging three well volumes, allow the water level to recover sufficiently for collection of a sample.
- For low-flow purging and sampling generally, do not allow the flow rate to exceed 0.5 liters per minute (0.132 gallons per minute). Using this technique, three well-casing volumes need not be purged as long as the field parameters listed in Table B-3-2 are stable for three consecutive readings.
- While purging, do not allow the drawdown to exceed 4 inches (0.3 feet). If this cannot be avoided, remove three well-casing volumes prior to sampling. If the well purges dry before three well-casing volumes can be removed, allow the well to recharge (refill) prior to sampling. Whenever possible, delay sampling until the well is 95-percent recovered, but no more than 24 hours between purging and sampling.
- For low-yield wells, instead of purging three casing volumes, measure the purge water temperature, conductivity, pH, dissolved oxygen, redox potential, and turbidity until these parameters are stable within the limits specified in Table B-3-2.
- After purging is complete, collect a groundwater sample from the well. Collect samples according to volatility (VOCs first, GRO second, DRO third, etc.) to minimize loss of contaminants. Note that samples for volatile analyses (methods SW8260B and AK101) require the 40-milliliter vials be filled to zero headspace. Tighten the cap securely, tap, and invert the vial to inspect for bubbles.
- Collect one duplicate sample for every 10 or fewer primary samples for quality control (QC).

- Designate one MS/MSD on the CoC form for each sample shipment/lab batch, or at a frequency of one per 20 samples per matrix, whichever is more.
- Store the samples at 4±2°C and submit to the laboratory under standard CoC procedures. Section 6.0 describes detailed procedures for sample handling, packaging, and documentation.
- Maintain a trip blank for each batch of 20 samples or one per cooler for VOCs and GRO analyses.
- Containerize and dispose of water removed during development and testing operations according to the WMP (Appendix F).

Table B-3-2
Groundwater Stabilization Parameters

Parameter	Acceptable Variation
Temperature	1 degree Celsius
Conductivity	±3%
pH	±0.2 pH units
Dissolved Oxygen	±10%
Redox Potential	±10 millivolts (mV)
Turbidity	±10% (1 NTU if reading is less than 10 NTUs)

3.2.5 Groundwater Grab Samples

Methods

Groundwater grab samples may be collected at FWA. If groundwater grab sampling is determined necessary, one of the following methods will be used depending on site conditions, well conditions, and professional judgment. The chosen method(s) will be specified in the site-specific work plan addendum.

The preferred method for collecting groundwater grab samples is the SP16 method utilized during soil sample collection. SP16 uses a protective screen, direct-push groundwater grab sampler that is sealed during drilling activities. Development of these temporary sampling ports may not be required. If it is not necessary to take groundwater parameters at the site, it may be specified in the site-specific work plan addendum. Fines will be allowed to settle out prior to sampling activities or samples will be filtered prior to analysis. A peristaltic pump will be used to collect the sample from the sampling port installed. The depth and borehole

identification (ID) from which the sample was collected, the time drilling stopped, and the sample time will be recorded in the field logbook.

Groundwater grab samples that cannot be collected using the direct-push SP16 method from the soil boring will be collected using one of the following methods:

- From the open borehole by slightly retracting the outer drilling core using a peristaltic pump or a disposable bailer;
- Through a temporary well screen lodged inside the drilling core barrel using a peristaltic pump; and
- Through a temporary well screen placed inside the open borehole after completely withdrawing the drilling core using a peristaltic pump or a disposable bailer.

Equipment

One of three types of sampling equipment can be used to collect groundwater samples from monitoring wells or boreholes:

- Peristaltic pump system
- Portable submersible pump
- Hand bailer

The selection of sampling equipment used on each well will be determined based on availability of equipment and what is appropriate for the contaminants of concern. When determined appropriate, sampling will occur using a disposable Teflon® bailer. A Teflon®-coated leader (8-foot length) will be securely attached to the bailer. This leader will then be attached to $^{1}/_{8}$-inch nylon line so that the bailer can be lowered to the desired depth. The bailer will be lowered slowly into the well, taking care to cause as little disturbance as possible to the water surface. Water will be collected from the middle of the screened interval of the well, if screening is in place. As the bailer is lowered and raised, the sampler will be careful to keep the nylon line clean and off the ground surface. To keep the line clean, it may be directed into a clean bucket or similar container as the bailer is being raised in the well. Bailers will be kept as a last resort for sampling wells.

In the event that floating product is detected in the well, a disposable polyethylene bailer will be used to remove the product from the top of the water column. The bailer will be lowered to just above static water level and purging cycles performed until no visible product remains at the groundwater interface. After the field crew has determined that no product remains in the casing, actual sampling procedures will begin.

Analytical water sample collection activities will be conducted in accordance with 18 Alaska Administrative Code (AAC) 75 protocols. Samples will be submitted for laboratory analysis and analyzed for site-specific analytes of concern in accordance with the site-specific work plan addendum.

Laboratory-approved, certified clean containers will be used for sample collection. Although the actual sample collection protocol depends on the specific analytes being tested, some general sample collection procedures apply as follows:

- Record the collection of each sample in the field logbook.
- Don new PPE (gloves, etc.) before starting sample collection.
- Keep the pump tubing off the ground and free of contaminating materials that could be carried into the boring.
- Take care to minimize disturbance of the groundwater.
- Collect samples according to volatility (VOCs first, GRO second, DRO third, etc.) to minimize loss of contaminants. Note that samples for volatile analyses (methods SW8260B and AK101) require the 40-milliliter vials be filled to zero headspace. Tighten the cap securely, tap, and invert the vial to inspect for bubbles. Rims must be cleaned before tightening lids.
- Maintain trip blanks for each batch of 20 samples or one per cooler for VOCs and GRO analyses.
- Collect one duplicate (QC) sample for every 10 or fewer primary samples.
- Designate MS/MSD on the CoC form for each sample shipment/lab batch, or at a frequency of one per 20 samples per matrix, whichever is more.
- Store samples at 4 ±2°C and submit to the laboratory under standard CoC procedures. Section 6.0 describes detailed procedures for sample handling, packaging, and documentation.

3.3 SOIL GAS MEDIA

Soil gas samples may be collected at FWA sites using passive or active methods.

3.3.1 Passive Soil Gas Sampling

Passive sampling provides qualitative data in units of mass. This data is useful for locating a vapor source and characterizing the extent of vapor migration, but will not be used alone to evaluate risk.

Collection of passive air samples shall proceed as follows:

- Record the collection of each sample in the field logbook and any other observations pertinent to the sampling event.
- Don new PPE (gloves, etc.) before starting sample collection.
- Install manufacturer-supplied soil gas module according to the associated instructions. Minimize soil disturbance as much as possible during installation.
- Leave in the ground for the recommended time period and return to manufacturer for analysis.

3.3.2 Active Soil Gas Sampling

Active soil gas sampling, provides quantitative data in units of concentration, it will be the primary method used for determining risk. Active soil gas samples are collected from three primary locations: exterior, near-slab and subslab. "Exterior" soil gas samples are collected 10 feet or more from the perimeter of the building. "Near-slab" soil gas samples are collected outside a structure but within a short distance (usually 10 feet) of the building's foundation. Finally, "subslab" soil gas samples are collected from below the building foundation or slab (ADEC 2009a).

<u>Exterior and Near Slab Soil Gas Samples</u>

Exterior soil gas samples will be collected from depths greater than 18 inches bgs to avoid dilution of samples with ambient air.

Samples may be collected using 1-liter or 6-liter summa canisters depending on the detection limits needed for the site. See the site-specific work plan addendum for these details.

Leak tests will be conducted using a five-gas meter at every soil gas probe less than 10 feet bgs, unless otherwise approved by ADEC. During a leak test, tracer compounds such as helium, pentane, isopropanol, isobutene, propane, or butane will be applied around the sampling train immediately before sampling. Leakage will be considered present when the tracer compound is present in the test sample at more than 10 percent of the source concentration.

Collection of air samples for laboratory analysis shall proceed as follows:

- Record the collection of each sample in the field logbook. In addition to the normal sampling information, include the canister identification number, remaining canister vacuum, air temperature, barometric pressure if samples are less than 5 feet bgs, precipitation if samples are less than 3 feet bgs, and any other observations pertinent to the sampling event. If rainfall greater than 1 inch has occurred within the last 8 hours, a percent moisture sample will be taken near the soil gas sampling location.
- Don new PPE (gloves, etc.) before starting sample collection.
- Install soil gas probes into 2 to 3 centimeter diameter holes to the depth specified in the site-specific work plan addendum. Minimize soil disturbance as much as possible during installation.
- Install surface seals using grout or other approved materials.
- Allow system to equilibrate.
- Probes installed with the direct push method, where the drive rod remains in the ground, will be left to equilibrate for at least 20 minutes following probe installation.
- Probes installed with the direct push method, where the drive rod does not remain in the ground, will be left to equilibrate for at least 30 minutes following probe installation.
- Probes installed with hollow-stem drilling method will be left to equilibrate for at least 48 hours following probe installation.
- Purge the system by pulling soil gas through the system to achieve a purge volume that equals at least three dead volumes (internal volume of the in-ground annular space, sample, and sampling manifold system). The purge rate will be between 100 to 200 milliliters per minute.
- Attach the certified clean summa canister to the sampling manifold.

- Slowly open the canister's valve approximately one full turn allowing the sample to collect at a rate of between 100 to 200 milliliters per minute.
- Close all appropriate valves after sampling.

Table B-3-1 presents the sample containers, preservation, and holding times (ADEC 2009a).

Sub-Slab Soil Gas Samples

Sub slab soil gas samples will be collected from directly below the building foundation or slab. Samples may be collected using 1-liter or 6-liter summa canisters depending on the detection limits needed for the site. Refer to the site-specific work plan addendum for details.

Leak tests will be conducted using a five-gas meter at every soil gas probe less than 10 feet bgs, unless otherwise approved by ADEC. During a leak test, tracer compounds such as helium, pentane, isopropanol, isobutene, propane, or butane, will be applied around the sampling train immediately before sampling. Leakage will be considered present when the tracer compound is present in the test sample at more than 10 percent of the source concentration (ADEC 2009a).

Collection of air samples for laboratory analysis shall proceed as follows:

- Record the collection of each sample in the field logbook. Include the canister identification number, remaining canister vacuum, and any other observations pertinent to the sampling event.
- Don new PPE (gloves, etc.) before starting sample collection.
- Drill through the foundation with a hand-held drill but do not extend into or disturb the soil.
- Install small-diameter (⅛- or ¼-inch outside diameter) stainless steel or another inert material and stainless steel compression fittings.
- Install surface seal around the probe to prevent air leakage into the subslab environment.
- Install surface seals using grout or other approved materials.
- Equilibration time is not necessary.
- Purge the system by pulling soil gas through the system to achieve a purge volume that equals at least three dead volumes (internal volume of the in-ground annular space, sample, and sampling manifold system). The purge rate will be between 100 to 200 milliliters per minute.

- Attach the certified-clean summa canister to the sampling manifold.
- Slowly open the canister's valve approximately one full turn allowing the sample to collect at a rate of between 100 to 200 milliliters per minute.
- Close all appropriate valves after sampling.

Table B-3-1 presents the sample containers, preservation, and holding times (ADEC 2009a).

3.4 WASTE MEDIA

Drum contents and waste testing will be performed in accordance with EM 200-1-3 (USACE 2001). Physical and chemical HazCat® testing will be used to characterize and segregate the contents of drums into the appropriate waste stream or group. HazCat® procedures are located in Attachment B-3. Initial inspection shall include a physical description of the drum or container including size, drum type, markings, and condition. Upon preliminary waste characterization testing, physical descriptions should be noted including number of phases, physical state, color, clarity, homogeneity, and any other observations with respect to appearance.

Using a coliwasa tube, bailer, or equivalent, samples will be collected from drums and tanks for HazCat® and laboratory analyses. The testing will utilize a chemical test analysis and combustion process to determine the general category of organic, inorganic, metals, reagents, and combustibility for total oil and grease and total petroleum hydrocarbons.

After HazCat® tests have confirmed compatibility, an aliquot of sample will be placed in a five-gallon bucket used to combine a composite liquid from a compatible waste stream. An analytical sample will then be collected from the composite liquid and submitted to the laboratory for the appropriate tests.

Following completion of all HazCat® screening and analytical sampling, drums will be handled in accordance with the WMP (Appendix E of the Work Plan).

Waste characterization samples will be collected according to the media-specific procedures detailed in Sections 3.1 through 3.2 as appropriate. Waste characterization methods will be detailed in the site-specific work plan addendum.

4.0 SPECIFIC ANALYTICAL SAMPLING TECHNIQUES

The following sampling techniques may be used at FWA sites as described in the site-specific work plan addendum. The multi-increment (MI) soil sampling approach and site-wide average for total organic carbon (TOC) may be utilized. The techniques are described in detail below.

4.1 TOTAL ORGANIC CARBON SAMPLING

TOC sampling may be conducted to assist in the evaluation of alternate cleanup levels and to determine any potential biogenic interference. TOC samples may be collected at each site for each soil type encountered during sampling and will be located outside the known area of contamination. TOC sampling will be conducted in accordance with ADEC Technical Memorandum 08-002 (ADEC 2008a).

4.2 MULTI INCREMENT SAMPLING

The MI soil sampling approach can determine an average concentration representative of the soil contained in a defined area. Analytical soil samples collected using the MI sampling approach will be performed in accordance with the ADEC *Draft Guidance on Multi-Increment Soil Sampling* (ADEC 2009b) within the decision areas specified in the site-specific work plan addendum. One MI sample will be collected for each decision unit. Decision units will be discussed in the site-specific work plan addendum.

A systematic random grid sampling pattern will be laid out over the decision area based on a randomly located starting point. The grid will contain a minimum of 30 nodes, and a minimum of 30 increments will compose each MI sample. One duplicate and one triplicate sample set will be collected as part of the MI sampling protocol. The sample locations for the duplicate and triplicate samples will not be collocated with the primary sample. The duplicate and triplicate samples will be collected by using separate borings and offset from the primary sample location by at least half of the calculated distance between nodes. The offset will be along one of the cardinal directions for the duplicate sample and a different cardinal direction

for the triplicate sample. If necessary, further details will be provided in the site-specific work plan addendum.

The laboratory will be asked to subsample the sieved portion for semivolatiles analysis according to the ADEC MI sampling guide to obtain a final 30- to 40-gram aliquot. The laboratory will perform the extraction and analysis on the entire final subsampled portion. Special containers will be needed to hold a larger weight of soil than is normally submitted for nonvolatile analysis.

5.0 FIELD-SCREENING ACTIVITIES

Field-screening techniques such as, but not limited to, Ultraviolet Optical Screening Tool (UVOST™), NITON X-ray fluorescence (XRF) analyzer, photoionization detector (PID), and PetroFLAG™ may be used to guide analytical soil sampling. These potential field-screening techniques are described in detail below.

5.1 ULTRAVIOLET OPTICAL SCREENING TOOL (UVOST™)

At sites that require delineation of fuel contamination, UVOST™ technology may be used to assist in determining the horizontal and vertical extents of contamination. UVOST™ is a real-time measurement technology that uses laser-induced fluorescence to detect fuel constituents in soil continuously and instantaneously. The response of the fluorescence signal generates a wavelength differentiating the various petroleum contaminants with individual heights and intensities. Data obtained from this fuel signature are displayed on a computer screen attached to the optical probe. The results are quantified as a percentage of relative emittance and is directly comparable to analytical laboratory data in parts per million (ppm). This technology will provide the field crew with real-time data to guide investigations at sites with fuel contamination. There are two potential methods to implement the UVOST™ technology: in situ and ex situ.

As a Geoprobe direct-push system drives an optical probe into the ground, UVOST™ emits ultraviolet light through the optical probe as it is advanced and produces in situ results. The UVOST™ will be set to screen the soil at 2 centimeters per second. This will aid in locating the areas of highest fuel concentrations and determining the extent of contamination. Analytical soil samples will be collected from the known source area, the clean edges of the delineation, and the midpoint contour or as described in the site-specific work plan addendum. Once the analytical sample locations have been selected, direct-push drilling will be conducted to obtain the samples for laboratory analysis.

Alternatively, field samplers may use standard sample collection methods to assess hydrocarbons in soil. This method allows for the acquisition of a soil sample (collected as

described in Section 3.1.1) which can be placed in a resealable bag. The bagged sample is then placed over the sampling window and the UVOST™ reads the sample as stated above.

5.2 NITON X-RAY FLUORESCENCE (XRF) ANALYZER

A NITON XRF analyzer will serve as the primary source of field screening for metal-contaminated soil. Visual observation will also be used, if necessary. Instructions on procedures to operate a NITON XRF are provided as Attachment B-5 to this FSP.

The NITON XRF analyzer will be used to screen soil for lead and other heavy metals in accordance with the manufacturer's instructions. At the start of each day, the field samplers will follow the startup and calibration procedures according to the manufacturers' specifications. The National Institute of Standards and Technology calibration check standard for lead provided by the manufacturer will be used to ensure proper calibration of the Niton XRF. Field samplers will conduct a calibration check after every calibration, after every 20 samples are analyzed, and at the end of the day. The calibration check will consist of a blank standard, a high concentration standard, and a low concentration standard to ensure the instrument is calibrated correctly over the entire range. Calibration check standards will be supplied by the manufacturer. The reading should be ±20 percent, as compared to the certified value of the standard sample. If the calibration check readings are not satisfactory, the instrument will be recalibrated as described by the manufacturer. Calibration results will be noted in the field logbooks. If the instrument repeatedly fails calibration checks, it will not be used, and the manufacturer will be contacted for technical support.

Soil may be screened in situ to survey the site or to check for the presence of lead prior to collecting confirmation samples. Detailed procedures for screening the soil in situ are in the manufacturer's instructions as well as outlined below:

1. Don PPE (gloves, etc.) before starting sample collection.
2. Select a screening location.
3. Clear surface debris and vegetation.
4. Collect and place sample in resealable bag.

5. Place the bag on the ground.
6. Place the test guard on the bag.
7. Hold the XRF in one hand.
8. Push the safety slide out from under the shutter release.
9. Place the XRF on the test guard so that the rectangular opening on the test guard is under the window of the XRF, squeeze the shutter release, and firmly press the XRF flat against the surface of the test guard so that the plunger is fully depressed.
10. After the desired interval (about 2 minutes for a new source), lift the XRF to end the test and record the result.

5.3 Photoionization Detector (PID) Field-Screening Procedures

The PID may be used to screen for and detect VOCs. The field-screening procedure for the PID is as follows:

- Calibrate (or verify calibration of) the PID at the beginning of each day. Calibrate the instrument to yield "total organic vapors" in ppm to a benzene equivalent (e.g., isobutylene). If significant drift in the instrument is suspected or observed, verify proper calibration. Perform operations, maintenance, and calibration in accordance with the manufacturer's specifications. Record all calibration information in a calibration notebook that accompanies the PID.
- Put the soil to be analyzed into a plastic resealable bag, approximately 40 percent full, ensuring sufficient headspace to allow vapors to accumulate.
- Allow headspace vapors to develop in the bag by shaking or agitation for 15 seconds. Once shaken, the sample should sit for at least 10 minutes, but no longer than 1 hour before a reading is collected. Ensure the temperature of the bag and contents reaches at least 40°F.
- Subsequent to headspace development, insert the instrument probe into the bag to a point about one half the headspace depth. Following probe insertion, record the highest meter reading in the field logbook.

Erratic meter response may occur at high organic vapor concentrations or conditions of elevated headspace moisture, in which case a note to that effect will accompany headspace data.

5.4 PetroFlag™

PetroFLAG™ test kits may be employed for field screening total petroleum hydrocarbons. The PetroFLAG™ kit employs methanol extraction, and a meter reads the absorbance and converts the reading to ppm, within a range of 10 to 1,000 ppm or more. High levels of organics in certain natural matrices (i.e., tundra) can cause interferences in PetroFlag™ screening because the organics discolor the solution. High levels of moisture may also interfere with the PetroFlag™. The manufacturer's field-screening test kit instructions shall be followed (Attachment B-6). All field-screening results will be recorded daily. Instructions for procedures to analyze field screening samples with PetroFLAG™ are provided as Attachment B-6 to this FSP.

6.0 SAMPLE DOCUMENTATION AND CHAIN-OF-CUSTODY (CoC)

The possession and handling of individual samples must be traceable from the time of sample collection until the time the analytical laboratory reports the results of chemical analysis to the appropriate parties. The sample handling procedures and documentation described in this section include the following elements:

- Field documentation (e.g., field logbook and field forms)
- Photographs
- Sample numbering system (e.g., sample labels)
- Chain of custody records (e.g., sample summary table)
- Sample packaging and shipping

6.1 FIELD DOCUMENTATION

Accurate and comprehensive recordkeeping is critical to documenting sample custody and includes a field logbook, field data forms, photographs, CoC records, and an analytical summary table.

A bound, sequentially paginated field logbook will be maintained daily to document all field activities, including the collection of every sample. All field notes will be entered in indelible (permanent) ink. If any changes are made to the field record, the original notation will be crossed out with a single line, initialed, and dated by the person making the correction. The field logbook will contain all information required to recreate the sampling event. At a minimum, field logbooks will contain the following information:

- Project name and number
- Date and time of work
- Name and location of site
- Names of the field sampling leader and all field personnel and the names, addresses, and telephone numbers of all pertinent project contacts
- Purpose of proposed work effort
- Summary of equipment preparation procedures as well as equipment brand names and model and serial numbers

- Description/sketch of work area (building, tank locations, etc.)
- Weather conditions
- Field observations (presence of sheen, stressed biota, etc.)
- Sample locations (include in sketches)
- Date and time of each sample collection event
- Field-screening locations and results
- Sample identification number, location, matrix, and depth (if applicable)
- Explanation of any deviations from this FSP, including rationale for deviation

In addition to data entry in field logbooks, separate data sheets may be used to complement the logbook information regarding sampling and measurement tasks. The data forms ensure that proper information is obtained for entry into an electronic database. Examples of field data forms are included in Attachment B-1.

Copies of field data forms, if completed, will be submitted daily to the project Contractor Quality Control Systems Manager or Technical Lead. The Contractor Quality Control Systems Manager or Technical Lead is required to review each field sample data form for completeness before the sampling effort concludes. The completed field forms shall be provided to the Project Chemist with the final CoCs at the completion of the field effort.

6.2 PHOTOGRAPHS

Field activities, site conditions, and sampling locations will be photographically documented. Photographs are at least as important as the reporting document, if not more so. Photographers must pick reference points and take several pictures throughout the duration of the project (start, middle, and end). Project photographs will be labeled with at least the following information: specific site name, photograph subject/activity, date photograph was taken, and photographer's initials. Table B-3-3 presents an example of a photograph label.

Table B-3-3
Photograph Label

Date	Subject/Activity	Site Identifier	Photographer's Initials
03.08.10	Southern/excavation	B1085	MD

6.3 SAMPLE NUMBERING SYSTEM

All FWA projects will use the following sample numbering system. This section describes CoC identification, sample identification, and location identification. Each CoC submitted to the laboratory will be assigned an identification number. The first four digits define the sampling year (2010). The next characters define the project (FWA) and the specific site (for example building number). The next three digits are incremented sequentially per CoC (001, 002, etc.). Table B-3-4 presents an example of the CoC number.

Table B-3-4
Chain-of-Custody Number

Year	Project Identifier	Site Identifier	CoC Number
2010	FWA	B1085	001

Each sample will be assigned an identification number. This identifier is a unique character sequence specified by the project, which identifies a distinct location within the project site. Elements of the sample naming convention will be used as appropriate for each specific site. An example of an alphanumeric sample identification system is as follows:

- The first two digits define the sampling year (e.g., 10)
- The third, fourth, and fifth characters (FWA) define the project as Fort Wainwright
- The next few characters identify the specific site location (e.g., building name)
- The following two characters define the sample matrix (potential matrix types are presented in Table B-3-5)
- The next two numbers indicate the relative depth at which the sample was collected (feet below ground surface)

- The next two digits identify what type of sample was collected (e.g., C for confirmation or correlation samples and W for waste samples)
- The next two digits denote the sample number (the sample number correlates with a specific location within the site, see section 6.4).

An example of a sample identifier is presented in Table B-3-6.

Table B-3-5
Sample Matrix

Matrix abbreviation	Sample Matrix
AR	Air
AS	Asbestos
GW	Groundwater
SW	Surface Water
SG	Soil Gas
SB	Soil (Boring)
SO	Soil (test pit/excavation)
SD	Sediment
WP	Wipe
PC	Paint Chip
WX	Unknown Liquid (Waste)
SX	Unknown Solid (Waste)

Table B-3-6
Sample Identifier

Year	Project Identifier	Site Identifier	Matrix	Depth (feet)	Sample Type	Sample Number
10	FWA	B1085	SO	03	C	01

When collecting QC duplicates, the duplicate identification number should be distinct from the primary sample identification number to ensure the duplicate samples are submitted blind to the laboratory. The duplicate should be labeled as the next subsequent sample after the primary. The sample summary and field logbook should indicate the primary and duplicate samples on a project.

6.3.1 Sample Labels

Sample labels are necessary to prevent misidentification of samples. Each sample container will have a sample label attached to it. Where necessary, the label will be protected from water and solvents with clear tape. No sample label or tape is to be placed on pretared sampling jars (volatile soil samples). Sample labels will include the following information:

- Project code or number
- Sampling date and time
- Sample number
- Sampler's initials
- Preservation
- Analyses requested

Sample containers will have labels that contain the same information as reported on the CoC records. At the time of sampling, appropriate sample numbers will be recorded in the field logbook.

6.4 LOCATION NUMBERING SYSTEM

Precise locations at each site will be surveyed and assigned a unique location identifier. Points that will be surveyed are sample locations, excavation boundaries, and nearby points of interest. Nomenclature used to identify these points will vary depending on the type of location, however, all location identifiers will begin with a specific site description (e.g., building name). An abbreviation of the type of location will follow the site description. The location types and their abbreviations are listed in Table B-4-1.

Table B-4-1
Type of Location

Location Abbreviation	Type of Location
smp	Sample
bdy	Boundary
well	Well location
bh	Borehole
pt	Point of Interest

For sample locations, the type of location will be followed by the sample type (e.g., C for confirmation or characterization samples and W for waste samples) and then the sample number. This information must also be recorded on the CoC. An example of a sample location identifier is listed in Table B-4-2.

Table B-4-2
Sample Location Identifier

Site Identifier	Type of Location	Sample Type	Sample Number
B1085	smp	C	01

For boundary locations, the type of location will be followed by the boundary location number. The location number is incremented sequentially per boundary location (01, 02, etc.). An example of a boundary location identifier is listed in Table B-4-3.

Table B-4-3
Boundary Location Identifier

Site Identifier	Type of Location	Boundary Location Number
B1085	bdy	01
B1085	well	01
B1085	bh	01

For point of interest locations, the type of location will be followed by a brief description. For example, if the point of interest is taken to show the location of a nearby utility pole, the brief description will be utility pole. An example of a point of interest location identifier is listed in Table B-4-4.

Table B-4-4
Point of Interest Location Identifier

Site Identifier	Type of Location	Brief Description
B1085	pt	Utility pole

6.5 CHAIN-OF-CUSTODY (CoC) RECORDS

Once a sample is collected, it will remain in the custody of the field team or the designee until it is shipped to the designated analytical laboratory. When the sample is transferred, a CoC form will be signed by the person(s) transferring custody of the sample container. Samples will be placed in a cooler or other appropriate shipping container. The original, properly completed CoC form for the samples will be contained in the cooler in accordance with Section 6.5. A separate CoC form will be completed for each cooler. A second copy of the CoC becomes a field record, and a digital copy is provided to the Jacobs Project Chemist, if possible.

6.5.1 Sample Summary Table

A sample summary table will record the CoC number, sample collection date and time, associated location identification, analyses and turnaround time (TAT) requested, cooler identification, quality control notes (e.g., matrix spikes, duplicates, etc), shipped date, and laboratory name. This table will be used to track changes to analyses requested and other CoC information after the samples are shipped to the laboratory. If a TAT other than 30 days is requested, the analytical summary table should also record the date preliminary results were received. A separate sample summary table may be completed for each FWA site.

6.6 SAMPLE PACKAGING AND SHIPPING

Container requirements, preservation requirements, and holding times for the samples to be collected are presented in Table B-3-1. A second person is required to review the CoC, sample jar labels, and sample summary for consistency before packing of a sample cooler for shipment. This individual should also confirm the presence of appropriate temperature blanks and other packing requirements as described below.

Samples and coolers should be packed in the following manner:

- Place 1 to 2 inches of certified asbestos-free vermiculite or other absorbent packaging material in the bottom of the cooler to be packed.
- Place a large, open plastic bag over bottom layer.
- Wrap sample jars designated for shipment to the laboratory in bubble wrap and seal in a resealable plastic bag before placing in the cooler. Samples for non-volatile analysis may be placed into their original boxes, if available.
- Place a temperature blank (tap water in a screw-top plastic vial or bottle, preferably 500 milliliters in volume) in the center of the cooler to measure the apparent temperature of samples upon arrival at the laboratory. Temperature blanks should be stored in the sample refrigerator until packed.
- Place samples and gel packs/cubitainers in the cooler. Use four to six cubitainers/gel packs (use more until trend of cooler temperatures is gathered).
- Once the temperature blanks, gel packs/cubitainers, and all samples have been placed in the cooler, seal the large plastic bag with a packaging tape.
- Fill any remaining void space in the cooler with certified asbestos-free vermiculite or equivalent packaging material (this packaging material is used to prevent the sample jars from breaking and to absorb any spills resulting from a broken container during shipment). Vermiculite must be used when shipping dangerous goods (methanol, sodium bisulfate, etc.). Packaging material need not be absorbent if samples do not contain liquid.
- Place the completed, signed CoC inside a resealable plastic bag (e.g., Ziploc®), and tape to the inside of the cooler lid.
- Place two signed and dated custody seals in opposite corners across the front and the back corners of the cooler and cover with clear tape to ensure they arrive sealed at the laboratory.
- Seal the cooler shut with strapping tape.
- Place arrow up ("⇑ ⇑") labels on the two ends of the cooler. Place "Fragile" and "Refrigerate, Do Not Freeze" labels on at least two sides of each cooler.

If at any time the cooler is opened prior to arriving at the laboratory, custody of the cooler's contents is assumed; therefore, the CoC must be signed and dated when assuming and relinquishing custody of the samples. Proper CoC procedures must be followed for repacking coolers.

The project laboratory will be informed via telephone, email, or facsimile message of cooler shipments, including information concerning the number of samples, analyses requested, sample matrices, any unique information such as rapid TAT requirements, and shipment tracking numbers. The laboratory will complete the Jacobs cooler receipt form (Attachment B-1) when samples are received and will document all sampling and shipping discrepancies. The Project Chemist and the USACE chemist will be notified of all discrepancies by the laboratory within 24 hours. A verbal and a written report will be provided. If changes need to be made to the CoC after the lab has received the coolers, a CoC variance (Attachment B-2) may be utilized.

The following points of contact and laboratory addresses will be recorded in the field logbooks:

Primary Laboratory:
TBD per site basis

Laboratory Project Manager:
TBD

Jacobs Project Chemist:
Anchorage Office - Angela Elmore
4300 B Street, Suite 600
Anchorage, Alaska 99503
907-751-3414 / 907-751-3234 fax

Fairbanks Office - Kari Hagen
907-356-1280

USACE Project Chemist:
Mike Utley
907-753-2691
Back-Up: Sean Benjamin

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7.0 DECONTAMINATION

Disposable sample collection equipment will be used as much as possible during FWA field efforts. Disposable equipment will be stored and disposed of with the appropriate waste stream and in accordance with the WMP (Appendix E). Disposable equipment that may be used during FWA projects includes trowels, sampling spoons (utensils), mixing bowls, bailers, and tubing. Sampling equipment and containers will be inventoried and inspected on site prior to beginning the field effort. Both wet and dry decontamination may be utilized at the FWA sites.

If wet decontamination is deemed necessary, the following procedures will be followed: contaminated materials will be decontaminated with potable water and Liquinox®/Alconox® solution, triple-rinsed with potable water, and air-dried between samplings. This may include sampling equipment, small equipment, and large equipment. Wet decontamination of large equipment may be performed on a bermed decontamination site with a sturdy impermeable liner using a hot-water/steam pressure washer. Decontamination water will be collected, sampled, and analyzed for proper disposal. See the WMP (Appendix E) for disposal procedures. Disposable sampling equipment will not require decontamination prior to use as long as the original packaging is intact.

Dry decontamination procedures may be used on sites with polychlorinated biphenyl (PCB) and metal contamination. Decontamination shall include the use of brooms, shovels, absorbent pads, and other appropriate material necessary to remove contamination from equipment.

Equipment used onsite will be gross-decontaminated prior to leaving the site to eliminate contaminant migration from the site and the potential for cross-contamination of sites. Gross-decontamination includes the removal of potentially contaminated materials by use of a shovel or other hand tools and stiff bristle brushes. Equipment used onsite will be decontaminated when it is no longer required onsite and prior to its return.

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8.0 INVESTIGATION-DERIVED WASTE

Investigation-derived waste (IDW) consists of wastes generated as a result of sampling efforts performed during the field effort. Anticipated IDW generated during the project consists of soiled PPE, disposable sampling tools, decontamination water, trash, and soil cuttings.

Soiled PPE and disposable sampling tools will not be characterized by analysis. All IDW will be handled according to the WMP (Appendix E).

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9.0 CORRECTIVE ACTIONS

Corrective action will be initiated when potential or existing conditions are identified that may adversely impact data quantity or quality. Events that may require corrective action include (at a minimum) violation of established field or analytical procedures or controls, and unsatisfactory results of performance, system, or project QA audits. QA personnel are authorized to stop work until the need for corrective action is assessed. All personnel are trained to recognize and report out-of-control conditions to supervisors. The individual who first recognizes an out-of-control condition will immediately notify his/her supervisor. Corrective actions include notifying the Jacobs Project Chemist and Site Manager, response, reestablishment of control, and documentation. The supervisor and appropriate task leader will investigate the extent of the problem and take the necessary corrective steps. Corrective actions will be approved by the appropriate personnel (Project Manager, Site Manager, and/or Project Chemist). The contract administrator will be notified when changes have an impact on subcontract specifications.

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10.0 REFERENCES

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ATTACHMENT B-1

Field Data Forms

Chain-of-Custody Report
CoC Variance Form
Cooler Receipt Form
Groundwater-Sampling Data Sheet
Well-Development Data Sheet
Soil-Boring Log
Well Details Form

Chain-of-Custody Report

Collection Organization: Jacobs

Chain-of-Custody:

Cooler ID:

NPDL Number:

Project Number:

Laboratory:

Bill to: Jacobs

Report to: Jacobs

CoC Sample ID	Collection Date Time	Sampler	Number	Containers Type	Volume	Preservative	Matrix	Analyses Requested Group	QC	TAT	Contents Caution	Dispose or Return Samples	Level

Comments:

Special Instructions:

Relinquish By:

Received By:

CoC VARIANCE REQUEST

Change Requestor: _____

Laboratory Project Manager: _____

Date/Time Requested: _____

Jacobs Program/ Project Chemist: _____

Jacobs Site Manager: _____

Jacobs Contracts Administrator _____

Project Name/Number _____

Laboratory Sample Delivery Group Number _____

Action to be taken (add analyses, change turnaround time, delete analysis, etc.):

_____

Specific Requirements

Jacobs Sample Number	Lab Sample Number	Action	Added Cost
		Total Additional Cost:	

Comments: _____

_____

_____

Authorization: .

Client Approval: _____ Date: _____

This form will be used to track changes to the chain-of-custody record and will not be used to modify or increase the value of a delivery order.

Signed Copy Routing: Jacobs Program/Project Chemist, Jacobs Site Manager, Jacobs Contracts Administrator

EXAMPLE COOLER RECEIPT FORM

Fax this form and the CoC records to Jacobs Program/Project Chemist within 24 hours of receiving sample.

CoC Number _____ **(One receipt form per cooler)**
Cooler Number/Name on CoC _____
Laboratory and Location _____
Laboratory SDG _____

1.	Were custody seals on outside of cooler?	**YES**	**NO**
	If yes, how many and where? _____		
	Were signatures and dates correct?	**YES**	**NO**
2.	Were custody papers taped to lid inside of cooler?	**YES**	**NO**
3.	Were custody papers properly filled out (ink, signed, etc.)?	**YES**	**NO**
4.	Did you sign custody papers in the appropriate place?	**YES**	**NO**
5.	Did you attach shipper's packing slip to this form?	**YES**	**NO**
6.	What kind of packing material was used? _____		
7.	Was sufficient ice used (if appropriate)?	**YES**	**NO**
8.	Were all bottles sealed in separate plastic bags?	**YES**	**NO**
9.	Did all bottles arrive in good condition?	**YES**	**NO**
10.	Were all bottle labels complete (number, date, signed, analysis, pres., etc.)?	**YES**	**NO**
11.	Did all bottle labels and tags agree with custody papers?	**YES**	**NO**
12.	Were correct bottles used for the tests?	**YES**	**NO**
13.	Were VOA vials checked for absence of air bubbles, and if present noted?	**YES**	**NO**
14.	Was sufficient amount of sample sent in each bottle?	**YES**	**NO**
15.	Chain-of-custody identification number: _____		
	Temperature blank reading: _____		
	Cooler temperature: _____		
	Identification number of thermometer: _____		
16.	Is temperature within 4+/–2°C?	**YES**	**NO**
17.	Were labels correctly associated with pretared containers? (not placed directly on jars)?	**YES**	**NO**
CORRECTIVE ACTION FORM ATTACHED		***YES***	***NO***

Jacobs Project Chemist contacted? Date/Time _____

Attach associated CoC record and Conversation Confirmer forms.
Explain any discrepancies: _____

_____

_____

Site Name: _____	Well ID: _____	**Acceptable Range for Field Parameters**
Site ID: _____	Well Type: ☐ Monitor ☐ Extraction	pH ± 0.1
Project #: _____	Well Material: ☐ PVC ☐ Stainless Steel	Conductivity ± 3%
Date: _____	Well Integrity: ☐ Excellent ☐ Good ☐ Fair ☐ Poor	Temp. ±0.2° C
Start Time: _____		Turbidity ±10% NTU
Finish Time: _____		
Sampled By: _____		
PID Reading: _____		
Weather Conditions:		

Probe Type:	Casing Diameter (in)	Gallons/Linear Foot	Casing Radius^2 (ft)
☐ Oil/Water Interface	☐ 2	☐ 0.17	☐ 0.0069
☐ Electronic Water Indicator	☐ 4	☐ 0.66	☐ 0.0280
☐ Other_____			

Purging Information

Start Time: _____	Depth to Product: _____	**Purging Equipment**
Finish Time: _____	Depth to GW: _____	☐ Bailer
	Total Depth (T.D.) of Well Casing: _____	☐ Submersible Pump
	Product Thickness:	☐ Peristaltic Pump

Casing Volume (Gallons) = (_____ - _____) = (_____) * (_____) = (_____) * 3 = (_____)

T.D. well casing | Depth to GW | Ft. water in well | Gallons/ Linear Foot | Gallons in well | Proposed Purge Volume

Actual Volume Purged_____ Gallons

Time Elapsed (Minutes)	Volume (Gallons)	pH	Conductivity (µS/cm)	Temp. (°F) (°C)	Turbidity (NTU)	Dissolved Oxygen (mg/L) (±10%)	ORP ±10mV	DRAW DOWN (ft)

Color	Odor	Purged Dry?	Meters Used	Purge Water
☐ Clear	☐ None	☐ Yes ☐ No	☐ Horiba U-10	☐ Treated
☐ Cloudy	☐ Faint		☐ Horiba U-22	☐ Discharged
☐ Yellow	☐ Moderate	**Sheen?**	☐ Multimeter	☐ Stored
☐ Brown	☐ Strong	☐ Yes ☐ No	☐ Hach	

Sampling Information

Date: _____	**Sampling Equipment**
Start Time: _____	☐ Bailer
Finish Time: _____	☐ Submersible Pump
Depth of Tubing:	☐ Peristaltic Pump

Sample ID #	Volume/Container	Analysis Requested	Preservative	Comments

Other Sample Types

QC Duplicate Sample #	QA Triplicate Sample #	Trip Blank Sample #

WELL-DEVELOPMENT DATA SHEET

Site Name:	Well ID:	**Acceptable Range for Field Parameters**
Site ID:	Well Type: Monitor	
Project #:	Extraction	pH ± 0.1
Date:	Well Material: PVC	Conductivity ± 3%
Start Time:	Stainless Steel	Temperature ± 0.2 °C
Finish Time:	Well Integrity: Excellent	Dissolved Oxygen ±10%
Developed By:	Good	Redox ±10mV
PID Reading:	Fair	Turbidity ±10%
Weather Conditions:	Poor	

Probe Type:	Casing Diameter (in)	Gallons/Linear Foot	Casing Radius^2 (ft)
Oil/Water Interface	2	0.17	0.0069
Electronic Water Indicator	4	0.66	0.028
Other_____			

Purging Information

	Depth to GW:	**Purging Equipment**
Start Time:	Total Depth of Casing:	Bailer
Finish Time:	Product Level:	Submersible Pump
	Amount of Product:	Peristaltic Pump

Casing Volume (Gallons) = (_____- _____) = (_____) * (_____) = (_____) * 3 = (_____)

T.D. well casing	Depth to GW	Ft. water in well	Gallons/ Linear Foot	Gallons in well	Proposed Purge Volume

Actual Volume Purged_____ Gallons

Time Elapsed (Minutes)	**Volume** (Gallons)	**pH** (Standard Units)	**Conductivity** (μmhos/cm) (μS/cm)	**Temperature** (°F) (°C)	**Turbidity** (NTU)	**Dissolved Oxygen** (mg/L)	**Salinity** (ppm)	**Other**

Color	**Odor**	**Purged Dry?**	**Meters Used**	**Discharge**
Clear	None	Yes No	Horiba U-10	**Water**
Cloudy	Faint		Horiba U-22	Treated
Yellow	Moderate	**Sheen?**	Multimeter	Discharged
Brown	Strong	Yes No	Hach	

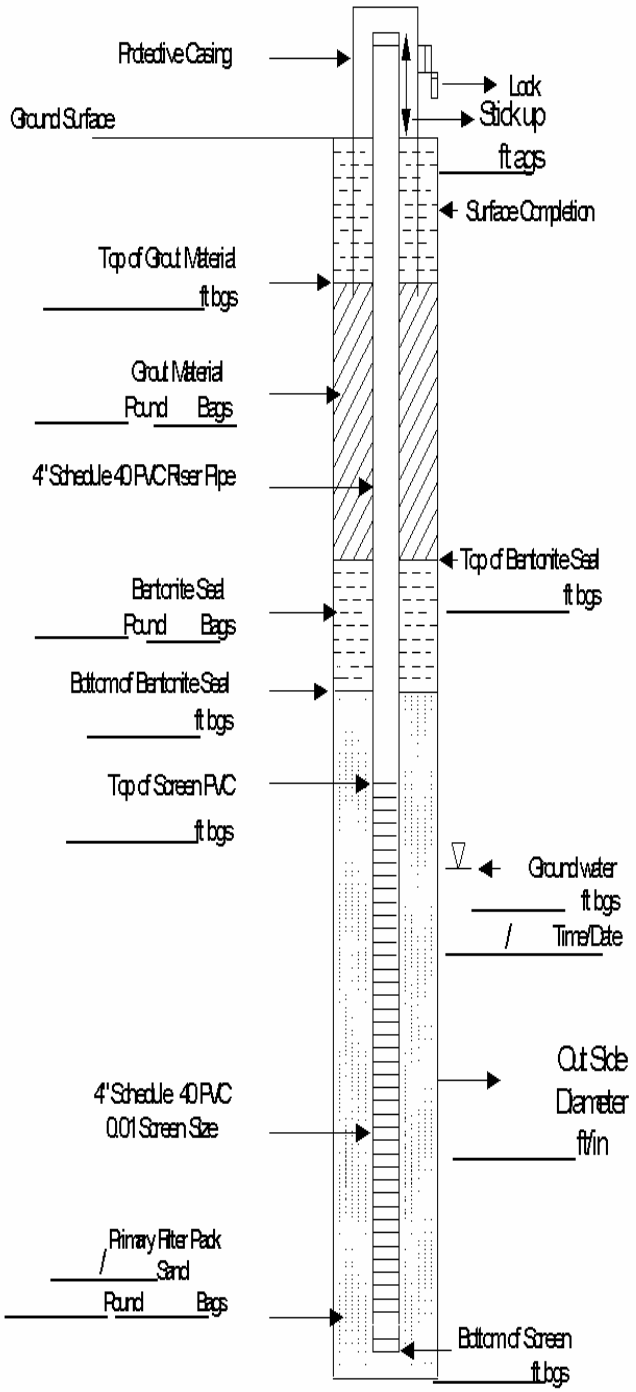
PROJECT: BORING LOG

BORING NO.	PROJECT NO.	LOCATION	SHEET OF
TIME START	DRILLING CONTRACTOR	DRILLING EQUIPMENT	DATE
TIME STOP	DRILLING CREW	DRILLING METHOD	SAMPLING METHOD
TOTAL DEPTH	BACKFILL MATERIAL	WATER FIRST ENCOUNTERD	FINAL DEPTH TO WATER

DEPTH BELOW SURFACE	FIELD SCREEN (ppm)	SAMPLE NUMBER	INCHES DRIVEN/ RECOVERED	WATER LEVEL	USCS	LOG OF MATERIAL (Lithology, grain size, sorting, angularity, Munsell color/notation, water, density, signs of contamination, consistency)
1						
2						
3						
4						
5						
6						
7						
8						
9						
0						
1						
2						
3						
4						
5						
6						
7						
8						
9						

LOGGED BY: _____ OFFICE: _____ DATE: _____

Well Details Form



Well Information

Contractor: _____

Drilling Company: _____

Project Name:_____

Project Number:_____

Location:_____

Hole Number:_____

Geologist: _____

Well Type:_____

Elevation of Ground Surface:_____ft.

Elevation of groundwater:_____ft.

(estimated from drilling)

Stick up distance:_____ft.

Elevation of Top of Casing: _____ft.

Total Depth of Boring: _____ft

Total Well Depth: _____ft

Total Screen Length: _____ft

Total Riser Pipe Length: _____ft

Date Installed

Started: _____

Finished:_____

Materials	# of Bags	Weight of Bags	Type of Material

ATTACHMENT B-2

Sample Shipment Forms

Example Shipping Forms and Cooler Labeling
DOT MeOH Exception Letter

SHIPPER'S DECLARATION FOR DANGEROUS GOODS **(Provide at least three copies to the airline.)**

Shipper

Air Waybill No.

Page of Pages

Shipper's Reference Number

Consignee

FedEx Express

Two completed and signed copies of this Declaration must be handed to the operator

WARNING

Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties.

TRANSPORT DETAILS

This shipment is within the limitations prescribed for: *(delete non applicable)*

PASSENGER AND CARGO AIRCRAFT	CARGO AIRCRAFT ONLY

Airport of Departure

Airport of Destination:

Shipment type: *(delete non-applicable)*

NON-RADIOACTIVE	RADIOACTIVE

NATURE AND QUANTITY OF DANGEROUS GOODS

Dangerous Goods Identification				Quantity and type of packaging	Packing Inst.	Authorization
UN or ID No.	Proper Shipping Name	Class or Division (Subsidiary Risk)	**Packing Group**			

Additional Handling Information

Emergency Telephone Number

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable International and National Governmental Regulations. I declare that all of the applicable air transport requirements have been met.

Name/Title of Signatory

Place and Date

Signature
(see warning above)

FOR RADIOACTIVE MATERIAL SHIPMENT ACCEPTABLE FOR PASSENGER AIRCRAFT, THE SHIPMENT CONTAINS RADIOACTIVE MATERIAL INTENDED FOR USE IN OR INCIDENT TO RESEARCH, MEDICAL DIAGNOSIS, OR TREATMENT.

May 6, 2009

U.S. Department
of Transportation

**Pipeline and Hazardous
Materials Safety Administration**

East Building, PHH-30
1200 New Jersey Avenue S.E.
Washington, D.C. 20590

DOT-SP 14506
(FIRST REVISION)

EXPIRATION DATE: April 30, 2013

(FOR RENEWAL, SEE 49 CFR § 107.109)

1. GRANTEE: Jacobs Engineering
Anchorage, AK

2. PURPOSE AND LIMITATION:

a. This special permit authorizes the transportation in commerce of a methanol mixture as a small quantity under the provisions of 49 CFR 173.4 when the amount of hazardous material in each inner receptacle exceeds 30 ml. This special permit provides no relief from the Hazardous Materials Regulations (HMR) other than as specifically stated herein. The most recent revision supersedes all previous revisions.

b. The safety analyses performed in the development of this special permit only considered the hazards and risks associated with the transportation in commerce.

c. No party status will be granted to this special permit.

3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts 106, 107 and 171-180.

4. REGULATIONS FROM WHICH EXEMPTED: 49 CFR § 173.4(a)(1)(i) in that the amount of material per inner receptacle may not exceed 30 ml, except as provided herein.

5. BASIS: This special permit is based on the application of Jacobs Engineering dated April 17, 2009 submitted in accordance with § 107.109.

6. HAZARDOUS MATERIALS (49 CFR § 172.101):

Hazardous Materials Description			
Proper Shipping Name	**Hazard Class/ Division**	**Identi- fication Number**	**Packing Group**
Methanol	3	UN1230	II

7. SAFETY CONTROL MEASURES:

a. PACKAGING - Prescribed packaging is as required for small quantities under § 173.4.

b. OPERATIONAL CONTROLS - The hazardous material is a mixture of 25 ml of methanol mixed with a non-hazardous soil sample.

8. SPECIAL PROVISIONS:

a. A person who is not a holder of this special permit who receives a package covered by this special permit may reoffer it for transportation provided no modification or change is made to the package and it is reoffered for transportation in conformance with this special permit and the HMR.

b. A current copy of this special permit must be maintained at each facility where the package is offered or reoffered for transportation.

9. MODES OF TRANSPORTATION AUTHORIZED: Motor Vehicle, Cargo aircraft, Cargo Vessel, Passenger-ferry vessel, Passenger-carrying aircraft, Rail Freight.

10. MODAL REQUIREMENTS: A current copy of this special permit must be carried aboard each cargo vessel, aircraft, or motor vehicle used to transport packages covered by this special permit. The shipper must furnish a copy of this special permit to the air carrier before or at the time the shipment is tendered.

11. COMPLIANCE: Failure by a person to comply with any of the following may result in suspension or revocation of this special permit and penalties prescribed by the Federal hazardous materials transportation law, 49 U.S.C. 5101 et seq:

    - All terms and conditions prescribed in this special permit and the Hazardous Materials Regulations, 49 CFR Parts 171-180.

    - Persons operating under the terms of this special permit must comply with the security plan requirement in Subpart I of Part 172 of the HMR, when applicable.

    - Registration required by § 107.601 et seq., when applicable.

    Each "Hazmat employee", as defined in § 171.8, who performs a function subject to this special permit must receive training on the requirements and conditions of this special permit in addition to the training required by §§ 172.700 through 172.704.

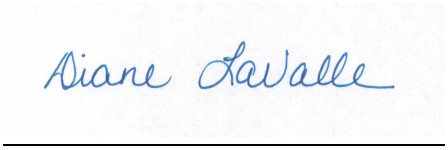
    No person may use or apply this special permit, including display of its number, when this special permit has expired or is otherwise no longer in effect.

    Under Title VII of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)—"The Hazardous Materials Safety and Security Reauthorization Act of 2005" (Pub. L. 109-59), 119 Stat. 1144 (August 10, 2005), amended the Federal hazardous materials transportation law by changing the term "exemption' to "special permit" and authorizes a special permit to be granted up to two years for new special permits and up to four years for renewals.

12. REPORTING REQUIREMENTS: Shipments or operations conducted under this special permit are subject to the Hazardous Materials Incident Reporting requirements specified in 49 CFR 171.15 - Immediate notice of certain hazardous materials incidents, and 171.16 - Detailed hazardous materials

incident reports. In addition, the grantee(s) of this special permit must notify the Associate Administrator for Hazardous Materials Safety, in writing, of any incident involving a package, shipment or operation conducted under terms of this special permit.

Issued in Washington, D.C.:



for Theodore L. Willke
Associate Administrator for Hazardous Materials Safety

Address all inquiries to: Associate Administrator for Hazardous Materials Safety, Pipeline and Hazardous Material Safety Administration, U.S. Department of Transportation, East Building PHH-30, 1200 New Jersey Avenue, Southeast, Washington, D.C. 20590.

Copies of this special permit may be obtained by accessing the Hazardous Materials Safety Homepage at http://hazmat.dot.gov/sp_app/special_permits/spec_perm_index.htm. Photo reproductions and legible reductions of this special permit are permitted. Any alteration of this special permit is prohibited.

PO: AM

IATA Excepted Quantity Label

ATTACHMENT B-3

Hazard Categorization Testing Methods

(modified from HazCat® Abridged Manual for Field Use by Robert Turkington, Feb 1995)

FLAMMABILITY

Place an amount of unknown material the size of a dollar coin into a watch glass.

Beginning two inches away, carefully move a lit match towards the watch glass. Flammability distinctions are based on the table below

Distance from Watch Glass	Reaction of Unknown	Flammability Distinction
Less than 2 inches from watch glass, but not in contact with watch glass	Unknown bursts into flames	Extremely Flammable
Match is just barely touching watch glass	Unknown bursts into flames	Extremely Flammable
Match is touching unknown	Unknown ignites quickly	Flammable
Match is touching unknown	Unknown wicks into match, then flame covers the whole surface of the unknown	Flammable
Match is touching unknown	Unknown flashes on contact, wicks up match, then entire surface of unknown is slowly covered in flame	Flammable
Match is touching unknown	Unknown slowly wicks up match, but the flame does not spread over the surface of the unknown	Combustible, but for safety treat as flammable

CORROSIVITY

Insert pH paper into unknown liquid. Keep pH paper in liquid as long as is recommended on the pH paper container and then compare the color of the pH test strip with the key on the pH paper container.

If the pH of the unknown liquid is less than 2 or greater than 12.5, then the unknown liquid is considered corrosive.

OXIDATION

Use 3N hydrochloric acid (HCl) to acidify an Oxidizer Test strip.

Use a pipette to drop some of the unknown on the acidified test paper.

If the unknown is an oxidizer, a blue/black or purple color will appear.

MISCIBILITY

Place a ½ inch of water in a test tube. Then place a small amount (pea-sized) of unknown into the water. If the solution does not react (heat or effervescence), then place a stopper on the test tube and shake.

Observe the reaction for a few minutes and determine if the unknown liquid floats, sinks, or is miscible in water. If the liquid floats, then the test indicates that it is most likely a petroleum-based liquid. If the liquid sinks, then the test indicates that chlorinated compounds may be present. If the liquid is miscible in water, then the test indicates that the unknown liquid could be a ketone, alcohol, or coolant.

HALOGENATED HYDROCARBONS

Use a torch flame to heat a copper wire until the flame shows no green color.

Let the wire cool, then place the wire in a test tube of the unknown.

Remove the wire from the test tube and apply the flame again.

The presence of chlorine is indicated by a green flame.

ATTACHMENT B-4

Multi-Incremental Sampling Instructions for Explosives Analysis

DoD Environmental Data Quality Workgroup

Guide for Implementing EPA SW-846 Method 8330B

Introduction:

In November of 2006 the Environmental Protection Agency (EPA) published method 8330B.[1] The method provides instruction for the trace analysis of explosives and propellant residues by high performance liquid chromatography (HPLC). The method includes an appendix (A), which describes sampling methodologies for collecting and processing representative samples for analysis.

Issue:

Method 8330B introduces several concepts that are new or are a change from 8330 and 8330A. The sampling and analytical modifications in 8330B are collectively intended to decrease the effects of sampling and subsampling error caused by the compositional and distributional heterogeneity typically encountered in solid environmental media at military training ranges. Various studies have shown that concentrations of energetic residues at military training ranges that were measured using the procedures in 8330B were statistically more representative relative to traditional sampling and analytical protocols[2,3,4]. However, it is uncertain as to whether some of the new concepts utilized in 8330B represent viable sampling and analytical procedures that can be adopted within other SW-846 methodologies or if all of these concepts have practical application to environmental investigations other than military training ranges. Therefore, the application of these sampling and sample preparation techniques to constituents other than those listed in 8330B should be applied with great caution. Like most SW-846 methods, 8330B is a guidance method that provides for flexibility in the choice of apparatus, materials, reagents, and supplies. The objectives of this paper are to highlight those steps that represent a change from historical sampling and analytical methodologies, to provide recommendations as to the appropriate use of the concepts presented in Method 8330B, and to provide recommended minimum method QC requirements for laboratories performing Method 8330B.

Scope:

This paper addresses all aspects of Method 8330B. For simplicity, Method 8330B has been separated into three phases: sampling, preparation/extraction, and analysis. The methodologies that represent changes in each phase, and key issues associated with those

changes are summarized. This paper is intended for DoD personnel and DoD contract support entities to assist in making informed decisions regarding Method 8330B and the sampling/analytical concepts introduced in that method that could be applied to other contaminants and applications.

Precautionary notes:

The most significant note regarding Method 8330B is that the method has been designed to meet very specific data quality objectives of characterizing the mean concentrations of specific energetic compounds within a specified decision unit at active military ranges. Method 8330B is based upon research that involved highly refined conceptual site models (CSM) and included specific knowledge of the physical characteristics of the contaminants, their deposition, and behavior at firing and target points. This highlights the importance of developing a CSM and focusing the sampling and analytical strategies using the systematic planning process. Potential users of 8330B and the sampling/analytical procedures therein are cautioned that the key assumptions and specific CSM details from which Method 8330B were developed may also represent limitations to site investigations where those assumptions are unknown or inconsistent with those established in 8330B. For example, Method 8330B addresses only those energetic material residues of secondary explosives and propellants that fall within the size classification of soil (< 2 mm). Further, it is assumed that most of the energetic material residue deposition on DoD training ranges occurs as pure particles or fibers. The sampling and analytical procedures used in Method 8330B may not be applicable to sites where there is little information about contaminant releases, site history, and the physical and distributional characteristics of the contaminants of concern (COCs).

Sampling

Appendix A of EPA Method 8330B specifically addresses field sampling. The appendix provides guidance for explosive residue sample collection, handling, and laboratory processing techniques. Method 8330B recommends the use of multi-increment (MI) sampling, which involves the extraction of a representative portion of material from within a single decision unit. In MI sampling, several increments from the same decision unit are combined to form one sample that is submitted for laboratory analysis. The procedures for MI sampling are specifically designed to minimize sampling error and provide a more scientifically-representative mean concentration of the contaminant(s) present in the decision unit.

MI sampling uses the advantages of more spatial coverage and an increased sample mass to overcome the problems associated with sample heterogeneity. The tradeoff is that information about the variability in spatial concentrations within the decision unit is lost. Each decision unit is represented by one MI sample which yields one data point. MI sampling therefore does not allow for the calculation of the 95% upper confidence limit (UCL) of the mean concentration unless multiple replicate samples are taken within the decision unit. The 95% UCL of the mean is often the exposure point concentration used

in the refinement stages of a risk assessment.[5] Variability in spatial concentrations between multiple decision units can be evaluated, provided the project team initially defines the spatial size and number of decision units needed.

Hot Spots: If the results of the sampling event will be used for a human health or ecological risk assessment, users should consult a risk assessor during the initial phases of project scoping in order to determine the appropriate minimal size of contaminant spatial resolution (e.g., to characterize "hotspots"). Compositing methods should be limited to decision units that best represent the average exposure of the receptor over time. The Alaska Depart of Environmental Conservation has guidance on utilizing MI sampling and emphasizes the importance of this limitation:

"There is a critical item to keep in mind when identifying decision units and developing the MI work plan: MI may not be used to "dilute" contamination and therefore underestimate the need for cleanup. This may occur if the decision unit inappropriately incorporates large, uncontaminated areas in addition to real source areas."[6]

The size of the decision unit selected should be dependent upon several factors, for example: the area influenced by a single event, the area influenced by an activity, or the area of concern for human health or ecological exposure (habitat). The Hawaii State Department of Health has adopted the use of MI sampling for specific applications and suggests that the size and shape of a decision unit is primarily controlled by the environmental concerns posed by the contaminants present and the intended use of the site.[7] As an example, for residential human health exposures the EPA recommends that the site be divided into areas or strata depending upon the likelihood of contamination and that each DU should be 0.5 acres or less.[8] Risk assessments for ecological receptors may require much smaller decision units. MI sampling can be adapted to establish gradients, boundaries, and locations with elevated concentrations if the location and size of decision units are predetermined using systematic planning. However, if the objective of the sampling event is to assess the spatial variability of concentrations, then the sampling design (using appropriately sized decision units to capture the spatial variability) needs to address this objective. The number of samples required to evaluate spatial changes would typically be rather large. Therefore, users must evaluate the costs and practicability of each sampling design prior to use. Of paramount importance, users are encouraged to use the critical elements of the systematic planning process to develop a conceptual site model and then formulate project quality objectives (PQO's) that can appropriately meet the needs of the project.

Sample Mass: Appendix A of Method 8330B states, "A collection of a 1 kg or larger sample comprised of 30 or more evenly spaced soil aliquots (i.e. increments) of the top 2.5 to 5.0 cm of the ground surface is recommended." Collection of such a large aliquot of sample represents a change from typical sampling protocols. Increased sample mass is recommended in order to decrease the effects of compositional heterogeneity. This inverse relationship between an increase in sample mass and a decrease in fundamental error is described in the particulate sampling theory described by Gy.[9] There are, however, some practical considerations that project teams and laboratories must assess with this increased sample mass:

- Large samples will have to be transported and shipped to the laboratory.
- Laboratories must be able to accommodate these large samples with increased storage facilities, large trays and holding racks, and large grinding equipment.
- Laboratory disposal costs will increase due to the large sample sizes. These costs will likely be passed to the client.
- Most commercial, environmental laboratories do not have the equipment and facilities to accommodate the requirements of Method 8330B so project teams should confirm the availability of environmental laboratories to perform Method 8330B.
- The sample preparation time is significantly increased from the previous method 8330 preparation procedure.

Sample Depth: The soil depth horizon of the top 2.5 to 5 cm of the surface soil as prescribed in Method 8330B may not be appropriate for all site investigations. Selection of soil depth in the method was made based upon research studies on fate and transport of munitions residuals at operational ranges. These assumptions may not be appropriate for all range investigations or other types of contaminants.

Sampling media: The appendix in Method 8330B suggests that all organic material that has historically been excluded from soil samples (e.g., moss, grass, roots) be retained and that the entire sample will be processed. The intended purpose of this change in the sampling procedure is to account for the small fibrous particles that have been shown to be deposited or adsorbed on vegetation at firing points or impact areas of active ranges. Historically, vegetation is not included in soil samples because it does not represent the actual soil being evaluated. This is of particular concern relative to data that will be utilized for ecological or human health risk assessments. This decision is mainly dependent upon the exposure assumptions of the receptors being evaluated. As part of the systematic planning process, the project team should first consult a risk assessor and then specifically define the types of media that will be included or excluded from the sample collected (inclusion/exclusion of vegetation, etc.).

Note: The sampling procedures described in Appendix A of Method 8330B were developed specifically from studies of energetic compounds and propellant residues at active firing ranges. Nonetheless, the fundamental concepts underlying MI sampling and sub-sampling procedures can be adapted to address a wide variety of sampling objectives, analytes, and settings other than those for which the appendix was developed. When adapting MI sampling for a specific site, the project team, using the systematic planning process and including all relevant technical personnel and decision makers, needs to ensure that all aspects of the strategy employed are well defined (decision units, sample homogenization procedures, quality control criteria, etc.) and will meet all the project goals for each contaminate of concern.

Preparation/Extraction

Grinding: Method 8330B incorporates a very aggressive grinding procedure that represents a change from typical preparation methods. To ensure that representative subsamples can be collected from the portion of the sample that is consistent with the classification of soil (< 2 mm), a particle size reduction step is necessary.[10] Method 8330B suggests grinding of samples to a particle size of <75 µm. This is a change from the previous Method 8330 which directs particle size reduction to 30 mesh (595 µm). The Method 8330B appendix states the importance of obtaining a representative mean concentration for the area selected. The grinding of samples is designed specifically to reduce the uncertainty caused by compositional heterogeneity thereby increasing the statistical representativeness of the original sample. "If evidence for representativeness is not presented, then the data cannot be characterized as effective for project decision making."[11] However, changing the physical characteristics of particle size/shape by grinding may incorporate a bias in the resulting data as the sample is no longer in its original state as it exists in nature. Particle size reduction represents a potential bias when the resulting data are used for risk assessment because it changes the bioavailability and exposure characteristics of the media. Grinding may also create a positive bias when the resulting data are used in fate and transport modeling. Project teams are encouraged to solicit the technical advice of a chemist and risk assessor during planning to evaluate the effects of particle size reduction on uncertainty relative to exposure assumptions and uncertainty associated with sampling error to ensure that the appropriate sampling criteria are used to meet the project goals.

There are additional practical considerations that project teams and laboratories must evaluate relative to grinding:

- The sample preparatory procedure in Method 8330B is significantly more labor intensive than that for Method 8330 or 8330A. Most commercial laboratories do not posses the equipment or facilities to prepare the samples.
- The method appendix gives specific instructions regarding grinding: "For samples containing NC (nitro-cellulose) based propellant residues, five 60-second grinding intervals are needed to adequately pulverize the same quantities of soil. Furthermore, to prevent the ring mill from warming to temperatures where more volatile energetic compounds may be lost, a 2-minute or longer cool down period is recommended between the grind cycles." Therefore, for any environmental investigations involving thermally labile constituents, it is highly recommended that appropriate data quality indicator(s) be used to evaluate the potential losses of analytes during the grinding step.
- Proficiency testing (PT) samples must go through the grinding process.
- A laboratory control sample (LCS) consisting of a solid reference material containing all reported analytes, must go through the grinding process and be analyzed with each batch.
- Grinding equipment must be thoroughly cleaned between the processing of separate samples and grinding blanks must be processed and analyzed to ensure cross-contamination is not occurring.

- Grinding to such a small particle size will create a dust which can easily result in contamination problems throughout the laboratory performing the test.
- The ball mill is not capable of reducing the size of polymeric materials (nitrocellulose). For this reason it should not be used without project-specific approval for samples from firing points, around direct - line - of sight targets, or other targets used for training with rockets and demolition ranges.

Sample Drying: Sample preparation in Method 8330B involves air drying the entire sample prior to sieving. Following sieving (<2mm) the entire sample is spread out and dried at room temperature to constant weight. For such a large sample, hydric soils and sediments will likely require several days to dry at room temperature to constant weight. Drying time can be significantly increased if there is a high concentration of vegetation included as well. Turnaround times could be an issue and the potential for analyte degradation to occur is likely.[12] Although Method 8330B is scoped to include soils and sediments, there is evidence that drying samples with high moisture content (e.g., sediment) can significantly affect extraction efficiencies.[12]

Extraction: Method 8330B recommends a change in the amount of sample extracted prior to analysis. Methods 8330 and 8095 directs that 2 grams of sample be extracted with 10 mLs of solvent while Method 8330B directs that 10 grams of sample be initially extracted with 20 mLs of solvent. This change will theoretically increase the sensitivity of the method but the increased sample mass may also increase the relative contributions of matrix interferences as well. Inclusion of organic material, such as grass and roots, may cause interferences with energetic compounds. The advantages/disadvantages of increased sample mass are specific to each method and each matrix. Therefore, a project chemist should be consulted to ensure that specific measurement performance criteria for the project will be met.

Analysis:

Section 11.4.3 of Method 8330B describes initial calibration verification using a second source QC standard: "Quantitative sample analyses should not proceed for those analytes that fail the second source standard initial calibration verification. However, analyses may continue for those analytes that fail the criteria with an understanding that these results could be used for screening purposes and would be considered estimated values." While this allowance is acceptable for screening or making qualitative decisions, it would not be appropriate for use in final risk determinations or clean up actions.

Similarly, Section 11.4.4 of Method 8330B describes mid-point calibration factor verification relative to the initial calibration curve: "Should the reanalysis fail for the majority of target analytes, a new initial calibration should be performed. In instances where only a few target analytes fail the verification criteria, sample analyses may proceed with an understanding the sample data associated with these compounds needs to be qualified as estimated." For the same reasons stated above, this allowance may be acceptable for screening or non-specific uses.

Method 8330B calls for the use of either a dual or multi-wavelength UV detector. Due to the non-specific nature of the UV detector, it is critical that appropriate confirmatory steps are utilized. Method 8330B allows for confirmation by an alternate detector. Due to the potential increase in matrix interference resulting from the Method 8330B sample preparation protocol and the need for definitive data, project teams should consider using mass spectrometry as the primary detector when using Method 8330B. Mass spectrometry provides both selectivity and sensitivity and is best suited to handle these analytical issues. Currently however, there is no analytical method in SW-846 using a mass spectrometric detector for explosives. Therefore, negotiation with regulatory agencies for acceptance of this technology is strongly recommended.

Table 1 contains minimum laboratory quality control criteria developed to improve the reliability of the data when using Method 8330B. These criteria are recommended for the routine use of the procedure and will be incorporated into the next update to the DoD Quality Systems Manual for Environmental Laboratories (DoD QSM).[13]

Table 1 - Quality Control Criteria for Method 8330B			
QC Element	**Minimum Frequency**	**Criteria/Requirements**	**Corrective Action/Flagging Criteria**
Batch Quality Control Samples	Every batch	Laboratory Control Sample (LCS) – A solid reference material containing all reported analytes, must be prepared (e.g., ground and subsampled) and analyzed in exactly the same manner as a field sample. In-house laboratory control limits for the LCS must demonstrate the laboratory's ability to meet the project's MQOs. Matrix Spike (MS) – For matrix evaluation only, therefore is taken post grinding from same ground sample as parent subsample is taken. Percent recovery must meet LCS limits. Matrix Spike Duplicate (MSD) or Sample Duplicate (SD) - For matrix evaluation only, therefore is taken post grinding from same ground sample as parent subsample is taken. Percent recovery must meet LCS limits and relative percent difference (RPD) < 20%.	Take corrective actions or flag data as prescribed in the DoD QSM.
Soil Drying Procedure	Each sample and batch LCS	Laboratory must have a procedure to determine when the sample is dry to constant weight. Record date, time, and ambient temperature on a daily basis while drying samples.	
Soil Sieving Procedure	Each sample and batch LCS	Weigh entire sample. Sieve entire sample with a 10 mesh sieve. Breakup pieces of soil (especially clay) with gloved hands. Do not intentionally include vegetation in the portion of the sample that passes through the sieve unless this is a project-specific requirement. Collect and weigh any portion unable to pass through the sieve.	n/a

Table 1 - Quality Control Criteria for Method 8330B			
QC Element	**Minimum Frequency**	**Criteria/Requirements**	**Corrective Action/Flagging Criteria**
Soil Grinding Procedure	Initial demonstration	The laboratory must initially demonstrate that the grinding procedure is capable of reducing the particle size to <75um by passing representative portions of ground sample through a 200 mesh sieve (ASTM E11).	
Soil Grinding Blank	Between each sample	A grinding blank using clean solid matrix (such as Ottawa sand) must be prepared (e.g., ground and subsampled) and analyzed in the same manner as a field sample. Grinding blanks can be analyzed individually or composited. No target analytes detected greater than 1/2 Reporting Limit (RL).	If the composite grinding blank exceeds the acceptance criteria, all samples associated with the grinding composite shall be qualified with a "B" qualifier. If any individual grinding blank is found to exceed the acceptance criteria, then the sample following that blank shall be "B" qualified. All blank results must be reported and the affected samples must be flagged accordingly.
Soil Subsampling Process	Each sample, duplicate, and batch LCS	Entire ground sample is mixed, spread out on a large flat surface (e.g., baking tray), and 30 or more randomly located increments are removed from the entire depth to sum a ~10 g subsample.	n/a
Soil Sample Triplicate	At the subsampling step, one sample per batch. Cannot be performed on any type of blank sample.	Three 10 g subsamples are taken from a sample expected to contain the highest levels of explosives within the Quantitation Range of the method. The % RSD (percent relative standard deviation) for results above the RL must not be more than 20%.	Corrective actions must be taken if this criterion is not met (e.g., the grinding process should be investigated to ensure that the samples are being reduced to a sufficiently small particle sizes).
Aqueous Sample Preparation	Each sample	Solid phase extraction (SPE) using resin-based solid phase disks or cartridges, is required. The salting-out procedure is not permitted.	n/a

Table 1 - Quality Control Criteria for Method 8330B			
QC Element	**Minimum Frequency**	**Criteria/Requirements**	**Corrective Action/Flagging Criteria**
Primary Analysis		Detection by HPLC UV, LC/MS, or LC/MS/MS is allowed. Initial Calibration (ICAL) - Minimum of 5 calibration standards with the lowest standard concentration at or below the RL. The apparent signal-to-noise ratio at the RL must be at least 5:1. Once the calibration curve or line is generated, the lowest calibration standard must be re-analyzed. All target analytes must recover within ± 20% of the true value (initial source). Second source Initial Calibration Verification (ICV) – Prior to analysis of any samples, immediately following the ICAL. All target analytes must recover within ± 20% of the true value (initial source). Continuing Calibration Verification (CCV) – Beginning of sequence, every ten samples, and at the end of the sequence. All target analytes and surrogates recover within ± 20% of the true value (initial source).	n/a
Confirmation Analysis	When target analytes are detected on the primary column using the UV Detector (HPLC) at concentrations exceeding the Limit of Detection (LOD).	Confirmation analysis is not needed if LC/MS or LC/MS/MS was used for the primary analysis Secondary column – Must be capable of resolving (separating) all of the analytes of interest and must have a different retention time order relative to the primary column. Any HPLC column used for confirmation analysis must be able to resolve and quantify all project analytes. Detection by HPLC UV, LC/MS or LC/MS/MS. Calibration and calibration verification acceptance criteria is the same as for the primary analysis. .	Report from both columns. If there is a > 40% RPD between the two column results data must be flagged accordingly.

References:

1. EPA Draft Method 8330B, 2006, Nitroaromatics, Nitramines, And Nitrate Esters By High Performance Liquid Chromatography (HPLC), http://www.epa.gov/SW-846/pdfs/8330b.pdf

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3. Jenkins, T.F., C.L. Grant, G.S. Brar, P.G. Thorne, P.W. Schumacher, and T.A. Ranney. 1997a. Sampling error associated with collection and analysis of soil samples at TNT contaminated sites. *Field Analytical Chemistry and Technology* 1: 151–163.

4. Jenkins, T.F., T.A. Ranney, A.D. Hewitt, M.E. Walsh, and K.L. Bjella. 2004b. *Representative sampling for energetic compounds at an antitank firing range.* ERDC/CRREL TR-04-7. Hanover, NH: U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory. http://www.crrel.usace.army.mil/techpub/CRREL_Reports/reports/TR04-7.pdf

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6. Draft Guidance on Multi-Increment Soil Sampling, March 2007, State of Alaska Department of Environmental Conservation, Division of Spill Prevention and Response, Contaminated Sites Program.

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12. Hawari J. and F. Monteil-Rivera (2007). Chemistry, Fate and Transport of Explosives in the Environment: EPA # 8330B, *Analytical & Environmental Chemistry Group Biotechnology Research Institute National Research Council of Canada,* Presentation to *Tri-Services Environmental Risk Assessment Working Group (TSERAWG) Portsmouth, VA, Aug 29, 2007.*

13. Department of Defense Quality Systems Manual For Environmental Laboratories (2006), Version 3.

ATTACHMENT B-5

NITON Field Screening Procedures

NITON XLi 300A/700A SERIES LEAD-BASED-PAINT ANALYZER

USER'S GUIDE

Part Number 500-941

Version 4.2

Thermo Electron Corporation
Portable Elemental Analysis
900 Middlesex Turnpike, Building 8
Billerica, Massachusetts 01821 USA
Voice: (800) 875-1578 • +1 (978) 670-7460 • Fax: +1 (978) 670-7430
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XLi™300 Series Lead-based-Paint Analyzer User's Guide
XLi™300 Series Lead-based-Paint Analyzer
Produced in the United States of America

Registration: Thermo Electron Corporation manufactures the XLi™ 300 Series Lead-based-Paint Analyzer under the authority of the Commonwealth of Massachusetts, in accordance with Radioactive Materials License 55-0238

Warning: Do not attempt to use this instrument without first reading and understanding the entire User's Guide!

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Introduction

YOUR NITON XRF ANALYZER

UNPACKING AND ASSEMBLING YOUR NITON XLi XRF ANALYZER

- Inspect the shipping carton for signs of damage such as crushed or water damaged packaging. Immediately notify the shipping company and Thermo Electron Corporation, in the United States, toll free, at (800) 875-1578, or outside the United States, at +1-978-670-7460, if there is any visible damage to the shipping container or any of its contents.
- Open the packing carton. If your instrument is not packed in its carrying case, please call Thermo Electron Corporation immediately, in the United States, toll free, at (800) 875-1578, or outside the United States, at +1-978-670-7460.
- Verify the contents of the shipping container against the enclosed packing list. If there are any discrepancies between the actual contents of the shipping container and the enclosed packing list, please notify Thermo Electron Corporation immediately, in the United States, toll free, at (800) 875-1578, or outside the United States, at +1-978-670-7460.
- Open the carrying case and visually inspect the instrument for damage before removing it from the case. Call the shipper and Thermo Electron Corporation if you find any damage to the case or its contents.
- Save the shipping carton and all packing materials. Store them in a safe, dry area for reuse the next time that you ship the instrument.

THE NITON XLi XRF ANALYZER OVERVIEW

The NITON XLi Analyzer is a single unit, hand held, high performance portable x-ray fluorescence (XRF) elemental analyzer.

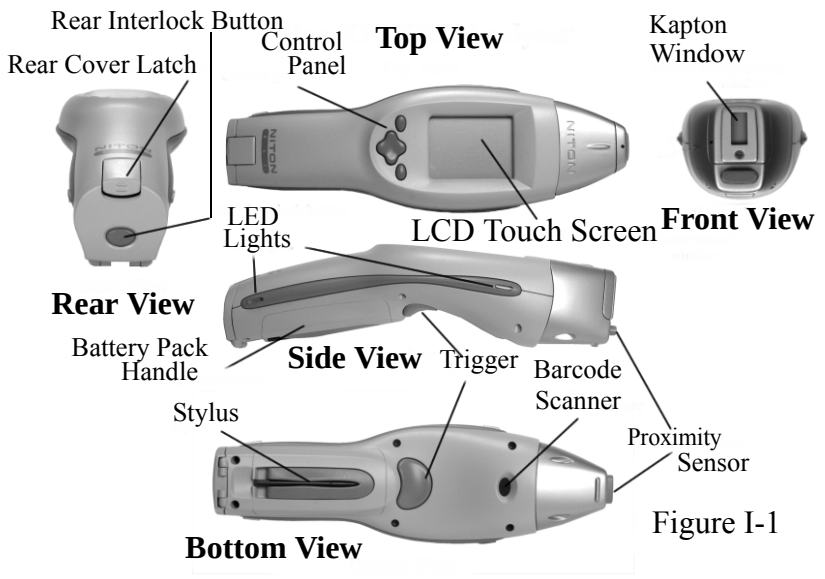


Figure I-1

THE CONTROL PANEL

The control panel is located on the instrument's top housing, directly below the LCD touch screen (see Figure I-2). The control panel consists of a 4 way touch pad and two control buttons, one on each side. Using either the control panel or the touch screen (with or without the NITON standard touch screen stylus accessory, that clips in the XLi battery pack) you may navigate through all of the instrument's screens and menus. You can control the movement of the screen cursor by pressing the four way control pad in one of four directions to highlight each of the menu options. The enter button on the right side of the four way touch pad is used to select highlighted menu options. The on/off/escape button both controls the power to the instrument and serves as an "escape" button. When the on/off/escape button is pushed and immediately released, it functions as an "escape", and brings you back to the Main Menu from the current screen in the menu system.

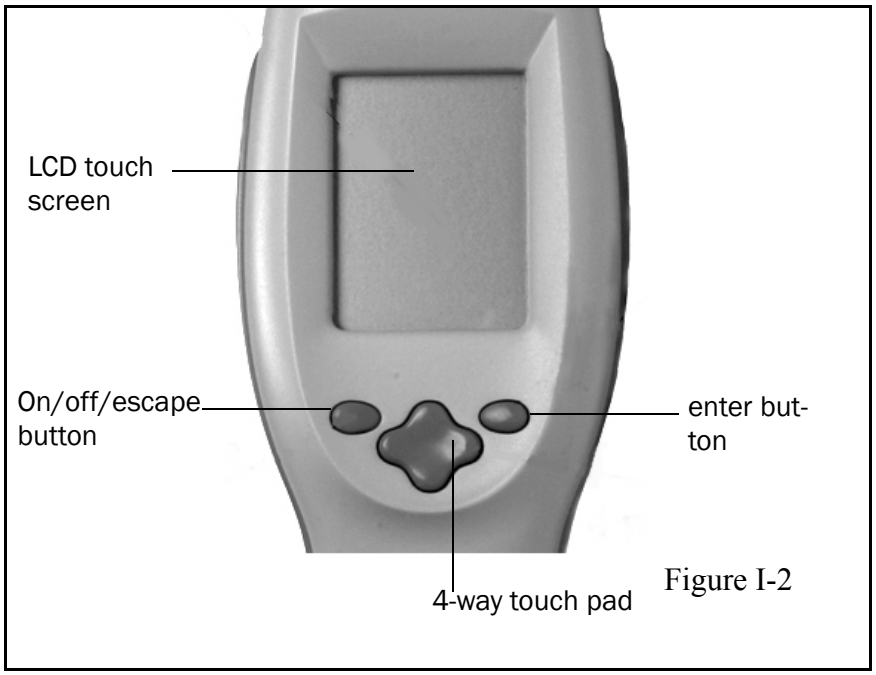


Figure I-2

Push and hold the **on/off/escape** button for at least 3 seconds to turn the instrument on. A 'beep' will sound as the power comes on. Push the **on/off/escape** button and hold it down for about 10 seconds to shut off power to the instrument from any screen in the menu system. The instrument will 'beep' as it shuts down.

You also have the option of operating the instrument, including navigating the menu system, by using the built in touch screen with or without the stylus. To select a menu option with the stylus, tap on the icon once. The touch screen icons have the same functionality as the four way touch pad, the **on/off/escape** button, and the **enter** button. This User's Guide will refer to the process of choosing a course of action by selecting an icon from a menu, either using the touch screen or using the control panel buttons, as “selecting.”

Selecting the **Return** icon works everywhere throughout the User Interface to bring you back to the previous menu from the current menu in the menu system. Use the on/off/escape button to return to the **Main Menu**.

INSTRUMENT STARTUP

To turn on the instrument, depress the **on/off/escape** button on the control panel for approximately 3 seconds, until you hear a beep.

Figure I-3

On startup, the screen will be replaced by a **Restart** screen (see Figure I-3) which will automatically count down from 9 to 0 in increments of one second.

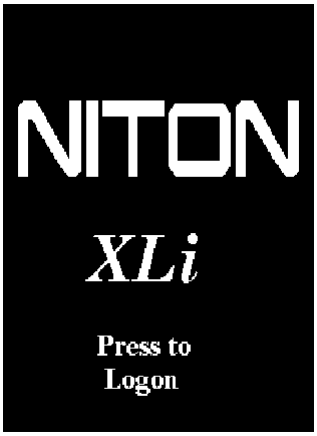


Figure I-4

When the **Restart** is complete, the **Restart Screen** will be replaced by the **Logon** screen (see Figure I-4). Tap anywhere on this screen to access the virtual touch pad:

7	8	9
4	5	6
1	2	3
[illegible]	0	E
<	>	.

Figure I-5

Select your 4 digit security code, followed by the enter (E) key. The temporary password assigned by default is 1-2-3-4, followed by the “E” key. After you have completed the log on procedure, the word "SUCCESS" will appear on the bottom of the screen, then the **Main Menu** will appear:

Check the **date/time**. The time should be set correctly for accurate and verifiable record keeping (see **Set Time and Date** on page 2-7).

Your analyzer can be stored safely in temperatures of up to 122ºF (50ºC) and is designed to operate at temperatures of up to 122ºF (50ºC). You will not be able to take a measurement if the instrument overheats. If it is hot to the touch, you should allow it to cool before testing.

SCREEN CONTRAST

To adjust the contrast of your instrument's touch screen display, press and hold the left and right ends of the 4 way Touch Pad until a beep sounds. After the beep, you may press the up portion of the 4 way Touch Pad to darken the screen, and the down portion to lighten the screen. When you have the display adjusted so that it is best for you, press the "Enter" button to save the current setting.

Chapter 1

RADIATION SAFETY

The NITON XLi Analyzer was designed so that virtually no measurable radiation external to any part of the instrument can escape when the shutter is closed. When the instrument is used in accordance with it's instructions, it is completely safe, that is, there is minimal radiation exposure, even with the shutter open.

NITON XLi Analyzers contain sealed ^{109}Cd and/or ^{55}Fe and/or ^{241}Am radioactive isotope sources. The source is designed to remain secure even under extreme conditions, so that even if the instrument is broken, crushed or burned, there should be no leakage of radioactive material.

During manufacturing, each sealed isotope source is locked in place in a solid tungsten alloy source holder. The source is completely secure in its housing because the aperture at the closure end of the housing is smaller than the source and is completely sealed. The source assembly is secured in the instrument’s case, which is fitted with tamper-proof screws.

Your exposure to radiation is determined by three factors: time, distance, and shielding. Human exposure to radiation is typically measured in rems, or in one-thousandths of a rem, called millirems (mrem).

For a given source of radiation, three factors will determine the radiation dosage you receive from the source:

1. **Duration of Exposure**

   The longer you are exposed to a source of radiation the more radiation strikes your body and the greater the dose you receive. Dosage increases in direct proportion to length of exposure.

2. **Distance from The Source**

   The closer you are to a source of radiation, the more radiation strikes you. The dosage increases in inverse-squared relation to

your distance from the source of radiation. For example, the radiation dose one inch from a source is nine times greater than the dose three inches from the source, and 144 times greater than the dose one foot (12 inches) from the source. For another example, the radiation dose one meter from the source of radiation is 100 times lower than the dose at 10 cm from the source of radiation. **Keep your hand and all body parts away from the front end of the instrument when the shutter is open to minimize your exposure.**

3. Shielding

Your instrument emits virtually no radiation with the shutter closed because the ^{109}Cd source is thoroughly shielded in every direction. This shielding absorbs nearly all of the radiation produced by the source – except when the shutter is open during testing. With the shutter open, the instrument emits a conical primary beam (see Figure 1.1) of radiation out the front of the device. This beam is mostly absorbed by sample in a typical measurement. Without a sample, the in-beam dose rate is approximately 315 mrem at a 5cm distance distance from the front of the device.

Note: Wearing a dosimeter badge does not protect you against radiation exposure. A dosimeter badge measures your exposure.

Note: Pregnant workers may want to take special precautions to reduce their exposure to radiation. Qualified scientists have recommended that the radiation dose to pregnant women should not exceed a total of 500 mrem/gestation period. See U.S. NRC Regulatory Guide 8.13 "Instruction Concerning Prenatal Radiation Exposure".

The Table 1-1 lists typical radiation doses encountered in daily life and lists the annual occupational radiation dosage limits for adults set forth in 105CMR 120.200

TYPICAL RADIATION DOSES IN MILLIREM (NCRP, 1987)

Table 1-1

Average total dose in US (annual)	360 mrem	(3.6 mSv)
Average worker exposure (annual)	210 mrem	(2.1 mSv)
Average exposure for underground miner (annual)	400 mrem	(4.0 mSv)
Exposure for airline crew (1,000 hours at 35,000 ft)	500 mrem	(5.0 mSv)
Additional from living in Denver at 5300' (annual)	25 mrem	(0.25 mSv)
Additional from 4 pCi/l radon in home (annual)	1,000 mrem	(10.0 mSv)
Typical chest x-ray	6 mrem	(0.06 mSv)
Typical head or neck x-ray	20 mrem	(0.2 mSv)
Typical pelvis/hip x-ray	65 mrem	(0.65 mSv)
Typical lumbar spine x-ray	30 mrem	(1.3 mSv)
Typical upper G.I. x-ray	245 mrem	(2.45 mSv)
Typical barium enema x-ray	405 mrem	(4.05 mSv)
Typical CAT scan	110 mrem	(1.10 mSv)
Minimum detectable dose on a standard film badge	5 mrem/QTR	(0.05 mSv)
Annual occupational dosage limits:		
Maximum allowable for the general public (annual)	100 mrem	(1.0 mSv)
Annual Occupational Dose Limits for Adults:		
Whole body	5,000 mrem/yr	(50 mSv)
For a pregnant worker (during gestation period)	500 mrem	(5.0 mSv)
For a minor	500 mrem	(5.0 mSv)
Eye dose equivalent	15,000 mrem	(150 mSv)
Shallow dose equivalent to the skin or any extremity or organ	50,000 mrem	(500 mSv)

As noted above, the allowable limit in the U.S. for occupational exposure is 5,000 mrem/year (50 mSv/year) for a whole-body and 50,000 mrem (500 mSv) for shallow penetration and extremities. Extremity exposure from a properly used NITON XRF instrument will be less than 100 mrem per year, (1.0 mSv per year) even if the instrument is used as much as 2,000 hours per year, with the shutter open continuously.

NOTE: NCRP is the National Council on Radiation Protection and Measurements

---

How to Use Your NITON XLi

The NITON XLi was designed to be as safe as possible. However, we strongly recommend that you follow these precautions to insure your safety and the safety of those around you.

WARNING!

Always be aware of the location of your instrument's radioactive sources and the direction of their beam of X-rays. The location of the sources is at the front end of the instrument.

Open the shutter only to do a test. The shutter can only be opened after the user has logged on to the instrument using the password.

During testing, a strong beam of radiation is continuously emitted through the kapton window at the front of the instrument (see Figure 1-1). There will be some radiation at the front and top-front of the instrument. There is negligible radiation at the handle of the instrument.

Direction of radioactive measurement beam

Figure 1-1

WARNING!

Always treat radiation with respect. Do not hold your instrument near the Kapton window during testing. Never point your instrument at yourself or anyone else when the shutter is open.

SHUTTER SAFETY

Under no circumstances should the shutter be open when the instrument is not in use!!!

The 4 warning lights on your instrument will go on when the shutter is open and stay on as long as the shutter remains open.

WARNING!

In the unlikely event that the shutter becomes stuck in the open position, remove the battery (see Battery Pack and Battery Charger - Routine Maintenance Guidelines - Note: All shutters will close immediately and remain locked in the closed position when the battery pack is not attached to the instrument), replace the instrument in its shielded holster, place the holster in the shielded carrying case, and call Thermo Electron Corporation's Service Department at (800) 875-1578 or +1-978-670-7460.

WARNING!

If your LCD Touch Screen displays the message "SHUTTER DOES NOT OPERATE", remove the battery (see Battery Pack and Battery Charger - Routine Maintenance Guidelines - Note: All shutters should close immediately and remain locked in the closed position when the battery pack is not attached to the instrument), replace the instrument in its shielded holster, place the holster in the shielded carrying case, and call Thermo Electron Corporation's Service Department at (800) 875-1578 or +1-978-670-7460.

MONITORING YOUR RADIATION EXPOSURE

Your state or country may have specific regulations concerning radiation monitoring. These badges are available from many companies. Two companies offering dosimeters in the USA are:

Landauer, Inc.

2 Science Road

Glenwood, IL 60425-9979.

Proxtronics

5795-B Burke Centre Highway

Burke, VA 22015

These companies are listed for information purposes only. NITON does not endorse the services of these companies. Please check with your local NITON representative if you are located outside the USA.

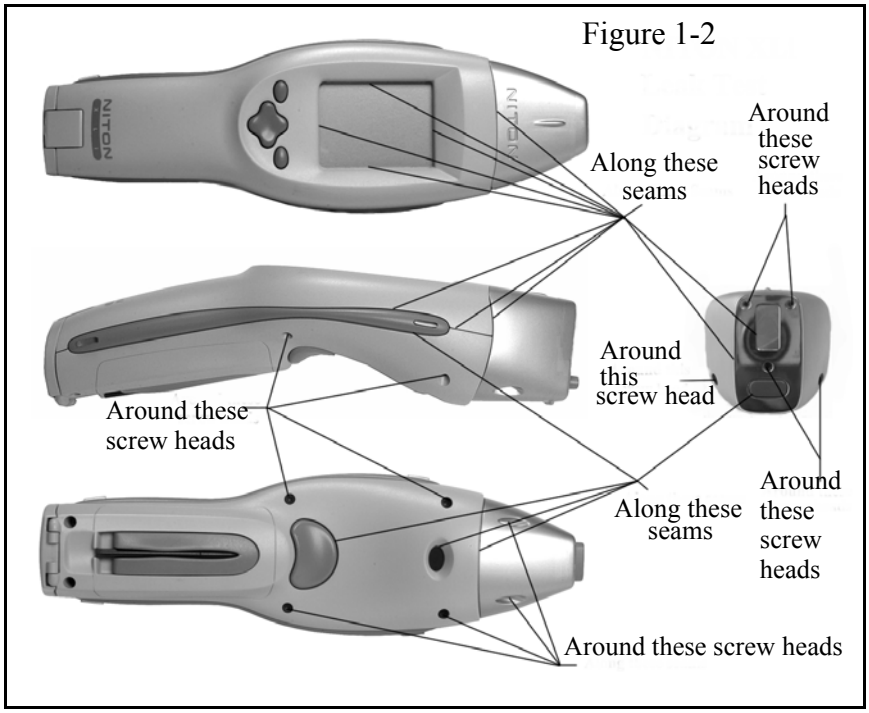
NITON recommends you ask your radiation dosimeter badge supplier for a quarterly schedule. Monthly schedules are also available.

Leak Tests

The radioisotope source shielding on your NITON XLi analyzer is designed to hold up even under extreme conditions, including the instrument being crushed or burned. The continued effectiveness of the instrument's radiation shielding should be tested every six months by performing a thorough leak test.

In the USA, this is a regulatory requirement: Thermo Electron Corporation's license requires that leak tests be repeated once every six months. Leak test kits, which include complete instructions for performing the test, are available from several vendors. These vendors typically remind you when it is time to perform the next leak test on your instrument. Please follow the test kit instructions carefully, and promptly mail the test samples to the laboratory.

The diagram in Figure 1-2 shows the test wipe locations.



The source shutter must be closed while performing a leak test!

The following laboratories supply leak test kits:

Applied Health Physics
2986 Industrial Blvd.
Bethel Park, PA 15102
Tel: (412) 835-9555

Stan A. Huber Consultants
200 N. Cedar Road
New Lennox, IL 60451
Tel: (800) 383-0468

Valley Safety Services
330 Old Enfield Road
Belchertown, MA 01007
Tel: (413) 323-9571

These companies are listed for information purposes only. NITON does not endorse the services of these companies. Please check with your local NITON representative if you are located outside the USA.

PROCEDURES FOR INSTRUMENT LOSS OR DAMAGE IN THE USA

If your instrument is damaged, destroyed, lost, or stolen, call:

1. The Office of Radiological Safety for your state's Dept. of Health.

   Telephone:_____

2. Ken Martin, C.I.H of Thermo Electron Corporation.

Table 1-2: During Regular Business Hours	
Calling from within the USA	(800) 875-1578 (toll-free)
Calling from outside the USA	+1-978-670-7460

Table 1-3: During Evenings and Weekends CALL ONLY WHEN YOU HAVE A RADIOLOGICAL EMERGENCY			
	Person	Phone Number	Mobile Phone Number
Calling from Any-where	Ken Martin	+1 (617) 923-6312	+1 (617) 901-3125

3. If your instrument is lost, stolen, or damaged in a car accident, also, immediately notify your State Police Department:

   Telephone: _____

   If your instrument is damaged in a fire or an explosion, also immediately, notify your local Fire Department.

   Telephone:_____

Note: Please fill in the phone numbers on these pages today. Keep copies where you can find them in case of an emergency.

PROCEDURES FOR INSTRUMENT LOSS OR DAMAGE OUTSIDE THE USA

If your instrument is damaged, destroyed, lost, or stolen, immediately notify:

1. The proper authorities for your location.

   Telephone:_____

2. Ken Martin, C.I.H. of Thermo Electron Corporation

Table 1-4: During Regular Business Hours	
Calling from within the USA	(800) 875-1578 (toll-free)
Calling from outside the USA	+1-978-670-7460

Table 1-3: During Evenings and Weekends CALL ONLY WHEN YOU HAVE A RADIOLOGICAL EMERGENCY			
	Person	Phone Number	Mobile Phone Number
Calling from Anywhere	Ken Martin	+1 (617) 923-6312	+1 (617) 901-3125

3. If your instrument is lost, or stolen, or damaged in a car accident, also, immediately notify your local Police Department:

   Telephone: _____

   If your instrument is damaged in a fire or an explosion, also immediately, notify your local Fire Department.

   Telephone:_____

Note: Please fill in the phone numbers on these pages today. Keep copies where you can find them in case of an emergency.

Substrate 3/4” thick pine.

Profile was taken with the strongest source and the least dense substrate to show the worst case scenario. Any other combination of source strength and substrate would result in lower dose rates from scatter radiation.

View of the Underside of the XLi Analyzer Showing Proper Placement of General and State Specific Radiation Labels

Figure 1-5

Not to Scale

Chapter 2 THE MENU SYSTEM

The NITON XLi Menu System enables you to perform critical tasks, including taking readings and viewing and moving data, with a minimum number of steps. Menus are presented as small pictures called icons which, when selected, will do one of three things:

1. **Toggle** between two different functions or views, such as turning backlighting on or off.
2. Present a subsidiary or **sub-menu** which will allow you access to more choices.
3. Present a **screen** which allows you to view data, edit data, or control the instrument.

Icons which appear on your NITON instrument screen display in light gray (grayed out) represent features which are not enabled, and therefore cannot be selected. In order to enable features on your NITON instrument which are currently not enabled, please contact Thermo Electron Corporation in the United States, toll free, at (800) 875-1578, or outside the United States, at +1-978-670-7460, or your local Authorized NITON Service Center.

Icons which appear on your NITON instrument screen display with a diagonal line through them represent features which are currently turned off. When an icon with a diagonal line through it is selected, the diagonal line through that icon will automatically be erased, and the feature corresponding to that icon will automatically become enabled.

THE MAIN MENU

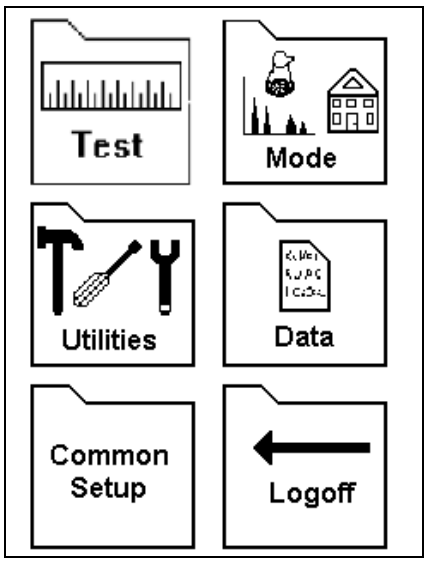


Figure 2-1

All NITON XLi instruments functions are accessible from the **Main Menu** and subsidiary menus. Each of the instrument functions represented by an icon on the **Main Menu** screen (Test, Mode, Utilities, Data, and Common Setup) may be selected by choosing the appropriate icon. When one of these **Main Menu** icons is selected, the function specific sub-menu appropriate to that icon will be displayed.

In order to test samples in the previously used test mode, simply select the **Test** icon. Your NITON XLi analyzer will operate in the testing mode that is currently selected. Choose an appropriate test mode for the samples you are testing by selecting a mode from the **Mode Menu**.

Access the **Mode Menu** by selecting the **Mode** icon from the **Main Menu** screen. The instrument will remember the last mode used on the instrument, and will use that mode by default unless another mode is selected.

Access the **Utilities Menu** by selecting the **Utilities** icon from the **Main Menu** screen. The **Utilities Menu** enables you to view instrument specifications; set the date and time; auto-calibrate the instrument electronics and the touch screen display; and update and maintain entry passwords and user profiles.

Access the **Data Menu** by selecting the **Data** icon from the **Main Menu** screen. The **Data Menu** allows you to view readings, and allows you to view the alloy library and stored signatures.

Access the **Common Setup Menu** by selecting the **Common Setup** icon from the **Main Menu** screen. The **Common Setup Menu** allows you to turn on or off the liquid crystal display backlight, turn on or off the integrated bar code scan engine, to enable and configure source utilization, and to enable or disable the printer.

Return to the **Logon** screen by selecting the **Logoff** icon. The **Logon** Screen logs you out and allows you to login again, preventing casual unauthorized access to your analyzer.

THE MODE MENU

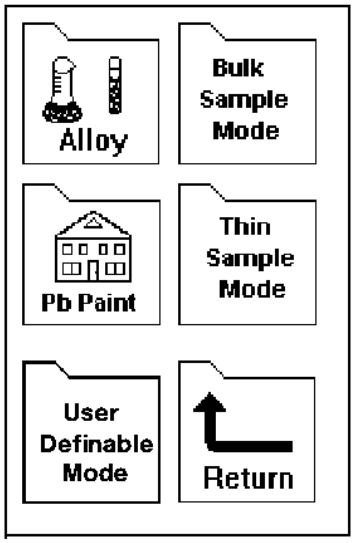


Figure 2-2

The **Mode Menu** enables you to select any one of the sample test modes that have been installed on your NITON XLi analyzer.

Select the **Alloy** icon to access any one of the alloy testing modes. The **Alloy Modes** enables you to test metal alloys for chemical composition and/or alloy identification. The **Alloy Testing Modes** are detailed in Chapter 3 of this User's Guide.

The **Pb Paint Mode** allows you to determine lead (Pb) loading in paint samples in units of mg/cm2, and to determine if paint samples are above or below the user-defined action level for lead in the shortest time possible. The **Pb Paint Mode** is detailed in chapter 4 of this User’s Guide.

Select the **Thin Sample Mode** icon to access the **Thin Sample Mode Menu**, where you may choose a thin sample testing mode appropriate to the samples you will be testing. The **Thin Sample Testing Modes** allow you to analyze thin samples, such as dust wipes and air filters, and coatings for elemental analysis. The **Thin Sample Test Modes** are detailed in Chapter 5 of this User's Guide.

Select the **Bulk Sample Mode** icon to access **Bulk Sample Mode**. The **Bulk Sample Mode** allows you to analyze soil, mining, and other thick samples for metallic composition and/or contamination. The **Bulk Sample Mode** is detailed in Chapter 6 of this User's Guide.

Select the **User Definable Mode** icon to access **User Definable Mode**. The **User Definable Mode** allows you to create your own protocols and methods for your own use. The **User Definable Mode** is detailed in Chapter 7 of this User's Guide.

THE UTILITIES MENU

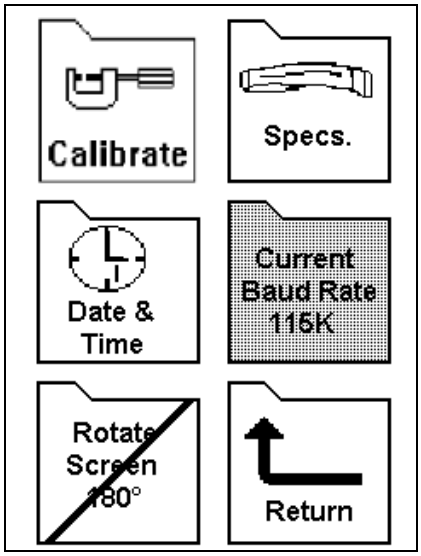
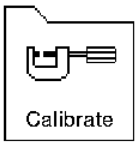


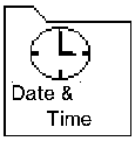
Figure 2-3

To access the **Utilities Menu**, select the **Utilities** icon from the **Main Menu** display. The **Utilities Menu** enables you to view your NITON instrument specifications, set the date and time, auto-calibrate your NITON's detector or touch screen display, Rotate the display on the LCD screen, or change the communication (baud) rate for the RS-232 port.



Select the **Calibrate** icon to access the **Calibrate Menu**. The **Calibrate Menu** allows you to calibrate the detector or to calibrate the touch screen.

Select the **Specs** icon to display the instrument's specifications. These specifications include your NITON XLi 's serial number, software and firmware versions, temperature, bias, and data coprocessors. Press the **enter** button to return to the **Utilities Menu**.



Select the **Date & Time** icon to set the date and time as needed for different time zones, daylight savings time, or any other reason. The date and time are factory preset prior to shipping. The format used is month/day/year - MM/DD/YY, and hour/minute - HH/MM, for the 24 hour clock.

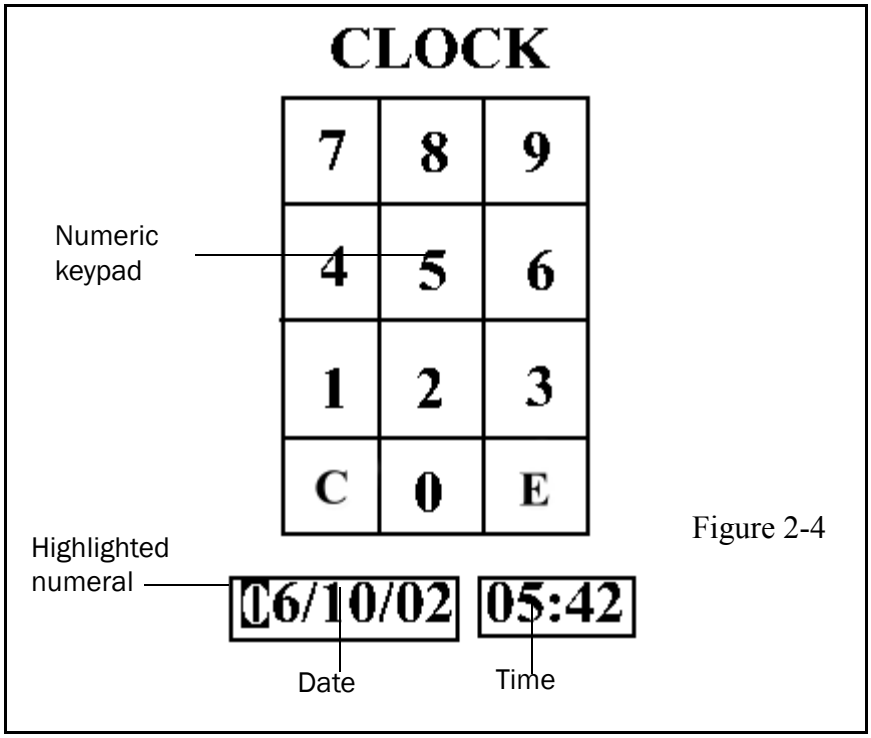


Figure 2-4

When the **Date & Time** icon is selected, the **Date & Time** screen comes up on your XLi's LCD Screen. Initially, the first character of the month is highlighted in reverse video (white on black), as in the sample display shown here. To change a character, select the digit you want to replace the character with from the virtual numeric keypad displayed on the screen, then select the Enter (E) character from the virtual numeric keypad. Your NITON XLi will then accept the entry and automatically advance to the next digit. To skip a character, simply select the Enter (E) character from the virtual numeric keypad without selecting a replacement character.

For example, on the sample display, if you wish to change the "06" of the month to "07", the display appears with the first character (0) highlighted. Select the Enter (E) character to skip the zero. The "6" will now be highlighted. Select the "7" digit from the virtual numeric keypad, then select the Enter (E) key from the virtual numeric keypad. The change is accepted and the next digit is highlighted. Continue to select the Enter (E) symbol from the virtual numeric keypad to skip over the remaining characters of the date and time until the last character is reached. When you select the Enter (E) key from the virtual numeric keypad to confirm the last

character, the word "SUCCESS" will appear beneath the Date field, and you will be returned to the **Main Menu**. The date is given in month/day/year format.

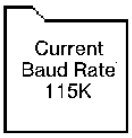
Caution

Your XLi analyzer must have the correct time and date set in order to test samples correctly using the ^{109}Cd radioisotope source. Please make sure that the time and date are set correctly before testing.

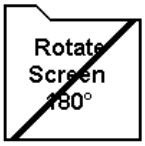
WARNING!

It is important that the date and time information displayed on the Date and Time screen is correct. If either the date or time is incorrect, the information stored with your readings will be incorrect. In addition, an incorrect date prevents the instrument from properly compensating for normal source decay - causing erroneous analysis results **for instruments equipped with ^{109}Cd.** This information must be correct before proceeding with testing.

The instrument will automatically return you to the Main Menu when the entry is complete.



Select the Current **Baud Rate** icon to change the communications rate for the RS-232 port. Selecting the **Current Baud Rate** icon will toggle the communications rate between 115 kbaud and 38 kbaud. The default 115 kbaud rate may be too fast for some older computers, and dropping the rate to 38 kbaud will insure proper communications between your PC and your NITON XLi Analyzer.



Select the **Rotate Screen** icon to toggle the orientation of the screen between right side up and upside down. This is used primarily when your analyzer is placed in the NITON Environmental Test Stand, because the analyzer is inverted when properly installed in the Test Stand.

THE DATA MENU

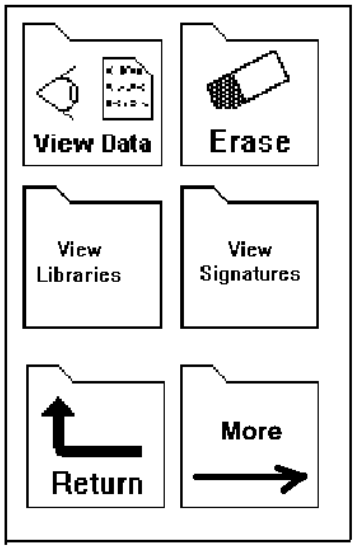
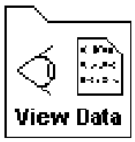


Figure 2-5a

To access the **Data Menu**, select the **Data** icon from the **Main Menu** display. The **Data Menu** enables you to access readings and libraries, for viewing or manipulation.



Select the **View Data** icon in order to view previously taken test result readings. When the **View Data** icon is selected, the **Results** screen of your most recent test is shown on the LCD display.

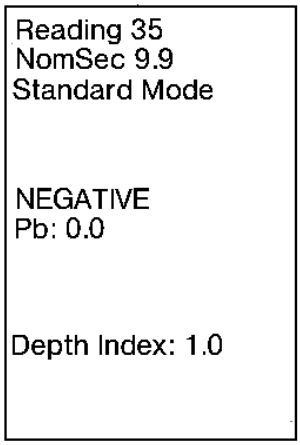


Figure 2-6

Using the buttons on the control panel, you may view different readings or additional data for different readings. Pressing the "Up" position on the 4-way touch pad of your NITON XLi 300 Series Lead-based-Paint Analyzer will display the standard screen analysis. Pressing the "Down" position on the 4-way touch pad will display a

complete scrolling elemental chemistry listing. Each press of the “Down” position scrolls the screen down to the next element. Pressing the "Left" position on the 4-way touch pad of your NITON XLi 300 Series Lead-based-Paint Analyzer will display the previous reading, or if the first reading is currently displayed, the last reading. Pressing the "Right" position on the 4-way touch pad will display the next reading, or if the last reading is currently displayed, the first reading. The NITON XLi 300 Series Lead-based-Paint Analyzer can store up to 3000 readings.

You can also look at the complete x-ray spectra for each reading stored in your NITON XLi 300 Series Lead-based-Paint Analyzer's memory.

For any reading result, simply use the **on/off/escape** button to gain access to the screen buttons at the bottom of the screen. Selecting **RETN** (Return) will take you to the previous menu. Selecting **DATA** will show the Data Entry parameters for the Reading. Selecting **SPTR** (Spectrum) will show a graphed spectrum of this reading, called **SpectraView**. **SpectraView** can be a useful tool for rapid, qualitative analysis of sample chemistries. See **Appendix C: SpectraView** for details.

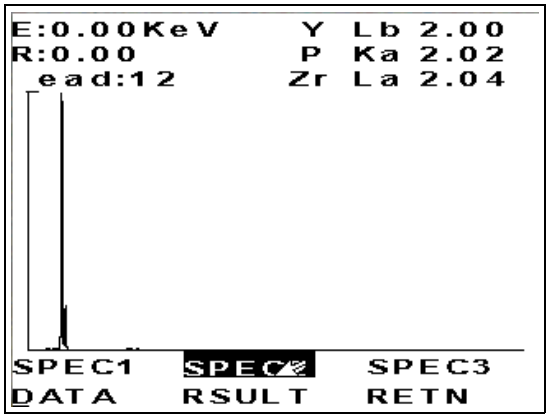
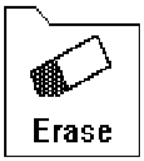


Figure 2-7

Pressing the **DATA** screen button while viewing the reading spectrum will access the parameter data for the reading. In this scrolling screen, you can see the parameters input into the **Data Entry Screen** describing the conditions of the reading test target, the inspector taking the reading, and other data concerning the reading.



Select the **Erase** icon to access the **Erase Menu**. The **Erase Menu** allows you to erase your data.

Caution

Never turn off the instrument while data is being erased!

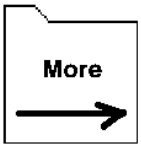
WARNING!

Do not attempt to take measurements while downloading readings! This will generate an error requiring a system reset, and may corrupt your stored readings, requiring all stored readings to be erased.

Select the **Return** screen button or use the **on/off/escape** button to the left of the four-way touch pad to return you to the **Main Menu**.

Select the **View Libraries** icon to access the **Library View Menu**. The **Library View Menu** allows you to view data in the Grade Library as well as the Superlib and Superstds libraries.

Select the **View Signatures** icon to view data saved as reference sample signatures in **Signature ID Mode**. When the **View Data** icon is selected, the **Results** screen of your most recent test is shown on the LCD display.



Select the **More** icon to access the second page of the **Data Menu**.

THE DATA MENU - SECOND PAGE

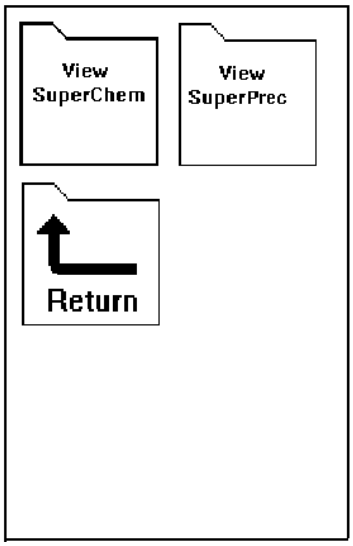
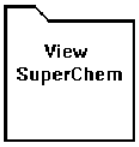


Figure 2-5b

To access the **Data Menu** Second Page, select the **More** icon from the **Data Menu** display. The **Data Menu** enables you to access readings and libraries, for viewing or deleting.



Select the **View SuperChem** icon in order to view your **SuperChem** data. The **SuperChem View** icon allows you to view your **SuperChem Mode** data, and also allows you to delete individual readings.When the **View Data** icon is selected, the **Results** screen of your most recent test is shown on the LCD display.

Select the **View SuperPrec** icon in order to view your **SuperPrec** data. The **View SuperPrec** icon allows you to view your **Super-Prec** Mode data, and also allows you to delete individual SuperChem standards.When the **View Data** icon is selected, the **Results** screen of your most recent test is shown on the LCD display.

THE VIEW LIBRARIES MENU

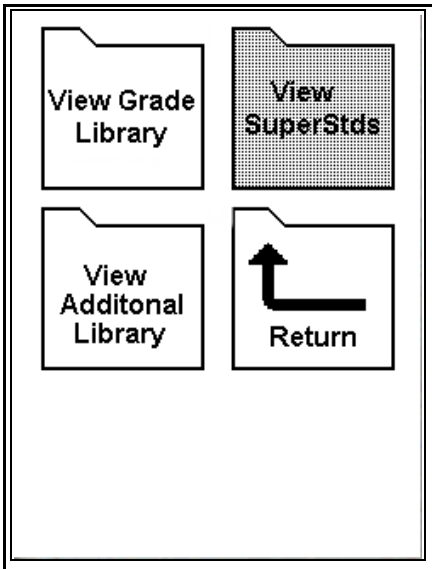


Figure 2-8

To access the **View Libraries Menu**, select the **View Libraries** icon from the **Data Menu**. The **View Libraries Menu** enables you to view reference data from your analyzer's libraries.

Select the **View Grade Library** icon to view your **Grade Library**, which is set by NITON. The entries in the **Grade Library** serve as a reference for chemistry based analysis. The library entries allow the analyzer to work properly "out of the box" without needing time-consuming pre-analysis. Please refer to the NDT User Guide for information on modifying the Grade Library.

Select the **View SuperStds** icon in order to view your **SuperStds** Alloy library.

Select the **View Additional Library** icon in order to view your **Additional Library** alloys, which you may have uploaded to your XLi Analyzer with the NDTl utility. If you have not uploaded an additional library, the **View Additional Library** icon will be grayed-out and the **View Additional Library** function will be unavailable.

THE COMMON SETUP MENU

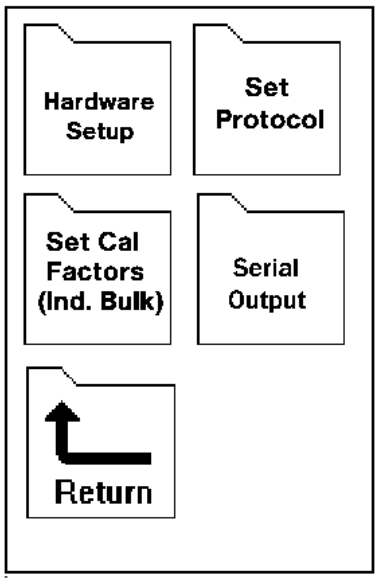


Figure 2-9

To access the **Common Setup Menu**, select the **Common Setup** icon from the **Main Menu** display. The **Common Setup Menu** gives you access to various NITON XLi instrument functions, including touch screen display backlighting and the built in bar code scanner, and enables you to configure the way the sources contained in your NITON XLi analyzer are used in sample testing.

Select the **Hardware Setup** icon to access the **Hardware Setup menu**. The **Hardware Setup Menu** allows you to toggle the display backlight on or off, toggle the built-in bar code scanner on or off, set up the analyzer to use a welding mask, or access the **Hot-foot Mode**.

Select the **Set Protocol** icon to bring up the **Set Protocol** menu. The Set Protocol Menu allows you to control source utilization by enabling and disabling individual sources, set the time between source autoswitching, and control the match number triggering source autoswitching.

Select the **Set Cal Factors (Ind Bulk)** icon to bring up the **Set Cal Factors Menu**. The Set Cal Factors Menu allows you to correct for the presence of certain light elements in a Bulk Mode test matrix which may influence the readings, even though they are not quantified by the analyzer.

Select the **Serial Output** icon to access the **Serial Output Menu**. The **Serial Output Menu** allows you to download data across a

serial line or a Bluetooth wireless connection from your instrument to a computer, printer, or other computing device.

THE CALIBRATE MENU

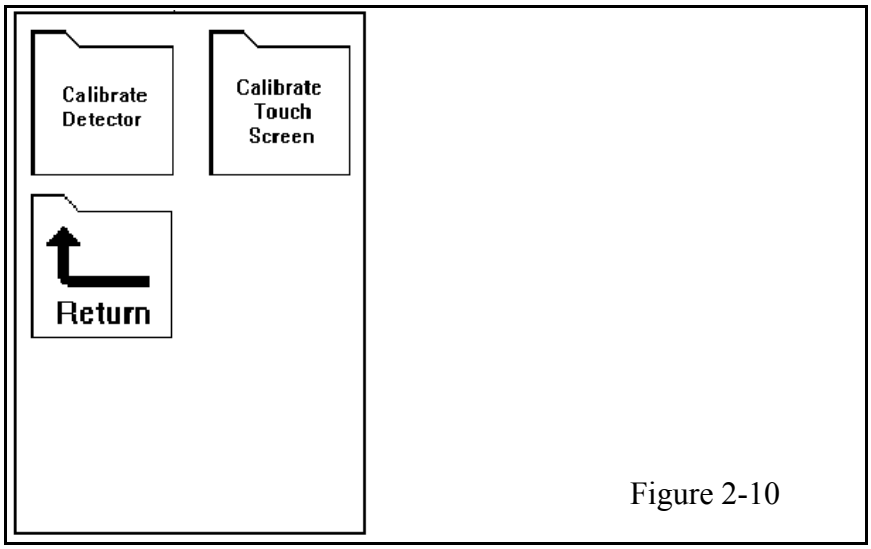


Figure 2-10

To access the **Calibrate Menu**, select the **Calibrate** icon from the **Utilities Menu**. The **Calibrate Menu** enables you to re-calibrate the instrument's touch screen display interface and to automatically re-calibrate your instrument's sample analysis electronics.

Select the **Calibrate Detector** icon to re-calibrate the instrument's electronics. As soon as the icon is selected, calibration will begin. The instrument is programmed to calibrate for a specific, predetermined period in order to ensure proper operation of your NITON XLi analyzer in the field. The instrument calibration screen will be displayed until calibration is complete. After the calibration has finished, the calibration results will be displayed. Press the **on/off/ escape** button or the Return icon to return to the **Main Menu**. In order to insure good test results, it is essential that you calibrate your NITON XLi300 Series Lead-based-Paint Analyzer's detector if a check sample test reveals discrepancies in the reading.

Select the **Calibrate Touch Screen** icon to re-calibrate the instrument's touch screen display. This procedure establishes the display boundaries for the touch screen interface. When the **Calibrate Touch Screen** icon is selected, the display will show the message: "Calibrate Touch Screen". There will be a small cross in the upper left-hand corner of the display. Tap on this cross with the stylus, and the cross will disappear and reappear in the lower left-hand corner of the screen. Tap on the cross again, and it will reappear in the lower right-hand corner of the screen. Tap on the cross again and it will reappear in the top right-hand corner of the screen. Tap on the

cross once more, and the **Logon Screen** will appear. Logon as normal, and you will be presented with the **Main Menu**

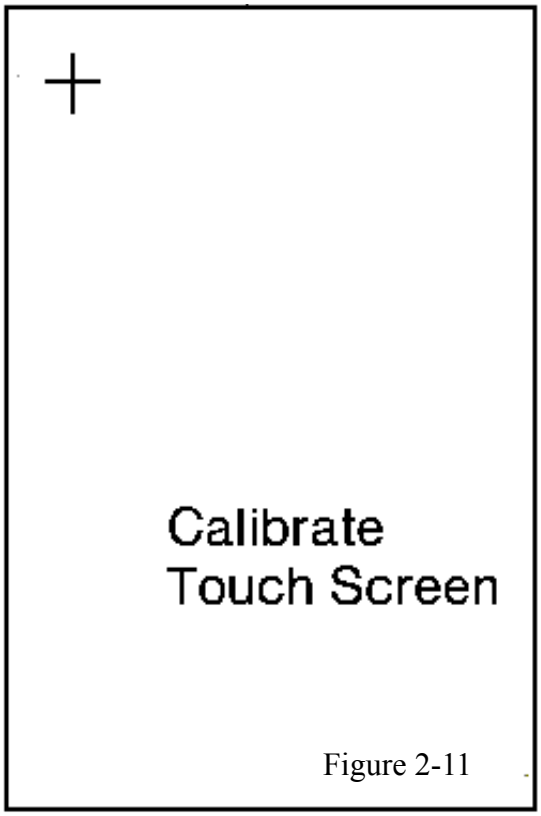


Figure 2-11

THE ERASE MENU

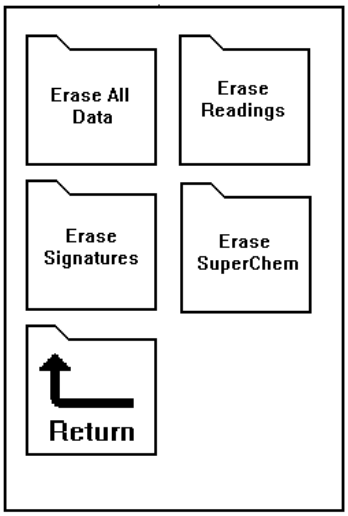


Figure 2-12

To access the **Erase Menu**, select the **Erase** icon from the **Data Menu**. The **Erase Menu** enables you to delete data from your analyzer, allowing you to gain storage space for more recent data. You should only erase data which you have already transferred to permanent storage, or when requested to do so by NITON service personnel.

Select the **Erase All Data** icon to erase all data, including signatures and SuperChem reference readings, from your analyzer. Selecting the **Erase All Data** icon will bring up a confirmation screen (see Figure 2-13) asking you “Are you sure?” with options to select “YES” or “NO”. Selecting “YES” will erase all reading data from your analyzer. Selecting “NO” will return you to the **Erase Menu.**

Select the **Erase Readings** icon to erase all accumulated test readings from your analyzer. Selecting the **Erase Readings** icon will bring up a confirmation screen (see Figure 2-13) asking you “Are you sure?” with options to select “YES” or “NO”. Selecting “YES” will erase all test reading data from your analyzer. Selecting “NO” will return you to the **Erase Menu.**

Select the **Erase Signatures** icon to erase all accumulated alloy signatures from your analyzer. Selecting the **Erase Signatures** icon will bring up a confirmation screen (see Figure 2-13) asking you “Are you sure?” with options to select “YES” or “NO”. Selecting “YES” will erase all signature data from your analyzer. Selecting “NO” will return you to the **Erase Menu.**

Select the **Erase SuperChem** icon to erase accumulated SuperChem reference readings from your analyzer. Selecting the **Erase SuperChem** icon will bring up a confirmation screen (see Figure 2-13) asking you "Are you sure?" with options to select "YES" or "NO". Selecting "YES" will erase all SuperChem reference reading data from your analyzer. Selecting "NO" will return you to the **Erase Menu.**

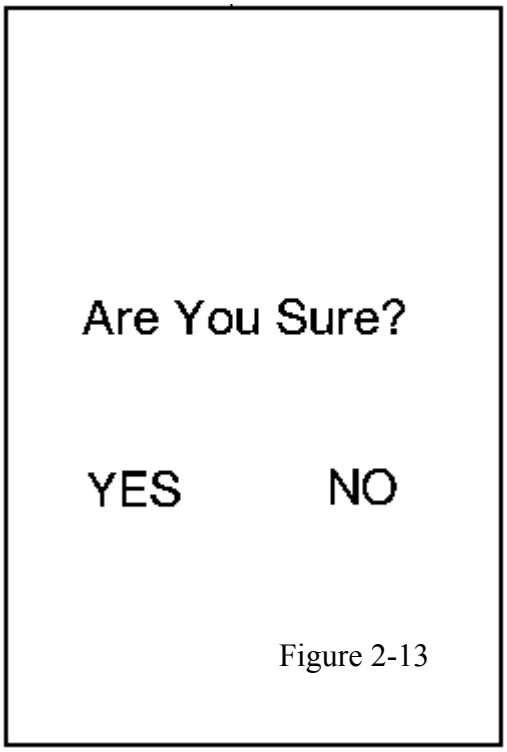


Figure 2-13

THE SERIAL OUTPUT MENU

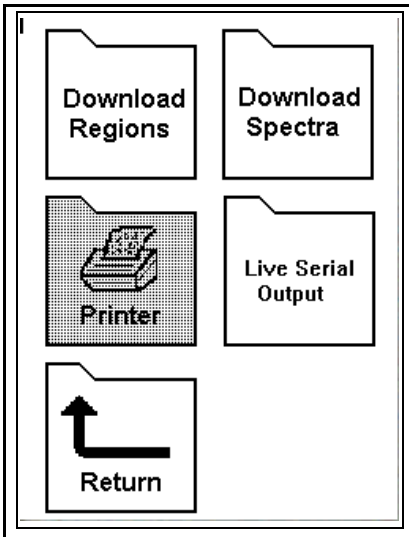


Figure 2-14

Select the **Download Regions** icon to toggle the configuration of the serial port to the task of exporting Regions data to your computer.

Select the **Download Spectra** icon to toggle the configuration of the serial port to the task of exporting Spectral data to your computer.

Select the **Printer** icon to toggle the configuration of the serial port to the task of sending your data to the printer. Enabling the **Printer** icon will disable Live Serial Output.

Select the Live Serial Output icon to toggle the serial post to the task of sending continuous data updates to an external device. Live Serial Output is very useful for online applications with continuous monitoring of a product stream. Enabling Live Serial Output icon will disable the Printer.

THE SET PROTOCOL MENU

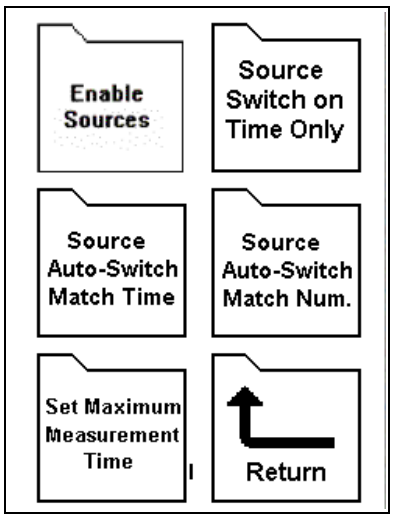
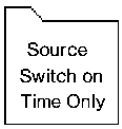


Figure 2-15

For NITON XLi analyzers equipped with more than one radioisotope source, the **Set Protocol Menu** enables you to directly enable or disable any source, control the time that a source irradiates the sample before auto-switching to another source, and select the chi-squared deviation cutoff for auto-switching between sources.

Select the **Enable Sources** icon from the **Set Protocol Menu** to bring up the **Source Menu**. From the **Source Menu**, you may choose exactly which of the sources contained in your NITON XLi analyzer will be used for sample testing.



Select the **Source Switch on Time Only** icon from the **Set Protocol Menu** to toggle **Time Switch Only Mode** on or off. In **Time Switch Only Mode**, the NITON XLi analyzer will ignore the match number and only switch sources according to the time interval you set in the **Source Auto-Switch Time** menu.

Select the **Source Auto-Switch Time** icon from the **Set Protocol Menu** to display the **Source Time Menu**. The **Source Time Menu** enables you to set the number of seconds each enabled source is allotted before auto-switching will occur when needed during sample testing. Your NITON XLi analyzer will auto-switch from one source to another when the testing time for that source is greater than or equal to the time you have chosen, the match number for that source is lower than the match number you have set, and the

identified alloy is flagged as needing the switch in the NITON Alloy Library.

Select the **Source Auto-switch Match Num.** icon from the **Set Protocol Menu** to display the **Source Match Menu**. The **Source Match Menu** enables you to set the chi-squared deviation (match number) below which the instrument will auto-switch to the next enabled source during alloy sample testing.

Select the **Set Maximum Measurement Time** icon from the S**et Protocol Menu** to display the **Max Time Screen**. The **Max Time Screen** allows you to set a cap on the maximum time any sample is allowed to be analyzed. This allows you to set up a sample in a NITON Test Stand for a reading without having to time the reading manually. In the field, the maximum measurement time feature also allows you to control measurement time in noisy or otherwise distracting environments.

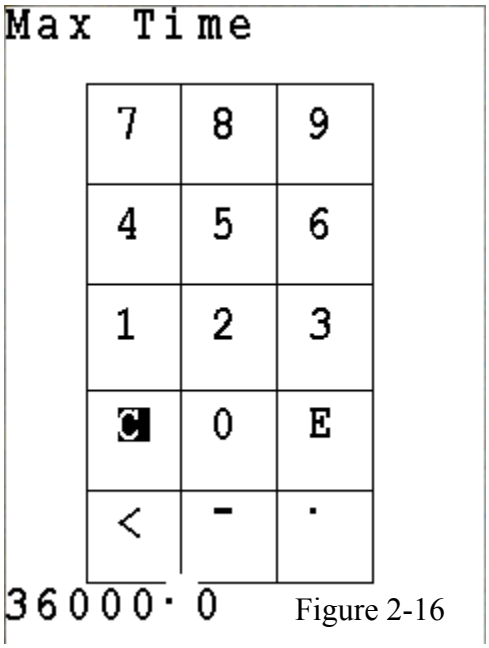


Figure 2-16

The **Max Time Screen** displays a virtual touchpad, similar to the ones used for logging on and setting the clock. At the top left is the name of the screen. At the bottom left is the current measurement time in source seconds. Select “C” to clear the current maximum measurement time, then key in the time you want to use as a measurement cap with the number keys. Select “E” to enter the time, and the maximum measurement time will be reset to the new value.

THE HARDWARE SETUP MENU

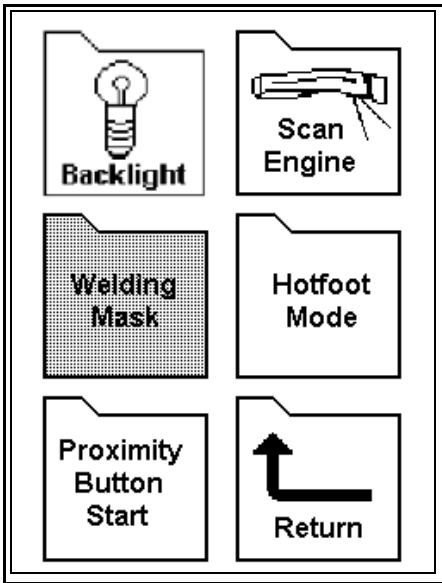
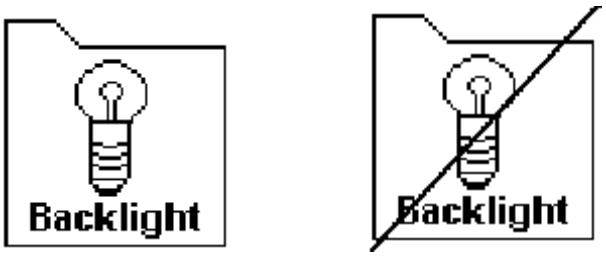


Figure 2-20

The **Hardware Setup Menu** enables you to toggle various options on or off, as well as select certain hardware dependant modes.

Select the **Backlight** icon to toggle the built in touch screen display backlight off and on. Select the **Backlight** icon to turn the backlight off. The display will then show the **Backlight** icon with a slash through it. Select the **Backlight** icon with a slash through it to turn the backlight on. The display will then show the **Backlight** icon without a slash through it.

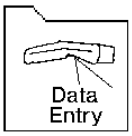
Figure 2-18



Backlight ON Backlight OFF

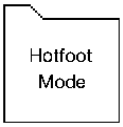
Caution

Enabling the backlight will reduce your battery pack operating time, requiring more frequent recharges.



Select the **Scan Engine** icon from the **Set Protocol Menu** to toggle the **Data Entry Screens** on or off. If the **Data Entry Screens** are currently enabled, you can select the **Scan Engine** icon to disable data entry. The display will then show the **Scan Engine** icon with a slash through it. If the **Data Entry Screens** are currently disabled, you can select the **Scan Engine** icon to enable data entry. The display will then show the **Scan Engine** icon without a slash through it.

Select the **Welding Mask** icon from the **Set Protocol Menu** to adjust for the presence or absence of a welding mask. **Welding Mask Mode** requires additional hardware and special calibration. **Welding Mask Mode** should not be used without the welding mask hardware to ensure proper analysis, as the calibration adjusts to compensate for the changed geometry when using the welding mask. When the **Welding Mask** icon is displayed with a diagonal line through it, **Welding Mask Mode** is disabled. Selecting the **Welding Mask** icon will toggle **Welding Mask Mode** between an enabled state and a disabled state. When changing from **Welding Mask Mode** to normal use and back, remember to enable or disable **Welding Mask Mode** as appropriate.



Select the **Hotfoot Mode** icon from the **Set Protocol Menu** to toggle for the presence or absence of a Hotfoot Attachment. This mode enables the rear actuator button for use with the Hotfoot attachment. Selecting the **Hotfoot Mode** icon again turns the **Hotfoot Mode** off. Some nations have laws or regulations which prohibit use of this feature. In this case, the feature will be disabled before shipping.

Note: If the Welding Mask Icon is grayed out contact Thermo Electron Corporation or your local NITON Sales representative to have Welding Mask mode installed on your instrument.

Select the **Proximity Start Button** icon from the **Set Protocol Menu** to toggle the use of the front proximity button. This enables the proximity button to be used to start taking a sample on contact.

Selecting the **Proximity Start Button** icon again turns the proximity button off.

Some nations have laws or regulations which prohibit use of this feature. In this case, the feature will be disabled before shipping.

THE SOURCE MENU

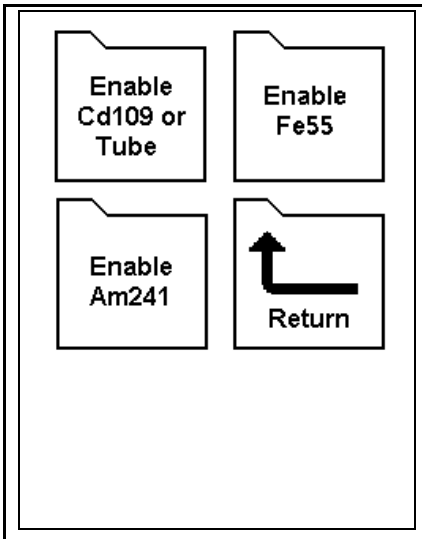
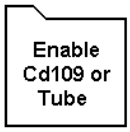


Figure 2-19

The **Source Menu** enables you to select exactly which sources will be activated during sample testing. Testing modes auto-switch between sources, based on the testing time and the match number parameters set for the instrument. You may disable a source if you know that the samples you are testing do not need that source for discrimination.



Select the **Enable Cd/Tube** icon to toggle the ^{109}Cd source x-ray tube between the enabled and disabled states. When the ^{109}Cd source is disabled, the **Enable Cd/Tube** icon will appear on the **Source Filter Menu** display with a black diagonal line running through the icon. When the ^{109}Cd source is enabled, there is no diagonal line through the icon.

Select the **Enable Fe55** icon to toggle the ^{55}Fe source between the enabled and disabled states. When the ^{55}Fe source is disabled, the **Enable Fe55** icon will appear on the source display with a black diagonal line running through the icon. When the ^{55}Fe source is enabled, there is no diagonal line through the icon.

Selecting the Enable Am241 icon will toggle the ^{241}Am source between the enabled and disabled states. When the ^{241}Am source is disabled, the Am source icon will appear on the source display with a black diagonal line running through the icon. When the ^{241}Am source is enabled, there is no diagonal line through the icon.

THE SOURCE TIME MENU

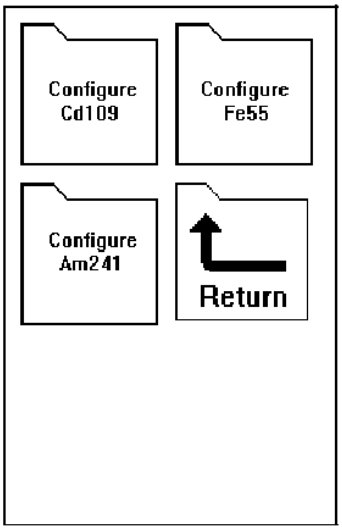


Figure 2-20

Select the **Source Autoswitch Match Time** icon from the **Set Protocol Menu** screen to display the **Source Time Menu.** Selecting appropriate icons from the **Source Time Menu** enables you to change the number of seconds that are allotted to each source before your NITON XLi analyzer auto-switches to the next source during sample testing.

Your NITON XLi analyzer will auto-switch from one source to another when the testing time for that source is greater than or equal to the time you have chosen and the match number for that source is lower than the match number you have set.

Select the **Configure Cd109** icon to bring up the **Source Time Configuration Screen** for the ^{109}Cd source. The **Source Time Configuration Screen** allows you to set the number of seconds the ^{109}Cd source is used before auto-switching to the next enabled source during testing.

Select the **Configure Fe55** icon to bring up the **Source Time Configuration Screen** for the ^{55}Fe source. The **Source Time Configuration Screen** allows you to set the number of seconds the ^{55}Fe source is used before auto-switching to the next enabled source during testing.

Select the **Configure Am241** icon to bring up the **Source Time Configuration Screen** for the ^{241}Am source. The **Source Time Configuration Screen** allows you to set the number of seconds the ^{241}Am source is used before auto-switching to the next enabled source during testing.

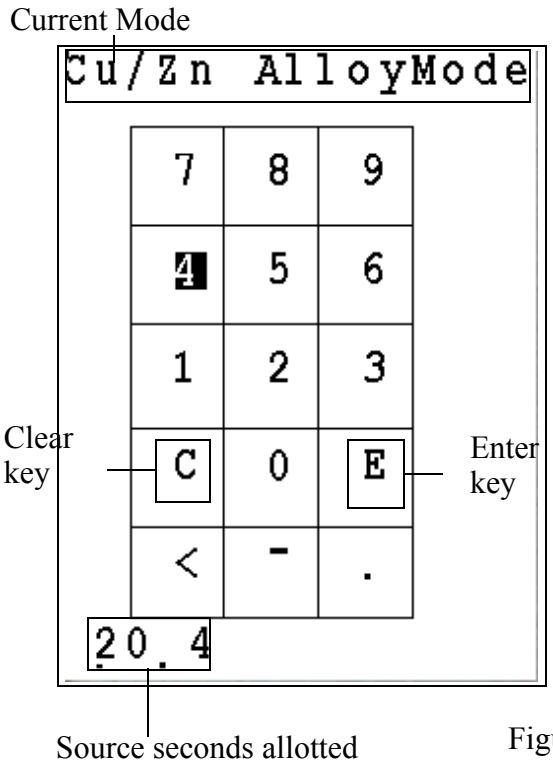


Figure 2-21

The **Source Time Configuration Screen** enables you to select the number of seconds each source will be used during a sample analysis. In the center, the display screen is dominated by a virtual numeric keypad. At the bottom left of the screen is the number of seconds the selected source is allotted during testing (Example: 20.4.)

To change the configuration for the selected source, clear the current number with the Clear key “C”, then change the number using the virtual numeric keypad, selecting the digits in order, then select enter (E). For example, to change the time from 20.4 seconds to 10.5 seconds: select “C”, then select "1", then select "0", then select ".", then select "5", then select "E". The source measurement time setting will be changed, and you will return to the previous menu.

THE SOURCE MATCH NUMBER MENU

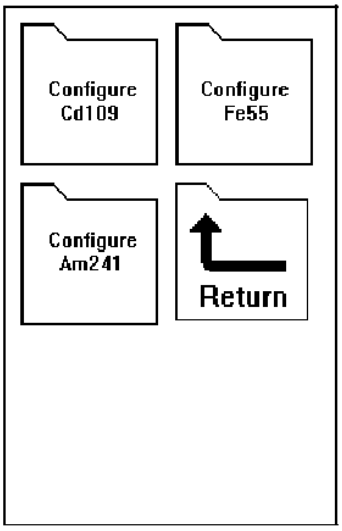


Figure 2-22

Select the **Source Autoswitch Match Number** icon from the **Set Protocol Menu** screen to display the **Source Match Number Menu.** Selecting appropriate icons from the **Source Match Number Menu** enables you to change the match number each source must reach before your NITON XLi analyzer auto-switches to the next source during sample testing.

Your NITON XLi analyzer will auto-switch from one source to another when the match number for that source is lower than the match number you have chosen and the time for that source is greater than or equal to the time you have set.

Select the **Configure Cd109** icon to bring up the **Source Match Number Configuration Screen** for the ^{109}Cd source. The **Source Match Number Configuration Screen** allows you to set the match number the ^{109}Cd source is compared to before auto-switching to the next enabled source during testing.

Select the **Configure Fe55** icon to bring up the **Source Match Number Configuration Screen** for the ^{55}Fe source. The **Source Match Number Configuration Screen** allows you to set the match number the ^{55}Fe source is compared to before auto-switching to the next enabled source during testing.

Select the **Configure Am241** icon to bring up the **Source Time Configuration Screen** for the ^{241}Am source. The **Source Time Configuration Screen** allows you to set the match number the ^{241}Am source is compared to before auto-switching to the next enabled source during testing.

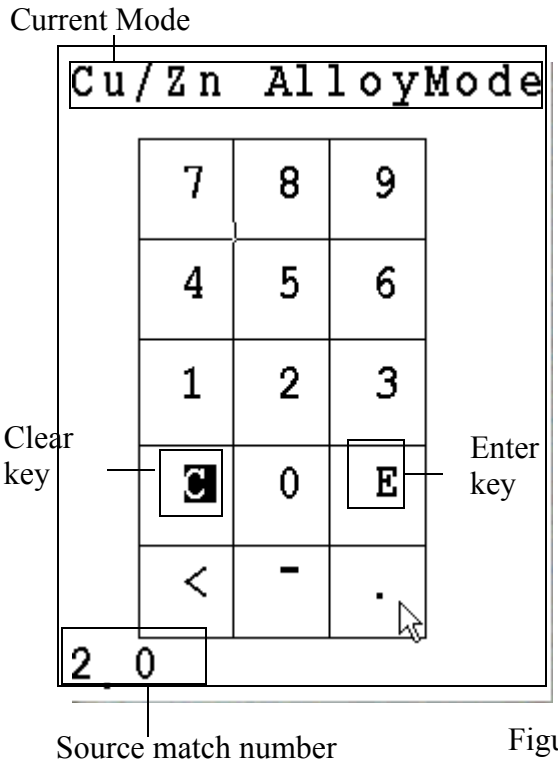


Figure 2-23

The **Source Match Number Configuration Screen** enables you to select the match number each source will be compared to during a sample analysis. The source being configured is displayed in the upper left hand corner of the screen display (Example: Fe^{55}) along with the parameter being configured (Example: Time.) In the center, the display screen is dominated by a virtual numeric keypad. At the bottom left of the screen is the match number the selected source is to be compared to during testing (Example: 2.0).

To change the configuration for the selected source, clear the current setting with the Clear key “C”, then change the number using the virtual numeric keypad, selecting the digits in order, then select enter (E). For example, to change the match number from 2.0 seconds to 3.0: select “C”, then select "3", then select ".", then select "0", then select "E". The source match number setting will be changed, and you will return to the previous menu.

Chapter 3

ALLOY TESTING

USING ALLOY TESTING MODE

Alloy Testing Mode is not enabled on your NITON XLi analyzer. **For more information on this feature please contact NITON's Customer Service Department in the United States, Toll free, at (800) 875-1578, or outside the United States at + 1-978-670-7460 or your authorized NITON Service Center.**

Chapter 4

PB PAINT MODE

USING PB PAINT MODE

Your NITON XLi 300A/700A Series Lead-in-Paint Analyzer is designed to detect and quantify the amount of lead present in painted surfaces. Your analyzer also tracks important information about your site readings using the integrated bar-code scanner or the analyzer's control panel.

Both Paint Modes can be used interchangeably to measure lead concentrations in paint in mg/cm2. In all paint modes, NITON analyzers simultaneously measure and analyze both K-shell and L-shell lead x-rays to determine:

1. The numerical value of the lead in mg/cm2 present in the sample;
2. The 95% confidence interval; and
3. Whether the sample has a lead concentration that is greater-than-or-equal-to ("Positive") or less-than ("Negative") the lead Action-level (in mg/cm2) that has been entered.

Note: In all paint testing modes, if a test is stopped before a "Positive" or "Negative" determination has been made, you will get a "Null" test result.

THE PB PAINT MODE MENU

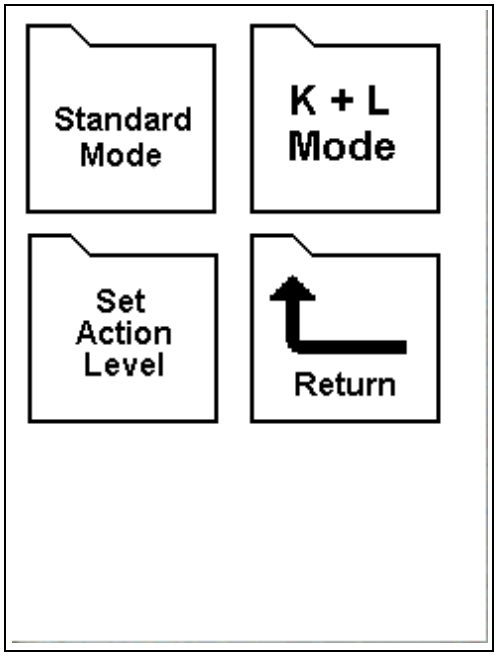


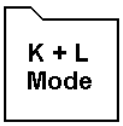
Figure 4-1

All NITON XLi 300A/700A Series Lead-in-Paint Analyzer Mode functions are accessible from the **Pb Paint Mode Menu** and subsidiary menus. Each of the instrument functions represented by an icon on the **Pb Paint Mode Menu** screen may be selected by choosing the appropriate icon. When one of these **Pb Paint Mode Menu** icons is selected, the function specific sub-menu appropriate to that icon will be displayed.

The **Standard Mode** icon allows you to select the Lead-in-Paint **Standard Mode**. In **Standard Mode**, the instrument reads until a 95% confident reading of "Positive" or "Negative" versus the Action-level is achieved. Then the instrument displays either Positive or Negative, and the Result in mg/cm^2. In **Standard Mode**, testing times will vary somewhat from sample to sample. The instrument will measure only until a 95% confident reading of "Positive" or "Negative" (versus the Action-level you have set) has been attained. Press the down section on the 4-way touchpad to see the Depth Index.

The **Depth Index** is a numerical value indicating the amount of non-leaded paint covering the lead (if any) detected by the analyzer.

A **Depth Index** of less than 1.5 indicates a reading very near the surface. A **Depth Index** between 1.6 and 4.0 indicates a moderate depth, while a **Depth Index** of greater than 4.0 indicates a deeply buried reading.



The **K+L Mode** icon allows you to select the Lead-in-Paint **K+L Mode**. In **K & L Mode**, the instrument displays the complete test information continuously, from the beginning of each reading, including the K-shell reading with two-sigma confidence interval, the L-shell reading with two-sigma confidence interval, the combined reading (Pb) with two-sigma confidence interval, and the **Depth Index**. With each reading, a Null result is displayed until a Positive or Negative result is determined. In **K & L Mode**, you may continue readings indefinitely after a "Positive" or "Negative" result is obtained, until you have attained a desired measurement time or degree of precision.

The **Set Action Level** icon allows you to change the Lead-in-Paint Action Level in your analyzer to match the current Action Level used in your locality. Selecting the **Set Action Level** icon brings up the **Set Action Level Screen**.

THE STANDARD MODE MENU

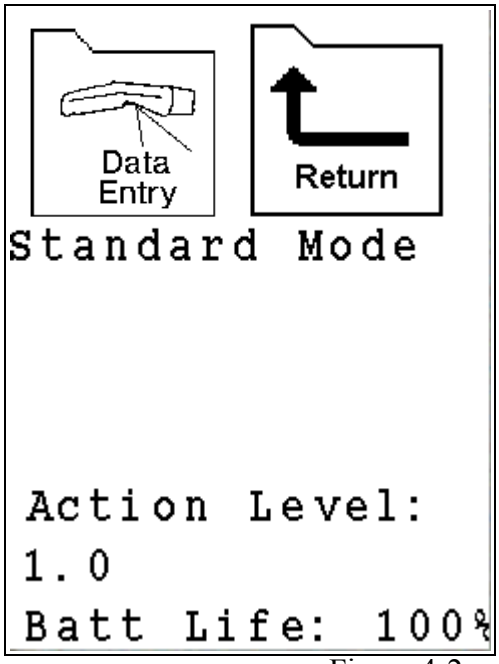
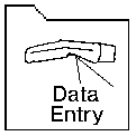


Figure 4-2a

All NITON XLi **Standard Mode** functions are accessible from the **Standard Mode Menu** and subsidiary sub-menus. When the **Standard Mode Menu Data Entry** icon is selected, the function specific sub-menu appropriate to that icon will be displayed.



Select the **Data Entry** icon from the **Standard Mode Menu** input the reading parameters for the reading. You may input the reading parameters in one of three ways:

- **Scan** in the bar coded parameter value using the standard accessory barcode sheet found in the case of your NITON XL XLi analyzer, or print your own with a bar code font. The parameter value you scan in will be used for that reading. After setting the parameters you want to set, you may continue with the reading.
- **Type** the parameter value using the Virtual Keyboard. The parameter value you type in will be used for that reading. After setting the parameters you want to set, you may continue with the reading.
- **Selec**t the parameter value using the drop down lists of predefined values. The parameter value you select will be used for that reading. After setting the parameters you want to set, you may continue with the reading.

The current Lead-in-Paint Action Level is displayed near the bottom of the screen. If this Action level does not match the Action Level in your locality, Reset the Action Level from the **Set Action Level** icon on the **Lead Paint Menu**.

The **Batt Life: XX%** line shows you the percentage of battery life left before recharging is needed.

THE K+L MODE MENU

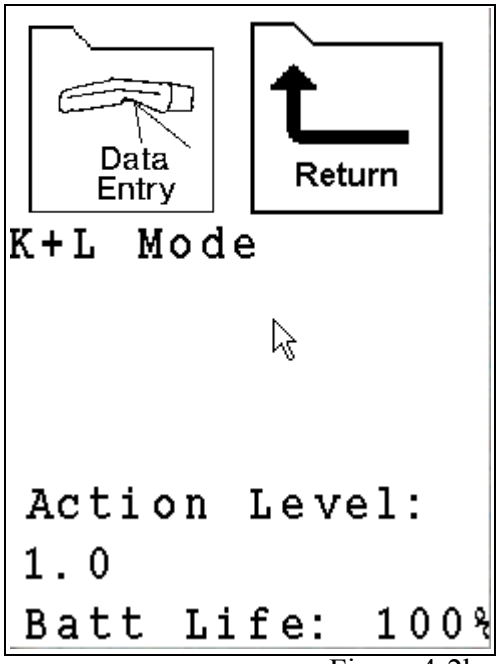
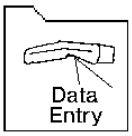


Figure 4-2b

All NITON XLi **K+L Mode** functions are accessible from the **K+L Mode Menu** and subsidiary sub-menus. When the **K+L Menu Data Entry** icon is selected, the function specific sub-menu appropriate to that icon will be displayed.



Select the **Data Entry** icon from the **K+L Mode Menu** input the reading parameters for the reading. You may input the reading parameters in one of three ways:

- **Scan** in the bar coded parameter value using the standard accessory barcode sheet found in the case of your NITON XL XLi analyzer, or print your own with a bar code font. The parameter value you scan in will be used for that reading. After setting the parameters you want to set, you may continue with the reading.
- **Type** the parameter value using the Virtual Keyboard. The parameter value you type in will be used for that reading. After setting the parameters you want to set, you may continue with the reading.
- **Selec**t the parameter value using the drop down lists of predefined values. The parameter value you select will be used for

that reading. After setting the parameters you want to set, you may continue with the reading.

The current Lead-in-Paint Action Level is displayed near the bottom of the screen. If this Action level does not match the Action Level in your locality, Reset the Action Level from the **Set Action Level** icon on the **Lead Paint Menu**.

The **Batt Life: XX%** line shows you the percentage of battery life left before recharging is needed.

THE SET ACTION LEVEL SCREEN

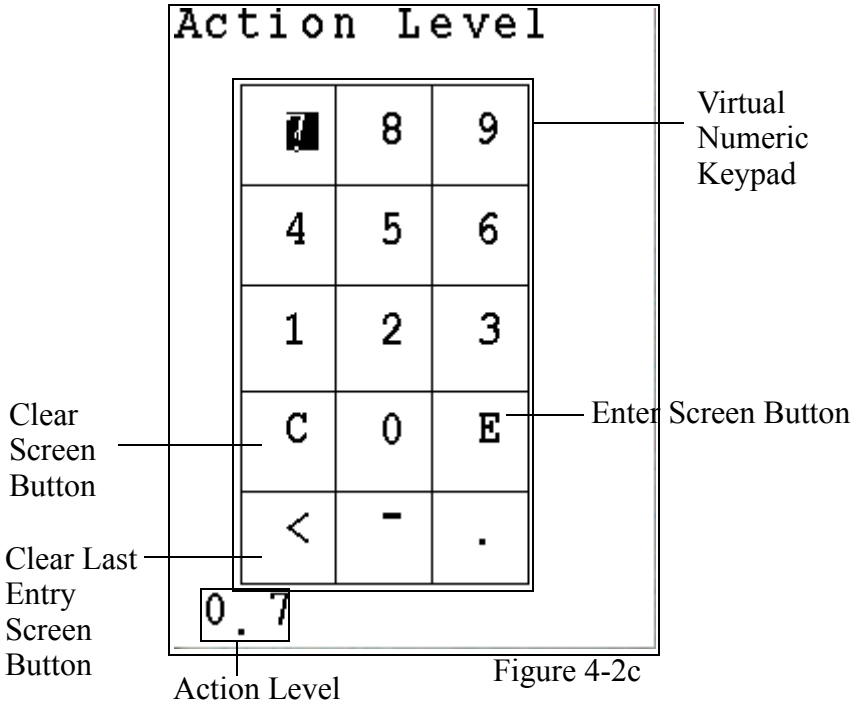


Figure 4-2c

The **Set Action Level Screen** can be accessed by selecting the **Set Action Level** icon from the **Paint Mode Menu**. This screen allows you to set a new Action Level or change an existing Action Level.

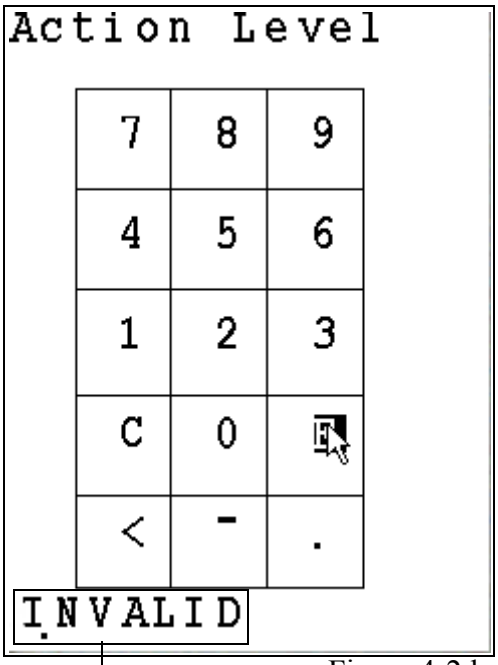
To set a new Action Level or change an existing Action Level, select the digits from the virtual numeric keypad displayed. This will append the selected digits onto the existing Action Level. For example, if the current Action Level is 2.5, selecting 4 from the virtual numeric keypad will display an Action Level of “2.54” on the screen. If the Action Level is cleared, selecting “2” and “.” and “5” from the virtual numeric keypad will display “2.5” as the new Action Level.

The **Clear Screen Button** clears the entire Action Level. For example, selecting this screen button while an Action Level of 2.5 is displayed will clear the Action Level to zero, displayed as “ . “ on the screen.

The **Clear Last Entry Screen Button** clears the last digit you entered. For example, if the Action Level reads 2.54, selecting the “<“ screen button will change the displayed Action Level to “2.5” on the screen.

Selecting the **Enter Screen Button** will place whatever number is displayed as the Action Level on the screen into the analyzer's memory as the new "Action Level." For example, if the Action Level displayed is 2.5, selecting the **Enter Screen Button** will place "2.5:" into the analyzer's memory as the new Action Level.

The Action Level entered must be between "3.0" and "0.3" inclusive. Any other value will be held as invalid and rejected. See Figure 4-2d.



Invalid Action Level

Figure 4-2d

TAKING A READING

There are five different methods of operation for taking a sample measurement, and your analyzer will be configured to use one of those methods for Lead-in-Paint samples, depending on the regulatory requirements of your locality. These methods are:

- Trigger-Only method. With the Trigger-Only method, you only need to place the measurement window close to the surface to be analyzed and pull the trigger for sample analysis to be initiated.
- Trigger-and-Proximity-Sensor method. With the Trigger-and-Proximity-Sensor method, you must place the measurement window against the surface to be analyzed to engage the proximity sensor on the front of the instrument, then pull the trigger for sample analysis to be initiated.
- Momentary-Trigger-Touch-and-Proximity-Sensor method. With the Momentary-Trigger-Touch-and-Proximity-Sensor method, you must place the measurement window against the surface to be analyzed to engage the proximity sensor on the front of the instrument, then pull the trigger.

  The trigger may be released and the reading will continue until you release the proximity button, or other criteria (such as Max Time) are reached. This is the primary mode of operation for the XLi 300A/700A Series Lead-in-Paint Analyzer in the USA.
- Trigger-and-Interlock method. With the Trigger-and-Interlock method, you need to place the measurement window close to the surface to be analyzed, press and keep pressing the interlock button at the rear of the instrument with your free hand, then pull the trigger for sample analysis to be initiated.
- Trigger-Interlock-and-Proximity-Sensor method. With the Trigger-Interlock-and-Proximity-Sensor method, you must place the measurement window against the surface to be analyzed to engage the proximity sensor on the front of the instrument, press and keep pressing the interlock button at the rear of the instrument with your free hand, then pull the trigger for sample analysis to be initiated.

After your NITON XLi analyzer is calibrated and your Data Entry is complete, initiate a sample reading using the appropriate method. If you attempt to initiate a sample reading using a different method, the analyzer will inform you that one or more of the preconditions need to be met in order for sample analysis to begin.

WARNING!

The Proximity Button must remain depressed for the duration of the reading in Standard Mode or K+L Mode. If the Proximity Button is released, the four LED lights will stop blinking, the shutter will close, and the measurement will end. The flashing of the LED lights is not synchronized to optimize power consumption.

To end a **K+L Mode** test, simply release the Proximity Button.

WARNING!

The four LED warning lights are designed to blink only during instrument calibration (See Chapter 2 page 16) or during a measurement, where the shutter is open and the preconditions for operation are in effect. If the LED lights blink at any other time, disconnect the battery pack immediately, place the instrument in its shielded holster, place the holster in the shielded carrying case, and call Thermo Electron Corporation's Service Department in the United States, toll free, at (800) 875-1578, or outside the United States, at +1-978-670-7460, or your local Authorized NITON Service Center.

Your NITON Analyzer will display the **Results Screen** throughout the duration of each reading, The **Results Screen** is updated regularly throughout the reading. When the reading is complete, a final screen update will appear, and your NITON analyzer will display the final results of the measurement which has just been completed.

STANDARD MODE RESULTS SCREEN

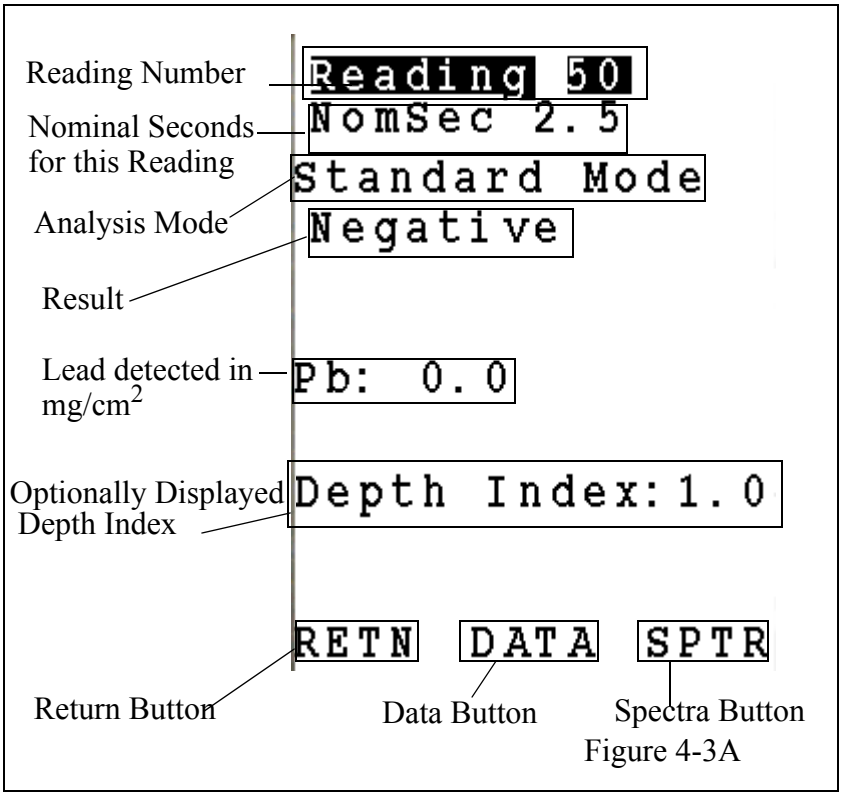


Figure 4-3A

Before the analyzer has reached a determination, the result will be shown as “Null”. Your analyzer will beep twice when a result is reached then terminate the reading. The display will change from “Null” to show the result, either “Positive” for lead detected above the action level, or “Negative” for no lead or lead below the action level. It will also display the amount of lead detected in mg/cm^2.

If you want to see the Depth Index, press the down section on the 4-way touchpad.

The **Depth Index** is a numerical value indicating the amount of non-leaded paint covering the lead (if any) detected by the analyzer. A **Depth Index** of less than 1.5 indicates a reading very near the surface. A **Depth Index** between 1.6 and 4.0 indicates a moderate depth, while a **Depth Index** of greater than 4.0 indicates a deeply buried reading.

K+L MODE RESULTS SCREEN

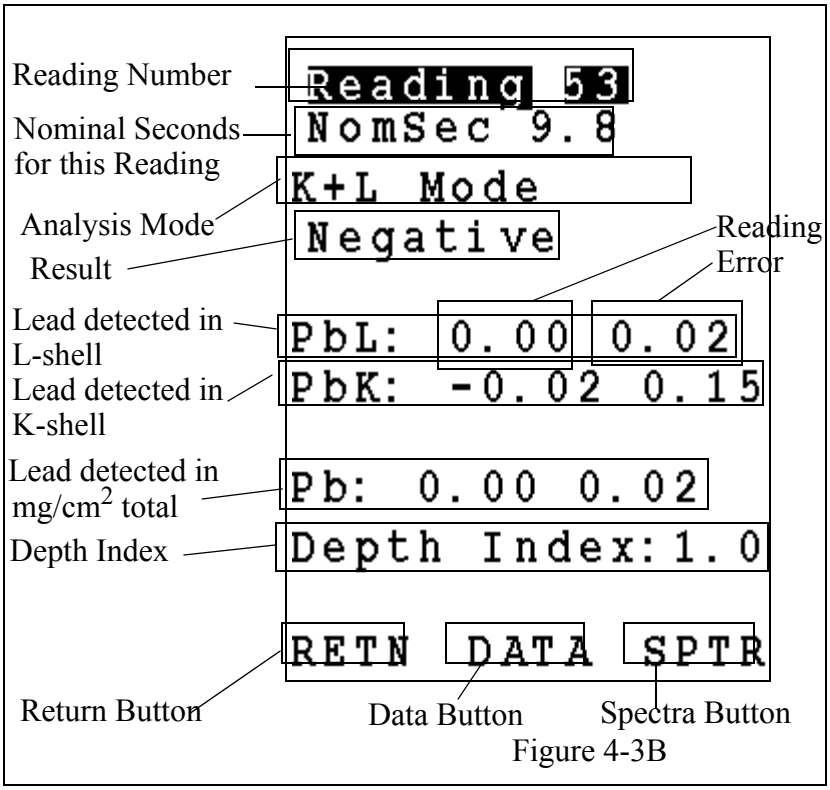


Figure 4-3B

The **K+L Mode Results Screen** will show the basic display indicated in Figure 4-3B throughout the reading. Your analyzer will beep twice to indicate it has reached a conclusion, and the Result field will change from “Null” to “Positive” or “Negative”, but the reading will continue for as long as you continue to contact the Proximity Sensor.

The K+L Results Screen shows the reading results and error for both K and L-shell readings. The “Lead Detected in mg/cm^2 total” field is the result of the instrument software’s determination as to which reading, K or L-shell, best represents the true condition.

The **Depth Index** is a numerical value indicating the amount of non-leaded paint covering the lead (if any) detected by the analyzer. A **Depth Index** of less than 1.5 indicates a reading very near the surface. A **Depth Index** between 1.6 and 4.0 indicates a moderate depth, while a **Depth Index** of greater than 4.0 indicates a deeply buried reading.

THE DATA ENTRY SCREENS

The **Data Entry Screen** and subsidiary sub-screens allow you to set the values for various parameters tracked by the system along with the actual analysis results. These parameters all describe the particular test target to be analyzed. The location of the target in the site, the type of target, the surface and substrate, the condition of the surface, and the inspector performing the test are some of the parameters tracked by the analyzer.

Navigating the Data Entry Screen

Data Entry Screen SAMPLE

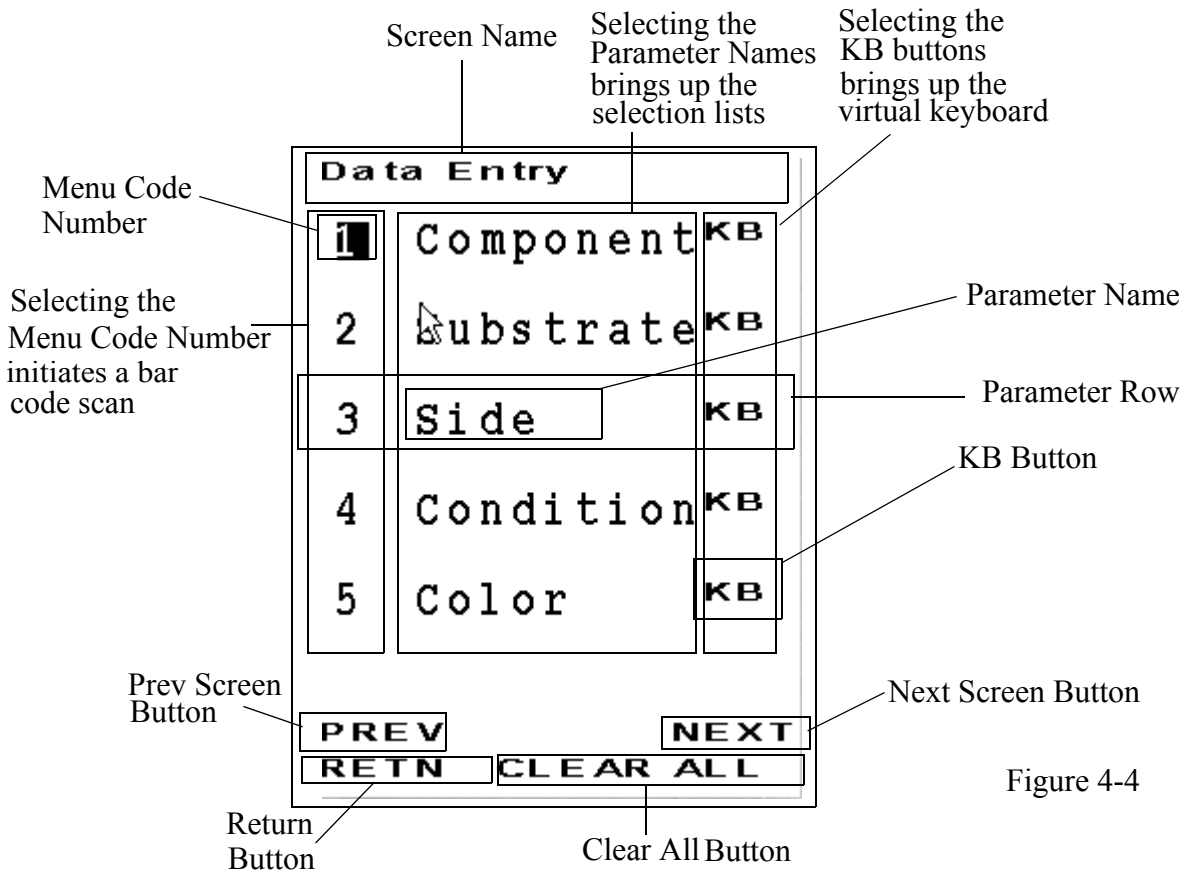
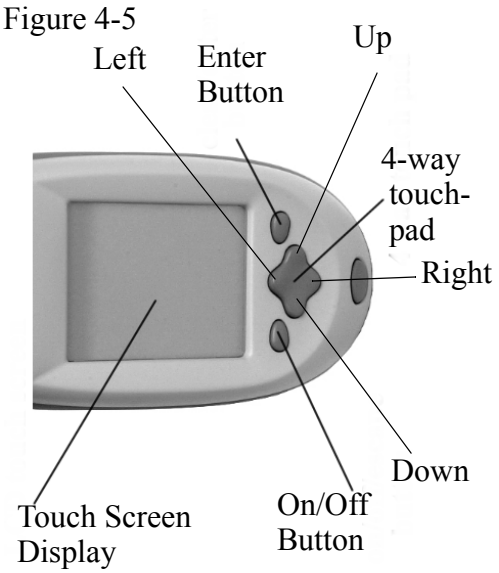


Figure 4-4

Above is a sample of the Data Entry Screen. To navigate through the Data Entry Screen and select your parameter settings, you can use the touch screen display or 4-way touch pad and control panel buttons.

Figure 4-5



The following description of screen navigation using the control panel assumes that the instrument is held so that the display is rotated to the left as in the figure above.

- To move from column to column, use the Right and Left portion of the 4-way touch pad.
- To move from row to row, use the Up and Down portions of the 4-way touch pad.
- To access the “Return”, “Clear All”, “Prev”, and “Next” buttons, press the On/Off button on the control panel once. To return to the parameter settings, press the On/Off button again. This is a toggle between those two screen areas.
- To select the highlighted option, press the Enter button on the control panel.

The Data Entry Screen is divided into sections of 3 setting parameters. By using the Down portion of the 4-way touch pad when you are on the last row of a section, the display will change to the next section. By using the Up portion of the 4-way touch pad when you are on the first row of a section, the display will change to the previous section.

By selecting the **Return** screen button, you will exit the **Data Entry Screen**. Selecting the **Clear All** screen button will clear all the settings.

USING THE DATA ENTRY SCREEN

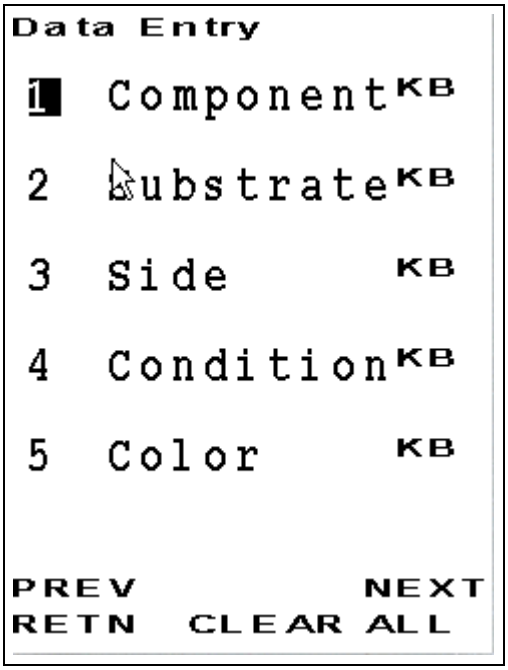


Figure 4-6A

This is the first section of the **Data Entry Screen**. There are five parameters in this section. The screen can display 13 characters in each parameter field, but internally the field can hold 32 characters maximum, all of which can be accessed and displayed on your computer using the NDT software.

Selecting **Component** allows you to input the reading location component parameter.

Selecting **Substrate** allows you to input the reading location substrate parameter.

Selecting **Side** allows you to input the reading location side parameter.

Selecting **Condition** allows you to input reading the reading location condition parameter.

Selecting **Color** allows you to input the reading location color parameter.

- Selecting the Menu Code Number will initiate a bar code scan to input pre-printed bar code parameter values

- Selecting the Parameter Name will access the particular sub-menu for that parameter, allowing you to select the parameter value from a pre-determined list.
- Selecting the KB button allows you to input a parameter value as required using the Virtual Keyboard.

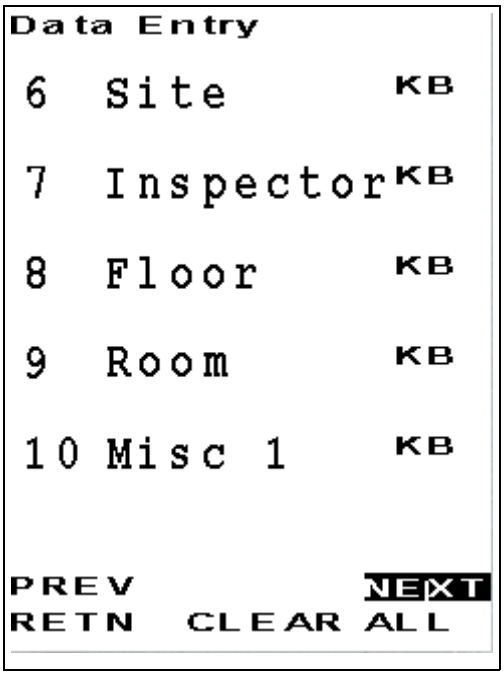


Figure 4-6B

This is the second section of the **Data Entry Screen**. There are three parameters in this section.

Selecting **Site** allows you to input the reading location site parameter.

Selecting **Inspector** allows you to input the reading inspector parameter.

Selecting **Floor** allows you to input the reading floor parameter.

Selecting **Room** allows you to input the reading location room parameter.

Selecting **Misc 1** allows you to input one pertinent miscellaneous reading parameter.

- Selecting the Menu Code Number will initiate a bar code scan to input pre-printed bar code parameter values
- Selecting the Parameter Name will access the particular sub-menu for that parameter, allowing you to select the parameter value from a pre-determined list.
- Selecting the KB button allows you to input a parameter value as required using the Virtual Keyboard.

Figure 4-6D

This is the last section of the **Data Entry Screen**. There are two parameters in this section.

Selecting **Misc 2** allows you to input one other pertinent miscellaneous reading parameter.

- Selecting the Menu Code Number will initiate a bar code scan to input pre-printed bar code parameter values
- Selecting the Parameter Name will access the particular sub-menu for that parameter, allowing you to select the parameter value from a pre-determined list.
- Selecting the KB button allows you to input a parameter value as required using the Virtual Keyboard.

A Sample Parameter Value Sub-screen

Following is a sample of the pre-determined lists of parameter values which can be accessed by selecting the Parameter Name in the Data Entry Screen.

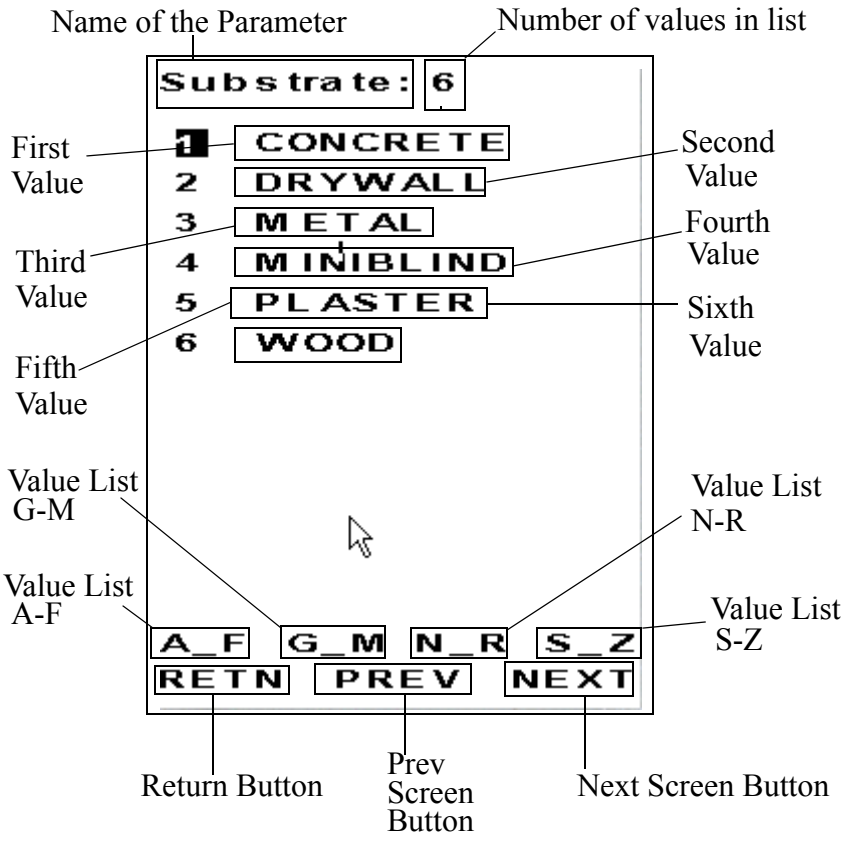


Figure 4-7A

Selecting the First Value will enter the value “Concrete” in the Substrate parameter.

Selecting the Second Value will enter the value “Drywall” in the Substrate parameter.

Selecting the Third Value will enter the value “Metal” in the Substrate parameter.

Selecting the Fourth Value will enter the value “Miniblind” in the Substrate parameter.

Selecting the Fifth Value will enter the value “Plaster” in the Substrate parameter.

Selecting the Sixth and final Value will enter the value “Wood” in the Substrate parameter.

Selecting the Prev Screen Button will return you to the previous screen in the sub-menu, if any.

Selecting the Next Screen Button will advance you to the next screen in the sub-menu, if any.

Selecting the Return Button will bring you back to the Data Entry Screen.

Selecting the Value List A-F Button list value choices which begin with the letter “A” through the letter “F.”

Selecting the Value List G-M Button list value choices which begin with the letter “G” through the letter “M.”

Selecting the Value List N-R Button list value choices which begin with the letter “N” through the letter “R.”

Selecting the Value List S-Z Button list value choices which begin with the letter “S” through the letter “Z.”

CALIBRATING THE XLI 300A/700A SERIES ANALYZER FOR LEAD-IN-PAINT ANALYSIS

Warm-up

Turn the instrument on. Before entering the instrument password, let the instrument stabilize for 5 minutes. You may then enter your password and continue.

Verify Date and Time

Your instrument must have the correct date and time in order to obtain accurate results. Verify the correct Date and Time from the Main Menu by selecting "Utilities." From the Utilities Menu, select "Specs." Tap the touch screen display or press any button on the Control Pad to return to the Main Menu.

If the Date and Time are incorrect, follow the instructions found elsewhere in this User Guide to make the necessary adjustments.

Instrument Internal Calibration

The instrument will prompt the user to perform an internal calibration prior to testing. The instrument may also perform an internal calibration at any time when initiated by the user. From the Main Menu, select "Utilities." From the Utilities Menu, select "Calibrate." From the Calibrate Menu, select "Calibrate Detector." When the calibration is completed, select "RETN" to access the Main Menu.

Initial Calibration Procedure Using Lead Paint Standards

Caution

The initial calibration procedure using lead paint standards should be performed using a substrate known to be free of lead, such as the XLi User's Guide. Do not use the NITON case for a substrate.

From the Main Menu, select "Mode" to access the Mode Menu. Select "Pb Paint" to access the Pb Paint Menu. Select "K + L Mode."

Perform a twenty source-second reading on the front side of the nominal 1.0 mg/cm2 Lead Paint Standard included with your instrument (or a nominal 1.0 mg/cm2 NIST standard). Perform a twenty second reading on the reverse side of the same standard. The reading should be within the acceptance range written on the Lead Paint Standard sheet.

If you are using a Lead Paint Standard sheet with no acceptance range listed, or a NIST Lead Paint Standard, the readings should be between minus 0.2 to plus 0.2 (inclusive) of the concentration listed for the standard. For example, if the Lead Paint Standard sheet lists the concentration of the nominal 1.0 mg/cm2 standard as 1.06 mg/cm2 the acceptance range for this standard would be 0.86 to 1.26 mg/cm2 inclusive.

Caution

Be certain to position the analyzer such that the instrument window completely covers the Lead Paint Standard.

The calibration procedure will fall outside of the range a small percentage of the time as a result of statistical variations. If either reading is outside of the range, re-calibrate the instrument with an internal calibration and follow the Calibration Procedure Using Lead Paint Standards again. Follow this procedure a maximum of two times, if it continues to fall outside of the acceptance range, contact NITON or your local NITON representative.

Continuing Calibration Checks Using Lead Paint Standards

It is recommended to perform calibration checks using Lead Paint Standards every two hours; at the end of the testing session; and at extended delays in testing. These Calibration Checks should use the procedure “Initial Calibration Procedure Using Lead Paint Standards” on page Chapter 4-21

For lead paint compliance testing, follow all additional procedures in the Performance Characteristic Sheet.

Chapter 5

THIN SAMPLE TEST MODES

You can use your NITON XLi Environmental Analyzer to measure a wide range of thin samples, such as:

- 25 mm and 37 mm filters used for exposure monitoring and air sampling methods.
- Total Suspended Particulate (TSP) and Particulate Monitoring (PM) filters.
- Dust Wipes.
- Thin coatings, depending on the substrate.
- Filters used for capturing suspended or dissolved metals in liquids

There are specific procedures for specific applications. Methods for many of these applications have been developed and may be selected from the **Thin Sample Mode Menu**. Other applications, such as analyzing coatings, may require you to develop your own protocol using **User-definable Thin Sample Mode**, which is available from the **Main Menu** on request.

USING THIN SAMPLE TEST MODES

The methods you can select have been developed to account for the size of the sample and the distribution of the contamination to be analyzed. Contamination captured on filters or wipes is not usually deposited uniformly, and as filters and wipes are also several times larger than the 1 cm x 2 cm measurement window of the instrument, these sample types usually require reading on several separate sections for accurate analysis. Depending on the sample, the individual readings may be first weighted to account for the loading characteristics of the sampling technique, and then all the individual reading in a sequence are averaged. These results are multiplied by an adjustment factor to account for the size of the sample and the desired units of measurement, so the individual and final results are displayed with an easily interpreted meaning. (i.e., dust wipes, which are used extensively to test for Pb dust on surfaces report in µg/wipe, which is easily converted to µg/foot^2, the units specified in state and federal regulations.) These calculations will be performed automatically when you choose the appropriate **Thin Sample Mode** from the **Thin Sample Mode Menu**.

THE THIN SAMPLE MODE MENU

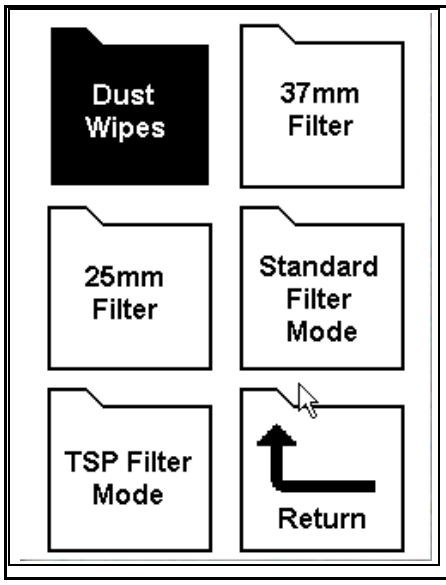


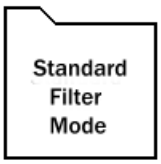
Figure 5-1a

All NITON XLiThin Sample Mode functions are accessible from the **Thin Sample Mode Menu** and subsidiary menus. Each of the instrument functions represented by an icon on the **Thin Sample Mode Menu** screen may be selected by choosing the appropriate icon. When one of these **Thin Sample Mode Menu** icons is selected, the function specific sub-menu appropriate to that icon will be displayed.

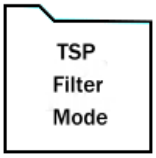
To use the **Dust Wipe Testing Mode**, simply select the **Dust Wipe** icon from the **Thin Sample Mode Menu** to place your instrument into **Dust Wipe Testing Mode**.

To use the **37mm Filter Testing Mode**, simply select the **37mm Filter** icon from the **Thin Sample Mode Menu** to place your instrument into **37mm Filter Testing Mode.**

To use the **25mm Filter Testing Mode**, simply select the **25mm Filter** icon from the **Thin Sample Mode Menu** to place your instrument into **25mm Filter Testing Mode.**



To use the **Standard Filter Testing Mode**, simply select the **Standard Filter Mode** icon from the **Thin Sample Mode Menu** to place your instrument into **Standard Filter Testing Mode.**



To use the **TSP Filter Testing Mode**, simply select the **TSP Filter Mode** icon from the **Thin Sample Mode Menu** to place your instrument into **TSP Filter Testing Mode.**

DUST WIPE TESTING MODE MENU

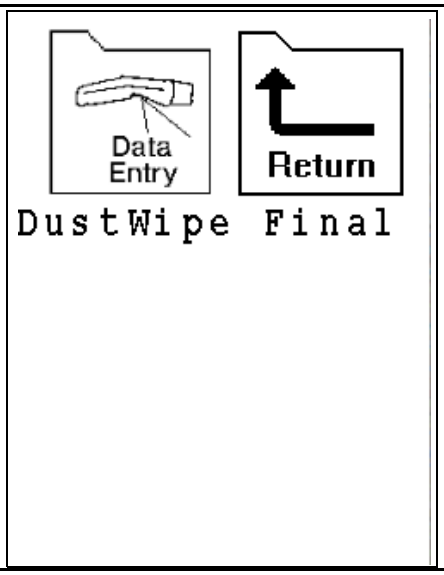


Figure 5-2

The Dust Wipe Mode prompts you to take four readings on a properly folded and bagged dust wipe, which are then averaged to give you a final test result.Dust wipes are usually analyzed for Pb, though many other contaminants may also be detected.

Please contact NITON at (800) 875-1578, or outside the United States at + 1-978-670-7460 for a list of suitable dust wipe media.

Note: Some brands of wipes are not compatible with the NITON method.

The following instructions are appropriate for screening purposes. The instrument displays levels of contamination in µg per wipe. The wipe reflects the levels of contaminants of the area wiped. Current regulations require lead contamination below 40 $\mu g/ft^2$ on floors, 250 $\mu g/ft^2$ on window sills, and 400 $\mu g/ft^2$ in window wells.

Note: Check with all local, state and federal regulatory bodies, as the regulations may change from location to location, and from time to time.

Taking a Dust Wipe Sample

NITON assumes that you will follow the ASTM 1792 Standard for taking a dust wipe, which is summarized here:

1. Measure a known area of the surface, typically one square foot A larger area can be wiped to increase the amount of material in the wipe.
2. Wear clean surgical gloves. Wipe the measured square with parallel strokes
3. Fold the wipe in half. Wipe in strokes 90° to the original direction.
4. Fold the wipe in half again.

Note: Thus far, you have followed the ASTM 1792 Standard for taking a wipe test. The following procedure is specific for testing with your instrument, though it will not affect your results should you decide on submitting the sample to an accredited laboratory.

5. Fold the wipe in half three more times. You will now have a pad measuring about 1 x 1.5 inches (2.5 x 3.7 cm). It is important to fold the wipe neatly, so that the final wipe is a neat rectangle measuring about 1 x 1.5 inches.
6. For optimum results, dry the sample thoroughly. For example, 20 min at 250 degrees F or explosed overnight to ambient temperature and humidity. The use of wire mesh aluminum screening has been found to be useful for stabilizing the sample during this phase of preparation.

NOTE: The addition of this step allows the sample to dry completely flat, thus making it easier to handle.

7. Allow oven-dried sample to sit in ambient air for 5 minutes.
8. Bag sample in 1.5” X 2” plastic (LDPE 1.5mil) bag (NITON P/N 187-473 or equivalent) and label. To eliminate the potential for cross contamination of samples, do not re-use the plastic bags. Do not place tape across the sample.
9. Position the wipe in the bag within the metal dust wipe holder (NITON P/N 180-407 or equivalent.)

Taking Measurements of Your Dust Wipe Sample

Position the instrument in the nose cone adaptor and initiate the first measurement and follow the procedure below:

1. Position the metal dust wipe holder on the number one position of the test stand and take the first measurement (60 nominal seconds minimum.)
2. Place the wipe in the number two position of the test stand and take the second measurement (60 nominal seconds minimum.)
3. Rotate the dust wipe holder 180 degrees (without turning the holder over).
4. Place the metal dust wipe holder in the number one position and take the third measurement (60 nominal seconds minimum.)
5. Place the metal dust wipe holder in the number one position and take the fourth measurement (60 nominal seconds minimum.)

The instrument will automatically average the four readings and give the total µg/dustwipe reading.

Reading The Measurement and Final Results Screens

The **Measurement** screen is continually updated during each test. When each test is terminated, the screen will update one final time and store the results for future review or downloading. After the fourth step of the test sequence is complete, the Final Results screen will appear.

When the four measurements are complete, the instrument automatically averages the results to yield the average loading in µg/wipe. These results are displayed on the **Final Result** screen.

Variations in concentration may be significant between steps of the dust wipe reading process. This is normal, as dust is not deposited evenly across the wipe.

```
Reading 410
NomSec 62.7
DustWipe 1 of 4
      ug    err
Mo 17.22  6.84
Sr 45.69  8.48
Pb 1965    78
Zn 264.0  32.1
Cu 73.00  25.03
Ni 106.4  28.2
Fe 2851   116
[Cd]
```

Reading Number
Reading Time in Seconds
Mode
Units of Measure
Element Detected
Units detected
Confidence Column (2 Sigma)

Figure 5-2a

```
Reading 411
NomSec 70.8
DustWipe 2 of 4
      ug    err
Mo 14.45  6.30
Sr 43.05  7.84
Rb  7.11  4.55
Pb 2025    74
Zn 291.8  31.0
Cu 67.80  23.18
Ni 71.11  24.59
[Cd]
```

Reading Number
Reading Time in Seconds
Mode
Units of Measure
Element Detected
Units detected
Confidence Column (2 Sigma)

Figure 5-2b

```
Reading 412
NomSec 67.2
DustWipe 3 of 4
      ug    err
Mo 14.26  6.44
Sr 50.46  8.39
Pb 2009    76
Zn 273.0  31.3
Cu 87.14  24.73
Ni 100.6  26.7
Fe 2143    98
[Cd]
```

Reading Number
Reading Time in Seconds
Mode
Units of Measure
Element Detected
Units detected
Confidence Column (2 Sigma)

Figure 5-2c

```
Reading 413
NomSec 264.3
DustWipe Final
      ug    err
Mo 19.49  7.03
Sr 48.67  8.54
Rb  8.54  4.93
Pb 2028    79
Se 19.28  8.65
Zn 294.2  32.8
Cu 63.86  24.25
[Cd]
```

Reading Number
Reading Time in Seconds
Mode
Units of Measure
Element Detected
Units detected
Confidence Column (2 Sigma)

Figure 5-2d

37MM TESTING MODE MENU

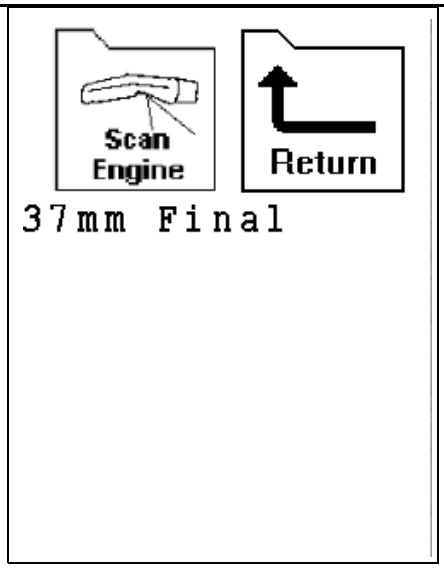


Figure 5-3

Preparing a filter

37 mm CE (Cellulose Ester) and glass fiber filters are often used for monitoring personal exposure. Dust vacuum measures (DVM) use the same size filters and are tested in much the same way. To prepare the filter for testing, remove it from the air-sampling cassette and load it in a the correct sized filter sleeve - NITON P/N 190-408. The filter sleeve consists of a thin piece of cardboard sandwiched between two layers of plastic film. The circular cutout in the cardboard should be slightly larger in diameter than the filter.

Note: To avoid contaminating the test results, wear clean surgical gloves when handling the filter. If using tweezers or forceps to handle the filter, make certain they are clean, and never reuse a filter sleeve.

1. On a clean surface, take a filter sleeve and peel back the top layer of film. The top is indicated by a red triangle.
2. Remove the bottom plug from the air sampling cassette. Separate the sections of the cassette so you can reach the filter.
3. Poke both the filter and filter pad through the outflow plug hole of the cassette, to release them from their seat in the cassette.
4. Touching only the edges of the filter and the pad, gently separate one from the other.
5. Lift the filter from the filter pad and place it on the sleeve in the cutout, collection side up. Be careful not to have the filter touch

the paper mounting of the sleeve, as the light adhesive that holds the plastic in place may rip the filter.

6. Fold back the clear plastic of the filter sleeve, covering the filter. A little wrinkling of the plastic is acceptable. Label sample.

Note: It is advisable to practice mounting several blank filter cassettes prior to mounting your first test sample.

Positioning the 37 mm Filter and Performing a Test.

Note: Make certain to place the filter stand on a flat stable surface. Be careful to work on a surface which will not contaminate the test fixtures or samples.

1. Open the drawer of the test platform. Verify that the adapter for holding 37 mm filters (NITON P/N 187-772) is in place. Insert the filter sleeve with the filter to be tested in **position A** of the adapter, red triangle up, and slide the drawer back into the test stand.

Note: Testing order is essential: The first reading must be taken from position A.

2. Select the **Thin Sample Mode Select** menu, and then choose 37mm Filters icon
3. Position the instrument in the nose cone adaptor and initiate the first reading.
4. You must take three readings, each from a different area of the filter to accurately determine the concentration of elements on the filter. When the desired test time has elapsed, remove the instrument to end the first test. Note: If concentrations of the elements of concern are significantly above the action level, the tests lengths may be shortened at the users discretion.
5. Open the drawer and change the filter to position B.
6. Repeat the above sequence to take the second test.
7. When the second test is complete, open the drawer and position the test sleeve in position C and take a third measurement.
8. The instrument will automatically calculate the contaminant loading, in total µg per filter, after the three readings have been completed, and display the total on a final result screen.

Reading The Measurement Screen in 37mm Testing Mode

The **Measurement** screen is continually updated during each test. When each test is terminated, the screen will update one final time, display the phrase Final Results, and store the results for future review or downloading. 37mm Testing Mode reports in units of µg of loading, and using the volumetric flow rate and air sampling time, the results can be converted to µg per volume (e.g. µg/m^3 or µg/yard^3) offline.

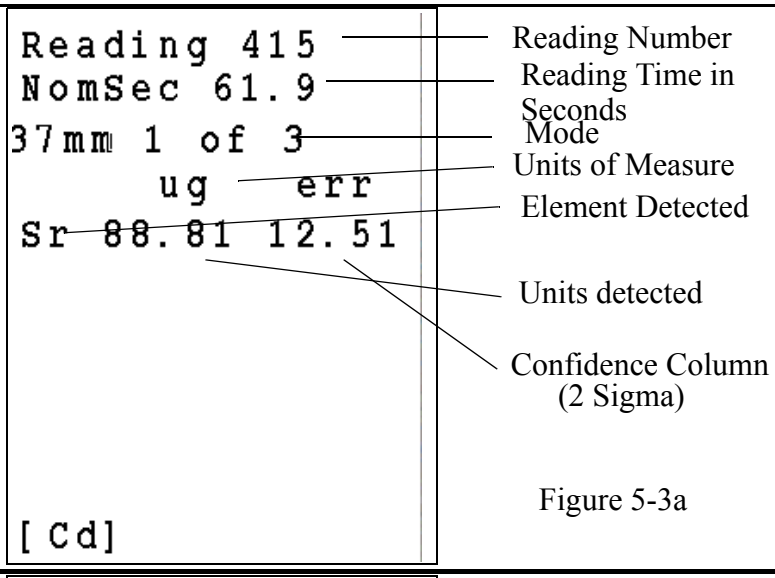


Figure 5-3a

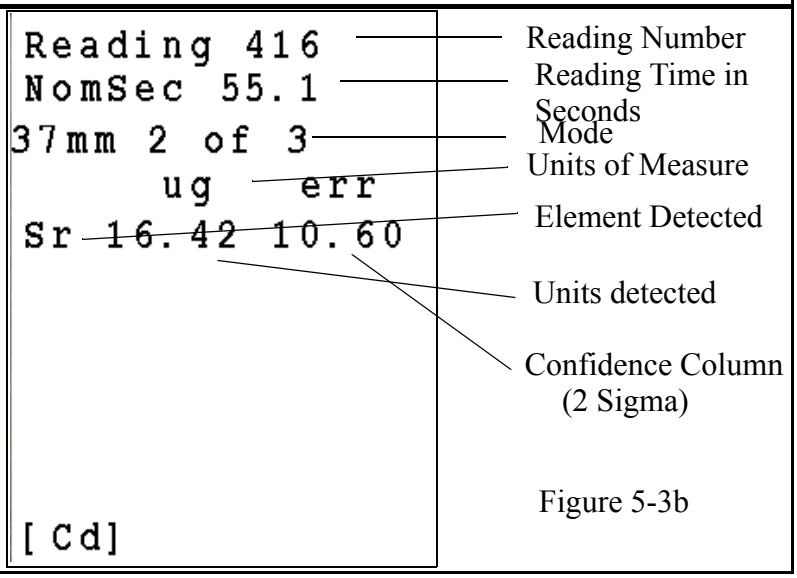


Figure 5-3b

25MM TESTING MODE MENU

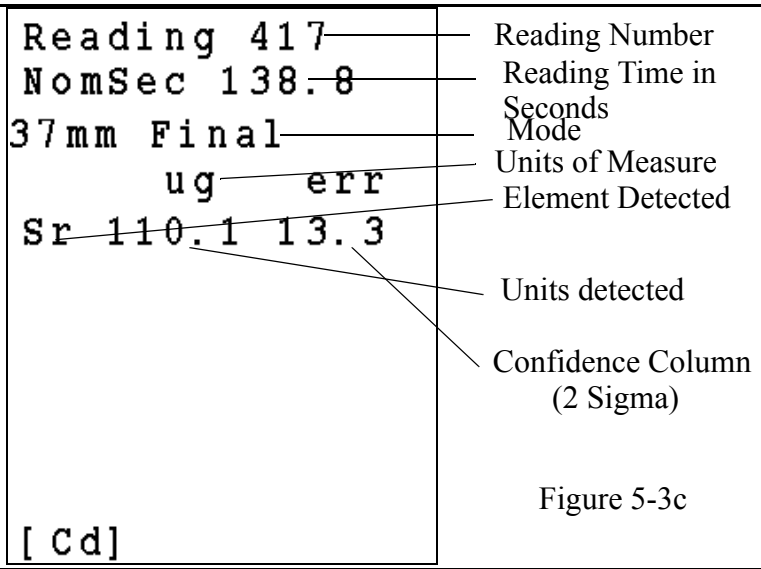


Figure 5-3c

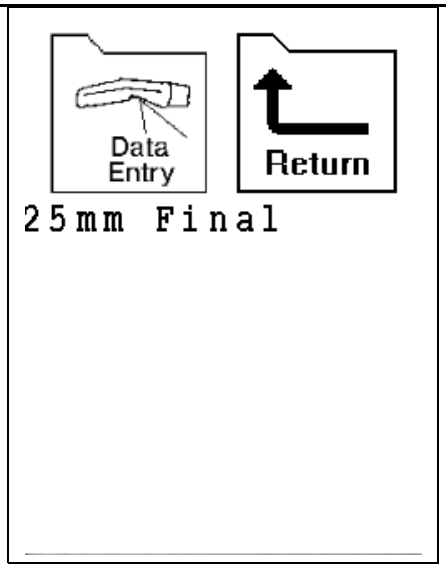


Figure 5-4

Preparing a filter

25 mm filters are often used for monitoring personal exposure. Dust vacuum measures (DVM) use the same size filters and are tested in much the same way. To prepare the filter for testing, remove it from the air-sampling cassette and load it in a the correct sized filter sleeve. The filter sleeve (NITON P/N 180-468) consists of a thin piece of cardboard sandwiched between two layers of plastic film. The circular cutout in the cardboard should be slightly larger in diameter than the filter.

Note: To avoid contaminating the test results, wear clean surgical gloves when handling the filter. If using tweezers or forceps to handle the filter, make certain they are clean, and never reuse a filter sleeve.

1. On a clean surface, take a filter sleeve and peel back the top layer of film.
2. Remove the bottom plug from the air sampling cassette. Separate the sections of the cassette so you can reach the filter.
3. Poke both the filter and filter pad, through the outflow plug hole of the cassette, to release them from their seat in the cassette.
4. Touching only the edges of the filter and the pad, gently separate one from the other.
5. Lift the filter from the cassette and place it on the sleeve in the cutout. Be careful not to have the filter touch the paper mounting of the sleeve, as the light adhesive that holds the plastic in place may rip the filter.
6. Fold back the clear plastic of the filter sleeve, covering the filter. A little wrinkling of the plastic is acceptable. Label the sample.

Note: It is advisable to practice mounting several blank filter cassettes prior to mounting your first test sample.

Positioning the 25 mm Filter and Performing a Test.

Note: Make certain to place the filter stand on a flat stable surface. Be careful to work on a surface which will not contaminate the test fixtures or samples.

1. Open the drawer of the test platform. Verify that the adapter for holding 25 mm filters is in place. Insert the filter sleeve with the filter to be tested in position two of the adapter, and slide the drawer back into the test stand.

Note: Testing order is essential: The first reading must be taken from the middle of the filter.

2. Select the **Thin Sample Mode Select** menu, and then choose **25mm Filters** icon
3. Position the instrument in the nose cone adaptor and initiate the first reading.
4. The instrument will automatically calculate the contaminant loading, in µg, after the reading has been completed.

Reading The Measurement Screen in 25mm Testing Mode

The **Measurement** screen is continually updated during the test. When the test is terminated, the screen will update one final time, display the phrase Final Results, and store the results for future review or downloading. **25mm Testing Mode** reports in units of µg of loading, and using the volumetric flow rate and airsampling time, the results can be converted to µg per volume.

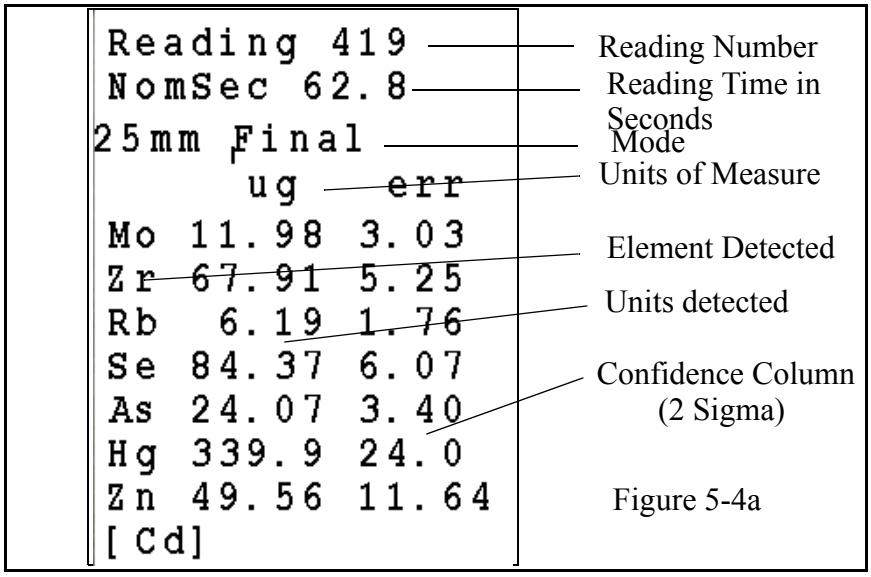


Figure 5-4a

TSP FILTER MODE

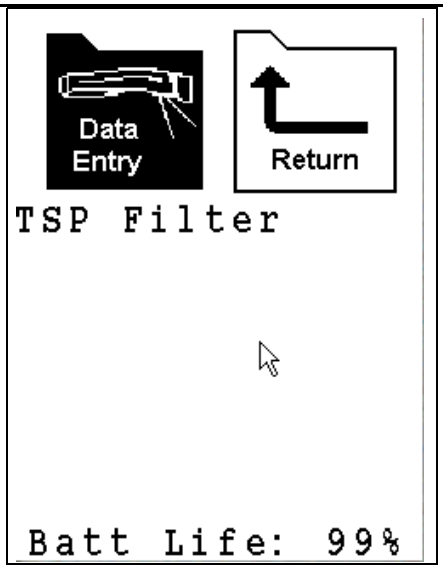


Figure 5-4

TSP and PM10 filters are generally used with high volume air sampler sysytems to monitor ambient air at lead abatement sites, construction sites, and other places where airbourne particulate matter is a problem.

Note: To avoid contaminating the test results, wear clean surgical gloves when handling the filter. If using tweezers or forceps to handle the filter, make certain they are clean.

Preparing a filter and performing a test

1. Mentally divide the filter into 4 quadrants.
2. Select the **Thin Sample Mode Select** menu, and then choose the **TSP Filters** icon
3. Take your first reading approximately in the center of any quadrant.
4. Take your second reading from approximately the middle of the quadrant diagonally opposite from where you took your first reading.

Note: Be careful to work on a surface which will not contaminate the test fixtures or samples.

The instrument will automatically calculate the contaminant loading, in µg, after the reading has been completed.

Reading The Measurement Screen in TSP Filter Testing Mode

The **Measurement** screen is continually updated during each test. When each test is terminated, the screen will update one final time, display the phrase Final Results, and store the results for future review or downloading. **TSP Filter Testing Mode** reports in units of µg of loading, and using the volumetric flow rate and airsampling time, the results can be converted to µg per volume.

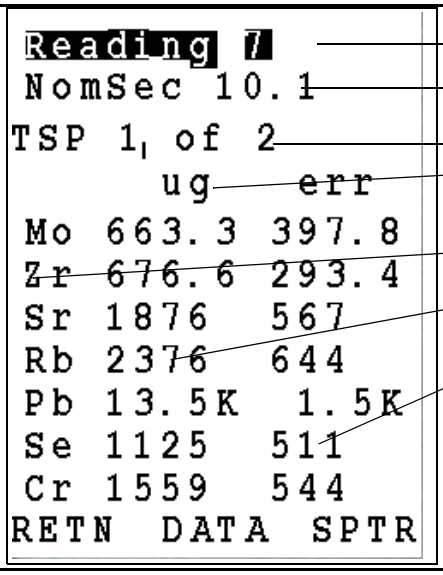


Figure 5-4c

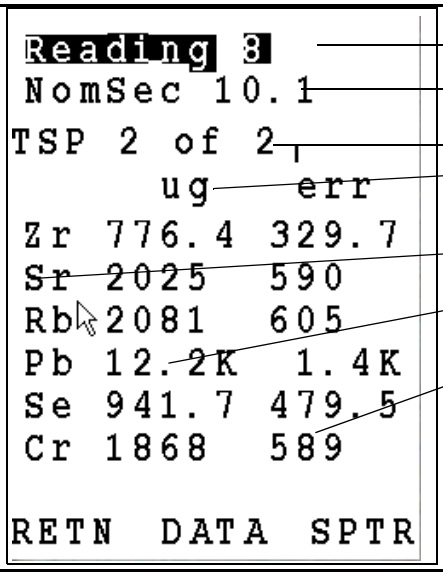


Figure 5-4d

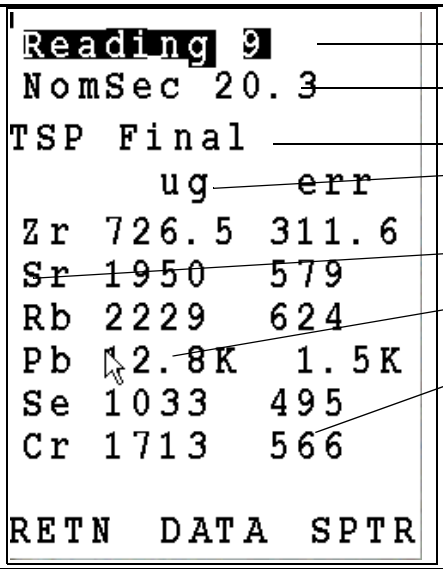

Reading 9
NomSec 20.3
TSP Final
ug err
Zr 726.5 311.6
Sr 1950 579
Rb 2229 624
Pb 2.8K 1.5K
Se 1033 495
Cr 1713 566
RETN DATA SPTR
Reading Number
Reading Time in Seconds
Mode
Units of Measure
Element Detected
Units detected
Confidence Column (2 Sigma)

Figure 5-4e

STANDARD TESTING MODE MENU

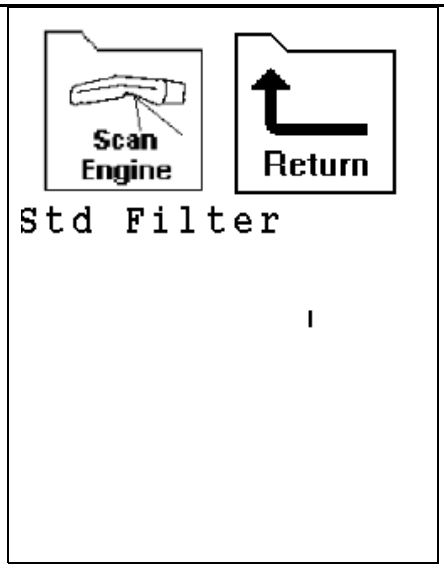


Figure 5-5

You should use **Standard Thin Sample Mode** to test thin samples that have uniform contamination or deposition. These include many filters for liquids and gases, various types of coatings, and the leaves of plants. Operators who want to make a single measurement and obtain a result in units of µg/cm² should use **Standard Thin Sample Mode.**

Caution

Standard Thin Sample Mode should not be used for quantitative lead-paint testing. Use only the three Paint Testing modes to test lead-based paint, which are available only on certain models.

In **Standard Thin Sample Mode**, each measurement is a separate test. For this reason, there is no separate **Final Result** screen in this mode. The results of each test are given in µg/cm².

Note: Testing coatings and paints with Standard Thin Sample Mode may yield lower-than-actual results. The penetration depth of the measurement is highly dependent on the composition of the sample.

Note: Standard Thin Sample Mode does not correct for shielding caused by the presence of overlaying coatings. Thus, for coatings testing, the results should be viewed as the minimum amount of contaminants present. If an element is not detected, it may be that the element is present but entirely shielded by overlaying coatings.

Reading The Measurement Screen in Standard Thin Sample Mode

The **Measurement** screen is continually updated during each test. When each test is terminated, the screen will update one final time and store the results for future review or downloading. **Standard Thin Sample Mode** reports in units of µg/cm²

.

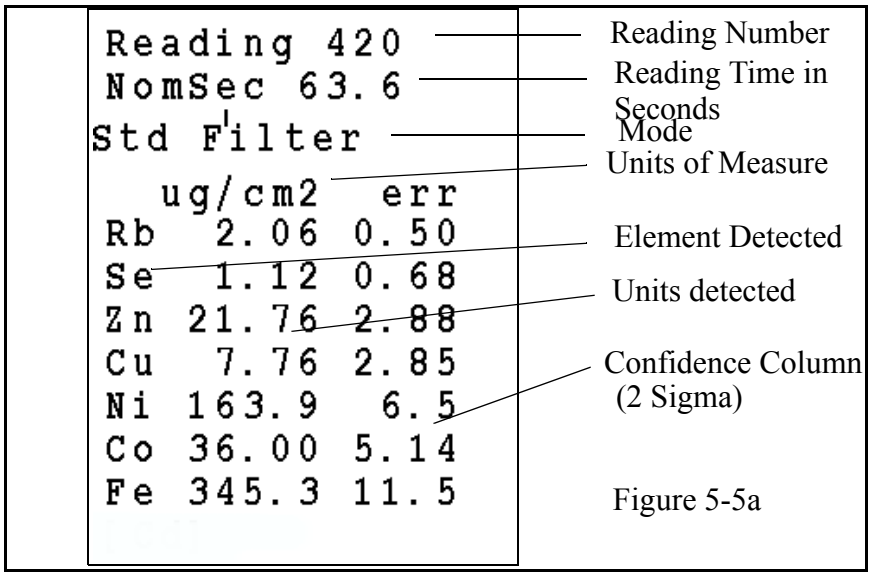


Figure 5-5a

For more information on this feature, please contact NITON's Customer Service Department in the United States, toll free, at (800) 875-1578, or outside the United States, at +1-978-670-7460 or your local Authorized NITON Service Center.

ANALYZING THIN SAMPLES

Caution

Caution: Whenever you turn on your NITON XLi 300A/700A Series Analyzer after it has been off for more than 30 minutes, always re-calibrate your NITON XLi Analyzer's sample analysis electronics before you start to take readings. When the instrument is turned on after being off for more than 30 minutes, your NITON analyzer will require a 10 minute warm-up period before the instrument can be calibrated, unless this 10 minute warm-up period is manually overridden.

There are five different methods of operation for taking a sample measurement, and your analyzer will be configured to use one of those methods for thin samples, depending on the regulatory requirements of your locality. These methods are:

- Trigger-Only method. With the Trigger-Only method, you only need to place the measurement window close to the sample to be analyzed and pull the trigger for sample analysis to be initiated.
- Trigger-and-Proximity-Sensor method. With the Trigger-and-Proximity-Sensor method, you must place the measurement window against the sample to be analyzed to engage the proximity sensor on the front of the instrument, then pull the trigger for sample analysis to be initiated.
- Momentary-Trigger-Touch-and-Proximity-Sensor method. With the Momentary-Trigger-Touch-and-Proximity-Sensor method, you must place the measurement window against the surface to be analyzed to engage the proximity sensor on the front of the instrument, then pull the trigger.

  The trigger may be released and the reading will continue until you release the proximity button, or other criteria (such as Max Time) are reached. This is the primary mode of operation for the XLp 300A/700A Series Lead-in-Paint Analyzer in the USA.
- Trigger-and-Interlock method. With the Trigger-and-Interlock method, you need to place the measurement window close to the sample to be analyzed, press and keep pressing the interlock button at the rear of the instrument with your free hand, then pull the trigger for sample analysis to be initiated.
- Trigger-Interlock-and-Proximity-Sensor method. With the Trigger-Interlock-and-Proximity-Sensor method, you must place

the measurement window against the sample to be analyzed to engage the proximity sensor on the front of the instrument, press and keep pressing the interlock button at the rear of the instrument with your free hand, then pull the trigger for sample analysis to be initiated.

With any of these methods, analysis will stop if any one of the preconditions are violated. For example, with the Trigger-Interlock-and-Proximity-Sensor method, if the trigger or the Proximity Sensor or the Interlock is released, the reading will stop immediately and the shutters will close.

- After your NITON XLi analyzer is calibrated, initiate a sample reading using the appropriate method. If you attempt to initiate a sample reading using a different method, the analyzer will inform you that one or more of the preconditions need to be met in order for sample analysis to begin.

Note: The **four** LED lights will blink during calibration or whenever there is a shutter open.

WARNING!

The preconditions for operation must be continued for the duration of the reading. If the preconditions are violated, all the shutters will close, and the measurement will end. The four LED lights will stop blinking, the shutters will close, and the measurement will end. The flashing of the LED lights is not synchronized to minimize power consumption.

WARNING!

The four LED warning lights are designed to blink only during instrument calibration (See Chapter 2 page 16) or during a measurement, where one or more of the shutters are open and the trigger depressed. If the LED lights blink at any other time, disconnect the battery pack immediately, place the instrument in its shielded holster, place the holster in the shielded carrying case, and call Thermo Electron Corporation's Service Department in the United States, toll free, at (800) 875-1578, or outside the United States, at +1-978-670-7460, or your local Authorized NITON Service Center.

Your NITON Analyzer will display the **Results Screen** throughout the duration of each reading, The **Results Screen** is updated regularly throughout the reading. When the reading is complete, a final screen update will appear, and your NITON analyzer will display the final results of the measurement which has just been completed.

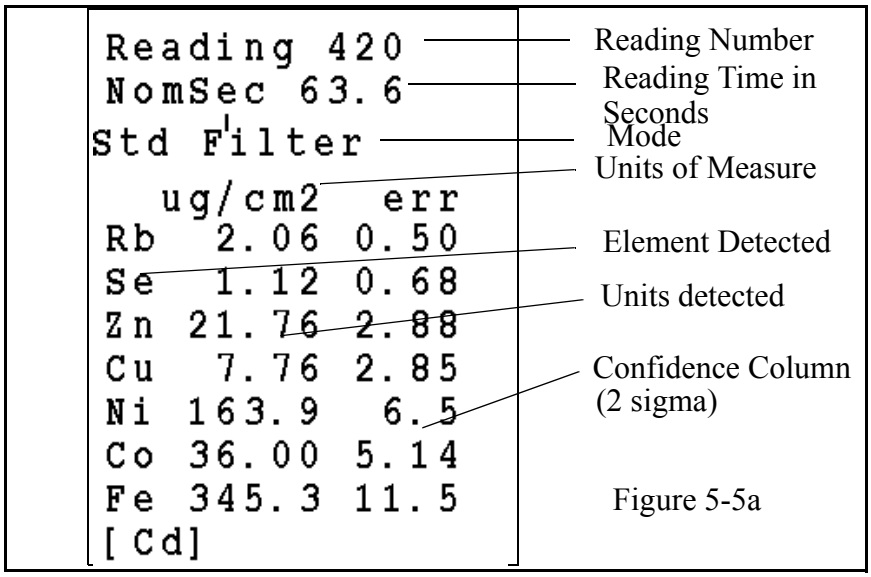


Figure 5-5a

THE DATA ENTRY SCREEN

The **Data Entry Screen** is accessed whenever you select the **Data Entry** icon from any screen. This screen allows you to input data in several different fields, or categories, concerning your sample. These fields are saved along with the reading, and allow you to associate important information about the sample directly with the reading, so that you have a full description of the sample tied into the reading itself.

Once you have input data into a field, that information carries over into the next reading, so that you only have to input the information that has changed since the last reading. For example, if you are analyzing several samples of a particular lot, you only need to input the lot information once during that series of readings, changing only the sample name.

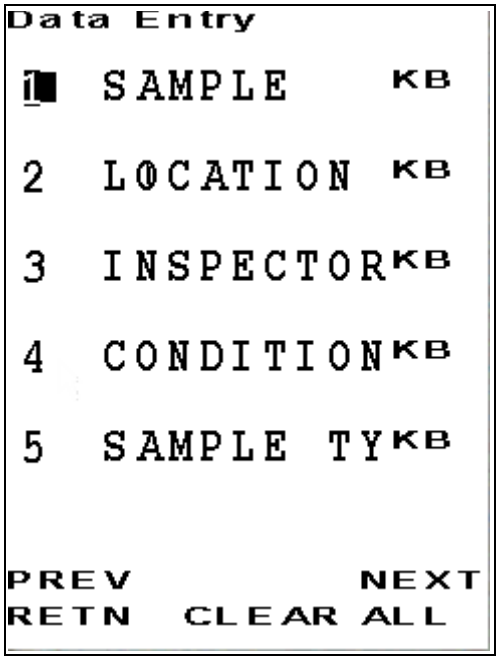


Figure 5-5b

This is the first section of the **Data Entry Screen**. There are five parameters in this section.

Selecting **Sample** allows you to input the sample name parameter

Selecting **Location** allows you to input the particular location information, if known

Selecting **Inspector** allows you to specify the inspector.

Selecting **Condition** allows you to input information on the sample's condition

Selecting **Sample Ty** allows you to specify the sample's type.

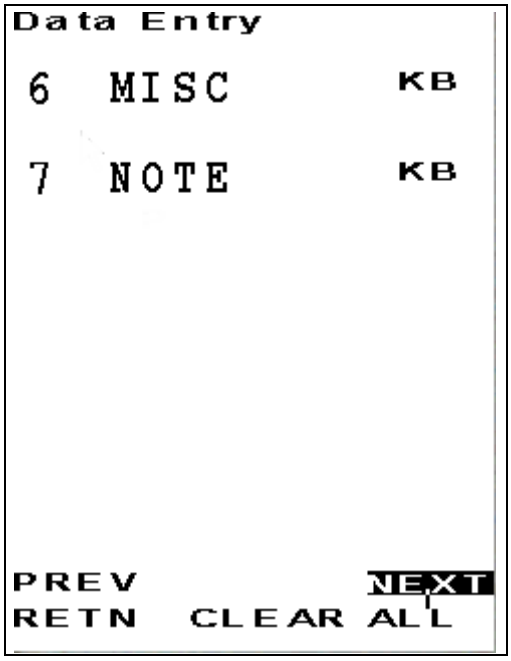


Figure 5-5c

This is the second section of the **Data Entry Screen**. There are two parameters in this section.

Selecting **Misc** allows you to input miscellaneous parameters

Selecting **Note** allows you to input notes on the sample

SETTING UP CUSTOM BARCODES

You can create custom barcodes on your computer using any modern spreadsheet or word processing program. You will need to acquire and install a 3 of 9 barcode font. Once you install the font, it will be available to any program on your computer. In your program of choice, type in the text that you want to input into the analyzer in the following manner:

(R/A/C(Field Number)) (Text) - ex.'R01 DUSTWIPE003'

Always start with an asterisk. This lets the analyzer know the following data is to be read in. Then type either R, A, or C, followed by the field number. R is a command meaning "replace any data in this field with the following data", A is a command meaning "append the following data to the data already in the field", and C is a command meaning "Clear this field". The fields can contain a maximum of 25 characters, although they may be shortened to display on the screen. Always end with an asterisk. This lets the instrument know the barcode is complete.

Some examples:

R01 25MM001

This will replace the data in field 01 with "25MM001"

A02 -A

This will append the text "-A to the data currently in field 02 {77) to create the new designation "77-A".

C03

This will clear field 03, leaving it blank.

C00

This will clear the current field, 00 always refers to the currently selected field.

C99

This will clear all fields, 99 always refers to all fields.

When you have entered all of the data, change the font used to the 3of9 font, and your barcodes are ready for printing.Use a laser printer or a good quality inkjet for printing so your barcodes will be crisp and easy to read. Make sure you leave enough white space on the paper around the bar codes that they will be easy to read. Your analyzer will be able to scan the barcode once you print it.

NAVIGATING THE DATA ENTRY SCREEN

Figure 4-5

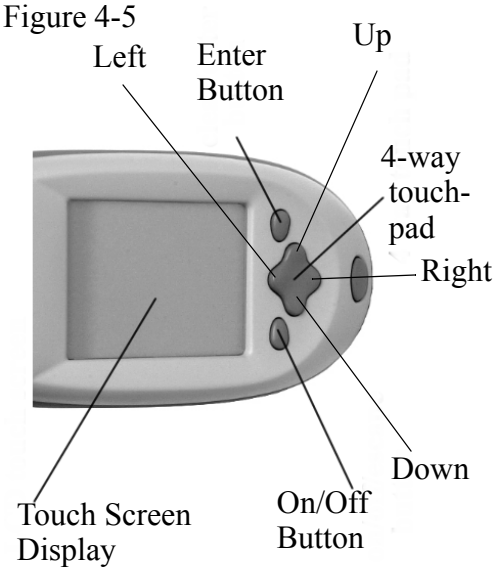


Figure 3-17

The following description of screen navigation using the control panel assumes that the instrument is held so that the display is rotated to the left as in the figure above.

- To move from column to column, use the Right and Left portion of the 4-way touch pad.
- To move from row to row, use the Up and Down portions of the 4-way touch pad.
- To access the “Return”, “Clear”, and “All” buttons, press the On/Off button on the control panel once. To return to the parameter settings, press the On/Off button again. This is a toggle between those two screen areas.
- To select the highlighted option, press the Enter button on the control panel.

The **Data Entry** Screen is divided into sections of 3 setting parameters. By using the Down portion of the 4-way touch pad when you are on the last row of a section, the display will change to the next section. By using the Up portion of the 4-way touch pad when you are on the first row of a section, the display will change to the previous section.

By selecting the **Return** screen button, you will exit the **Data Entry** Screen. You will enter Data Viewing Mode, and be unable to edit any of the settings. Selecting the **Clear** screen button will clear the present setting, and selecting the **All** screen button will clear all the settings.

THE VIRTUAL KEYBOARD

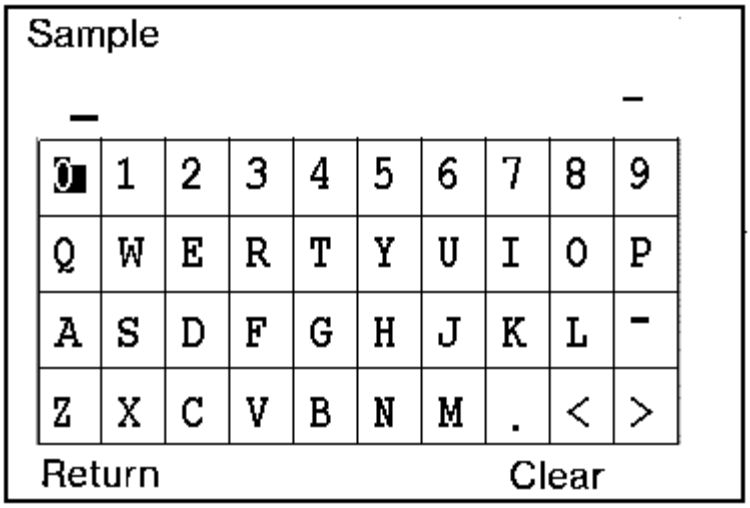


Figure 3-18

The Virtual Keyboard is a full alphanumeric keyboard which appears on the LCD Touch Screen Display. You can use the Virtual Keyboard either with the four-way touch pad and control panel buttons, or using the touch screen display directly.

At the top of the screen is the data field you are entering data for, in this case, “Sample”, Directly underneath is the data you are entering, in this case “25MM001”, On this line also is the underscore cursor. This graphically shows where the next character will be placed. Up to 25 characters can be stored in the data fields.

Next is the Virtual Keyboard itself, with numbers 0-9, letters A-Z, and special characters *,<,>, and -.

Last is the control button line. This contains the screen buttons for Return and Clear.

When using the four-way touch pad and control buttons, pressing the On/Off button allows you access to the Return and Clear screen buttons. The Return screen button will enter the data and return you to the Data Entry Screen, while the Clear screen button will clear the data you have

All screen areas can be directly accessed using the LCD Touch Screen.

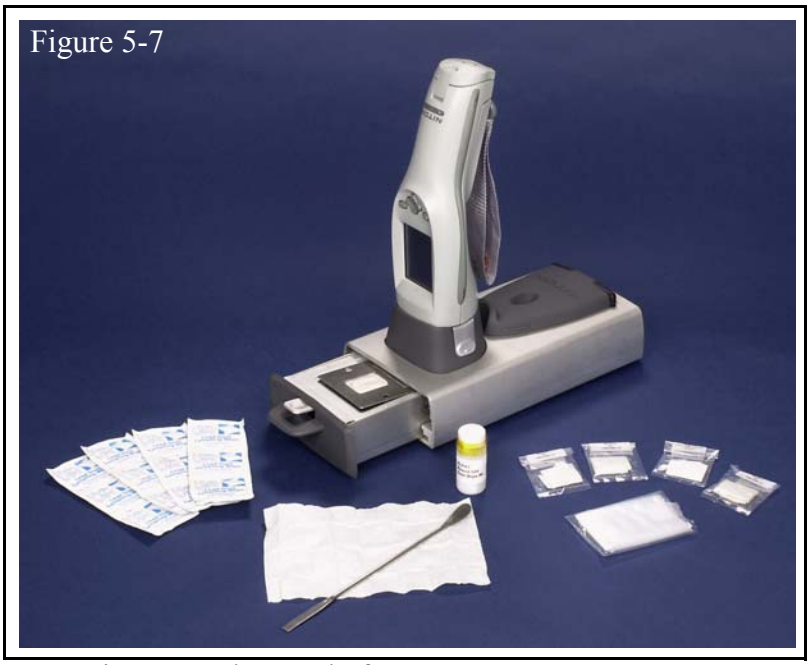
NITON Environmental Test Platform

The NITON Environmental Test Platform is designed to facilitate bulk and thin sample testing using the NITON XLi 700 Series Environmental Analyzers.

1. Place the NITON Test Platform on a flat, solid surface with the sample test drawer towards you.
2. Place the XLi in the Nose Cone Adapter with the Analyzer's Analysis Window against the test stand's analysis window and the LCD Screen towards you.
3. Scan the sample's bar code with the NITON XLi Analyzer's Integrated Bar Code Scanner.
4. Place the prepared sample in the proper pocket on the test platform
5. Depress the Test Platform Lever and push the Sample Test Drawer fully closed.
6. Initiate a test per the test procedure desired.
7. Rotate and/or move the slide as described in the proper test procedure description.

Repeat steps 5-7 as required.

View of NITON XLi Environmental Analyzer inserted into the



NITON Environmental Test Platform.

The Sample Test Drawer is under the Nose Cone Adapter.

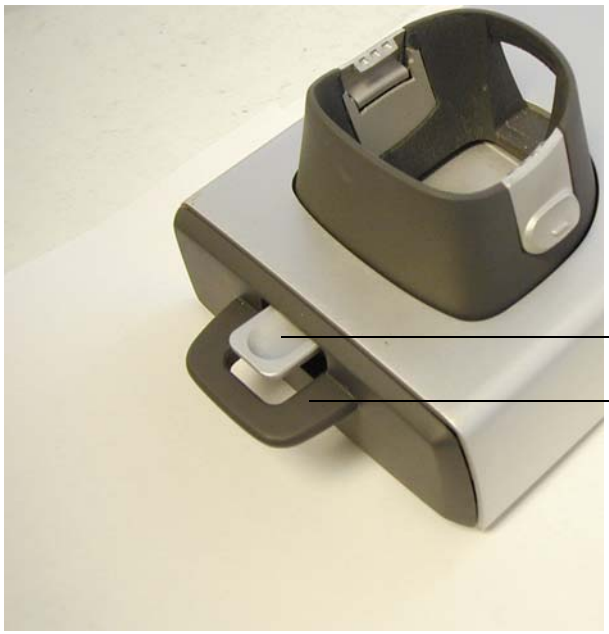


Figure 5-8

Press down on the Test Platform Lever with your thumb, squeeze it

Figure 5-9

together with the Drawer Pull and slide the drawer towards you.

The drawer slides open revealing the Test Surface Cutout.

Figure 5-10

Chapter 6

BULK SAMPLE TEST MODES

USING BULK SAMPLE TEST MODES

Bulk Sample Test Modes allow you to test soils and other ground samples for composition and contamination. Your NITON XLi Analyzer may be used for soil and bulk analysis, either *in-situ* or *ex-situ*.

THE BULK SAMPLE MODE MENU

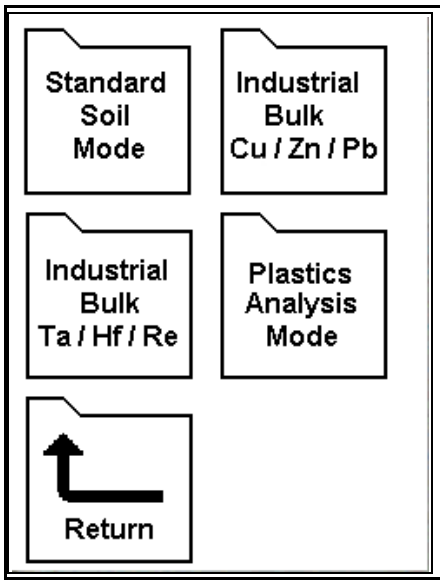


Figure 6-1

All NITON XLiBulk Mode functions are accessible from the **Bulk Mode Menu** and subsidiary menus. Each of the instrument functions represented by an icon on the **Bulk Mode Menu** screen may be selected by choosing the appropriate icon. When one of these **Bulk Mode Menu** icons is selected, the function specific sub-menu appropriate to that icon will be displayed.

To use the **Standard Soil Mode**, simply select the **Standard Soil Mode** icon from the **Bulk Mode Menu** to place your instrument into **Standard Soil Mode**. Use the **Standard Soil Mode** if:

- The percentage of the elements of interest are <1.0%
- The material is of a light matrix, for example aluminum silicate
- Elements with atomic number greater than iron do not exceed several percent

To use the **Industrial Bulk Cu/Zn/Pb Testing Mode**, simply select the **Industrial Bulk Cu/Zn/Pb** icon from the **Bulk Mode Menu** to place your instrument into **Industrial Bulk Cu/Zn/Pb Testing Mode**. In **Industrial Bulk Cu/Zn/Pb Testing Mode**, all other programmed elements are active in addition to Cu/Zn/Pb (e.g. Ti, Cr, Mn, Fe, Co, Ni, Zr, Nb, Mo, W, etc.). **Industrial Bulk Cu/Zn/Pb Testing Mode** is recommended if you know, *without a doubt,* that your sample contains Cu, Zn, and/or Pb and <u>not</u> Ta, Hf, or Re. When your NITON XLi analyzer is operating in **Industrial Bulk Cu/Zn/Pb Testing Mode**, the NITON XLi analyzer will not mea-

sure concentrations of **Hf, Ta, or Re** in a sample. Once **Industrial Bulk Cu/Zn/Pb Testing Mode** is selected, you may begin testing samples.

Use **Industrial Bulk Cu/Zn/Pb Testing Mode** if:

- There is more Cu/Pb/Zn than Ta/Hf/Re in the sample
- The percentage of the elements of interest are >1.0%
- The matrix material is **not** a light matrix
- Elements with atomic number greater than iron (Z = 26) exceed several percent

To use the **Industrial Bulk Ta/Hf/Re Testing Mode**, simply select the **Industrial Bulk Ta/Hf/Re** icon from the **Bulk Mode Menu** to place your instrument into **Industrial Bulk Ta/Hf/Re Testing Mode**. In **Industrial Bulk Ta/Hf/Re Testing Mode**, all other programmed elements are active in addition to Ta, Hf, or Re (e.g. Ti, Cr, Mn, Fe, Co, Ni, Zr, Nb, Mo, W, etc.). **Industrial Bulk Ta/Hf/Re Testing Mode** is recommended if you know, *without a doubt,* that your sample contains Ta, Hf, and/or Re and <u>not</u> Cu, Zn, and/or Pb. When your NITON XLi analyzer is operating in **Industrial Bulk Ta/Hf/Re Testing Mode**, the NITON XLi analyzer will not measure concentrations of **Cu, Zn, or Pb** in a sample. Once **Industrial Bulk Ta/Hf/Re Testing Mode** is selected, you may begin testing samples.

Use **Industrial Bulk Ta/Hf/Re Testing Mode** if:

- There is more Ta/Hf/Re than Cu/Pb/Zn in the sample
- The percentage of the elements of interest are >1.0%
- The matrix material is **not** a light matrix
- Elements with atomic number greater than iron (Z = 26) exceed several percent

Select the **Plastics Analysis** icon from the **Bulk Mode Menu** to place your instrument into **Plastics Analysis Mode**. Use **Plastics Analysis Mode** to find elements of interest in a plastic matrix. **Plastics Analysis Mode** is not available on this analyzer. For further information on **Plastics Analysis Mode**, contact NITON or your local NITON representative.

STANDARD SOIL MODE

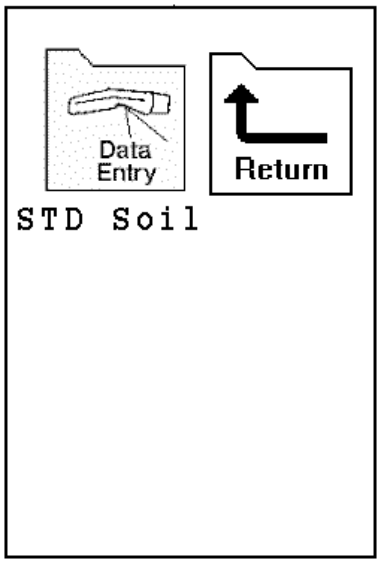
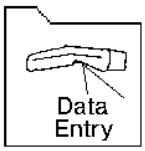


Figure 6-2

The **Standard Soil Mode** is available from the **Bulk Mode Menu**. The **Standard Soil Mode** allows you to perform tests on soil and other bulk samples without adjusting for a particular matrix. **The Standard Soil Mode** is ideal for finding contaminants in soil. **The Standard Soil Mode** uses Compton Normalization to automatically adjust for the effects of the matrix.

This mode of operation is optimum for any sample whose elements of interest are present at less than 1%. **Standard Soil Mode** utilizes the Compton Scatter (Inelastic Collisions) of a particular sample. Compton scatter occurs when primary X-rays do not cause fluorescence but instead collide with the atoms of the sample. The Compton Scatter that occurs is directly proportional to the density (average atomic number (Z)) of the sample. A light matrix material, such as an oil or sand, will have a much greater scatter than that of a heavy matrix, such as ore. The analyzer measures this scatter peak and automatically adjusts the concentration based on the matrix of the material and allows for the analysis of a bulk sample without the use of site specific calibration standards. This mode is used chiefly for the analysis of contaminants in soils.



Select the **Data Entry** icon from the **Standard Soil Mode Menu** to prepare to initiate a Standard Soil Mode sample measurement. Type the parameters of the sample directly into the instrument using the **Virtual Keyboard**. The parameters you choose will be attached to the next **Standard Soil Mode** test you perform. You may also use the NITON bar code scanner and a custom bar code sheet and scan in the bar coded designation of the sample you wish to test. You can print your own bar code sheets with a bar code font.

INDUSTRIAL BULK CU/ZN/PB TESTING MODE

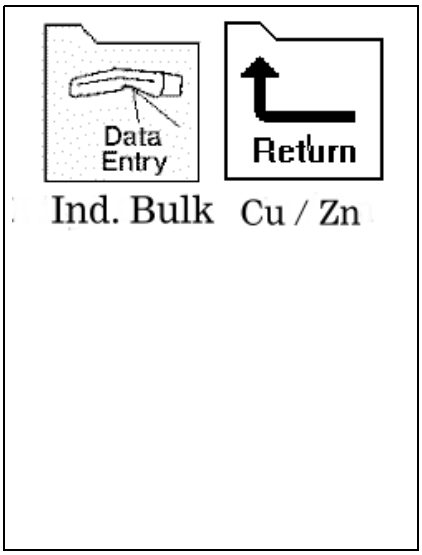
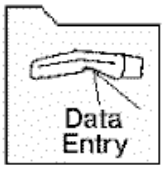


Figure 6-2b

The **Industrial Bulk Cu/Zn/Pb Testing Mode** is available from the **Bulk Mode Menu**. The **Industrial Bulk Cu/Zn/Pb Testing Mode** allows you to perform tests on soil and other bulk samples without adjusting for a particular matrix. **Industrial Bulk Cu/Zn/Pb Testing Mode** is ideal for finding concentrations of analytes in rock or soil. This mode of operation is optimum for any sample whose elements of interest are present at 1% or greater. **Industrial Bulk Cu/Zn/Pb Testing Mode** utilizes Fundamental Parameters to analyze the sample.



Select the **Data Entry** icon from the **Industrial Bulk Cu/Zn/Pb Testing Mode** to prepare to initiate a sample measurement. Type the parameters of the sample directly into the instrument using the **Virtual Keyboard**. The parameters you choose will be attached to the next **Industrial Bulk Cu/Zn/Pb Testing Mode** test you perform. You may also use the NITON bar code scanner and a custom bar code sheet and scan in the bar coded designation of the sample you wish to test. You can print your own bar code sheets with a bar code font.

INDUSTRIAL BULK TA/HF/RE TESTING MODE

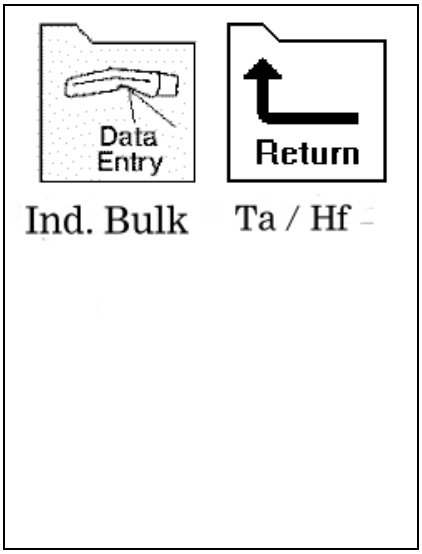
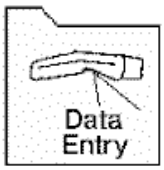


Figure 6-4a

The **Industrial Bulk Ta/Hf/Re Testing Mode** is available from the **Bulk Mode Menu**. The **Industrial Bulk Ta/Hf/Re Testing Mode** allows you to perform tests on soil and other bulk samples without adjusting for a particular matrix. **Industrial Bulk Ta/Hf/Re Testing Mode** is ideal for finding concentrations of analytes in rock or soil. This mode of operation is optimum for any sample whose elements of interest are present at 1% or greater. **Industrial Bulk Ta/Hf/Re Testing Mode** utilizes Fundamental Parameters to analyze the sample.



Select the Data Entry icon from the Industrial Bulk Ta/Hf/Re Testing Mode to prepare to initiate a sample measurement. Type the parameters of the sample directly into the instrument using the Virtual Keyboard. The parameters you choose will be attached to the next Industrial Bulk Ta/Hf/Re Testing Mode test you perform. You may also use the NITON bar code scanner and a custom bar code sheet and scan in the bar coded designation of the sample you wish to test. You can print your own bar code sheets with a bar code font.

ANALYZING BULK SAMPLES

Caution

Caution: Whenever you turn on your NITON XLi 300A/700A Series Analyzer after it has been off for more than 30 minutes, always re-calibrate your NITON XLi Analyzer's sample analysis electronics before you start to take readings. When the instrument is turned on after being off for more than 30 minutes, your NITON analyzer will require a 10 minute warm-up period before the instrument can be calibrated, unless this 10 minute warm-up period is manually overridden.

There are five different methods of operation for taking a sample measurement, and your analyzer will be configured to use one of those methods for soil samples, depending on the regulatory requirements of your locality. These methods are:

- Trigger-Only method. With the Trigger-Only method, you only need to place the measurement window close to the sample to be analyzed and pull the trigger for sample analysis to be initiated.
- Trigger-and-Proximity-Sensor method. With the Trigger-and-Proximity-Sensor method, you must place the measurement window against the sample to be analyzed to engage the proximity sensor on the front of the instrument, then pull the trigger for sample analysis to be initiated.
- Momentary-Trigger-Touch-and-Proximity-Sensor method. With the Momentary-Trigger-Touch-and-Proximity-Sensor method, you must place the measurement window against the surface to be analyzed to engage the proximity sensor on the front of the instrument, then pull the trigger.

  The trigger may be released and the reading will continue until you release the proximity button, or other criteria (such as Max Time) are reached. This is the primary mode of operation for the XLp 300A/700A Series Lead-in-Paint Analyzer in the USA.
- Trigger-and-Interlock method. With the Trigger-and-Interlock method, you need to place the measurement window close to the sample to be analyzed, press and keep pressing the interlock button at the rear of the instrument with your free hand, then pull the trigger for sample analysis to be initiated.
- Trigger-Interlock-and-Proximity-Sensor method. With the Trigger-Interlock-and-Proximity-Sensor method, you must place

the measurement window against the sample to be analyzed to engage the proximity sensor on the front of the instrument, press and keep pressing the interlock button at the rear of the instrument with your free hand, then pull the trigger for sample analysis to be initiated.

With any of these methods, analysis will stop if any one of the preconditions are violated. For example, with the Trigger-Interlock-and-Proximity-Sensor method, if the trigger or the Proximity Sensor or the Interlock is released, the reading will stop immediately, and the shutters will close.

After your NITON XLi analyzer is calibrated, initiate a sample reading using the appropriate method. If you attempt to initiate a sample reading using a different method, the analyzer will inform you that one or more of the preconditions need to be met in order for sample analysis to begin.

Note: The **four** LED lights will blink during calibration or whenever there is a shutter open.

WARNING!

The preconditions for operation must be continued for the duration of the reading. If the preconditions are violated, all the shutters will close, and the measurement will end. The four LED lights will stop blinking, the shutters will close, and the measurement will end. The flashing of the LED lights is not synchronized to minimize power consumption.

WARNING!

The four LED warning lights are designed to blink only during instrument calibration (See Chapter 2 page 16) or during a measurement, where one or more of the shutters are open and the trigger depressed. If the LED lights blink at any other time, disconnect the battery pack immediately, place the instrument in its shielded holster, place the holster in the shielded carrying case, and call Thermo Electron Corporation's Service Department in the United States, toll free, at (800) 875-1578, or outside the United States, at +1-978-670-7460, or your local Authorized NITON Service Center.

Your NITON Analyzer will display the **Results Screen** throughout the duration of each reading, The **Results Screen** is updated regularly throughout the reading. When the reading is complete, a final screen update will appear, and your NITON analyzer will display the final results of the measurement which has just been completed.

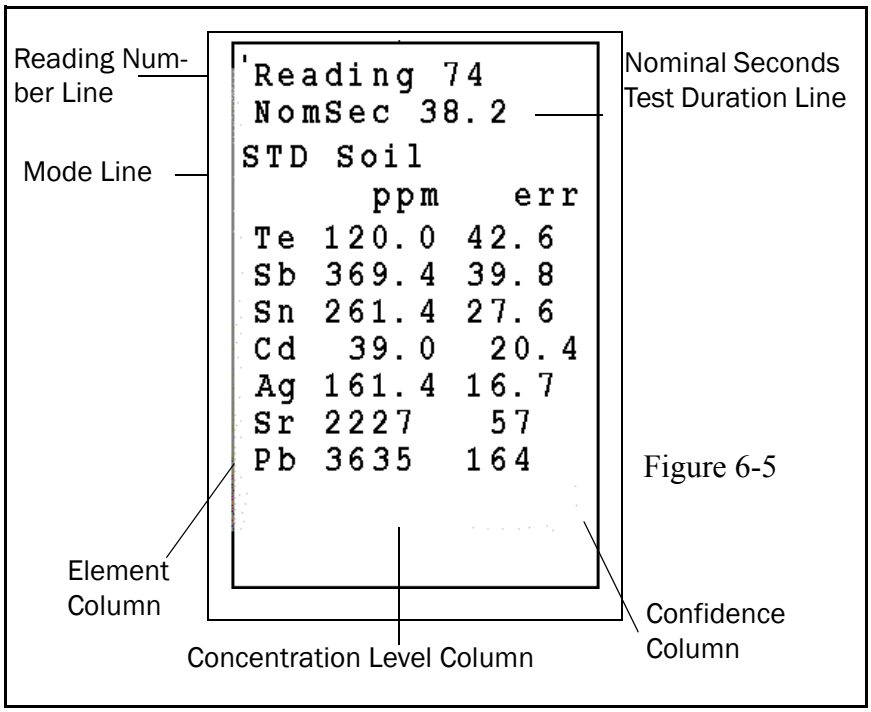


Figure 6-5

The **Results Screen** displays the following information:

- The **Reading Number** line shows a number automatically assigned by your NITON analyzer in order to uniquely identify each reading. The reading number automatically increments up by one with each successive reading.

- The **Nominal Seconds Test Duration** line shows the number of nominal (source) seconds elapsing since the initiation of the reading. Nominal seconds are true, clock seconds slowed down to compensate for the electronic dead-time that occurs when the NITON XLi is taking a measurement.
- The **Mode** line displays the test mode in use during the measurement.
- The **Element** (left) column shows the elements that have been detected in the sample.
- The **Concentration Level** (central) column shows the concentration levels of the corresponding elements in percentages.
- The **Confidence** (right) column displays the 2 sigma (95%) confidence interval for the corresponding elements.
- The **Return Screen Button** returns you to the previous screen.
- The **Data Screen Button** allows you to view the sample parameter entries.
- The **Spectra Screen Button** allows you to view the sample spectrum in **SpectraView**.

TO PREPARE OR NOT TO PREPARE – IN SITU VS. EX SITU

Bulk media are generally tested either on-site (*in situ*) for screening purposes, or removed and prepared (*ex situ*) to enhance the accuracy of the measurement. The degree of preparation may vary depending on the accuracy desired, the characteristics of the sample, and the characteristics of the site.

Understanding the advantages of *in situ* testing and of various degrees of preparation is crucial to obtaining useful data. *In situ* measurements should be used to profile an area, locate sources of contamination, determine the boundaries of contaminated areas, or gather data that will subsequently be used to design a sampling plan.

In situ measurements are usually only approximations, though they may correlate very well with lab analysis if the site tested is highly homogeneous. If the site is non-homogeneous, as is often the case, then in situ measurement results may differ greatly from laboratory obtained results. Both sets of results may be correct. The difference arises from the fact that actual samples tested were different.

Analysis of Unprepared Samples – **In Situ**

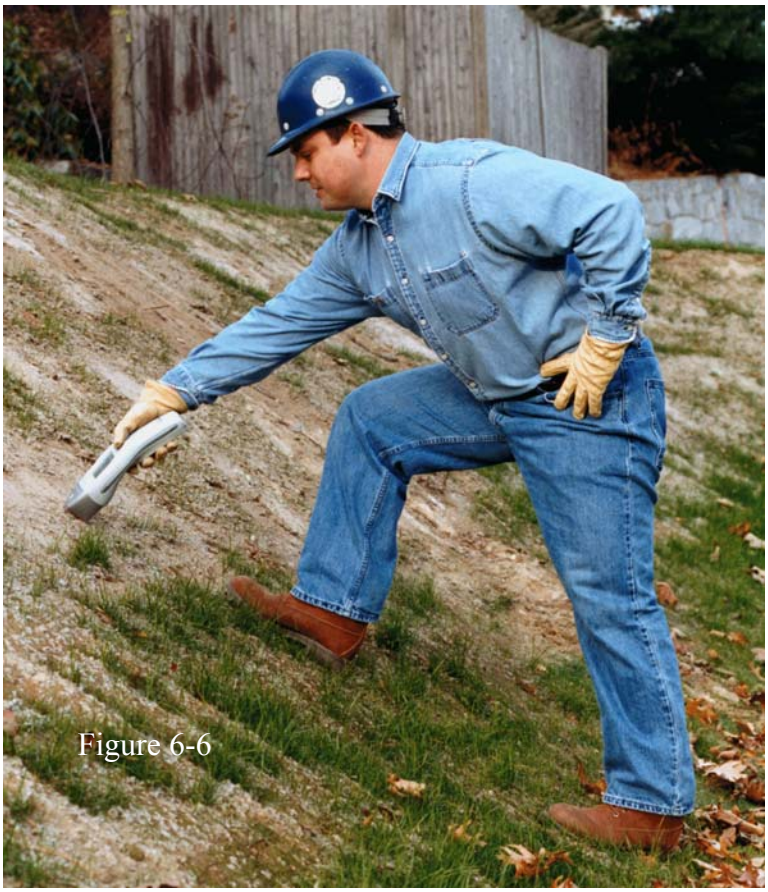


Figure 6-6

Screening Techniques

Use direct measurement when you need to determine whether an element is present (rather than in accurately measuring how much is present). Use preliminary direct measurements to survey a site quickly even if you intend to take samples

Testing In Situ

WARNING!

When taking samples from a site where toxic chemicals may be present, always use gloves and respiration equipment for your own protection.

1. Select a measurement site, and clear away any surface debris and vegetation.

Note: Valid results will depend on a sufficient and appropriate selection of sites to sample. Lead-in-soil from paint, for instance, will usually be concentrated within a few feet of the painted structure.

2. Choose an area to test where the measurement window of the analyzer will be flush with the test media. Position the nose against the surface to be analyzed and initiate a reading by squeezing the shutter release, and firmly pressing the instrument flat against the surface.
3. After the test, inspect the nose of the instrument for contamination, which may affect future analysis. If the nose appears to be soiled, clean it with a soft cloth or tissue.

WARNING!

Always treat radiation with respect. Do not hold your instrument near the Kapton window during testing. Never point your instrument at yourself or anyone else when the shutter is open.

Note: Never use in situ testing with field portable XRF when comparing field results with laboratory results to justify XRF usage. Always collect samples and prepare them before testing. Refer to the instructions on sample collection and preparation in *Ex Situ* Testing.

On-site vs. Lab Analysis

When comparing field screening to laboratory analysis, it is preferable to compare results obtained from the same samples. Start by collecting a sample large enough to be divided into two parts, with one portion stored for future reference and the other submitted to a laboratory for independent analysis. For best results, follow the complete protocol for sample preparation, including drying and grinding of the sample. Grinding is essential for homogenizing the sample, ensuring that the portion sent to the lab is the sample as that analyzed on-site.

If you must test for *in situ* performance evaluation, take several XRF readings bracketing a spot. Then take a sample for laboratory testing from that spot. For further discussion of field screening, please refer to EPA Method 6200, “Field Screening Using A Field-Portable XRF,” which can be obtained from NITON Corporation’s Customer Service Department. EPA accepts field screening results using portable XRF provided that Method 6200 protocol is followed.

In Situ Depth Profiling

XRF analysis for soil is a surface technique. To perform a depth profile, remove a vertical slice of soil and test several samples taken from different depths. This procedure will yield information, rapidly, about the depth of contamination.

Figure 6-7

Analysis of Prepared Samples – **Ex Situ**

Figure 6-8

Analysis of bagged bulk samples

Sometimes it is convenient to measure samples in plastic bags. Without further preparation of the sample, you can screen the site by testing each bag. Because you are testing through a bag, test results will tend to be lower than test results obtained from direct analysis. This effect will vary depending on the element analyzed and the thickness of the plastic through which the sample is tested. Bagged samples can be retested and/or be further prepared and then retested, allowing samples of particular interest to be more accurately analyzed.

Sample Collection

Examine the site for differences in soil characteristics before sampling. Valid results depend on a sufficient and appropriate selection of sites to sample. Incorrect sample collection may give rise to misleading or meaningless results, regardless of the analysis method. Delineate sections with different characteristics and treat them as different areas. It may be desirable to subdivide larger areas even if they have the same characteristics to ensure a thorough examination.

Note: When testing for lead-in-soil in a residential setting, it is standard practice to sample the top 4 to 6 inches of soil.

Lead is usually concentrated near a building with lead paint (within 4–6 feet), and appropriate sample areas should be defined. Samples from the following areas should also be collected and combined separately:

1. near painted structures
2. near roads and driveways
3. near to where various types of waste have been stored, or
4. near pressure-treated wood

The soil probe or sampling tube is a very convenient sampling tool. It quickly takes accurate and consistent samples, and may be inserted to a marked depth to removes the same amount of soil at each insertion. In addition, there also are core-sampling devices that can remove an intact cylinder of sample material. If no sample tool is available, a shovel, spade, narrow (1-1/2 inch) garden trowel, or other sampling tool is adequate to take a soil slice of the required depth.

WARNING!

When taking samples from a site where toxic chemicals may be present, always use gloves and respiration equipment for your own protection.

Individual samples may require reduction in size if they were taken with a spade, trowel, or other large sampling tools. Reduce the samples by taking a vertical slice (so it is representative of the entire sample) about one inch wide.

Prepare a composite sample from each predetermined area. A composite sample of an area consists of many smaller samples from different sections of that area. These samples should consist of vertical columns of material approximately 1 inch in diameter. The length of each column should be about 6 inches. The elements you wish to measure and the local history will determine the depth at which you need to sample. For example, lead from paint is usually concentrated within the top 1–4 inches.

Do not combine samples from different areas. A composite sample taken from two distinctly different areas is not representative of either area.

Place the samples in a clean pail. Then mix the sample thoroughly by stirring and by rotating the pail at an angle of 45 degrees. Don't shake the sample—you do not want to stratify the sample.

A sample should contain at least 50–100 grams of soil. Once the sample has been thoroughly mixed, place it in a clean bag that can be closed securely (with a twist tie for example). Zip Lock style bags are very convenient, though extra care must be taken to ensure the bags do not unseal, which could ruin the samples.

Make certain to label each bag thoroughly. Common information included on each bag includes the person and/or the company who collected the sample, the location and area where the sample was taken, and the date the sample was collected.

Testing Samples in Bags

Flatten the bag of soil to form a continuous uniform layer of at least 1 cm. (0.4 inch) thickness. Place the measurement window of the NITON XLi Lead Paint Analyzer on the bag. Then follow *In Situ* testing instructions from page 5.

1. Choose a convenient work surface. This surface should be free of material containing elements that may be detected by the analyzer. When uncertain of the work surface, test the surface with the analyzer.
2. Flatten the bag of soil to form a continuous uniform layer of at least 1 cm. (0.4 inch) thickness. Place the nose of the NITON analyzer on the bag. Be careful of bags with manufacturers printing or labeling surfaces. This printing often contains detectable elements, most notable Ti, and should be avoided when possible.
3. Position the instrument against the surface of the bagged sample, and initiate a reading by squeezing the shutter release, and firmly pressing the instrument flat against the sample. The trigger and the proximity sensor must both be engaged before the shutter will open and the measurement initiated.

WARNING!

Do not hold bagged samples while testing.

Prepared sample analysis is the most accurate method for determining the concentration of elements in a bulk medium using the instrument. Sample preparation will minimize the effects of moisture, large particle size, variations in particle size and sample non-homogeneity.

Note: More sample preparation (drying, milling and sifting) will yield greater accuracy. The drier, finer, and more homogeneous the particles, the better the measurements.

Preparing Bulk Soil Samples

NITON recommends a specific sample protocol. Following this protocol for preparing and testing samples is vital for achieving a level of accuracy comparable with laboratory results.

The equipment you need to prepare samples is included in your kit. Among these are a mortar and pestle, several different sized metal sieves, cups to hold the samples, and the soil test platform.

Caution

Caution: All test equipment must be kept clean to prevent contamination of samples.

Cleaning Your Equipment:

The mortar, pestle, and grinding mill may be cleaned with dry paper towels. You can also clean the mortar, pestle, and the mill's container with water, but be sure each is absolutely dry before using them on another sample. The mortar and pestle may be cleaned by grinding clean, dry sand in the mortar. Use the short bristle brushes (included in your Soil Testing Kit) to clean the sieves. If you have an electric soil grinder in your kit, when the soil grinder blades wear out, unbolt the worn blades and replace them. Call the NITON Sales Department at 1-800-875-1578 for replacement blades.

NOTE: Using the soil grinder may artificially increase the amount of Fe in soil samples.

Sample Preparation

Prior to analysis, the material should be dry and well homogenized. Ideally, the entire sample should be dried to constant weight, sifted to remove gravel and debris, and ground or milled to a fine powder.

Dry the sample if it is moist and cohesive. The sample can be dried in any of several ways. Choose one of the following:

1. Oven dry the sample for approximately 2 hours at 150° C, until the sample reaches a constant weight. Note: Oven drying is inappropriate when volatile compounds may be present in the sample. For example, lead present as tetraethyl lead would be driven off by the heat of drying. Some forms of mercury and arsenic are volatile. Air drying will preserve more of these volatile substances.
2. Air dry the sample overnight at room temperature in a shallow pan.
3. Stir gently and warm the sample in a pan over a hot plate or burner.

Coning and Quartering

You may need to divide your sample at various times during preparation. Coning and quartering is a method for dividing the sample into homogenous quarters.

Pour the dry material slowly and carefully onto a flat sheet or pan, forming a symmetrical cone. Divide the cone into equal piles using a flat thin-bladed tool, such as a knife or ruler. Divide these in half again.

Now you have four samples, each one-quarter the size of the original and each more homogenous than the original.

Grind the sample to break up dirt clods and/or paint chips.

WARNING!

Grinding and sifting dried samples produces dust. Even clean soil contains silica, which may be hazardous when airborne. Prepare all samples in a ventilated area; wear a mask, gloves, and an apron; and spread a drop cloth.

Sift using the #10 (2mm) mesh and separate out the larger pieces (stones, organic matter, metallic objects, etc. Examine the larger particles by eye (look for paint chips), but do not include in the sample. Grind the sample again so its particles will be finer and more homogenous. Use mortar and pestle, or an electrically powered grinding mill. Sift at least 10 grams of the sample through #60 (250 µm) and #120 (125 µm) mesh. Re-grind the un-passed material until the entire fraction is able to pass. Mix the resulting sample.

Placing the Sample in an XRF Sample Cup

The container used to hold the sample will affect the accuracy of the measurement. Use a container with as thin-walled a window as is convenient and use the same kind of container and window for each sample. Consistency and careful attention to detail are keys to accurate measurement.

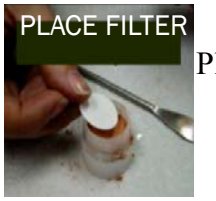
Note: The sample container should be a sample cup of a type that can be filled from the rear; that is, the side opposite the window (e.g. NITON Part Number 187-466). NITON recommends using a 1/4 mil Mylar film (e.g. NITON Part Number 187-492). A supply of cups and films are included.

Place a circle of Mylar film on top of an XRF sample cup. This film goes on the end of the cup with the indented ring. NITON recommends preparing the cup ahead of time, if possible.

Secure the film with the collar. The flange inside the collar faces down and snaps into the indented ring of the cup. Inspect the installed film window for continuity and smooth, taut appearance.

Set the cup on a flat surface film-window-side down. Fill it with at least five grams of the prepared sample, making sure that no voids or uneven layers.

Lightly tamp the sample into the cup. The end of the pestle makes a convenient tamper.

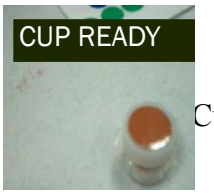


Place a filter-paper disk on the sample after tamping it.

Fill the rest of the cup with polyester fiber stuffing to prevent sample movement. Use aquarium filter or pillow filling as stuffing. A small supply of stuffing comes with your bulk sample kit.

Cap the cup.

Place a label on the cup. Using a pen with indelible ink, write identifying information on the cup. Keep a record of the sample designation, the site and location, the date of the sample, and any other relevant comments.



Cup is ready for testing.

Preparing Liquids, Sludge or Dust

Liquids

Fill an XRF sample cup with the liquid to be tested (do not pad the sample with cotton). The cup must be full so it is best if some liquid is allowed to overflow when the cap is put on.

Sludge

Sludge can be placed directly into an XRF cup for screening. This is considered in-situ testing because no attempt has been made to prepare the sample. For more accuracy, the sludge can be dried, sieved, and ground.

Dust

Vacuum dust with a household vacuum cleaner and use large dust samples taken from the vacuum cleaner bag. Remove fibers, hairs, and debris. At least three grams of dust are needed to assure accurate analysis. Samples as small as one or two grams may be measured with less accuracy. Even smaller samples (0.3 to 1.0 grams)

can be analyzed by applying a weight correction factor and by using a funnel to place the sample in the center of the sample cup.

Prepare in an XRF sample cup and test the same way you would with a soil sample. For risk analysis, it is advisable to use a 60-mesh sieve to isolate and test only fine particles.

Standard Soil Mode

NITON provides three NIST soil standards: Lead high, Lead medium, and Lead low, to check the calibration of the instrument when testing in **Standard Soil Mode**. For the compositions of these standards, see Chapter 6 - page 36.

Note: Although the standards do not contain every element that the Lead Paint Analyzer is capable of testing, and although the standards do contain elements that the analyzer is not capable of testing, it can be assumed that the XLi Environmental Analyzer will measure all elements correctly if it correctly measures those elements contained in the standards supplied.

Test the standards regularly. NITON recommends testing immediately after the instrument finishes self-calibration. Test the standard samples appropriate to the type of tests you are conducting, and once every 1–2 hours thereafter.

Note: For defensible Quality Control, keep a record of the time and precision of every calibration, using the bar code system when possible.

WARNING!

Tampering with the 5,500 ppm (lead high) lead-in-soil standard may cause exposure to lead dust. Keep all standards out of the reach of children.

Caution

Caution: Never tamper with Test Standards. They should not be used unless they are completely intact.

During each test, the instrument looks at the full range of x-ray spectrum and continuously corrects for cross-element interference.

Testing Prepared Samples

Set the NITON test platform on a flat, solid surface. Slide out the drawer and place the sample cup in the holder and slide the drawer shut. Insert the instrument into the nose cone adaptor so that the LCD screen is facing the side that the test platform drawer is on, and follow in-situ bulk sample instructions

FP Soil Testing Modes

These modes of the operating software are intended primarily for the detection of metal concentrations greater than 1% in light or heavy matrices. The full fundamentals parameter (FP) algorithm accurately measures elemental concentrations from minor levels to 100%, and automatically corrects for inter-element effects. However, elements lighter than calcium cannot be detected by XRF and light element combinations, such as oxides, carbonates, and silicates are common matrix components. To fine-tune results, you may enter calibration factors for individual elements to adjust for effects of light element interference. These calibration factors are linear corrections, which adjust the FP calculation. Calibrations only need to be entered once per matrix. However, as matrices can vary considerably from one sampling area to another, it is recommended that new calibrations be done for each change in matrix.

Using both the ^{109}Cd and ^{241}Am sources, concentrations for the following analytes can be determined:

Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, W, Pb, Bi, Zr, Ta, Nb, Mo, Sn, and Ag.

All concentrations are displayed in units of wt.%.

Note: For defensible Quality Control, keep a record of the time and precision of every calibration, using the bar code system wherever possible.

WARNING!

Tampering with the 5,500 ppm (Lead high) lead-in-soil standard may cause exposure to lead dust. Keep all standards out of reach of children.

Caution

Caution: Never tamper with Test Standards. They should not be used unless they are completely intact.

During each test, the instrument looks at the full range of x-ray spectrum and continuously corrects for cross-element interference.

Testing Prepared Samples

Set the NITON test platform on a flat, solid surface. Slide out the drawer and place the sample cup mylar side facing up in the holder and slide the drawer shut. Insert the instrument into the nose cone adaptor so that the LCD screen is facing in the same side as the test platform drawer and follow ex-situ bulk sample instructions

THE DATA ENTRY SCREEN

The **Data Entry Screen** is accessed whenever you select the **Data Entry** icon from any screen. This screen allows you to input data in several different fields, or categories, concerning your sample. These fields are saved along with the reading, and allow you to associate important information about the sample directly with the reading, so that you have a full description of the sample tied into the reading itself.

Once you have input data into a field, that information carries over into the next reading, so that you only have to input the information that has changed since the last reading. For example, if you are analyzing several samples of a particular lot, you only need to input the lot information once during that series of readings, changing only the sample name.

Standard Soil Mode Data Entry Screens

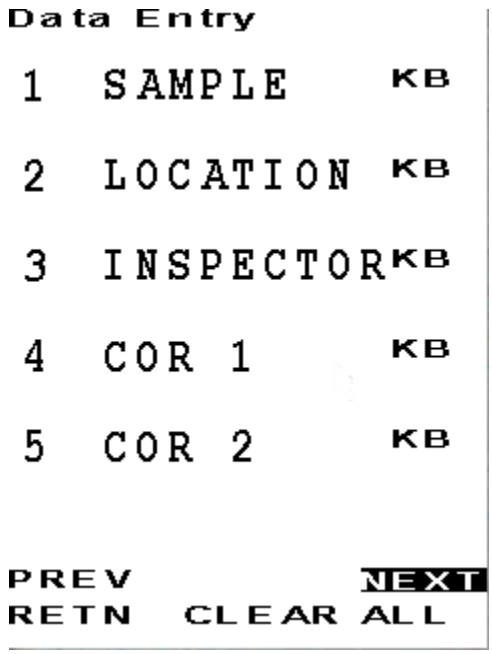


Figure 6-9a

This is the first section of the **Standard Soil Data Entry Screen**. There are five parameters in this section.

Selecting **Sample** allows you to input the sample name parameter

Selecting **Location** allows you to input the particular location information, if known

Selecting **Inspector** allows you to specify the inspector.

Selecting **Cor 1** allows you to specify the sample's first GPS coordinate.

Selecting **Cor 2** allows you to specify the sample's second GPS coordinate.

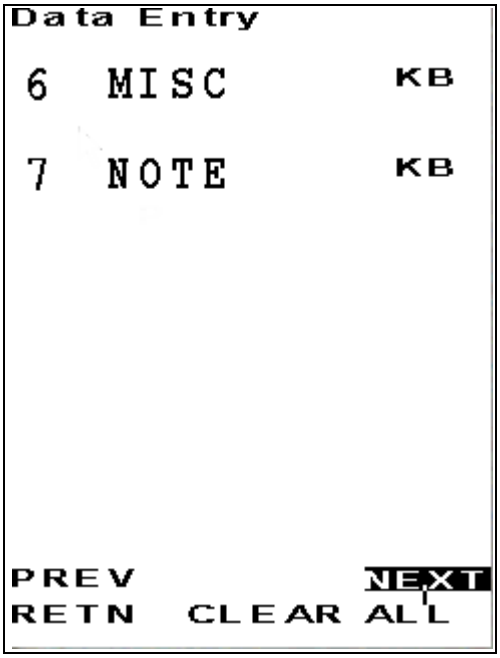


Figure 6-9b

This is the second section of the **Standard Soil Data Entry Screen**. There are two parameters in this section.

Selecting **Misc** allows you to input miscellaneous parameters

Selecting **Note** allows you to input notes on the sample

Data Entry Screens for all other Bulk Modes

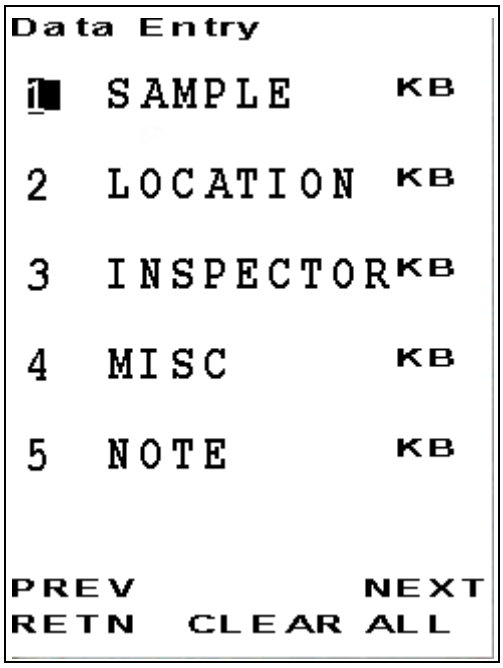


Figure 6-9d

This is the only section of the **Data Entry Screen**. There are five parameters in this section.

Selecting **Sample** allows you to input the sample name parameter

Selecting **Location** allows you to input the particular location information, if known

Selecting **Inspector** allows you to specify the inspector.

Selecting **Misc** allows you to input miscellaneous parameters

Selecting **Note** allows you to input notes on the sample

SETTING UP CUSTOM BARCODES

You can create custom barcodes on your computer using any modern spreadsheet or word processing program. You will need to acquire and install a 3 of 9 barcode font. Once you install the font, it will be available to any program on your computer. In your program of choice, type in the text that you want to input into the analyzer in the following manner:

(R/A/C(Field Number)) (Text) - ex.'R01 CLAY-015'

Always start with an asterisk. This lets the analyzer know the following data is to be read in. Then type either R, A, or C, followed by the field number. R is a command meaning "replace any data in this field with the following data", A is a command meaning "append the following data to the data already in the field", and C is a command meaning "Clear this field". The fields can contain a maximum of 25 characters, although they may be shortened to display on the screen. Always end with an asterisk. This lets the instrument know the barcode is complete.

Some examples:

R01 DRIPLINE001

This will replace the data in field 01 with "DRIPLINE001"

A02 -A

This will append the text "-A to the data currently in field 02 {77) to create the new designation "77-A".

C03

This will clear field 03, leaving it blank.

C00

This will clear the current field, 00 always refers to the currently selected field.

C99

This will clear all fields, 99 always refers to all fields.

When you have entered all of the data, change the font used to the 3of9 font, and your barcodes are ready for printing.Use a laser printer or a good quality inkjet for printing so your barcodes will be crisp and easy to read. Make sure you leave enough white space on the paper around the bar codes that they will be easy to read. Your analyzer will be able to scan the barcode once you print it.

NAVIGATING THE DATA ENTRY SCREEN

Figure 4-5

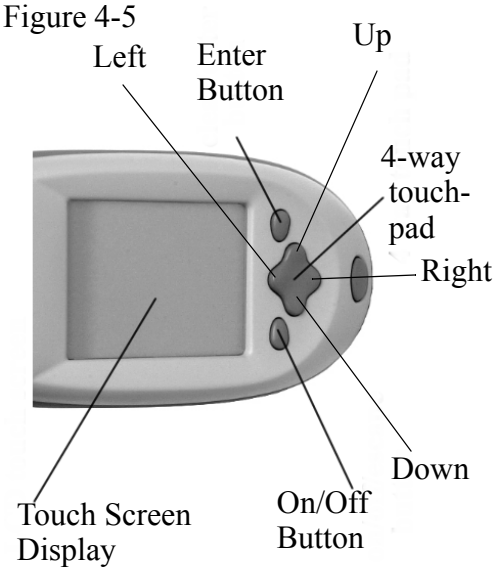


Figure 6-10

The following description of screen navigation using the control panel assumes that the instrument is held so that the display is rotated to the left as in the figure above.

- To move from column to column, use the Right and Left portion of the 4-way touch pad.
- To move from row to row, use the Up and Down portions of the 4-way touch pad.
- To access the “Return”, “Clear”, and “All” buttons, press the On/Off button on the control panel once. To return to the parameter settings, press the On/Off button again. This is a toggle between those two screen areas.
- To select the highlighted option, press the Enter button on the control panel.

The **Data Entry** Screen is divided into sections of 3 setting parameters. By using the Down portion of the 4-way touch pad when you are on the last row of a section, the display will change to the next section. By using the Up portion of the 4-way touch pad when you are on the first row of a section, the display will change to the previous section.

By selecting the **Return** screen button, you will exit the **Data Entry** Screen. You will enter Data Viewing Mode, and be unable to edit any of the settings. Selecting the **Clear** screen button will clear the present setting, and selecting the **All** screen button will clear all the settings.

THE VIRTUAL KEYBOARD

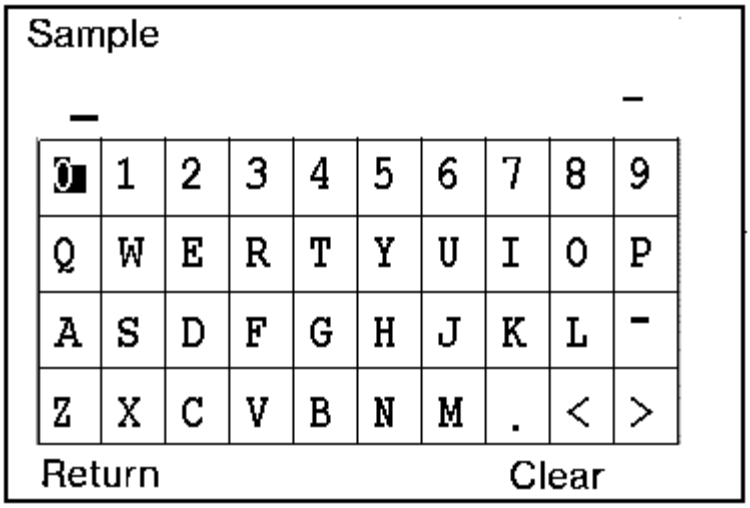


FIGURE 6-11

The Virtual Keyboard is a full alphanumeric keyboard which appears on the LCD Touch Screen Display. You can use the Virtual Keyboard either with the four-way touch pad and control panel buttons, or using the touch screen display directly.

At the top of the screen is the data field you are entering data for, in this case, “Sample”, Directly underneath is the data you are entering, in this case “DRIPLINE001”, On this line also is the underscore cursor. This graphically shows where the next character will be placed. Up to 25 characters can be stored in the data fields.

Next is the Virtual Keyboard itself, with numbers 0-9, letters A-Z, and special characters *,<,>, and -.

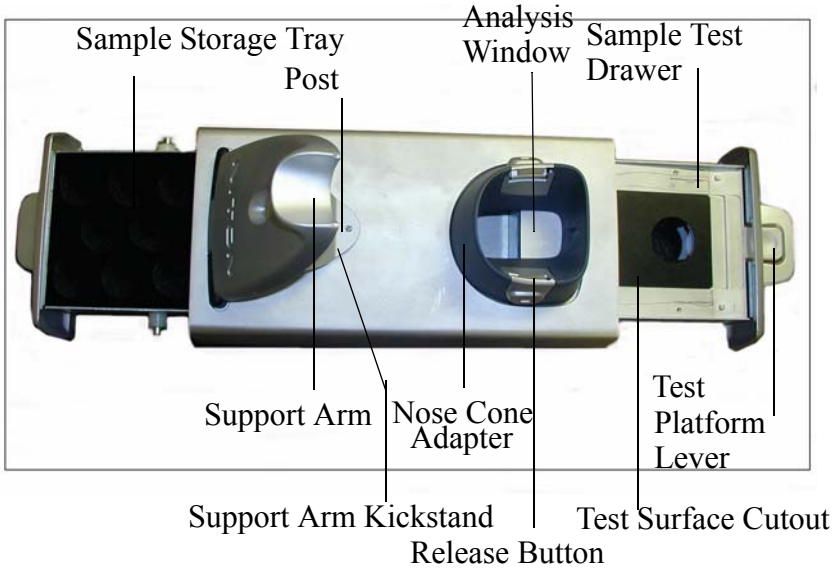
Last is the control button line. This contains the screen buttons for Return and Clear.

When using the four-way touch pad and control buttons, pressing the On/Off button allows you access to the Return and Clear screen buttons. The Return screen button will enter the data and return you to the Data Entry Screen, while the Clear screen button will clear the data you have

All screen areas can be directly accessed using the LCD Touch Screen.

NITON LEAD PAINT TEST PLATFORM

Figure 6-25



The NITON Lead Paint Test Platform is designed to facilitate bulk sample testing using the NITON XLi Series Lead Paint Analyzers.

Using the Lead Paint Test Platform for Bulk Analysis

1. Place the NITON Test Platform on a flat, solid surface with the sample test drawer towards you.
2. Place the XLi in the Nose Cone Adapter with the Analyzer's Analysis Window against the test stand's analysis window and the LCD Screen towards you.
3. Place the clear Mylar and foam support part into the opening in the test surface with the mylar facing up.
4. Scan the sample's bar code with the NITON XLi Analyzer's Integrated Bar Code Scanner.
5. Place the prepared sample cup into the foam support with the mylar facing up
6. Depress the Test Platform Lever and push the Sample Test Drawer fully closed.
7. Initiate a test per the procedure Analyzing Bulk Samples on Chapter 6 - page 8.

Repeat steps 4-7 as required.

NITON RCRA Verification Response Sample

This sample contains 7 0f the 8 RCRA metals as follows:

As, Ba, Cd, Cr, Pb, Se, and Ag

NITON may recommend the analysis of this sample if you question the data that the instrument is displaying for the above elements.

CERTIFIED VALUES FOR NIST STANDARDS

The three NIST soil samples included with your bulk testing kit (Low, Medium, and High) are certified to the following specifications in these selected elements:

Low Standard - NIST #2709

Element	Mass Fraction %	Variation %		Element	Mass Fraction µg/g	Variation µg/g
Aluminum	7.50	± 0.06		Antimony	7.9	± 0.6
Calcium	1.89	± 0.05		Arsenic	17.7	± 0.8
Iron	3.50	± 0.11		Barium	968.0	± 40
Magnesium	1.51	± 0.05		Cadmium	0.38	± 0.01
Phosphorus	0.062	± 0.005		Chromium	130.0	± 4.0
Potassium	2.03	± 0.06		Cobalt	13.4	± 0.7
Silicon	29.66	± 0.23		Copper	34.6	± 0.7
Sodium	1.16	± 0.03		Lead	18.9	± 0.5
Sulphur	0.089	± 0.002		Manganese	538.0	± 17.0
Titanium	0.342	± 0.024		Mercury	1.40	± 0.08
		±		Nickel	88.0	± 5.0
		±		Selenium	1.57	± 0.08
		±		Silver	0.41	± 0.03
		±		Strontium	231.0	± 2.0
		±		Thallium	0.74	± 0.05
		±		Vanadium	112.0	± 5.0
				Zinc	106.0	± 3.0

The complete Certificate of Analysis can be obtained from the NIST web site at: http://patapasco.nist.gov/smcatalog/certificates/2709.pdf

Non-Certified Values - NIST Standard 2709

Element	Mass Fraction %		Element	Mass Fraction µg/g
Carbon	1.2		Cerium	42.0
			Cesium	5.3
			Dysprosium	3.5
			Europium	0.9
			Gallium	14.0
			Gold	0.3
			Hafnium	3.7
			Holmium	0.54
			Iodine	5.0
			Lanthanum	23.0
			Molybdenum	2.0
			Neodymium	19.0
			Rubidium	96.0
			Samarium	3.8
			Scandium	12.0
			Thorium	11.0
			Tungsten	2.0
			Uranium	3.0
			Ytterbium	1.6
			Yttrium	18.0
			Zirconium	160.0

Medium Standard - NIST # 2711

Element	Mass Fraction %	Variation %		Element	Mass Fraction µg/g	Variation % µg/g
Aluminum	6.53	± 0.09		Antimony	19.4	± 1.8
Calcium	2.88	± 0.08		Arsenic	105.0	± 8.0
Iron	2.89	± 0.06		Barium	726.0	± 38.0
Magnesium	1.05	± 0.03		Cadmium	41.7	± 0.25
Phosphorus	0.086	± 0.007		Copper	114.0	± 2.0
Potassium	2.45	± 0.08		Lead	1162.0	± 31.0
Silicon	30.44	± 0.19		Manganese	638	± 28.0
Sodium	1.14	± 0.03		Mercury	6.25	± 0.19
Sulphur	0.042	± 0.001		Nickel	20.6	± 1.1
Titanium	0.306	± 0.023		Selenium	1.52	± 0.14
		±		Silver	4.63	± 0.39
		±		Strontium	245.3	± .0.7
		±		Thallium	2.47	± 0.15
		±		Vanadium	81.6	2.9
		±		Zinc	350.4	4.8

The complete Certificate of Analysis can be obtained from the NIST web site at: http://patapasco.nist.gov/smcatalog/certificates/2711.pdf

Non-Certified Values - NIST Standard 2711

Element	Mass Fraction %		Element	Mass Fraction µg/g
Carbon	2.0		Bromine	5.0
			Cerium	69.0
			Cesium	6.1
			Chromium	47.0

Element	Mass Fraction %		Element	Mass Fraction µg/g
			Cobalt	10.0
			Dysprosium	5.6
			Europium	1.1
			Gallium	15.0
			Gold	0.03
			Hafnium	7.3
			Holmium	1.0
			Indium	1.1
			Iodine	3.0
			Lanthanum	40.0
			Molybdenum	1.6
			Neodymium	31.0
			Rubidium	110.0
			Samarium	5.9
			Scandium	9.0
			Thorium	14.0
			Tungsten	3.0
			Uranium	2.6
			Ytterbium	2.7
			Yttrium	25.0
			Zirconium	230.0

High Standard - NIST # 2710

Element	Mass Fraction %	Variation %		Element	Mass Fraction µg/g	Variation % µg/g
Aluminum	6.44	± 0.08		Antimony	38.4	± 3.0
Calcium	1.25	± 0.03		Arsenic	626.0	± 38.0
Iron	3.38	± 0.10		Barium	707.0	± 51.0
Magnesium	0.853	± 0.042		Cadmium	21.8	± 0.2
Manganese	1.01	± 0.04		Copper	2950.0	± 130.0
Phosphorus	0.106	± 0.015		Lead	5532.0	± 80.0
Potassium	2.11	± 0.11		Mercury	32.6	± 1.8
Silicon	28.97	± 0.18		Nickel	14.3	± 1.0
Sodium	1.14	± 0.06		Silver	35.3	± 1.5
Sulfur	0.240	± 0.006		Vanadium	76.6	± 2.3
Titanium	0.283	± 0.010		Zinc	6952.0	± 91.0

The complete Certificate of Analysis can be obtained from the NIST web site at: http://patapasco.nist.gov/smcatalog/certificates/2710.pdf

Non-Certified Values - NIST Standard 2710

Element	Mass Fraction %		Element	Mass Fraction µg/g
Carbon	3.0		Bromine	6.0
			Cerium	57.0
			Cesium	107.0
			Chromium	39.0
			Cobalt	10.0
			Dysprosium	5.4
			Europium	1.0
			Gallium	34.0

Element	Mass Fraction %		Element	Mass Fraction µg/g
			Gold	0.6
			Hafnium	3.2
			Holmium	0.6
			Indium	5.1
			Lanthanum	34.0
			Molybdenum	19.0
			Neodymium	23.0
			Rubidium	120.0
			Samarium	7.8
			Scandium	8.7
			Strontium	330.0
			Thallium	1.3
			Thorium	13.0
			Tungsten	93.0
			Uranium	25.0
			Ytterbium	1.3
			Yttrium	23.0

Chapter 7

PRECIOUS METALS MODE

USING PRECIOUS METALS MODE

Precious Metals Mode is not enabled on your NITON XLi analyzer. **For more information on this feature please contact NITON's Customer Service Department in the United States, Toll free, at (800) 875-1578, or outside the United States at + 1-978-670-7460 or your authorized NITON Service Center.**

Afterword

ROUTINE MAINTENANCE GUIDELINES

BATTERY PACK AND BATTERY CHARGER

Each NITON XLi 300A/700A Series Lead-based-Paint Analyzer is shipped with two lithium ion battery packs. When fully charged, the battery pack provides approximately 8-12 hours of use, depending on duty cycle.

There are two types of battery chargers distributed with NITON XRF Analyzers. The European Union battery charger is distributed only in the EU and carries the CE mark. The standard battery chargers are distributed everywhere else.

The EU battery charger has a single light which informs you of the charge status of the battery, When connected to a wall outlet and the battery charger port on the battery, the EU battery charger light will blink while charging the battery, and will remain steadily on when the charge is complete.

The standard battery charger has 2 lights in the top of the battery charger. When connected to a wall outlet, the lights will display the following information:

Left Hand Light	Right Hand Light	Battery Status
ON	OFF	CHARGING
ON	ON	80% CHARGED
OFF	ON	COMPLETE
BLINK	BLINK	ERROR

Left Hand Light	Right Hand Light	Battery Status
OFF	OFF	NO BATTERY

Replacement battery packs (NITON part number 600-640) may be ordered from NITON in the United States, toll free, at (800) 875-1578, or outside the United States, at +1-978-670-7460, or from your local Authorized NITON Service Center.

Note: Before beginning a test, be certain that the battery has sufficient charge.

Caution

Do not leave the battery pack connected to the charger for excessive periods of time. Overnight recharging is recommended.

Caution

Store the instrument and the spare battery packs in a cool place, away from direct sunlight.

Replacing The Battery Pack

1. Rest your NITON XLi analyzer on a clean surface. Avoid damp or dusty environments.
2. Press in the battery housing latch.

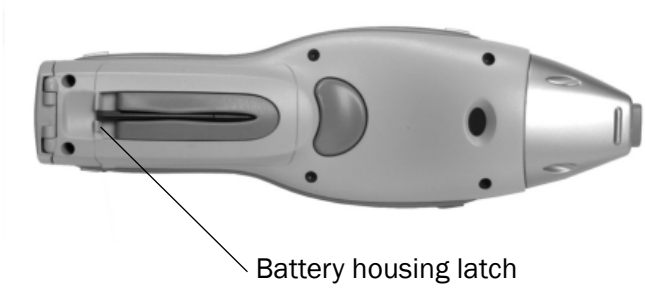


Figure Afterword - 1

3. Slide out the battery pack out.
4. Fully insert the new battery pack, making sure that it seats properly.
5. Press in until the latch resets.

Recharging The Battery Pack

Fully recharging a NITON XLi battery pack takes approximately 2 hours.

1) Remove the battery from the instrument.

2) Plug one end of the AC Adapter/Battery Charger (AC adapter or 12V adapter) into the battery charger port.

3) Plug the other end of the AC adapter into a wall socket.

Figure Afterword-2

Caution

Do not force the charger into the RS-232 port!

Caution

Do not let the battery pack recharge for excessive periods of time.

Caution

Do not store battery packs or charger in direct sunlight.

MAINTENANCE, CLEANING AND REPAIRS

To ensure the reliability, durability, and performance of your NITON XLi 300A/700A Series Lead-based-Paint Analyzer, keep it clean—especially the transparent Kapton window covering the analysis window. Clean the Kapton window gently with a cotton swab. Clean the body of the instrument with a soft cloth. Never use detergents, or solvents on your analyzer, or immerse your analyzer in water. If the Kapton window becomes frayed, ripped, or contaminated with metal particulates, replace it with a new window. Kapton windows (NITON P/N 187-095) may be ordered from Thermo Electron Corporation's Service Department in the United States, toll free, at (800) 875-1578, or outside the United States, at +1-978-670-7460 or from your local Authorized NITON Service Center.

From time to time, your touch screen will need cleaning. NITON recommends that you use a lens cleaning solution with a soft cloth. Do not use water to clean your NITON Analyzer.

WARNING!

All Service, except exterior cleaning and Kapton window replacement, must be performed by Thermo Electron Corporation. Do not attempt to make repairs yourself. Opening the case of your NITON will void the instrument Warranty in its entirety.

Caution

Always obtain a Return Authorization (RA) number from Thermo Electron Corporation's Service Department in the United States, toll free, at (800) 875-1578, or outside the United States, at +1-978-670-7460 before returning your instrument to the NITON Service Department or local Authorized NITON Service Center.

Replacing the Kapton Window:

1. Remove the three Phillips head screws.

Figure Afterword-4

2. Remove the face plate and place it face down.

Figure Afterword-5

3. Remove the old Kapton window.
4. Clean the back surface of the face plate and install the new Window.

5. Turn the face plate over and replace it on the instrument's front end.

Figure Afterword-6

6. Reinstall the three screws, being careful not to over-tighten them.

Figure Afterword-7

STORING AND TRANSPORTING YOUR NITON XLi 300A/700A SERIES ANALYZER

All NITON XLi 300A/700A Series Lead-based-Paint Analyzers are transported in waterproof, drop-proof, fully padded carrying cases with padlocks. In most countries, NITON XRF analyzers may be transported by car or plane or shipped as an *ordinary* package. For most courier services, no special labels are required on the outside of the NITON instrument case or on additional packaging.

Figure Afterword-8

The padlocks are shipped with a default combination of “0-0-0”. If you change this combination, please inform NITON of the new combination when returning the unit for service.

To change the combination:

1: Dial the default combination to open the lock, and pull out the shackle.

2: Rotate the shackle 180 degrees and push it down as far as it can go.

3:While holding the shackle down, rotate it 90 degrees back in either direction and release shackle.

4: Change the dial settings to the desired combination, record the combination, and without disturbing the dials, rotate the shackle back 90 degrees to the position it had in step 2.

5: Pull shackle out and rotate it 180 degrees and secure it. Your lock now has its own secret combination.

Caution

Always transport the unit in its padded carrying case, and store the NITON Analyzer in its case whenever it is not being used.

Caution

In most cases, no notification is required if transporting within state boundaries. This may not be the case when entering federal properties.

Caution

Within the United States, always keep a copy of the US DOT compliance statement in your NITON instrument case at all times. A copy is included with your instrument.

Caution

Always follow all pertinent local and national regulations and guidelines, wherever your XLi 300A/700A series analyzer is transported or used.

Caution

Always obtain a Return Authorization (RA) number from Thermo Electron Corporation's Service Department in the United States, toll free, at (800) 875-1578, or outside the United States, at +1-978-670-7460 before returning your instrument to the Service Department or to your local Authorized NITON Service Center.

Caution

If you return your NITON instrument without the carrying case, you will void your NITON XLi 300A/700A Series Analyzer's warranty in its entirety. You will be billed for a replacement case plus any repairs resulting from improper shipping.

Caution

Always remove the battery pack when transporting or storing your instrument.

THE NITON SPECTRUM ANALYZER CONFORMS TO THE CONDITIONS AND LIMITATIONS SPECIFIED IN 49 CFR 173.424 FOR EXCEPTED RADIOACTIVE MATERIAL. EXCEPTED-PACKAGE INSTRUMENTS AND ARTICLES, N.O.S. UN-2911.

APPENDIX A

X-RAY EMISSION ENERGIES, ARRANGED BY ELEMENT, BY ATOMIC NUMBER

Table A-1

Element	Symbol	Atomic Number	Atomic Weight	Ka	Kb	La	Lb	Lg
sodium	Na	11	22.99	1.0	1.1			
magnesium	Mg	12	24.31	1.3	1.3			
aluminum	Al	13	26.98	1.5	1.6			
silicon	Si	14	28.09	1.7	1.8			
phosphorus	P	14	30.97	2.0	2.1			
sulphur	S	16	32.07	2.3	2.5			
chlorine	Cl	17	35.45	2.6	2.8			
argon	Ar	18	39.98	3.0	3.2			
potassium	K	19	39.10	3.3	3.7			
calcium	Ca	20	40.80	3.7	4.0			
scandium	Sc	21	44.96	4.1	4.5			
titanium	Ti	22	47.90	4.5	4.9			
vanadium	V	23	50.94	4.9	5.4			
chromium	Cr	24	52.00	5.4	5.9			
manganese	Mn	25	54.94	5.9	6.5			
iron	Fe	26	55.85	6.4	7.1			
cobalt	Co	27	58.93	6.9	7.6			
nickel	Ni	28	58.70	7.5	8.3			
copper	Cu	29	63.55	8.0	8.9			
zinc	Zn	30	65.38	8.6	9.6			
gallium	Ga	31	69.72	9.2	10.3			
germanium	Ge	32	72.59	9.9	11.0			
arsenic	As	33	74.92	10.5	11.7			
selenium	Se	34	78.96	11.2	12.5			
bromine	Br	35	79.90	11.9	13.3			
krypton	Kr	36	83.80	12.6	14.1			
rubidium	Rb	37	85.47	13.4	15.0			
strontium	Sr	38	87.62	14.1	15.8			
yttrium	Y	39	88.91	14.9	16.8			
zirconium	Zr	40	91.22	15.7	17.7			
niobium	Nb	41	92.91	16.6	18.6			
molybdenum	Mo	42	95.94	17.4	19.6			
technetium	Tc	43	98.00	18.3	20.6	2.4	2.5	2.8

ruthenium	Ru	44	101.07	19.2	21.7	2.6	2.6	3.0
rhodium	Rh	45	102.91	20.2	22.8	2.7	2.8	3.1
palladium	Pd	46	106.42	21.1	23.9	2.8	3.0	3.3
silver	Ag	47	107.87	22.1	25.0	3.0	3.2	3.5
cadmium	Cd	48	112.41	23.1	26.1	3.1	3.3	3.7
indium	In	49	114.82	24.1	27.4	3.3	3.5	3.9
Tin	Sn	50	118.71	25.2	28.6	3.4	3.7	4.1
antimony	Sb	51	121.76	26.3	29.9	3.6	3.8	4.3
tellurium	Te	52	127.60	27.4	31.1	3.8	4.0	4.6
iodine	I	53	126.90	28.5	32.4	3.9	4.2	4.8
xenon	Se	54	131.30	29.7	33.8	4.1	4.4	5.0
cesium	Cs	55	132.91	30.9	35.1	4.3	4.6	5.3
barium	Ba	56	137.33	32.1	36.6	4.5	4.8	5.5
lanthanum	La	57	138.91	33.3	38.0	4.7	5.0	5.8
cerium	Ce	58	140.12	34.6	39.5	4.8	5.3	6.0
praseodymium	Pr	59	140.91	35.9	41.0	5.0	5.5	6.3
neodymium	Nd	60	144.24	37.2	42.5	5.2	5.7	6.6
promethium	Pm	61	145.00	38.5	44.0	5.4	6.0	6.9
samarium	Sm	62	150.35	39.9	45.6	5.6	6.2	7.2
europium	Eu	63	151.96	41.3	47.3	5.8	6.5	7.5
gadolinium	Gd	64	157.25	42.8	48.9	6.1	6.7	7.8
terbium	Tb	65	158.92	44.2	50.7	6.3	7.0	8.1
dysproium	Dy	66	162.50	45.7	52.4	6.5	7.3	8.4
holmium	Ho	67	164.93	47.3	54.2	6.7	7.5	8.7
erbium	Er	68	167.26	48.8	56.0	6.9	7.8	9.1
thulium	Tm	69	168.93	50.4	57.8	7.2	8.1	9.4
ytterbium	Yb	70	173.04	52.0	59.7	7.4	8.4	9.8
lutetium	Lu	71	174.97	53.7	61.6	7.7	8.7	10.1
hafnium	Hf	72	178.49	55.4	63.6	7.9	9.0	10.5
tantalum	Ta	73	180.95	57.1	65.6	8.1	9.3	10.9
tungsten	W	74	183.85	58.9	67.6	8.4	9.7	11.3
rhenium	Re	75	186.20	60.7	69.7	8.7	10.0	11.7
osmium	Os	76	190.20	62.5	71.8	8.9	10.4	12.1
iridium	Ir	77	192.20	64.3	73.9	9.2	10.7	12.5
platinum	Pt	78	195.09	66.2	76.1	9.4	11.0	12.9
gold	Au	79	196.97	68.2	78.4	9.7	11.4	13.4
mercury	Hg	80	200.59	70.2	80.7	10.0	11.8	13.8
thallium	Tl	81	204.37	72.2	83.0	10.3	12.2	14.3
lead	Pb	82	207.19	74.2	85.4	10.5	12.6	14.8
bismuth	Bi	83	208.98			10.8	13.0	15.2
polonium	Po	84	(209.0)			11.1	13.4	15.7
astatine	At	85	(210.0)			11.4	13.9	16.2
radon	Ra	86	(222.0)			11.7	14.3	16.8
francium	Fr	87	(223.0)			12.0	14.8	17.3
radium	Ra	88	(226.0)			12.3	15.2	17.8
actinium	Ac	89	(226.0)			12.7	15.7	18.4
thorium	Th	90	232.04			13.0	16.2	19.0
protactinium	Pa	91	(231.0)			13.3	16.7	19.6
uranium	U	92	238.03			13.6	17.2	20.2
neptunium	Np	93	237.00			13.9	17.7	20.8
plutonium	Pu	94	242.00			14.3	18.3	21.4

Table A-1 (continued)

:

APPENDIX B

X-RAY EMISSION ENERGIES ARRANGED ALPHABETICALLY BY ELEMENT

Table B-1

Element	Symbol	Atomic Number	Atomic Weight	Ka	Kb	La	Lb	Lg
actinium	Ac	89	(226.0)			12.7	15.7	18.4
aluminum	Al	13	26.98	1.5	1.6			
antimony	Sb	51	121.76	26.3	29.9	3.6	3.8	4.3
arsenic	As	33	74.92	10.5	11.7			
astatine	At	85	(210.0)			11.4	13.9	16.2
barium	Ba	56	137.33	32.1	36.6	4.5	4.8	5.5
bismuth	Bi	83	208.98			10.8	13.0	15.2
bromine	Br	35	79.90	11.9	13.3			
cadmium	Cd	48	112.41	23.1	26.1	3.1	3.3	3.7
calcium	Ca	20	40.80	3.7	4.0			
cerium	Ce	58	140.12	34.6	39.5	4.8	5.3	6.0
cesium	Cs	55	132.91	30.9	35.1	4.3	4.6	5.3
chlorine	Cl	17	35.45	2.6	2.8			
chlorine	Cl	17	35.45	2.6	2.8			
chromium	Cr	24	52.00	5.4	5.9			
cobalt	Co	27	58.93	6.9	7.6			
copper	Cu	29	63.55	8.0	8.9			
dysprosium	Dy	66	162.50	45.7	52.4	6.5	7.3	8.4
erbium	Er	68	167.26	48.8	56.0	6.9	7.8	9.1
europium	Eu	63	151.96	41.3	47.3	5.8	6.5	7.5
francium	Fr	87	(223.0)			12.0	14.8	17.3
gadolinium	Gd	64	157.25	42.8	48.9	6.1	6.7	7.8
gallium	Ga	31	69.72	9.2	10.3			
germanium	Ge	32	72.59	9.9	11.0			
gold	Au	79	196.97	68.2	78.4	9.7	11.4	13.4
hafnium	Hf	72	178.49	55.4	63.6	7.9	9.0	10.5
holmium	Ho	67	164.93	47.3	54.2	6.7	7.5	8.7
indium	In	49	114.82	24.1	27.4	3.3	3.5	3.9
iodine	I	53	126.90	28.5	32.4	3.9	4.2	4.8
iridium	Ir	77	192.20	64.3	73.9	9.2	10.7	12.5
iron	Fe	26	55.85	6.4	7.1			
krypton	Kr	36	83.80	12.6	14.1			
lanthanum	La	57	138.91	33.3	38.0	4.7	5.0	5.8
lead	Pb	82	207.19	74.2	85.4	10.5	12.6	14.8
lutecium	Lu	71	174.97	53.7	61.6	7.7	8.7	10.1
magnesium	Mg	12	24.31	1.3	1.3			
manganese	Mn	25	54.94	5.9	6.5			
mercury	Hg	80	200.59	70.2	80.7	10.0	11.8	13.8
molybdenum	Mo	42	95.94	17.4	19.6			

neodymium	Nd	60	144.24	37.2	42.5	5.2	5.7	6.6
neptunium	Np	93	237.05			13.9	17.7	20.8
nickel	Ni	28	58.70	7.5	8.3			
niobium	Nb	41	92.91	16.6	18.6			
osmium	Os	76	190.20	62.5	71.8	8.9	10.4	12.1
palladium	Pd	46	106.42	21.1	23.9	2.8	3.0	3.3
phosphorus	P	14	30.97	2.0	2.1			
platinum	Pt	78	195.09	66.2	76.1	9.4	11.0	12.9
plutonium	Pu	94	244.00			14.3	18.3	21.4
polonium	Po	84	(209.0)			11.1	13.4	15.7
potassium	K	19	39.10	3.3	3.7			
praseodymium	Pr	59	140.91	35.9	41.0	5.0	5.5	6.3
promethium	Pm	61	(145.0)	38.5	44.0	5.4	6.0	6.9
protactinium	Pa	91	231.0			13.3	16.7	19.6
radium	Ra	88	(226.0)			12.3	15.2	17.8
radon	Rn	86	(222.0)			11.7	14.3	16.8
rhenium	Re	75	186.20	60.7	69.7	8.7	10.0	11.7
rhodium	Rh	45	102.91	20.2	22.8	2.7	2.8	3.1
rubidium	Rb	37	85.47	13.4	15.0			
samarium	Sm	62	150.35	39.9	45.6	5.6	6.2	7.2
scandium	Sc	21	44.96	4.1	4.5			
selenium	Se	34	78.96	11.2	12.5			
silicon	Si	14	28.09	1.7	1.8			
silver	Ag	47	107.87	22.1	25.0	3.0	3.2	3.5
sodium	Na	11	22.99	1.0	1.1			
strontium	Sr	38	87.62	14.1	15.8			
sulphur	S	16	32.07	2.3	2.5			
tantalum	Ta	7	180.95	57.1	65.6	8.1	9.3	10.9
tellurium	Te	52	127.60	27.4	31.1	3.8	4.0	4.6
terbium	Tb	65	158.92	44.2	50.7	6.3	7.0	8.1
thallium	Tl	81	204.37	72.2	83.0	10.3	12.2	14.3
thorium	Th	90	232.04			13.0	16.2	19.0
thulium	Tm	69	168.93	50.4	57.8	7.2	8.1	9.4
tin	Sn	50	118.71	25.2	28.6	3.4	3.7	4.1
titanium	Ti	22	47.90	4.5	4.9			
tungsten	W	74	183.85	58.9	67.6	8.4	9.7	11.3
uranium	U	92	238.03			13.6	17.2	20.2
vanadium	V	23	50.94	4.9	5.4			
xenon	Se	54	131.30	29.7	33.8	4.1	4.4	5.0
ytterbium	Yb	70	173.04	52.0	59.7	7.4	8.4	9.8
yttrium	Y	39	88.91	14.9	16.8			
zinc	Zn	30	65.38	8.6	9.6			
zirconium	Zr	40	91.22	15.7	17.7			

Table B-1 (continued)

APPENDIX C

SPECTRAVIEW

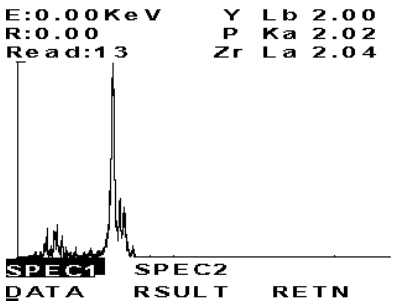
SpectraView enables you to qualitatively analyze the fluorescent x-rays of most of the elements in the periodic table from sodium (element 19) through plutonium (element 94) in a given sample. For a complete list of elements and their fluorescent x-rays see Appendix A. In SpectraView Mode, the spectrum is displayed in a linear scale, autoscaled logarithmically so that the highest peak on the screen reaches the top of the scale.

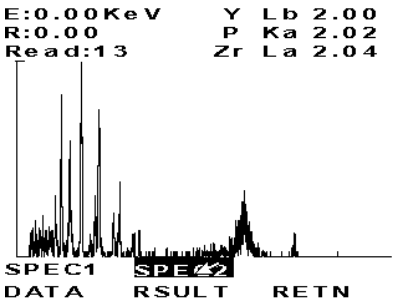
How to Use SpectraView

You can toggle to the SpectraView screen after taking a measurement in any mode by selecting the **"SPTR"** screen button. Once you are in SpectraView, you can use the up and down positions of the 4-way touch pad to scroll through the spectrum, or you can tap on the spectrum display with the stylus to place the cursor at the point you tapped. The vertical cursor line indicates the current position along the spectrum.

Multiple Test Spectra

When you are taking readings using more than one source, you can view the different spectra produced by the different sources from the spectra display. Choose the Spec1, Spec2, or Spec3 screen buttons on the bottom of the display to select that spectrum. If no reading was taken by a given source, the spectrum shown will be a flat line.





Viewing the Information in SpectraView Mode

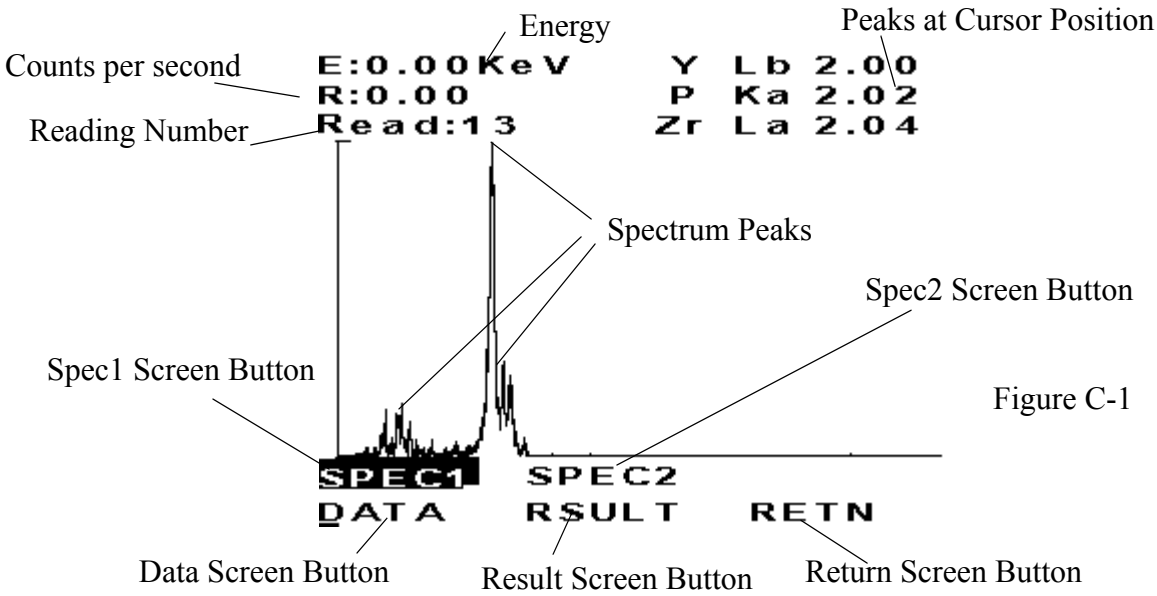


Figure C-1

By default, the following information is shown along with the spectrum:

The **position of the cursor** on the energy scale (Top Left), in the form "E: x.xx KeV", where KeV is thousands of electron volts.

The **Count Rate** or counts per second (Top Left, under the energy position), in the form “R:x.xx”.

Ka, **Kb**, **La, Lb**, and/or **Lg** peaks of the three elements closest to where your cursor is positioned on the energy scale (Top Right). This information is written with the element symbol first, followed by either Ka (K shell alpha peak), Kb (K shell beta peak), La (L shell alpha peak), La (L shell beta peak), or Lg (L shell gamma peak). An example would be "Al Ka 1.5"

The **Reading** number (Top Left, under the Resolution) in the form "Read:x", where x is the Reading number.

The “**DATA**” screen button will display the information stored with the reading.

The "**RSLT**" screen button will return you to the measurement **Results Screen**.

The “**RETN**“ screen button will return you to the previous menu.

Above and to the right of the spectrum is a list of the **elements with XRF energies** close to where you are currently looking on the spectrum. To determine if a given element is present, look at the count rate at that cursor position.

The “Spec1” button will display the display the spectrum produced by excitation from the first source.

The “Spec2” button will display the display the spectrum produced by excitation from the second source.

The “Spec3” button will display the display the spectrum produced by excitation from the third source.

The currently selected Spec screen button will be displayed in inverse video - i.e. white text in a black box.

SpectraView cannot be used to determine exact element percentages in a sample.

SpectraView Zoom

Use the SpectraView zoom feature to look at a part of the spectrum in greater detail.

Use the left button on the 4-way touch pad to expand the spectrum, centered on the position of the cursor.

Use the right button on the 4-way touch pad to contract the spectrum, centered on the position of the cursor.

APPENDIX D:

Summary of Warnings

WARNING!

Do not attempt to use this instrument without first reading and understanding the entire User's Guide!

WARNING!

It is important that the date and time information displayed on the Date and Time screen is correct. If either the date or time is incorrect, the information stored with your readings will be incorrect. In addition, an incorrect date prevents the instrument from properly compensating for normal source decay - causing erroneous analysis results for instruments equipped with ^{109}Cd sources. This information must be correct before proceeding with testing.

WARNING!

Always be aware of the location of your instrument's radioactive sources and the direction of their beam of X-rays. The location of the sources is at the front end of the instrument.

WARNING!

Always treat radiation with respect. Do not hold your instrument near the Kapton window during testing. Never point your instrument at yourself or anyone else when the shutter is open.

WARNING!

In the unlikely event that the shutter becomes stuck in the open position, remove the battery (see Battery Pack and Battery Charger - Routine Maintenance Guidelines - Note: All shutters will close immediately and remain locked in the closed position when the battery pack is not attached to the instrument), replace the instrument in its shielded holster, place the holster in the shielded carrying case, and call Thermo Electron Corporation's Service Department at (800) 875-1578 or +1-978-670-7460.

WARNING!

If your LCD Touch Screen displays the message "SHUTTER DOES NOT OPERATE", remove the battery (see Battery Pack and Battery Charger - Routine Maintenance Guidelines - Note: All shutters should close immediately and remain locked in the closed position when the battery pack is not attached to the instrument), replace the instrument in its shielded holster, place the holster in the shielded carrying case, and call Thermo Electron Corporation's Service Department at (800) 875-1578 or +1-978-670-7460.

WARNING!

Do not attempt to take measurements while downloading readings! This will generate an error requiring a system reset, and may corrupt your stored readings, requiring all stored readings to be erased.

WARNING!

The **four** LED warning lights are designed to blink only during instrument calibration (See Chapter 2 page 16) or during a measurement, where one or more of the shutters are open and the preconditions for operation are in effect. If the LED lights blink at any other time, disconnect the battery pack immediately, place the instrument in its shielded holster, place the holster in the shielded carrying case, and call Thermo Electron Corporation's Service Department in the United States, toll free, at (800) 875-1578, or outside the United States, at +1-978-670-7460, or your local Authorized NITON Service Center.

WARNING!

The preconditions for operation must be continued for the duration of the reading. If the preconditions are violated, all the shutters will close, and the measurement will end. The **four** LED lights will stop blinking, the shutters will close, and the measurement will end. The flashing of the LED lights is not synchronized to minimize power consumption.

WARNING!

All Service, except exterior cleaning and Kapton window replacement, must be performed by Thermo Electron Corporation. Do not attempt to make repairs yourself. Opening the case of your NITON will void the instrument Warranty in its entirety.

WARNING!

The Proximity Button must remain depressed for the duration of the reading in Standard Mode or K+L Mode. If the Proximity Button is released, the four LED lights will stop blinking, the shutter will close, and the measurement will end. The flashing of the LED lights is not synchronized to optimize power consumption.

WARNING!

When taking samples from a site where toxic chemicals may be present, always use gloves and respiration equipment for your own protection.

WARNING!

Do not hold bagged samples while testing.

WARNING!

Grinding and sifting dried samples produces dust. Even clean soil contains silica, which may be hazardous when airborne. Prepare all samples in a ventilated area; wear a mask, gloves, and an apron; and spread a drop cloth.

WARNING!

Tampering with the 5,500 ppm (lead high) lead-in-soil standard may cause exposure to lead dust. Keep all standards out of the reach of children.

APPENDIX E:

Summary of Cautions

Caution: Your XLi analyzer must have the correct time and date set in order to test samples correctly using the ^{109}Cd radioisotope source. Please make sure that the time and date are set correctly before testing.

Caution: Never turn off the instrument while data is being erased!

Caution: Enabling the backlight will reduce your battery pack operating time, requiring more frequent recharges.

Caution: Never tamper with Test Standards. They should not be used unless they are completely intact.

Caution: All test equipment must be kept clean to prevent contamination of samples.

Caution: Do not leave the battery pack connected to the charger for excessive periods of time. Overnight recharging is recommended.

Caution: Standard Thin Sample Mode should not be used for quantitative lead-paint testing. Use only the three Paint Testing modes to test lead-based paint.

Caution: Store the instrument and the spare battery packs in a cool place, away from direct sunlight.

Caution: Do not let the battery pack recharge for excessive periods of time.

Caution: Do not store battery packs or charger in direct sunlight.

Caution: Do not force the charger into the RS-232 port!

Caution: Always transport the unit in its padded carrying case, and store the NITON Analyzer in its case whenever it is not being used.

Caution: In most cases, no notification is required if transporting within state boundaries. This may not be the case when entering federal properties.

Caution: Within the United States, always keep a copy of the US DOT compliance statement in your NITON instrument case at all times. A copy is included with your instrument.

Caution: Always follow all pertinent local and national regulations and guidelines, wherever your XLi 300A/700A series analyzer is transported or used.

Caution: Always obtain a Return Authorization (RA) number from Thermo Electron Corporation's Service Department in the United States, toll free, at (800) 875-1578, or outside the United States, at +1-978-670-7460 before returning your instrument to the Service Department or to your local Authorized NITON Service Center.

Caution: If you return your NITON instrument without the carrying case, you will void your NITON XLi 300A/700A Series Analyzer's warranty in its entirety. You will be billed for a replacement case plus any repairs resulting from improper shipping.

Caution: Always remove the battery pack when transporting or storing your instrument.

Caution: Whenever you turn on your NITON XLi 300A/700A Series Analyzer after it has been off for more than 30 minutes, always re-calibrate your NITON XLi Analyzer's sample analysis electronics before you start to take readings. When the instrument is turned on after being off for more than 30 minutes, your NITON analyzer will require a 10 minute warm-up period before the instrument can be calibrated, unless this 10 minute warm-up period is manually overridden.

Caution: The initial calibration procedure using lead paint standards should be performed using a substrate known to be free of lead, such as the XLi User's Guide. Do not use the NITON case for a substrate.

Caution: Be certain to position the analyzer such that the instrument window completely covers the Lead Paint Standard.

Caution: Use of controls, adjustments or performance of procedures other than those specified herein may result in hazardous laser light exposure.

APPENDIX F:

Laser Device Notice

Thermo Electron Corporation products using lasers comply with US 21CFR1040.10, Subchapter J, and with IEC825/EN 60 825 or IEC825-1/EN 60 825-1, depending on date of manufacture. The laser classification is marked on one of the labels on the product.

Class 1 laser devices are not considered to be hazardous when used for their intended purpose. The following statement is required to comply with IUS and International regulations:

Caution

Use of controls, adjustments or performance of procedures other than those specified herein may result in hazardous laser light exposure.

Class 2 laser scanners use a low power, visible light diode. As with any very bright light source, such as the sun. the user should avoid staring directly into the light beam. Momentary exposure to a Class 2 laser is not known to be harmful.

APPENDIX G: WARRANTY

Thermo Electron will warranty parts and labor for any manufacturer's defects for the period of the Warranty. No precision instrument is warranted if crushed, dropped on the floor or in a bucket of water. All service, including repairs and routine maintenance, and re-sourcing, must be performed by Thermo Electron Corporation or by an Authorized NITON Service Facility. Any attempt to open the sealed plastic housing of your NITON instrument will nullify the instrument warranty in its entirety.

Limited Warranty Provision for Use with Purchase and License Agreement for Thermo Electron Corporation NITON XRF Detection instruments:

(a) Except as otherwise agreed in writing, Thermo Electron Corporation warrants, under normal conditions of operation, each product sold (except for components not of its manufacture) against defects of material and workmanship, provided that such product has been properly utilized. This warranty applies to the original purchaser only and shall commence to run from the date of shipment and shall continue for the warranty period, which is defined in the sales offer and confirmed in the invoice. In any event, Thermo Electron Corporation's liability for any such defects of material and workmanship shall not exceed the cost of replacement of defective parts upon timely notification of such defect in writing delivered to Thermo Electron Corporation's home office. Thermo Electron Corporation shall not be liable for damage or destruction caused during delivery or caused other than by employees of Thermo Electron Corporation.

(b) Material, accessories, parts, or items of equipment furnished by suppliers to Thermo Electron Corporation and used in the manufacture of Thermo Electron Corporation products are guaranteed by Thermo Electron Corporation only to the extent of the original manufacturer's express warranty to Thermo Electron Corporation for a period not to exceed the warranty period described in paragraph (a) above and provided that the purchaser shall have notified Thermo Electron Corporation so as to enable Thermo Electron Corporation to avail itself of its rights under such original manufacturer's express warranty.

(c) Thermo Electron Corporation shall, at its option, repair such defects or replace the parts or products found defective. All defective parts are to be returned, freight prepaid, immediately to Thermo Electron Corporation for inspection and credit. Thermo Electron Corporation will make no allowance for repairs or alterations made by the purchaser unless made with the advance written consent of Thermo Electron Corporation. Thermo Electron Corporation assumes no liability for costs of disassembly of defective parts and equipment. Shipment by purchaser of all repairs and replacements under this warranty are F.O.B. Thermo Electron Corporation's factory or authorized service representative and method of shipment will be determined by Thermo Electron Corporation. The purchaser will pay shipping costs and insurance in both directions of products, parts, or components shipped for warranty service hereunder. The purchaser will be responsible for risk of loss in both direction. Replaced parts or components will become the property of Thermo Electron Corporation. Replacement parts or components may contain recycled, refurbished, or remanufactured parts equivalent to new parts and shall be warranted for the remainder of the original warranty period for the products.

(d) Thermo Electron Corporation shall not be liable for delays, deprivation of use, or any other damages, direct or indirect, which may result to the purchaser because of defects in the product or because of the purchaser's inability to operate it or use it to his satisfaction. Thermo Electron Corporation will not be liable to anyone for special or consequential damages of any kind. Thermo Electron Corporation neither assumes nor authorizes any person to assume for it, any other obligation or liability with respect to Thermo Electron Corporation products.

Except for the foregoing express warranty, there are no warranties, representations, or guarantees, express or implied, except as are expressly set forth herein. The foregoing warranty is the only warranty made by Thermo Electron Corporation. Any implied warranty of merchantability or fitness for a particular purpose on this product is limited in duration to the warranty period duration of this written warranty. Some countries, and some states within the United States, do not allow limitations on how long an implied warranty lasts or the exclusion of limitation of incidental or consequential damages so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state and country to country.

Note: This warranty is non-transferable

ATTACHMENT B-6

PetroFlag™ Field Screening Procedures

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PetroFLAG is a registered trademark of Dexsil Corporation, US Patents 5,756,357 & 5,928,950 and 6,117,682

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Introduction to the PetroFLAG®U Hydrocarbon Analysis System

NOTE: PLEASE READ THE ENTIRE MANUAL BEFORE ATTEMPTING TO RUN THIS TEST

The PetroFLAG hydrocarbon analysis system is a broad spectrum field analytical tool suitable for any type of hydrocarbon contamination regardless of the source or state of degradation[1]. Unlike other field screening methods, the PetroFLAG system does not target specific compounds such as BTEX (Benzene, Toluene, Methylbenzene and Xylene) or PNAs (Poly-Nuclear Aromatics) that may be part of some hydrocarbon mixture. This makes the PetroFLAG system a very versatile analytical method that can be used on most hydrocarbon spills without prior knowledge of the BTEX or PNA content of the contaminant. The PetroFLAG system uses patented chemistry to respond to the broadest range of hydrocarbons possible. The PetroFLAG system is most sensitive to heavier hydrocarbons such as oils and greases and less sensitive to the lighter more volatile hydrocarbon fuels. The specially designed PetroFLAG analyzer allows the user to select, in the field, the response factor that is appropriate for the suspected contaminant at each site. The response factors for a number of contaminants are listed in Table 1. Using the selected response factor, the analyzer compensates for the relative response of each analyte and displays the correct concentration in ppm. The response curves for some typical hydrocarbon contaminants are plotted in Appendix A.

All chemical methods for hydrocarbon analysis in soil that are currently in use, whether they be field screening or laboratory methods, depend on solvent extraction to remove the hydrocarbons from the soil sample. The extraction efficiency for each method is a function of the solvent used and the extraction procedure. This efficiency is also dependent on many other factors such as the soil type, water content, pH, etc. Many EPA SW-846 methods use chlorinated solvents or Freon as extraction solvents. These solvents were originally chosen for their extraction efficiency of polar organic compounds and may not be appropriate for hydrocarbons. Furthermore, special measures need to be taken with these lab methods when the soil is wet.[2] The extraction efficiencies may be as low as 1%[3] in some cases.

The extraction solvent used in the PetroFLAG system has been carefully developed to give consistent extraction efficiencies over the range of soil types and conditions most commonly encountered in the field. The PetroFLAG solvent system contains no chlorofluorocarbons or chlorinated solvents. The extraction efficiency is unaffected by soil moisture and, in most cases, is up to 15%(w/w).[4]

Because the PetroFLAG system has such a broad response spectrum, there are situations where it will indicate a higher hydrocarbon concentration than other methods. This can be due to the higher extraction efficiency of the PetroFLAG extraction solution or the broader response range of the detection system. SW-846 method 8015B, for example, targets only a very narrow range of

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[1]Brake fluid, phosphate ester based hydraulic oil, and other soluble fluids, will not be detected by the PetroFLAG system.

[2]USEPA SW846 Method 3550A Ultrasonic Extraction Rev 1, November 1992

[3]Lee, W.E. III, Houchin, C.A. and Albergo, N., "TRPH Discrimination of Petroleum and Non-petroleum Organic Materials", *American Environmental Lab*, December 1993.

[4]The presence of water will cause a dilution effect resulting in a lower response. This effect can be corrected for, if the water content is known. (For a more complete discussion see “” singUthe PetroFLAG System: Effects of Soil Water Content on PetroFLAG Result)U

hydrocarbons typically in the "Diesel" or "Gasoline" range (DRO or GRO). This method does not detect oils or greases unless the analyst changes the method and specifically looks for the heavier compounds. Requesting 8015B for diesel range hydrocarbons may result in under reporting of the actual total hydrocarbon contamination when oils or greases are present. Method 418.1 is a more general method and detects any Freon extractable compounds that contain a C-H bond. This method has relatively poor extraction efficiencies with many soil types. For a more complete discussion of the comparability of hydrocarbon methods see Appendix B.

Since the PetroFLAG system responds to the full range of hydrocarbons it will also detect some naturally occurring hydrocarbon-like compounds. (Method 418.1 uses a silica column to remove some of these compounds, but will still detect naturally occurring terpenes and creosotes, etc.) Therefore, in situations where high organic content is suspected, background levels outside the spill site should be determined. This will help to identify any naturally occurring sources of hydrocarbons that may cause a positive interference with the test. In cases where there exists a high natural organic background, a "Soil Calibration" can, in limited circumstances, be used to correct readings for this positive interference. Note: Because of the broad spectrum screening nature of the test, naturally occurring waxes and oils can cause high readings; however, false negatives or under-reported levels are very unlikely.

The PetroFLAG system is a valuable field analytical tool when used as part of a systematic sampling plan. As part of any site work, always have the hydrocarbon contamination characterized at some point during the project by sending confirmation samples for closure to a certified laboratory. Since each laboratory method for petroleum hydrocarbons has a different target analyte and different response characteristics, use only appropriate methods for comparison. Furthermore, since the proficiency of laboratory methods for petroleum hydrocarbons varies from one laboratory to another; it is important to verify that the lab you use is proficient with the method you request. Always ask for QA/QC data and verify that the blanks, duplicates and spikes are within specification for the method. When using a lab that is new to you, send them proficiency samples of known concentrations and varying water content.

Lab results often contain one or more samples that are designated "ND" (none detected) without a qualifier. This type of reporting is misleading because information on the limit of quantification is not included. The designation "ND" never means zero ppm and should be followed by an indication of the detection limits of the method used to obtain the result, e.g., ND<40 ppm. In many cases the detection limits for a method will vary with sample size, dilution factors or extraction procedures and may not be the same for all samples in the sample batch. The detection limits for some of the common lab TPH methods are on the order of 40-50 ppm. Therefore, when comparing laboratory data it is important to know the realized detection limits implied in any "ND" results.

The PetroFLAG analyzer has been specifically designed to be used with the unique patented chemistry of the PetroFLAG system. The meter is shipped fully calibrated, preset with response factor 5. This calibration is sufficient to begin screening measurements; however, in order to achieve optimum performance we recommend that the analyzer be calibrated with each batch of samples, or at least daily. The PetroFLAG analyzer is easy to calibrate and a calibration standard is included with every refill pack.

The PetroFLAG analyzer stores two independent calibration equations in separate memory locations. Each calibration has a unique designation, "rC" or "Sc". One way to effectively use this feature is to use one for a "low temp.U calibrationU and one for a "high temp.U calibration. This practice is very useful when working at field locations where the ambient temperature varies by more than 10°C over the course of the day. One calibration, run at the lower temperature in the morning, could be stored under "ScU Uand Ulater Uas UtheU temperature rises, triggering a temperature warning, a new calibration can be run and stored under "rCU (See below under "Temperature EffectsU)U This feature can also be used to store both a site-specific "soil" calibration as "ScUand aU "reagent" calibration as "rCU However, due toU previously mentioned difficulties associated with a soil calibration, this practice is not recommended and should only be used if very good data is available documenting the uniform presence of background organic material.

Table 1: Response Factors and Method Detection Limits for Common Hydrocarbons

Hydrocarbon Type	Method Detection Limit (ppm)	Response Setting
Transformer Oil	15	10
Grease	15	9
Hydraulic Fluid	10	8
Transmission Fluid	19	8
Motor Oil	19	7
#2 Fuel Oil	25	7
#6 Fuel Oil	18	6
Diesel Fuel	13	5
Gear Oil	22	5
Low Aromatic Diesel	27	4
Pennsylvania Crude Oil	20	4
Kerosene	28	4
Jet A	27	4
Weathered Gasoline	200*+	2

*See Appendix A
+Due to the non-linear response curve of Gasoline, quantification below 1000 ppm may underestimate the true contamination

Choosing the Correct Response Factor

The microprocessor in the PetroFLAG analyzer uses the calibration data to convert the optical reading into a preliminary concentration. The selected response factor is then used to calculate the correct concentration for the analyte of interest. Therefore, it is important to choose the response factor that is appropriate for the particular hydrocarbon or class of hydrocarbons present at the site. The response factor can be changed at any time without affecting the stored calibrations. (See "Analyzer Operation Examples: Standard Operation-Changing Response Factor Without Recalibrating)U

If the contaminant is known or suspected, choose the appropriate response factor from Table 1 and set that response factor on the analyzer. (See "AnalyzerU Operation below.) If there is a mixture of hydrocarbons, use the most conservative response factor (i.e. the lowest) for the contaminants known to be present. If the contaminants are unknown, choose a conservative response factor based on those hydrocarbons that are likely to be on the site. Examination of Table 1, indicates that the majority of typical contaminants are in response category 5 or above.

Analyzing High Concentration Samples

The PetroFLAG Hydrocarbon Analyzer is pre-programmed to warn the user of an over-range condition. If the over-range reading is outside of the linear range (±10 precision), but still within theU quantifiable range (±20% precision), the reading willU be displayed blinking. This reading can be used as an indication that the concentration in the sample is not less than the displayed value. Since the response curve for most analytes is non-linear at high concentrations, the concentration in the sample may be higher than the displayed value. If the over-range condition is outside of the quantifiable range of the meter, the display will show a blinking "EEEE". Either error indication can be cleared by simply inserting the next vial and pressing the <READ/ON> key.

Accurate results can be difficult to obtain when 10 gram soil samples with high contaminant concentrations are used since they may cause a over-range condition on the PetroFLAG analyzer. To quantify these high contaminant samples, extract fresh soil samples of 1 gram size and reanalyze. Then multiply the result by 10 to obtain the concentration in the sample. Using this procedure, it is possible to measure oils containing up to 50,000 ppm of light hydrocarbon contamination or 10,000 ppm of a heavier hydrocarbon. For readings at higher concentrations, a “high range kitUis available.U

NOTE: The use of either smaller samples or “highU range kits will affect the precision and accuracy of the method as well as raise the MDL (Minimum Detection Limit) in proportion to the dilution factor.

Converting Response Factors for Data Already Collected

Collected data can be easily converted to the correct reading when it has been determined that the wrong response factor has been used. To make this conversion, multiply the measured value by the response factor initially used to make the measurement and divide by the new response factor.

Temperature Effects on Measurements

The PetroFLAG analyzer is equipped with an onboard temperature sensor to measure the ambient temperature while measurements are being made. The software uses the temperature readings to correct the optical readings for drift caused by the temperature fluctuations. The corrections have been determined for their effects on the turbidity development and the temperature drift of the electronics.

The PetroFLAG analyzer can be used at temperatures from 4ºC to 45ºC. The temperature corrections are valid for temperatures within 10ºC of the calibration temperature. If a calibration is run with each batch of samples, the temperature correction is not significant and measurements can be made at any temperature within the usable range of the instrument. However, if no calibration is run and the ambient temperature deviates from the calibration temperature by more than 10ºC, an error condition will result. The analyzer will display "Err4" which can only be cleared by pressing the <NEXT> key. Pressing of the <NEXT> key will clear the error and display the current reading. This reading can be recorded but it should be noted that the ambient temperature was outside of the acceptable 10ºC window. Any other samples remaining in the series can be read, however, the same error condition will most likely occur. The meter must be recalibrated to eliminate this error condition.

The ambient temperature should be checked before starting to avoid a temperature error when a calibration is not run with the samples,. This can be

done by taking a reading without inserting a vial into the meter. If a reading is displayed, the temperature is within range and additional readings can proceed. If an error is displayed, the meter must be recalibrated before proceeding.

As previously mentioned, the storage of two calibrations, each at a different temperature, will reduce the number of recalibrations necessary as the temperature changes. If the two calibrations are stored under "ScUUand U'rCUUand Uare Urun UatU temperatures levels 20°C apart, the effective temperature range for measurements now becomes 40°C.

Effects of Soil Water Content on PetroFLAG Result

The presence of water in a soil sample will have a definite effect on the reporting value in the final PetroFLAG result. As with all field measurements, the PetroFLAG system result is calculated based on the sample weight "as receivedU If there is waterU present in the sample, this will produce a "wetU weight result causing an apparent under reporting by the PetroFLAG technique when compared to a laboratory reporting on a "dry weightUbasis.U

To correct for the difference between "wet weightU vs. "dry UweightUUresults, Usimply Udivide UtheU PetroFLAG value by the "fraction solidsU (FS),U where fraction solids is:

FS = Dry Weight/Wet Weight

or:

FS = (100 • %water)/100

Furthermore, when reporting the wet weight vs. dry weight results, the presence of water in a soil sample will cause a "dilution effectU Since the PetroFLAG solvent system is miscible with water, the water in the soil will be extracted into the solvent phase. The aliquot filtered into the developer vial will, therefore, be diluted by the presence of the water. To a first approximation, the correction for this "dilutionU effect is made by multiplying the PetroFLAG result by one plus the "fraction waterU in the sample,U R'=R(1+FW), where fraction water (FW) is:U

FW=(Wet Weight • Dry Weight)/Wet Weight

or:

FW = %water/100

The equation below can be used to achieve an overall correction that includes both the conversion of the PetroFLAG result to a "dry weightUvalue andU the correction for the dilution effect:

R'=R((2/FS) • 1)

where:

R' = "Dry WeightUCorrected ResultU
R = Result displayed by PetroFLAG unit
FS = Fraction Solids

where:

FS = (100 • %water)/100

The above correction is applicable for typical soil types containing up to approximately 15% water by weight. For heavy clays or samples with higher water content, the effect of water content will vary with the analyte and should be determined specifically for each site.

In many cases, the effects of water content can be overcome by using a smaller sample size. This approach is the simplest and can be used effectively when a reduction in precision resulting from a smaller sample size still satisfies the overall data quality objective.

In some soils with high water content, the PetroFLAG response will be reduced both by the poor extraction efficiency of the analyte and a simple dilution. In these soils, the effect of water content on the extraction efficiency can sometimes be reduced by the addition of anhydrous sodium sulfate.

To treat such soils with sodium sulfate, weigh out the appropriate amount of soil sample (10 grams for a standard analysis) followed by the addition of up to 10 grams of anhydrous sodium sulfate. Mix the system thoroughly by stirring and/or shaking the sample until a free-flowing mixture is formed. Add the extraction solvent from a break-top ampule and then, follow the standard analysis procedure.

Treatment with sodium sulfate can improve the extraction efficiency, but will not correct for either the dilution effect or the wet weight/dry weight reporting error. The actual water content in the sample should be determined at some point so that the above corrections for wet weight and the dilution effect can be applied to the final result.

Sample Preparation

Each 10-pack of soil reagents contains reagents and supplies for 10 tests. In addition, one blank and one calibration standard are included. Samples can be run individually or by batch. For optimum performance and throughput, samples should be run in groups of 10 samples, once the meter has been calibrated with a blank and a standard. The meter does not need to be recalibrated, provided that the operating conditions and reaction times are maintained. Total time to analyze 10-15 samples is approximately 20-25 minutes.

Calibration

To insure accurate quantification and repeatable results, it is recommended that the PetroFLAG meter be recalibrated with each batch of 10 samples or, at least, daily. The meter is easily calibrated using an extraction solvent ampule as a blank and the calibration standard (supplied with each ten-pack of reagents). The blank and calibration standard can be used as a "reagent calibration", or together with a clean soil sample to generate a site-specific "soil calibration" spike. If there is no verifiably clean soil available, *do not* use a soil calibration; use a reagent calibration. Only when a clean soil has been identified should it be used to prepare site specific standards to calibrate the PetroFLAG meter.

NOTE: The soil calibration method should be used with extreme caution due to the high likelihood of introducing a bias, of unknown magnitude, into the data.

After exiting the calibration mode, all additional readings made by the PetroFLAG analyzer will automatically incorporate the selected response factor. Therefore, rereading of the calibration standard will result in an incorrect reading unless the response factor being used is 10 and within the correct development time of the sample.

NOTE: Once the *blank* and *calibration standard* have been read, discard them. They will fade with time and cannot be reused; DO NOT USE THEM TO RECALIBRATE THE METER OR TO CHECK THE EXISTING CALIBRATION.

Preparing Blanks and Standards

The following description summarizes the procedure for preparing the blank and calibration standard. Read the step-by-step instructions below completely before beginning the calibration process.

To prepare a reagent *blank* and a *calibration standard*, first label two soil tubes, one as the "blank" and the other as the "standard". Add to the *blank* tube the contents of a break-top ampule labeled “Extraction SolventU Add the contents of the break-top ampule labeled "Calibration Standard" to the *standard* soil tube. Process the blank and standard exactly as soil samples as described below. (See “The PetroFLAG Test ProcedureU)

A soil calibration is prepared in the same way, with the additional step of adding 10 grams of uncontaminated native soil to each of the labeled calibration tubes (blank and standard). After the soil has been added, proceed as above and process the standards along with the unknown samples.

QA/QC

Performing periodic calibrations of the PetroFLAG meter is one of the most important quality control checks that can be made. In addition to calibrating the PetroFLAG meter, performance of periodic calibration also serves as a quality control check of the entire analysis system. Each time a calibration is performed the individual operator needs to prepare a fresh set standards following the entire analysis procedure. To complete a valid calibration, the resulting test standards must meet the QC acceptance criteria stored in the meter. Each time a calibration is carried out, the meter verifies if the operator is performing the test correctly, e.g.,

following the correct order of steps in sample preparation, holding to the timing requirements, operating the meter correctly, etc. while the meter checks its basic operation. As each calibration is made, the intensity of the test solution is compared to the stored values for acceptance. If the optics have degraded or the electronics are out of specification the calibration will be flagged as an error.

The most important factor affecting the accuracy of PetroFLAGmeasurements is operator error followed by the ambient temperature determination. If the temperature varies by more than 10ºC from the calibration temperature, the accuracy of the resulting measurement will be affected. Therefore, during each measurement made by the meter, the current ambient temperature is compared to the temperature determined at calibration. If the difference is more than 10ºC, a warning is flashed alerting the operator of the temperature drift. This QC check is transparent to the user unless an error condition exists.

The internal check of the optical system is also transparent to the user. The PetroFLAG meter is designed with two independent optical channels. If, during a measurement, both channels do not agree, an error condition will be generated.

Along with these QC checks, which are performed automatically by the PetroFLAG meter, additional QA/QC procedures should be developed to provide assurances that the data quality objectives for each project are met. The most important part of any SOP (Standard Operating Procedure) should include provisions for ensuring that confirmatory samples are sent to a qualified lab for verification as to the type of hydrocarbon contamination present. This will also serve as a check of the response factor being used. When PetroFLAG meter results are determined to be either high or low when correlated to laboratory data, then a new response factor should be calculated and used. If the PetroFLAG results are not well correlated with the lab, then the field techniques should be examined to determine possible sources of error. A lack of correlation may be the result of inhomogeneous samples or may be due to splitting technique, etc.

A program of field QA/QC should be developed that is compatible with the competing requirements of each user. It should include, a minimum of periodic soil blanks, equipment blanks, soil spikes, and dupes. Other procedures should be implemented depending on the specific requirements of each site.

The PetroFLAG Test Procedure

1) Label the soil extraction tubes (plastic tubes with colored caps) and developer vials (small glass vials with black caps) with the appropriate sample ID. Use the self-adhesive labels to label the screw cap of the developer vial. Do not write in the center 1/3 of the developer vial as this may obscure the optical path when the readings are made

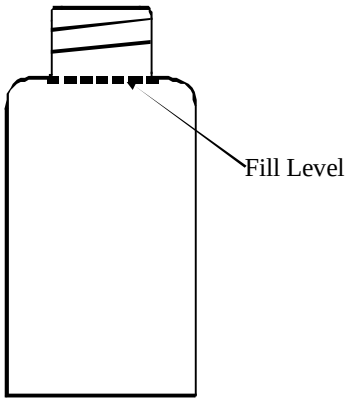
2) Weigh 10 grams (± 0.1 gram) samples of allU unknown soils into each of the labeled color-capped polypropylene tubes.

3) Set timer for 5 minutes. Add one break-top ampule of extraction solvent (blue polypropylene top) to the first tube. Start 5 minute timer and shake for 15 seconds. A separate ampule of extraction solvent is added to each of the remaining sample tubes when additional samples are being analyzed. Shake each tube for 15 seconds ensuring that the soil samples are fully wet. Shake each tube intermittently for a total of 4 minutes, then allow each tube to stand for the remaining 1 minute.

4) Verify that the filter disk is firmly attached to the syringe barrel. Remove the cap from the first labeled developer vial. Carefully decant the liquid from the polypropylene soil tube into the syringe barrel minimizing the transfer of soil particles, as this may plug the filter. Insert the plunger into the syringe barrel. Discard the first few drops from the filter into a waste container by pressing the plunger. Next, add the soil extract drop-wise to the developer solution until the meniscus just enters the neck of the vial (see figure). Shake the vial for 10 seconds, start the 10 minute timer and proceed to the next sample. Do not let the developer vials stands longer than 20 minutes before reading, as this may result in lower than actual values.

5) If meter is off, turn on the meter by pressing <READ/ON> key and calibrate (optional, see Analyzer Operation).

6) To read, wipe the vial, place into the meter and press the <READ/ON> key. Be sure that the outside of the vial is clean before reading. Record result on work sheet. Read vials in the same order as they were prepared.



6 mL Developer Vial

The PetroFLAG analyzer is controlled by a low-power consumption micro-computer with a pre-loaded operating program which is stored in EEPROM memory. The program cannot be lost regardless of battery condition. The meter stores two calibration curves in separate memory locations. These calibration curves can be independently updated and the response factors can be changed without losing the calibrations.

The PetroFLAG meter is configured to allow easy access to the program modes. The currently active mode is indicated on the LCD display while a reading is in progress. The response factor and the active calibration can be changed from the MAIN MENU using the four keys on the keypad. The four keys are:

SCROLL	Scrolls through menu choices.
NEXT	Exits the read mode or skips a menu option without changing or executing. (Also used to clear error conditions.)
READ ON	Turns the meter on and starts a reading.
SELECT OFF	Selects a menu choice. Manually turns meter off (only in the *read* mode).

When the PetroFLAG analyzer is turned on, the unit will return to the last mode it was in prior to being shut down. Under normal operating conditions, the analyzer will power up in the *read* mode. When the analyzer powers up in the *read* mode, the screen will display the last measured value for two seconds, and then, display the currently selected calibration curve ("rCU" or "ScU") and response factor (1-15). The meter is now ready to resume measurement. Simply insert a new sample vial into the meter and push the <READ/ON> key. The display will initially indicate the calibration curve (either "rCU" or "ScU") and the response factor (1-15) that is currently selected. Next, the term "CALC" will flash on the screen and after 15 seconds, the measured concentration in ppm will be displayed.

NOTE: If the battery is disconnected and then reconnected, the meter will automatically return to the MAIN MENU. If the calibration curve and response factor displayed are the desired parameters, the MAIN MENU can be exited while retaining the calibration data by pushing the <NEXT> key. To return to the *read* mode, continue pressing the <NEXT> key until the display shows the calibration curve and the response factor continuously without blinking.

If you wish to exit the *read* mode, push the <NEXT> key and the operation is returned to the MAIN MENU. The <NEXT> key is also used to skip a step where a menu selection is required. To change a flashing menu option, push the <SCROLL> key while the option is flashing. To store the currently flashing menu choice, push the <SELECT> key. This stores the current choice and moves the flashing cursor to the next program mode.

Selecting a Calibration Curve

Either of the two calibration curves, identified as "rC" and "Sc", can be selected from the MAIN MENU. From either calibration curve any response factor can be selected. To change the response factor or to re-calibrate the unit, use the <NEXT> key to enter the MAIN MENU screen. Immediately upon entering this menu three decimal points and the response factor are displayed. Next, the first two characters on the screen indicates the calibration curve that is currently selected ("rCU" or "ScU") is displayed. They will blink, indicating that

a new curve may be selected. Use the <SCROLL> key to scroll to the next calibration curve. Push the <SELECT/OFF> key to select the curve.

The response factor will then blink. Use the <“SCROLL> key to scroll to the desired response factor for the target analyte and press the <SELECT/OFF> key.

Reading the Blank and Standard

After the response factor has been selected, the screen will read “CALCUfor five seconds and thenU display the calibration temperature. This temperature will remain on the screen until either the <NEXT> key or the <READ/ON> key is pressed. The screen will then prompt you for the "blank" vial by displaying "-bL-". Insert the blank vial in the meter and press the <READ/ON> key (See "Preparing Blanks and Standards" under "Using the PetroFLAG Hydrocarbon Analysis System). After 5 seconds the screen display should read "0" for 2 seconds. The screen will then prompt for the calibration standard, "-CSd". Insert the calibration standard in the meter, press the <READ/ON> key and after 5 seconds, the calibration is complete. The meter will then re-read the calibration standard to verify a valid calibration and display "1000". If the concentration of the calibration standard is not correct using the newly calculated equation, an error message will flash until the <NEXT> key is pushed. If an error condition exists, the previously stored calibration constants will be retained until a valid calibration is completed (See Appendix C, Table 1: Error Conditions).

Taking a Reading

After calibration, the meter will then display the calibration curve in use (“rCU or “ScU) and theU current response factor selected. The meter is ready to read the first sample by inserting the sample vial into the meter and pressing the <READ/ON> key. After reading the sample, the meter will display the concentration in parts per million (ppm) until either the <READ/ON> key or the <NEXT> key is pushed. If no key is pushed for a period of five minutes, the meter will turn off automatically. If the meter turns off automatically, the meter can be reactivated by pressing the <READ/ON> key and the unit will return to the operation mode last used. The meter can be turned off manually by using the <SELECT/OFF> key, while in the *read* mode only.

The optical system on the PetroFLAG analyzer is covered with a screw cap to keep out stray light. To remove this screw cap from the vial holder, simply unscrew it 1/4 of a turn counter-clockwise. To make a measurement, insert the developer vial into the unit, place the screw cap over the vial, and while pressing down on the cap (depressing the spring in the bottom of the vial holder), rotate the cap clockwise. Turn the cap until it is snug, but do not over-tighten.

Power Requirement

The PetroFLAG analyzer is powered by one 9V alkaline battery (included). This battery should last for several thousand readings. If a low battery condition exists "LP" will appear on the display.

Analyzer Operation Examples

Outlined below are step-by-step examples of how to use the PetroFLAG analyzer. Under normal operating conditions the meter will power up in the *read* mode. The examples given here categorized as "standard operation" assume that the meter was last operated in the *read* mode. If the meter was left in another mode for longer than five minutes or the batteries were removed, see below for special cases.

Standard Operation:

(Whenever the last operation mode was *read*, the calibration data is current and the last-used response factor is valid.)

1) Turn the meter on by pressing:

READ ON	The last reading will be displayed for 2 seconds. The display will show the calibration curve and response factor currently selected. The meter is now in the *read* mode.

2) Remove the screw cap, insert developer vial to be read and retighten cap.

3) To begin reading press:

READ ON	The display will show the calibration curve and response factor currently selected (blinking), the display will read "CALC" for 3 seconds, and the final result will be displayed.

4) The result will be displayed until the next reading is taken. To make the next reading: remove the vial and repeat steps 2 and 3 above.

Standard Operation/Changing Response Factor Without Recalibrating:

(Whenever the last operation mode was *read* and a different response factor is desired.)

1) Turn the meter on by pressing:

READ ON	The last reading will be displayed for 2 seconds. The display will show the calibration curve and response factor currently selected. The meter is now in the *read* mode.

2) Return the operation to the MAIN MENU by pressing:

NEXT	Three decimal points will be displayed along with the current response factor. The calibration curve designation will begin blinking.

3) The response factor entry mode is activated by pressing:

NEXT	The response factor will begin to blink indicating that it may be changed.

4) Scroll to the desired response factor by pressing:

SCROLL	The next response factor will be displayed. Continue pressing the SCROLL key until the desired response factor is displayed. (Response factors scroll in descending order, i.e., 15-1)

5) When the desired response factor is reached, select it by pressing:

SELECT OFF	The new response factor has been selected. The meter will calculate and display the current temperature.

6) Move to the next screen by pressing:

NEXT	The meter will prompt for the blank to be entered and the calibration procedure to begin by displaying "-bL-".

7) Skip this calibration procedure and move directly to the *read* mode, saving the new response factor but not recalibrating, by pressing (This exits the calibration mode without affecting the current calibration data):

NEXT	The meter will display the current calibration curve and the selected response factor and is ready to read a sample using the new response factor.

8) Proceed with the reading of a sample by following the above procedure for "Standard Operation" beginning at step 2.

Standard Operation With Recalibration:

(Where the last operational mode was the *read* mode and the meter is to be recalibrated.)

Prior to performing this calibration procedure, prepare the *blank* and *standard* as described in the manual under "Using the PetroFLAG Hydrocarbon Analysis System - Preparing Blanks and Standards". The calibration solutions can be prepared by using clean soil for a "soil calibration" or the reagents alone for a "reagent calibration". They may also be prepared along with the unknown samples in order to save time.

1) Turn the meter on by pressing:

READ ON	The last reading will be displayed for 2 seconds. The display will show the calibration curve and response factor currently selected. The meter is now in the *read* mode.

2) Return the operation to the MAIN MENU by pressing:

NEXT	Three decimal points will be displayed along with the current response factor. The calibration curve designation will begin blinking, indicating that it may be changed.

(If the displayed calibration curve is the one to be redetermined, skip directly to the response factor input by pressing the < NEXT> key.)

OTHERWISE

3) Scroll to the calibration curve that is to be redetermined by pressing:

SCROLL	The display will show the next calibration curve designation.

4) When the desired calibration curve is determined, select it by pressing:

SELECT OFF	The calibration curve is selected and the meter will prompt for the input of the response factor.

5) If the response factor displayed is not the desired one, use the <SCROLL> key as described the previous section above under "Standard Operation - Changing Response Factor Without Recalibrating". If the response factor is correct, skip this step by pressing:

NEXT	The meter will calculate and display the current temperature.

6) Move to the next screen by pressing:

NEXT

The meter will prompt for the blank to be entered and the calibration procedure to begin by displaying "-bL-".

7) Remove the screw cap and insert the prepared blank vial, replace the cap and begin calibration by pressing:

READ ON

The display will blink showing the selected calibration curve and response factor. The meter will display "0" for three seconds and prompt for the calibration standard by displaying "-CSd".

8) Remove the screw cap and blank vial and insert the calibration standard vial. Read the calibration standard by pressing:

READ ON

The display will blink showing the selected calibration curve and response factor. The display will read "1000" for three seconds and display the currently selected calibration curve and response factor continuously. The meter is now in the read mode.

9) Proceed with reading the unknown samples by following the procedure for "StandardU Operation above, beginning with step 2.U

Special Operating Conditions:

Replacement of Battery:

NOTE: **Use ONLY 9V Alkaline or 9V Lithium battery. Use of carbon/zinc battery will cause the PetroFLAG meter to malfunction.**

Open the battery compartment by sliding the compartment door back (indicated by the arrow on the back of the unit). Lift out the old battery from the compartment and carefully unsnap the battery from the wire harness/connector. Replace with a fresh alkaline battery by snapping the wire harness/connector onto the new battery making sure the polarity is correct (The snaps will only go on one way). Reinsert the battery and connector into the compartment being careful not to twist/ damage the connector wires. Replace compartment door by sliding the door forward until the latch clicks.

Operation of the Meter After the Battery has been Disconnected:

When the battery has been disconnected the micro-processor will automatically return to the MAIN MENU once the battery has been reconnected. The meter, however, will not be in a *read* mode but is calibrated for use, unless other factors warrant recalibration. The operations to be performed will determine the exact steps to be followed. The steps to follow are described above in the various sections of "Analyzer Operation Examples.U

Meter Left to Turn Off in Other Mode:

When the meter is left in any "screen" for five minutes the meter will shut off automatically. The meter will return to last active screen when the <READ/ON> key is pressed.

When PetroFLAG test results indicate no hydrocarbons are present, the sample can be sent in for certified laboratory confirmatory analysis. All environmental soil sampling used for final closure should be performed using methods that are approved by the local regulating agency.

Personal protection should be worn during soil sampling and testing. A minimum of latex gloves and goggles should be worn.

Decontamination stations should be set up using appropriate cleaners and rinsing solutions. Soil sampling equipment not supplied with the reagent pack should be decontaminated between sampling locations to prevent the possibility of cross contamination.

All reagents and sampling scoops supplied with the kit are single-use disposable items. Therefore, *do not* reuse spoons, tubes, filters, or vials. The electronic balance is *NOT* disposable.

Check ambient temperature BEFORE extracting soils, when a calibration procedure is not planned for the current batch of test samples.

Make sure the filter disks are screwed on tightly before adding the soil extract to a filter syringe.

Do not leave the PetroFLAG analyzer in direct sunlight when not in use. Store the instrument in the protective carrying case with the lid closed.

Make sure that the contamination at the site is characterized at some time during the investigation.

Avoid sampling organic matter. Scrape away organic material (leaves, sticks, etc.) before sampling.

Avoid sampling directly under pine, cedar, and fir trees unless the sample is collected below the organic layer. Do not collect samples from areas where tree roots have been encountered.

Avoid sampling directly beneath creosote bushes, sage brush and other oil bearing plants.

Commonly Asked Questions

What are the response factors?

A response factor (RF) is the relationship between the analyte of interest and the calibration standard. The turbidity formed in the development solution by the sample is compared to the calibration standard followed by a calculation which determines the correct concentration for your contaminant. For Example: Equal concentrations of diesel and mineral oil do not produce the same level of turbidity. A RF value of 10 for mineral oil divided by the RF value of 5 for diesel produces a result of 2. This means that mineral oil forms twice the turbidity of diesel at the same concentration. Stated another way, 250ppm mineral oil forms the same turbidity as 500 ppm diesel. For more information please see Appendix A in the Manual.

Why doesn't my calibration standard read 1000ppm when I re-read it after calibrating?

This is directly related to the first question. The calibration standard is 1000 ppm mineral oil, therefore, if you read it on any RF other than 10 you will get a different number.

How long are my samples good for after they develop for 10 minutes?

The PetroFLAG development process is a temporary reaction, so readings should be taken right at the end of the 10 minute development period. The turbidity will continue to develop for period of time, after which it begin to fade, therefore no measurements should be taken after 20 minutes. This means you must record your data as it is generated because you cannot save your sample vials for future analysis.

After I prepare a set of calibration solutions how long are they good for?

Since the PetroFLAG development chemistry fades over time they are only good for a single use and the 10 minute time window should be adhered to.

The screen is displaying an error code, what does it mean?

See the reference table in Appendix D for a list of "Error ConditionsUU

What can I do if my reading is over-range?

Process a new sample using a 1 gram soil sample and multiply the end result by 10. This sample dilution will allow you to read up to 10,000-15,000 ppm on most samples (1-1.5%).

The meter is stuck"in the calibration program mode with the rC"or Sc"characters flashing?

The meter will not allow normal calibration procedure or sample measurement when the <READ/ON> key is pressed, but returns to a flashing "rCUor "ScUscreen. This is usually causedU by use of a non-alkaline battery. Replacement with a fresh 9V Alkaline battery should eliminate the problem and the meter should return to normal operation.

Caution

When opening the break-top ampules *DO NOT* remove the plastic sleeve from the top. It is there for your protection. Removing it may result in personal injury.

The Extraction Solvent and Calibration Standards contain methanol and are Flammable and Poisonous.

Wear rubber gloves and safety glasses while performing tests.

Dispose of all used reagents and soil properly.

Read the Material Safety Data Sheet before performing test.

Manufacturer's Warranty

The reagents and supplies used in the PetroFLAG test are warranted to be free of defects in material and workmanship until the expiration date stamped on the box. Manufacturer's sole and exclusive liability under this warranty shall be limited to replacement of any materials that are proved to be defective. Manufacturer shall not be liable for any incidental or consequential damages.

Reliable test results are highly dependent upon the care with which the directions are followed and, consequently, cannot be guaranteed.

Appendix A: PetroFLAG Response Curves

Most fuels, lubes and greases are complex mixtures of various hydrocarbons having a broad range of physical and chemical properties. The PetroFLAG system will detect a majority of the ecologically important hydrocarbon mixtures. The PetroFLAG responses to some typical hydrocarbon contaminants are plotted in figure 1[5].

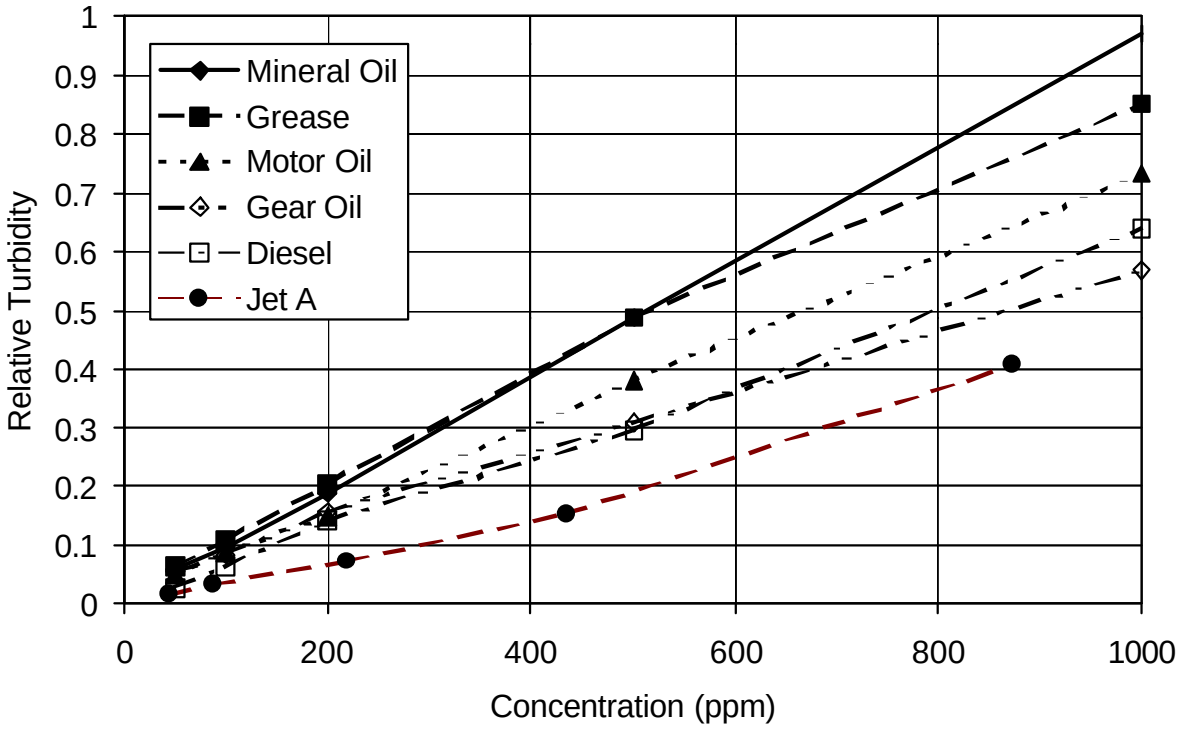


Figure 1: Relative Intensity Data for Common Analytes

[5]The lower limit of quantification, using a 10 gram sample size, is 1000 ppm for gasoline (linear range from 1000 ppm to 5,000 ppm). Brake fluid, phosphate ester based hydraulic oil, or other water soluble compounds will not be detected by the PetroFLAG system.

Appendix B: Comparison with Laboratory Methods

In field trials, the PetroFLAG system was used at sites contaminated with diesel fuel or with oil and grease. In both cases the PetroFLAG results correlated very well with EPA laboratory methods. Both EPA methods 8015B and 418.1 were used to analyze the samples from the diesel site. The resulting correlations were 89% and 92% respectively[6]. The samples from the oil and grease site were analyzed using EPA method 418.1 for soil. The lab results confirmed the PetroFLAG results with no false negatives and only 2 false positives (10%). When comparing the field results and the lab results for the field split samples, the correlation between the PetroFLAG data and EPA method 418.1 for the laboratory split samples was 90%[7] .

When comparing the PetroFLAG field results with laboratory results using EPA methods it is important to keep in mind that EPA laboratory methods for TPH are known to have variable extraction efficiency. The extraction efficiency achieved using EPA laboratory methods varies with soil type and moisture content. In addition, the degree to which moisture affects the extraction is dependent on how the individual laboratory is implementing the method. It is, therefore, important to verify that the lab used for comparison is performing the method properly and that the recovery is known.

Another important factor affecting laboratory confirmation analysis is the inhomogeneous nature of soil samples. Whenever possible, homogenize samples using standard methods[8] before taking "splits" to send to the lab for confirmation.

---

[6]Wright, Keith A., "Evaluation of a New Field Test Kit for Determining Total Petroleum Hydrocarbon Concentrations in Soil at a Site Contaminated by Diesel Fuel", Presented at the AEHS Conference on "Hydrocarbon Contaminated Soils", January 11-13, 1995, New Orleans, LA.

[7]Wright, Keith A. and Jermstad, David B., "Evaluation of a Rapid Field Analytical Test Kit for Assessing Hydrocarbon Soil Contamination", Presented at the "Third International Conference On-Site Analysis", January 22-25, 1995 Houston, TX.

[8]See for example: Pitard, Francis F. , Pierre Gy's Sampling Theory and Sampling Practice, Volumes 1 and 2, CRC Press, Inc., Boca Raton, FL, 1992).

Appendix C: Determining the Response Factor for Hydrocarbons Not Listed in Table 1

The response factors listed in Table 1 are calculated from response curves similar to those in Figure 1 in Appendix A. The response factor is equal to the slope of the response curve multiplied by 10. The slope of the response curve for the analyte is calculated from the response of the specific analyte relative to the response of the calibration standard. The calibration standard has a slope of one and a response factor of 10 on the PetroFLAG meter. Multiplying the slope of a specific analyte's response curve by 10 yields the appropriate response factor for that analyte.

When a suspected contaminant is not listed in Table 1, there are a few methods that may be used to determine the response factor. The method used is determined by the information and facilities available. The most accurate method would be to replicate the data in Figure 1 for the specific analyte, and then calculate the response factor from the slope of the response curve.

Initially, prepare soil standards from a single homogeneous batch of clean soil spiked at a minimum of 5 different concentrations between 100 and 1000 ppm. (For light hydrocarbons, a higher concentration range can be used.) Next, analyze the soil standards in triplicate using a calibrated PetroFLAG meterset to a response factor of 10. Plot the results with the true spiked concentrations on the "X" axis and the meter readings on the "Y" axis. The slope of the regression line (least squares line) through the data points multiplied by 10 is the response factor that should be used for this analyte. To avoid a low bias and false negatives, round the resulting number down to the nearest whole number when selecting the response factor for the meter. This method can be used if either the contaminant is known or a sample of the neat product is available.

NOTE: When the soil used to prepare the spiked soil standards is not actually clean but contains some hydrocarbons, the curve will have a positive intercept. This result should not affect the calculated response factor provided that the highest spiked standard does not read higher than 1000 ppm on the PetroFLAG meter.

When the contaminant is unknown and a sample of the pure product is not available, then an alternative method can be used. The PetroFLAG results, with the meter set to response factor 10, can be compared with laboratory results from split samples analyzed in triplicate. This method requires extreme care in the homogenizing of the bulk material and also, the preparation of the split samples. Improper sample preparation can result in errors of 100 to 200% or greater. To minimize the effects of this sample variation, as many samples as possible should be analyzed (greater than 20) and the concentrations used should be evenly distributed over the range of 100 to 1000 ppm. Once the data has been collected, plot the data as described above using the laboratory reference method results as the known concentration. The slope of the regression line multiplied by 10 is then the response factor.

NOTE: This method is not as precise as the spike method and any bias in the laboratory method will result in an error in determining this response factor. It is important to check both the laboratory method and the lab performing the analysis thoroughly before using it as the reference method. (See Appendix B)

If the facilities are not available to perform these tests contact Dexsil for advice.

Appendix D: Error Conditions

Table 2: Error Conditions

Message	Cause	Solution
Flashing Concentration Reading [Applies to Unknown Measurements]	Over range condition. Sample concentration outside of linear range.	Use smaller sample (1 gram recommended) and rerun.
Flashing "EEEE" [Applies to Unknown Measurements]	Sensor over range condition. Sample concentration too high.	Use smaller sample (1 gram recommended) and rerun.
"Err0" [Applies to Calibration Mode]	Blank and Calibration Standard vials mixed up. Blank or Calibration Standard outside of QC window (bL too high or CSd too low).	Check calibration vials. Rerun and/or make up new ones.
"Err1" [Applies to All Modes]	Readings from the two optical channels do not agree.	Check vial and reread. If error remains, rerun using another vial.
"Err2" [Applies to Unknown Measurements]	Sample is reading lower than the blank, e.g., Calibration Blank soil unusually high background or not zero.	Recalibrate using true Blank soil.
"Err3" [Applies to Calibration Mode]	Blank or Calibration Standard outside of QC window (bL too low or CSd too high).	Recalibrate using fresh calibration solutions.
"Err4" [Applies to Unknown Measurements]	Absolute temperature difference between calibration and reading exceeds 10ºC.	Recalibrate at current temperature.
"Err5" [Applies to All Modes]	Ambient temperature outside of operating range. (4ºC - 45ºC)	Remove meter and reagents to climate controlled environment to recalibrate/rerun.
"LP"	Low Power	Replace battery.

Appendix E: Meter Specifications

A/D Resolution:	0.5 ppm
Display Resolution:	1 ppm
Precision:	Analyte Dependent From MDL to Max Linear Range (MLR) ±10% +5 ppmU From Max Linear Range to Max Quantifiable Range (MQR) ± 20%U
Measurement Range:	10-10,000 ppm (linear range analyte dependent)
Operating Temperature:	4ºC to 45ºC

Quantification Limit:

Analyte Dependent Response Factor	Approx. MLR (ppm)*	Approx. MQR (ppm)*
15	730	1,460
10	1,000	2,000
5	2,000	4,000
2	5,000	10,000

*Actual limits realized in the field are temperature and device dependent. PetroFLAG meter automatically warns user when each limit has been reached.

Program Storage:	EEPROM
Calibration Storage:	EEPROM
Display:	4 digit ½ inch seven segment LCD
Batteries:	One 9V Alkaline (included) [Use only Alkaline or Lithium type]
Battery Life:	Approx. 4000 measurements or 1 year (using a 550 mAh alkaline battery)
Dimensions:	length=5.75" width=3.5" height=2"
Weight:	9.85 oz (280 g)

APPENDIX C

Quality Assurance Project Plan

FINAL

FORT WAINWRIGHT
POST WIDE WORK PLAN

APPENDIX C
Quality Assurance Project Plan

FORT WAINWRIGHT, ALASKA

MARCH 2011

U.S. Army Corps of Engineers, Alaska District
Environmental Remediation Services
Contract No. W911KB-06-D-0006
Task Order No. 20

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
CCC	criteria continuous concentration
CMC	criteria maximum concentration
CoC	chain-of-custody
CQC	contractor quality control
DFW	definable features of work
DL	detection limit
DoD	U.S. Department of Defense
DQA	data quality assessment
DQO	data quality objectives
DRO	diesel-range organics
EDB	1,2-dibromoethane (ethylene dibromide)
EPA	U.S. Environmental Protection Agency
FSP	field sampling plan
FWA	Fort Wainwright, Alaska
GC/MS	gas chromatography/mass spectroscopy
GRO	gasoline-range organics
Jacobs	Jacobs Engineering Group Inc.
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	limits of detection
LOQ	limits of quantitation
MEK	2-butanone (methyl ethyl ketone)
mg/kg	milligram per kilogram
mg/L	milligram per liter
MS	matrix spike
MSD	matrix spike duplicate

ACRONYMS AND ABBREVIATIONS (Continued)

NCR	nonconformance report
NOAA	National Oceanic and Atmospheric Administration
ORNL	Oak Ridge National Laboratory
PAH	polynuclear aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PCE	tetrachloroethene
PEL	permissible exposure limits
PM	Project Manager
PRG	Preliminary Remediation Goal
QA	quality assurance
QAPP	Quality Assurance Project Plan
QAR	quality assurance representative
QC	quality control
QSM	Quality Systems Manual
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
RRO	residual-range organics
SDG	sample delivery group
SVOC	semivolatile organic compounds
TAH	total aromatic hydrocarbons
TAqH	total aqueous hydrocarbons
TCE	trichloroethene
TCLP	Toxicity Characteristic Leaching Procedures
TEL	threshold effects level
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compounds
$\mu g/m^3$	micrograms per cubic meter

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) presents analytical standards and procedures to be followed for anticipated work conducted in association with the Fort Wainwright, Alaska (FWA) sites. This QAPP was developed to detail quality assurance (QA), and quality control (QC) procedures for use by Jacobs Engineering Group Inc. (Jacobs) and the laboratory subcontractor(s) for all samples collected from the FWA sites. The work described herein will be performed by Jacobs for the U.S. Army Engineer District, Alaska (USAED) under Environmental Restoration Services Contract No.W911KB-06-D-0006, Task Order Number 20 – Fort Wainwright Environmental Support. As such, this QAPP establishes analytical protocols and documentation requirements to ensure data are collected, reviewed, and analyzed in a consistent and appropriate manner.

The following guidance and objectives are organized in this QAPP:

- Section 2 presents the project organization and responsibilities for the Project Chemist, Laboratory Project Manager, and Field Samplers.
- Section 3 presents the analytical data quality objectives (DQO) including data usage, data quality requirements, QC samples and criteria, and regulatory criteria.
- Section 4 presents the analytical data quality assessment (DQA), which includes data review, qualification, and reporting.
- Section 5 presents the laboratory requirements and certifications.
- Section 6 presents the corrective action, response, and reestablishment of control.

Attachments C-1 through C-5 provide potential action limit criteria:

- C-1 presents soil cleanup criteria.
- C-2 presents sediment screening criteria.
- C-3 presents groundwater cleanup criteria.
- C-4 presents surface water screening criteria.
- C-5 presents soil gas screening criteria.
- C-6 presents Resource Conservation and Recovery Act (RCRA) Toxicity Characteristic Leaching Procedure (TCLP) concentrations.

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2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

This section presents the responsibilities of the key QA/QC personnel.

2.1 PROJECT CHEMIST

The Jacobs Project Chemist will ensure that the laboratory is performing the analytical protocols and meeting the QC criteria as specified in the Field Sampling Plan (FSP) (Appendix B), and this QAPP. The Project Chemist will evaluate the laboratory-generated data packages for completeness and validity and will serve as the primary point of contact for all analytical technical issues or chemistry-related issues.

2.2 LABORATORY PROJECT MANAGER

The Laboratory Project Manager (PM) will have ultimate responsibility for the analytical performance, including adherence to contract requirements and QC requirements. The Laboratory PM will serve as the primary laboratory point of contact, will monitor the progress and timeliness of the work, and will review work orders and all laboratory reports. The Laboratory PM is responsible for ensuring that personnel involved in the project (beginning with sample custodians and ending with the data manager) are familiar with the subcontract and site-specific DQOs and that the proper corrective action has been taken to address problems identified by QC sample results or QA audit findings. The Laboratory PM has responsibility for project administration, including coordinating shipments of coolers to the field and samples to the laboratory, project updates, sample bottle orders, and sample receiving. The Laboratory PM will review and sign correspondence with contractor personnel.

2.3 SITE MANAGER

The Site Manager oversees all Jacobs and subcontractor employees working on site and serves as the onsite point of contact between the U.S. Army Corps of Engineers (USACE) and Jacobs. The Site Manager is responsible for overseeing all activities and verifying their conduct in accordance with the site-specific addendum and all applicable federal and state regulations.

2.4 FIELD SAMPLERS

The Field Samplers are responsible for collecting samples and field measurements and documenting field activities in accordance with procedures stated in the FSP (Appendix B) and corresponding operating procedures. Field Samplers are also responsible for:

- Sample labeling and logging;
- Chain-of-custody (CoC) documentation;
- Assuring that sample containers, preservation, and holding times are implemented as described in the FSP (Appendix B);
- Packaging and shipping samples to the analytical laboratory; and
- Collecting and reviewing analytical results for use in the field.

At least one Alaska Department of Environmental Conservation (ADEC)-qualified sampler will oversee all sampling activities.

3.0 ANALYTICAL DATA QUALITY OBJECTIVES

The analytical DQOs listed in this section have been developed to provide criteria that may be used for the FWA sites. This QAPP, the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) version 4.1 (DoD 2009), the analytical methods (U.S. Environmental Protection Agency [EPA] 1996, ADEC 2002), ADEC Technical Memorandum *Environmental Laboratory Data and Quality Assurance Requirements* (ADEC 2009b), and the laboratory-generated limits define the QA/QC requirements for this project. These documents provide guidance and specifications to ensure that the following analytical DQOs are accomplished:

- Data usage including screening data and definitive data
- Data quality requirements including precision, accuracy, representativeness, completeness, comparability, and sensitivity
- QC samples and criteria for definitive data
- Regulatory criteria

3.1 DATA USAGE

Two descriptive data categories, screening data and definitive data, address different data uses and therefore require different QA/QC elements to achieve the level of data quality required for this project.

3.1.1 Screening Data

In order to generate rapid results, data generated by screening instrumentation and procedures involve less precise measurement than fixed laboratory analysis. Screening data will be used for health and safety monitoring at the site and to locate areas for subsequent and more accurate sample collection and analyses. The FSP describes the common screening methods that may be used to collect data for USACE projects.

3.1.2 Definitive Data

Definitive data will be generated by using analytical methods defined by the ADEC *Underground Storage Tanks Procedures Manual* (ADEC 2002), EPA *Test Methods for Evaluating Solid Waste SW-846* (EPA 1996) and/or subsequent updates, and EPA *Methods for Determination of Organic Compounds in Drinking Water Supplement III* (EPA 1995). Additional methods may be utilized and specified in the site-specific work plan addendum. Definitive data will be quantitative with known and documented analytical precision and accuracy. Deliverables will be generated as a basis for the data validation process and preparation of a DQA report. Electronic data deliverables and hard copy (or PDF) data packages may be requested.

Discrete field screening and definitive analytical confirmation samples will be collected in order to delineate areas of contamination. A correlation between field screening results and definitive analytical results may also be developed.

3.2 DATA QUALITY REQUIREMENTS

The analytical DQOs for this project will be considered met when the quality of the sample data meets precision, accuracy, representativeness, completeness, comparability, and sensitivity requirements specified in this QAPP.

Analytical DQOs will be evaluated by reviewing the QA parameters and criteria presented in Sections 3.2.1 through 3.2.6.

3.2.1 Precision

Precision will be evaluated by comparing the following criteria:

- Primary and field duplicate sample results (relative percent difference [RPD] < 30 for waters, RPD < 50 for soils)
- Matrix spike (MS) and matrix spike duplicate (MSD) samples to determine the effect of the sample matrix on the precision of the results generated using the selected analytical method

- Laboratory control sample (LCS) and laboratory control sample duplicates (LCSD) to determine the precision of the laboratory procedures and verify matrix interference for the Alaska Series methods

3.2.2 Accuracy

Accuracy is evaluated by reviewing the following data:

- Calibrations – initial and continuing; acceptability and frequency (deviations are assumed to be noted in laboratory case narratives)
- Surrogates – recovery and frequency
- LCS and LCSD recoveries
- MS and MSD recoveries
- Relative response factors and relative standard deviation (deviations are assumed to be noted in laboratory case narratives)
- Method blanks
- Gas chromatography second-column confirmation (if required)
- Tune criteria gas chromatography/mass spectroscopy (GC/MS) – acceptability and frequency (deviations are assumed to be noted in laboratory case narratives)
- Internal standards (GC/MS) – acceptability and frequency (deviations are assumed to be noted in laboratory case narratives)

3.2.3 Representativeness

The following information will be reviewed to evaluate representativeness:

- Sample quantities and locations
- Sampling procedures and equipment
- Sample CoCs and field logbooks
- Holding times and preservation

3.2.4 Completeness

Completeness is a quantitative evaluation (expressed as a percentage) of the overall data quality of the results generated. Valid data are considered usable in the context of the project goals. The completeness goal is considered met when 95 percent of sample data are not rejected.

3.2.5 Comparability

Comparability is a qualitative indicator of the confidence with which one data set can be compared to another. To ensure data set comparability, the following steps will be taken:

- Standard operating procedures (SOP) and established analytical methods will be followed.
- Instruments will be operated within their calibrated range according to established procedures that are based on approved methodology.

3.2.6 Sensitivity

Limits of quantitation (LOQ), limits of detection (LOD), and detection limits (DL) will be compared against regulatory action limits and screening criteria.

3.3 QUALITY CONTROL SAMPLES AND CRITERIA FOR DEFINITIVE DATA

QC samples include field duplicates, MS/MSD, LCS/LCSD, method blanks, trip blanks, and surrogate spikes. Field QC samples will be collected at the following frequencies:

- Field duplicates – one per every ten or fewer primary samples (10 percent). Field duplicates will not be collected for waste characterization samples.
- MS/MSD – will be designated for each sample shipment/lab batch, or at a frequency of one pair per 20 or fewer primary samples (5 percent). MS/MSD samples may be collected for waste characterization unless adequate sample volume is unavailable or safety concerns impact sample collection. MS/MSD samples will not be collected for field screening purposes.
- Trip blanks – one per cooler containing samples for volatile analyses.

This QAPP and the method and laboratory acceptance criteria may be referenced by the Project Chemist to assess the data usability and to apply qualifiers to the data summary tables, as appropriate. Table 3-1 presents QC criteria of the LCS percent recovery, LCS RPD, surrogate recovery, MS recovery, and MS RPD for methods that may be used on FWA sites.

Table C-3-1
Quality Control Criteria for Analytical Methods

Parameter	AK101[1]	AK102[1]	AK103[1]	SW6020[2]	SW7470	SW7471[2]	SW8081[2]	SW8151[2]	SW8082[2]	SW8260[2]	SW8270[2]	SW8321	SW8330	504.1[3]
LCS Recovery Limits	60% to 120%	75% to 125%	60% to 120%	80% to 120%	80% to 120	80% to 120	DoD QSM, Tables G-14 & G-15	DoD QSM, Tables G-8 & G-9	DoD QSM, Tables G-16 & G-17	DoD QSM, Tables G-4 & G-5	DoD QSM, Tables G-6 & G-7	DoD QSM, Tables G-12 & G-13	DoD QSM, Tables G-12 & G-13	70%-130%
LCS RPD	20%	20%	20%	20%	20%	20%	30%	30%	30%	30%	30%	30%	30%	20%
Surrogate Recovery	60%-120% (lab samples) 50%-150% (field samples)	60%-120% (lab samples) 50%-150% (field samples)	60%-120% (lab samples) 50%-150% (field samples)	Not Applicable	Not applicable	Not Applicable	DoD QSM, Table G-3	Laboratory Limits	DoD QSM, Table G-3	DoD QSM, Table G-3	DoD QSM, Table G-3	Laboratory Limits	Laboratory Limits	Not Applicable
MS Recovery	60%-120%	75%-125%	60%-120%	80%-120%	80%-120%	80%-120%	DoD QSM, Tables G-14 & G-15	DoD QSM, Tables G-8 & G-9	DoD QSM, Tables G-16 & G-17	DoD QSM, Tables G-4 & G-5	DoD QSM, Tables G-6 & G-7	DoD QSM, Tables G-12 & G-13	DoD QSM, Tables G-12 & G-13	70%-130%
MS Recovery RPD	20%	20%	20%	20%	20%	20%	30%	30%	30%	30%	30%	30%	30%	20%

Notes:
For definitions, see the Acronyms and Abbreviations section
[1] = Criteria from the AK series methods (2002)
[2] = Criteria from the DoD QSM v.4.1
[3] = Criteria from EPA method 504.1
The numbers may be changed as methods are updated and new methods become available.

3.4 REGULATORY CRITERIA

The regulatory action limit criteria and contaminants of potential concern will be listed in the site-specific addendum. Attachments C-1 through C-4 provide the potential action limits and screening levels for soil, sediment, groundwater, and surface water. The possible methods that may be used include:

- AK101 – gasoline-range organics (GRO)
- AK102 – diesel-range organics (DRO)
- AK103 – residual-range organics (RRO)
- SW6020/SW7470/SW7471 – RCRA metals/mercury
- SW8081 – pesticides
- SW8151 – herbicides
- SW8082 – polychlorinated biphenyls (PCBs)
- SW8260 – volatile organic compounds (VOC)
- SW8270 – semivolatile organic compounds (SVOC)
- SW8321– explosives
- SW8330 – explosives
- 504.1 – 1,2-dibromoethane (EDB)

Cleanup levels will reflect those listed in Alaska Administrative Code (AAC), Title 18, Chapter 75, Tables B1 and B2 (soil), and C (groundwater) (ADEC 2008). Screening levels for sediment and surface water reflect those listed in National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (Buchman 2008) and Oak Ridge National Laboratory (ORNL 1997). Screening levels for soil gas reflect those listed in the *Draft Vapor Intrusions Guidance for Contaminated Sites* (ADEC 2009a).

Once the criteria have been defined in the site-specific addendum, the laboratory subcontractors' maximum reporting limits will be evaluated against these criteria. Laboratory LOQs, LODs, and DLs will be evaluated by the Project Chemist prior to project mobilization. Due to method limitations, the following SW8260 and SW8270 compounds may have detection limits that exceed ADEC action limits: 1,2,3-trichloropropane, 1,2- EDB, bis(2-

chloroethyl)ether, n-nitrosodi-n-propylamine, pentachlorophenol, 1,2-dichloroethane, 1,2-dichloropropane, methylene chloride, 1,1,2,2-tetrachloroethane, vinyl chloride, 2,4-dinitrotoluene, 2,6-dinitrotoluene, and 3,3'-dichlorobenzidine.

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4.0 ANALYTICAL DATA QUALITY ASSESSMENT

The DQA involves reviewing the field and laboratory records, maintaining proper recordkeeping, and assessing the laboratory data (Section 4.1). Regular review of records will be conducted by members of the sampling/analysis team and the Jacobs Project Chemist. A report and ADEC checklists will be completed based on the data review and qualifications and will be presented in the site-specific after action report.

4.1 DATA REVIEW AND QUALIFICATION

The analytical data will be reviewed by the Jacobs Project Chemist. This evaluation will consist of a review of CoC and sample receipt records; laboratory case narratives; and laboratory data including analytical methodology, sample holding times, laboratory blanks, reporting limits, surrogate recoveries, LCS/LCSD recoveries, MS/MSD recoveries, and precision. The analytical data will be evaluated for compliance with project-specific DQOs. In the absence of guidance, the DoD QSM version 4.1, method criteria, laboratory criteria, and best professional judgment will apply, in that order. The data review will identify any data requiring qualifications and identify usability impacts. The contractor will determine whether samples are to be re-collected when data gaps are created as a result of rejected data.

Qualifiers to be applied to the analytical data set, as appropriate, include the following:

- "J" – The analyte is an estimated value, the associated result was greater than the DL and less than the LOQ.
- "B" – The analyte was detected in the method blank or the trip blank greater than ½ the LOQ, and the concentration in the sample did not exceed the blank concentration by a factor of 5 (factor of 10 for common laboratory contaminants acetone and methylene chloride).
- "U" – Analyte was not detected and is reported as less than the LOD.
- "+" – The result is biased high.
- "–" – The result is biased low.
- "JL(±)" – The result was an estimated value because the analyte failed recovery criteria in the LCS or LCSD sample or both. The result was either biased low because the LCS and LCSD recovery was less than the lower control limit, or the result was biased high because the recovery exceeded the upper control limit.

- "JM(±)" – The result was an estimated value because the analyte failed recovery criteria in the MS and/or MSD sample. The MS sample recoveries were only evaluated (flagged) if the spiked concentration was less than the native sample concentration.
- "JS(±)" – The result was an estimated value because at least one surrogate failed recovery criteria for that sample, or two or more surrogates failed only for methods SW8260 and SW8270.
- "JH" – The numerical result was considered an estimate because the analysis was performed at greater than the method holding time and less than twice the method holding time.
- "JI(±)" – The numerical result was considered an estimate because the internal standard failed QC limits. The result was either biased low because the internal standard failed high, or the result was biased high because the recovery failed low.
- "JP" – The result was considered an estimated value because incorrect or inadequate preservation methods were used.
- "JTE" – The cooler temperature blank, upon receipt at the laboratory, exceeded 6 °Celsius or the sample cooler contained frozen samples.
- "JC(±)" – The result was an estimated value because the analyte failed recovery criteria in the continuing calibration verification. The result was either biased low because the continuing calibration verification recovery was less than the lower control limit or biased high because the recovery exceeded the upper control limit.
- "R" – The result was rejected. A rejected result was not usable and therefore was deleted from the report.

Qualification will not be required in the following circumstances:

- Surrogate or MS recoveries were outside QC limits, and the sample was diluted by a factor of 5 or greater.
- MS recoveries were outside QC limits, and the spiked concentration was less than the native sample concentration.
- An analyte was detected in the method blank, but there was no detection in the sample.
- MS or LCS recoveries exceeded upper control limits, and no analytes were detected in the sample(s).

Data may be rejected on the following grounds:

- Initial calibration (per compound) criteria not met
- Continuing calibration (per compound) not verified
- All nondetects with the continuing calibration recovery less than control limits

- All nondetects with the LCS recovery less than control limits
- Any compound with LCS recovery less than 10 percent
- Missed holding times greater than two times the method-specified holding time
- Surrogate recovery of less than 10 percent and a dilution factor of 5 or less

Completeness is a quantitative evaluation (expressed as a percentage) of the overall data quality of the generated results. The completeness goal is met when 95 percent of sample data is not rejected.

4.2 REPORTING

Analytical data will be tabulated in the completed report. Chemistry data tables will include the following information:

- Sample identification
- Location ID
- Lab sample number
- Date collected
- Matrix
- Unit
- LOD (when LOD is not available, LOQ will be presented)
- Analytical method
- Analyte
- Result
- Appropriate qualifiers
- Regulatory or screening criteria

Data quality and usability will be discussed in the summary report. Complete electronic and hard copy data deliverables will be provided to Jacobs by the subcontracted laboratory and submitted to the client. ADEC checklists will be completed for each sample delivery group (SDG).

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5.0 LABORATORY REQUIREMENTS AND CERTIFICATIONS

Any laboratories used to perform work for this project will be required to follow the appropriate program and method requirements to ensure that the data quality is acceptable and can be used to support project decisions.

Laboratory data will be presented in hard copy and electronic formats consistent with the laboratory subcontract. Data deliverables will consist of a hard copy data package as detailed in the laboratory subcontract and in accordance with the DoD QSM version 4.1 (DoD 2009) and the ADEC *Environmental Laboratory Data and Quality Assurance Requirements* Technical Memorandum (ADEC 2009b). Hard copy laboratory summary forms and sampling receiving documentation and complete electronic deliverables will be provided to Jacobs by the subcontracted laboratory and submitted to the client. The laboratory will be required to provide electronic data as COELT per sample delivery group. A searchable and bookmarked electronic PDF file of the data package containing sample and QC results will also be required.

Laboratory certification includes the following requirements:

- Current State of Alaska contaminated sites laboratory approval
- National Environmental Laboratory Accreditation Program (NELAP) and/or DoD ELAP accreditation for the fields of testing and matrices proposed on the project
- Three rounds of proficiency testing studies for review

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6.0 CORRECTIVE ACTION, RESPONSE, REESTABLISHMENT OF CONTROL

Corrective action for either field screening or analytical operations includes response, reestablishment of control, and documentation. Corrective actions shall be approved by the appropriate personnel (Site Manager and/or Jacobs Project Chemist). Implementation of corrective actions will be documented, and documentation shall be maintained and provided with the deliverables. Implementation of corrective action(s) will depend on the nature of the variance and may include repeating field activities, resampling, or documentation in the final report.

Corrective action will be initiated when potential or existing conditions are identified that may adversely affect data quantity or quality. Instituting the corrective action will be the responsibility of the individual who first recognizes an out-of-control event to initiate corrective action.

Events that may require corrective action include the following, at a minimum:

- Deviation from established procedures
- Deviation from established analytical procedures or controls
- Unsatisfactory results of performance, system, or project QA audits

Corrective action includes notification of the Jacobs Project Chemist, Site Manager, and/or Field Sampler(s); response; reestablishment of control; and documentation. The supervisor and appropriate task leader will investigate the extent of the problem and take the necessary corrective steps.

The corrective action may be immediate or long-term. A corrective action requiring immediate response may be recalculation, reanalysis, or repeating sample collection. Long-term corrective action may be identified through, but not be limited to, performance evaluation samples, QA samples, and in-house laboratory standards.

Immediate corrective action is usually applied to spontaneous, nonrecurring problems. Instrument and equipment malfunctions and nonconforming field procedures are amenable to

this type of action. The individual who suspects nonconformance to previously established criteria or protocol in equipment, instruments, data, or methods will immediately notify his/her supervisor. The supervisor and the appropriate task leader will investigate the extent of the problem and take the necessary corrective steps. If a large quantity of data is affected, the Jacobs Project Manager, Jacobs Project Chemist, and Contract Administrator may collectively decide how to proceed.

7.0 CONTRACTOR QUALITY CONTROL

A contractor quality control (CQC) Plan is not required for work at FWA, as government oversight in the form of a Quality Assurance Representative (QAR) is not anticipated to occur on any of the project sites. However, all general CQC procedures will be followed during the execution of each project to be completed under this Work Plan. This section explains a two-phase QC system adopted to ensure quality completeness of all definable features of work (DFW) during the project. This brief summary of CQC procedures is written to provide field staff guidance to address project quality control issues, site documentation and reporting requirements, and standard forms to be used.

This two-phase system forms the core of the QC system and is comprised of the following phases:

- The preparatory phase (prior to beginning the DFW) will consist of a meeting conducted by the Site Manager or Technical Lead and attended by all persons involved in the performance of the DFW. This meeting will include a detailed discussion of the contract plans, work items, and hazards involved in the DFW.
- The follow-up phase (during performance of the DFW) consists of the performance of periodic checks to assure continuing compliance with contractual requirements, including safety. Follow-up checks will be performed until the completion of the DFW. The specific tasks, or control points, required to complete each DFW are described in the forms presented in the attachments to this QAPP.

Attachment C-7 presents the forms used to outline the specific preparatory phase control requirement for each anticipated DFW, the forms used for preparatory phase meeting minutes, and the form used for the daily QC report. This last form documents the follow-up phase requirements. Preparatory phase checklists will be completed for each DFW in the site-specific work plan addendum.

7.1 CQC RESPONSIBILITIES

Site activities will be performed by Jacobs and approved subcontractors. The Technical Lead shall be responsible for overall management of the CQC system and will have authority to act in all matters for the contractor, ensuring compliance with the requirements identified in each Task Order or Delivery Order. The Technical Lead reports directly to the Site Manager.

The Technical Lead shall perform the following actions:

- Use authority to stop work that is not conducted in accordance with the contract and project plans.
- Ensure that site personnel assigned to the project are aware of and abide by the task order requirements.
- Monitor the work performed by the subcontractors and Jacobs employees to ensure contract items and conditions are fulfilled in accordance with work plans, specifications, and standard operating procedures.
- Perform or monitor tests, evaluations, or other measurements needed to meet quality requirements.
- Prevent, stop, or correct QC deficiencies, defective work, or noncompliance.
- Investigate, research, define, and isolate quality problems and participate in their resolution.
- Implement required field-reporting procedures as outlined in the work plans and as required in the task order.
- Keep a daily logbook (or daily activity report) to record all significant project site events.
- Submit daily QC reports to the project decision team.
- Initiate and maintain QC records, review procedures, and documentation for completeness, accuracy, and compliance with contract requirements.
- Hold preparatory phase meetings for each DFW and perform follow-up inspections in the form of daily QC reports as appropriate.
- Monitor and update the submittal register (if applicable) and review submittals.
- Effectively communicate the content and purpose of the contract documents to the members of the field team to ensure consistency of implementation.
- Obtain, present, and discuss in detail all applicable permits, certificates, and licenses in preparatory-phase meetings.

7.2 ADDITIONAL QUALITY CONTROL PERSONNEL

The field scientist and/or technicians will possess adequate formal training and sufficient practical, technical, and administrative experience in executing site surveillance and recording inspection activities. Inspection personnel shall demonstrate knowledge of construction and remediation, codes and regulations, equipment installation, observation and testing procedures, equipment, and general site safety. Such personnel shall receive training in pertinent project documents relating to the work.

7.3 NONCONFORMANCE AND CORRECTIVE ACTION

All nonconforming material, assembly, or construction methods must be corrected through systematic actions. Any time that a condition exists that does not comply with drawings, specifications, codes, workmanship standards, or contract requirements, the Site Manager or Technical Lead shall take the following actions:

- Initiate prompt corrective action or stop work if necessary.
- Notify the client of any nonconformance as soon as possible. Notification will include information for the intended corrective action and schedule to alleviate the nonconformance.
- Document discrepancies on a nonconformance report (NCR) form (Attachment C-7). The NCR shall contain a detailed description of the item or conditions that failed to meet drawing or specification requirements. The NCR register form will be updated daily and maintained during construction. When an NCR is written, it will be attached to the daily report.
- The CQC System Manager shall evaluate discrepancies to coordinate the resolution and determine methods of correction.
- In the final correction block of the NCR form, the CQC System Manager shall note any retest required and performed, nondestructive examination required, or change in replacement parts used in correcting the problem.

When a corrective action is complete, the item shall again be subject to final inspection.

7.4 CHANGE CONTROL

A formal process shall identify, document, and track status of procedural and condition changes in project design and remedial construction work. Personnel shall notify the CQC System Manager and the Jacobs Site Manager immediately once a change is anticipated. All such changes shall be reviewed and closely coordinated with the U.S. Army Corps of Engineers (USACE).

7.5 DOCUMENTATION

Jacobs will maintain current records providing factual evidence that QC activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall include the following information:

- Contractor/subcontractor and area of responsibility
- Operating plant/equipment with hours worked, idle, or down for repair
- Work performed each day, location, description, and by whom
- Test and/or control activities performed, with results and references to specifications, drawings, requirements, and deficiencies noted with corrective actions taken
- Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements
- Submittals reviewed, with contract reference, by whom, and action taken
- Offsite surveillance activities, including actions taken
- Job safety evaluations stating what was checked, results, and instructions of corrective actions
- Instructions given/received and conflicts in plans and/or specifications
- Contractor's verification statement

8.0 REFERENCES

ADEC (Alaska Department of Environmental Conservation). 2009a (April). *Draft Vapor Intrusion Guidance for Contaminated Sites.*

ADEC. 2009b (March). *Environmental Laboratory Data and Quality Assurance Requirements*. Technical Memorandum.

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ADEC. 2002 (November). *Underground Storage Tanks Procedures Manual – Guidance for Remediation of Petroleum-Contaminated Soil and Water and Standard Sampling Procedures*.

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EPA. 1995. *Methods for Determination of Organic Compounds in Drinking Water Supplement III*.

ORNL (Oak Ridge National Laboratory). 1997 (August). *Preliminary Remediation Goals for Ecological Endpoints*. Doc. ES\ER\TM-162\R2.

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ATTACHMENT C-1
ADEC Method Two, Under 40-inch, Regulatory Action Limits

Attachment C-1
ADEC Method Two, Under 40-inch, Regulatory Action Limits

Analyte	CAS Number	Ingestion (mg/kg)	Inhalation (mg/kg)	Migration to Groundwater (mg/kg)
Petroleum Hydrocarbons				
Gasoline Range Organics by AK101	–	1400	1400	260
Diesel Range Organics by AK102	–	10250	10250	230
Residual Range Organics by AK103	–	10000	22000	11000

Analyte	CAS Number	Direct Contact (mg/kg)	Outdoor Inhalation (mg/kg)	Migration to Groundwater (mg/kg)
VOCs by Method SW8260				
1,1,1-Trichloroethane	71-55-6	20300	360	0.82
1,1,1,2-Tetrachloroethane	630-20-6	–	–	–
1,1,2,2-Tetrachloroethane	79-34-5	42	5.5	0.017
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	–	750	750
1,1,2-Trichloroethane	79-00-5	150	11	0.018
1,1-Dichloroethane	75-34-3	20300	900	25
1,1-Dichloroethene	75-35-4	14	0.85	0.03
1,1-Dichloropropene	563-58-6	–	–	–
1,2,3-Trichlorobenzene	87-61-6	–	–	–
1,2,3-Trichloropropane	96-18-4	1.2	0.17	0.00053
1,2,4-Trichlorobenzene	120-82-1	1000	41	0.85
1,2,4-Trimethylbenzene	95-63-6	5100	49	23
1,2-Dibromo-3-chloropropane	96-12-8	–	–	–
1,2-Dibromoethane (Ethylene dibromide, EDB)	106-93-4	4.2	0.6	0.00016
1,2-Dichlorobenzene	95-50-1	9100	45	5.1
1,2-Dichloroethane	107-06-2	91	4.8	0.016
1,2-Dichloropropane	78-87-5	120	5.3	0.018
1,3,5-Trimethylbenzene	108-67-8	5100	42	23
1,3-Dichlorobenzene	541-73-1	9100	69	28
1,3-Dichloropropane	142-28-9	–	–	–
1,3-Dichloropropene	542-75-6	83	27	0.033
1,4-Dichlorobenzene	106-46-7	350	30	0.64
2,2-Dichloropropane	594-20-7	–	–	–
2-Chlorotoluene	95-49-8	–	–	–
2-Hexanone	591-78-6	–	–	–
4-Chlorotoluene	106-43-4	–	–	–
4-Isopropyltoluene	99-87-6	–	–	–
Acetone	67-64-1	91300	68600	88

Attachment C-1
ADEC Method Two, Under 40-inch, Regulatory Action Limits (Continued)

Analyte	CAS Number	Direct Contact (mg/kg)	Outdoor Inhalation (mg/kg)	Migration to Groundwater (mg/kg)
Benzene	71-43-2	150	11	0.025
Bromobenzene	108-86-1	–	–	–
Bromochloromethane	74-97-5	–	–	–
Bromodichloromethane	75-27-4	130	10	0.044
Bromoform	75-25-2	1100	420	0.34
Butanol (Butyl alcohol)	71-36-3	6500	-	9.8
Carbon disulfide	75-15-0	4800	250	12
Carbon tetrachloride	56-23-5	64	3.1	0.023
Chlorobenzene	108-90-7	2000	200	0.63
Chlorodibromomethane (Dibromochloromethane)	124-48-1	99	14	0.032
Chloroethane	75-00-3	2900	23	580
Chloroform	67-66-3	1000	3.2	0.46
cis-1,2-Dichloroethene	156-59-2	1000	130	0.24
Dichlorodifluoromethane	75-71-8	20300	380	140
Ethylbenzene	100-41-4	10100	110	6.9
Ethylene glycol	107-21-1	130000	–	190
Hexachloro-1,3-butadiene	87-68-3	13	3.8	0.12
Isopropylbenzene	98-82-8	10100	62	51
Methyl bromide (Bromomethane)	74-83-9	140	14	0.16
Methyl chloride (Chloromethane)	74-87-3	640	25	0.21
Methyl ethyl ketone (MEK, 2-butanone)	78-93-3	60800	23300	59
Methyl isobutyl ketone (MIBK, 4-methyl-2-pentanone)	108-10-1	8100	2100	8.1
Methylene bromide	74-95-3	1000	370	1.1
Methylene chloride (Dichloromethane)	75-09-2	1100	160	0.016
Methyl-tert-butyl ether (MTBE)	1634-04-4	4600	290	1.3
Naphthalene	91-20-3	1400	28	20
n-Butylbenzene	104-51-8	1000	42	15
n-Propylbenzene	103-65-1	1000	42	15
o-Xylene	95-47-6	20300	63	63
sec-Butylbenzene	135-98-8	1000	41	12
Styrene	100-42-5	20300	200	0.96
tert-Butylbenzene	98-06-6	1000	70	12
Tetrachloroethene (PCE)	127-18-4	15	10	0.024
Toluene	108-88-3	8100	220	6.5
trans-1,2-Dichloroethene	156-60-5	2000	160	0.37
Trichloroethene (TCE)	79-01-6	21	0.57	0.02

Attachment C-1
ADEC Method Two, Under 40-inch, Regulatory Action Limits (Continued)

Analyte	CAS Number	Direct Contact (mg/kg)	Outdoor Inhalation (mg/kg)	Migration to Groundwater (mg/kg)
Trichlorofluoromethane (Freon-11)	75-69-4	30400	990	86
Vinyl acetate	108-05-4	101000	1500	100
Vinyl chloride	75-01-4	5.5	4.3	0.0085
Xylene, Isomers m & p	108-38-2	20300	63	63
Total Xylenes	1330-20-7	20300	63	63
SVOCs by Method SW8270				
1,2,4-Trichlorobenzene	120-82-1	1000	41	0.85
1,2-Dichlorobenzene	95-50-1	9100	45	5.1
1,2-Diphenylhydrazine	122-66-7	–	–	–
1,3-Dichlorobenzene	541-73-1	9100	69	28
1,4-Dichlorobenzene	106-46-7	350	30	0.64
1,4-Dioxane	123-91-1	540	–	0.21
1-Methylnaphthalene	90-12-0	280	760	6.2
2,4,5-Trichlorophenol	95-95-4	6500	–	67
2,4,6-Trichlorophenol	88-06-2	460	4100	1.4
2,4-Dichlorophenol	120-83-2	230	–	1.3
2,4-Dimethylphenol	105-67-9	1300	–	8.8
2,4-Dinitrophenol	51-28-5	160	–	0.54
2,4-Dinitrotoluene	121-14-2	8.8	–	0.0093
2,6-Dichlorophenol	87-65-0	–	–	–
2,6-Dinitrotoluene	606-20-2	8.9	–	0.0094
2-Chloronaphthalene	91-58-7	4700	–	120
2-Chlorophenol	95-57-8	510	2500	1.5
2-Methyl-4,6-dinitrophenol	534-52-1	–	–	–
2-Methylnaphthalene	91-57-6	280	750	6.1
2-Methylphenol (o-cresol)	95-48-7	3200	–	15
2-Nitroaniline	88-74-4	–	–	–
2-Nitrophenol	88-75-5	–	–	–
3,3'-Dichlorobenzidine	91-94-1	11	–	0.19
3-Methylphenol (m-cresol)	108-39-4	3200	–	15
3-Nitroaniline	99-09-2	–	–	–
4-Bromophenyl phenyl ether	101-55-3	–	–	–
4-Chloro-3-methylphenol	59-50-7	–	–	–
4-Chloroaniline	106-47-8	90	–	0.057
4-Chlorophenyl phenyl ether	7005-72-3	–	–	–
4-Methylphenol (p-cresol)	106-44-5	350	–	1.5
4-Nitroaniline	100-01-6	–	–	–
4-Nitrophenol	100-02-7	–	–	–

Attachment C-1
ADEC Method Two, Under 40-inch, Regulatory Action Limits (Continued)

Analyte	CAS Number	Direct Contact (mg/kg)	Outdoor Inhalation (mg/kg)	Migration to Groundwater (mg/kg)
Acenaphthene	83-32-9	2800	–	180
Acenaphthylene	208-96-8	2800	–	180
Aniline	62-53-3	–	–	–
Anthracene	120-12-7	20600	–	3000
Azobenzene	103-33-3	–	–	–
Benzidine	92-87-5	–	–	–
Benzo(a)anthracene	56-55-3	4.9	–	3.6
Benzo(a)pyrene	50-32-8	0.49	–	2.1
Benzo(b)fluoranthene	205-99-2	4.9	–	12
Benzo(g,h,i)perylene	191-24-2	1400	–	38700
Benzo(k)fluoranthene	207-08-9	49	–	120
Benzoic acid	65-85-0	317000	–	410
Benzyl alcohol	100-51-6	–	–	–
bis-(2-Chloroethoxy)methane	111-91-1	–	–	–
bis-(2-Chloroethyl)ether	111-44-4	7.5	3.3	0.0022
bis(2-Chloroisopropyl)ether	108-60-1	–	–	–
bis-(2-Ethylhexyl)phthalate	117-81-7	220	–	13
Butyl benzyl phthalate	85-68-7	2900	–	920
Carbazole	86-74-8	290	–	6.5
Chrysene	218-01-9	490	–	360
Dibenzo(a,h)anthracene	53-70-3	0.49	–	4
Dibenzofuran	132-64-9	200	–	11
Diethyl phthalate	84-66-2	61900	–	130
Dimethyl phthalate	131-11-3	773000	–	1100
Di-n-butyl phthalate	84-74-2	7900	–	80
Di-n-octyl phthalate	117-84-0	3100	–	3800
Diphenylamine	122-39-4	1600	–	25
Fluoranthene	206-44-0	1900	–	1400
Fluorene	86-73-7	2300	–	220
Hexachlorobenzene	118-74-1	3.2	1.5	0.047
Hexachlorobutadiene	87-68-3	13	3.8	0.12
Hexachlorocyclopentadiene	77-47-4	390	2	1.3
Hexachloroethane	67-72-1	65	170	0.21
Indeno(1,2,3-cd)pyrene	193-39-5	4.9	–	41
Isophorone	78-59-1	5300	–	3.1
Naphthalene	91-20-3	1400	28	20
Nitrobenzene	98-95-3	51	120	0.094
n-Nitrosodimethylamine	62-75-9	0.16	0.19	0.000053

Attachment C-1
ADEC Method Two, Under 40-inch, Regulatory Action Limits (Continued)

Analyte	CAS Number	Direct Contact (mg/kg)	Outdoor Inhalation (mg/kg)	Migration to Groundwater (mg/kg)
n-Nitrosodi-n-propylamine	621-64-7	0.52	–	0.0011
n-Nitrosodiphenylamine	86-30-6	750	–	15
n-Nitrosopyrrolidine	930-55-2	–	–	–
Pentachlorophenol	87-86-5	39	–	0.047
Phenanthrene	85-01-8	20600	–	3000
Phenol	108-95-2	23200	–	68
Pyrene	129-00-0	1400	–	1000
Pyridine	110-86-1	–	–	–
PAHs by Method SW8270 SIM				
Acenaphthene	83-32-9	2800	–	180
Acenaphthylene	208-96-8	2800	–	180
Anthracene	120-12-7	20600	–	3000
Benzo(a)anthracene	56-55-3	4.9	–	3.6
Benzo(a)pyrene	50-32-8	0.49	–	2.1
Benzo(b)fluoranthene	205-99-2	4.9	–	12
Benzo(g,h,i)perylene	191-24-2	1400	–	38700
Benzo(k)fluoranthene	207-08-9	49	–	120
Chrysene	218-01-9	490	–	360
Dibenzo(a,h)anthracene	53-70-3	0.49	–	4
Fluoranthene	206-44-0	1900	–	1400
Fluorene	86-73-7	2300	–	220
Indeno(1,2,3-cd)pyrene	193-39-5	4.9	–	41
Naphthalene	91-20-3	1400	28	20
Phenanthrene	85-01-8	20600	–	3000
Pyrene	129-00-0	1400	–	1000
Organochlorine Pesticides by Method SW8081				
4,4'-DDD	72-54-8	30	–	7.2
4,4'-DDE	72-55-9	21	–	5.1
4,4'-DDT	50-29-3	21	–	7.3
Aldrin	309-00-2	0.3	–	0.07
alpha-Chlordane	5103-71-9	19	–	2.3
alpha-Hexachlorocyclohexane (α-BHC)	319-84-6	1.2	–	0.0064
beta-Hexachlorocyclohexane (β-BHC)	319-85-7	4	–	0.022
Chlordane	57-74-9	19	–	2.3
delta-Hexachlorocyclohexane (δ-BHC)	319-86-8	–	–	–
Dieldrin	60-57-1	0.32	–	0.0076
Endosulfan	115-29-7	610	–	64
Endosulfan I	959-98-8	–	–	–

Attachment C-1
ADEC Method Two, Under 40-inch, Regulatory Action Limits (Continued)

Analyte	CAS Number	Direct Contact (mg/kg)	Outdoor Inhalation (mg/kg)	Migration to Groundwater (mg/kg)
Endosulfan II	33213-65-9	–	–	–
Endosulfan sulfate	1031-07-8	–	–	–
Endrin	72-20-8	2	–	0.29
Endrin aldehyde	7421-93-4	–	–	–
Endrin ketone	53494-70-5	–	–	–
gamma-Chlordane	5103-74-2	19	–	2.3
gamma-Hexachlorocyclohexane (γ-BHC, lindane)	58-89-9	5.6	–	0.0095
Heptachlor	76-44-8	1.3	–	0.28
Heptachlor epoxide	1024-57-3	0.63	–	0.014
Methoxychlor	72-43-5	320	–	23
Toxaphene	8001-35-2	7.5	–	3.9
PCBs by Method SW8082				
PCB-1016 (Aroclor 1016)	12674-11-2	1	–	–
PCB-1221 (Aroclor 1221)	11104-28-2	1	–	–
PCB-1232 (Aroclor 1232)	11141-16-5	1	–	–
PCB-1242 (Aroclor 1242)	53469-21-9	1	–	–
PCB-1248 (Aroclor 1248)	12672-29-6	1	–	–
PCB-1254 (Aroclor 1254)	11097-69-1	1	–	–
PCB-1260 (Aroclor 1260)	11096-82-5	1	–	–
Total PCBs	133-63-63	1	–	–
Herbicides by Method SW8151				
2,4,5-trichlorophenoxy acetic acid (2,4,5-T)	93-76-5	–	–	–
2-(2,4,5-Trichlorophenoxy) propionic acid (2,4,5-TP)	93-72-1	520	–	0.19
2,4-Dichlororphenoxy acetic acid (2,4-D)	94-75-7	860	–	0.21
4-(2,4-Dichlorophenoxy) butanoic acid (2,4-DB)	94-82-6	–	–	–
2-Methyl-4-chlorophenoxy acetic acid (MCPA)	94-74-6	–	–	–
2-(4-chloro-2-methylphenoxy) propanoic acid (MCPP)	93-65-2	–	–	–
Dalapon	75-99-0	–	–	–
Dicamba	1918-00-9	–	–	–
Dichloroprop	120-36-5	–	–	–
Dinoseb	88-85-7	–	–	–
Explosives by Methods SW8321/8330				
1,2-Dinitrobenzene	528-29-0	7.8	–	0.02
1,3,5-Trinitrobenzene	99-35-4	2800	–	19
1,3-Dinitrobenzene	99-65-0	7.1	–	0.02
1,4-Dinitrobenzene	100-25-4	6.5	–	0.02

Attachment C-1
ADEC Method Two, Under 40-inch, Regulatory Action Limits (Continued)

Analyte	CAS Number	Direct Contact (mg/kg)	Outdoor Inhalation (mg/kg)	Migration to Groundwater (mg/kg)
2,4,6-Trinitrophenylmethylnitramine (Tetryl)	479-45-8	400	–	4.5
2,4,6-Trinitrotoluene (TNT)	118-96-7	44	–	0.49
2,4-Dinitrotoluene	121-14-2	8.8	–	0.0093
2,6-Dinitrotoluene	606-20-2	8.9	–	0.0094
2-Amino-4,6-dinitrotoluene	35572-78-2	20	–	0.029
2-Nitrotoluene	88-72-2	26	–	0.025
3-Nitrotoluene	99-08-1	1500	–	4.9
4-Amino-2,6-dinitrotoluene	19406-51-0	19	–	0.029
4-Nitrotoluene	99-99-0	350	–	–
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	72	–	0.04
Nitrobenzene	98-95-3	51	120	0.094
Nitroglycerin	55-63-0	300	–	0.22
Nitroguanidine	556-88-7	6500	–	11
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	4600	–	49
Dioxins/Furans by Method SW8290				
1,2,3,4,6,7,8,9-Octachlorodibenzofurans	39001-02-0	–	–	–
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	3268-87-9	–	–	–
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	–	–	–
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9	–	–	–
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-87-7	–	–	–
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	–	–	–
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6	–	–	–
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	–	–	–
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	–	–	–
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	–	–	–
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	–	–	–
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	–	–	–
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	–	–	–
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	–	–	–
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	–	–	–
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	–	–	–
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	1746-01-6	0.000047	–	0.000058
Chlorpyrifos	2921-88-2	–	–	–
Other Organic Analytes by Various Methods				
Hydrazine	302-01-2	1.7	0.98	0.0008
Methyl Mercury	22967-92-6	7.7	–	0.012

Attachment C-1
ADEC Method Two, Under 40-inch, Regulatory Action Limits (Continued)

Analyte	CAS Number	Direct Contact (mg/kg)	Outdoor Inhalation (mg/kg)	Migration to Groundwater (mg/kg)
Tributyltin	688-73-3	19	–	5500
Metals by Method SW6020				
Aluminium	7429-90-5	–	–	–
Antimony	7440-36-0	41	–	3.6
Arsenic	7440-38-2	4.5	–	3.9
Barium	7440-39-3	20300	–	1100
Beryllium	7440-41-7	200	–	42
Cadmium	7440-43-9	79	–	5
Calcium	7440-70-2	–	–	–
Chromium (Total)	7440-47-3	300	–	25
Chromium +3	16065-83-1	152000	–	–
Cobalt	7440-48-4	–	–	–
Copper	7440-50-8	4100	–	460
Iron	7439-89-6	–	–	–
Lead	7439-92-1	400	–	–
Magnesium	7439-95-4	–	–	–
Manganese	7439-96-5	–	–	–
Molybdenum	7439-98-7	–	–	–
Nickel	7440-02-0	2000	–	86
Potassium	7440-09-7	–	–	–
Selenium	7782-49-2	510	–	3.4
Silver	7440-22-4	510	–	11.2
Sodium	7440-23-5	–	–	–
Thallium	7440-28-0	8.1	–	1.9
Vanadium	7440-62-2	710	–	3400
Zinc	7440-66-6	30400	–	4100
Total Mercury by Method SW7471				
Mercury	7439-97-6	30	18	1.4
Other Inorganic Analytes by Various Methods				
Chromium +6	18540-29-9	300	–	25
Cyanide	57-12-5	2000	–	27
Perchlorate	7790-98-9	71	–	0.067
White phosphorus	7723-14-0	2	–	0.036

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
[1] 18 AAC 75, Tables B1 and B2 (ADEC 2008)
[2] Total xylenes is the sum of m-, o-, and p-xylenes.
– No applicable regulatory action limit or screening criteria available.

ATTACHMENT C-2
Sediment Screening Criteria

Attachment C-2
Sediment Screening Criteria

Analyte	CAS Number	Freshwater		Marine	
		NOAA TEL (mg/kg)	NOAA PEL (mg/kg)	NOAA TEL (mg/kg)	NOAA PEL (mg/kg)
Petroleum Hydrocarbons					
GRO	–	–	–	–	–
DRO	–	–	–	–	–
RRO	–	–	–	–	–
VOCs by SW8260B					
1,1,1-Trichloroethane	71-55-6	–	–	–	–
1,1,1,2-Tetrachloroethane	630-20-6	–	–	–	–
1,1,2,2-Tetrachloroethane	79-34-5	–	–	–	–
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1		–	–	–
1,1,2-Trichloroethane	79-00-5	–	–	–	–
1,1-Dichloroethane	75-34-3	–	–	–	–
1,1-Dichloroethene	75-35-4	–	–	–	–
1,1-Dichloropropene	563-58-6	–	–	–	–
1,2,3-Trichloropropane	96-18-4	–	–	–	–
1,2,4-Trichlorobenzene	120-82-1	–	–	–	–
1,2,4-Trimethylbenzene	95-63-6	–	–	–	–
1,2-Dibromoethane (Ethylene dibromide, EDB)	106-93-4	–	–	–	–
1,2-Dichlorobenzene	95-50-1	–	–	–	–
1,2-Dichloroethane	107-06-2	–	–	–	–
1,2-Dichloropropane	78-87-5	–	–	–	–
1,3,5-Trimethylbenzene	108-67-8	–	–	–	–
1,3-Dichlorobenzene	541-73-1	–	–	–	–
1,3-Dichloropropane	142-28-9	–	–	–	–
1,3-Dichloropropene	542-75-6	–	–	–	–
1,4-Dichlorobenzene	106-46-7	–	–	–	–
2,2-Dichloropropane	594-20-7	–	–	–	–
2-Chlorotoluene	95-49-8	–	–	–	–
2-Hexanone	591-78-6	–	–	–	–
4-Chlorotoluene	106-43-4	–	–	–	–
4-Isopropyltoluene	99-87-6	–	–	–	–
Acetone	67-64-1	–	–	–	–
Benzene	71-43-2	–	–	–	–
Bromobenzene	108-86-1	–	–	–	–
Bromochloromethane	74-97-5	–	–	–	–
Bromodichloromethane	75-27-4	–	–	–	–
Bromoform	75-25-2	–	–	–	–
Carbon disulfide	75-15-0	–	–	–	–
Carbon tetrachloride	56-23-5	–	–	–	–

Attachment C-2
Sediment Screening Criteria (Continued)

Analyte	CAS Number	Freshwater		Marine	
		NOAA TEL (mg/kg)	NOAA PEL (mg/kg)	NOAA TEL (mg/kg)	NOAA PEL (mg/kg)
Chlorobenzene	108-90-7	–	–	–	–
Chlorodibromomethane (Dibromochloromethane)	124-48-1	–	–	–	–
Chloroethane	75-00-3	–	–	–	–
Chloroform	67-66-3	–	–	–	–
cis-1,2-Dichloroethene	156-59-2	–	–	–	–
Dichlorodifluoromethane	75-71-8	–	–	–	–
Ethylbenzene	100-41-4	–	–	–	–
Ethylene glycol	107-21-1	–	–	–	–
Hexachloro-1,3-butadiene	87-68-3	–	–	–	–
Isopropylbenzene	98-82-8	–	–	–	–
Methyl bromide (Bromomethane)	74-83-9	–	–	–	–
Methyl chloride (Chloromethane)	74-87-3	–	–	–	–
Methyl ethyl ketone (MEK, 2-butanone)	78-93-3	–	–	–	–
Methyl isobutyl ketone (MIBK, 4-methyl-2-pentanone)	108-10-1	–	–	–	–
Methylene bromide	74-95-3	–	–	–	–
Methylene chloride (Dichloromethane)	75-09-2	–	–	–	–
Methyl-tert-butyl ether (MTBE)	1634-04-4	–	–	–	
Naphthalene	91-20-3	0.0346	0.391	0.0346	0.0391
n-Butylbenzene	104-51-8	–	–	–	–
n-Propylbenzene	103-65-1	–	–	–	–
o-Xylene	95-47-6	–	–	–	–
sec-Butylbenzene	135-98-8	–	–	–	–
Styrene	100-42-5	–	–	–	–
tert-Butylbenzene	98-06-6	–	–	–	–
Tetrachloroethene (PCE)	127-18-4	–	–	–	–
Toluene	108-88-3	–	–	–	–
trans-1,2-Dichloroethene	156-60-5	–	–	–	–
Trichloroethene (TCE)	79-01-6	–	–	–	–
Trichlorofluoromethane (Freon-11)	75-69-4	–	–	–	–
Vinyl acetate	108-05-4	–	–	–	–
Vinyl chloride (Chloroethene)	75-01-4	–	–	–	–
Xylene, Isomers m & p	108-38-2	–	–	–	–
Total Xylenes	1330-20-7	–	–	–	–
SVOCs by Method SW8270					
1,2,4-Trichlorobenzene	120-82-1	–	–	–	–
1,2-Dichlorobenzene	95-50-1	–	–	–	–

Attachment C-2
Sediment Screening Criteria (Continued)

Analyte	CAS Number	Freshwater		Marine	
		NOAA TEL (mg/kg)	NOAA PEL (mg/kg)	NOAA TEL (mg/kg)	NOAA PEL (mg/kg)
1,2-Diphenylhydrazine	122-66-7	–	–	–	–
1,3-Dichlorobenzene	541-73-1	–	–	–	–
1,4-Dichlorobenzene	106-46-7	–	–	–	–
1-Methylnaphthalene	90-12-0	–	–	–	–
2,4,5-Trichlorophenol	95-95-4	–	–	–	–
2,4,6-Trichlorophenol	88-06-2	–	–	–	–
2,4-Dichlorophenol	120-83-2	–	–	–	–
2,4-Dimethylphenol	105-67-9	–	–	–	–
2,4-Dinitrophenol	51-28-5	–	–	–	–
2,4-Dinitrotoluene	121-14-2	–	–	–	–
2,6-Dichlorophenol	87-65-0	–	–	–	–
2,6-Dinitrotoluene	606-20-2	–	–	–	–
2-Chloronaphthalene	91-58-7	–	–	–	–
2-Chlorophenol	95-57-8	–	–	–	–
2-Methyl-4,6-dinitrophenol	534-52-1	–	–	–	–
2-Methylnaphthalene	91-57-6	–	–	0.02021	0.20128
2-Methylphenol (o-cresol)	95-48-7	–	–	–	–
2-Nitroaniline	88-74-4	–	–	–	–
2-Nitrophenol	88-75-5	–	–	–	–
3,3-Dichlorobenzidine	91-94-1	–	–	–	–
3-Methylphenol (m-cresol)	108-39-4	–	–	–	–
3-Nitroaniline	99-09-2	–	–	–	–
4-Bromophenyl phenyl ether	101-55-3	–	–	–	–
4-Chloro-3-methylphenol	59-50-7	–	–	–	–
4-Chloroaniline	106-47-8	–	–	–	–
4-Chlorophenyl phenyl ether	7005-72-3	–	–	–	–
4-Methylphenol (p-cresol)	106-44-5	–	–	–	–
4-Nitroaniline	100-01-6	–	–	–	–
4-Nitrophenol	100-02-7	–	–	–	–
Acenaphthene	83-32-9	0.00671	0.0889	0.00671	0.0889
Acenaphthylene	208-96-8	0.00587	0.128	0.00587	0.128
Aniline	62-53-3	–	–	–	–
Anthracene	120-12-7	0.0469	0.245	0.04685	0.245
Azobenzene	103-33-3	–	–	–	–
Benzidine	92-87-5	–	–	–	–
Benzo(a)anthracene	56-55-3	0.0320	0.385	0.0748	0.693
Benzo(a)pyrene	50-32-8	0.0319	0.782	0.0888	0.763

Attachment C-2
Sediment Screening Criteria (Continued)

Analyte	CAS Number	Freshwater		Marine	
		NOAA TEL (mg/kg)	NOAA PEL (mg/kg)	NOAA TEL (mg/kg)	NOAA PEL (mg/kg)
Benzo(b)fluoranthene	205-99-2	–	–	–	–
Benzo(g,h,i)perylene	191-24-2	–	–	–	–
Benzo(k)fluoranthene	207-08-9	–	–	–	–
Benzoic acid	65-85-0	–	–	–	–
Benzyl alcohol	100-51-6	–	–	–	–
Bis(2-chloroethoxy)methane	111-91-1	–	–	–	–
Bis(2-chloroethyl)ether	111-44-4	–	–	–	–
Bis(2-chloroisopropyl)ether	108-60-1	–	–	–	–
Bis(2-ethylhexyl)phthalate	117-81-7	–	–	0.182	2.647
Butyl benzyl phthalate	85-68-7	–	–	–	–
Carbazole	86-74-8	–	–	–	–
Chrysene	218-01-9	0.0571	0.862	0.108	0.846
Dibenzo(a,h)anthracene	53-70-3	0.00622	0.135	0.00622	0.135
Dibenzofuran	132-64-9	–	–	–	–
Diethyl phthalate	84-66-2	–	–	–	–
Dimethyl phthalate	131-11-3	–	–	–	–
Di-n-butyl phthalate	84-74-2	–	–	–	–
Di-n-octyl phthalate	117-84-0	–	–	–	–
Diphenylamine	122-39-4				
Fluoranthene	206-44-0	0.111	2.355	0.113	1.494
Fluorene	86-73-7	0.0212	0.144	0.02117	0.144
Hexachlorobenzene	118-74-1	–	–	–	–
Hexachloro-1,3-butadiene	87-68-3	–	–	–	–
Hexachlorocyclopentadiene	77-47-4	–	–	–	–
Hexachloroethane	67-72-1	–	–	–	–
Indeno(1,2,3-c,d)pyrene	193-39-5	–	–	–	–
Isophorone	78-59-1	–	–	–	–
Naphthalene	91-20-3	0.0346	0.391	0.03457	0.391
Nitrobenzene	98-95-3	–	–	–	–
n-Nitrosodimethylamine	62-75-9	–	–	–	–
n-Nitrosodi-n-propylamine	621-64-7	–	–	–	–
n-Nitrosodiphenylamine	86-30-6	–	–	–	–
n-Nitrosopyrrolidine	930-55-2				
Pentachlorophenol	87-86-5	–	–	–	–
Phenanthrene	85-01-8	0.0419	0.515	0.08668	0.54353
Phenol	108-95-2	–	–	–	–
Pyrene	129-00-0	0.053	0.875	0.15266	1.3976

Attachment C-2
Sediment Screening Criteria (Continued)

Analyte	CAS Number	Freshwater		Marine	
		NOAA TEL (mg/kg)	NOAA PEL (mg/kg)	NOAA TEL (mg/kg)	NOAA PEL (mg/kg)
Pyridine	110-86-1	–	–	–	–
PAHs by Method SW8270 SIM					
Acenaphthene	83-32-9	0.00671	0.0889	0.00671	0.0889
Acenaphthylene	208-96-8	0.00587	0.128	0.00587	0.128
Anthracene	120-12-7	0.0469	0.245	0.0469	0.245
Benzo(a)anthracene	56-55-3	0.0317	0.385	0.0748	0.693
Benzo(a)pyrene	50-32-8	0.0319	0.782	0.0888	0.763
Benzo(b)fluoranthene	205-99-2	–	–	–	–
Benzo(g,h,i)perylene	191-24-2	–	–	–	–
Benzo(k)fluoranthene	207-08-9	–	–	–	–
Chrysene	218-01-9	0.0571	0.862	0.108	0.846
Dibenzo(a,h)anthracene	53-70-3	0.0622	0.135	0.00622	0.135
Indeno(1,2,3-c,d)pyrene	206-44-0	–	–	–	–
Fluoranthene	86-73-7	0.111	2.355	0.113	1.494
Fluorene	193-39-5	–	–	0.0212	0.1443
Naphthalene	91-20-3	0.0346	0.391	0.0346	0.391
Phenanthrene	85-01-8	0.0419	0.515	0.0867	0.544
Pyrene	129-00-0	0.053	0.875	0.153	1.398
PAH, Total	–	–	–	1.684	16.770
Organochlorine Pesticides by Method SW8081					
4,4'-DDD	72-54-8	0.00354	0.00851	0.00122	0.00781
4,4'-DDE	72-55-9	0.00142	0.00675	0.00207	0.374
4,4'-DDT	50-29-3	0.00119	0.00477	0.00119	0.00477
Aldrin	309-00-2	–	–	–	–
alpha-Chlordane	5103-71-9	–	–	–	–
alpha-Hexachlorocyclohexane (α-BHC)	319-84-6	–	–	–	–
beta-Hexachlorocyclohexane (β-BHC)	319-85-7	–	–	–	–
Chlordane	57-74-9	0.0045	0.0089	0.00226	0.00479
delta-Hexachlorocyclohexane (δ-BHC)	319-86-8	–	–	–	–
Dieldrin	60-57-1	0.00285	0.00667	0.00072	0.0043
Endosulfan	115-29-7	–	–	–	–
Endosulfan I	959-98-8	–	–	–	–
Endosulfan II	33213-65-9	–	–	–	–
Endosulfan sulfate	1031-07-8	–	–	–	–
Endrin	72-20-8	0.00267	0.0624	–	–
Endrin aldehyde	7421-93-4	–	–	–	–
Endrin ketone	53494-70-5	–	–	–	–

Attachment C-2
Sediment Screening Criteria (Continued)

Analyte	CAS Number	Freshwater		Marine	
		NOAA TEL (mg/kg)	NOAA PEL (mg/kg)	NOAA TEL (mg/kg)	NOAA PEL (mg/kg)
gamma-Chlordane	5103-74-2	–	–	–	–
gamma-Hexachlorocyclohexane (γ-BHC, lindane)	58-89-9	0.00094	0.00138	0.00032	0.00099
Heptachlor	76-44-8	–	–	–	–
Heptachlor epoxide	1024-57-3	0.0006	0.00274	–	0.00274
Methoxychlor	72-43-5	–	–	–	–
Toxaphene	8001-35-2	0.0001	–	0.0001	–
PCBs by Method SW8082					
PCB-1016 (Aroclor 1016)	12674-11-2	–	–	–	–
PCB-1221 (Aroclor 1221)	11104-28-2	–	–	–	–
PCB-1232 (Aroclor 1232)	11141-16-5	–	–	–	–
PCB-1242 (Aroclor 1242)	53469-21-9	–	–	–	–
PCB-1248 (Aroclor 1248)	12672-29-6	–	–	–	–
PCB-1254 (Aroclor 1254)	11097-69-1	0.060	0.340	0.0633	0.709
PCB-1260 (Aroclor 1260)	11096-82-5	–	–	–	–
Total PCBs	133-63-63	0.0341	0.277	0.0216	0.189
Herbicides by Method SW8151					
2,4,5-trichlorophenoxy acetic acid (2,4,5-T)	93-76-5	–	–	–	–
2-(2,4,5-Trichlorophenoxy) propionic acid (2,4,5-TP)	93-72-1	–	–	–	–
2,4-Dichlororphenoxy acetic acid (2,4-D)	94-75-7	–	–	–	–
4-(2,4-Dichlorophenoxy) butanoic acid (2,4-DB)	94-82-6	–	–	–	–
2-Methyl-4-chlorophenoxy acetic acid (MCPA)	94-74-6	–	–	–	–
2-(4-chloro-2-methylphenoxy) propanoic acid (MCPP)	93-65-2	–	–	–	–
Dalapon	75-99-0	–	–	–	–
Dicamba	1918-00-9	–	–	–	–
Dichloroprop	120-36-5	–	–	–	–
Dinoseb	88-85-7	–	–	–	–
Pentachlorophenol	87-86-5	–	–	–	–
Explosives by Methods SW8321/8330					
1,2-Dinitrobenzene	528-29-0	–	–	–	–
1,3,5-Trinitrobenzene	99-35-4	–	–	–	–
1,3-Dinitrobenzene	99-65-0	–	–	–	–
1,4-Dinitrobenzene	100-25-4	–	–	–	–
2,4,6-Trinitrophenylmethylnitramine (Tetryl)	479-45-8	–	–	–	–
2,4,6-Trinitrotoluene (TNT)	118-96-7	–	–	–	–
2,4-Dinitrotoluene	121-14-2	–	–	–	–
2,6-Dinitrotoluene	606-20-2	–	–	–	–

Attachment C-2
Sediment Screening Criteria (Continued)

Analyte	CAS Number	Freshwater		Marine	
		NOAA TEL (mg/kg)	NOAA PEL (mg/kg)	NOAA TEL (mg/kg)	NOAA PEL (mg/kg)
2-Amino-4,6-dinitrotoluene	35572-78-2	–	–	–	–
2-Nitrotoluene	88-72-2	–	–	–	–
3-Nitrotoluene	99-08-1	–	–	–	–
4-Amino-2,6-dinitrotoluene	19406-51-0	–	–	–	–
4-Nitrotoluene	99-99-0	–	–	–	–
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	–	–	–	–
Nitrobenzene	98-95-3	–	–	–	–
Nitroglycerin	55-63-0	–	–	–	–
Nitroguanidine	556-88-7	–	–	–	–
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	–	–	–	–
Dioxins/Furans by Method SW8290					
1,2,3,4,6,7,8,9-Octachlorodibenzofurans	39001-02-0	–	–	–	–
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	3268-87-9	–	–	–	–
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	–	–	–	–
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9	–	–	–	–
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-87-7	–	–	–	–
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	–	–	–	–
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6	–	–	–	–
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	–	–	–	–
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	–	–	–	–
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	–	–	–	–
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	–	–	–	–
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	–	–	–	–
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	–	–	–	–
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	–	–	–	–
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	–	–	–	–
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	–	–	–	–
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	1746-01-6	0.00000085	0.0000215	0.00000085	0.0000215
Chlorpyrifos	2921-88-2	–	–	–	–
Other Organic Analytes by Various Methods					
Hydrazine	302-01-2	–	–	–	–
Methyl Mercury	22967-92-6	–	–	–	–
Tributyltin	688-73-3	–	–	–	–
Metals by Method SW6020					
Aluminium	7429-90-5	–	–	–	–
Antimony	7440-36-0	–	–	–	–

Attachment C-2
Sediment Screening Criteria (Continued)

Analyte	CAS Number	Freshwater		Marine	
		NOAA TEL (mg/kg)	NOAA PEL (mg/kg)	NOAA TEL (mg/kg)	NOAA PEL (mg/kg)
Arsenic	7440-38-2	5.9	17	7.24	41.6
Barium	7440-39-3	–	–	–	–
Beryllium	7440-41-7	–	–	–	–
Cadmium	7440-43-9	0.596	3.53	0.680	4.21
Calcium	7440-70-2	–	–	–	–
Chromium (Total)	7440-47-3	37.3	90	52.3	160.0
Chromium +3	16065-83-1	–	–	–	–
Cobalt	7440-48-4	–	–	–	–
Copper	7440-50-8	35.7	197	18.7	108
Lead	7439-92-1	35	91.3	30.24	112
Magnesium	7439-95-4	–	–	–	–
Manganese	7439-96-5	–	–	–	–
Molybdenum	7439-98-7	–	–	–	–
Nickel	7440-02-0	18	36	15.9	42.8
Selenium	7782-49-2	–	–	–	–
Silver	7440-22-4	–	–	0.73	1.77
Sodium	7440-23-5	–	–	–	–
Thallium	7440-28-0	–	–	–	–
Vanadium	7440-62-2	–	–	–	–
Zinc	7440-66-6	123	315	124	271
Total Mercury by Method SW7470					
Mercury	7439-97-6	0.174	0.486	0.13	0.700
Other Inorganic Analytes by Various Methods					
Chromium VI	18540-29-9	–	–	–	–
Cyanide	57-12-5	–	–	–	–
Perchlorate	7790-98-9	–	–	–	–
White phosphorus	7723-14-0	–	–	–	–

Notes:
[2] NOAA SquiRTs (NOAA 2008)
[3] Total xylenes is the sum of m-, o-, and p-xylenes.
– No applicable regulatory action limit or screening criteria available.

ATTACHMENT C-3
Groundwater Cleanup Criteria

Attachment C-3
Groundwater Cleanup Criteria

Analyte	CAS Number	Groundwater (mg/L)
Petroleum Hydrocarbons		
Gasoline Range Organics by AK101	–	2.2
Diesel Range Organics by AK102	–	1.5
Residual Range Organics by AK103	–	1.1
VOCs by Method SW8260		
1,1,1-Trichloroethane	71-55-6	0.2
1,1,1,2-Tetrachloroethane	630-20-6	–
1,1,2,2-Tetrachloroethane	79-34-5	0.0043
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	1100
1,1,2-Trichloroethane	79-00-5	0.005
1,1-Dichloroethane	75-34-3	7.3
1,1-Dichloroethene	75-35-4	0.007
1,1-Dichloropropene	563-58-6	–
1,2,3-Trichloropropane	96-18-4	0.00012
1,2,4-Trichlorobenzene	120-82-1	0.07
1,2,4-Trimethylbenzene	95-63-6	1.8
1,2-Dibromoethane (Ethylene dibromide, EDB)	106-93-4	0.00005
1,2-Dichlorobenzene	95-50-1	0.6
1,2-Dichloroethane	107-06-2	0.005
1,2-Dichloropropane	78-87-5	0.005
1,3,5-Trimethylbenzene	108-67-8	1.8
1,3-Dichlorobenzene	541-73-1	3.3
1,3-Dichloropropane	142-28-9	–
1,3-Dichloropropene	542-75-6	0.0085
1,4-Dichlorobenzene	106-46-7	0.075
2,2-Dichloropropane	594-20-7	–
2-Chlorotoluene	95-49-8	–
2-Hexanone	591-78-6	–
4-Chlorotoluene	106-43-4	–
4-Isopropyltoluene	99-87-6	–
Acetone	67-64-1	33
Benzene	71-43-2	0.005
Bromobenzene	108-86-1	–
Bromochloromethane	74-97-5	–
Bromodichloromethane	75-27-4	0.1
Bromoform	75-25-2	0.11
Carbon disulfide	75-15-0	3.7
Carbon tetrachloride	56-23-5	0.005

Attachment C-3
Groundwater Cleanup Criteria (Continued)

Analyte	CAS Number	Groundwater (mg/L)
Chlorobenzene	108-90-7	0.1
Chlorodibromomethane (Dibromochloromethane)	124-48-1	0.01
Chloroethane	75-00-3	0.29
Chloroform	67-66-3	0.14
cis-1,2-Dichloroethene	156-59-2	0.07
Dichlorodifluoromethane	75-71-8	7.3
Ethylbenzene	100-41-4	0.7
Ethylene glycol	107-21-1	73
Hexachloro-1,3-butadiene	87-68-3	0.0073
Isopropylbenzene	98-82-8	3.7
Methyl bromide (Bromomethane)	74-83-9	0.051
Methyl chloride (Chloromethane)	74-87-3	0.066
Methyl ethyl ketone (MEK, 2-butanone)	78-93-3	22
Methyl isobutyl ketone (MIBK, 4-methyl-2-pentanone)	108-10-1	2.9
Methylene bromide	74-95-3	0.37
Methylene chloride (Dichloromethane)	75-09-2	0.005
Methyl-tert-butyl ether (MTBE)	1634-04-4	0.47
Naphthalene	91-20-3	0.73
n-Butylbenzene	104-51-8	0.37
n-Propylbenzene	103-65-1	0.37
o-Xylene	95-47-6	10
sec-Butylbenzene	135-98-8	0.37
Styrene	100-42-5	0.1
tert-Butylbenzene	98-06-6	0.37
Tetrachloroethene (PCE)	127-18-4	0.005
Toluene	108-88-3	1
trans-1,2-Dichloroethene	156-60-5	0.1
Trichloroethene (TCE)	79-01-6	0.005
Trichlorofluoromethane (Freon-11)	75-69-4	11
Vinyl acetate	108-05-4	37
Vinyl chloride (Chloroethene)	75-01-4	0.002
Xylene, Isomers m & p	108-38-2	10
Total Xylenes	1330-20-7	10
1,2-Dibromoethane (EDB) by Method 504.1		
1,2-Dibromoethane (Ethylene dibromide, EDB)	106-93-4	0.00005
SVOCs by Method SW8270		
1,2,4-Trichlorobenzene	120-82-1	0.07
1,2-Dichlorobenzene	95-50-1	0.6

Attachment C-3
Groundwater Cleanup Criteria (Continued)

Analyte	CAS Number	Groundwater (mg/L)
1,2-Diphenylhydrazine	122-66-7	–
1,3-Dichlorobenzene	541-73-1	3.3
1,4-Dichlorobenzene	106-46-7	0.075
1-Methylnaphthalene	90-12-0	0.15
2,4,5-Trichlorophenol	95-95-4	3.7
2,4,6-Trichlorophenol	88-06-2	0.077
2,4-Dichlorophenol	120-83-2	0.11
2,4-Dimethylphenol	105-67-9	0.73
2,4-Dinitrophenol	51-28-5	0.073
2,4-Dinitrotoluene	121-14-2	0.0013
2,6-Dichlorophenol	87-65-0	–
2,6-Dinitrotoluene	606-20-2	0.0013
2-Chloronaphthalene	91-58-7	2.9
2-Chlorophenol	95-57-8	0.18
2-Methyl-4,6-dinitrophenol	534-52-1	–
2-Methylnaphthalene	91-57-6	0.15
2-Methylphenol (o-cresol)	95-48-7	1.8
2-Nitroaniline	88-74-4	–
2-Nitrophenol	88-75-5	–
3,3-Dichlorobenzidine	91-94-1	0.0019
3-Methylphenol (m-cresol)	108-39-4	1.8
3-Nitroaniline	99-09-2	–
4-Bromophenyl phenyl ether	101-55-3	–
4-Chloro-3-methylphenol	59-50-7	–
4-Chloroaniline	106-47-8	0.016
4-Chlorophenyl phenyl ether	7005-72-3	–
4-Methylphenol (p-cresol)	106-44-5	0.18
4-Nitroaniline	100-01-6	–
4-Nitrophenol	100-02-7	–
Acenaphthene	83-32-9	2.2
Acenaphthylene	208-96-8	2.2
Aniline	62-53-3	–
Anthracene	120-12-7	11
Azobenzene	103-33-3	–
Benzidine	92-87-5	–
Benzo(a)anthracene	56-55-3	0.0012
Benzo(a)pyrene	50-32-8	0.0002
Benzo(b)fluoranthene	205-99-2	0.0012

Attachment C-3
Groundwater Cleanup Criteria (Continued)

Analyte	CAS Number	Groundwater (mg/L)
Benzo(g,h,i)perylene	191-24-2	1.1
Benzo(k)fluoranthene	207-08-9	0.012
Benzoic acid	65-85-0	150
Benzyl alcohol	100-51-6	–
Bis(2-chloroethoxy)methane	111-91-1	–
Bis(2-chloroethyl)ether	111-44-4	0.00077
Bis(2-chloroisopropyl)ether	108-60-1	–
Bis(2-ethylhexyl)phthalate	117-81-7	0.006
Butyl benzyl phthalate	85-68-7	7.3
Carbazole	86-74-8	0.043
Chrysene	218-01-9	0.12
Dibenzo(a,h)anthracene	53-70-3	0.00012
Dibenzofuran	132-64-9	0.073
Diethyl phthalate	84-66-2	29
Dimethyl phthalate	131-11-3	370
Di-n-butyl phthalate	84-74-2	3.7
Di-n-octyl phthalate	117-84-0	1.5
Diphenylamine	122-39-4	0.91
Fluoranthene	206-44-0	1.5
Fluorene	86-73-7	1.5
Hexachlorobenzene	118-74-1	0.001
Hexachlorobutadiene	87-68-3	0.0073
Hexachlorocyclopentadiene	77-47-4	0.05
Hexachloroethane	67-72-1	0.04
Indeno(1,2,3-c,d)pyrene	193-39-5	0.0012
Isophorone	78-59-1	0.9
Naphthalene	91-20-3	0.73
Nitrobenzene	98-95-3	0.018
n-Nitrosodimethylamine	62-75-9	0.000017
n-Nitrosodi-n-propylamine	621-64-7	0.00012
n-Nitrosodiphenylamine	86-30-6	0.17
n-Nitrosopyrrolidine	930-55-2	–
Pentachlorophenol	87-86-5	0.001
Phenanthrene	85-01-8	11
Phenol	108-95-2	11
Pyrene	129-00-0	1.1
Pyridine	110-86-1	–

Attachment C-3
Groundwater Cleanup Criteria (Continued)

Analyte	CAS Number	Groundwater (mg/L)
PAHs by Method SW8270 SIM		
Acenaphthene	83-32-9	2.2
Acenaphthylene	208-96-8	2.2
Anthracene	120-12-7	11
Benzo(a)anthracene	56-55-3	0.0012
Benzo(a)pyrene	50-32-8	0.0002
Benzo(b)fluoranthene	205-99-2	0.0012
Benzo(g,h,i)perylene	191-24-2	1.1
Benzo(k)fluoranthene	207-08-9	0.012
Chrysene	218-01-9	0.12
Dibenzo(a,h)anthracene	53-70-3	0.00012
Indeno(1,2,3-c,d)pyrene	206-44-0	0.0012
Fluoranthene	86-73-7	1.5
Fluorene	193-39-5	1.5
Naphthalene	91-20-3	0.73
Phenanthrene	85-01-8	11
Pyrene	129-00-0	1.1
Organochlorine Pesticides by Method SW8081		
4,4'-DDD	72-54-8	0.0035
4,4'-DDE	72-55-9	0.0025
4,4'-DDT	50-29-3	0.0025
Aldrin	309-00-2	0.00005
alpha-Chlordane	5103-71-9	–
alpha-Hexachlorocyclohexane (α-BHC)	319-84-6	0.00014
beta-Hexachlorocyclohexane (β-BHC)	319-85-7	0.00047
Chlordane	57-74-9	0.002
delta-Hexachlorocyclohexane (δ-BHC)	319-86-8	–
Dieldrin	60-57-1	0.000053
Endosulfan	115-29-7	0.22
Endosulfan I	959-98-8	0.22
Endosulfan II	33213-65-9	0.22
Endosulfan sulfate	1031-07-8	–
Endrin	72-20-8	0.002
Endrin aldehyde	7421-93-4	–
Endrin ketone	53494-70-5	–
gamma-Chlordane	5103-74-2	–
gamma-Hexachlorocyclohexane (γ-BHC, lindane)	58-89-9	0.0002
Heptachlor	76-44-8	0.0004

Attachment C-3
Groundwater Cleanup Criteria (Continued)

Analyte	CAS Number	Groundwater (mg/L)
Heptachlor epoxide	1024-57-3	0.0002
Methoxychlor	72-43-5	0.04
Toxaphene	8001-35-2	0.003
PCBs by Method SW8082		
PCB-1016 (Aroclor 1016)	12674-11-2	0.0005
PCB-1221 (Aroclor 1221)	11104-28-2	0.0005
PCB-1232 (Aroclor 1232)	11141-16-5	0.0005
PCB-1242 (Aroclor 1242)	53469-21-9	0.0005
PCB-1248 (Aroclor 1248)	12672-29-6	0.0005
PCB-1254 (Aroclor 1254)	11097-69-1	0.0005
PCB-1260 (Aroclor 1260)	11096-82-5	0.0005
Total PCBs	133-63-63	0.0005
Herbicides by Method SW8151		
2,4,5-trichlorophenoxy acetic acid (2,4,5-T)	93-76-5	–
2-(2,4,5-Trichlorophenoxy) propionic acid (2,4,5-TP)	93-72-1	0.05
2,4-Dichlororphenoxy acetic acid (2,4-D)	94-75-7	0.07
4-(2,4-Dichlorophenoxy) butanoic acid (2,4-DB)	94-82-6	–
2-Methyl-4-chlorophenoxy acetic acid (MCPA)	94-74-6	–
2-(4-chloro-2-methylphenoxy) propanoic acid (MCPP)	93-65-2	–
Dalapon	75-99-0	–
Dicamba	1918-00-9	–
Dichloroprop	120-36-5	–
Dinoseb	88-85-7	–
Explosives by Methods SW8321/8330		
1,2-Dinitrobenzene	528-29-0	0.0037
1,3,5-Trinitrobenzene	99-35-4	1.1
1,3-Dinitrobenzene	99-65-0	0.0037
1,4-Dinitrobenzene	100-25-4	0.0037
2,4,6-Trinitrophenylmethylnitramine (Tetryl)	479-45-8	0.15
2,4,6-Trinitrotoluene (TNT)	118-96-7	0.018
2,4-Dinitrotoluene	121-14-2	0.0013
2,6-Dinitrotoluene	606-20-2	0.0013
2-Amino-4,6-dinitrotoluene	35572-78-2	0.0073
2-Nitrotoluene	88-72-2	0.0037
3-Nitrotoluene	99-08-1	0.73
4-Amino-2,6-dinitrotoluene	19406-51-0	0.0073
4-Nitrotoluene	99-99-0	0.050
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	0.0077

Attachment C-3
Groundwater Cleanup Criteria (Continued)

Analyte	CAS Number	Groundwater (mg/L)
Nitrobenzene	98-95-3	0.018
Nitroglycerin	55-63-0	0.050
Nitroguanidine	556-88-7	3.7
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	1.8
Dioxins/Furans by Method SW8290		
1,2,3,4,6,7,8,9-Octachlorodibenzofurans	39001-02-0	–
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	3268-87-9	–
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	–
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9	–
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-87-7	–
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	–
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6	–
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	–
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	–
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	–
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	–
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	–
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	–
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	–
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	–
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	–
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	1746-01-6	0.000000030
Chlorpyrifos	2921-88-2	–
Other Organic Analytes by Various Methods		
Hydrazine	302-01-2	0.00028
Methyl Mercury	22967-92-6	0.0037
Tributyltin	688-73-3	0.011
Metals by Method SW6020		
Aluminium	7429-90-5	–
Antimony	7440-36-0	0.006
Arsenic	7440-38-2	0.01
Barium	7440-39-3	2
Beryllium	7440-41-7	0.004
Cadmium	7440-43-9	0.005
Calcium	7440-70-2	–
Chromium (Total)	7440-47-3	0.1
Chromium +3	16065-83-1	55
Cobalt	7440-48-4	–

Attachment C-3
Groundwater Cleanup Criteria (Continued)

Analyte	CAS Number	Groundwater (mg/L)
Copper	7440-50-8	1
Lead	7439-92-1	0.015
Magnesium	7439-95-4	–
Manganese	7439-96-5	–
Molybdenum	7439-98-7	–
Nickel	7440-02-0	0.1
Selenium	7782-49-2	0.05
Silver	7440-22-4	0.1
Sodium	7440-23-5	–
Thallium	7440-28-0	0.002
Vanadium	7440-62-2	0.26
Zinc	7440-66-6	5
Total Mercury by Method SW7470		
Mercury	7439-97-6	0.002
Other Inorganic Analytes by Various Methods		
Chromium VI	18540-29-9	0.1
Cyanide	57-12-5	0.2
Perchlorate	7790-98-9	0.026
White phosphorus	7723-14-0	0.00073

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
[1] 18 AAC 75, Table C (ADEC 2008)
[2] Total xylenes is the sum of m-, o-, and p-xylenes.
– No applicable regulatory action limit or screening criteria available.

ATTACHMENT C-4
Surface Water Screening Criteria

Attachment C-4
Surface Water Screening Criteria

Analyte	CAS Number	ADEC Surface Water Criteria (mg/L)
Total Aromatic Hydrocarbons/Total Aqueous Hydrocarbons		
TAH (sum of BTEX compounds)	–	0.010
TAqH (sum of BTEX and PAHs)	–	0.015

Analyte	CAS Number	NOAA Freshwater		NOAA Marine	
		NOAA CMC (mg/L)	NOAA CCC (mg/L)	NOAA CMC (mg/L)	NOAA CCC (mg/L)
Petroleum Hydrocarbons					
GRO	–	–	–	–	–
DRO	–	–	–	–	–
RRO	–	–	–	–	–
VOCs by SW8260B					
1,1,1-Trichloroethane		0.200	0.011	31.2	3.12
1,1,1,2-Tetrachloroethane	630-20-6	–	–	–	–
1,1,2,2-Tetrachloroethane	79-34-5	2.100	0.111	9.02	0.902
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	–	–	–	–
1,1,2-Trichloroethane		5.2	0.5	–	1.9
1,1-Dichloroethane		0.830	0.047	–	–
1,1-Dichloroethene		0.450	0.025	224	–
1,1-Dichloropropene	563-58-6	–	–	–	–
1,2,3-Trichloropropane		–	–	–	–
1,2,4-Trichlorobenzene		0.25	50	0.16	0.129
1,2,4-Trimethylbenzene		–	–	–	–
1,2-Dibromoethane (Ethylene dibromide, EDB)		–	–	–	–
1,2-Dichlorobenzene		0.260	0.0007	1.97	0.042
1,2-Dichloroethane		8.800	0.100	113	11.3
1,2-Dichloropropane		23	5.700	10.3	3.04
1,3,5-Trimethylbenzene		–	–	–	–
1,3-Dichlorobenzene		0.630	0.038	1.970	–
1,3-Dichloropropane	142-28-9	–	–	–	–
1,3-Dichloropropene		0.99	0.000055	0.790	–
1,4-Dichlorobenzene		0.180	0.0094	1.970	0.129
2,2-Dichloropropane	594-20-7	–	–	–	–
2-Chlorotoluene	95-49-8	–	–	–	–
2-Hexanone	591-78-6	–	–	–	–
4-Chlorotoluene	106-43-4	–	–	–	–
4-Isopropyltoluene	99-87-6	–	–	–	–
Acetone		28	1.500	–	–

Attachment C-4
Surface Water Screening Criteria (Continued)

Analyte	CAS Number	NOAA Freshwater		NOAA Marine	
		NOAA CMC (mg/L)	NOAA CCC (mg/L)	NOAA CMC (mg/L)	NOAA CCC (mg/L)
Benzene		2.300	0.046	5.100	0.11
Bromobenzene		–	–	–	–
Bromochloromethane		–	–	–	–
Bromodichloromethane		11	–	12	6.4
Bromoform		2.3	0.320	–	–
Carbon disulfide		0.017	0.00092	–	–
Carbon tetrachloride		0.18	0.0098	50	5.000
Chlorobenzene		0.25	50	0.16	0.129
Chlorodibromomethane (Dibromochloromethane)		11	–	12	6.4
Chloroethane	75-00-3				
Chloroform		0.490	0.0018	–	–
cis-1,2-Dichloroethene		1.100	0.590	224	–
Dichlorodifluoromethane		–	–	–	–
Ethylbenzene		0.13	0.0073	0.430	0.025
Ethylene glycol	107-21-1	–	192	–	–
Hexachloro-1,3-butadiene		0.090	0.000053	0.032	0.0032
Isopropylbenzene		–	–	–	–
Methyl bromide (Bromomethane)		–	0.016	–	–
Methyl chloride (Chloromethane)	74-87-3	–	–	–	–
Methyl ethyl ketone (MEK, 2-butanone)		240	14	–	–
Methyl isobutyl ketone (MIBK, 4-methyl-2-pentanone)	108-10-1	2.200	0.170	–	–
Methylene bromide		11	–	12	6.4
Methylene chloride (Dichloromethane)		26	0.0981	12	6.4
Methyl-tert-butyl ether (MTBE)	1634-04-4	–	10	–	5
Naphthalene		0.190	0.0011	2.350	0.0014
n-Butylbenzene		–	–	–	–
n-Propylbenzene	103-65-1	–	–	–	–
o-Xylene	95-47-6	–	0.350	–	–
sec-Butylbenzene		–	–	–	–
Styrene		–	0.32	–	–
tert-Butylbenzene		–	–	–	–
Tetrachloroethene (PCE)		0.830	0.045	10.2	0.450
Toluene		0.120	0.002	6.3	0.215
trans-1,2-Dichloroethene		11.6	1.16	224	–
Trichloroethene (TCE)		–	0.021	2	0.2
Trichlorofluoromethane (Freon-11)		11	–	12	6.4

Attachment C-4
Surface Water Screening Criteria (Continued)

Analyte	CAS Number	NOAA Freshwater		NOAA Marine	
		NOAA CMC (mg/L)	NOAA CCC (mg/L)	NOAA CMC (mg/L)	NOAA CCC (mg/L)
Vinyl acetate		0.280	0.016	–	–
Vinyl chloride (Chloroethene)		–	0.930	–	–
Xylene, Isomers m & p	108-38-2	0.032	0.0018		
Total Xylenes	1330-20-7	0.23	0.013	–	–
SVOCs by SW8270C					
1,2,4-Trichlorobenzene	120-82-1	0.700	0.024	0.160	0.0054
1,2-Dichlorobenzene	95-50-1	0.260	0.0007	1.970	0.042
1,2-Diphenylhydrazine	122-66-7	0.270	0.027	–	–
1,3-Dichlorobenzene	541-73-1	0.630	0.038	1.970	–
1,4-Dichlorobenzene	106-46-7	0.180	0.0094	1.970	0.129
1-Methylnaphthalene	90-12-0	0.037	0.0021	–	–
2,4,5-Trichlorophenol	95-95-4	0.1	0.063	0.24	0.011
2,4,6-Trichlorophenol	88-06-2	–	0.0649	–	–
2,4-Dichlorophenol	120-83-2	2.02	0.011	–	–
2,4-Dimethylphenol	105-67-9	2.12	0.100	–	–
2,4-Dinitrophenol	51-28-5	0.230	0.019	4.850	–
2,4-Dinitrotoluene	121-14-2	0.33	0.044	0.590	0.370
2,6-Dichlorophenol	87-65-0	–	0.0002	–	–
2,6-Dinitrotoluene	606-20-2	–	–	–	–
2-Chloronaphthalene	91-58-7	1.6	–	0.0075	–
2-Chlorophenol	95-57-8	4.38	0.024	–	–
2-Methyl-4,6-dinitrophenol	534-52-1	–	–	–	–
2-Methylnaphthalene	91-57-6	–	0.330	0.300	–
2-Methylphenol (o-cresol)	95-48-7	0.230	0.013	–	–
2-Nitroaniline	88-74-4	–	–	–	–
2-Nitrophenol	88-75-5	–	–	–	–
3,3-Dichlorobenzidine	91-94-1	–	0.0045	–	–
3-Methylphenol (m-cresol)	108-39-4	–	–	–	–
3-Nitroaniline	99-09-2	–	–	–	–
4-Bromophenyl phenyl ether	101-55-3				
4-Chloro-3-methylphenol	59-50-7				
4-Chloroaniline	106-47-8	0.25	0.050	0.160	0.129
4-Chlorophenyl phenyl ether	7005-72-3	–	–	–	–
4-Methylphenol (p-cresol)	106-44-5	–	–	–	–
4-Nitroaniline	100-01-6	–	–	–	–
4-Nitrophenol	100-02-7	1.200	0.060	4.85	–
Acenaphthene	83-32-9	1.7	0.0058	0.970	0.040

Attachment C-4
Surface Water Screening Criteria (Continued)

Analyte	CAS Number	NOAA Freshwater		NOAA Marine	
		NOAA CMC (mg/L)	NOAA CCC (mg/L)	NOAA CMC (mg/L)	NOAA CCC (mg/L)
Acenaphthylene	208-96-8	–	4.840	0.300	–
Aniline	62-53-3	–	–	–	–
Anthracene	120-12-7	0.013	0.000012	0.300	–
Azobenzene	103-33-3	–	–	–	–
Benzidine	92-87-5	0.070	0.0039	–	–
Benzo(a)anthracene	56-55-3	0.00049	0.000027	0.300	–
Benzo(a)pyrene	50-32-8	0.00024	0.000014	0.300	–
Benzo(b)fluoranthene	205-99-2	–	0.00907	0.300	–
Benzo(g,h,i)perylene	191-24-2	–	0.00764	0.300	–
Benzo(k)fluoranthene	207-08-9	–	–	0.300	–
Benzoic acid	65-85-0	0.740	0.042	–	–
Benzyl alcohol	100-51-6	0.150	0.0086	–	–
Bis(2-chloroethoxy)methane	111-91-1	11.000	–	–	12.000
Bis(2-chloroethyl)ether	111-44-4	–	1.900	–	–
Bis(2-chloroisopropyl)ether	108-60-1	–	–	–	–
Bis(2-ethylhexyl)phthalate	117-81-7	0.400	0.0003	0.400	0.360
Butyl benzyl phthalate	85-68-7	0.94	0.019	2.944	0.0034
Carbazole	86-74-8	–	–	–	–
Chrysene	218-01-9	–	–	0.300	–
Dibenzo(a,h)anthracene	53-70-3	–	–	0.3	–
Dibenzofuran	132-64-9	0.066	0.0037	–	–
Diethyl phthalate	84-66-2	1.80	0.110	2.944	0.0034
Dimethyl phthalate	131-11-3	0.94	0.003	2.944	0.0034
Di-n-butyl phthalate	84-74-2	0.19	0.0097	2.944	0.0034
Di-n-octyl phthalate	117-84-0	0.94	0.003	2.944	0.0034
Diphenylamine	122-39-4	–	–	–	–
Fluoranthene	206-44-0	3.98	0.00004	0.040	0.011
Fluorene	86-73-7	0.070	0.0039	0.300	–
Hexachlorobenzene	118-74-1	0.006	0.0000003	0.160	0.129
Hexachloro-1,3-butadiene	87-68-3	0.090	0.000053	0.032	0.0032
Hexachlorocyclopentadiene	77-47-4	–	–	–	–
Hexachloroethane	67-72-1	0.210	0.008	0.940	0.094
Indeno(1,2,3-c,d)pyrene	193-39-5	–	0.00431	0.300	–
Isophorone	78-59-1	117	0.920	12.9	1.290
Naphthalene	91-20-3	0.190	0.0011	2.35	0.0014
Nitrobenzene	98-95-3	27	0.220	6.68	0.668

Attachment C-4
Surface Water Screening Criteria (Continued)

Analyte	CAS Number	NOAA Freshwater		NOAA Marine	
		NOAA CMC (mg/L)	NOAA CCC (mg/L)	NOAA CMC (mg/L)	NOAA CCC (mg/L)
n-Nitrosodimethylamine	62-75-9	–	–	–	–
n-Nitrosodi-n-propylamine	621-64-7	–	–	–	–
n-Nitrosodiphenylamine	86-30-6	3.800	0.210	3300	–
n-Nitrosopyrrolidine	930-55-2				
Pentachlorophenol	87-86-5	0.019	0.015	0.013	0.0079
Phenanthrene	85-01-8	0.030	0.0036	0.0077	0.0046
Phenol	108-95-2	10.2	0.180	5.8	0.400
Pyrene	129-00-0	–	0.000025	0.300	–
Pyridine	110-86-1	–	–	–	–
PAHs byMethod SW8270 SIM					
Acenaphthene	83-32-9	1.7	0.0058	0.970	0.040
Acenaphthylene	208-96-8	–	4.840	0.300	–
Anthracene	120-12-7	0.013	0.000012	0.300	–
Benzo(a)anthracene	56-55-3	0.00049	0.000027	0.300	–
Benzo(a)pyrene	50-32-8	0.00024	0.000014	0.300	–
Benzo(b)fluoranthene	205-99-2	–	0.00907	0.300	–
Benzo(g,h,i)perylene	191-24-2	–	0.00764	0.300	–
Benzo(k)fluoranthene	207-08-9	–	–	0.300	–
Chrysene	218-01-9	–	–	0.300	–
Dibenzo(a,h)anthracene	53-70-3	–	–	0.300	–
Indeno(1,2,3-c,d)pyrene	206-44-0	–	0.00431	0.300	–
Fluoranthene	86-73-7	3.98	0.00004	0.040	0.016
Fluorene	193-39-5	0.070	0.0039	0.300	–
Naphthalene	91-20-3	0.190	0.0011	2.35	0.0014
Phenanthrene	85-01-8	0.030	0.0036	0.0077	0.0046
Pyrene	129-00-0	–	0.000025	0.300	–
Organochlorine Pesticides by Method SW8081					
4,4'-DDD	72-54-8	0.00019	0.000011	0.0036	0.00036
4,4'-DDE	72-55-9	1.05	0.105	0.014	0.0014
4,4'-DDT	50-29-3	0.00055	0.0000005	0.000065	0.0000005
Aldrin	309-00-2	0.0015	0.000017	0.00065	–
alpha-Chlordane	5103-71-9	–	–	–	–
alpha-Hexachlorocyclohexane (α-BHC)	319-84-6	0.039	0.0022	–	–
beta-Hexachlorocyclohexane (β-BHC)	319-85-7	0.039	0.000495	–	–
Chlordane	57-74-9	0.0012	2.15E-06	0.000045	0.000002
delta-Hexachlorocyclohexane (δ-BHC)	319-86-8	0.039	0.0022	–	–

Attachment C-4
Surface Water Screening Criteria (Continued)

Analyte	CAS Number	NOAA Freshwater		NOAA Marine	
		NOAA CMC (mg/L)	NOAA CCC (mg/L)	NOAA CMC (mg/L)	NOAA CCC (mg/L)
Dieldrin	60-57-1	0.00024	0.000056	0.000355	9.5E-07
Endosulfan	115-29-7	0.00011	0.000028	0.000017	4.35E-06
Endosulfan I	959-98-8	0.00011	0.000028	0.000017	4.35E-06
Endosulfan II	33213-65-9	0.00011	0.000028	0.000017	4.35E-06
Endosulfan sulfate	1031-07-8	–	0.00222	–	–
Endrin	72-20-8	0.000086	0.000036	0.0000185	1.15E-06
Endrin aldehyde	7421-93-4	–	0.00015	–	–
Endrin ketone	53494-70-5	–	–	–	–
gamma-Chlordane	5103-74-2	–	–	–	–
gamma-Hexachlorocyclohexane (γ-BHC, lindane)	58-89-9	0.00095	0.00008	0.00008	–
Heptachlor	76-44-8	0.00026	0.0000019	0.0000265	0.0000018
Heptachlor epoxide	1024-57-3	0.00026	0.0000019	0.0000265	0.0000018
Methoxychlor	72-43-5	–	0.00003	–	0.00003
Toxaphene	8001-35-2	0.00073	0.0000002	0.00021	0.0000002
PCBs by SW8082					
PCB-1016 (Aroclor 1016)	12674-11-2	0.00003	0.000014	0.000033	0.00003
PCB-1221 (Aroclor 1221)	11104-28-2	0.00003	0.000014	0.000033	0.00003
PCB-1232 (Aroclor 1232)	11141-16-5	0.00003	0.000014	0.000033	0.00003
PCB-1242 (Aroclor 1242)	53469-21-9	0.00003	0.000014	0.000033	0.00003
PCB-1248 (Aroclor 1248)	12672-29-6	0.00003	0.000014	0.000033	0.00003
PCB-1254 (Aroclor 1254)	11097-69-1	0.00003	0.000014	0.000033	0.00003
PCB-1260 (Aroclor 1260)	11096-82-5	0.00003	0.000014	0.000033	0.00003
Total PCBs	133-63-63	0.00003	0.000014	0.000033	0.00003
Herbicides by Method SW8151					
2,4,5-trichlorophenoxy acetic acid (2,4,5-T)	93-76-5	–	0.036	–	–
2-(2,4,5-Trichlorophenoxy) propionic acid (2,4,5-TP)	93-72-1	–	–	–	–
2,4-Dichlororphenoxy acetic acid (2,4-D)	94-75-7	–	0.004	–	–
4-(2,4-Dichlorophenoxy) butanoic acid (2,4-DB)	94-82-6	–	–	–	–
2-Methyl-4-chlorophenoxy acetic acid (MCPA)	94-74-6	–	0.0026	–	–
2-(4-chloro-2-methylphenoxy) propanoic acid (MCPP)	93-65-2	–	–	–	–
Dalapon	75-99-0	–	–	–	–
Dicamba	1918-00-9	–	0.0010	–	–

Attachment C-4
Surface Water Screening Criteria (Continued)

Analyte	CAS Number	NOAA Freshwater		NOAA Marine	
		NOAA CMC (mg/L)	NOAA CCC (mg/L)	NOAA CMC (mg/L)	NOAA CCC (mg/L)
Dichloroprop	120-36-5	–	–	–	–
Dinoseb	88-85-7	–	0.00005	–	–
Explosives by Methods SW8321/8330					
1,2-Dinitrobenzene	528-29-0	–	–	–	–
1,3,5-Trinitrobenzene	99-35-4	–	–	–	–
1,3-Dinitrobenzene	99-65-0	–	–	–	–
1,4-Dinitrobenzene	100-25-4	–	–	–	–
2,4,6-Trinitrophenylmethylnitramine (Tetryl)	479-45-8	–	–	–	–
2,4,6-Trinitrotoluene (TNT)	118-96-7	–	0.140	–	–
2,4-Dinitrotoluene	121-14-2	0.330	0.0044	0.59	0.37
2,6-Dinitrotoluene	606-20-2	–	–	–	–
2-Amino-4,6-dinitrotoluene	35572-78-2	–	–	–	–
2-Nitrotoluene	88-72-2	–	–	–	–
3-Nitrotoluene	99-08-1	–	–	–	–
4-Amino-2,6-dinitrotoluene	19406-51-0	–	–	–	–
4-Nitrotoluene	99-99-0	–	–	–	–
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	–	–	–	–
Nitrobenzene	98-95-3	27	0.22	6.680	0.668
Nitroglycerin	55-63-0	–	–	–	–
Nitroguanidine	556-88-7	–	–	–	–
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	–	–	–	–
Dioxins/Furans by Method SW8290					
1,2,3,4,6,7,8,9-Octachlorodibenzofurans	39001-02-0	–	–	–	–
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin	3268-87-9	–	–	–	–
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	–	–	–	–
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9	–	–	–	–
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-87-7	–	–	–	–
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	–	–	–	–
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6	–	–	–	–
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	–	–	–	–
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	–	–	–	–
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	–	–	–	–
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	–	–	–	–
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	–	–	–	–
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	–	–	–	–
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	–	–	–	–

Attachment C-4
Surface Water Screening Criteria (Continued)

Analyte	CAS Number	NOAA Freshwater		NOAA Marine	
		NOAA CMC (mg/L)	NOAA CCC (mg/L)	NOAA CMC (mg/L)	NOAA CCC (mg/L)
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	–	–	–	–
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	–	–	–	–
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	1746-01-6	<.00001	<.00000001	–	–
Chlorpyrifos	2921-88-2	0.000083	0.000041	0.000011	0.0000056
Other Organic Analytes by Various Methods					
Hydrazine	302-01-2	–	–	–	–
Methyl Mercury	22967-92-6	–	–	–	–
Tributyltin	688-73-3	–	–	–	–
Metals by Method SW6020					
Aluminium	7429-90-5	–	–	–	–
Antimony	7440-36-0	–	–	–	–
Arsenic	7440-38-2	0.34	0.15	0.069	0.036
Barium	7440-39-3	0.11	0.004	–	–
Beryllium	7440-41-7	–	–	–	–
Cadmium	7440-43-9	0.002	0.00025	0.04	0.0088
Calcium	7440-70-2	–	–	–	–
Chromium (Total)	7440-47-3	–	–	–	–
Chromium +3	16065-83-1	–	–	–	–
Cobalt	7440-48-4	–	–	–	–
Copper	7440-50-8	–	–	–	–
Lead	7439-92-1	0.065	0.0025	0.21	0.0081
Magnesium	7439-95-4	–	–	–	–
Manganese	7439-96-5	–	–	–	–
Molybdenum	7439-98-7	–	–	–	–
Nickel	7440-02-0	–	–	–	–
Selenium	7782-49-2	0.186	0.005	0.29	0.071
Silver	7440-22-4	0.0016	–	0.00095	–
Sodium	7440-23-5	–	–	–	–
Thallium	7440-28-0	–	–	–	–
Vanadium	7440-62-2	–	–	–	–
Zinc	7440-66-6	–	–	–	–
Total Mercury by Method SW7470					
Mercury	7439-97-6	0.0014	0.00077	0.0018	0.00094
Other Inorganic Analytes by Various Methods					
Chromium VI	18540-29-9	0.016	0.011	1.1	0.05

Attachment C-4
Surface Water Screening Criteria (Continued)

Analyte	CAS Number	NOAA Freshwater		NOAA Marine	
		NOAA CMC (mg/L)	NOAA CCC (mg/L)	NOAA CMC (mg/L)	NOAA CCC (mg/L)
Cyanide	57-12-5	–	–	–	–
Perchlorate	7790-98-9	–	–	–	–
White phosphorus	7723-14-0	–	–	–	–

Notes:
For definitions, refer to the Acronyms and Abbreviations section.
[1] 18 AAC 70 (ADEC 2006)
[2] NOAA SquiRTs (NOAA 2008)
[4] Total xylenes is the sum of m-, o-, and p-xylenes.
– No applicable regulatory action limit or screening criteria available.

ATTACHMENT C-5
Soil Gas Screening Criteria

Attachment C-5
Soil Gas Screening Criteria

CAS Number	Hazardous Substance[2]	Target Levels for Shallow[1] or Subslab Soil Gas				Target Levels for Deep Soil Gas[1]			
		Residential Soil Gas (µg/m3)	Residential Soil Gas (ppbv)	Commercial Soil Gas (µg/m3)	Commercial Soil Gas (ppbv)	Residential Soil Gas (µg/m3)	Residential Soil Gas (ppbv)	Commercial Soil Gas (µg/m3)	Commercial Soil Gas (ppbv)
67-64-1	Acetone	32900	13800	138000	58100	329000	138000	1380000	581000
71-43-2	Benzene[3]	31	9.8	160	49	310	98	1600	490
111-44-4	Bis(2-chloroethyl)ether	0.74	0.13	3.7	0.64	7.4	1.3	37	6.4
75-27-4	Bromodichloromethane	14	2.1	69	10	140	21	690	100
75-25-2	Bromoform	220	21	1100	110	2200	210	11000	1100
104-51-8	n-Butylbenzene[3]	370	67	1500	280	3700	670	15000	2800
135-98-8	sec-Butylbenzene[3]	370	67	1500	280	3700	670	15000	2800
98-06-6	tert-Butylbenzene[3]	370	67	1500	280	3700	670	15000	2800
75-15-0	Carbon Disulfide	7300	2300	30700	9900	73000	23000	307000	99000
56-23-5	Carbon Tetrachloride	16	2.6	82	13	160	26	820	130
108-90-7	Chlorobenzene	520	110	2200	480	5200	1100	22000	4800
124-48-1	Chlorodibromomethane	10	1.2	51	6	100	12	510	60
75-00-3	Chloroethane	290	110	1500	560	2900	1100	15000	5600
67-66-3	Chloroform	11	2.2	53	11	110	22	530	110
95-57-8	2-Chlorophenol	180	35	770	150	1800	350	7700	1500
95-50-1	1,2-Dichlorobenzene	2100	350	8800	1500	21000	3500	88000	15000
541-73-1	1,3-Dichlorobenzene	2100	350	8800	1500	21000	3500	88000	15000
106-46-7	1,4-Dichlorobenzene	35	5.9	180	30	350	59	1800	300
75-71-8	Dichlorodifluoromethane	2100	420	8800	1800	21000	4200	88000	18000
75-34-3	1,1-Dichloroethane	5200	1300	21900	5400	52000	13000	219000	54000
107-06-2	1,2-Dichloroethane	9.4	2.3	47	12	94	23	470	120
75-35-4	1,1-Dichloroethylene	4.9	1.2	25	6.2	49	12	250	62
156-59-2	cis-1,2-Dichloroethylene	370	92	1500	390	3700	920	15000	3900
156-60-5	trans-1,2-Dichloroethylene	630	160	2600	660	6300	1600	26000	6600
78-87-5	1,2-Dichloropropane	13	2.7	63	14	130	27	630	140
542-75-6	1,3-Dichloropropene	61	13	310	68	610	130	3100	680
100-41-4	Ethylbenzene[3]	220	51	110	260	2200	510	11000	2600

Attachment C-5
Soil Gas Screening Criteria (Continued)

CAS Number	Hazardous Substance[2]	Target Levels for Shallow[1] or Subslab Soil Gas				Target Levels for Deep Soil Gas[1]			
		Residential Soil Gas (µg/m3)	Residential Soil Gas (ppbv)	Commercial Soil Gas (µg/m3)	Commercial Soil Gas (ppbv)	Residential Soil Gas (µg/m3)	Residential Soil Gas (ppbv)	Commercial Soil Gas (µg/m3)	Commercial Soil Gas (ppbv)
106-93-4	EDB (1,2-Dibromoethane)	0.41	0.053	2	0.27	4.1	0.53	20	2.7
50-00-0	Formaldehyde	19	15	94	77	190	150	940	770
118-74-1	Hexachlorobenzene	0.53	0.045	2.7	0.23	5.3	0.45	27	2.3
87-68-3	Hexachloro-1,3-butadiene	11.1	1.04	56	5.2	111	10.4	560	52
77-47-4	Hexachlorocyclopentadiene	2.1	0.19	8.8	0.79	21	1.9	88	7.9
67-72-1	Hexachloroethane	61	6.3	310	32	610	63	3100	320
302-01-2	Hydrazine	0.05	0.038	0.25	0.19	0.5	0.38	2.5	1.9
98-82-8	Isopropylbenzene	4200	850	17500	3600	42000	8500	175000	36000
74-83-9	Methyl Bromide	52	13	220	56	520	130	2200	560
74-87-3	Methyl Chloride	140	66	680	330	1400	660	6800	3300
78-93-3	MEK	52100	17700	219000	74300	521000	177000	2190000	743000
108-10-1	MIBK	31300	7600	131000	32100	313000	76000	1310000	321000
7439-97-6	Mercury (elemental)	3.1	0.38	13	1.6	31	3.8	130	16
74-95-3	Methylene Bromide	370	51	1500	220	3700	510	15000	2200
75-09-2	Methylene Chloride	520	150	2600	750	5200	1500	26000	7500
90-12-0	1-Methylnaphthalene	150	25	610	110	1500	250	6100	1100
91-57-6	2-Methylnaphthalene	150	25	610	110	1500	250	6100	1100
1634-04-4	MTBE	470	130	2400	660	4700	1300	24000	6600
91-20-3	Naphthalene[3]	7.2	1.4	36	6.9	72	14	360	69
98-95-3	Nitrobenzene	21	4.1	88	17	210	41	880	170
62-75-9	n-Nitrosodimethylamine	0.017	0.0057	0.088	0.029	0.17	0.057	0.88	0.29
103-65-1	n-Propylbenzene[3]	370	74	1500	310	3700	740	15000	3100
100-42-5	Styrene[3]	10400	2400	43800	10300	104000	24000	438000	103000
79-34-5	1,1,2,2-Tetrachloroethane	4.2	0.61	21	3.1	42	6.1	210	31
127-18-4	Tetrachloroethylene (PCE)	41	6.1	210	31	410	61	2100	310
108-88-3	Toluene[3]	52100	13800	219000	58200	521000	138000	2190000	582000
120-82-1	1,2,4-Trichlorobenzene	42	5.6	180	24	420	56	1800	240

Attachment C-5
Soil Gas Screening Criteria (Continued)

CAS Number	Hazardous Substance[2]	Target Levels for Shallow[1] or Subslab Soil Gas				Target Levels for Deep Soil Gas[1]			
		Residential Soil Gas (µg/m3)	Residential Soil Gas (ppbv)	Commercial Soil Gas (µg/m3)	Commercial Soil Gas (ppbv)	Residential Soil Gas (µg/m3)	Residential Soil Gas (ppbv)	Commercial Soil Gas (µg/m3)	Commercial Soil Gas (ppbv)
71-55-6	1,1,1-Trichloroethane	22900	4200	96400	17700	229000	42000	964000	177000
79-00-5	1,1,2-Trichloroethane	15	2.8	77	14	150	28	770	140
79-01-6	Trichloroethylene (TCE)	2.2	0.41	11	2.1	22	4.1	110	21
96-18-4	1,2,3-Trichloropropane	0.12	0.02	0.61	0.1	1.2	0.2	6.1	1
76-13-1	Trichlorotrifluoroethane	313000	40800	1310000	172000	3130000	408000	1310000	1720000
75-69-4	Trichlorofluoromethane	7300	1300	30700	5500	73000	13000	307000	55000
95-63-6	1,2,4-Trimethylbenzene[3]	73	15	310	62	730	150	3100	620
108-67-8	1,3,5-Trimethylbenzene[3]	73	15	310	62	730	150	3100	620
108-05-4	Vinyl Acetate	2100	590	8800	2500	21000	5900	88000	25000
75-01-1	Vinyl Chloride (Chloroethene)	8.1	3.2	11	4.1	81	32	110	41
1330-20-7	Xylenes (total)[3]	1000	240	4400	1000	10000	2400	44000	10000

Notes:

For definitions, see Acronyms and Abbreviations section.

[1] Shallow soil gas includes soil gas collected from 5 feet below ground surface and less, deep soil gas includes soil gas collected from greater than 5 feet below ground surface.

[2] The chemicals listed here are found in Table B2 of 18 AAC 75.341 and Table C of 18 AAC 75.345 and are volatile compounds as defined by ADEC.

[3] These chemicals should be investigated as chemicals of potential concern when petroleum is present.

– Soil gas levels referenced above are from ADEC's Draft Vapor Intrusion Guidance (ADEC 2009a).

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Attachment C-6
Resource Conservation and Recovery Act
Toxicity Characteristic Leaching Procedure Concentrations

Attachment C-6
Resource Conservation and Recovery Act
Toxicity Characteristic Leaching Procedure Concentrations

Sample Suite	Sample Method	Chemical Analyte	RCRA TCLP Concentration (mg/L)	20 Times TCLP Action Level (mg/kg)
RCRA Metals	SW6020/7470A	Arsenic	5.0	100
		Barium	100	2,000
		Cadmium	1.0	20
		Chromium	5.0	100
		Lead	5.0	100
		Mercury	0.2	4.0
		Selenium	1.0	20
		Silver	5.0	100
VOCs	SW8260B	Benzene	0.5	10
		Carbon Tetrachloride	0.5	10
		Chlorobenzene	100	2,000
		Chloroform	6.0	120
		1,4-Dichlorobenzene	7.5	150
		1,2-Dichloroethane	0.5	10
		1,1-Dichloroethlene	0.7	14
		Hexachlorobutadiene	0.5	10
		Methyl Ethyl Ketone	200	4,000
		Tetrachloroethylene	0.7	14
		Trichloroethylene	0.5	10
		Vinyl Chloride	0.2	4.0
SVOCs	SW8270C	2,4-Dinitrotoluene	0.13	2.6
		Hexachlorobenzene	0.13	2.6
		Hexachloroethane	3.0	60
		Nitrobenzene	2.0	40
		Pentachlorophenol	100	2,000
		Pyridine	5.0	100
		2,4,5-Trichlorophenol	400	8,000
		2,4,6-Trichlorophenol	2.0	40

Attachment C-6 (continued)
Resource Conservation and Recovery Act
Toxicity Characteristic Leaching Procedure Concentrations

Sample Suite	Sample Method	Chemical Analyte	RCRA TCLP Concentration (mg/L)	20 Times TCLP Action Level (mg/kg)
Herbicides	SW8151	2,4-D	10	200
		2,4,5-TP Silvex	1.0	20
Pesticides	SW8081A	Chlordane	0.03	0.60
		Endrin	0.02	0.4
		Lindane	0.4	8
		Methoxychlor	10	200
		Toxaphene	0.5	10

Attachment C-7
Contractor Quality Control Forms

JACOBS ENGINEERING GROUP INC.
PREPARATORY-PHASE CHECKLIST

Project Name: **Fort Wainwright Post Wide Work Plan**
Project Number: _____
Definable Feature of Work: _____ Date _____

SEQUENCE OF WORK

CONTROL POINTS	CONTROL REFERENCE, LOCATION	TYPE OF INSPECTION	ACCEPTANCE CRITERIA, REFERENCE

Notes:
FSP = Field Sampling Plan
QC = quality control
HSP = Health and Safety Plan
WP = Work Plan
QAPP = Quality Assurance Project Plan
EPP = Environmental Protection Plan
For other definitions, see Acronyms and Abbreviations section.

JACOBS ENGINEERING GROUP INC.
PREPARATORY-PHASE CHECKLIST
MEETING

Project Name: **Fort Wainwright Post Wide Work Plan**
Project Number: _____
Definable Feature of Work: _____ Date _____

AGENDA:

1. Review of Contract, Work Plan
2. Definable Feature of Work (DFW)
3. Location of Site Affected
4. Relationship to other DFW
5. Sequence of Work
6. Personnel/Other Certification
7. Safety Hazards List
8. Equipment Certification
9. Permits Required
10. Testing Requirements
11. Review of Submitted Approval
12. Other

NAMES OF THOSE PRESENT:

Name	Affiliation	Name	Affiliation
1.		10.	
2.		11.	
3.		12.	
4.		13.	
5.		14.	
6.		15.	
7.		16.	
8.		17.	
9.		18.	

Points of Discussion:

_____

_____

_____

QAR Notified (Date): _____

Safety Features Reviewed by: _____

***REVIEW SIGNATURES*:**

CQC System Manager _____ Date: _____

Site Manager _____ Date: _____

Site Safety and Health Officer _____ Date: _____

Submitted to QAR on _____

Environmental Quality Control/Quality Assurance Report

(ER 415-1-302)

Contract Number/Task Order Number | **UPC/Project Title**

CQC Report Number | **Date or Time Period** | **Location and Team**

Weather Conditions | **Contractor**

Temp Low _____ **Temp High** _____

Wind Speed _____ **Conditions** _____

Quality Control Inspections Performed This Date (Include inspections, results, deficiencies observed, and corrective action.)

Preparatory ☐ see attached checklist

Initial ☐ see attached checklist

Follow-up ☐

Was the construction deficiency tracking list updated this date? **Yes** ☐ **No** ☐

Field Sampling and Testing

Has field testing been performed this date? **Yes** ☐ **No** ☐

Type of test	Method/Matrix	Results

Have Data Quality Objectives been achieved? **Yes** ☐ **No** ☐

Have Samples Been Collected for Laboratory Analysis? **Yes** ☐ **No** ☐

Type of Test	EPA Test Method/Matrix	Quantity of Samples

Has required amount of QC trip blanks and rinsates been achieved? **Yes** ☐ **No** ☐

Have appropriate QC laboratory tests been ordered? (matrix spikes, method blanks, surrogates, reference standards, etc.) **Yes** ☐ **No** ☐

Have QA and QC samples been collected in the specified quantity**?** **Yes** ☐ **No** ☐

Have samples been properly labeled and packaged? **Yes** ☐ **No** ☐

Health and Safety

Worker protection levels this date: **Level A** ☐ **Level B** ☐ **Level C** ☐ **Level D** ☐

Was any work activity conducted within a confined space? **Yes** ☐ **No** ☐

Was any work activity conducted within an area determined to be immediately dangerous to life and health? **Yes** ☐ **No** ☐

Were approved decontamination procedures used on workers and equipment as required? **Yes** ☐ **No** ☐

Was a Job Safety Meeting held this date? **Yes** ☐ **No** ☐

Were there any lost time accidents this date? **(If YES, attach copy of completed accident report)** **Yes** ☐ **No** ☐

Was hazardous waste/material released into the environment? **Yes** ☐ **No** ☐

Safety Comments: (Include any infractions of approved safety plan, and include instructions from government personnel. Specify corrective action taken.)

Work Activities Performed This Date

Reference (NAS ID #/Tech Spec #)	Activity & Location	Quantity	Subcontractor

Manpower and Equipment

Labor			**Equipment**			
Classification	Number	Hours	Type	Hours Used	Hours Idle	Hours Repair

Total Hours_____ Total Hours_____

Material Received to be Incorporated into Job None ☐

Instructions Given by the Government to the Contractor (Include names, reactions, and remarks.) **Verbal** ☐ **Written** ☐ **None** ☐

Work Progress

Are there any Contractor-caused delays?	**Yes** ☐ **No** ☐
Are there any potential findings of fact by Contractor?	**Yes** ☐ **No** ☐
Are there any Government-caused delays or potential findings of fact?	**Yes** ☐ **No** ☐
Are there any potential findings of fact by Government?	**Yes** ☐ **No** ☐
Are there any unforeseeable or weather-related delays?	**Yes** ☐ **No** ☐

Rework Items Identified Today **(Not corrected by COB)** **Rework Items Corrected Today** **(From Rework Items List)**

Remarks (Include any visitors to project and miscellaneous remarks pertinent to work.)

The above report is complete and correct, and all work reported is believed, to the best of my knowledge, to be in compliance with state and federal requirements, and the contract specifications.

CQC System Manager Signature_____
Date_____

Site Manager Signature_____
Date_____

Government Quality Assurance Comments
Concurs with the QC report? **Yes** ☐ **No** ☐
Additional comments or exceptions:

QAR Signature_____ **Date**_____ **Supervisor's Initial**_____
Date_____

QUALITY CONTROL

NONCONFORMANCE REPORT

CLIENT: _____ **PROJECT NO.:** _____

ITEM	NCR NO.
LOCATION	DATE
REF. DWG. CODE OR SPEC.	
NONCONFORMANCE	
QC INSPECTOR	DATE
DISPOSITION ☐ REPLACE ☐ REWORK ☐ REPAIR ☐ USE AS IS	
QC INSPECTOR/DATE	AUTH. INSPECTOR/DATE / CLIENT REP./DATE
FINAL STATUS ☐ ACCEPT ☐ REJECT ☐ REMARKS	
FINAL ACCEPTANCE	
QC SUPERVISOR	DATE
AUTHORIZED INSPECTOR	DATE
CLIENT REPRESENTATIVE	DATE

QUALITY CONTROL
NONCONFORMANCE REPORT REGISTER

CLIENT: _____ **PROJECT NO.:** _____

LINE NO.	RECEIVING REPORT NO.: / SITE	NCR NO.: / SITE	REFERENCE DAILY INSPECTION REPORT NO.	NONCONFORMANCE REPORT DESCRIPTION	DATE ENTERED	DATE CLEARED

APPENDIX D

Environmental Protection Plan and Storm Water Pollution Prevention Plan

FINAL

FORT WAINWRIGHT
POST WIDE WORK PLAN

APPENDIX D
Environmental Protection Plan

FORT WAINWRIGHT, ALASKA

MARCH 2011

U.S. Army Corps of Engineers, Alaska District
Environmental Remediation Services
Contract No. W911KB-06-D-0006
Task Order No. 20

Prepared by
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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADF&G	Alaska Department of Fish and Game
ARAR	applicable, relevant, and appropriate requirements
BMP	Best Management Practices
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DOT	Department of Transportation
EPA	U.S. Environmental Protection Agency
EPP	Environmental Protection Plan
FWA	Fort Wainwright Post
IDW	investigation-derived waste
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyls
POL	petroleum, oil, and lubricants
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
SSHP	Site Safety and Health Plan
SWPPP	Stormwater Pollution Prevention Plan
TBC	To Be Considered
USACE	U.S. Army Corps of Engineers
USAED	U.S. Army Engineer District, Alaska
USC	U.S. Code
USFWS	U.S. Fish and Wildlife Service
UST	underground storage tank
WMP	Waste Management Plan

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1.0 INTRODUCTION

The purpose of this Environmental Protection Plan (EPP) is to outline environmental plans and procedures for activities at all sites covered by the *2010 Fort Wainwright Post Wide Work Plan*. The work described herein will be performed by Jacobs Engineering Group Inc. (Jacobs) for the U.S. Army Engineer District, Alaska (USAED) under Environmental Restoration Services Contract No.W911KB-06-D-0006, Task Order Number 20 – Fort Wainwright Environmental Support.

This EPP identifies the areas where environmental conditions might be affected by the planned work, and the methods that will be used to preserve the environmental status of the potentially affected areas. This document summarizes the measures that will be used to protect vegetation, land, water, and resources within the project boundary during execution of the scope of work. This EPP shall be made available to all project and site personnel.

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2.0 BACKGROUND

This EPP was prepared to support a variety of activities planned for multiple sites located within Fort Wainwright, Alaska (FWA). No protected land areas containing threatened or endangered species, critical habitat, historical landmarks, or other protected elements have been identified within the work areas. Precautions will be implemented to prevent and mitigate damage to areas from construction traffic, erosion, and spills. Work will be conducted in a manner that:

- Protects local archaeological, historical, fish, and wildlife resources and their habitats;
- Minimizes pollution of air, water, and land; and
- Controls noise and dust within regulatory limits established by local, state, and/or federal laws.

To the extent practicable, the work sites will be restored upon completion of work activities to a condition appropriate for current and expected future land use. Any deviations to this EPP or site-specific requirements will be included in the site-specific work plan addendums.

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3.0 PROJECT ENVIRONMENTAL DOCUMENTATION

This section discusses the documentation required to support the project work.

3.1 ENVIRONMENTAL ASSESSMENT

The National Environmental Policy Act (NEPA) ensures that federal agencies consider the potential environmental impact of projects prior to project execution and make this consideration available to public officials and citizens before decisions are made and actions are taken. As applicable, an environmental assessment/finding of no significant impact, environmental impact statement, or categorical exclusion will be presented based on USAED judgment concerning the scope and magnitude of the project.

3.2 RIGHT-OF-ENTRY AND ACCESS PERMITS

If any right-of-entry or access permits are required for a site, they will be obtained before site work is initiated and will be included in site-specific work plan addendums.

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4.0 ENVIRONMENTAL PROTECTION

This section describes the project requirements for protecting land, water, fish and wildlife, and cultural resources.

4.1 PROTECTION OF LAND RESOURCES

Land resources are considered in the planning process to ensure vegetation remains in a reasonably natural state during field activities, and compromised areas are restored at the completion of site work.

Land outside the limits of the work detailed in site-specific work plan addendums shall be preserved in its existing condition. Work shall be confined to areas specifically designated for Jacobs' use and approved by USAED.

4.2 PROTECTION OF VEGETATION

Land conditions, namely grass cover, may be impacted through the mobilization of equipment and personnel. Worksite boundaries and access routes will be selected to minimize potentially adverse vegetative effects. Work areas and access corridors located off established roadways will be clearly delineated with stakes or pin flags at regular intervals. The trafficking of equipment will be controlled. No trees or shrubs will be used as anchors. Vegetative disturbances that result from site activities possibly contributing to soil erosion will be remediated. Limited clearing of vegetation may be required to accomplish project objectives. Any vegetation that is cleared will be stacked on site.

To protect wetlands, silt fencing will be placed along wetland perimeters in areas where heavy equipment will be utilized. Heavy equipment may be placed on mats if it is determined that mats would effectively reduce undesirable environmental impacts. Access routes through wetlands will be avoided whenever possible. However, where wetland areas surround a site, vehicular access will be limited to prevent vegetative damage.

Soil erosion circumstances may arise from vehicular traffic, excavation, and drilling activities. Soil erosion pathways will be protected with silt fences, hay bales, or sandbags, as needed, to mitigate sediment transport to surface water. Section 5.2 of this EPP provides more specific erosion control measures.

Upon completion of each field activity, Jacobs will remove all signs of temporary control measures associated with work and staging areas to include waste materials, signage, and any other materials used during field activities, unless otherwise directed by USAED. Backfill will be inspected to ensure it is free of deleterious and decomposable material that could affect the integrity of the area in the future.

4.3 PROTECTION OF FISH AND WILDLIFE

Based on the wide variety of site conditions and natural environments within FWA, fish and wildlife issues will be discussed as part of the site-specific addendums. If endangered/threatened species are encountered, Jacobs and USAED Project Managers will be notified immediately.

4.4 PROTECTION OF WATER RESOURCES

Groundwater, freshwater lakes, streams, and wetlands may potentially be impacted by field activities. Potential flow pathways include infiltration to groundwater and surface flow to surface water. Several methods may be enlisted to protect waterways including establishing berms around excavations; containing contaminated media with liners, berms and covers; and enacting spill prevention procedures. Proposed field activities, including site characterization activities, will be conducted in compliance with federal stormwater management regulations, including, but not limited to, the National Pollutant Discharge Elimination System (NPDES) program. Sections 5.2 and 5.3 of this EPP describe general measures for controlling erosion and stormwater runoff.

4.5 PROTECTION OF CULTURAL RESOURCES

In compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA), federal agencies must take into account the effects of their undertakings on historic properties. A map of FWA Historic properties can be found in Attachment D-4. If a cultural object is discovered, the Jacobs Site Manager and Project Manager shall be promptly notified, and a Cultural Resource Notification Form (Attachment D-4) shall be completed. The Jacobs Site and/or Project Manager will then notify the USAED Project Manager of the discovery within 2 hours after discovery. The USAED Project Manager will notify the relevant agencies, which may include the State Historic Preservation Office and/or the Bureau of Land Management. Jacobs and project subcontractors will comply with federal law by establishing and following procedures to protect cultural resources.

During fieldwork, the Jacobs Project Manager will ensure field personnel, including subcontractors, comply with applicable laws and regulations governing cultural resource management should cultural material be uncovered or present in surrounding areas. When necessary, a cultural resource board will be posted in the project office. This board will display maps detailing off-limit, protected, or clearance-required areas due to the presence of cultural resources. Employees will familiarize themselves with these restrictions and will not enter restricted areas unless authorized to do so by the Jacobs Project or Site Manager.

Work shall cease immediately if any prehistoric or historic object or potential human remains are discovered. Prehistoric or historic objects may include funerary objects, sacred objects, or objects of cultural patrimony as defined by the Native American Graves Protection and Repatriation Act (NAGPRA). Found objects will be left within the context(s) in which they were discovered.

When work is performed adjacent to a known archeological site, an onsite archaeologist may be present to monitor the fieldwork.

Jacobs will not tolerate vandalizing, moving, or removing cultural objects from sites. Engaging in these actions will result in disciplinary measures for Jacobs employees, including immediate dismissal from the work site and termination. Subcontractors are also subject to this policy.

The points of contact for this project are included in Table 4-1.

Table D-4-1
Points of Contact

Organization	Name	Contact Information
USAED Project Manager/COR	Robert Brock	Phone: 907-753-5612 Mobile: 907-250-1144
Directorate Public Works POC P.O. Box 6898 Fort Wainwright, Fairbanks AK	Joe Malen	Phone: 907-361-4512 Mobile l: 907-388-7518
Jacobs 4300 B Street, Suite 600 Anchorage, AK 99518		Phone: (907) 563-3322 Fax: (907) 563-3320
Project Manager	Sarah Belway	Phone: (907-356-1280 Mobile: 907-382-2569 (cell)
Site Safety and Health Officer	Pete Redmond	Phone (321)-266-4276 Mobile: (865)-220-4800
Site Manager	Dave Frandsen	Phone: 907-356 -1280 Mobile: 865-621-1632

5.0 CONTROL

Pollution control measures will be accomplished using standard best management practices. This section provides further details regarding the dust control, erosion control, stormwater pollution prevention, and other environmental measures that will be employed during the 2010 field season.

5.1 DUST CONTROL

Jacobs shall maintain all embankments, access roads, waste areas, and work areas to prevent excess dust from becoming a hazard or nuisance. Dust control will be performed as the work proceeds and whenever a dust nuisance or hazard occurs. Visible dust from any vehicle will be minimized. In addition, Jacobs shall ensure that no material of any type will fall off any vehicle while in transit. Any dirt or mud tracked onto paved or surfaced roadways shall be cleaned away within the day it is deposited.

5.2 EROSION CONTROL

Every effort will be made to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow, and fill operations. Efforts to prevent sheetwash and site degradation are required to minimize the potential for surface-water violations. General erosion control measures include limiting the disturbance of land and vegetation to designated work areas and making use of engineering controls, such as properly installed silt fences, hay bales, and/or rolled erosion-control products. Engineered products, such as rolled erosion-control products placed at right angles to the slope, may also be utilized. In addition, the field team will minimize vehicular traffic to and from work areas and will stabilize and recontour rutted areas created by vehicular traffic, as deemed necessary by the Jacobs Site Manager.

5.3 STORMWATER POLLUTION PREVENTION REQUIREMENTS

Stormwater Pollution Prevention Planning (SWPPP) and permitting will be prepared in accordance with Title 40, Section 122.26(b)(14)(x), of the Code of Federal Regulations

(CFR). The SWPPP will provide general guidelines to be used as the basis for preventing storm water run off at all FWA sites. Attachment D-5 provides a Post Wide SWPPP. Site-specific best management practices (BMP) will be discussed in site-specific addendums as needed.

5.4 DECONTAMINATION

Decontamination requirements apply to investigation and removal activities conducted during the 2010 field work. Site workers will adhere to personal decontamination procedures as outlined in the Site Safety and Health Plan (SSHP) (Appendix A to the Work Plan). The equipment used during field activities will be dry decontaminated to prevent the spreading of contaminants from a project site. Dry decontamination methods will include the use of brooms, shovels, or other appropriate tools necessary to remove all contamination from equipment.

Wet decontamination methods are not anticipated; however, should wet decontamination be necessary, any decontamination rinsate will be collected, containerized, and transported for disposal, as detailed in the WMP (Appendix E).

5.5 WASTE DISPOSAL

Waste may be generated as a result of project activities. All waste generated during this project will be managed, containerized and disposed of based on analytical sample results and in accordance with the WMP (Appendix E). Any deviations to that plan or specific requirements for waste handling and disposal will be addressed in site-specific addendums.

5.6 SPILL PREVENTION

All field activities will be conducted and managed in a manner that will prevent the release into the environment of contaminants or waste materials. This section describes both the fuel handling requirements and spill reporting requirements.

5.6.1 Fuel Handling Procedures

All fueling operations will be performed in a safe and environmentally responsible manner, in compliance with the requirements of the Alaska Administrative Code (AAC), Title 18, Chapter 75, and Title 46 of the Alaska Statutes. However, spills could occur during the fueling of vehicles, portable generators, and other equipment. To minimize the risk of a fuel spill, the following procedures will be followed:

- All equipment anticipated to be used onsite will be inspected by a competent person.
- Checks will be performed prior to operation to ensure that vehicles or equipment have been properly maintained and there are no petroleum, oil, and lubricant (POL) leaks.
- Vehicles or equipment will be staged in a central location away from water bodies, tundra, or other sensitive areas.
- Equipment will be positioned so that valves, piping, tanks, or other fuel-containing parts are protected from damage by other vehicles or equipment.
- All hoses, connections, and valves will be inspected prior to any fuel transfer operations, to ensure these items have been properly maintained.
- Adequate secondary containment and absorbent pads will be placed under all appropriate connections, vents, or other likely source of spillage, utilizing as many secondary containers as necessary.
- Line of sight with the equipment operator and/or all connections and other potential sources of spillage will be maintained during fuel transfer.
- A fuel transfer will never be left unattended.
- Secondary containment will be maintained while disconnecting filling hoses.
- Fuel transfer operations will not be conducted during sampling activities.

Jacobs will stage spill response equipment in close proximity to the worksite, facilitating rapid response. The spill kit will contain the following materials:

- Noncombustible oliophilic absorbent material in quantities consistent with the possible size of spill
- 55-gallon overpack drums
- Brooms, shovels, bulk absorbents, fire extinguishers, plastic buckets, and Visqueen®
- Personal protective equipment consistent with the Site Safety and Health Plan (SSHP) (Appendix A to the Work Plan)
- Nonphosphate detergents (such as Liquinox®) for equipment decontamination

Underground and aboveground storage tanks, drums, and piping may be encountered at FWA sites. Spills could occur during decommissioning and/or draining activities. When draining product, field personnel will be expected to follow the spill prevention procedures outlined above. Adequate absorbent materials will be placed under coupling areas. The contact numbers for spills and contacts with toxins are included in Table 5-1.

Table D-5-1
Spills and Toxins Emergency Contacts

Organization	Contact Information
ADEC Response Team Office	907-451-2121 phone 907-451-2362 fax 800-478-9300 (outside normal business hours)
National Response Center (Oil & Toxic Chemical Spills)	(800) 424-8802
CHEMTREC® (Customer ID #JAC001)	(800) 424-9300
Poison Control Center	(800) 222-1222

5.6.2 Spill Notification Requirements

Should a spill occur, mitigation and reporting procedures will be implemented as follows:

- The Site Safety and Health Officer (SSHO) will assess the need for personnel to don a higher level of personal protective equipment by taking air-monitoring readings.
- If the spill is too large to be handled safely by the field team, the area around the spill will be secured, and the Project Manager, Site Manager, Site Safety and Health Office, and USAED Contracting Officer will be notified. Absorbent material will be used to temporarily berm and contain the spill as well as clean up the material.
- An appropriate drum or container will be obtained to package the spilled material.
- Spilled material and any additional contaminated soil will be pumped or scooped up and placed in a container.

- State of Alaska and federal regulations require immediate notification of a hazardous material discharge or release (18 AAC 75.300-307 and CERCLA). Consequently, field personnel will immediately record the following information for a spill of any volume and contact the Site Manager and/or USAED for reporting:
  - Date, time, and location of discharge
  - Name, mailing address and telephone number of person(s) causing or responsible for the discharge
  - Cause of discharge
  - Environmental damage, including volume of soil or water affected, caused by the discharge, to the extent the damage can be identified
  - Cleanup actions taken
  - If the material has been disposed of, the date, location, and method of hazardous substance and cleanup materials
  - Estimate of the volume of cleanup materials used
  - Any actions taken to prevent recurrence of the discharge
  - Other information the field team considers important to the discharge episode

In the event of a spill, the appropriate State of Alaska spill reporting forms will be prepared by Jacobs and submitted to the USAED Project Manager, who will determine whether reporting will be performed by USAED or Jacobs. Attachment D-3 contains contact numbers and copies of the required forms outlining the spill-reporting procedures.

5.7 ENVIRONMENTAL RESTORATION

Work will be conducted within the project boundaries as defined in site-specific work plan addendums. After field activities have been completed at a site, all signs of temporary facilities such as work areas, staging areas, waste materials, and other vestiges of the field activities will be removed.

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ATTACHMENT D-1

Summary of Environmental Protection Issues
2010 USAED Statewide Field Activities

Summary of Environmental Protection Issues
2010 USAED Statewide Field Activities

EPP Requirement	Reference to Where EPP Requirement Is Described[1]	
	Document	**Section**
1 Identification of Work Area		
Storage areas	SSWP	TBD
Staging areas	SSWP	TBD
Travel/access routes	SSWP	TBD
2 Identification of Protected Land Area		
Foliage	EPP	4.1 and 4.2
Surface vegetation	EPP	4.1 and 4.2
Wetlands	EPP	4.1 and 4.2
Special habitat	EPP	4.1 and 4.2
Environmentally sensitive areas	EPP	4.1 and 4.2
Other protected lands	EPP	4.1 and 4.2
3 Identification of Fish and Wildlife		
General	EPP	4.3
Endangered	EPP	4.3
Threatened	EPP	4.3
4 Identification of Protected Water Resources		
Lakes, streams, rivers	EPP	4.4
Tidal areas	EPP	4.4
Oceans	EPP	4.4
Groundwater	EPP	4.4
5 Identification of Erosion Control Requirements		
Potentially required	EPP	5.2
Required	EPP	5.2
6 Identification of Potentially Contaminated Sediment Control Requirements		
Location	SSWP	TBD
Disposal methods in Waste Management Plan	SSWP	TBD
7 Stormwater-Pollution Prevention Plan Requirements		
Task order requirement	EPP	Attachment D-5
Calculation per 40 CFR 122.26 (b)(14)(x)	SSWP	TBD
8 Identification of Onsite Waste Disposal		
Disposal/permits	WMP	Appendix E
Burning/permits	N/A	
9 Identification of Dust Control/Monitoring Requirements		
	EPP	5.1
10 Identification of Decontamination Requirement		
	EPP	5.4
11 Identification of Spill Response Requirements		
Drips/spill control identified	EPP	5.6
Containment areas described	SSWP	TBD
Emergency response equipment list identified	EPP	5.6
Emergency spill instructions indicated	EPP	5.6 and Att-3
Installation/user requirements included	EPP	5.6 and Att-3
Written spill report requirements indicated	EPP	5.6 and Att-3
ADEC Reporting Forms included	EPP	5.6 and Att-3
12 Identification of Cultural Resources		
Cultural resources	EPP	4.4

Notes:
[1] Each element of the matrix is identified by a work plan component. For example, an EPP item that is found in Section 5.2 of the task order's Waste Management Plan would be designated as WMP 5.2.
ADEC = Alaska Department of Environmental Conservation; CFR = Code of Federal Regulations; EPP = Environmental Protection Plan; N/A = not applicable; SSWP = Site Specific Work Plan; TBD = To Be Determined

ATTACHMENT D-2

Summary of Environmental Protection Issues

Possible Applicable, Relevant, and Appropriate Requirements (ARARs); and To Be Considereds (TBCs)

Summary of Environmental Protection Issues
Possible Applicable, Relevant, and Appropriate Requirements (ARARs); and To Be Considereds (TBCs)

Act or Regulation	Description	Comments
Endangered Species Act of 1973 (16 USC 1531. et seq.: 50 CFR 200; 50 CFR 402)	Provides for the protection of endangered and threatened species.	To Be Considered
Migratory Bird Conservation Act (16 USC 715)	The main purpose of the Act is to conduct investigations, to publish documents related to North American birds, and to maintain and develop refuges.	To Be Considered
Fish and Wildlife Coordination Act (16 USC 661, et seq., 40 CFR 6.302)	Requires that federal agencies consult with USFWS, NMFS and state fish and wildlife agencies concerning potential effects on fish and wildlife. Applies to federal and nonfederal permitted/licensed water development projects.	To Be Considered
Fish and Game Alaska Statutes (AS, Title 16)	Authorizes ADF&G to regulate activities proposed for streams supporting anadromous fish. A permit is required from ADF&G for activities that impact anadromous fish streams.	To Be Considered
Marine Mammal Protection Act (16 USC 1361, et seq.)	Assigns federal responsibility to maintain marine mammal population at sustainable levels through protection of environments and ecosystems in which these animals interact.	To Be Considered
Federal Coastal Zone Management Act (16 USC Section 1451-1464)	Requires coordinated land and water use planning in the coastal zones to protect important coastal resource values.	To Be Considered
Bald and Golden Eagle Protection Act (16 USC 668-6681; 50 CFR 10 and 50 CFR 22)	Prohibits pursuing, hunting, shooting, killing, trapping, capturing, or collecting of bald or golden eagles, their eggs or nests.	To Be Considered
Executive Order 11990, Protection of Wetlands (40 CFR 6, Appendix A)	Provides for protection of wetlands.	To Be Considered
Alaska Coastal Management Program (6 AAC 50)	Protects coastal resource districts by requiring that projects undergo a review for consistency with the Alaska Coastal Management Program.	To Be Considered

Summary of Environmental Protection Issues, Possible ARARs, and TBCs (Continued)

Act or Regulation	Description	Comments
Federal Regulations		
NEPA (42 USC. 4371, et seq.)	Establishes a general decision-making procedure for "major federal actions" that may have potential environmental affects. Requires federal agencies to evaluate the environmental consequences of their actions, consider all feasible alternatives, mitigate actions and involve stakeholders.	To Be Considered
RCRA (40 CFR 240-281)	Tracks hazardous wastes “from cradle to grave" and controls hazardous waste treatment, storage, and disposal facilities. Specifies whether a waste is hazardous.	To Be Considered
Toxic Substance Control Regulations (for PCBs) (40 CFR 761)	Defines PCB-containing fluids and regulates their movement.	To Be Considered
Nationwide Permit 38 as part of the Clean Water Act; Cleanup of Hazardous and Toxic Waste (33 CFR 330, Appendix A)	Covers specific activities involved in the containment, stabilization, or removal of hazardous toxic waste materials that are performed by a government agency.	To Be Considered
Clean Water Act	Prohibits the discharge of dredged or fill material that contributes to degradation of water quality or jeopardizes endangered or threatened species.	To Be Considered
NPDES Storm Water-Pollution Prevention Plan (Point-Source and Nonpoint-Source Management)	Provides compliance requirements for point-source and nonpoint-source discharges.	To Be Considered
Guidance for Conducting RIs and Feasibility Studies under CERCLA (EPA 1988b)	Outlines procedures for completion of RIs, including the use of ARARs, TBCs and risk-based cleanup levels.	To Be Considered
Management IDWs During Site Inspections (EPA 1991)	Outlines procedures for handling and disposal of IDW.	To Be Considered
DOT Hazardous Materials, Substances and Waste Regulations (49 CFR Parts 171, 172 and 173)	Oversees transportation of various preservatives, field supplies, IDW supplies and other hazardous materials. Transportation of hazardous materials within coastal waters is subject to USAED enforcement. The USAED regulations require vessels to obtain permits to ship hazardous materials.	To Be Considered

Summary of Environmental Protection Issues, Possible ARARs, and TBCs (Continued)

Act or Regulation	Description	Comments
Occupational Safety and Health Administration (40 CFR 1910.120)	OSHA requires safe and healthful work practices and environments, including specific training for hazardous or toxic waste site actions.	To Be Considered
State of Alaska		
Alaska Solid Waste Management (18 AAC 60)	Regulates solid waste accumulation, storage, transportation, and disposal.	To Be Considered
Alaska Oil and Hazardous Substance Pollution Control (18 AAC 75)	Defines release and disposal requirements for discharge and cleanup of petroleum hydrocarbons.	To Be Considered
Transportation of Hazardous Waste (18 AAC 62.230, 18 AAC 62.310)	Outlines hazardous waste transportation regulations.	To Be Considered
ADEC Interim Guidance for Non-UST POL Soil	Provides guidance for non-UST POL-impacted soils, from storage to sampling, handling, and disposal.	To Be Considered
ADEC Guidance for Wastewater Discharge	Provides guidance for application, permitting, and restrictions for discharge of wastewater.	To Be Considered
Short-Term Water Use Permit	Provides guidance and permitting requirements for short-term water use.	To Be Considered
Safety and Health Requirements Manual (EM385-1-1)	Prescribes health and safety requirements for USACE activities.	To Be Considered

Note: For definitions, see Acronyms and Abbreviations section.

ATTACHMENT D-3

Oil and Hazardous Substances Spill Forms

Report all Spills Notification

Discharge Notification and Reporting Requirements

Oil and Hazardous Spill Notification

Oil and Hazardous Spill Final Report

REPORT ALL

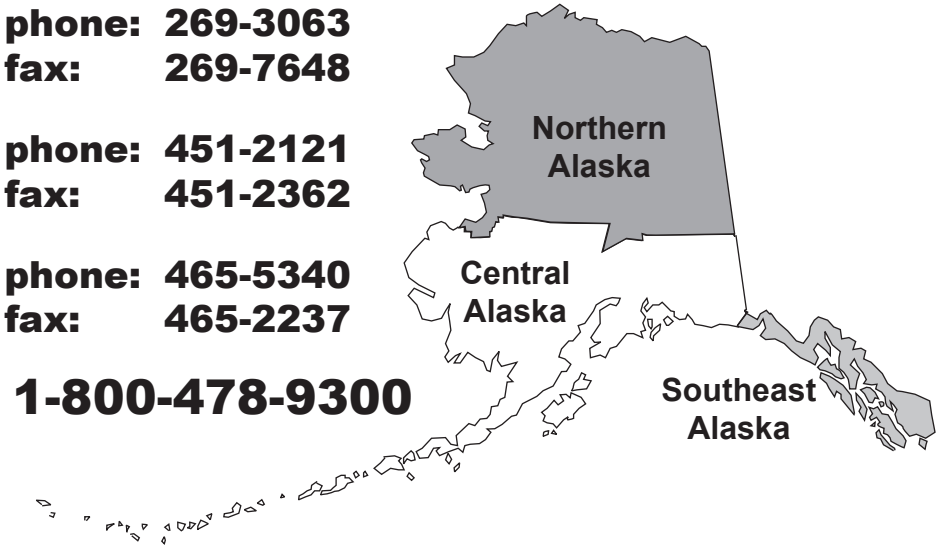
OIL AND HAZARDOUS SUBSTANCE SPILLS

ALASKA LAW REQUIRES REPORTING OF ALL SPILLS

During normal business hours

contact the nearest DEC Area Response Team office:

Central Area Response Team:	**Anchorage**	**phone: 269-3063** **fax: 269-7648**
Northern Area Response Team:	**Fairbanks**	**phone: 451-2121** **fax: 451-2362**
Southeast Area Response Team:	**Juneau**	**phone: 465-5340** **fax: 465-2237**



Outside normal business hours, call: 1-800-478-9300

Alaska Department of Environmental Conservation
Division of Spill Prevention and Response

rev. May/2005

Alaska Department of Environmental Conservation

Discharge Notification and Reporting Requirements

AS 46.03.755 and 18 AAC 75 Article 3

Notification of a discharge must be made to the **nearest** Area Response Team during working hours:

Anchorage:	**269-3063**	**Fairbanks:**	**451-2121**	**Juneau:**	**465-5340**
	269-7648 (FAX)		**451-2362 (FAX)**		**465-2237 (FAX)**

OR

to the 24-Hour Emergency Reporting Number during non-working hours: **1-800-478-9300**

Notification Requirements

Hazardous Substance Discharges

Any release of a hazardous substance must be reported as soon as the person has knowledge of the discharge.

Oil Discharges

- **TO WATER**
  - Any release of oil to water must be reported as soon as the person has knowledge of the discharge.
- **TO LAND**
  - Any release of oil in ***excess of 55 gallons*** must be reported as soon as the person has knowledge of the discharge.
  - Any release of oil in ***excess of 10 gallons but less than 55 gallons*** must be reported within 48 hours after the person has knowledge of the discharge.
  - A person in charge of a facility or operation shall maintain, and provide to the Department on a monthly basis, a written record of any discharge of oil ***from 1 to 10 gallons***.
- **TO IMPERMEABLE SECONDARY CONTAINMENT AREAS**
  - Any release of oil ***in excess of 55 gallons*** must be reported within 48 hours after the person has knowledge of the discharge.

Special Requirements for Regulated Underground Storage Tank (UST) Facilities*

If your **release detection system** indicates a possible discharge, or if you notice **unusual operating conditions** that might indicate a release, you must notify the Storage Tank Program at the nearest DEC Office **within 7 days**:

Anchorage:	(907) 269-7504	Fairbanks:	(907) 451-2360
Juneau:	(907) 465-5200	Soldotna:	(907) 262-5210

*Regulated UST facilities are defined at 18 AAC 78.005 and do not include heating oil tanks.

rev. May/2005

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

OIL & HAZARDOUS SUBSTANCES SPILL NOTIFICATION

ADEC SPILL #	ADEC FILE #	ADEC LC
PERSON REPORTING	PHONE NUMBER	REPORTED HOW? ☐ Troopers ☐ phone ☐ fax

DATE/ TIME OF SPILL	DATE/TIME DISCOVERED	DATE/TIME REPORTED

LOCATION/ADDRESS	LAT.		SUBSTANCE TYPE	PRODUCT
	LONG.		A) CR EHS HS NC PW UNK B) CR EHS HS NC PW UNK	A) B)

QUANTITY SPILLED	QUANTITY CONTAINED	QUANTITY RECOVERED	QUANTITY DISPOSED
☐ gallons ☐ pounds	☐ gallons ☐ pounds	☐ gallons ☐ pounds	☐ gallons ☐ pounds

POTENTIAL RESPONSIBLE PARTY C-Plan Holder? YES ☐ NO ☐	FACILITY TYPE

SOURCE OF SPILL	☐ >400 GT Vessel?
CAUSE OF SPILL (List Primary Cause first)	☐ Accident ☐ Human Factors ☐ Structural/Mechanical ☐ Other

CLEANUP ACTIONS

DISPOSAL METHODS AND LOCATION

RESOURCES AFFECTED/THREATENED (Water sources, wildlife, wells. etc.)	AIR	LAND	MARINE	FRESH	SURF. AREA AFFECTED	SURF. TYPE

COMMENTS

DEC USE ONLY

SPILL NAME, IF ANY	NAMES OF DEC STAFF RESPONDING	C-PLAN MGR NOTIFIED YES ☐ NO ☐ _____
DEC RESPONSE ☐ phone follow-up ☐ field visit ☐ took report	CASELOAD CODE ☐ First and Final ☐ Open/No LC ☐ LC assigned	CLEANUP CLOSURE ACTION ☐ NFA ☐ Monitoring ☐ Transferred to CS or STP

STATUS OF CASE (circle) OPEN CLOSED DATE CASE CLOSED _____

COMMENTS:

REPORT PREPARED BY	DATE

State of Alaska
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

OIL & HAZARDOUS MATERIALS INCIDENT FINAL REPORT

The following written report is required by State regulations 18 AAC 75.300(e), following departmental notification of a discharge of oil and hazardous materials. The report is due within 15 days after the cleanup is completed, or if no cleanup occurs, within 15 days after the discharge. Forward the report to the nearest DEC office of the department. The report must contain, as applicable:

1. Date and time of the discharge:

2. Location of the discharge:

3. Name of the site, facility or operation:

4. Name, mailing address, and telephone number of:

A. Person or persons causing or responsible for the discharge:

B. Owner and operator of the site, facility or operation:

5. Type and amount of each oil or hazardous substance discharged:

6. Cause of the discharge:

7. Description of any environmental damage caused by the discharge or containment, to the extent the damage can be identified:

8. Description of cleanup actions taken:

9. Estimated amount of:

(A) oil or hazardous substance cleaned up:

(B) oily or hazardous waste generated:

10. Date, location, and method of ultimate disposal of the oil, hazardous substance and any contaminated materials, including cleanup materials:

11. Description of actions being taken to prevent recurrence of the discharge:

12. Other information the department requires to fully assess the cause and impact of the discharge (receipts for disposal if available):

Signature	**Printed name**
Date	**Title**

MAIL OR FAX TO the Closest A.D.E.C. Office below

Anchorage
Phone: 269-3063
Fax: 269-7648
555 Cordova Street
Anchorage, AK 99501

Fairbanks
Phone: 451-2121
Fax: 451-2362
610 University Ave.
Fairbanks, AK 99709-3643

Juneau
Phone: 465-5340
Fax: 465-2237
410 Willoughby Ave., Suite 309
Juneau, AK 99801-1795

DEC USE ONLY	
ADEC Project Manager:	ADEC Spill #:

ATTACHMENT D-4

Cultural Resource Notification Form
Map of Fort Wainwright Historic Landmarks and Buildings

CULTURAL RESOURCE NOTIFICATION FORM					
Project Name*:*			**Project Number:**		
Discovery Date:	Time: am / pm		By:		
REPORTING REQUIREMENTS*: Stop work immediately/Secure the site; Notify Site Manager Notify Task Mgr; Complete a CR Notification Form*					
Jacobs Site Manager: Jacobs Task Manager:					
Date Notified:			Time: am / pm		Initial:
Comments:					
Onsite Archaeological Monitor*:*					
Date notified:			Time: am / pm		Initial:
NOTIFY THE FOLLOWING PERSONS WITHIN 2 HOURS:					
USAED Archaeologist:	Date:	TIME: am / pm	Phone:	Fax:	Initial:
Comments:					
USAED Project Manager:	Date:	Time: am / pm	Phone:	Fax:	Initial:
Comments:					
USAED Environ. Res. Mgr:	Date:	Time: am / pm	Phone:	Fax:	Initial:
Comments:					
Jacobs Cultural Res. Rep:	Date:	Time: am / pm	Phone:	Fax:	Initial:
Comments:					
TERC Quality Assurance Rep:	Date:	Time: am / pm	Phone:	Fax:	Initial:
Comments:					
Jacobs Project Manager:	Date:	Time: am / pm	Phone:	Fax:	Initial:
Comments:					

National Historic Landmark & Historic District Buildings

Cantonment Area
Fort Wainwright, Alaska.

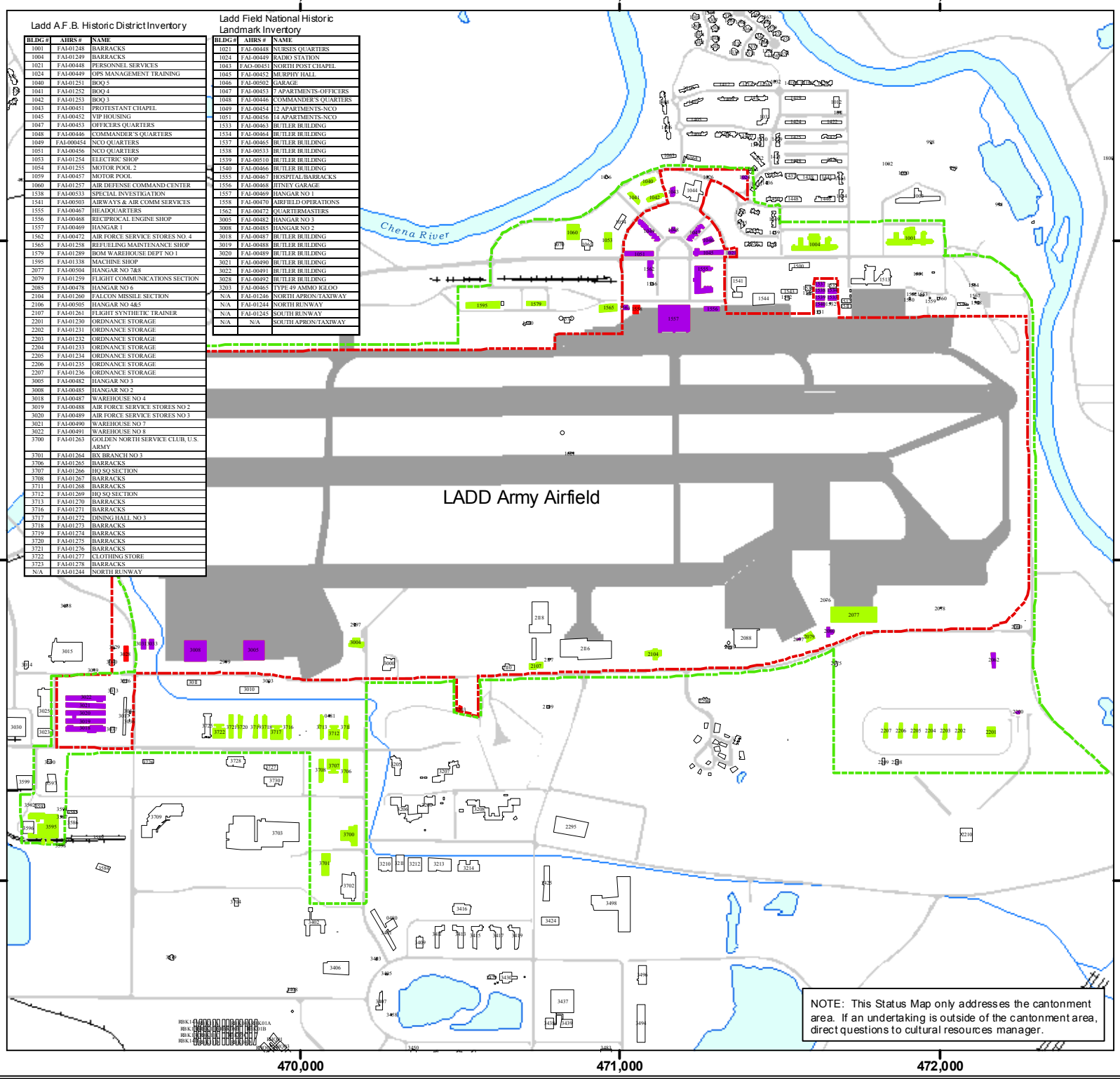
USAR Fort Wainwright
Environmental GIS
BLDG 3 023 (907) 3 61- 3551

Ladd A.F.B. Historic District Inventory

BLDG #	AHRS #	NAME
1001	FAI-01248	BARRACKS
1004	FAI-01249	BARRACKS
1021	FAI-00448	PERSONNEL SERVICES
1024	FAI-00449	OPS MANAGEMENT TRAINING
1040	FAI-01251	BOQ 5
1041	FAI-01252	BOQ 4
1042	FAI-01253	BOQ 3
1043	FAI-00451	PROTESTANT CHAPEL
1045	FAI-00452	VIP HOUSING
1047	FAI-00453	OFFICERS QUARTERS
1048	FAI-00446	COMMANDER'S QUARTERS
1049	FAI-00454	NCO QUARTERS
1051	FAI-00456	NCO QUARTERS
1053	FAI-01254	ELECTRIC SHOP
1054	FAI-01255	MOTOR POOL 2
1059	FAI-00457	MOTOR POOL
1060	FAI-01257	AIR DEFENSE COMMAND CENTER
1538	FAI-00533	SPECIAL INVESTIGATION
1541	FAI-00503	AIRWAYS & AIR COMM SERVICES
1555	FAI-00467	HEADQUARTERS
1556	FAI-00468	RECIPROCAL ENGINE SHOP
1557	FAI-00469	HANGAR 1
1562	FAI-00472	AIR FORCE SERVICE STORES NO. 4
1565	FAI-01258	REFUELING MAINTENANCE SHOP
1579	FAI-01289	BOM WAREHOUSE DEPT NO 1
1595	FAI-01338	MACHINE SHOP
2077	FAI-00504	HANGAR NO 7&8
2079	FAI-01259	FLIGHT COMMUNICATIONS SECTION
2085	FAI-00478	HANGAR NO 6
2104	FAI-01260	FALCON MISSILE SECTION
2106	FAI-00505	HANGAR NO 4&5
2107	FAI-01261	FLIGHT SYNTHETIC TRAINER
2201	FAI-01230	ORDNANCE STORAGE
2202	FAI-01231	ORDNANCE STORAGE
2203	FAI-01232	ORDNANCE STORAGE
2204	FAI-01233	ORDNANCE STORAGE
2205	FAI-01234	ORDNANCE STORAGE
2206	FAI-01235	ORDNANCE STORAGE
2207	FAI-01236	ORDNANCE STORAGE
3005	FAI-00482	HANGAR NO 3
3008	FAI-00485	HANGAR NO 2
3018	FAI-00487	WAREHOUSE NO 4
3019	FAI-00488	AIR FORCE SERVICE STORES NO 2
3020	FAI-00489	AIR FORCE SERVICE STORES NO 3
3021	FAI-00490	WAREHOUSE NO 7
3022	FAI-00491	WAREHOUSE NO 8
3700	FAI-01263	GOLDEN NORTH SERVICE CLUB, U.S. ARMY
3701	FAI-01264	BX BRANCH NO 3
3706	FAI-01265	BARRACKS
3707	FAI-01266	HQ SQ SECTION
3708	FAI-01267	BARRACKS
3711	FAI-01268	BARRACKS
3712	FAI-01269	HQ SQ SECTION
3713	FAI-01270	BARRACKS
3716	FAI-01271	BARRACKS
3717	FAI-01272	DINING HALL NO 3
3718	FAI-01273	BARRACKS
3719	FAI-01274	BARRACKS
3720	FAI-01275	BARRACKS
3721	FAI-01276	BARRACKS
3722	FAI-01277	CLOTHING STORE
3723	FAI-01278	BARRACKS
N/A	FAI-01244	NORTH RUNWAY

Ladd Field National Historic Landmark Inventory

BLDG #	AHRS #	NAME
1021	FAI-00448	NURSES QUARTERS
1024	FAI-00449	RADIO STATION
1043	FAO-00451	NORTH POST CHAPEL
1045	FAI-00452	MURPHY HALL
1046	FAI-00502	GARAGE
1047	FAI-00453	7 APARTMENTS-OFFICERS
1048	FAI-00446	COMMANDER'S QUARTERS
1049	FAI-00454	12 APARTMENTS-NCO
1051	FAI-00456	14 APARTMENTS-NCO
1533	FAI-00463	BUTLER BUILDING
1534	FAI-00464	BUTLER BUILDING
1537	FAI-00465	BUTLER BUILDING
1538	FAI-00533	BUTLER BUILDING
1539	FAI-00510	BUTLER BUILDING
1540	FAI-00466	BUTLER BUILDING
1555	FAI-00467	HOSPITAL/BARRACKS
1556	FAI-00468	JITNEY GARAGE
1557	FAI-00469	HANGAR NO 1
1558	FAI-00470	AIRFIELD OPERATIONS
1562	FAI-00472	QUARTERMASTERS
3005	FAI-00482	HANGAR NO 3
3008	FAI-00485	HANGAR NO 2
3018	FAI-00487	BUTLER BUILDING
3019	FAI-00488	BUTLER BUILDING
3020	FAI-00489	BUTLER BUILDING
3021	FAI-00490	BUTLER BUILDING
3022	FAI-00491	BUTLER BUILDING
3028	FAI-00492	BUTLER BUILDING
3203	FAI-00465	TYPE 49 AMMO IGLOO
N/A	FAI-01246	NORTH APRON/TAXIWAY
N/A	FAI-01244	NORTH RUNWAY
N/A	FAI-01245	SOUTH RUNWAY
N/A	N/A	SOUTH APRON/TAXIWAY



NOTE: This Status Map only addresses the cantonment area. If an undertaking is outside of the cantonment area, direct questions to cultural resources manager.

Legend

- Historic District Buildings
- Historic Landmark Buildings
- Both NHL & HD Buildings
- Ladd AFB Historic District Boundary
- Ladd Field National Historic Landmark Boundary

1) Status of building and boundaries subject to change. If map is older than 6 months direct status questions to the cultural resources manager:
Lisa Graham: (907) 361-3002.

2) All Undertakings subject to section 106 review and compliance regardless of eligibility of building affected, unless otherwise noted.

UTM Zone 6N
WGS 1984
Meters

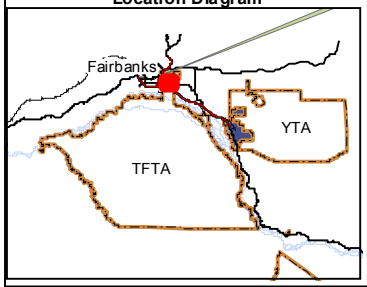
Grid Spacing:
1,000 m

1:16,588

0 0.05 0.1 0.2 0.3 0.4
Miles

0 0.05 0.1 0.2 0.3 0.4
Kilometers

Location Diagram



PrintDate: 02/03/2010
Author: DDS (907) 361-3551
FileName: hist_property_status_jan2010c.mxd
Dir: F:\GIS_Projects\Cultural_Resources\fwa_buildings\

ATTACHMENT D-5

Storm Water Pollution Prevention Plan

FINAL

FORT WAINWRIGHT
POST WIDE WORK PLAN

Attachment D-5
Storm Water Pollution Prevention Plan

FORT WAINWRIGHT, ALASKA

MARCH 2011

U.S. Army Corps of Engineers, Alaska District
Environmental Remediation Services
Contract No. W911KB-06-D-0006
Task Order No. 20

Prepared by
Jacobs Engineering Group Inc.
4300 B Street, Suite 600
Anchorage, Alaska 99503

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Exhibit H – Grading and Stabilization Activities Log
Exhibit I – Training Log
Exhibit J – Delegation of Authority

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ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Conservation
AST	aboveground storage tank
BMP	Best Management Practices
CERCLA	Comprehensive Environmental Response
CGA	Comprehensive Environmental Response, Compensation, and Liability Act
DPW	Department of Public Works
EPA	U.S Environmental Protection Agency
FWA	Fort Wainwright, Alaska
CGP	construction general permit
HDPE	high-density polyethylene
IDW	investigation-derived waste
Jacobs	Jacobs Engineering Group, Inc.
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
POC	Point of Contact
TMDL	total maximum daily limit
USAED	U.S. Army Engineer District, Alaska
UST	underground storage tank

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1.0 SITE EVALUATION, ASSESSMENT, AND PLANNING

1.1 PROJECT/SITE INFORMATION

Project/Site Name: Fort Wainwright Post Wide Environmental Remediation Services

Project Street/Location: 4762 Alder Road, Ft Wainwright

City: Fairbanks State: AK ZIP Code: 99703

County or Similar Subdivision: Fairbanks North Star Borough

Latitude/Longitude (Use one of three possible formats, and specify method)

Latitude:	Longitude:
1. 64 º 49 '18" N (degrees, minutes, seconds)	1.147 º 14 ' 7" W (degrees, minutes, seconds)
2. _ _ º _ _ . _ _' N (degrees, minutes, decimal)	2. _ _ º _ _ . _ _' W (degrees, minutes, decimal)
3. _ _ . _ _ _ _ º N (decimal)	3. _ _ . _ _ _ _ º W (decimal)

Method for determining latitude/longitude:

☐ USGS topographic map (specify scale: _____) ☐ EPA Web site ☒ GPS

☐ Other (please specify): _____

Is the project located in Indian country? ☐ Yes ☒ No

If yes, name of Reservation, or if not part of a Reservation, indicate "not applicable."

Not Applicable

Is this project considered a federal facility? ☒ Yes ☐ No

NPDES project or permit tracking number*: TBD

**(This is the unique identifying number assigned to your project by your permitting authority after you have applied for coverage under the appropriate National Pollutant Discharge Elimination System (NPDES) construction general permit.)*

1.2 CONTACT INFORMATION/RESPONSIBLE PARTIES

Operator:
Jacobs Engineering
4300 B Street, Suite 600
Anchorage, Alaska, 99504
Phone: 907 382-2569 Fax: 907 563-3320

Project Manager:
Jacobs Engineering
Sarah Belway
4762 Alder Avenue
Fairbanks, Alaska, 99703
907 356-1280
Sarah.belway@jacobs.com

SWPPP Contact(s):
Jacobs Engineering
Sarah Belway/Meagan DeRaps
4762 Alder Avenue
Fairbanks, Alaska, 99703
907 356-1280
Sarah.belway@jacobs.com/Meagan.deraps@jacobs.com
Project Manager/Technical Staff

This SWPPP was Prepared by:
Jacobs Engineering
Meagan DeRaps
4762 Alder Avenue
Fairbanks, Alaska, 99703
907 356-1280
Meagan.deraps@jacobs.com

Subcontractor(s):
To be determined on a site-specific basis

Emergency 24-Hour Contact:
Jacobs Engineering
Sarah Belway / Meagan DeRaps
907 382-2569 / 907 388-9174

1.3 NATURE AND SEQUENCE OF CONSTRUCTION ACTIVITY

During the 2010 field season, Jacobs Engineering Group Inc. (Jacobs) will conduct environmental remediation activities at various sites throughout Fort Wainwright, Alaska (FWA) (Exhibit D-5-A). Work phases associated with the *2010 Fort Wainwright Post Wide Work Plan* may include the following activities:

- Site Access Control and Site Setup
- Utility Clearance
- Site Survey
- Geophysical Survey
- Munitions and Explosives of Concern (MEC) Investigation
- Underground storage tank / aboveground storage tank (UST/AST) removal and decommissioning
- Excavation and waste characterization
- Well installation and groundwater monitoring
- Sampling
- Stockpile Construction
- Waste Management
- Backfilling
- Site Restoration

What is the function of the construction activity?
☐ Residential ☐ Commercial ☐ Industrial ☐ Road Construction
☐ Linear Utility ☒ Other (please specify): Military

Estimated Project Start Date: 04 / 01/ 2010
Estimated Project Completion Date: 12/ 31 / 2010

1.4 SOILS, SLOPES, RAINFALL, AND CURRENT DRAINAGE PATTERNS

1.4.1 Soil types

Soils at FWA consist of glacial outwash and fluvial deposits of gravel, sand, and silt. They are well-drained and when not frozen are highly permeable. FWA lies within the discontinuous

permafrost zone of Alaska. When present, permafrost inhibits the infiltration of surface water (USAG-AK 2005).

1.4.2 Slopes

The majority of FWA lies within the floodplains of both the Chena and Tanana Rivers. With the exception of the hills to the north, the topography of the post is generally flat, consistent with typical floodplain geomorphology. Slopes as steep as 14 degrees are common in the northern part of the post where the base of the hills constitute part of the Yukon-Tanana Upland.

Where excavation occurs, slopes will generally maintain a 1:2 slope or less. Excavations will be backfilled and re-graded to a level surface following removal of debris, although they may remain for a period of weeks prior to backfilling.

Detailed slope information will be provided on a site-specific basis.

1.4.3 Rainfall

Precipitation at FWA averages 10.4 inches per year. Over half of the annual precipitation falls as rain in June, July, and August. In the city of Fairbanks, an extreme rainfall event involves 2.7 inches of rain and occurs once every 25 years. A more typical rainfall event involves 1.25 inches of rain and occurs once every two years. Under typical rainfall conditions, stormwater runoff at FWA is minor. The majority of runoff occurs during initial snowmelt in the spring (USAG-AK 2005).

1.4.4 Drainage Patterns

Due to the flat topography and permeable soils, most of the storm water runoff (not including snow melt) infiltrates the ground before it reaches a surface body of water. The majority of water that is not infiltrated will eventually end up in the Chena River.

Fort Wainwright is divided into 11 groups based on drainage patterns (Exhibit A). Outfalls associated with each group identify the point source where the area drains. Outfalls 1 through 8 discharge directly to the Chena River via a pipe or defined channel. Outfalls 9 and 10 drain into a pond created by gravel and sand mining operations. Outfall 11 is a small tributary of the Chena and receives drainage from the Fort Wainwright Landfill. Since almost all FWA stormwater that is not infiltrated passes through one of these 11 outfalls, they are designated locations for Stormwater Pollution and Prevention Plan (SWPPP) monitoring (USAG-AK 2005).

The outfalls are described in more detail below. Maps displaying their locations and drainage areas can be found in Exhibit A (Figures D-2 through D-3). Information regarding FWA drainage as well as the associated maps provided in Exhibit A was taken from the U.S. Army Garrison, Alaska Fort Wainwright SWPPP (USAG-AK 2005).

Outfall 1

Outfall 1 is the furthest outfall downstream on the Chena River. Most of the area drained by this outfall is residential; however water from the hospital and landscaping activities will drain to this location as well. There is a low potential for stormwater pollution due to limited industrial activities and few impervious areas.

Outfall 2

Outfall 2 discharges to the Chena River east of 10th Street along Gaffney Road. The area drained by this outfall is relatively small and covered by grass.

Outfall 3

Outfall 3 discharges 400 feet upstream of Outfall 2. The drainage area for this outfall is small, mostly grass-covered, and landscaped. It also contains several industrial facilities.

Outfall 4

Outfall 4 discharges to the Chena River a short distance east of the River Road Bridge. This outfall is the primary industrial stormwater outfall for FWA. The outfall receives runoff from

the west end of the runway, parts of north post, and most industrial facilities on the south side of the runway. Outfall 4 is the most significant outfall with regard to volume of runoff and potential pollutant sources.

Outfall 5

Outfall 5 discharges to the Chena River in the North Post area. This outfall has a relatively small drainage area and once contained several industrial facilities that are no longer in service. Potential for stormwater pollution is low due to limited industrial activities and permeable soil.

Outfall 6

Outfall 6 discharges approximately 500 feet upstream of Outfall 5. This outfall has a very small drainage area and no longer houses industrial activities. It has a low potential for stormwater pollution due to the limited number of industrial facilities.

Outfall 7

Outfall 7 discharges into the Chena River east of 103rd Avenue in the North Post area. This outfall receives runoff from a large part of the north runway and several industrial facilities. The potential for stormwater pollution is high. The pollutants of primary concern are petroleum products associated with fuels and lubricants.

Outfall 8

Outfall 8 discharges into the Chena River at the east end of the runway. This outfall receives runoff from portions of the runway. The potential pollutants from this area are associated with spills or leaks of petroleum products that could occur during flight operations.

Outfall 9

Outfall 9 discharges to a borrow area pond located near a sand and gravel mining operation. Unlike most of the stormwater in FWA, the discharge of this outfall is not into a natural body of water. Outfall 9 receives runoff from several nearby motor pools. Potential pollutants are

materials associated with maintenance of mechanized vehicles and equipment; these include petroleum hydrocarbons, antifreeze, coolants, and various solvents.

Outfall 10

Outfall 10 discharges to a borrow area pond located near a sand and gravel mining operation. Unlike most of the stormwater in FWA (and similar to Outfall 9) the discharge of this outfall is not into a natural body of water. A vegetated buffer exists between these facilities and the pond that offers treatment potential for runoff.

Outfall 11

Outfall 11 discharges from the Fort Wainwright Landfill to a small tributary of the Chena River. The potential impacts to surface water quality are expected to be small. The principal pollutant is expected to be sediment.

1.5 CONSTRUCTION SITE ESTIMATES

The following are estimates of the construction site:

Total project area:	Calculated on a site specsite-specific basis
Construction site area to be disturbed:	Calculated on a site specsite-specific basis
Percentage impervious area before construction:	Calculated on a site specsite-specific basis
Runoff coefficient before construction:	Calculated on a site specsite-specific basis
Percentage impervious area after construction:	Calculated on a site specsite-specific basis
Runoff coefficient after construction:	Calculated on a site specsite-specific basis

1.6 RECEIVING WATERS

Description of receiving waters

Runoff from FWA project sites may join overland flow, eventually emptying to the Chena River. Exhibit A, Figure D-1 shows the location of the Chena River in relation to FWA.

Description of storm sewer systems

Stormwater sewer systems will be identified on a site-specific basis.

Description of impaired waters or waters subject to total maximum daily limit (TMDL)

The potential runoff from the project site may join overland flow before eventually emptying to the Chena River. The Chena River is on the Section 303(d) list as an impaired water body for petroleum products and sediments (Alaska ID number 40506-007). No determination has been made on the effects of any designated use.

1.7 SITE FEATURES AND SENSITIVE AREAS TO BE PROTECTED

Description of unique features that are to be preserved

The potential runoff from all FWA project sites may join overland flow before eventually emptying to the Chena River. The Chena River is on the Section 303(d) list as an impaired water body for petroleum products and sediments (Alaska ID number 40506-007). Additional site features and sensitive areas will be identified on a site-specific basis.

Measures to protect these features

All excavated sites will be backfilled upon completion of cleanup activities. Backfilled excavated areas will be contoured to minimize soil erosion. Potentially contaminated soil will be stored in bermed, lined, and covered stockpiles. These will be managed according to the *Long-Term Soil Stockpile Plan* (Appendix F of this Work Plan). No sediment or runoff is anticipated to originate from these stockpiles. Overburden removed from the excavations will be stored adjacent to the excavations and used as backfill once excavation activities are complete and cleanup activities have ceased. Stockpiles will be inspected regularly (minimum once every 7 days or following a rain event) as part of the site maintenance procedures. (See Best Management Practices [BMP], Section 2.0). Additional measures will be described on a site-specific basis.

1.8 POTENTIAL SOURCES OF POLLUTION

Potential sources of sediment to stormwater runoff

Excavation runoff and dust control measures (water spraying) may cause additional sediment to enter the stormwater discharges unless controlled by BMPs.

Potential pollutants and sources (other than sediment) to stormwater runoff

Potential pollutants may include trash and debris produced during daily operations, and oil and grease from refueling operations.

1.9 ENDANGERED SPECIES CERTIFICATION

Are endangered or threatened species and critical habitats on or near the project area?

☐ Yes ☒ No

Describe how this determination was made:

There are no listed species or critical habitat areas on or near the project area (USAG-AK 2005).

If yes, describe the species and/or critical habitat:

N/A

1.10 HISTORIC PRESERVATION

Are there any historic sites on or near the construction site?

☐ Yes ☒ No

Describe how this determination was made

Current stormwater discharges do not have the potential to effect historic properties (USAG-AK 2005). Historic properties will be re-evaluated on a site-specific basis.

1.11 APPLICABLE FEDERAL, TRIBAL, STATE OR LOCAL PROGRAMS

FWA has a post wide SWPPP (USAG-AK 2005) that is also applicable to the project area. No other federal, tribal, state or local requirements apply.

1.12 MAPS

Four maps are presented in Exhibit A. The first shows the location of FWA (Figure D-1). The three additional figures show the location of drainage areas and their associated outfalls (Figures D-2 through D-4).

2.0 ADMINISTRATIVE REQUIREMENTS

Jacobs will comply with the administrative requirements detailed in Chapter 3 of the *Alaska SWPPP Guide* (effective 14 January 2005) and stated in the NPDES General Permit.

2.1 INSPECTION AND MAINTENANCE RECORDS

Inspection and maintenance records will be retained at the Jacobs Taku field trailer at 4762 Alder Avenue, Fairbanks, Alaska 99703.

2.2 PLAN LOCATION

A copy of the SWPPP will be kept at the Jacobs Taku field trailer from the time construction begins until demobilization.

2.3 OTHER ADMINISTRATIVE REQUIREMENTS

The following sections describe the forms that are required to be filed with the appropriate regulatory agencies and the procedures necessary to fulfill any additional administrative requirements under the NPDES General Permit.

2.3.1 Notice of Intent (NOI)

A copy of the NOI is included in Exhibit C. Jacobs will submit the NOI along with the SWPPP to Alaska Department of Environmental Conservation (ADEC) by Certified Mail. Earth-disturbing operations may not begin until 7 days after the NOI postmark date.

2.3.2 Notice of Termination (NOT)

Once final stabilization has been achieved Jacobs will submit the Notice of Termination (NOT) to DEC. A copy of the NOT form is included in Exhibit C.

2.3.3 SWPPP Modification

To accurately reflect current project worksite features and operations, the SWPPP will be amended as required. Inspections of stormwater controls and management practices will provide a basis for determining when updates or modifications to the SWPPP are needed. SWPPP amendments must be completed within 7 calendar days of the storm event or regular inspection report that first identified the need for updates and/or modifications. A log of modifications will be kept in Exhibit F.

3.0 EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES

3.1 MINIMIZE DISTURBED AREA AND PROTECT NATURAL FEATURES AND SOIL

BMP Description: Minimizing disruption of areas not planned for investigation

Installation Schedule: Daily management of field activities. As part of 14 day inspection (or after rain event) routes will be checked

Maintenance and Inspection: No excavation or other activity is planned outside of the areas marked on the maps presented in Exhibit A

**Only designated routes will be used throughout the project site to minimize disruption of areas not being investigated.*

Responsible Staff: Sarah Belway or designated representative

3.2 PHASE CONSTRUCTION ACTIVITY

The *2010 Fort Wainwright Post Wide Work Plan* includes the following activities:

- Site access control and site setup
- Utility clearance
- Site survey
- Geophysical survey
- MEC investigation
- UST/AST removal and decommissioning
- Excavation and waste characterization
- Well installation and groundwater monitoring
- Sampling
- Stockpile construction
- Waste management
- Backfilling
- Site restoration

Detailed BMPs associated with the phases above will be addressed on a site-specific basis and included in the project addendums.

3.3 CONTROL STORM WATER FLOWING ONTO AND THROUGH THE PROJECT

BMP Description: Inspection of installed erosion and Sediment control measures in the preexisting drainage swale.	
Installation Schedule:	Every 7 days or after a rain event
Maintenance and Inspection:	Maintaining all erosion and sediment control, as required, to check that they are installed and functioning properly. Making all repairs or replacements as soon as practicable, such as: • Removing excess sediment from collection areas and place in disposal areas as necessary • Repairing or replacing silt fences if damaged, clogged or not functioning properly • Revise method of erosion and sediment control as inspections and conditions indicate • Maintaining existing drainage patterns disturbed as a result of construction, including reestablishment of drainage ditches and swales to their preconstruction condition, grade, and elevation
Responsible Staff:	Sarah Belway or designated representative

BMP Description: Stabilization	
Installation Schedule:	Stabilization measures will be inspected once every 14 days or after a rain/storm event.
Maintenance and Inspection:	Proposed stabilization controls include construction of temporary berms, dikes, dams, sediment basins, slope drains, and the use of temporary mulches, or seeding as necessary to control erosion. Straw bales and silt fences will be used to minimize the effects of precipitation-induced soil erosion and runoff in the swales leading to the Chena River. The structural controls will be monitored and adjusted as necessary to prevent materials from eroding and contributing fines to storm water runoff. To remove the silt fences, the fabric will be cut off at ground level and the wire and posts removed. No silt will be discharged into any water bodies when removing the silt fence. If a sediment height in excess of 4 inches (100 millimeters) above ground remains, the sediment will be spread on the roadway side of the fence location and seeded immediately.
Responsible Staff:	Sarah Belway or designated representative

BMP Description: Structural Controls	
Installation Schedule:	Structural controls will be inspected once every 14 days or after a rain/storm event.
Maintenance and Inspection:	Straw bales and silt fences will be used to minimize the effects of precipitation-induced soil erosion and runoff in the swales leading to the Chena River. The structural controls will be monitored and adjusted as necessary to prevent materials from eroding and contributing fines to storm water runoff. To remove the silt fences, the fabric will be cut off at ground level and the wire and posts removed. No silt will be discharged into any water bodies when removing the silt fence. If a sediment height in excess of 4 inches (100 millimeters) above ground remains, the sediment will be spread on the roadway side of the fence location and seeded immediately.
Responsible Staff:	Sarah Belway or designated representative

BMP Description: Stormwater Management	
Installation Schedule:	Inspections once every 14 days or after a rain/storm event.
Maintenance and Inspection:	All excavated sites will be backfilled upon completion of cleanup activities. Backfilled excavated areas will be contoured to minimize soil erosion and sedimentation effects on surface waters.
Responsible Staff:	Sarah Belway or designated representative

3.4 STABILIZE SOILS

BMP Description: Stabilization controls	
☐ *Permanent*	☒ *Temporary*
Installation Schedule:	Inspections once every 14 days or after a rain/storm event.
Maintenance and Inspection:	Proposed stabilization controls include construction of temporary berms, dikes, dams, sediment basins, slope drains, and the use of temporary mulches, or seeding as necessary to control erosion. Use of these controls is not expected to be necessary.
Responsible Staff:	Sarah Belway or designated representative

BMP Description: Maintain excavation slopes to minimize soil erosion.	
☐ *Permanent*	☒ *Temporary*
Installation Schedule:	Inspections once every 14 days or after a rain/storm event.
Maintenance and Inspection:	Excavations will maintain a 1:2 slope angle and should not cause soil to erode from the excavation areas.
Responsible Staff:	Sarah Belway or designated representative

BMP Description: Stockpile construction	
☐ *Permanent*	☒ *Temporary*
Installation Schedule:	Inspections once every 14 days or after a rain/storm event.
Maintenance and Inspection:	Stockpiles will be constructed with 12-inch-high berms and lined with 20-millimeter high-density polyethylene (HDPE) liner to contain any runoff and prevent soil and runoff waters from leaving the stockpile area. A 10-mil HDPE top cover will be placed over the stockpiles during field activities.
Responsible Staff:	Sarah Belway or designated representative

BMP Description: Dust control	
☐ *Permanent*	☒ *Temporary*
Installation Schedule:	Inspections once every 14 days or after a rain/storm event.
Maintenance and Inspection:	All disturbed areas resulting from excavation activities will be kept damp at all times to prevent wind erosion.
Responsible Staff:	Sarah Belway or designated representative

3.5 PROTECT SLOPES

BMP Description: Maintain excavation slopes to minimize soil erosion.	
Installation Schedule:	Inspections once every 14 days or after a rain/storm event.
Maintenance and Inspection:	Excavations will maintain a 1:2 slope angle and should not cause soil to erode from the excavation areas.
Responsible Staff:	Sarah Belway or designated representative

BMP Description: Minimizing disruption of areas not planned for investigation	
Installation Schedule:	Daily management of field activities. As part of 14 day inspection (or after rain event) routes will be checked
Maintenance and Inspection:	No excavation or other activity is planned outside of the areas marked on the maps presented in Exhibit A. Only designated routes will be used throughout the project site to minimize disruption of areas not being investigated. No vehicles or equipment will be driving on sound berm.
Responsible Staff:	Sarah Belway or designated representative

3.6 PROTECT STORM DRAIN INLETS

Drain inlets have been constructed as part of previous construction. Management of this system is covered under the U.S. Army Garrison, Alaska Fort Wainwright SWPPP (USAG-AK 2005).

3.7 ESTABLISH PERIMETER CONTROLS AND SEDIMENT BARRIERS

BMP Description: Inspection of installed erosion and Sediment control measures in pre existing drainage swales	
Installation Schedule:	Every 7 days or after a rain event

Maintenance and Inspection:	Maintaining all erosion and sediment control, as required, to check that they are installed and functioning properly.
	• Making all repairs or replacements as soon as practicable, such as:
	  • Removing excess sediment from collection areas and place in disposal areas as necessary.
	  • Repairing or replacing silt fences if damaged, clogged, or not functioning properly.
	  • Revising method of erosion and sediment control as inspections and conditions indicate.
	  • Maintaining existing drainage patterns disturbed as a result of construction, including reestablishment of drainage ditches and swales to their preconstruction condition, grade, and elevation.

Responsible Staff:	Sarah Belway or designated representative

BMP Description: Stabilization	
Installation Schedule:	Stabilization measures will be inspected once every 14 days or after a rain/storm event.
Maintenance and Inspection:	Proposed stabilization controls include construction of temporary berms, dikes, dams, sediment basins, slope drains, and the use of temporary mulches or seeding as necessary to control erosion. Straw bales and silt fences will be used to minimize the effects of precipitation-induced soil erosion and runoff in the swales leading to the Chena River. The structural controls will be monitored and adjusted as necessary to prevent materials from eroding and contributing fines to storm water runoff. To remove the silt fences, the fabric will be cut off at ground level and the wire and posts removed. No silt will be discharged into any water bodies when removing the silt fence. If a sediment height in excess of 4 inches (100 millimeters) above ground remains, the sediment will be spread on the roadway side of the fence location and seeded immediately.
Responsible Staff:	Sarah Belway or designated representative

BMP Description: Structural Controls	
Installation Schedule:	Structural controls will be inspected once every 14 days or after a rain/storm event.
Maintenance and Inspection:	Straw bales and silt fences will be used to minimize the effects of precipitation-induced soil erosion and runoff in the swales leading to the Chena River. The structural controls will be monitored and adjusted as necessary to prevent materials from eroding and contributing fines to storm water runoff. To remove the silt fences, the fabric will be cut off at ground level and the wire and posts removed. No silt will be discharged into any water bodies when removing the silt fence. If a sediment height in excess of 4 inches (100 millimeters) above ground remains, the sediment will be spread on the roadway side of the fence location and seeded immediately.
Responsible Staff:	Sarah Belway or designated representative

3.8 RETAIN SEDIMENT ON-SITE

BMP Description: Structural Controls	
Installation Schedule:	Structural controls will be inspected once every 14 days or after a rain/storm event.
Maintenance and Inspection:	Straw bales and silt fences will be used to minimize the effects of precipitation-induced soil erosion and runoff in the swales leading to the Chena River. The structural controls will be monitored and adjusted as necessary to prevent materials from eroding and contributing fines to storm water runoff. To remove the silt fences, the fabric will be cut off at ground level and the wire and posts removed. No silt will be discharged into any water bodies when removing the silt fence. If a sediment height in excess of 4 inches (100 millimeters) above ground remains, the sediment will be spread on the roadway side of the fence location and seeded immediately.
Responsible Staff:	Sarah Belway or designated representative

BMP Description: Stabilization	
Installation Schedule:	Stabilization measures will be inspected once every 14 days or after a rain/storm event.
Maintenance and Inspection:	Proposed stabilization controls include construction of temporary berms, dikes, dams, sediment basins, slope drains, and the use of temporary mulches, or seeding as necessary to control erosion. Straw bales and silt fences will be used to minimize the effects of precipitation-induced soil erosion and runoff in the swales leading to the Chena River. The structural controls will be monitored and adjusted as necessary to prevent materials from eroding and contributing fines to storm water runoff. To remove the silt fences, the fabric will be cut off at ground level and the wire and posts removed. No silt will be discharged into any water bodies when removing the silt fence. If a sediment height in excess of 4 inches (100 millimeters) above ground remains, the sediment will be spread on the roadway side of the fence location and seeded immediately.
Responsible Staff:	Sarah Belway or designated representative

3.9 ESTABLISH STABILIZED CONSTRUCTION EXITS

BMP Description: Vehicle tracking	
Installation Schedule:	Vehicles will be inspected daily while in use.
Maintenance and Inspection:	It will be ensured that no material of any type will fall off any vehicle while in transit. Any dirt or mud, which is tracked onto paved or surfaced roadways, will be cleaned away within the day it is deposited.
Responsible Staff:	Sarah Belway or designated representative

BMP Description: Dust Control	
Installation Schedule:	Dust minimization measures (a water truck) will be used when ever there is visible dust at the site.
Maintenance and Inspection:	All disturbed areas resulting from excavation activities will be kept damp at all times to prevent wind erosion.
Responsible Staff:	Sarah Belway or designated representative

4.0 GOOD HOUSEKEEPING BEST MANAGEMENT PRACTICES

4.1 MATERIAL HANDLING AND WASTE MANAGEMENT

BMP Description: General Waste Management	
Installation Schedule:	Dumpster for general office waste emptied once every two weeks or when required.
Maintenance and Inspection:	Dumpster provided for office waste and litter.
Responsible Staff:	Sarah Belway or designated representative

BMP Description: Investigation-Derived Waste (IDW) Management	
Installation Schedule:	As required if IDW is encountered
Maintenance and Inspection:	Overpacks or 55 gallon drums are provided for consolidation, storage and transport of waste material. These are stored in a lined bermed storage area.
Responsible Staff:	Sarah Belway or designated representative

4.2 ESTABLISH PROPER BUILDING MATERIAL STAGING AREAS

BMP Description: Materials storage areas	
Installation Schedule:	Inspected every 14 days or after a rain event
Maintenance and Inspection:	Where necessary materials are stored in a lined, bermed and covered storage area or in a sealed connex Significant amounts of building materials will not be stored on site during site investigation.
Responsible Staff:	Sarah Belway or designated representative

4.3 DESIGNATE WASHOUT AREAS

Washing of vehicles will occur off site. Washing out of concrete mixers, paint or stucco for example will be dealt with on an as-needed, site-specific basis.

4.4 ESTABLISH PROPER EQUIPMENT/VEHICLE FUELING AND MAINTENANCE PRACTICES

BMP Description: Fueling	
Installation Schedule:	Fueling as required during site investigation activities.
Maintenance and Inspection:	Fueling will occur according to the spill prevention and control plan as outlined in section 4.6
Responsible Staff:	Sarah Belway or designated representative

4.5 CONTROL EQUIPMENT/VEHICLE WASHING

BMP Description: Equipment Washing/cleaning	
Installation Schedule:	Washing of equipment as required
Maintenance and Inspection:	Equipment will be dry brush decontaminated prior to leaving excavation areas. If wet decontamination is required it will occur in lined berm areas and decontamination liquid will be collected and put into drums for off site disposal Other equipment and vehicles will be washed off site.
Responsible Staff:	Sarah Belway or designated representative

4.6 SPILL PREVENTION AND CONTROL PLAN

All field activities will be conducted and managed in a manner that will prevent the release of contaminants to the environment. The greatest risk of a reportable spill is during fueling of heavy equipment. To minimize the risk of a fuel spill, the following procedures will be performed by a Competent Person during any fueling activity:

- Inspect all equipment anticipated to be used on site and document the equipment condition prior to mobilization to the site.
- Check the vehicle or equipment. Ensure that it has been properly maintained and no petroleum, oil, and lubricant leaks are present prior to operation.
- Stage vehicles in a central location, away from water bodies or other sensitive areas.
- Position equipment so that valves, piping, tanks, or other fuel-containing parts are protected from damage by other vehicles or equipment.
- Verify that adequate secondary containment and absorbent pads are onsite.
- Before starting any fuel-transfer operation, inspect all hoses, connections, valves, etc.

Ensure that these items have been properly maintained and all connections are properly tightened.

- Use secondary containment or absorbent pads under all appropriate connections, vents, or any other likely source of spillage. Use as many secondary containers as necessary.
- During fuel transfer, maintain line of sight with the equipment operator and/or all connections and other potential sources of spillage.
- Never leave a fuel transfer unattended.
- Maintain secondary containment while disconnecting filling hoses.

4.7 SPILL RESPONSE

Spill response will be conducted in accordance with the Spill Response Plan (Section 5.6 of Appendix D in this Work Plan, and the Fort Wainwright Spill Response Policy (Exhibit C).

4.8 SPILL REPORTING

18 AAC 75.300-307 and federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulations require immediate notification of a hazardous material discharge or release. Consequently, field personnel will immediately record the following information for a spill of any volume and contact the Site Manager (Sarah Belway), FWA Department of Public Works (DPW) Point of Contact (POC) (Joe Malen), and U.S. Army Engineer District, Alaska (USAED) Project Manager (Bob Brock) for reporting the following information:

- Date, time, and location of discharge
- Name, mailing address and telephone number of person(s) or responsible for the discharge
- Cause of discharge
- Environmental damage caused by the discharge, including volume of soil or water affected, to the extent the damage can be identified
- Cleanup actions taken
- If the material has been disposed of, the date, location, method of hazardous substance and cleanup materials
- Estimate of the volume of cleanup materials used
- Any actions taken to prevent recurrence of the discharge

- Other information the field team considers important to the discharge episode

In the event of a spill, Jacobs will prepare the appropriate State of Alaska spill reporting forms (Attachment D-3) and submit them to the USAED Project Manager and FWA DPW POC, who will determine whether reporting will be performed by USAED or Jacobs.

4.9 ALLOWABLE NON-STORMWATER DISCHARGE BEST MANAGEMENT PRACTICES

Follow these steps to determine the allowable non-stormwater discharge best management practices:

- Identify all allowable sources of non-stormwater discharges that are not identified. The allowable non-stormwater discharges identified in Part 1.3.B of the U.S. Environmental Protection Agency (EPA) construction general permit (CGP) include
  - Discharges from firefighting activities
  - Fire hydrant flushings
  - Waters used to wash vehicles where detergents are not used
  - Water used to control dust in accordance with EPA CGP, Part 3, Subpart 3.4.G
  - Potable water including uncontaminated water line flushings
  - Routine external building wash down that does not use detergents
  - Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used
  - Uncontaminated air conditioning or compressor condensate
  - Uncontaminated ground water or spring water
  - Foundation or footing drains where flows are not contaminated with process materials such as solvents
  - Uncontaminated excavation dewatering
  - Landscape irrigation
- Identify measures used to eliminate or reduce these discharges and the BMPs used to prevent them from becoming contaminated.
- For more information, see *SWPPP Guide*, Chapter 3.A or EPA CGP Part 1.3.B and 3.5.
- List allowable non-stormwater discharges, the measures used to eliminate or reduce them, and the measures used to prevent them from becoming contaminated.

5.0 SELECTING POST-CONSTRUCTION BEST MANAGEMENT PRACTICES

Follow these steps to select the post-construction BMPs:

- Describe all post-construction stormwater management measures that will be installed during the construction process to control pollutants in stormwater discharges after construction operations have been completed. Examples of post-construction BMPs include the following:
  - Biofilters
  - Detention/retention devices
  - Earth dikes, drainage swales, and lined ditches
  - Infiltration basins
  - Porous pavement
  - Other proprietary permanent structural BMPs
  - Outlet protection/velocity dissipation devices
  - Slope protection
  - Vegetated strips and/or swales
- Identify any applicable federal, state, local, or tribal requirements for design or installation.
- Describe how low-impact designs or smart growth considerations have been incorporated into the design.
- For any structural BMPs, you include design specifications and details within the text or as appendices to the SWPPP.

For more information on this topic, refer to the *Stormwater Manual* for the State of Alaska, or consult one of the references listed in Exhibit D of the *SWPPP Guide* and EPA CGP Part 3, Subparts 3.4.E and 3.9. More information on BMPs can be found in the post-construction section of the EPA Menu of BMPs at: <www.epa.gov/npes/menuofbmps>.

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6.0 INSPECTIONS

6.1 INSPECTIONS

6.1.1 Inspection Personnel

Sarah Belway or designated representative

6.1.2 Inspection Schedule and Procedures

The inspection schedule and procedures are outlined in the BMPs above. The schedule and procedure for inspection may vary on a site-specific basis. A blank inspection report is provided in Exhibit D for amendments to the general post wide BMPs. If amendments are required to any BMPs, they will be completed prior to the next inspection.

6.2 DELEGATION OF AUTHORITY

Duly Authorized Representative(s) or Position(s):

Jacobs Engineering
Sarah Belway
950 E Alder Avenue, Fort Wainwright
Fairbanks, Alaska, 99703
907 356-1280
Sarah.belway@jacobs.com
Project Manager

A Delegation of Authority form is provided in Exhibit J.

6.3 CORRECTIVE ACTION LOG

The Corrective Action Log is presented in Exhibit E.

(intentionally blank)

7.0 RECORDKEEPING AND TRAINING

7.1 RECORDKEEPING

All records will be retained for a minimum of at least 3 years after the permit is terminated.

7.2 GRADING AND STABILIZATION ACTIVITIES LOG

Date(s) when major grading activities occur:

Dates when grading and excavation activities temporarily cease will be determined in the field. The Grading and Stabilization Log is presented in Exhibit H.

Date(s) when construction activities temporarily or permanently cease on a portion of the site:

Dates when grading and excavation activities temporarily cease will be determined in the field.

Date(s) when an area is either temporarily or permanently stabilized:

All excavations will be backfilled prior to project completion. Dates for completion will be assigned on a site-specific basis.

7.3 LOG OF CHANGES TO THE SWPPP

The SWPPP Amendment Log is presented in Exhibit F.

7.4 TRAINING

Individual Responsible for Training: Sarah Belway

Training Conducted:

- General stormwater and BMP awareness training for staff and subcontractors
- All staff will be made aware of where to locate stormwater BMPs and access and egress routes.

(intentionally blank)

8.0 FINAL STABILIZATION

Following completion of site investigation activities, excavations will be backfilled to the level prior to activities taking place.

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9.0 CERTIFICATION AND NOTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____ Title: _____

Signature: _____ Date: _____

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10.0 REFERENCES

USAG-AK. 2005 (July). Storm Water Pollution Prevention Plan, Fort Wainwright, U.S. Army Garrison Alaska.

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EXHIBITS TO ATTACHMENT D-5
Storm Water Pollution Prevention Plan

Exhibit A – Site Figures

Exhibit B – Construction General Permit

Exhibit C – NOI and NOT Forms

Exhibit D – Inspection Reports

Exhibit E – Corrective Action Log

Exhibit F – SWPPP Amendment Log

Exhibit G – Subcontractor Certifications/Agreements

Exhibit H – Grading and Stabilization Activities Log

Exhibit I – Training Log

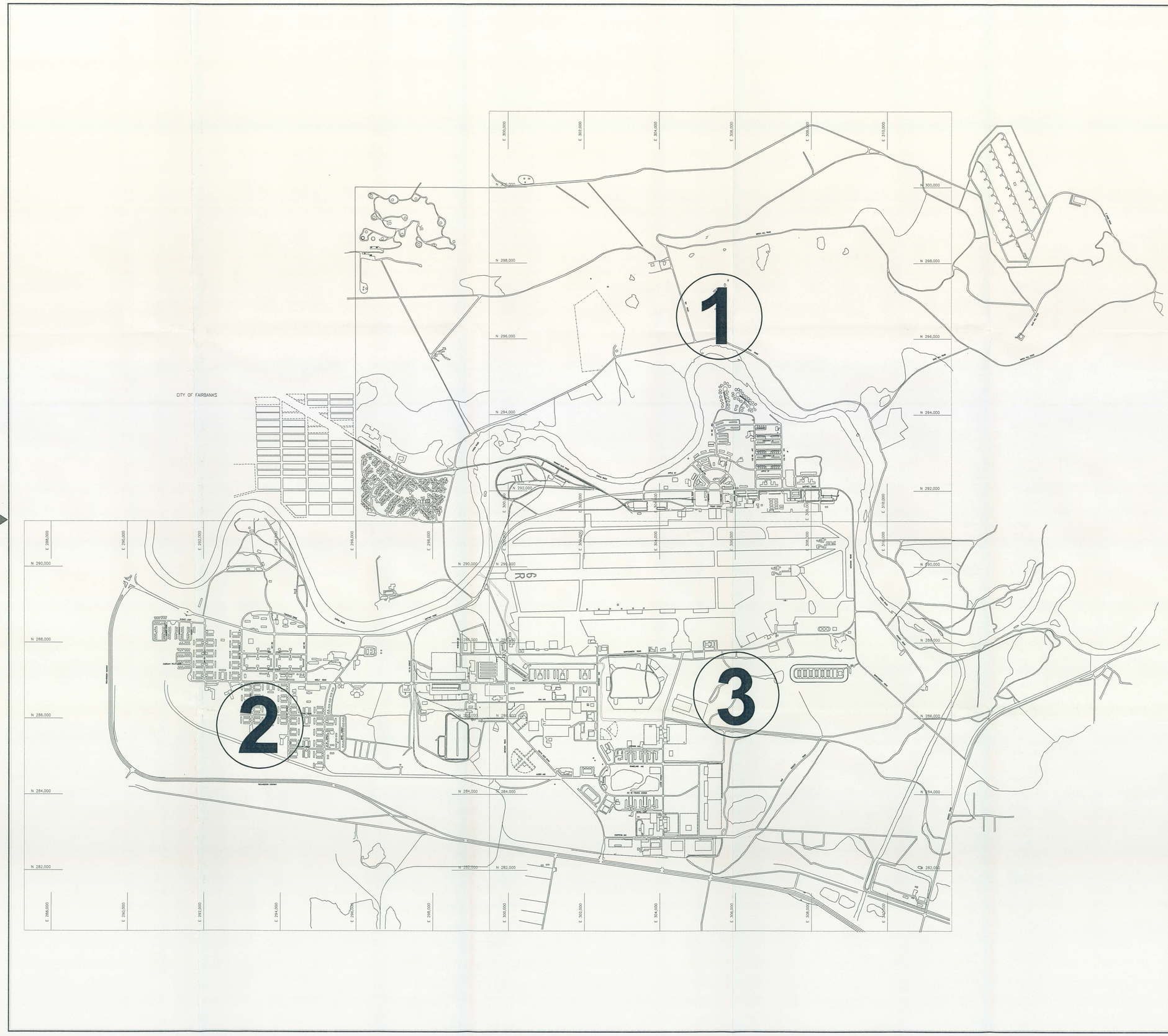
Exhibit J – Delegation of Authority

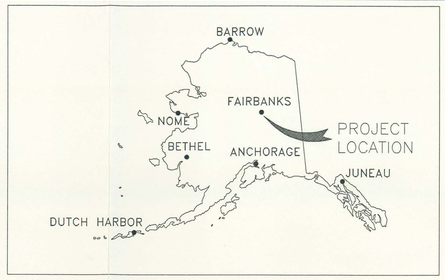
EXHIBIT A

Site Figures

CORPS OF ENGINEERS

U. S. ARMY





PROJECTION LOCATION MAP

0 1000 2000 4000

SCALE IN FEET

REV.	DATE	C.O.	ACTION	DESCRIPTION	BY	APP'D
0	3/8/96			ORIGINAL BY WOODWARD CLYDE		
1	8/10/00			REV1 – USAED SWPPP UPDATE 2000		
2	1/31/04			REV2 – WCGI SWPPP UPDATE 2004		

CONTRACT NO. _____

CONTRACTOR _____ STATE _____

PRIME CONTRACTOR

APPROVED: _____ RESIDENT ENGINEER

DATE: 1/31/04

ALASKA, DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: WJD
DRAWN: WJD
TRACED:
CHECKED:
SUBMITTED:
CHIEF, ARCHITECTURAL SECTION

FORT WAINWRIGHT, ALASKA
STORM WATER POLLUTION
PREVENTION PLAN
VIEW INDEX MAP

RECOMMENDED:

CHIEF, DESIGN BRANCH | CHIEF, PROJECT MGT. BRANCH | APPROVED: CHIEF, ENGINEERING DIVISION | DATE:

SCALE: 1" = 1000'

SPEC. NO.

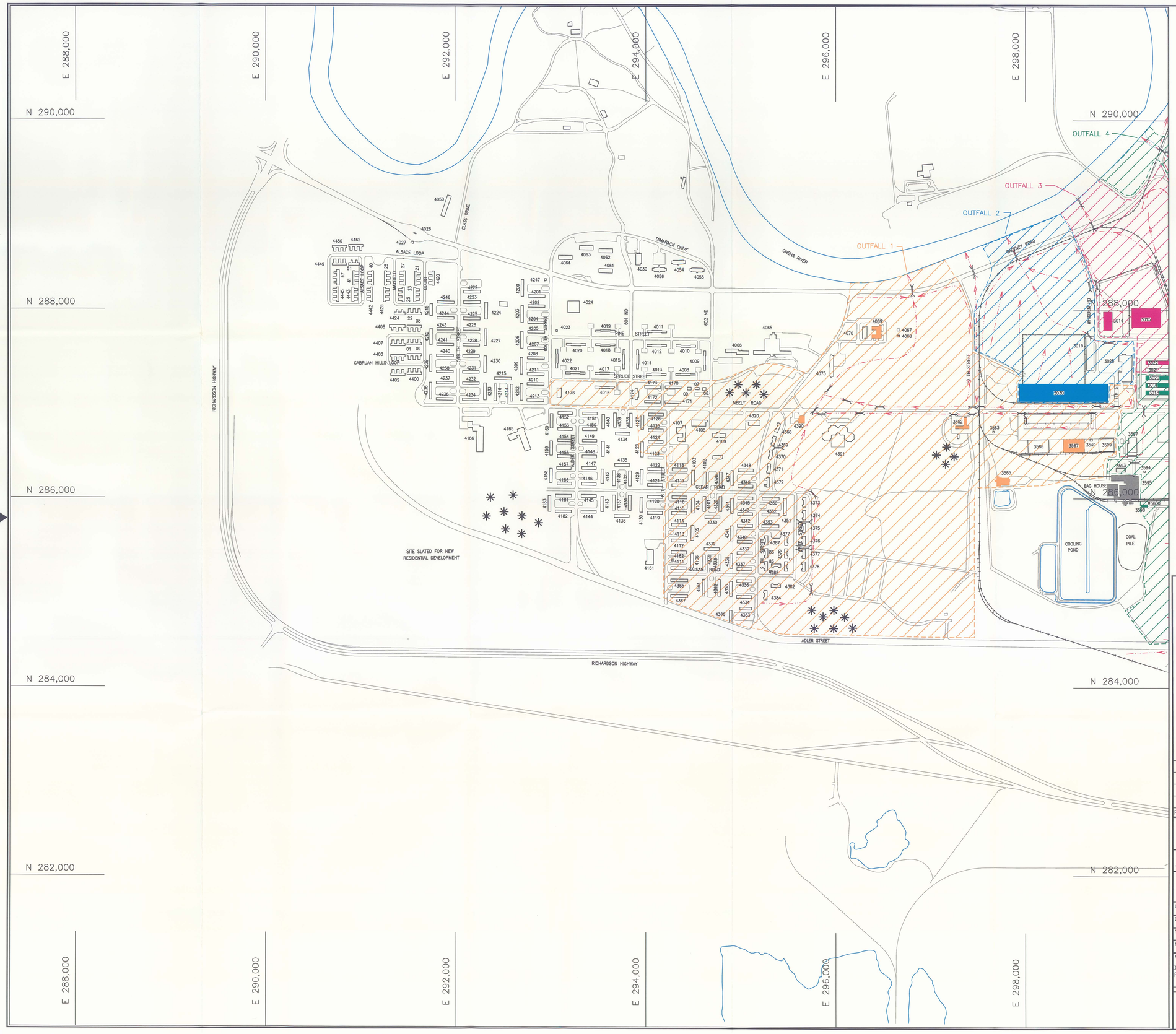
DRAWING NUMBER

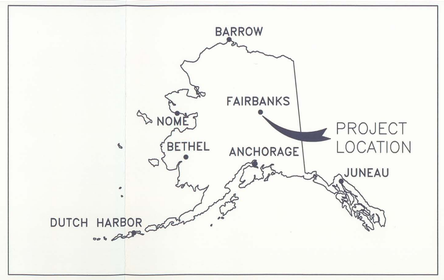
SHEET 1 OF 4

INV. NO. DACA85-00-B-0000

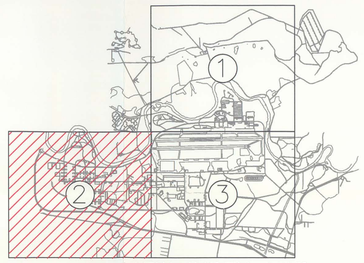
CORPS OF ENGINEERS

U. S. ARMY





PROJECTION LOCATION MAP



VIEW INDEX MAP

OUTFALL	COLOR
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FACILITY TO OUTFALL DISCHARGE COLOR INDEX

SYMBOL LEGEND

- CATCH BASIN
- MANHOLE
- OPEN DITCH FLOW
- STORM SEWER
- CULVERT
- FENCE
- RAILROAD
- SNOW DUMP AREA
- OUTFALL DRAINAGE BASIN BOUNDARY (TYP)
- OUTFALL DRAINAGE AREA (TYP)
- 18000 INDUSTRIAL FACILITY CONTAINED IN SWPPP (TYP)

0 400 800 1600

SCALE IN FEET

REV.	DATE	C.O.	ACTION	DESCRIPTION	BY	APP'D
0	3/8/96			ORIGINAL BY WOODWARD CLYDE		
1	8/10/00			REV1 – USAED SWPPP UPDATE 2000		
2	1/31/04			REV2 – WCGI SWPPP UPDATE 2004		

CONTRACT NO. _____

CONTRACTOR _____

STATE _____

PRIME CONTRACTOR | APPROVED: RESIDENT ENGINEER | DATE: 1/31/04

ALASKA, DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: WJD
DRAWN: WJD
TRACED:
CHECKED:
SUBMITTED:
CHIEF, ARCHITECTURAL SECTION

FORT WAINWRIGHT, ALASKA
STORM WATER POLLUTION PREVENTION PLAN
DRAINAGE MAP
VIEW 2

RECOMMENDED: CHIEF, DESIGN BRANCH | CHIEF, PROJECT MGT. BRANCH | APPROVED: CHIEF, ENGINEERING DIVISION | DATE:

SCALE: 1" = 400' | SPEC. NO.

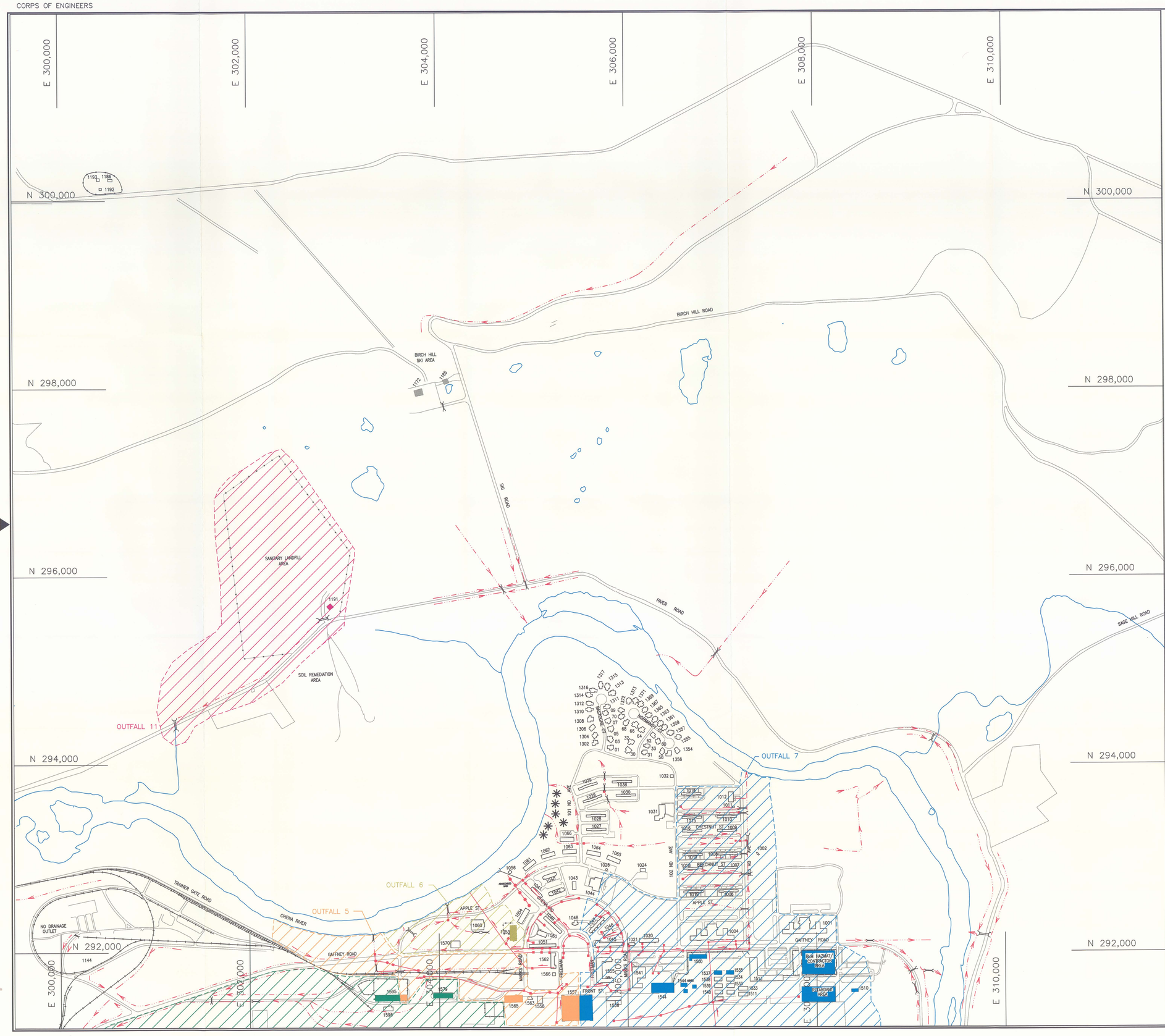
DRAWING NUMBER

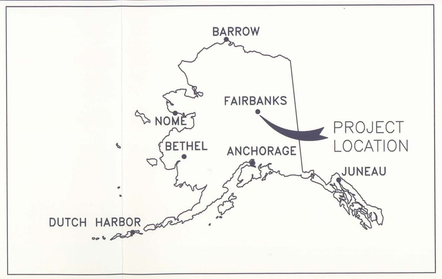
SHEET 3 OF 4

INV. NO. DACA85–00–B–0000

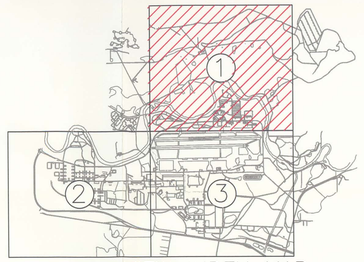
CORPS OF ENGINEERS

U. S. ARMY





PROJECTION LOCATION MAP



VIEW INDEX MAP

OUTFALL	COLOR
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FACILITY TO OUTFALL DISCHARGE COLOR INDEX

SYMBOL LEGEND

- CATCH BASIN
- MANHOLE
- OPEN DITCH FLOW
- STORM SEWER
- CULVERT
- FENCE
- RAILROAD
- SNOW DUMP AREA
- OUTFALL DRAINAGE BASIN BOUNDARY (TYP)
- OUTFALL DRAINAGE AREA (TYP)
- 1000 INDUSTRIAL FACILITY CONTAINED IN SWPPP (TYP)

0 400 800 1600

SCALE IN FEET

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PRIME CONTRACTOR | APPROVED: RESIDENT ENGINEER | DATE: 1/31/04

ALASKA, DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: WJD
DRAWN: WJD
TRACED:
CHECKED:
SUBMITTED:
CHIEF, ARCHITECTURAL SECTION

FORT WAINWRIGHT, ALASKA
STORM WATER POLLUTION PREVENTION PLAN
DRAINAGE MAP
VIEW 1

RECOMMENDED: CHIEF, DESIGN BRANCH | CHIEF, PROJECT MGT. BRANCH | APPROVED: CHIEF, ENGINEERING DIVISION | DATE:

SPEC. NO.

SCALE: 1" = 400'

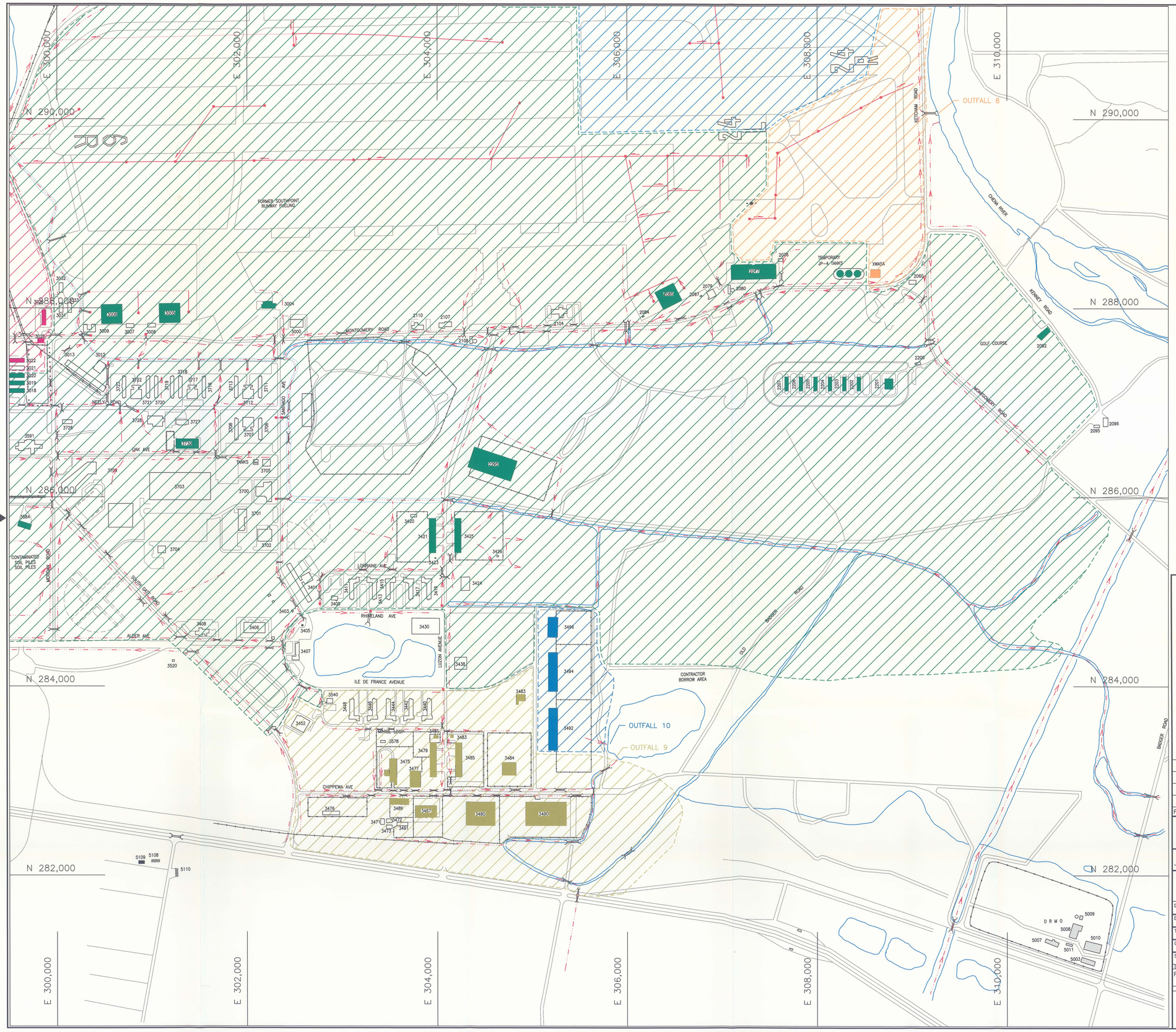
DRAWING NUMBER

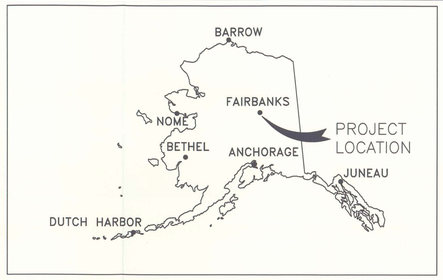
SHEET 2 OF 4

INV. NO. DACA85-00-B-0000

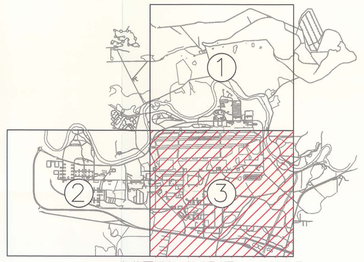
CORPS OF ENGINEERS

U. S. ARMY





PROJECTION LOCATION MAP



VIEW INDEX MAP

OUTFALL	COLOR
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FACILITY TO OUTFALL DISCHARGE COLOR INDEX

SYMBOL LEGEND

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0 400 800 1600

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STATE _____

PRIME CONTRACTOR | APPROVED: RESIDENT ENGINEER | DATE: 1/31/04

ALASKA, DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

DESIGNED: WJD
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TRACED:
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SUBMITTED:
CHIEF, ARCHITECTURAL SECTION

FORT WAINWRIGHT, ALASKA
STORM WATER POLLUTION PREVENTION PLAN
DRAINAGE MAP
VIEW 3

RECOMMENDED: CHIEF, DESIGN BRANCH | CHIEF, PROJECT MGT. BRANCH | APPROVED: CHIEF, ENGINEERING DIVISION | DATE:

SCALE: 1" = 400' | SPEC. NO.

DRAWING NUMBER

SHEET 4 OF 4

INV. NO. DACA85-00-B-0000

EXHIBIT B

NPDES Construction General Permit

ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

GENERAL PERMIT FOR DISCHARGES FROM LARGE AND SMALL CONSTRUCTION ACTIVITIES

Permit Number: AKR100000

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Wastewater Discharge Authorization Program
555 Cordova St.
Anchorage, AK 99501

In compliance with the provisions of the Clean Water Act (CWA), 33 U.S.C. §1251 et. seq., as amended by the Water Quality Act of 1987, P.L. 100-4, this permit is issued under provisions of Alaska Statutes (AS) 46.03; the Alaska Administrative Code (AAC) as amended; and other applicable State laws and regulations.

Operators of large and small construction activities that are described in Part 1.3 of this Alaska Pollutant Discharge Elimination System (APDES) construction general permit, except for those activities excluded from authorization of discharge in Part 1.3.3 of this permit, are authorized to discharge pollutants to waters of the United States in accordance with the conditions and requirements set forth herein. Permit coverage is required from the "commencement of construction activities" until "final stabilization" as defined in Appendix A.

General permit coverage for storm water discharges from large and small construction activities was authorized by the U.S. Environmental Protection Agency (EPA) in accordance with the conditions and requirements of the 2003 construction general permit (CGP) effective July 1, 2003 as modified (2003 CGP), and the 2008 CGP effective June 30, 2008 as modified (2008 CGP). On October 19, 2009, EPA proposed to modify the 2008 CGP to extend the June 30, 2010 expiration date by one year to June 30, 2011.

On October 31, 2009, the authority to issue storm water discharge permits was transferred from EPA to ADEC. Consistent with the Memorandum of Agreement between EPA and ADEC this permit incorporates the terms and conditions of the 2008 CGP as appropriate into APDES format and extends the expiration date for the 2008 CGP coverage to June 30, 2011.

This permit as modified shall become effective on January 31, 2010.

This permit and the authorization to discharge shall expire at midnight, June 30, 2011.

Signed:

Sharon R. Morgan	December 31, 2009
Signature	Date
Sharon R. Morgan	Acting Program Manager
Printed Name	Title

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PART 1 COVERAGE UNDER THIS PERMIT

1.1 Introduction

This Construction General Permit (CGP) authorizes storm water discharges from large and small construction activities that result in a total land disturbance of equal to or greater than one acre, where those discharges enter surface waters of the United States or a municipal separate storm sewer system (MS4) leading to surface waters of the United States subject to the conditions set forth in this permit. This permit also authorizes storm water discharges from any other construction activity designated by the Alaska Department of Environmental Conservation (ADEC) where ADEC makes that designation based on the potential for contribution to an excursion of a water quality standard or for significant contribution of pollutants to waters of the United States.

This permit uses the terms “permittee” or “owner or operator” to identify the person(s) who owns or operates a “facility” or “activity” as defined in Appendix A and who must comply with the conditions of this permit. This format should allow the permittee of a large or small construction activity to easily locate and understand applicable requirements.

The goal of this permit is to minimize the discharge of storm water pollutants from construction activity.

1.2 Permit Area

If an owner or operator of a large or small construction activity is located within the State of Alaska, except the Indian Reservation of Metlakatla, the owner or operator may be eligible to obtain coverage under this permit.

1.3 Eligibility

Permit eligibility is limited to discharges from “large” and “small” construction activity, and to “new projects” and “unpermitted ongoing projects,” as defined in Appendix A or as otherwise designated by ADEC. This general permit contains eligibility restrictions, as well as permit conditions and requirements. The owner or operator may have to take certain actions to be eligible for coverage under this permit. In such cases, the owner or operator must continue to satisfy those eligibility provisions to maintain permit authorization. If the owner or operator does not meet the requirements that are a pre-condition to eligibility, then resulting discharges constitute unpermitted discharges. By contrast, if the owner or operator is eligible for coverage under this permit and does not comply with the requirements of the general permit, the owner or operator may be in violation of the general permit for otherwise eligible discharges.

1.3.1 Allowable Storm Water Discharges

Subject to compliance with the terms and conditions of this permit, the permittee is authorized to discharge pollutants in:

1.3.1.1 Storm water discharges associated with large and small construction activity from "new projects" and "unpermitted ongoing projects" as defined in Appendix A;

1.3.1.2 Storm water discharges designated by ADEC as needing a storm water permit under 40 CFR §122.26(a)(1)(v) or §122.26(b)(15)(ii);

1.3.1.3 Discharges from support activities (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) provided:

1.3.1.3.1 The support activity is directly related to the construction site required to have APDES permit coverage for discharges of storm water associated with construction activity;

1.3.1.3.2 The support activity is not a commercial operation serving multiple unrelated construction projects by different operators, and does not operate beyond the completion of the construction activity at the last construction project it supports; and

1.3.1.3.3 Pollutant discharges from support activity areas are minimized in compliance with Part 3.1.7.

1.3.1.4 Discharges composed of allowable discharges listed in Parts 1.3.1 and 1.3.2 commingled with a discharge authorized by a different APDES or NPDES permit and/or a discharge that does not require APDES permit authorization.

1.3.2 Allowable Non-Storm Water Discharges

The permittee is authorized for the following non-storm water discharges, provided the non-storm water component of the discharge is in compliance with Part 5.4 (Non-Storm water Discharges):

1.3.2.1 Discharges from fire-fighting activities;

1.3.2.2 Fire hydrant flushings;

1.3.2.3 Waters used to wash vehicles where detergents are not used;

1.3.2.4 Water used to control dust in accordance with Part 3.1.2;

1.3.2.5 Potable water including uncontaminated water line flushings;

1.3.2.6 Routine external building wash down that does not use detergents;

1.3.2.7 Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used;

1.3.2.8 Uncontaminated air conditioning or compressor condensate;

1.3.2.9 Uncontaminated ground water or spring water;

1.3.2.10 Foundation or footing drains where flows are not contaminated with process materials such as solvents;

1.3.2.11 Uncontaminated excavation dewatering; and

1.3.2.12 Landscape irrigation.

1.3.3 Limitations on Coverage

1.3.3.1 This permit does not authorize post-construction discharges that originate from the site after construction activities have been completed and the site has achieved final stabilization, including any temporary support activity. Post-construction storm water discharges from industrial sites may need to be covered by a separate APDES permit.

1.3.3.2 This permit does not authorize discharges mixed with non-storm water. This exclusion does not apply to discharges identified in Part 1.3.2, provided the discharges are in compliance with Part 5.4 (Non-Storm water Discharges).

1.3.3.3 This permit does not authorize storm water discharges associated with construction activity that have been covered under an individual permit or required to obtain coverage under an alternative general permit in accordance with Part 2.6.

1.3.3.4 This permit does not authorize discharges that ADEC, prior to authorization under this permit, determines will cause, have the reasonable potential to cause, or contribute to an excursion above any applicable water quality standard. Where such a determination is made prior to authorization, ADEC may notify a permittee that an individual permit application is necessary in accordance with Part 2.6. However, ADEC may authorize coverage under this permit after the permittee has included appropriate controls and implementation procedures designed to bring the discharge into compliance with water quality standards.

1.3.3.5 Discharging into Receiving Waters With an Approved or Established Total Maximum Daily Load Analysis

1.3.3.5.1 The permittee is not eligible for coverage under this permit for discharges of pollutants of concern to waters for which there is a total maximum daily load (TMDL) established or approved by EPA unless the permittee implements measures or controls that are consistent with the assumptions and requirements of such TMDL. To be eligible for coverage under this general permit, the permittee must implement conditions applicable to discharges necessary for consistency with the assumptions and requirements of such TMDL. If a specific wasteload allocation has been established that would apply to the permittee's discharge, the permittee must implement necessary steps to meet that allocation.

1.3.3.5.2 In a situation where an EPA-approved or established TMDL has specified a general wasteload allocation applicable to construction storm water discharges, but no specific requirements for construction sites have been identified in the TMDL, the permittee should consult with the State or Federal TMDL authority to confirm that meeting the effluent limits in Part 3 of this permit will be consistent with the approved TMDL. Where an EPA-approved or established TMDL has not specified a wasteload allocation applicable to construction storm water discharges, but has not specifically excluded these discharges, compliance with the effluent limits in Part 3 of this permit will generally be assumed to be consistent with the approved TMDL. If the EPA-approved or established TMDL specifically precludes such discharges, the permittee is not eligible for coverage under the CGP.

1.3.3.6 Endangered and Threatened Species and Critical Habitat Protection

1.3.3.6.1 Coverage under this permit is available only if the storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities, as defined in Appendix A, are not likely to jeopardize the continued existence of any species that are federally-listed as endangered or threatened ("listed") under the Endangered Species Act (ESA) or result in the adverse modification or destruction of habitat that is federally-designated as critical under the ESA ("critical habitat").

1.3.3.6.2 The permittee is not eligible to discharge if the storm water discharges, allowable non-storm water discharges, or storm water discharge-related activities would cause a prohibited "take" of federally-listed endangered or threatened species (as defined under section 3 of the ESA and 50 CFR §17.3), unless such takes are authorized under sections 7 or 10 of the ESA.

1.3.3.6.3 Determining Eligibility: The permittee must use the process in Appendix C (ESA Review Procedures) to determine eligibility PRIOR to submittal of the Notice of Intent (NOI). The permittee must meet one or more of the following six criteria (A-F) for the entire term of coverage under the permit:

Criterion A. No federally-listed threatened or endangered species or their designated critical habitat are in the project area as defined in Appendix C; or

Criterion B. Formal consultation with the United States Fish and Wildlife Service (FWS) and/or the United States National Marine Fisheries Service (NMFS) under section 7 of the ESA has been concluded and that consultation:

i. Addressed the effects of the project's storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities on federally-listed threatened or endangered species and federally-designated critical habitat, and

ii. The consultation resulted in either:

a. Biological opinion finding no jeopardy to federally-listed species or destruction/adverse modification of federally-designated critical habitat, or

b. Written concurrence from the Service(s) with a finding that the storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities are not likely to adversely affect federally-listed species or federally-designated critical habitat; or

Criterion C. Informal consultation with the FWS and/or the NMFS under section 7 of the ESA has been concluded and that consultation:

i. Addressed the effects of the project's storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities on federally-listed threatened or endangered species and federally-designated critical habitat, and

ii. The consultation resulted in either:

a. Biological opinion finding no jeopardy to federally-listed species or destruction/adverse modification of federally-designated critical habitat, or

b. Written concurrence from the Service(s) with a finding that the storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities are not

likely to adversely affect federally-listed species or federally-designated critical habitat; or

Criterion D. The construction activities are authorized through the issuance of a permit under section 10 of the ESA, and that authorization addresses the effects of the storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities on federally-listed species and federally-designated critical habitat; or

Criterion E. Storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities are not likely to adversely affect any federally-listed threatened or endangered species or result in the destruction or adverse modification of federally-designated critical habitat; or

Criterion F. The project's storm water discharges, allowable non-storm water discharges, and storm water discharge-related activities were already addressed in another operator's valid certification of eligibility under Criteria A-E which included the permittee's construction activities and there is no reason to believe that federally-listed species or federally-designated critical habitat not considered in the prior certification may be present or located in the project area. By certifying eligibility under this criterion, the permittee agrees to comply with any measures or controls upon which the other operator's certification was based.

The permittee must comply with any applicable terms, conditions, or other requirements developed in the process of meeting the eligibility requirements of the criteria in this section to remain eligible for coverage under this permit.

1.3.3.7 Historic Properties

The permittee must comply with applicable state, tribal and local laws concerning the protection of historic properties and places.

1.4 Waivers for Certain Small Construction Activities

Three scenarios exist under which small construction activities (as defined in Appendix A) may be waived from the APDES permitting requirements detailed in this general permit. These exemptions are predicated on certain criteria being met and proper notification procedures being followed. Details of the waiver options and procedures for requesting a waiver are provided in Appendix B.

PART 2 AUTHORIZATION FOR DISCHARGES OF STORM WATER FROM CONSTRUCTION ACTIVITY

2.1 How to Obtain Authorization

To obtain coverage under this general permit, the owner or operator must prepare and submit a complete and accurate Notice of Intent (NOI), as described in this Part. Discharges are not authorized if the NOI is incomplete or inaccurate or if the permittee was never eligible for permit coverage.

2.2 How to Submit the NOI

The owner or operator must either use ADEC's electronic NOI system (accessible at http://dec.alaska.gov/water/wnpspc/stormwater/index.htm or use a paper form available on ADEC's website http://dec.alaska.gov/water/wnpspc/stormwater/index.htm and then submit that paper form to:

Alaska Department of Environmental Conservation
Wastewater Discharge Authorization Program - Storm Water NOI
555 Cordova St.
Anchorage, AK 99501

2.3 Authorization to Discharge Date

The permittee is authorized to discharge storm water from construction activities under the terms and conditions of this permit seven (7) calendar days after acknowledgment of receipt of the permittee's completed NOI is posted on ADEC's Storm Water website at http://dec.alaska.gov/water/wnpspc/stormwater/index.htm The exception to this 7-day timeframe is if ADEC delays the permittee's authorization based on eligibility considerations of Part 1.3 (e.g., ESA concerns). Under this circumstance, the permittee is not authorized for coverage under this permit until the permittee receives notice from ADEC of their eligibility.

2.4 Submission Deadlines

2.4.1 New Projects

To obtain coverage under this permit, the permittee must submit a complete and accurate NOI and be authorized consistent with Part 2.3 prior to commencement of construction activities (as defined in Appendix A).

2.4.2 Permitted Ongoing Projects

Previously permitted ongoing projects are not eligible for coverage under this permit. If the permittee previously received authorization to discharge for the project under the EPA (e.g. under the EPA 2003 CGP, or the EPA 2008 CGP), or from ADEC under the 2008 CGP following transfer of permitting authority from

EPA to ADEC on October 31, 2009, the permittee's authorization to discharge will be automatically continued under the respective permit until the expiration of this permit (currently June 30, 2011) and the issuance of a new CGP by ADEC, or the termination of coverage by the permittee under the respective permit, whichever is earlier. Note: If the permittee is an operator of a permitted ongoing project and transfers ownership of the project, or a portion thereof, to a different operator, that operator will be required to submit a complete and accurate NOI for a new project in accordance with Part 2.2.

2.4.3 Unpermitted Ongoing Projects

If the permittee previously did not receive authorization to discharge for the project under the 2003 CGP or the 2008 CGP and the permittee wishes to obtain coverage under this permit, the permittee must submit an NOI within 90 days of the issuance date of this permit.

2.4.4 Late Notifications

Operators are not prohibited from submitting NOIs after initiating clearing, grading, excavation activities, or other construction activities. When a late NOI is submitted, authorization for discharges occurs consistent with Part 2.3. The Department reserves the right to take enforcement action for any unpermitted discharges that occur between the commencement of construction activities (as defined in Appendix A) and discharge authorization.

2.5 Continuation of the Expired General Permit

If this permit is not reissued or replaced prior to the expiration date, it will be administratively continued in accordance with 18 AAC 83.155 and remain in force and effect. If the permittee was granted permit coverage prior to the expiration date, the permittee will automatically remain covered by the continued permit until the earliest of:

2.5.1 Reissuance or replacement of this permit, at which time the permittee must comply with the conditions of the new permit to maintain authorization to discharge; or

2.5.2 The permittee submits a Notice of Termination; or

2.5.3 Issuance of an individual permit for the project's discharges; or

2.5.4 A formal permit decision by ADEC to not reissue this general permit, at which time the permittee must seek coverage under an alternative general permit or an individual permit.

2.6 Requiring Coverage Under an Individual Permit or an Alternative General Permit

2.6.1 ADEC may terminate or revoke any permittee's coverage under this permit, and may require a permittee to apply for and/or obtain either an individual APDES permit or coverage under an alternative APDES general permit. Any interested person may petition ADEC to take action under this paragraph. If ADEC requires a permittee to apply for an individual APDES permit, ADEC will notify the permittee in writing that a permit application is required. This notification will include a brief statement of the reasons for this decision and an application form. In addition, if an existing permittee is covered under this permit, the notice will set a deadline to file the application, and will include a statement that on the effective date of issuance or denial of the individual APDES permit or the coverage or denial of coverage under the alternative general permit as it applies to that existing permittee, coverage under this general permit will automatically terminate. Applications must be submitted to ADEC at the ADEC office listed in Part 2.2 of this permit. ADEC may grant additional time to submit the application upon written request. If the permittee is covered under this permit and fails to submit in a timely manner an individual APDES permit application as required by ADEC, then the applicability of this permit is automatically terminated at the end of the day specified by ADEC as the deadline for application submittal.

2.6.2 A permittee may request to be excluded from coverage under this general permit by applying for an individual permit. In such a case, the permittee shall submit an individual application in accordance with the requirements of 18 AAC 83.215), with reasons supporting the request, to ADEC at the applicable ADEC office listed in Part 2.2 of this permit. The request may be granted by issuance of an individual permit or coverage under an alternative general permit if the reasons are adequate to support the request.

2.6.3 When an individual NPDES or APDES permit is issued to a permittee (as an entity that is otherwise subject to this permit), or the permittee is authorized to discharge under an alternative APDES general permit, the applicability of this permit is automatically terminated on the effective date of the individual permit or the date of authorization of coverage under the alternative general permit, whichever the case may be. If a permittee (as an entity that is otherwise subject to this permit) is denied an individual APDES permit or an alternative APDES general permit, the applicability of this permit to the permittee is automatically terminated on the date of such denial, unless otherwise specified by ADEC.

PART 3 EFFLUENT LIMITS

This section includes technology-based and water quality-based effluent limits that apply to all dischargers, unless otherwise specified. The permittee must select, install, and maintain control measures (e.g., Best Management Practices ("BMPs"), controls, practices, etc.) for each major construction activity identified in the Part 5 project description to meet these effluent limits. All control measures must be properly selected, installed, and maintained in accordance with any relevant manufacturer specifications and good engineering practices. The permittee must implement the control measures from commencement of construction activity until final stabilization is complete.

The term "minimize" as used in Part 3 means reduce and/or eliminate to the extent achievable using control measures that are technologically available and economically practicable and achievable in light of best industry practice.

3.1 Effluent Limits to Reduce Pollutants in Storm Water Discharges

The permittee must implement control measures to minimize pollutants in storm water discharges.

3.1.1 Sediment Controls

The permittee must implement the following, where applicable:

3.1.1.1 Sediment Basins: For common drainage locations that serve an area with 10 or more acres disturbed at one time, a temporary (or permanent) sediment basin that provides storage for a calculated volume of runoff from the drainage area from a 2-year, 24-hour storm, or equivalent control measures, must be provided where attainable until final stabilization of the site. Where no such calculation has been performed, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage per acre drained, or equivalent control measures, must be provided where attainable until final stabilization of the site. When computing the number of acres draining into a common location, it is not necessary to include flows from offsite areas and flows from on-site areas that are either undisturbed or have undergone final stabilization where such flows are diverted around both the disturbed area and the sediment basin. In determining whether installing a sediment basin is attainable, the operator may consider factors such as site soils, slope, available area on-site, etc. In any event, the operator must consider public safety, especially as it relates to children, as a design factor for the sediment basin, and alternative sediment controls must be used where site limitations would preclude a safe design.

3.1.1.2 For drainage locations which serve ten (10) or more disturbed acres at one time and where a temporary sediment basin or equivalent controls is not attainable,

smaller sediment basins and/or sediment traps should be used. At a minimum, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all down slope boundaries (and for those side slope boundaries deemed appropriate as dictated by individual site conditions).

3.1.1.3 For drainage locations serving less than ten (10) acres, smaller sediment basins and/or sediment traps should be used. At a minimum, silt fences, vegetative buffer strips, or equivalent sediment controls are required for all down slope boundaries (and for those side slope boundaries deemed appropriate as dictated by individual site conditions) of the construction area unless a sediment basin providing storage for a calculated volume of runoff from a 2-year, 24-hour storm or 3,600 cubic feet of storage per acre drained is provided.

3.1.2 Off-Site Sediment Tracking and Dust Control

The permittee must minimize off-site vehicle tracking of sediments onto paved surfaces and the generation of dust. If sediment escapes the construction site, off-site accumulations of sediment must be removed at a frequency sufficient to minimize off-site impacts.

3.1.3 Runoff Management

The permittee must divert flows from exposed soils, retain/detain flows or otherwise minimize runoff and the discharge of pollutants from exposed areas of the site. The permittee must avoid placement of structural practices in floodplains to the degree technologically and economically practicable and achievable.

3.1.4 Erosive Velocity Control

The permittee must place velocity dissipation devices at discharge locations and along the length of any outfall channel to provide a non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g., no significant changes in the hydrological regime of the receiving water).

3.1.5 Post-Construction Storm Water Management

The permittee must comply with any applicable federal, local, state, or tribal requirements regarding the design and installation of post-construction storm water controls. Structural measures should be placed on upland soils to the degree practicable and achievable.

3.1.6 Construction and Waste Materials

The permittee must:

3.1.6.1 Prevent the discharge of solid materials, including building materials, to waters of the United States, except as authorized by a permit issued under section 404 of the CWA;

3.1.6.2 Minimize exposure of construction and waste materials to storm water, and the occurrence of spills, through the use of storage practices, prevention and response practices, and other controls; and

3.1.6.3 Prevent litter, construction debris, and construction chemicals (e.g., diesel fuel, hydraulic fluids, and other petroleum products) that could be exposed to storm water from becoming a pollutant source in storm water discharges.

3.1.7 Non-Construction Wastes

The permittee must minimize pollutant discharges from areas other than construction (including storm water discharges from dedicated asphalt plants and dedicated concrete plants).

3.1.8 Erosion Control and Stabilization

3.1.8.1 General Requirements: The permittee must stabilize the site. The permittee must ensure that existing vegetation is preserved where possible and that disturbed portions of the site are stabilized. The permittee should avoid using impervious surfaces for stabilization.

3.1.8.2 Initiation Deadlines: The permittee must initiate stabilization measures, except as provided below, as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.

3.1.8.2.1 Where stabilization by the 14th day is precluded by snow cover or frozen ground conditions, stabilization measures must be initiated as soon as practicable.

3.1.8.2.2 Where construction activity on a portion of the site is temporarily ceased, and earth disturbing activities will be resumed within 14 days, temporary stabilization measures do not have to be initiated on that portion of the site.

3.1.8.2.3 In arid, semiarid, and drought-stricken areas where initiating perennial vegetative stabilization measures is not possible within 14 days after construction activity has temporarily or permanently ceased, final vegetative stabilization measures must be initiated as soon as practicable.

3.1.9 Spills / Releases in Excess of Reportable Quantities

3.1.9.1 The permittee is not authorized to discharge hazardous substances or oil resulting from an on-site spill. This permit does not relieve the permittee of the federal reporting requirements of 40 CFR Part 110, 40 CFR Part 117 and 40 CFR Part 302 relating to spills or other releases of oils or hazardous substances.

3.1.9.2 Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117 or 40 CFR Part 302, occurs during a 24-hour period, the permittee must:

3.1.9.2.1 Provide notice to the National Response Center (NRC) (800–424–8802) in accordance with the requirements of 40 CFR Part 110, 40 CFR Part 117 and 40 CFR Part 302 as soon as site staff have knowledge of the discharge; and during normal business hours call the nearest ADEC Area Response Team Office – Southeast (Juneau) 907-465-5340; Central (Anchorage) 907-269-3063; Northern (Fairbanks) 907-451-2121; or outside normal business hours call 1-800-478-9300; and

3.1.9.2.2 Within seven (7) calendar days of knowledge of the release, provide a description of the release, the circumstances leading to the release, and the date of the release to the nearest ADEC Area Response Team Office, listed in Part 3.1.9.2.1. The permittee must also implement measures to prevent the reoccurrence of such releases and to respond to such releases.

3.2 Effluent Limits to Reduce Pollutants in Non-Storm Water Discharges

The permittee must minimize any non-storm water discharges authorized by this permit.

3.3 Effluent Limits Related to Endangered Species

The permittee must protect federally-listed endangered or threatened species, or federally-designated critical habitat to maintain eligibility under Part 1.3.3.6.

3.4 Attainment of Water Quality Standards

3.4.1 The permittee must select, install, implement and maintain control measures at the construction site that minimize pollutants in the discharge as necessary to meet applicable water quality standards. In general, except in situations explained in Part 3.4.2 below, the permittee's storm water controls developed, implemented, and updated consistent with the other provisions of Part 3 are considered as stringent as necessary to ensure that the permittee's discharges do not cause or contribute to an excursion above any applicable water quality standard.

3.4.2 At any time after authorization, ADEC may determine that the permittee's storm water discharges may cause, have reasonable potential to cause, or contribute to an excursion above any applicable water quality standard. If such a determination is made, ADEC will require the permittee to:

3.4.2.1 Modify storm water controls in accordance with Part 3.6 to address adequately the identified water quality concerns;

3.4.2.2 Submit valid and verifiable data and information that are representative of ambient conditions and indicate that the receiving water is attaining water quality standards; or

3.4.2.3 Cease discharges of pollutants from construction activity and submit an individual permit application according to Part 2.6.

3.4.3 All written responses required under this part must include a signed certification consistent with the requirements of Appendix F.

3.5 Consistency with Total Maximum Daily Loads

If the permittee is discharging into a water with an EPA established or approved TMDL, the permittee must implement measures to ensure that their discharge of pollutants from the site is consistent with the assumptions and requirements of the EPA-established or approved TMDL, including any specific wasteload allocation that has been established that would apply to the permittee's discharge. See Part 1.3.3.5 for further information on determining permit eligibility related to TMDLs.

3.6 Maintenance of Control Measures

3.6.1 The permittee must maintain all control measures and other protective measures in effective operating condition. If site inspections required by Part 4 identify BMPs that are not operating effectively, the permittee must perform maintenance as soon as possible and before the next storm event whenever practicable to maintain the continued effectiveness of storm water controls.

3.6.2 If existing BMPs need to be modified or if additional BMPs are necessary for any reason, the permittee must complete implementation before the next storm event whenever practicable. If implementation before the next storm event is impracticable, the permittee must implement alternative BMPs as soon as possible.

3.6.3 The permittee must remove sediment from sediment traps or sedimentation ponds when design capacity has been reduced by 50 percent.

3.6.4 The permittee must remove trapped sediment from a silt fence before the deposit reaches 50 percent of the above-ground fence height (or before it reaches a lower height based on manufacturer's specifications).

3.7 Training of Employees

The permittee must train employees and subcontractors as necessary to make them aware of the applicable control measures implemented at the site so that they follow applicable procedures.

3.8 Applicable State, Tribal, or Local Programs

The permittee must ensure that the storm water controls implemented at the site are consistent with all applicable federal, state, tribal, or local requirements for soil and erosion control and storm water management.

PART 4 INSPECTIONS

4.1 Inspection Frequency

The permittee must conduct inspections in accordance with one of the two schedules listed below. The permittee must specify in the SWPPP which schedule will be followed.

4.1.1 At least once every seven (7) calendar days, OR

4.1.2 At least once every fourteen (14) calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater.

4.2 Case-by-Case Reductions in Inspection Frequency

The permittee may reduce inspection frequency to at least once every month if:

4.2.1 The entire site is temporarily stabilized;

4.2.2 Runoff is unlikely due to winter conditions (e.g., site is covered with snow, ice, or the ground is frozen); or

4.2.3 Construction is occurring during seasonal arid periods in arid areas and semi-arid areas.

4.3 Inspection Waiver for Frozen Conditions

A waiver of the inspection requirements is available until one month before thawing conditions are expected to result in a discharge if all of the following requirements are met:

4.3.1 The project is located in an area where frozen conditions are anticipated to continue for extended periods of time (i.e., more than one month);

4.3.2 Land disturbance activities have been suspended; and

4.3.3 The beginning and ending dates of the waiver period are documented in the SWPPP.

4.4 Qualified Personnel

Inspections must be conducted by qualified personnel (provided by the operator or cooperatively by multiple operators). “Qualified personnel” means a person knowledgeable in the principles and practice of erosion and sediment controls who possesses the skills to assess conditions at the construction site that could impact storm water quality and to assess the effectiveness of any sediment and erosion control measures selected to control the quality of storm water discharges from the construction activity.

4.5 Scope of Inspections

Inspections must include all areas of the site disturbed by construction activity and areas used for storage of materials that are exposed to precipitation. Inspectors must look for evidence of, or the potential for, pollutants entering the storm water conveyance system. Sedimentation and erosion control measures must be observed to ensure proper operation. Discharge locations must be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to waters of the United States, where accessible. Where discharge locations are inaccessible, nearby downstream locations must be inspected to the

extent that such inspections are practicable. Locations where vehicles enter or exit the site must be inspected for evidence of off-site sediment tracking.

4.6 Reductions in Scope of Inspections for Stabilized Areas

Once a definable area has been finally stabilized, no further inspection requirements apply to that portion of the site (e.g., earth-disturbing activities around one of three buildings in a complex are done and the area is finally stabilized, one mile of a roadway or pipeline project is done and finally stabilized, etc).

4.7 Utility Line Inspections

Utility line installation, pipeline construction, and other examples of long, narrow, linear construction activities may limit the access of inspection personnel to the areas described in Part 4.5 above. Inspection of these areas could require that vehicles compromise temporarily or even permanently stabilized areas, cause additional disturbance of soils, and increase the potential for erosion. In these circumstances, controls must be inspected on the same frequencies as other construction projects, but representative inspections may be performed. For representative inspections, personnel must inspect controls along the construction site for 0.25 mile above and below each access point where a roadway, undisturbed right-of-way, or other similar feature intersects the construction site and allows access to the areas described above. The conditions of the controls along each inspected 0.25 mile segment may be considered as representative of the condition of controls along that reach extending from the end of the 0.25 mile segment to either the end of the next 0.25 mile inspected segment, or to the end of the project, whichever occurs first.

4.8 Inspection Report

4.8.1 For each inspection required above, the permittee must complete an inspection report. At a minimum, the inspection report must include:

4.8.1.1 The inspection date;

4.8.1.2 Names, titles, and qualifications of personnel making the inspection;

4.8.1.3 Weather information for the period since the last inspection (or since commencement of construction activity if the first inspection) including a best estimate of the beginning of each storm event, duration of each storm event, approximate amount of rainfall for each storm event (in inches), and whether any discharges occurred;

4.8.1.4 Weather information and a description of any discharges occurring at the time of the inspection;

4.8.1.5 Location(s) of discharges of sediment or other pollutants from the site;

4.8.1.6 Location(s) of BMPs that need to be maintained;

4.8.1.7 Location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location;

4.8.1.8 Location(s) where additional BMPs are needed that did not exist at the time of inspection; and

4.8.1.9 Corrective action required including implementation dates.

4.8.2 The inspection report must be signed in accordance with the requirements of Appendix F of this permit.

PART 5 STORM WATER POLLUTION PREVENTION PLANS (SWPPPs)

5.1 Storm Water Pollution Prevention Plan Framework

5.1.1 The permittee must prepare a SWPPP before submitting the Notice of Intent (NOI) for permit coverage. At least one SWPPP must be developed for each construction project covered by this permit and the storm water controls implemented at the site must be documented in the SWPPP. If the permittee prepared a SWPPP for coverage under a previous NPDES or APDES permit, the permittee must review and update the SWPPP prior to submitting the NOI.

The SWPPP does not contain effluent limitations; the technology and water quality-based effluent limitations are contained in Part 3 of this permit. The SWPPP is intended to document the selection, design, installation, and implementation of control measures that are being used to comply with the effluent limitations set forth in Part 3.

5.1.2 The SWPPP must:

5.1.2.1 Identify all potential sources of pollutants that may reasonably be expected to affect the quality of storm water discharges from the construction site; and

5.1.2.2 Describe control measures to be used to meet the effluent limits set forth in Part 3.

5.2 SWPPP Contents: Site and Activity Description

5.2.1 Construction Site Operators

The SWPPP must identify all operators for the project site and the areas of the site over which each operator has control.

5.2.2 Nature of Construction Activity

The SWPPP briefly must describe the nature of the construction activity, including:

5.2.2.1 The function of the project (e.g., low density residential, shopping mall, highway, etc.);

5.2.2.2 The intended sequence and timing of activities that disturb soils at the site;

5.2.2.3 Estimates of the total area expected to be disturbed by excavation, grading, or other construction activities, including dedicated off-site borrow and fill areas; and

5.2.2.4 A general location map (e.g., USGS quadrangle map, a portion of a city or county map, or other map) with enough detail to identify the location of the construction site and waters of the United States within one mile of the site.

5.2.3 Site Map

The SWPPP must contain a legible site map, showing the entire site, identifying:

5.2.3.1 Direction(s) of storm water flow and approximate slopes anticipated after grading activities;

5.2.3.2 Areas of soil disturbance and areas that will not be disturbed (or a statement that all areas of the site will be disturbed unless otherwise noted);

5.2.3.3 Locations of major structural and nonstructural BMPs identified in the SWPPP;

5.2.3.4 Locations where stabilization practices are expected to occur;

5.2.3.5 Locations of off-site material, waste, borrow or equipment storage areas;

5.2.3.6 Locations of all waters of the United States (including wetlands);

5.2.3.7 Locations where storm water discharges to a surface water; and

5.2.3.8 Areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

5.2.4 Construction and Waste Materials

The SWPPP must include a description of construction and waste materials expected to be stored on-site with updates as appropriate.

5.2.5 Locations of Other Industrial Storm Water Discharges

The SWPPP must describe and identify the location and description of any storm water discharge associated with industrial activity other than construction at the site. This includes storm water discharges from dedicated asphalt plants and dedicated concrete plants that are covered by this permit.

5.3 Description of Control Measures to Reduce Pollutant Discharges

5.3.1 Control Measures

The SWPPP must include a description of all control measures that will be implemented to meet the effluent limits in Part 3. For each major activity identified in the project description the SWPPP must clearly document appropriate control measures, the general sequence during the construction process in which the measures will be implemented, and which operator is responsible for the control measure's implementation.

5.3.2 Stabilization

The SWPPP must include a description of interim and permanent stabilization practices for the site, including a schedule of when the practices will be implemented.

5.3.3 Post-Authorization Records

The following records must be maintained with the SWPPP following authorization under this permit:

5.3.3.1 Dates when grading activities occur;

5.3.3.2 Dates when construction activities temporarily or permanently cease on a portion of the site; and

5.3.3.3 Dates when stabilization measures are initiated.

5.4 Non-Storm Water Discharges

The SWPPP must identify all allowable sources of non-storm water discharges listed in Part 1.3.2 of this permit, except for flows from fire fighting activities that are combined with storm water discharges associated with construction activity at the site. The SWPPP must also describe the pollution prevention measures used to eliminate or reduce non-storm water discharges consistent with Part 3.2.

5.5 Documentation of Permit Eligibility Related to Endangered Species

The SWPPP must include documentation supporting a determination of permit eligibility with regard to the Endangered Species Act, including:

5.5.1 Information on whether federally-listed endangered or threatened species or federally-designated critical habitat may be in the project area;

5.5.2 Whether such species or critical habitat may be adversely affected by storm water discharges or storm water discharge-related activities from the project;

5.5.3 Results of the Appendix C listed species and critical habitat screening determinations;

5.5.4 Confirmation of delivery of NOI to ADEC or to ADEC's electronic NOI system. This may include an overnight, express, or registered mail receipt acknowledgment or electronic acknowledgment from ADEC's electronic NOI system;

5.5.5 Any correspondence for any stage of project planning between the FWS, EPA, NMFS, or others and the permittee regarding listed species and critical habitat, including any notification that delays the permittee's authorization to discharge under this permit; and

5.5.6 A description of measures necessary to protect federally-listed endangered or threatened species or federally-designated critical habitat.

5.6 Documentation of Permit Eligibility Related to Total Maximum Daily Loads

The SWPPP must include documentation supporting a determination of permit eligibility with regard to waters of the United States that have an EPA-established or approved TMDL, including:

5.6.1 Identification of whether the permittee's discharge is identified, either specifically or generally, in an EPA-established or approved TMDL and any associated allocations, requirements, and assumptions identified for the discharge;

5.6.2 Summaries of consultation with State or Federal TMDL authorities on consistency of SWPPP conditions with the approved TMDL; and

5.6.3 Measures taken by the permittee to ensure that the discharge of pollutants from the site is consistent with the assumptions and requirements of the EPA-established or approved TMDL, including any specific wasteload allocation that has been established that would apply to their discharge.

See Part 1.3.3.5 for further information on determining permit eligibility related to TMDLs.

5.7 Copy of Permit Requirements

A copy of this permit and of the signed and certified NOI form that was submitted to ADEC must be included in the SWPPP. Also, upon receipt, a copy of the letter from ADEC, notifying the permittee of the Department's receipt of the administratively complete NOI must also be included as a component of the SWPPP.

5.8 Applicable State, Tribal, or Local Programs

The SWPPP must be updated as necessary to reflect any revisions to applicable federal, state, tribal, or local requirements that affect the storm water controls the permittee implements at the construction site.

5.9 Inspections

A record of each inspection and of any actions taken in accordance with Part 4 must be retained with the SWPPP for at least three years from the date that permit coverage expires or is terminated. The inspection reports must identify any incidents of non-compliance with the permit conditions. Where a report does not identify any incidents of non-compliance, the report must contain a certification that the construction project or site is in compliance with this permit.

5.10 Maintaining an Updated Plan

The SWPPP must be updated:

5.10.1 To reflect modifications to storm water control measures made in response to a change in design, construction, operation, or maintenance at the construction site that has or could have a significant effect on the discharge of pollutants to the waters of the United States that has not been previously addressed in the SWPPP.

5.10.2 If during inspections or investigations by site staff, or by local, state, tribal or federal officials, it is determined that the existing storm water controls are ineffective in eliminating or significantly minimizing pollutants in storm water discharges from the construction site.

5.10.3 Based on the results of an inspection, as necessary to properly document additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP must be completed within seven (7) calendar days following the inspection.

5.11 Signature, Plan Review, and Making Plans Available

5.11.1 Retention of SWPPP

A copy of the SWPPP (including a copy of the permit), NOI, and acknowledgement letter from ADEC must be retained at the construction site (or other location easily

accessible during normal business hours to ADEC, a state, tribal or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; the operator of a MS4 receiving discharges from the site; and representatives of the FWS or the NMFS) from the date of commencement of construction activities to the date of final stabilization. If the permittee has day-to-day operational control over SWPPP implementation, the permittee must have a copy of the SWPPP available at a central location on-site for the use of all those identified as having responsibilities under the SWPPP whenever they are on the construction site. If an on-site location is unavailable to store the SWPPP when no personnel are present, notice of the plan's location must be posted near the main entrance at the construction site.

5.11.2 Main Entrance Signage

A sign or other notice must be posted conspicuously near the main entrance of the construction site. If displaying near the main entrance is infeasible, the notice can be posted in a local public building such as the town hall or public library. The sign or other notice must contain the following information:

5.11.2.1 A copy of the completed NOI as submitted to ADEC; and

5.11.2.2 If the location of the SWPPP or the name and telephone number of the contact person for scheduling SWPPP viewing times has changed (i.e., is different than that submitted in the NOI), the current location of the SWPPP and name and telephone number of a contact person for scheduling viewing times.

For linear projects, the sign or other notice must be posted at a publicly accessible location near the active part of the construction project (e.g., where a pipeline project crosses a public road).

5.11.3 Availability of SWPPP

SWPPPs must be made available upon request by ADEC; a state, tribal or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; the operator of a MS4 receiving discharges from the site; and representatives of the FWS or the NMFS to the requestor. The copy of the SWPPP that is required to be kept on-site or locally available must be made available, in its entirety, to the ADEC staff for review and copying at the time of an on-site inspection.

5.11.4 Signature and Certification

All SWPPPs must be signed and certified in accordance with the requirements of Appendix F.

5.12 Requirements for Different Types of Operators

The permittee may meet one or both of the operational control components in the definition of operator found in Appendix A. Part 5.12.3 applies to all permittees having control over only a portion of a construction site.

5.12.1 If the permittee has operational control over construction plans and specifications, the permittee must ensure that:

5.12.1.1 The project specifications meet the minimum requirements of this Part and all other applicable permit conditions;

5.12.1.2 The SWPPP indicates the areas of the project where the permitee has operational control over project specifications, including the ability to make modifications in specifications;

5.12.1.3 All other permittees implementing portions of the SWPPP (or their own SWPPP) who may be impacted by a change to the construction plan are notified of such changes in a timely manner; and

5.12.1.4 The SWPPP indicates the name of the party(ies) with day-to-day operational control of those activities necessary to ensure compliance with the SWPPP or other permit conditions.

5.12.2 If the permittee has operational control over day-to-day activities, the permittee must ensure that:

5.12.2.1 The SWPPP meets the minimum requirements of this Part and identifies the parties responsible for implementation of control measures identified in the plan;

5.12.2.2 The SWPPP indicates areas of the project where the permittee has operational control over day-to-day activities; and

5.12.2.3 The SWPPP indicates the name of the party(ies) with operational control over project specifications (including the ability to make modifications in specifications).

5.12.3 If the permittee has operational control over only a portion of a larger project (e.g., one of four homebuilders in a subdivision), the permittee is responsible for compliance with all applicable effluent limits, terms, and conditions of this permit as it relates to the activities on the permittee's portion of the construction site, including protection of endangered species, critical habitat, and historic properties and implementation of control measures described in the SWPPP. The permittee must ensure, either directly or through coordination with other permittees, that activities do not render another party's pollutant discharge controls ineffective. The permittee must either implement a portion of a common SWPPP or develop and implement its own SWPPP.

For more effective coordination of BMPs and opportunities for cost sharing, a cooperative effort by the different operators at a site to prepare and participate in a comprehensive SWPPP is encouraged. Individual operators at a site may, but are not required to, develop separate SWPPPs that cover only their portion of the project provided reference is made to other operators at the site. In instances where there is more than one SWPPP for a site, cooperation between the permittees is encouraged to ensure the storm water discharge control measures are consistent with one another (e.g., provisions to protect listed species and critical habitat).

5.13 Submittal of SWPPP for Review

5.13.1 The permittee must submit a copy of the SWPPP to ADEC for review (at the address specified in Part 2.2) if the project is located outside the areas of the local governments described in Parts 5.13.2, 5.13.3, 5.13.4, and 5.13.5 and the project disturbs five or more acres of land;

5.13.2 Within the Municipality of Anchorage

5.13.2.1 An owner or operator of construction projects disturbing one or more acres of land shall submit a copy of the SWPPP to either ADEC or the Municipality based on the project type and operator as shown in the following table

Project Type	Submit SWPPP to
Government (federal, state, municipal) road projects and other government transportation projects such as ports, railroads or airports	ADEC
Utility projects for which the utility is initiating the work	Municipality
Work that requires a Building Permit	Municipality
Non-publicly funded transportation projects	Municipality

5.13.2.2 Submittal of the SWPPP to the Municipality should be made before or at the same time the NOI is submitted to ADEC and shall be accompanied by any

Municipality-required fee. A copy of the SWPPP shall be submitted to the Municipality at the following address:

Municipality of Anchorage
Office of Planning Development and Public Works
4700 South Elmore Rd.
PO Box 196650
Anchorage, AK 99519-6650

5.13.2.3 Submittals to ADEC shall include a copy of the SWPPP for review.

5.13.3 Within the urbanized area boundary of the Fairbanks North Star Borough check with the Borough for the latest requirements.

Fairbanks North Star Borough
Department of Public Works
PO Box 71267
Fairbanks, AK 99707

5.13.4 Within the urbanized area boundary of the City of Fairbanks

5.13.4.1 Owners or operators of privately-funded construction projects disturbing one or more acres of land shall submit a copy of the SWPPP to the City of Fairbanks.

5.13.4.2 Submittal of the SWPPP to the City of Fairbanks should be made before or at the same time the NOI is submitted to ADEC and shall be accompanied by any City-required fee. A copy of the SWPPP shall be submitted to the City of Fairbanks at the following address:

City of Fairbanks
Engineering Division
800 Cushman St
Fairbanks, AK 99701

5.13.4.3 Owners or operators of publicly-funded projects disturbing one or more acres of land shall submit a copy of the SWPPP to ADEC for review.

5.13.5 Within the urbanized area boundary of the City of North Pole

5.13.5.1 Owners or operators of privately-funded construction projects disturbing one or more acres of land shall submit a copy of the SWPPP to the City of North Pole.

5.13.5.2 Submittal of the SWPPP to the City of North Pole should be made before or at the same time the NOI is submitted to ADEC and shall be accompanied by any City-required fee. A copy of the SWPPP shall be submitted to the City of North Pole at the following address:

City of North Pole
Department of Public Works
125 Snowman Lane
North Pole, AK 99705

5.13.5.3 Owners or operators of publicly-funded projects disturbing one or more acres of land shall submit a copy of the SWPPP to ADEC for review.

5.13.6 For Post-Construction (Permanent) Storm Water Control Measures (Part 3.1.5 [Post-Construction Storm Water Management] of the CGP)

5.13.6.1 Operators of construction projects who construct, alter, install, modify, or operate any part of a storm water treatment system and are located outside the Municipality of Anchorage, shall submit a copy of the engineering plans to ADEC for review at the address given in Part 2.2 (see 18 AAC 72.600).

5.13.6.2 Operators of construction projects who construct, alter, install, modify, or operate any part of a storm water treatment system and are located inside the Municipality of Anchorage, shall submit a copy of the engineering plans to the respective government agency based on project type, as indicated in the table in Part 5.13.2.1, for review at the addresses given in Part 2.2 or 5.13.2.2

PART 6 TERMINATION OF COVERAGE

6.1 Submitting a Notice of Termination

Submit a complete and accurate Notice of Termination (NOT) either electronically (strongly encouraged) at http://www.dec.state.ak.us/water/wnpspc/storm water/index.htm or by completing the paper Notice of Termination form found on ADEC's website http://www.dec.state.ak.us/water/wnpspc/storm water/index.htm and submitting that form to the address listed in Part 2.2. If the permittee received an NOI from EPA before October 31, 2009, the permittee must submit the NOT to ADEC.

6.2 When to Submit a Notice of Termination

6.2.1 The permittee may only submit a Notice of Termination (NOT) after one or more of the following conditions have been met:

6.2.1.1 Final stabilization has been achieved on all portions of the site for which the permittee is responsible;

6.2.1.2 Another operator has assumed control according to the requirements of Appendix F over all areas of the site that have not been finally stabilized;

6.2.1.3 Coverage under an individual or alternative general NPDES or APDES permit has been obtained; or

6.2.1.4 For residential construction only, temporary stabilization has been completed and the residence has been transferred to the homeowner.

6.2.2 The NOT must be submitted within thirty (30) days of one of the above conditions being met. Authorization to discharge terminates at midnight of the day the NOT is signed.

PART 7 RETENTION OF RECORDS

Copies of the SWPPP and all documentation required by this permit, including records of all data used to complete the NOI to be covered by this permit, must be retained for at least three (3) years from the date that permit coverage expires or is terminated. This period may be extended by request of ADEC at any time.

PART 8 REOPENER CLAUSE

8.1 Procedures for Modification or Revocation

Permit modification or revocation will be conducted according to 18 AAC 83.130, 18 AAC 83.135, 18 AAC 83.140, and 18 AAC 83.145.

8.2 Water Quality Protection

If there is evidence indicating that the storm water discharges authorized by this permit cause, have the reasonable potential to cause or contribute to an excursion above any applicable water quality standard, the permittee may be required to obtain an individual permit in accordance with Part 2.6 of this permit, or the permit may be modified to include different limitations and/or requirements.

8.3 Timing of Permit Modification

ADEC may elect to modify the permit prior to its expiration (rather than waiting for the new permit cycle) to comply with any new statutory or regulatory requirements, such as for effluent limitation guidelines that may be promulgated in the course of the current permit cycle.

Stormwater Construction Site Inspection Report

General Information			
Project Name			
NPDES Tracking No.		**Location**	Ft Wainwright
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			
Describe present phase of construction			

Type of Inspection:
❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event

Weather Information

Has there been a storm event since the last inspection? ❑Yes ❑No
If yes, provide:
Storm Start Date & Time: Storm Duration (hrs): Approximate Amount of Precipitation (in):

Weather at time of this inspection?
❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds
❑ Other: Temperature:

Have any discharges occurred since the last inspection? ❑Yes ❑No
If yes, describe:

Are there any discharges at the time of inspection? ❑Yes ❑No
If yes, describe:

Site-specific BMPs

- *Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below (add as many BMPs as necessary). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.*
- *Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log.*

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
1	Minimize disruption of areas not planned for investigation	❑Yes ❑No	❑Yes ❑No	
2	Inspection of installed erosion and sediment control measures	❑Yes ❑No	❑Yes ❑No	
3	Dust Control	❑Yes ❑No	❑Yes ❑No	

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
4	Inspection of Test Pits	❑Yes ❑No	❑Yes ❑No	
5	Stormwater management (with regard to excavated areas)	❑Yes ❑No	❑Yes ❑No	
6	Stabilization (Inspection of stabilization measures)	❑Yes ❑No	❑Yes ❑No	
7	Inspection of Structural controls	❑Yes ❑No	❑Yes ❑No	
8	Maintain Excavation slopes to minimize erosion	❑Yes ❑No	❑Yes ❑No	
9	Stockpile construction	❑Yes ❑No	❑Yes ❑No	
10	Vehicle Tracking	❑Yes ❑No	❑Yes ❑No	
11	General Waste Management	❑Yes ❑No	❑Yes ❑No	
12	IDW waste management	❑Yes ❑No	❑Yes ❑No	
13	Material Storage Areas	❑Yes ❑No	❑Yes ❑No	
14	Vehicle Fueling and maintenance	❑Yes ❑No	❑Yes ❑No	
15	Equipment Washing Cleaning	❑Yes ❑No	❑Yes ❑No	

Overall Site Issues (also see above)

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
1	Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
2	Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
3	Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	❑Yes ❑No	❑Yes ❑No	
4	Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
5	Are storm drain inlets properly protected?	❑Yes ❑No	❑Yes ❑No	
6	Is the construction exit preventing sediment from being tracked into the street?	❑Yes ❑No	❑Yes ❑No	

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
7	Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
8	Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No	
9	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	
10	Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No	
11	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
12	(Other)	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title: _____

Signature:_____ **Date:**_____

Appendix A

Abbreviations and Definitions

Appendix A. Abbreviations and Definitions (for the purposes of this permit)

Abbreviations

ADEC	Alaska Department of Environmental Conservation
APDES	Alaska Pollutant Discharge Elimination System
BMP or BMPs	Best Management Practice(s)
CGP	Construction General Permit
CFR	Code of Federal Regulations
CWA	Clean Water Act
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FWS	United States Fish and Wildlife Service
MS4	Municipal Separate Storm Sewer System
MSGP	Multi-Sector General Permit
NHPA	National Historic Preservation Act
NMFS	United States National Marine Fisheries Service
NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
POTW	Publicly Owned Treatment Works
SHPO	State Historic Preservation Office
SWPPP	Storm Water Pollution Prevention Plan
THPO	Tribal Historic Preservation Officer
TMDL	Total Maximum Daily Load
WQS	Water Quality Standard

Definitions

Arid Areas	Areas with an average annual rainfall of 0 to 10 inches.
Best Management Practices or BMPs	Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States. BMPs also include treatment requirements, operating procedures, and practice to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.
Clean Water Act or CWA	The Clean Water Act or the Federal Water Pollution Control Act, 33 U.S.C. section1251 et seq.
Commencement of Construction Activities	The initial disturbance of soils associated with clearing, grading, or excavating activities or other construction-related activities (e.g., stockpiling of fill material).
Control Measure	As used in this permit, refers to any BMP or other method used to prevent or reduce the discharge of pollutants to waters of the United States.
Department	Refers to the Alaska Department of Environmental Conservation
Discharge	When used without qualification means the "discharge of a pollutant"
Discharge of Storm Water Associated with Construction Activity	As used in this permit, refers to a discharge of pollutants in storm water from areas where soil disturbing activities (e.g., clearing, grading, or excavation), construction materials or equipment storage or maintenance (e.g., fill piles, borrow area, concrete truck chute washdown, fueling), or other industrial storm water directly related to the construction process (e.g., concrete or asphalt batch plants) are located.
Eligible	Qualified for authorization to discharge storm water under this general permit.
Facility or Activity	Any "point source" or any other facility or activity (including land or appurtenances thereto) that is subject to regulation under the APDES program
Federal Facility	Any buildings, installations, structures, land, public works, equipment, aircraft, vessels, and other vehicles and property, owned by, or constructed or manufactured for the purpose of leasing to, the Federal government.
Final Stabilization	Means that : 1. All soil disturbing activities at the site have been completed and either of the two following criteria are met: a. a uniform (e.g,, evenly distributed, without large bare areas) perennial vegetative cover with a density of 70 percent of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or b. equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed. 2. When background native vegetation will cover less than 100 percent of the ground (e.g., arid areas, beaches), the 70 percent coverage criteria is adjusted as follows: if the native vegetation covers 50 percent of the ground, 70 percent of 50 percent (0.70 X 0.50 = 0.35) would require 35 percent total cover for final

stabilization. On a beach with no natural vegetation, no stabilization is required.

3. In arid and semi-arid areas only, all soil disturbing activities at the site have been completed and both of the following criteria have been met:
   a. Temporary erosion control measures (e.g., degradable rolled erosion control product) are selected, designed, and installed along with an appropriate seed base to provide erosion control for at least three years without active maintenance by the permittee,
   b. The temporary erosion control measures are selected, designed, and installed to achieve 70 percent vegetative coverage within three years.
4. For individual lots in residential construction, final stabilization means that either:
   a. The homebuilder has completed final stabilization as specified above, or
   b. The homebuilder has established temporary stabilization including perimeter controls for an individual lot prior to occupation of the home by the homeowner and informing the homeowner of the need for, and benefits of, final stabilization.
5. For construction projects on land used for agricultural purposes (e.g., pipelines across crop or range land, staging areas for highway construction, etc.), final stabilization may be accomplished by returning the disturbed land to its preconstruction agricultural use. Areas disturbed that were not previously used for agricultural activities, such as buffer strips immediately adjacent to ‘‘waters of the United States,’’ and areas which are not being returned to their preconstruction agricultural use must meet the final stabilization criteria (1), (2), or (3) above.

Indian country

Defined at 40 CFR §122.2 to mean:

1. All land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and, including rights-of-way running through the reservation;
2. All dependent Indian communities with the borders of the United States whether within the originally or subsequently acquired territory thereof, and whether within or without the limits of a state; and
3. All Indian allotments, the Indian titles to which have not been extinguished, including rights-of-ways running through the same.

Large Construction Activity

Defined at 40 CFR §122.26(b)(14)(x) and incorporated here by reference. A large construction activity includes clearing, grading, and excavating resulting in a land disturbance that will disturb equal to or greater than five (5) acres of land or will disturb less than five (5) acres of total land area but is part of a larger common plan of development or sale that will ultimately disturb equal to or greater than five (5) acres. Large construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the site.

Municipal Separate Storm Sewer System or MS4

Defined at 40 CFR §122.26(b)(8) to mean a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains):

1. Owned and operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district, drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management

agency under section 208 of the CWA that discharges to waters of the United States;

2. Designed or used for collecting or conveying storm water;
3. Which is not a combined sewer; and
4. Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR §122.2.

New Project	The "commencement of construction " occurs after the effective date of this permit.
Ongoing Project	The "commencement of construction " occurs before the effective date of this permit.
Operator	For the purpose of this permit and in the context of storm water associated with construction activity, means any party associated with a construction project that meets either of the following two criteria: 1. The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or 2. The party has day-to-day operational control of those activities at a project which are necessary to ensure compliance with a SWPPP for the site or other permit conditions (e.g., they are authorized to direct workers at a site to carry out activities required by the SWPPP or comply with other permit conditions). This definition is provided to inform permittees of ADEC's interpretation of how the regulatory definitions of "owner or operator" and "facility or activity" are applied to discharges of storm water associated with construction activity.
Owner or operator	Means the owner or operator of any ''facility or activity'' subject to regulation under the APDES program
Permittee	Means the company, organization, association, entity or person who has coverage under this permit and must comply with conditions of this permit.
Permitting Authority	The Alaska Department of Environmental Conservation or an authorized representative
Point Source	Any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock concentrated animal feeding operation, landfill leachate collection system, or vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.
Pollutant	Defined at 40 CFR §122.2. A partial listing from this definition includes: dredged spoil, solid waste, sewage, garbage, sewage sludge, chemical wastes, biological materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial or municipal waste.
Project Area	− The areas on the construction site where storm water discharges originate and flow toward the point of discharge into the receiving waters (including areas where excavation, site development, or other ground disturbance activities occur) and the immediate vicinity. (Example: Where bald eagles nest in a tree that is on or bordering a construction site and could be disturbed by the construction activity or where grading causes storm water to flow into a small wetland or other habitat that is on the

	site that contains listed species.) − The areas where storm water discharges flow from the construction site to the point of discharge into receiving waters. (Example: Where storm water flows into a ditch, swale, or gully that leads to receiving waters and where listed species (such as amphibians) are found in the ditch, swale, or gully.) − The areas where storm water from construction activities discharge into receiving waters and the areas in the immediate vicinity of the point of discharge. (Example: Where storm water from construction activities discharges into a stream segment that is known to harbor listed aquatic species.) − The areas where storm water BMPs will be constructed and operated, including any areas where storm water flows to and from BMPs. (Example: Where a storm water retention pond would be built.) − The areas upstream and /or downstream from construction activities discharges into a stream segment that may be affected by the said discharges. (Example: Where sediment discharged to a receiving stream settles downstream and impacts a breeding area of a listed aquatic species.)
Receiving water	The "waters of the United States" as defined in 40 CFR §122.2 into which the regulated storm water discharges
Runoff coefficient	The fraction of total rainfall that will appear at the conveyance as runoff.
Semi-Arid Areas	Areas with an average annual rainfall of 10 to 20 inches.
Site	The land or water area where any "facility or activity" is physically located or conducted, including adjacent land used in connection with the facility or activity.
Small Construction Activity	Defined at 40 CFR §122.26(b)(15) and incorporated here by reference. A small construction activity includes clearing, grading, and excavating resulting in a land disturbance that will disturb equal to or greater than one (1) acre and less than five (5) acres of land or will disturb less than one (1) acre of total land area but is part of a larger common plan of development or sale that will ultimately disturb equal to or greater than one (1) acre and less than five (5) acres. Small construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the site.
Storm Water	Storm water runoff, snow melt runoff, and surface runoff and drainage.
Storm Water Discharge-Related Activities	Activities that cause, contribute to, or result in storm water point source pollutant discharges, including but not limited to: excavation, site development, grading and other surface disturbance activities; and measures to control storm water including the siting, construction and operation of BMPs to control, reduce or prevent storm water pollution.
Total Maximum Daily Load or TMDL	The sum of the individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background. If a receiving water has only one point source discharger, the TMDL is the sum of that point source WLA plus the LAs for any nonpoint sources of pollution and natural background sources, tributaries, or adjacent segments. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure.

Waters of the United States	Defined at 18 AAC 83.900(77).
Wetland	Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Appendix B

Small Construction Waivers and Instructions

Appendix B - Small Construction Waivers and Instructions

These waivers are only available to storm water discharges associated with small construction activities (i.e., 1-5 acres). As the operator of a small construction activity, you may be able to qualify for a waiver in lieu of needing to obtain coverage under this general permit based on: (A) a low rainfall erosivity factor, (B) a TMDL analysis, or (C) an equivalent analysis that determines allocations for small construction sites are not needed. Each owner or operator, otherwise needing permit coverage, must notify ADEC of its intention for a waiver. It is the responsibility of those individuals wishing to obtain a waiver from coverage under this general permit to submit a complete and accurate waiver certification as described below. Where the owner or operator changes or another is added during the construction project, the new owner or operator must also submit a waiver certification to be waived.

A. Rainfall Erosivity Waiver

Under this scenario the small construction project's rainfall erosivity factor calculation ("R" in the Revised Universal Soil Loss Equation) is less than 5 during the period of construction activity. The owner or operator must certify to the ADEC that construction activity will occur only when the rainfall erosivity factor is less than 5. The period of construction activity begins at initial earth disturbance and ends with final stabilization. Where vegetation will be used for final stabilization, the date of installation of a stabilization practice that will provide temporary non-vegetative stabilization can be used for the end of the construction period, provided the owner or operator commits (as a condition of waiver eligibility) to periodically inspect and properly maintain the area until the criteria for final stabilization as defined in the construction general permit have been met. If use of this temporary stabilization eligibility condition was relied on to qualify for the waiver, signature on the waiver with its certification statement constitutes acceptance of and commitment to complete the final stabilization process. The owner or operator must submit a waiver certification to ADEC prior to commencing construction activities.

Note: The basis of the rainfall erosivity factor "R" was determined in accordance with Chapter 2 of Agriculture Handbook Number 703, Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE), pages 21–64, dated January 1997; United States Department of Agriculture (USDA), Agricultural Research Service. R factor information for Alaska can be found in the Fact Sheet and were obtained from RUSLE2 Version 1.26.6.4 http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm . (Database last modified on Feb, 28, 2008).

If the owner or operator of the construction activity is eligible for a waiver based on low erosivity potential, the owner or operator may submit a rainfall erosivity waiver to the address listed in Part 2.2 of this permit and provide the following information on the waiver certification form in order to be waived from permitting requirements:

1. Name, address and telephone number of the construction site operators;

2. Name (or other identifier), address, county or similar governmental subdivision, and latitude/longitude of the construction project or site;
3. Estimated construction start and completion (i.e., final stabilization) dates, and total acreage (to the nearest quarter acre) to be disturbed;
4. The rainfall erosivity factor calculation that applies to the active construction phase at your project site; and
5. A statement, signed and dated by an authorized representative as provided in Appendix F that certifies that the construction activity will take place during a period when the value of the rainfall erosivity factor is less than five.

An owner or operator can access the waiver certification form from ADEC's website at: (http://www.dec.state.ak.us/water/wnpspc/stormwater/index.htm) the form must be sent to the addresses listed in Part 2.2 of this permit.

Note: If the R factor is 5 or greater, you cannot apply for the rainfall erosivity waiver, and must apply for permit coverage as per Part 2.1 of the construction general permit, unless you qualify for the Water Quality Waiver as described below.

If the small construction project continues beyond the projected completion date given on the waiver certification, the owner or operator must recalculate the rainfall erosivity factor for the new project duration. If the R factor is below five (5), the owner or operator must update all applicable information on the waiver certification and retain a copy of the revised waiver as part of the site SWPPP. The new waiver certification must be submitted prior to the projected completion date listed on the original waiver form to assure exemption from permitting requirements is uninterrupted. If the new R factor is five (5) or above, the owner or operator must submit an NOI as per Part 2 of this permit.

B. TMDL Waiver

This waiver is available if EPA has established or approved a TMDL that addresses the pollutant(s) of concern and has determined that controls on storm water discharges from small construction activity are not needed to protect water quality. The pollutant(s) of concern include sediment (such as total suspended solids, turbidity or siltation) and any other pollutant that has been identified as a cause of impairment of any water body that will receive a discharge from the construction activity. Information on TMDLs that have been established or approved by EPA is available from EPA online at http://www.epa.gov/owow/tmdl/ and from ADEC online at http://www.dec.state.ak.us/water/tmdl/approvedtmdls.htm .

If the owner or operator of the construction activity is eligible for a waiver based on compliance with an ADEC or EPA established or approved TMDL, the owner or operator must provide the following information on the Waiver Certification form in order to be waived from permitting requirements:

1. Name, address and telephone number of the construction site operator(s);
2. Name (or other identifier), address, county or similar governmental subdivision, and latitude/longitude of the construction project or site;

3. Estimated construction start and completion (i.e., final stabilization) dates, and total acreage (to the nearest quarter acre) to be disturbed;
4. The name of the water body(s) that would be receiving storm water discharges from your construction project;
5. The name and approval date of the TMDL;
6. A statement signed and dated by an authorized representative as provided in Appendix E, Subsection 11 that certifies that the construction activity will take place and that the storm water discharges will occur within the drainage area addressed by the TMDL.

C. Equivalent Analysis Waiver

This waiver is available for non-impaired waters only (see http://www.dec.state.ak.us/water/wqsar/waterbody/integratedreport.htm for list of impaired waters). The owner or operator can develop an equivalent analysis that determines allocations for the small construction site for the pollutant(s) of concern or determines that such allocations are not needed to protect water quality. This waiver requires a small construction owner or operator to develop an equivalent analysis based on existing in-stream concentrations, expected growth in pollutant concentrations from all sources, and a margin of safety.

If the owner or operator of the construction activity wants to use this waiver, the owner or operator must develop an equivalent analysis and provide the following information to be waived from permitting requirements:

1. Name, address and telephone number of the construction site operator(s);
2. Name (or other identifier), address, county or similar governmental subdivision, and latitude/longitude of the construction project or site;
3. Estimated construction start and completion (i.e., final stabilization) dates, and total acreage (to the nearest quarter acre) to be disturbed;
4. The name of the water bodies that would be receiving storm water discharges from your construction project;
5. The equivalent analysis;
6. A statement, signed and dated by an authorized representative as provided in Appendix F that certifies that the construction activity will take place and that the storm water discharges will occur, within the drainage area addressed by the equivalent analysis.

D. Waiver Deadlines and Submissions

1. Waiver certifications must be submitted prior to commencement of construction activities (as defined in Appendix A).
2. If an owner or operator submits a TMDL or equivalent analysis waiver request, that owner or operator is not waived until ADEC approves the request. As such, the owner or operator may not commence construction activities until receipt of approval from ADEC.

3. Late Notifications: Owners or operators are not prohibited from submitting waiver certifications after initiating clearing, grading, excavation activities, or other construction activities. ADEC reserves the right to take enforcement for any unpermitted discharges that occur between the time of commencement of construction activities and waiver authorization is granted.

Submittal of a waiver certification is an optional alternative to obtaining permit coverage for discharges of storm water associated with small construction activity, provided the owner or operator qualifies for the waiver. Any discharge of storm water associated with small construction activity not covered by either a permit or a waiver may be considered an unpermitted discharge under the Clean Water Act. As mentioned above, ADEC reserves the right to take enforcement for any unpermitted discharges that occur between the time of commencement of construction activities and either discharge authorization is granted or a complete and accurate waiver certification is submitted. ADEC may notify any operator covered by a waiver that they must apply for a permit. ADEC may notify any owner or operator who has been in non-compliance with a waiver that they may no longer use the waiver for future projects. Any member of the public may petition ADEC to take action under this provision by submitting written notice along with supporting justification.

Appendix C

Endangered Species Act Review Procedures

Appendix C - Endangered Species Act Review Procedures

The permittee must meet at least one of the six criteria in Part 1.3.3.6 to be eligible for coverage under this permit. The permittee must follow the procedures in this Appendix to assess the potential effects of storm water discharges and storm water discharge-related activities on listed species and their critical habitat. When evaluating these potential effects, permittees must evaluate the entire project area.

For purposes of this Appendix, the term "project area" is inclusive of the term "Action Area." Action area is defined in 50 CFR §402.02 as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action.

This includes areas beyond the footprint of the construction area that may be affected by storm water discharges and storm water discharge related activities. "Project area" is defined in Appendix A.

(Permittees who are eligible and able to certify eligibility under Criterion B, C, D, or F of Part 1.3.3.6 because of a previously issued ESA section 10 permit, a previously completed ESA section 7 consultation, or because the operator's activities were already addressed in another operator's certification of eligibility may proceed directly to Step Four.)

Step One: Determine if Listed Threatened or Endangered Species are Present On or Near the Permittee Project Area

The permittee must determine, to the best of their knowledge, whether listed species are located on or near their project area. To make this determination, the permittee should:

- Determine if listed species are in their county or township. The local offices of the U.S. Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), and State or Tribal Heritage Centers often maintain lists of federally listed endangered or threatened species on their internet sites. Visit http://www.epa.gov/npdes/stormwater/cgp to find the appropriate site for your state or check with your local office. In most cases, these lists allow the permittee to determine if there are listed species in their county or township.
- If there are listed species in the permittee's county or township, check to see if critical habitat has been designated and if that area overlaps or is near the permittee's project area.
- Contact the local FWS, NMFS, or State or Tribal Heritage Center to determine if the listed species could be found on or near the permittee's project area and if any critical habitat areas have been designated that overlap or are near the permittee's project area. Critical habitat areas may be designated independently from the listed species for the permittee's county, so even if there are no listed species in the permittee's county or township, the permittee must still contact one of the agencies mentioned above to determine if there are any critical habitat areas on or near the permittee's project area.

The permittee can also find critical habitat designations and associated requirements at 50 CFR Parts 17 and 226. http://www.access.gpo.gov.

If there are no listed species in the permittee's county or township, no critical habitat areas on or near your project area, or if the local FWS, NMFS, or State or Tribal Heritage Center indicates that listed species are not a concern in the permittee's part of the county or township, the permittee may check box A on the Notice of Intent Form.

If there are listed species and if the local FWS, NMFS, or State or Tribal Heritage Center indicates that these species could exist on or near the permittee's project area, the permittee will need to do one or more of the following:

- Conduct visual inspections: This method may be particularly suitable for construction sites that are smaller in size or located in non-natural settings such as highly urbanized areas or industrial parks where there is little or no natural habitat, or for construction activities that discharge directly into municipal storm water collection systems.
- Conduct a formal biological survey. In some cases, particularly for larger construction sites with extensive storm water discharges, biological surveys may be an appropriate way to assess whether species are located on or near the project area and whether there are likely adverse effects to such species. Biological surveys are frequently performed by environmental consulting firms. A biological survey may in some cases be useful in conjunction with Steps Two, Three, or Four of these instructions.
- Conduct an environmental assessment under the National Environmental Policy Act (NEPA). Such reviews may indicate if listed species are in proximity to the project area. Coverage under the CGP does not trigger such a review because the CGP does not regulate new sources (that is, dischargers subject to New Source Performance Standards under section 306 of the Clean Water Act), and is thus statutorily exempted from NEPA. See CWA section 511(c). However, some construction activities might require review under NEPA for other reasons such as federal funding or other federal involvement in the project.
- If listed threatened or endangered species or critical habitat is present in the project area, you must look at impacts to species and/or habitat when following Steps Two through Four. Note that many but not all measures imposed to protect listed species under these steps will also protect critical habitat. Thus, meeting the eligibility requirements of this CGP may require measures to protect critical habitat that are separate from those to protect listed species.

Step Two: Determine if the Construction Activity's Storm Water Discharges or Storm Water Discharge- Related Activities Are Likely to Adversely Affect Listed Threatened or Endangered Species or Designated Critical Habitat

To receive CGP coverage, the permittee must assess whether their storm water discharges or storm water discharge related activities is likely to adversely affect listed threatened or endangered species or designated critical habitat that are present on or near the permittee's project area.

Potential adverse effects from storm water discharges and storm water discharge-related activities include:

- *Hydrological.* Storm water discharges may cause siltation, sedimentation or induce other changes in receiving waters such as temperature, salinity or pH. These effects will vary with the amount of storm water discharged and the volume and condition of the receiving water. Where a storm water discharge constitutes a minute portion of the total volume of the receiving water, adverse hydrological effects are less likely. Construction activity itself may also alter drainage patterns on a site where construction occurs that can impact listed species or critical habitat.
- *Habitat.* Excavation, site development, grading, and other surface disturbance activities from construction activities, including the installation or placement of storm water BMPs, may adversely affect listed species or their habitat. Storm water may drain or inundate listed species habitat.
- *Toxicity.* In some cases, pollutants in storm water may have toxic effects on listed species.

The scope of effects to consider will vary with each site. If the permittee is having difficulty determining whether their project is likely to adversely affect listed species or critical habitat, or one of the Services has already raised concerns to the permittee, the permittee must contact the appropriate office of the FWS, NMFS or Natural Heritage Center for assistance. If adverse effects are not likely, then the permittee may check box E on the NOI form and apply for coverage under the CGP. If the discharge may adversely effect listed species or critical habitat, you must follow Step Three.

Step Three: Determine if Measures Can Be Implemented to Avoid Adverse Effects

If the permittee makes a preliminary determination that adverse effects are likely to occur, the permittee can still receive coverage under Criterion E of Part 1.3.3.6 of the CGP if appropriate measures are undertaken to avoid or eliminate the likelihood of adverse effects prior to applying for CGP coverage. These measures may involve relatively simple changes to construction activities such as re-routing a storm water discharge to bypass an area where species are located, relocating BMPs, or by changing the “footprint” of the construction activity. The permittee should contact the FWS and/or NMFS to see what appropriate measures might be suitable to avoid or eliminate the likelihood of adverse impacts to listed species and/or critical habitat. (See 50 CFR §402.13(b)). This can entail the initiation of informal consultation with the FWS and/or NMFS (described in more detail in Step Four).

If the permittee adopts measures to avoid or eliminate adverse affects, the permittee must continue to abide by those measures for the duration of the construction project and coverage under the CGP. These measures must be described in the SWPPP and are enforceable CGP conditions and/or conditions for meeting the eligibility criteria in Part 1.3. If appropriate measures to avoid the likelihood of adverse effects are not available, the permittee must follow Step Four.

Step Four: Determine if the Eligibility Requirements of Criterion B, C, D, or F of Part 1.3.3.6 Can Be Met

Where adverse effects are likely, the permittee must contact the FWS and/or NMFS. The permittee may still be eligible for CGP coverage if any likely adverse effects can be addressed through meeting Criterion B, C, D, or F of Part 1.3.3.6 of the CGP. These criteria are as follows:

1. *An ESA Section 7 Consultation Is Performed for Your Activity (See Criterion B or C of Part 1.3.3.6 of the CGP).*

Formal or informal ESA section 7 consultation is performed with the FWS and/or NMFS that addresses the effects of the permittee's storm water discharges and storm water discharge-related activities on federally-listed and threatened species and designated critical habitat. FWS and/or NMFS may request that consultation take place if any actions are identified that may affect listed species or critical habitat. In order to be eligible for coverage under this permit, consultation must result in a "no jeopardy opinion" or a written concurrence by the Service(s) on a finding that the permittee's storm water discharge(s) and storm water discharge-related activities are not likely to adversely affect listed species or critical habitat (For more information on consultation, see 50 CFR §402). If the permittee receives a "jeopardy opinion," the permittee may continue to work with the FWS and/or NMFS and ADEC to modify the permittee's project so that it will not jeopardize listed species or designated critical habitat.

Most consultations are accomplished through informal consultation. By the terms of this CGP, EPA has automatically designated operators as non-federal representatives for the purpose of conducting informal consultations. See Part 1.3.3.6 and 50 CFR §402.08 and §402.13. When conducting informal ESA section 7 consultation as a non-federal representative, the permittee must follow the procedures found in 50 CFR Part 402 of the ESA regulations. The permittee must notify FWS and/or NMFS of their intention and agreement to conduct consultation as a non-federal representative.

Consultation may occur in the context of another federal action at the construction site (e.g., where ESA section 7 consultation was performed for issuance of a wetlands dredge and fill permit for the project or where a NEPA review is performed for the project that incorporates a section 7 consultation). Any terms and conditions developed through consultations to protect listed species and critical habitat must be incorporated into the SWPPP. As noted above, operators may, if they wish, initiate consultation with the Services at Step Four.

Whether ESA section 7 consultation must be performed with either the FWS, NMFS or both Services depends on the listed species that may be affected by the permittee's activity. In general, NMFS has jurisdiction over marine, estuaries, and anadromous species. Operators should also be aware that while formal section 7 consultation provides protection from incidental takings liability, informal consultation does not.

2. *An Incidental Taking Permit Under Section 10 of the ESA is Issued for the Permittee's Activity (See Criterion D of Part 1.3.3.6 of the CGP).*

The permittee's construction activities are authorized through the issuance of a permit under section 10 of the ESA and that authorization addresses the effects of your storm water discharge(s) and storm water discharge-related activities on federally-listed species and designated critical habitat. The permittee must follow FWS and/or NMFS procedures when applying for an ESA Section 10 permit (see 50 CFR §17.22(b)(1) for FWS and §222.22 for NMFS). Application instructions for section 10 permits for FWS and NMFS can be obtained by accessing the FWS and NMFS websites (http://www.fws.gov and http://www.nmfs.noaa.gov) or by contacting the appropriate FWS and NMFS regional office.

3. *The permittee is Covered Under the Eligibility Certification of Another Permittee for the Project Area (See Criterion F of Part 1.3.3.6 of the CGP).*

The permittee's storm water discharges and storm water discharge-related activities were already addressed in another operator's certification of eligibility under Criteria A through E of Part 1.3.3.6 which also included the permittee's project area. For example, a general contractor or developer may have completed and filed an NOI for the entire project area with the necessary Endangered Species Act certifications (criteria A-E), subcontractors may then rely upon that certification and must comply with any conditions resulting from that process. By certifying eligibility under Criterion F of Part 1.3.3.6, the permittee agrees to comply with any measures or controls upon which the other permittee's certification under Criterion B, C, or D of Part 1.3.3.6 was based. Certification under Criterion F of Part 1.3.3.6 is discussed in more detail in the Fact Sheet that accompanies this permit.

The permittee must comply with any terms and conditions imposed under the eligibility requirements of Criterion A through F to ensure that their storm water discharges and storm water discharge-related activities are protective of listed species and/or critical habitat. Such terms and conditions must be incorporated in the project's SWPPP. If the eligibility requirements of Part 1.3.3.6 cannot be met, then the permittee is not eligible for coverage under the CGP. In these instances, the permittee may consider applying to ADEC for an individual permit.

Appendix D

Notice of Intent (NOI) Form

Appendix D –Notice of Intent (NOI) Form

From the effective date of this permit, to obtain coverage under this permit, an owner or operator must submit a Notice of Intent (NOI). The owner or operator must either (1) apply for coverage using ADEC's electronic Notice of Intent (eNOI) system, available at http://www.dec.state.ak.us/water/wnpspc/stormwater/index.htm , or (2) file a paper copy of the NOI which is available at the above website and sent to the address given in Part 2.2 of this permit.

Appendix E

Notice of Termination (NOT) Form

Appendix E – Notice of Termination (NOT) Form

From the effective date of this permit, to terminate coverage under this permit, the permittee must submit a Notice of Termination (NOT). The permittee must either (1) terminate coverage using ADEC's electronic NOI system, available at http://www.dec.state.ak.us/water/wnpspc/stormwater/index.htm , or (2) file a paper copy of the NOT which is available at the above website and sent to the address given in Part 2.2 of this permit.

Appendix F

Standard Permit Conditions

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Appendix F, Standard Conditions is an integral and enforceable part of the permit. Failure to comply with a Standard Condition in this Appendix constitutes a violation of the permit and is subject to enforcement.

1.0 Standard Conditions Applicable to All Permits

1.1 Contact Information and Addresses

1.1.1 Permitting Program

Documents, reports, and plans required under the permit and Appendix F are to be sent to the following address:

Alaska Department of Environmental Conservation
Division of Water
WDAP – Storm Water Section
555 Cordova Street
Anchorage, Alaska 99501
Telephone (907) 269-6285
Fax (907) 269-7508
Email: DEC.Water.WQPermit@alaska.gov

1.1.2 Compliance and Enforcement Program

Documents and reports required under the permit and Appendix F relating to compliance are to be sent to the following address:

Alaska Department of Environmental Conservation
Division of Water
Compliance and Enforcement Program
555 Cordova Street
Anchorage, Alaska 99501
Telephone Nationwide (877) 569-4114
Anchorage Area / International (907) 269-4114
Fax (907) 269-4604
Email: dec-wqreporting@alaska.gov

1.2 Duty to Comply

The permittee shall comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and applicable state law is grounds for enforcement action by ADEC including termination, revocation and

reissuance, modification of a permit, or denial of a permit renewal application. A permittee shall comply with effluent standards or prohibitions established under 33 U.S.C. §1317(a) for toxic pollutants within the time provided in the regulations that establish those effluent standards or prohibitions even if the permit has not yet been modified to incorporate the requirement.

1.3 Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after its expiration date, the permittee must apply for and obtain a new permit. In accordance with 18 AAC 83.105(b), the permittee with a currently effective permit shall reapply by submitting a new application at least 180 days before the existing permit expires, unless the Department has granted the permittee permission to submit an application on a later date. However, the Department will not grant permission for an application to be submitted after the expiration date of the existing permit.

1.4 Need to Halt or Reduce Activity Not a Defense

In an enforcement action, the permittee shall not assert as a defense that compliance with the conditions of the permit would have made it necessary for the permittee to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

1.5 Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

1.6 Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which the permittee installs or uses to achieve compliance with the conditions of the permit. The permittee's duty to properly operate and maintain includes using adequate laboratory controls and appropriate quality assurance procedures. However, the permittee is not required to operate back-up or auxiliary facilities or similar systems that the permittee installs unless operation of those facilities is necessary to achieve compliance with the conditions of this permit.

1.7 Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause as provided in 18 AAC 83.130. If the permittee files a request to modify, revoke and reissue, or terminate a permit, or gives notice of planned changes or anticipated noncompliance, the filing or notice does not stay any permit condition.

1.8 Property Rights

The permit does not convey any property rights or exclusive privilege.

1.9 Duty to Provide Information

The permittee shall, within a reasonable time, provide to the Department any information that the Department requests to determine whether a permittee is in compliance with the permit, or whether cause exists to modify, revoke and reissue, or terminate the permit. A permittee shall also provide to the Department, upon request, copies of any records the permittee is required to keep under the permit.

1.10 Inspection and Entry

A permittee shall allow the Department, or an authorized representative, including a contractor acting as a representative of the Department, at reasonable times and upon presentation of credentials and any other documents as may be required by law, to:

1.10.1 Enter the premises where the permittee's regulated facility or activity is located or conducted, or where permit conditions require records to be kept;

1.10.2 Have access to and copy any records that permit conditions require the permittee to keep;

1.10.3 Inspect any facilities, equipment, including monitoring and control equipment, practices, or operations regulated or required under this permit; and

1.10.4 Sample or monitor any substances or parameters at any location for the purpose of assuring permit compliance or as otherwise authorized by the Clean Water Act.

1.11 Monitoring and Records

The permittee must comply with the following monitoring and recordkeeping conditions:

1.11.1 Samples and measurements taken for the purpose of monitoring must be representative of the monitored activity.

1.11.2 The permittee shall retain records in Alaska of all monitoring information for at least three (3) years, or longer at the Department's request at any time, from the date of the sample, measurement, report, or application. Monitoring records required to be kept include:

1.11.2.1 All calibration and maintenance records;

1.11.2.2 All original strip chart recordings or other forms of data approved by the Department for continuous monitoring instrumentation;

1.11.2.3 All reports required by this permit;

1.11.2.4 Records of all data used to complete the application for this permit;

1.11.2.5 Field logbooks or visual monitoring logbooks;

1.11.2.6 Quality assurance chain of custody forms;

1.11.2.7 Copies of discharge monitoring reports; and

1.11.2.8 A copy of this permit.

1.11.3 Records of monitoring information must include:

1.11.3.1 The date, exact place, and time of any sampling or measurement;

1.11.3.2 The name(s) of any individual(s) who performed the sampling or measurements;

1.11.3.3 The date(s) and time any analysis was performed;

1.11.3.4 The name(s) of any individual(s) who performed any analysis;

1.11.3.5 Any analytical technique or method used; and

1.11.3.6 The results of the analyses.

1.11.4 Monitoring Procedures

Analyses of pollutants using test procedures approved under 40 CFR Part 136, adopted by reference at 18 AAC 83.010, for pollutants with approved test procedures, and using test procedures specified in the permit for pollutants without approved methods.

1.12 Signature Requirements and Penalties

1.12.1 Any application, report, or information submitted to the Department in compliance with requirement of this permit must be signed and certified in accordance with 18 AAC 83.385. Any person who knowingly makes any false material statement, representation, or certification in any application, record, report, or other document filed or required to be maintained under a permit, or who knowingly falsifies, tampers with, or renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be subject to penalties under 33 U.S.C. §1319(c)(4) and

1.12.2 In accordance with 18 AAC 83.385, any application for coverage under this permit (e.g. NOI) must be signed as follows:

1.12.2.1 For a corporation, by a responsible corporate officer; or

1.12.2.2 For a partnership or sole proprietorship, by the general partner or the proprietor, respectively; or

1.12.2.3 For a municipality, state, federal, or other public agency, by either a principal executive officer or ranking elected official.

1.12.3 In accordance with 18 AAC 83.385, any report required by this permit, including the SWPPP, and a submittal with any other information requested by the Department, must be signed by a person described in Appendix F, Part 1.12.2, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

1.12.3.1 The authorization is made in writing by a person described in Appendix F, Part 1.12.2;

1.12.3.2 The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, including the position of plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility; or an individual or position having overall responsibility for environmental matters for the company; and

1.12.3.3 The written authorization is submitted to the Department to the Permitting Program address in Appendix F, Part 1.1.1, or included in the SWPPP.

1.12.4 Changes to Authorization. If an authorization under Appendix F, Part 1.12.3 is no longer effective because a different individual or position has responsibility for the overall operation of the regulated facility or activity, a new NOI satisfying the requirements of Appendix F, Part 1.12.3 must be submitted to the Department, or included in the SWPPP, prior to or together with any report, information, or application to be signed by an authorized representative.

1.12.5 Any person signing a document under Appendix F, Part 1.12.2 or Part 1.12.3 shall certify as follows:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

1.13 Proprietary or Confidential Information

1.13.1 A permit applicant or permittee may assert a claim of confidentiality for proprietary or confidential business information by stamping the words "confidential business information" on each page of a submission containing proprietary or confidential business information. The Department will treat the stamped submissions as confidential if the information satisfies the test in 40 CFR §2.208, adopted by reference in 18 AAC 83.010, and is not otherwise required to be made public by state law.

1.13.2 A claim of confidentiality under Appendix F, Part 1.13.1 may not be asserted for the name and address of any permit applicant or permittee, a permit application, a permit, effluent data, sewage sludge data, and information required by APDES or NPDES application forms provided by the Department, whether submitted on the forms themselves or in any attachments used to supply information required by the forms.

1.13.3 A permittee's claim of confidentiality authorized under Appendix F, Part 1.13.1 is not waived if the Department provides the proprietary or confidential business information to the EPA or to other agencies participating in the permitting process. The Department will supply any information obtained or used in the administration of the state APDES program to the EPA upon request under 40 CFR §123.41, as revised as of July 1, 2005. When providing information submitted to the Department with a claim of confidentiality to the EPA, the Department will notify the EPA of the confidentiality claim. If the Department provides the EPA information that is not claimed to be confidential, the EPA may make the information available to the public without further notice.

1.14 Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject to under any applicable state laws addressing oil and hazardous substances.

1.15 Cultural and Paleontological Resources

If cultural or paleontological resources are discovered after the initial commencement of construction activities, work that would disturb such resources is to be stopped, and the Office of History and Archaeology, a Division of Parks and Outdoor Recreation of the Alaska Department of Natural Resources (http://www.dnr.state.ak.us/parks/oha/), is to be notified immediately at (907) 269-8721.

1.16 Fee

The permittee must pay the appropriate permit fee described in 18 AAC 72.

1.17 Other Legal Obligations

To the extent not otherwise included in any of the other standard conditions covered under this subpart, any other permit conditions generally required to be included in an APDES permit under 18 AAC 83 are hereby incorporated by reference and applicable to this permit. This permit does not relieve the permittee from the duty to obtain any other necessary permits from the Department or from other local, state, or federal agencies and to comply with the requirements contained in any such permits. All activities conducted and all plan approvals implemented by the permittee pursuant to the terms of this permit shall comply with all applicable local, state, and federal laws and regulations.

2.0 Special Reporting Obligations

2.1 Planned Changes

2.1.1 The permittee shall give notice to the Department as soon as possible of any planned physical alteration or addition to the permitted facility if:

2.1.1.1 The alteration or addition may make the facility a “new source” under one or more of the criteria in 18 AAC 83.990(44); or

2.1.1.2 The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged if those pollutants are not subject to effluent limitations in the permit or to notification requirements under 18 AAC 83.610.

2.1.2 If the proposed changes are subject to plan review, then the plans must be submitted at least thirty (30) days before implementation of changes (see 18 AAC 15.020 and 18 AAC 72 for plan review requirements). Written approval is not required for an emergency repair or routine maintenance.

2.1.3 Written notice must be sent to the Permitting Program address in Appendix F, Part 1.1.1, or included in the SWPPP.

2.2 Anticipated Noncompliance

2.2.1 The permittee shall give seven (7) days’ notice to the Department before commencing any planned change in the permitted facility or activity that may result in noncompliance with permit requirements.

2.2.2 Written notice must be sent to the Compliance and Enforcement Program address in Appendix F, Part 1.1.2.

2.3 Transfers

2.3.1 The permittee may not transfer a permit for a facility or activity to any person except after written notice to the Department in accordance with 18 AAC 83.150. The Department may modify or revoke and reissue the permit to change the name of the permittee and incorporate such other requirements under the Clean Water Act or any applicable state law.

2.3.2 Written notice must be sent to the Permitting Program address in Appendix F, Part 1.1.1.

2.4 Compliance Schedules

2.4.1 The permittee must submit progress or compliance reports on interim and final requirements in any compliance schedule of this permit no later than fourteen (14) days following each schedule date.

2.4.2 Written notice must be sent to the Compliance and Enforcement Program address in Appendix F, Part 1.1.2.

2.5 Corrective Information

2.5.1 If the permittee becomes aware that it failed to submit a relevant fact in a permit application or submitted incorrect information in a permit application or in any report to the Department, the permittee shall promptly submit the relevant fact or the correct information.

2.5.2 Information must be sent to the Permitting Program address in Appendix F, Part 1.1.1.

2.6 Bypass

2.6.1 Prohibition of Bypass

Bypass is prohibited. The Department may take enforcement action against the permittee for any bypass, unless:

2.6.1.1 The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

2.6.1.2 There were no feasible alternatives to the bypass, including use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. However, this condition is not satisfied if the permittee, in the exercise of reasonable engineering judgment, should have installed adequate back-up equipment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance; and

2.6.1.3 The permittee provides notice to the Department of a bypass event in the manner, as appropriate, under Appendix F, Part 2.6.2.

2.6.2 Notice of bypass

2.6.2.1 For an anticipated bypass, the permittee submits written notice at least ten (10) days before the date of the bypass. The Department may approve an anticipated bypass, after considering its adverse effects, if the Department determines that it will meet the conditions of Appendix F, Parts 2.6.1.1 and 2.6.1.2.

2.6.2.2 For an unanticipated bypass, the permittee submits 24-hour notice, as required in 18 AAC 83.410(f) and Appendix F, Part 3.4, Twenty-four Hour Reporting.

2.6.2.3 Written notice must be sent to the Compliance and Enforcement Program address in Appendix F, Part 1.1.2.

2.6.3 Notwithstanding Appendix F, Part 2.6.1, a permittee may allow a bypass that:

2.6.3.1 Does not cause an effluent limitation to be exceeded, and

2.6.3.2 Is for essential maintenance to assure efficient operation.

2.7 Upset

2.7.1 In any enforcement action for noncompliance with technology-based permit effluent limitations, the permittee may claim upset as an affirmative defense. A permittee seeking to establish the occurrence of an upset has the burden of proof to show that the requirements of Appendix F, Part 2.7.2 are met.

2.7.2 To establish the affirmative defense of upset, the permittee must demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that:

2.7.2.1 An upset occurred and the permittee can identify the cause or causes of the upset;

2.7.2.2 The permitted facility was at the time being properly operated;

2.7.2.3 The permittee submitted 24-hour notice of the upset, as required in 18 AAC 83.410(f) and Appendix F, Part 3.4, Twenty-four Hour Reporting; and

2.7.2.4 The permittee complied with any mitigation measures required under 18 AAC 83.405(e) and Appendix F, Part 1.5, Duty to Mitigate.

2.7.3 Any determination made in administrative review of a claim that noncompliance was caused by upset, before an action for noncompliance is commenced, is not final administrative action subject to judicial review.

3.0 Monitoring, Recording, and Reporting Requirements

3.1 Representative Sampling

If the permittee is required to collect effluent samples by this permit, the permittee must collect effluent samples from the effluent stream after the last treatment unit before discharge into the receiving waters. Samples and measurements must be representative of the volume and nature of the monitored activity or discharge.

3.2 Reporting of Monitoring Results

At intervals specified in the permit, monitoring results must be reported on the EPA discharge monitoring report (DMR) form, as revised as of March 1999, adopted by reference.

3.2.1 Monitoring results shall be summarized each month on the DMR form or an approved equivalent report. The permittee must submit the DMR form or equivalent report on a monthly basis postmarked by the 15th day of the following month.

3.2.2 The permittee must sign and certify all DMRs and all other reports in accordance with the requirements of Appendix F, Part 1.11, Signatory Requirements and Penalties. All signed and certified legible original DMRs and all other reports and documents must be submitted to the Department at the Compliance and Enforcement Program address in Appendix F, Part 1.1.2.

3.2.3 If, during the period when this permit is effective, the Department makes available electronic reporting, the permittee may, as an alternative to the requirements of Appendix F, Part 3.2.2, submit monthly DMRs electronically by the 15th day of the following month in accordance with guidance provided by the Department. The permittee must certify all DMRs and other reports, in accordance with the requirements of Appendix F, Part 1.12. The permittee must retain the legible originals of these documents and make them available to the Department upon request.

3.3 Additional Monitoring by Permittee

If the permittee monitors any pollutant more frequently than the permit requires using test procedures approved in 40 CFR Part 136, adopted by reference in 18 AAC 83.010, or as specified in this permit, the results of that additional monitoring must be included in the calculation and reporting of the data submitted in the DMR required by Appendix F, Part 3.2. All limitations that require averaging of measurements must be calculated using an arithmetic means unless the Department specifies another method in the permit. Upon request by the Department, the permittee must submit the results of any other sampling and monitoring regardless of the test method used.

3.4 Twenty-four Hour Reporting

The permittee shall report any noncompliance event that may endanger health or the environment as follows:

3.4.1 A report must be made:

3.4.1.1 Orally within 24 hours after the permittee becomes aware of the circumstances, and

3.4.1.2 In writing within five (5) days after the permittee becomes aware of the circumstances.

3.4.2 A report must include the following information:

3.4.2.1 A description of the noncompliance and its causes, including the specific details of the noncompliance;

3.4.2.2 The period of noncompliance, including exact dates and times;

3.4.2.3 If the noncompliance has not been corrected, a statement regarding the anticipated time the noncompliance is expected to continue; and

3.4.2.4 Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

3.4.3 An event that must be reported within 24 hours includes:

3.4.3.1 An unanticipated bypass that exceeds any effluent limitation in the permit (see Appendix F, Part 2.6, Bypass).

3.4.3.2 An upset that exceeds any effluent limitation in the permit (see Appendix F, Part 2.7, Upset).

3.4.3.3 A violation of a maximum daily discharge limitation for any of the pollutants listed in the permit as requiring 24-hour reporting.

3.4.4 The Department may waive the written report on a case-by-case basis for reports under Appendix F, Part 3.4 if the oral report has been received within 24 hours of the permittee becoming aware of the noncompliance event.

3.4.5 The permittee may satisfy the written reporting submission requirements of Appendix F, Part 3.4.1.2 by submitting the written report via e-mail, if the following conditions are met:

3.4.5.1 The written report includes all the information required under Appendix F, Part 3.4.2;

3.4.5.2 The written report is properly certified and signed in accordance with 18 AAC 83.385 and 18 AAC 83.405(*l*);

3.4.5.3 The written report is scanned as a PDF (portable document format) document and transmitted to the Department as an attachment to the e-mail; and

3.4.5.4 The permittee retains in the SWPPP the original signed and certified written report.

3.4.6 The e-mail and PDF written report will satisfy the written report submission requirements of this permit provided the e-mail is received by the Department within five (5) days after the time the permittee becomes aware of the noncompliance event and the e-mail and written report satisfy the criteria of Part 3.4.5. The e-mail address to report noncompliance to ADEC is at: dec-wqreporting@alaska.gov

3.5 Other Noncompliance Reporting

The permittee shall report all instances of noncompliance not required to be reported under Appendix F, Parts 2.4 (Compliance Schedules), 3.3 (Additional Monitoring by Permittee), and 3.4 (Twenty-four Hour Reporting) at the time the permittee submits monitoring reports under Appendix F, Part 3.2 (Reporting of Monitoring Results). A report of noncompliance under this part must contain the information listed in Appendix F, Part 3.4.2 and be sent to the Compliance and Enforcement Program address in Appendix F, Part 1.1.2.

4.0 Penalties for Violations of Permit Conditions

Alaska laws allow the State to pursue both civil and criminal actions concurrently for violations of the conditions of this permit.

4.1 Civil Action

Under AS 46.03.760(e), a person who violates or causes or permits to be violated a regulation, a lawful order of the Department, or a permit, approval, or acceptance, or term or condition of a permit, approval or acceptance issued under the program authorized by AS 46.03.020 (12) is liable, in a civil action, to the state for a sum to be assessed by the court of not less than $500 nor more than $100,000 for the initial violation, nor more than $5,000 for each day after that on which the violation continues, and that shall reflect, when applicable:

4.1.1 Reasonable compensation in the nature of liquated damages for any adverse environmental effects caused by the violation, that shall be determined by the court according to the toxicity, degradability, and dispersal characteristics of the substance discharged, the sensitivity of the receiving environment, and the degree to which the discharge degrades existing environmental quality;

4.1.2 Reasonable costs incurred by the state in detection, investigation, and attempted correction of the violation;

4.1.3 The economic savings realized by the person in not complying with the requirements for which a violation is charged; and

4.1.4 The need for an enhanced civil penalty to deter future noncompliance.

4.2 Civil Injunctive Relief

4.2.1 Under AS 46.03.820, the Department may, without prior hearing, where a person is causing, engaging, or maintaining a condition or activity which in the judgment of the Department presents an imminent or present danger to the health or welfare of the people of the State of Alaska that would be likely to result in irreversible damage to the natural resources or environment, order that person to immediately discontinue, abate, or alleviate the condition or activity. Upon receipt of notice of such an order, the proscribed condition or activity shall be immediately discontinued, abated, or alleviated.

4.2.2 Under AS 46.03.765, the Department can bring an action in Alaska Superior Court seeking to enjoin ongoing or threatened violations for Department-issued permits and Department statutes and regulations.

4.3 Criminal Action

Under AS 46.03.790(h), a person is guilty of a Class A misdemeanor if the person negligently:

4.3.1 Violates a regulation adopted by the Department under AS 46.03.020(12);

4.3.2 Violates a permit issued under the program authorized by AS 46.03.020(12);

4.3.3 Fails to provide information or provides false information required by a regulation adopted under AS 46.03.020(12);

4.3.4 Makes a false statement, representation, or certification in an application, notice, record, report, permit, or other document filed, maintained, or used for purposes of compliance with a permit issued under or a regulation adopted under AS 46.03.020(12); or

4.3.5 Renders inaccurate a monitoring device or method required to be maintained by a permit issued or under a regulation adopted under AS 46.03.020(12).

4.4 Other Fines

Upon conviction of a violation of a regulation adopted under AS 46.03.020(12), AS 46.03.790(g) provides that a defendant who is not an organization may be sentenced to pay a fine of not more than $10,000 for each separate violation.

EXHIBIT C

Notice of Intent (NOI) Form
Notice of Termination (NOT) Form

For Agency Use
Permit #_____

Notice of Termination (NOT) of Coverage for Storm Water Discharges Associated with Construction Activity Under an APDES Construction General Permit

Submission of this Notice of Termination (NOT) constitutes notice that the party identified in Section II of this form is no longer authorized to discharge storm water associated with construction activity under the APDES program for the site identified in Section III of this form. All necessary information must be included on the form. Coverage under the APDES Construction General Permit (CGP) is terminated at midnight of the day the NOT is signed. The NOT must be submitted within 30 days of one of the conditions in Section 6.2 of the CGP being met. Refer to the instructions at the end of this form for information on submitting a NOT.

I. Permit Information

Permit Tracking Number:

Reason for Termination (Check only one):

- ☐ Final stabilization has been achieved on all portions of the site for which you are responsible.
- ☐ Another operator has assumed control, according to Appendix G, Section 11.C of the CGP, over all areas of the site that have not been finally stabilized.
- ☐ Coverage under an alternative APDES permit has been obtained.
- ☐ For residential construction only, temporary stabilization has been completed and the residence has been transferred to the homeowner.

II. Operator Information

Name:

Mailing Address:	Street (PO Box):		
	City:	State:	Zip:
	Phone:	Fax(optional):	
	Email:		

III. Project/Site Information

Project/Site Name:

Project Street/Location:

City: State: Alaska Zip:

Borough or similar government subdivision:

IV. Certification Information

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Printed Name: Title:

Signature: Date: Email:

Who May File an NOT Form

Permittees presently covered under the Alaska Pollutant Discharge Elimination System (APDES) General Permit for Storm Water Discharges Associated with Construction Activity may submit an NOT form when:

- *final stabilization has been achieved on all portions of the site for which you are responsible;*
- *another operator has assumed control, in accordance with Appendix G, Section 11.C of the General Permit, over all areas of the site that have not been finally stabilized;*
- *coverage under an alternative APDES permit has been obtained; or*
- *for residential construction only, temporary stabilization has been completed and the residence has been transferred to the homeowner.*

"Final stabilization" means that all soil disturbing activities at the site have been completed and that a uniform perennial vegetative cover with a density of at least 70% of the native background vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures (such as the use of riprap, gabions, or geotextiles) have been employed. See "final stabilization" definition in Appendix A of the Construction General Permit for further guidance where background native vegetation covers less than 100 percent of the ground, in arid or semi-arid areas, for individual lots in residential construction, and for construction projects on land used for agricultural purposes.

Completing the Form

Type or print, in the appropriate areas only. "NA" can be entered in areas that are not applicable. If you have any questions about how or when to use this form, contact the ADEC Storm Water Program at (907) 269-6285 or online at http://www.dec.state.ak.us/water/wnpspc/stormwater/stormwater.htm.

Section I. Permit Number

Enter the existing NPDES or APDES Storm water General Permit Tracking Number assigned to the project by EPA or ADEC's Storm water Program. If you do not know the tracking number, you can find the tracking number assigned to your facility on ADEC's Water Permit Search:
www.dec.state.ak.us/water/WaterPermitSearch/Search.aspx
or EPA's Notice of Intent (NOI) Search website (www.epa.gov/npdes/noisearch) if you submitted your NOI on EPA's website.

Indicate your reason for submitting this Notice of Termination by checking the appropriate box. Check only one.

Section II. Operator Information
a. Provide the legal name of the person, firm, public organization, or any other entity that operates the project described in this application and is covered by the permit tracking number identified in Section I. The operator of the project is the legal entity that controls the site operation, rather than the site manager.

b. Enter the operator's complete mailing address, telephone number, email address, and fax number (optional) of the operator.

Section III. Project/Site Information
Enter the official or legal name and complete street address, including city, state, zip code, and borough or similar government subdivision of the project or site. If the project or site lacks a street address, indicate the general location of the site (e.g., Intersection of State Highways 61 and 34). Complete site information must be provided for termination of permit coverage to be valid.

Section IV. Certification Information
The NOTs, must be signed as follows:

(1) For a corporation, a responsible corporate officer shall sign the NOT, a responsible corporate officer means:

(A) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation; or

(B) the manager of one or more manufacturing, production, or operating facilities, if

(i) the manager is authorized to make management decisions that govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental statutes and regulations;

(ii) the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and

(iii) authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) For a partnership or sole proprietorship, the general partner or the proprietor, respectively; or

(3) for a municipality, state, or other public agency, either a principal executive officer or ranking elected official shall sign the application; in this subsection, a principal executive officer of an agency means

(A) the chief executive officer of the agency; or

(B) a senior executive officer having responsibility for the overall operations of a principal geographic unit or division of the agency.

Include the name, title, and email address of the person signing the form and the date of signing. An unsigned or undated NOT form will not be considered valid termination of permit coverage.

Where to File NOT form
ADEC encourages you to complete the NOT form electronically via the Internet. ADEC's Online Application System (OASys) can be found at https://myalaska.state.ak.us/dec/water/opa. Filing electronically is the fastest way to terminate permit coverage and help ensure that your NOT is complete. If you choose not to file electronically, you must send the NOT to the address listed below.

If you file by mail, please submit the original form with a signature in ink. ADEC will not accept a photocopied signature. Remember to retain a copy for your records.

NOTs sent by mail:

Alaska Dept. of Environmental Conservation
Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, AK 99501
Phone: (907) 269-6285

For Agency Use
Permit #_____

Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity Under an APDES Construction General Permit

Submission of this Notice of Intent (NOI) constitutes notice that the party identified in Section I of this form requests authorization to discharge pursuant to the APDES Construction General Permit (CGP). Submission of this NOI also constitutes notice that the party identified in Section I of this form meets the eligibility requirements of the CGP for the project identified in Section II of this form. Permit coverage is required prior to commencement of construction activity until you are eligible to terminate coverage as detailed in the CGP. To obtain authorization, you must submit a complete and accurate NOI form. Refer to the instructions at the end of this form.

I. Operator Information

Name:			
Mailing Address:	Street (PO Box):		
	City:	State:	Zip:
	Phone:		Fax(optional):
	Email:		

II. Project/Site Information

Project/Site Name:			
Project Street/Location:			
City:	State:	Alaska	Zip:
Borough or similar government subdivision:			
Latitude:	Longitude:		
Determined By: ☐ GPS	☐ USGS topographic map	☐ Other:	
If you used a USGS topographic map, what was the scale?			
Estimated Project Start Date:	Estimated Project Completion Date:		
Estimated Area to be Disturbed (to the nearest quarter acre):			

III. SWPPP (Storm Water Pollution Prevention Plan)

Has the SWPPP been prepared in advance of filing this NOI?	☐ Yes	☐ No	
Location of SWPPP for Viewing:	☐ Address in Section I	☐ Address in Section II	☐ Other
If other:	SWPPP Street:		
	City:	State:	Zip:
	SWPPP Contact Information (if different than that in Section I):		
	Name:		
	Phone:		Fax(optional):
	Email:		

For Agency Use
Permit #_____

IV. Discharge Information	
Identify the name(s) of waterbodies to which you discharge:	
Is this discharge consistent with the assumptions and requirements of applicable EPA approved or established TMDL(s)?	☐ Yes ☐ No

V. Endangered Species Protection	
Under which criterion of Part 1.3.C.6 of the permit have you satisfied your ESA eligibility obligations?	
☐ A ☐ B ☐ C ☐ D ☐ E ☐ F	
If you select criterion F, provide permit tracking number of operator under which you are certifying eligibility:	

VI. Certification Information		
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.		
Printed Name:	Title:	
Signature:	Date:	Email:
NOI Preparer (Complete if NOI was prepared by someone other than the certifier)		
Prepared By:		
Organization:		
Phone:	Email:	

Who Must File an NOI Form:
Operators of construction sites where one or more acres are disturbed, smaller sites that are part of a larger common plan of development or sale where there is a cumulative disturbance of at least one acre, or any other site specifically designated by the Director, must submit an NOI to obtain coverage under an APDES construction general permit. Each person, firm, public organization, or any other entity that meets either of the following criteria must file this form: (1) they have operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or (2) they have day-to-day operational control of those activities at the project necessary to ensure compliance with SWPPP requirements or other permit conditions.

Completing the Form

Type or print, in the appropriate areas only. "NA" can be entered in areas that are not applicable. If you have any questions about how or when to use this form, contact the ADEC Storm Water Program at (907) 269-6285 or online at http://www.dec.state.ak.us/water/wnpspc/stormwater/.

Section I. Operator Information:
Provide the legal name of the person, firm, public organization, or any other entity that operates the project described in this application. An operator of a project is a legal entity that controls at least a portion of site operations and is not necessarily the site manager. Also provide the operator's mailing address, telephone number, fax number (optional) and e-mail address (to be notified via e-mail of NOI approval when available). Correspondence for the NOI will be sent to this address.

Section II. Project/Site Information:
Enter the official or legal name and complete street address, including city, state, zip code, and county or similar government subdivision of the project or site. If the project or site lacks a street address, indicate the general location of the site (e.g., Intersection of State Highways 61 and 34). Complete site information must be provided for permit coverage to be granted.

The applicant must also provide the latitude and longitude of the facility either in degrees, minutes, seconds; degrees, minutes, decimal; or decimal format. The latitude and longitude of your facility can be determined in several different ways, including through the use of global positioning system (GPS) receivers, U.S. Geological Survey (U.S.G.S.) topographic or quadrangle maps, and EPA's web-based siting tools, among others. Refer to www.epa.gov/npdes/stormwater/cgp for further guidance on the use of these methodologies. For consistency, ADEC requests that measurements be taken from the approximate center of the construction site. Applicants must specify which method they used to determine latitude and longitude. If a U.S.G.S. topographic map is used, applicants are required to specify the scale of the map used. Enter the estimated construction start and completion dates using four digits for the year (i.e., 05/27/2009).

Enter the estimated area to be disturbed including but not limited to: grubbing, excavation, grading, and utilities and infrastructure installation. Indicate to the nearest quarter acre. Note: 1 acre = 43,560 sq. ft.

Section III. SWPPP (Storm Water Pollution Prevention Plan) Information:
Indicate whether or not the SWPPP was prepared in advance of filing the NOI form. Check the appropriate box for the location where the SWPPP may be viewed. Provide the name, fax number (optional), and e-mail address of the contact person if different than that listed in Section I of the NOI form.

Section IV. Discharge Information:
Enter the name(s) of receiving water bodies to which the project's storm water will discharge. These should be the first bodies of water that the discharge will reach. (Note: If you discharge to more than one water body, please indicate all such waters in the space provided and attach a separate sheet if necessary.) For example, if the discharge leaves your site and travels through a roadside swale or a storm sewer and then enters a stream that flows to a river, the stream would be the receiving water body. Waters of the U.S. include lakes, streams, creeks, rivers, wetlands, impoundments, estuaries, bays, oceans, and other surface bodies of water within the confines of the U.S. and U.S. coastal waters. Waters of the U.S. do not include man-made structures created solely for the purpose of wastewater treatment. U.S.G.S. topographical maps may be used to make this determination. If the map does not provide a name, use a format such as "unnamed tributary to Cross Creek". If you discharge into a municipal separate storm sewer system (MS4), you must identify the water body into which that portion of the storm sewer discharges. That information should be readily available from the operator of the MS4.

Indicate whether your storm water discharges from construction activities will be consistent with the assumptions and requirements of applicable EPA approved or established total maximum daily load(s)(TMDL(s)). To answer this question, refer to www.epa.gov/npdes/stormwater/cgp for state- and regional-specific TMDL information related to the construction general permit. You may also have to contact ADEC. If there are no applicable TMDLs or no related requirements, please check the "yes" box in the NOI form.

Section V. Endangered Species Information:
Indicate for which criterion (i.e., A, B, C, D, E, or F) of the permit the applicant is eligible with regard to protection of federally listed endangered and threatened species and designated critical habitat. See Part 1.3.C.6 and Appendix C of the permit. If you select criterion F, provide the permit tracking number of the operator under which you are certifying eligibility. The permit tracking number is the number assigned to the operator by ADEC Storm Water Program after ADEC's acceptance of the NOI.

Section VI. Certification Information:
The NOIs, must be signed as follows:

(1) For a corporation, a responsible corporate officer shall sign the NOI, a responsible corporate officer means:

(A) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation; or

(B) the manager of one or more manufacturing, production, or operating facilities, if

(i) the manager is authorized to make management decisions that govern the operation of the regulated facility, including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental statutes and regulations;
(ii) the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and
(iii) authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(2) For a partnership or sole proprietorship, the general partner or the proprietor, respectively; or

(3) for a municipality, state, or other public agency, either a principal executive officer or ranking elected official shall sign the application; in this subsection, a principal executive officer of an agency means

(A) the chief executive officer of the agency; or

(B) a senior executive officer having responsibility for the overall operations of a principal geographic unit or division of the agency.

Include the name, title, and email address of the person signing the form and the date of signing. An unsigned or undated NOI form will not be considered valid application for permit coverage. If the NOI was prepared by someone other than the certifier (for example, if the NOI was prepared by the facility SWPPP contact or a consultant for the certifier's signature), include the name, organization, telephone number and email address of the NOI preparer.

Where to File NOI form
ADEC encourages you to complete the NOI form electronically via the Internet. ADEC's Online Application System (OASys) can be found at https://myalaska.state.ak.us/dec/water/opa . Filing electronically is the fastest way to obtain permit coverage and help ensure that your NOI is complete. If you choose not to file electronically, you must send the NOI to the address listed below.

If you file by mail, please submit the original form with a signature in ink. ADEC will not accept a photocopied signature. Remember to retain a copy for your records.

NOIs sent by mail:

Alaska Dept. of Environmental Conservation
Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, AK 99501
Phone: (907) 269-6285

EXHIBIT D

Inspection Report Form

National Pollutant Discharge Elimination System
Construction Activity
SWPPP Inspection Report Form 25D-100

Date: _____

Project No. _____

Project Name: _____

Inspectors: _____

Contractor: _____

Type of Inspection (check one): Weekly: ☐ 0.5 inches or greater rainfall: ☐ Monthly: ☐

Site Status (check one): ☐ Active ☐ Inactive ☐ Completed

Site Conditions: In compliance with approved plan? ☐ Yes ☐ No
Approved plan is adequate for the site? ☐ Yes ☐ No

If no, explain deficiencies and list corrective actions on a continuation sheet (Form 25D-065)

1. Are erosion control measures identified in the SWPPP such as silt fence, straw bake dikes, diversion channels, etc., functioning properly? Yes ☐ No ☐ If no, explain deficiencies and list corrective actions on a continuation sheet (Form 25D-065),

2. Are any vehicles tracking sediment offsite? Yes ☐ No ☐ If yes, explain deficiencies and list corrective actions on a continuation sheet (Form 25D-065).

3. Are any significant signs of erosion or sediment entering receiving waters adjacent to the project that are associated with the construction activity? Yes ☐ No ☐ If yes, explain deficiencies and list corrective actions on a continuation sheet (Form 25D-0065).

4. Is there any potential for pollutants to enter adjacent receiving waters from material storage areas or disposal sites? Yes ☐ No ☐ If yes, explain deficiencies and list corrective actions on a continuation sheet (Form 25D-065).

Note: Corrective actions listed may require an amendment to the SWPPP.

Actions to be taken:
No action necessary. Continue routine inspections ☐
Correct noted site deficiencies by (Date)
Submit SWPPP modifications as noted in written comments by (Date)
Final inspection, project completed (Date)

I certify under penalty of law that this document and all of the attachments were prepared under direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

U.S. Army Corps of Engineer, QAR: BCC-Jacobs Site Manager:

Signature: _____ Signature: _____

EXHIBIT E

Corrective Action Log

Exhibit E –Corrective Action Log

Project Name:
SWPPP Contact:

Inspection Date	Inspector Name(s)	Description of BMP Deficiency	Corrective Action Needed (including planned date/responsible person)	Date Action Taken/Responsible person

EXHIBIT F

SWPPP Amendment Log

Exhibit F –SWPPP Amendment Log

Project Name:
SWPPP Contact:

Amendment No.	Description of the Amendment	Date of Amendment	Amendment Prepared by [Name(s) and Title]

EXHIBIT G

Subcontractor Certifications/Agreements

Exhibit G –Subcontractor Certifications/Agreements

SUBCONTRACTOR CERTIFICATION
STORMWATER POLLUTION PREVENTION PLAN

Project Number: _____

Project Title: _____

Operator(s): _____

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the BMPs and practices described in the SWPPP.

This certification is hereby signed in reference to the above named project:

Company: _____

Address: _____

Telephone Number: _____

Type of construction service to be provided: _____

_____

Signature: _____

Title: _____

Date: _____

EXHIBIT H

Grading and Stabilization Activities Log

Exhibit H –Grading and Stabilization Activities Log

Project Name:
SWPPP Contact:

Date Grading Activity Initiated	Description of Grading Activity	Date Grading Activity Ceased (Indicate Temporary or Permanent)	Date When Stabilization Measures are Initiated	Description of Stabilization Measure and Location

EXHIBIT I

SWPPP Training Log

Exhibit I –SWPPP Training Log

Stormwater Pollution Prevention Training Log

Project Name:

Project Location:

Instructor's Name(s):

Instructor's Title(s):

Course Location: _____ Date: _____

Course Length (hours): _____

Stormwater Training Topic: *(check as appropriate)*

- ❑ Erosion Control BMPs
- ❑ Emergency Procedures
- ❑ Sediment Control BMPs
- ❑ Good Housekeeping BMPs
- ❑ Non-Stormwater BMPs

Specific Training Objective:_____

_____

Attendee Roster: *(attach additional pages as necessary)*

No.	Name of Attendee	Company
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

EXHIBIT J

Delegation of Authority Form

Exhibit J –Delegation of Authority Form

Delegation of Authority

I, _____ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the _____ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

_____ (name of person or position)
_____ (company)
_____ (address)
_____ (city, state, zip)
_____ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in Exhibit G, Subsection 11.A of EPA's Construction General Permit (CGP), and that the designee above meets the definition of a "duly authorized representative" as set forth in Exhibit G, Subsection 11.B (1-3).

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name:

Company:

Title: _____

Signature: _____

Date: _____

APPENDIX E

Waste Management Plan

FINAL

FORT WAINWRIGHT
POST WIDE WORK PLAN

APPENDIX E
Waste Management Plan

FORT WAINWRIGHT, ALASKA

MARCH 2011

U.S. Army Corps of Engineers, Alaska District
Environmental Remediation Services
Contract No. W911KB-06-D-0006
Task Order No. 20

JACOBS

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ACM	asbestos-containing material
CESQG	conditionally exempt small quantity generator
CFR	Code of Federal Regulations
DOT	U.S. Department of Transportation
DRO	diesel-range organics
EPA	U.S. Environmental Protection Agency
FSP	field sampling plan
GRO	gasoline-range organics
ID	identification
Jacobs	Jacobs Engineering Group Inc.
KVA	kilovolt amperes
MEC	munitions and explosives of concern
LDR	land disposal restrictions
mg/kg	milligram per kilogram
mg/L	milligram per liter
MSDS	Material Safety Data Sheet
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyls
PID	photoionization detector
POL	petroleum, oil, and lubricants
PPE	personal protective equipment
ppm	parts per million
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RRO	residual-range organics
TAH	total aromatic hydrocarbons
TAqH	total aqueous hydrocarbons
TCLP	Toxicity Characteristic Leaching Procedure

ACRONYMS AND ABBREVIATIONS (Continued)

TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
UXO	unexploded ordnance
VOC	volatile organic compounds
WMP	Waste Management Plan
WSC	Waste Subcontractor

1.0 INTRODUCTION

The purpose of this Waste Management Plan (WMP) document is to address the management of all anticipated waste streams that may be encountered during field activities and to summarize the methods that will be used to handle, store, and dispose of the wastes. This WMP also identifies the reporting requirements for disposal of the wastes. Wastes generated as part of the project will be managed by a waste management team. The team will include the U.S. Army Engineer District, Alaska (USAED), Jacobs Engineering Group Inc. (Jacobs), Jacobs subcontractors, and the Treatment Storage and Disposal Facilities (TSDF). The work described herein will be performed for the USAED under Environmental Restoration Services Contract No.W911KB-06-D-0006, Task Order Number 20 – Fort Wainwright Environmental Support.

Sections 2.0 through 9.0 address the management of all waste streams that may be produced during field activities at all Fort Wainwright (FWA) sites. Additional information on waste sampling is presented in the Field Sampling Plan (FSP) (Appendix B of the Work Plan) and the Quality Assurance Program Plan (QAPP) (Appendix C of the Work Plan).

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2.0 REGULATORY INFORMATION

The identification, characterization, and handling of wastes will be performed in accordance with the following regulations. This list is not intended as a complete reference for compliance with all regulations governing waste management activities:

- Hazardous waste will be managed in compliance with Title 40 of the *Code of Federal Regulations* (CFR), Sections 260 through 268 and 40 CFR 279, including the Resource Conservation and Recovery Act (RCRA), as well as Title 18 Alaska Administrative Code (AAC) Chapter 62. In addition, polychlorinated biphenyl (PCB) wastes will be handled in accordance with 40 CFR 761, Toxic Substances Control Act (TSCA).
- Radioactive materials and radiation-contaminated materials will be managed under the applicable portions of Titles 10, 40, and 49 of the CFR, depending upon the specific characteristics of the materials and/or waste. These materials will be defined and handled on a case-by-case basis.
- Munitions and Explosives of Concern (MEC) and munitions-related materials and wastes shall be managed in accordance with Department of Defense regulations as well as all applicable federal, state, and local requirements. Appendix H presents the MEC Plan, which details specific requirements and the anticipated types of MEC at FWA. All related work shall be conducted in close coordination with trained U.S. military and/or trained civilian Unexploded Ordnance (UXO) personnel, as applicable.
- Asbestos wastes will be managed in compliance with all applicable federal, state, and local regulations. Federal Occupational Safety and Health Administration (OSHA) regulations for asbestos management are included in 29 CFR 1926.1101; asbestos labeling requirements are included in 40 CFR 61.150.
- All nonregulated wastes will be managed and handled in accordance with all applicable federal, state, and local regulations and will be addressed in site-specific work plan addendums.
- Whenever possible, wastes shall be recycled to minimize disposal of wastes in landfills. Recycling may include energy recovery of a product.
- Mixed wastes will be managed in accordance with all applicable federal, state, and local regulations.

The following is a list of common regulatory references cover some packaging, labeling, marking, placarding, and waste accumulation tasks for hazardous wastes, but do not cover references for nonregulated wastes, radioactive materials, radiation-contaminated materials, MEC, asbestos wastes, and mixed wastes:

- Profiling in accordance with 40 CFR 261
- Packaging in accordance with 49 CFR 172, 173, and 178
- Labeling in accordance with 49 CFR 172.400 through 172.450
- Marking in accordance with 40 CFR 761.40 and 49 CFR 172.300 through 172.388
- Placarding in accordance with 49 CFR 172.500 through 172.560
- Waste accumulation per 40 CFR 262 and 18 AAC 61 (refer to Section 10)
- Emergency contact: Before shipping hazardous waste, the Jacobs subcontractor will submit a 24-hour emergency point of contact and a 24-hour telephone number to Jacobs per 49 CFR 172 Subpart G.)

Transportation and disposal of wastes will meet the aforementioned regulatory requirements. All waste will be accurately tracked and recorded in field logbooks that include the type of waste, location of the source, and amount generated. This information will also be recorded in the waste tracking spreadsheet, an example of which is presented as an attachment to this document (Attachment E-3). Any RCRA waste that may be generated will be shipped under a U.S. Army Corp of Engineers (USACE) RCRA Facility Identification (ID) Number AK6210022426. The ID number is specific to FWA and will be used for tracking purposes.

3.0 RESPONSIBILITIES

The waste management team consists of USAED, Jacobs, Jacobs' subcontractors, and the TSDF. Jacobs may perform the work described in this WMP using a combination of subcontractors. Project responsibilities are summarized in Table E-3-1.

Table E-3-1
Organization Responsibilities

Organization	Responsibilities
USAED	Responsible for providing technical guidance to Jacobs as related to waste management decisions. For management of waste from FWA sites, the Army is designated as the generator with U.S. Environmental Protection Agency (EPA) ID WAD058364647. A designated representative of USAED will be responsible for providing signatures for waste manifests. The USAED, on rare occasions, may delegate in writing to Jacobs the authority to sign on the behalf of the Army, if required.
Jacobs	Responsible for managing project task orders, as directed by USAED. In terms of waste management activities, Jacobs is responsible for accumulating, segregating, field characterizing, sampling, and analyzing waste materials. Jacobs will also complete subsequent profiling, labeling, manifesting, transport, and disposal of regulated and nonregulated waste streams directly or through the management of subcontractors. The Army will remain the generator.
Subcontractors	Responsible for the waste management process and activities as directed by Jacobs. These activities may include accumulation, packaging, field characterization, bulking, sampling, and analysis of waste materials and profiling, labeling, manifesting, transport, and disposal of regulated and nonregulated waste streams. If required, the waste management subcontractor will be responsible for decontamination of bulk waste containers (i.e., roll-offs, isolation (ISO) tanks, etc.). The subcontractor is also responsible for tracking wastes to their final dispositions and assisting Jacobs with compilation of waste generation reports.
TSDF	Responsible for providing facility-specific recycling, treatment, storage, and disposal, as well as final disposition paperwork to Jacobs (e.g., Certificates of Disposal, Landfill Tipping Fee Receipts, etc.).

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4.0 ANTICIPATED WASTE STREAMS

Table E-4-1 presents waste streams that may be encountered during the 2010 field season. This table will be used as the preliminary tool for evaluating the probability of wastes to be considered a characteristic hazardous waste. This table should be used in conjunction with the work plan, FSP, and QAPP. The site-specific work plan addendum will present the anticipated quantity of wastes. Review of waste stream sample results will determine the appropriateness of each disposal option. Table E-4-2 presents the RCRA characteristic compounds, regulated levels, 20-times concentrations, and associated EPA waste codes. All munitions found will be inspected by UXO technicians and handled in accordance with the MEC Safety Plan (Appendix H).

Table E-4-1
Anticipated Waste Streams at Fort Wainwright Sites

Waste Stream	Contaminant of Concern	Probable Packaging	Suggested Characterization Sampling Summary[1]
POL-contaminated soil (nonhazardous)	GRO, DRO, RRO, RCRA metals	CONEX bins, Super Sacks®, or 55-gallon drums	Landfills typically require ten samples for first 1,000 cubic yards and one for each additional 500 cubic yards. In situ may be used for non-hazardous soil.
POL-contaminated soil (hazardous)	benzene, lead	Cubic yard Super Sacks®, CONEX bins	Two random samples representative of first 20 tons plus one for each additional 40 tons.
POL-contaminated plastic, debris, PPE, and sampling equipment	GRO, DRO, RRO, RCRA metals	CONEX bins, Super Sacks®, or 55-gallon drums	No samples required; handle with related POL-contaminated soil.
POL-contaminated rinsate water	DRO, RRO, RCRA metals	55-gallon drums	Two grab samples per 4 drums; analyze for TAH and TAqH for onsite discharge.
RCRA metals-contaminated soil	RCRA metals	CONEX bins, Super Sacks®, or 55-gallon drums	Two random samples representative of first 20 tons plus one for each additional 40 tons.

Table E-4-1
Anticipated Waste Streams at Fort Wainwright Sites (Continued)

Waste Stream	Contaminant of Concern	Probable Packaging	Suggested Characterization Sampling Summary[1]
RCRA metal-contaminated plastic, PPE, and sampling equipment	RCRA metals	CONEX bins, Super Sacks®, or 55-gallon drums	No samples; handle with related soil waste stream.
RCRA metal-contaminated rinsate water	RCRA metals	55-gallon drums	One grab sample per drum or one composite per waste stream, whichever is less.
PCB-contaminated soil (TSCA)	PCBs	CONEX bins, Super Sacks®, or 55-gallon drums	Two random samples representative of first 20 tons plus two for each additional shipping bin (20 to 25 tons).
PCB-contaminated soil (non-TSCA)	PCBs	CONEX bins, Super Sacks®, or 55-gallon drums	Two random samples representative of first 20 tons plus two for each additional shipping bin (20 to 25 tons).
PCB-contaminated plastic, debris, personal protective equipment (PPE), and sampling equipment	PCBs	CONEX bins, Super Sacks®, or 55-gallon drums	No samples required; handle with related PCB soil waste stream.
PCB-contaminated rinsate water	PCBs	55-gallon drums	One grab sample per drum or one composite per waste stream, whichever is less.
PCB transformers or large capacitors	PCBs	Polyethylene totes or metal drums (appropriate size for transformer)	None if presume PCBs >500 mg/kg; one grab sample per transformer containing PCB oil with unknown PCB concentrations.
Lead acid batteries	Battery exclusion	Polyethylene bags then on pallets, in polyethylene totes, or drums	No samples required; use battery exclusion.
Asbestos-containing materials	ACM	Double bagged, then in Super Sacks®	Verify not also coated with lead-based paint. If not, no sample required–handle as ACM. If coated, analyze for lead.
Creosote-treated timbers	Cresols, arsenic, lead, cadmium, pentachlorophenol	CONEX bin, palletized bundle	Two random samples representative of first 20 tons plus two for each additional shipping bin (20 to 25 tons).

Table E-4-1
Anticipated Waste Streams at Fort Wainwright Sites (Continued)

Waste Stream	Contaminant of Concern	Probable Packaging	Suggested Characterization Sampling Summary[1]
Lead paint-treated timbers	Lead	CONEX bin, palletized bundle (if nonhazardous)	Two random samples representative of first 20 tons plus two for each additional shipping bin (20 to 25 tons).
Spent field-screening kits with methanol or hexane	Ignitability	Wide-mouth 1-liter amber jar over-packed with 5-gallon bucket	No samples required; waste is either characteristic and/or spent.
Nonlead acid batteries	Universal waste	Polyethylene bags then on pallets, in polyethylene totes, or drums	No samples required; universal waste must be handled by universal waste handler.
Aerosols	Ignitability or reactivity	Aerosols may require puncturing (with approved puncture device) and draining or aerosols may be containerized in an overpack	Sample drained liquids and use Material Safety Data Sheets (MSDS)s.
Lab chemicals	Various cleaning, and other unique chemicals in original packaging	Overpack in drum with like chemicals, ship/ label as laboratory waste	Typically none; use labels and MSDS to characterize waste.
MEC	UXO	Based on type of ordnance – see MEC plan (Appendix H)	N/A

Note:
For definitions, see Acronyms and Abbreviations section.
[1] Sample quantities may be modified based on additional site information and concurrence of the waste management team and regulator.

Table E-4-2
Maximum Concentration of Contaminants for Toxicity Characteristic Leaching Procedure

EPA Hazardous Waste Number	Contaminant	Analytical Method	Regulatory Level TCLP (mg/L)	20 x TCLP Regulatory Level (mg/kg)
D004	Arsenic	SW6020	5.0	100.0
D005	Barium	SW6020	100.0	2000.0
D018	Benzene	SW8260B	0.5	10
D006	Cadmium	SW6020	1.0	20.0
D019	Carbon tetrachloride	SW8260B	0.5	10
D020	Chlordane	SW8081A	0.03	0.6
D021	Chlorobenzene	SW8260B	100.0	2000.0
D022	Chloroform	SW8260B	6.0	120.0
D007	Chromium	SW6020	5.0	100.0
D023	o-Cresol (2-methylphenol)	SW8270C	200.0[2]	4000.0
D024	m-Cresol (3-methylphenol)	SW8270C	200.0[2]	4000.0
D025	p-Cresol (4-methylphenol)	SW8270C	200.0[2]	4000.0
D026	Cresol (methylphenols)	SW8270C	200.0[2]	4000.0
D016	2,4-D	SW8151A	10.0	200.0
D027	1,4-Dichlorobenzene	SW8260B	7.5	150.0
D028	1,2-Dichloroethane	SW8260B	0.5	10.0
D029	1,1-Dichlorethylene	SW8260B	0.7	14.0
D030	2,4-Dinitrotoluene	SW8270C	0.13[1]	2.6
D012	Endrin	SW8081A	0.02	0.4
D031	Heptachlor (and its epoxide)	SW8081A	0.008	0.16
D032	Hexachlorobenzene	SW8270C	0.13[1]	2.6
D033	Hexachlorobutadiene	SW8260B	0.5	10
D034	Hexachloroethane	SW8270C	3.0	60.0
D008	Lead	SW6020	5.0	100.0
D013	Lindane	SW8081A	0.4	8.0
D009	Mercury	SW7470A	0.2	4.0
D014	Methoxychlor	SW8081A	10.0	200.0
D035	Methyl ethyl ketone	SW8260B	200.0	4000.0
D036	Nitrobenzene	SW8270C	2.0	40.0
D037	Pentachlorophenol	SW8270C	100.0	2000.0
D038	Pyridine	SW8270C	5.0[1]	100.0

Table E-4-2
Maximum Concentration of Contaminants for Toxicity Characteristic Leaching Procedure (Continued)

EPA Hazardous Waste Number	Contaminant	Analytical Method	Regulatory Level TCLP (mg/L)	20 x TCLP Regulatory Level (mg/kg)
D010	Selenium	SW6020	1.0	20.0
D011	Silver	SW6020	5.0	100.0
D039	Tetrachloroethylene	SW8260B	0.7	14.0
D015	Toxaphene	SW8081A	0.5	10.0
D040	Trichloroethylene	SW8260B	0.5	10.0
D041	2,4,5-Trichlorophenol	SW8270C	400.0	8000.0
D042	2,4,6-Trichlorophenol	SW8270C	2.0	40.0
D017	2,4,5-TP (Silvex)	SW8151A	1.0	20.0
D043	Vinyl chloride	SW8260B	0.2	4.0

Notes:
[1] Quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level.
[2] If o-, m-, and p-Cresol concentration cannot be differentiated, the total cresol (D026) concentration is used. The regulatory level of total cresol is 200 mg/L.

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5.0 WORK PLAN AND SCHEDULE FOR WASTE HANDLING

Field activity schedules will be developed as work is awarded. A full description of field activities to be accomplished for each project will be outlined in the site-specific work plan addendums.

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6.0 WASTE HANDLING EQUIPMENT

Waste handling equipment may include the following items:

- Forklifts, loaders, and other heavy equipment as needed
- Pumps, tanks, and drums
- Barrel chokes and drum clamps
- Nonsparking tools and drum deheading equipment
- Wooden pallets
- Shovels, scoops, and sorbents
- Polyethylene bags, totes, and drums

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7.0 WASTE TRANSPORT AND DISPOSAL INFORMATION

Nonhazardous solid waste such as general trash will be transported to the Fort Wainwright Landfill. All other wastes will be transported by subcontractors for offsite disposal.

Waste will be sampled for compounds of potential concern and treated accordingly. Sampling will be conducted in accordance with the field sampling plan and QAPP (Appendices B and C, respectively, of the main Work Plan). Table E-7-1 presents some potential waste disposal facilities and Table E-7-2 presents potential waste transporter subcontractors.

Table E-7-1
Potential Waste Disposal Facilities

Type	Name	EPA ID No.	Phone No.
Incineration	Organic Incineration Technology (OIT)	Not Applicable	907-488-4899
Metal Recycler	C&R Pipe	Not Required	907 456-8386
Subtitle B Landfill	Fort Wainwright Landfill	AK6210022426	907-271-3425
Subtitle D Landfill	WMI – Columbia Ridge	ORD 987 173 457	541-454-2030
Subtitle C Landfill	CWMNW – Arlington	ORD 089 452 353	541-454-2643
Fuel/Water Recycler	Environmental Compliance Consultants (ECC Ltd.)	Awaiting information	907-356-2023
Fuel/Water Recycler	Emerald Petroleum (WA)	WAD 058 367 152	206-832-3000
Fuel/Water Recycler	Emerald Petroleum (AK)	AKR 000004184	(800) 482-3190

Table E-7-2
Waste Transportation Subcontractors

Type	Name	EPA ID No.	Phone No.
Ground	SLT Express	UTD 981 552 425	800-627-3047
Ground	Carlisle Enterprises	AKD 122081243	907-276-7797
Ground	Lynden Transport	WAD 002799260	907-276-4800
Rail	Union Pacific Railroad	MOD 006 968 101	206-764-1541
Rail	BNSF Railroad	MND 048 341 788	817-352-6251
Air	Northern Air Cargo	AKD 003845526	907-243-3331
Air	Lynden Air Transport	AKR 000001909	907-243-6150

As mentioned above, the Fort Wainright Landfill is the most likely destination for demolition debris, some vegetation, and asbestos. Depending on analytical results, some waste may be re-used within FWA. Space is limited within the landfill and all activities will be coordinated with Directorate of Public Works prior to any disposal or transport. OIT Inc. is the most likely treatment location for the majority of petroleum-contaminated wastes, however, capacity at the facility may be limited, and other thermal treatment options may be used. Environmental Compliance Consultant (ECC) Ltd. generally deals with small quantities of solid and liquid waste and disposal with them is coordinated through the Directorate of Public Works.

8.0 WASTE MANAGEMENT

This section includes procedures for accumulating, evaluating, consolidating, containerizing, labeling, tracking, storing, characterizing, and disposing of wastes generated as part of the FWA projects. Waste management activities should conform to the procedures and specifications detailed in Section 8.1 through 8.5. To the extent practical, the project team shall minimize the generation of wastes during the course of the field activities.

8.1 WASTE ACCUMULATION, CONTAINERIZATION, AND TEMPORARY ONSITE STORAGE

The scope of each site-specific project may require Jacobs to construct temporary waste staging areas (central staging areas). A temporary storage area for nonregulated solid waste and project supplies will be established at an agreed-upon location. Contaminated PPE and associated disposable sampling equipment will be disposed of in the same manner as the associated waste (e.g., petroleum, oil, and lubricant (POL)-contaminated PPE will be disposed of with POL-contaminated soil, and so on). General trash will be disposed of at the Fort Wainwright Landfill. Table E-8-1 presents a summary of the key procedures.

The subcontractor shall package, label, and deliver wastes to each staging area in appropriate containers. Waste containers shall be labeled as required based on characterization data and/ or waste profile information. All wastes shall be delivered in a manner that maintains safe working conditions, preserves the integrity of the staging area, and prevents spillage or contamination from the wastes. The Contractor Quality Control Manager (CQCM) will maintain records of the quantities of waste delivered to the staging area. The CQCM will maintain a cumulative and current log documenting each type of waste delivered to the staging area, the specific package/container identification number, the container type, the date of generation, and estimated quantity/weight of each waste package. The cumulative log will be reported at the end of each work shift.

Jacobs will order all containers required to transport the waste from the staging area to their final disposition. All regulated wastes will be placed in containers that comply with U.S. Department of Transportation (DOT) shipping requirements established in 49 CFR 173. Hazardous liquids will be typically packaged in UN/1A1/Y or UN/1A2/Y drums, or isolation tank intermodal containers (if large volumes). Hazardous solids will be shipped in UN/1A2/Y steel drums, Super Sacks® (5H packaging per 49 CFR 173), fiberboard boxes, or bulk intermodal containers. The minimum packaging/container supply requirements for each site-specific project shall be established following notice to proceed from USAED.

Storage facilities for waste will be constructed on a site-specific basis. A post-wide storage area may also be used. Prior to accumulating waste, a time line for storage and shipment of the waste should be developed. Appropriate segregation between waste types will be made as required, which may generate separate stockpiles. Further details are provided in the Stockpile Construction Plan (Appendix F). For drum storage, a central lined and bermed storage area will be maintained, depending on the size of the drums. Four drums will be stored per pallet. Drums will be labeled and confirmed closed prior to placing in storage.

All wastes shall be labeled as they are generated. Waste container labels shall contain the following information:

- Generator (U.S. Army)
- Project location and description
- Waste description and contaminant of concern
- Waste generation or collection location and accumulation start date

A completed waste profile worksheet (Attachment E-1) and accompanying analytical results for all waste streams will be provided to the disposal facility for review and approval prior to acceptance. The waste profile will be generated by the waste subcontractor and submitted to the disposal facility 7 days in advance of planned delivery.

Table E-8-1
Waste Accumulation, Consolidation, and Storage

Waste Stream	Accumulation	Consolidation	Onsite Storage	Anticipated Disposal Facility
POL-contaminated soil (nonhazardous)	• Temporary or long-term stockpiles for large quantities • Central staging areas for containers	• Consolidate like soil only • Offsite transport should maximize content per container	• Preapproved stockpile locations • Central staging areas until mobilization • Typically 2 year limit for stockpiles	OIT or determined by DRMO
POL-contaminated soil (hazardous)	• Containers only, no stockpiles	• Consolidate like soil only • Offsite transport should maximize content per container	• Storage typically 90 to 270 days • Consider drums and Subpart CC for VOC emissions	OIT
POL-contaminated plastic, debris, PPE, and sampling equipment (nonhazardous)	• Accumulate in drums, overpacks or Super Sacks®	• Handle with related POL soil waste stream	• Handle with related POL soil waste stream	Fort Wainwright Landfill or determined by DRMO
POL-contaminated rinsate water	• Accumulate in drums near source • Accumulate drums in central staging area	• Consolidate like waters only • Never add potential RCRA or TSCA water	• Store in central drum storage area	To be determined by DRMO
RCRA metals-contaminated soil	• If hazardous, accumulate directly in bulk bins or Super Sacks® • If non-hazardous consolidate with like waste and treat appropriately	• Consolidate like waste only • Never mix characteristic waste and nonhazardous waste after characterization	• Storage typically 90 to 270 days • Consider drums and Subpart CC for VOC emissions	Hazardous – Out of State TSDF Non-hazardous – To be determined by DRMO

Table E-8-1
Waste Accumulation, Consolidation, and Storage (Continued)

Waste Stream	Accumulation	Consolidation	Onsite Storage	Anticipated Disposal Facility
RCRA metals-contaminated plastic, PPE, and sampling equipment	• If presumed RCRA, accumulate directly in bulk bins or Super Sacks®	• Handle with related soil waste stream; Consolidate like waste only • CONEX bins, Super Sacks®, or 55-gallon drums	• Handle with related soil waste stream	Fort Wainwright Landfill or determined by DRMO
RCRA metals-contaminated rinsate water	• Accumulate in drums near source • Accumulate drums in central staging area	• Consolidate like waters only • Never add potential RCRA or TSCA water	• Store in central drum storage area	To be determined by DRMO
PCB-contaminated soil (TSCA)	• Temporary or long-term stockpiles for large quantities (40 CFR 761) • Central staging areas for containers	• Consolidate like soil only • Offsite transport should maximize content per container	• Preapproved stockpile locations • Central staging areas until mobilization • Typically a time limit for stockpiles and plans to ship should be made prior to accumulation	Out of State TSDF
PCB-contaminated soil (non-TSCA)	• Temporary or long-term stockpiles for large quantities (40 CFR 761) • Central staging areas for containers	• Consolidate like soil only • Offsite transport should maximize content per container	• Preapproved stockpile locations • Central staging areas until demobilization	Out of State TSDF
PCB-contaminated plastic, debris, PPE, and sampling equipment	• Handle with related soil waste stream	• Handle with related soil waste stream; Consolidate like waste only • CONEX bins, Super Sacks®, or 55-gallon drums	• Handle with related soil waste stream	To be determined by DRMO

Table E-8-1
Waste Accumulation, Consolidation, and Storage (Continued)

Waste Stream	Accumulation	Consolidation	Onsite Storage	Anticipated Disposal Facility
PCB-contaminated rinsate water	• Accumulate in drums near source • Accumulate drums in central staging area	• Consolidate like waters only	• Store in central drum storage area	To be determined by DRMO
PCB transformers or large capacitors	• Overpack into appropriate containers • Accumulate drums in central staging area	• Maintain detailed inventory of overpacked capacitors and transformers	• Central staging area • Plan to ship items should be made prior to generation and accumulation	To be determined by DRMO
Lead acid batteries	• Package appropriately • Accumulate packages in central staging area • Battery exclusion is difficult to apply to plastic battery debris	• Consolidate lead acid batteries on pallets or in totes • Never load batteries directly on the posts of other batteries	• Store up to one year	To be determined by DRMO
Asbestos-containing materials	• Approved ACM workers must package in double bags. • Secondary containment in secured area. • Bags must labeled as containing asbestos	• Consolidate bags in other containers or bins • Label the outer containers or bins	• Store containers or bins at central area until demobilization • Evaluate disposal options prior to generating ACM waste	Fort Wainwright Landfill or determined by DRMO
Creosote-treated timbers	• Assumed nonhazardous and package on pallets or bulk bins • If hazardous, must be immediately labeled and packaged for RCRA offsite transportation	• Consolidate appropriately in CONEX bin, palletized bundle	• If nonhazardous, may be stacked and accumulated as required by USAED • If hazardous, must be shipped within 90 to 270 days	Fort Wainwright Landfill or determined by DRMO

Table E-8-1
Waste Accumulation, Consolidation, and Storage (Continued)

Waste Stream	Accumulation	Consolidation	Onsite Storage	Anticipated Disposal Facility
Lead-paint-treated timbers	• Assumed nonhazardous; package on pallets or bulk bins • If hazardous; must be immediately labeled and packaged for RCRA offsite transportation	• Consolidate appropriately in CONEX bin, palletized bundle	• If nonhazardous, may be stacked and accumulated as required by USAED • If hazardous, must be shipped within 90 to 270 days	Fort Wainwright Landfill or determined by DRMO
Spent field-screening kits with methanol or hexane	• Accumulate in jar near field-screening area • Label jar with date and contents	• Consolidate only like waste • If CESQG, may consolidate used and unused methanol	• Store in sample management area until demobilization • Whenever possible use flammable storage lockers	Out of State TSDF
Non-lead acid batteries	• Segregate batteries by type (lithium ion, nickel cadmium, alkaline, etc.) • Place in plastic bags or jars, label U.S. universal waste • Consider air restrictions before packaging	• Consolidate like batteries only	• Limits are typically 1 year	To be determined by DRMO
Aerosols	• Use aerosols until empty; once empty accumulate in poly bags • Consider difficulty of shipping partial aerosols by aircraft	• Aerosols require puncturing and draining or containerizing • Consolidate into bags to verify proper management	• None; use label and MSDS to characterize contents	Fort Wainwright Landfill or determined by DRMO

Table E-8-1
Waste Accumulation, Consolidation, and Storage (Continued)

Waste Stream	Accumulation	Consolidation	Onsite Storage	Anticipated Disposal Facility
Lab chemicals	• Segregate by anticipated hazard class • Verify packing instructions with waste sub prior to packaging • Maintain in sample management area whenever feasible	• Overpack in drum with like chemicals • Only consolidate (dump and combine liquids or solids) after written approval from Health, Safety, and the Environment (HSE) Manager	• Once packaged, should be shipped offsite at demobilization	Out of State TSDF
MEC	• As determined by onsite UXO technicians	• As determined by onsite UXO technicians	• As determined by onsite UXO technicians • Details provided in MEC plan.	To be determined by DRMO

Note: For definitions, see Acronyms and Abbreviations section.

8.2 WASTE CHARACTERIZATION/CONSOLIDATION

Table E-4-1 presents a summary of the sampling frequencies for typical waste streams. In general, consolidation of wastes should be limited to like waste streams. Table E-8-1 presents a summary of considerations for consolidation and onsite pre-disposal storage. Areas potentially contaminated with compounds not identified in the WMP should always be segregated until characterization is completed. The following sections detail the typical methods for waste characterization sampling and waste management.

8.2.1 Waste Characterization Sampling

In order to characterize any potential waste and soil prior to transportation and disposal, samples will be collected for analyses. Refer to the site-specific work plan addendum for the analytes and methods to be analyzed.

The intent of this sampling effort is to characterize environmental waste that could be a potential source of contamination to the groundwater and current or future residents in the area. Waste characterization data will be used to manage the contents of waste bins and to consolidate any similar waste into appropriate waste streams. Using standard industry practice, excavated soil will be visually and olfactory screened for contaminants, and analyzed by a photoionization detector (PID) for a range of volatile contaminants. PID screening and calibration will be performed in accordance with the Field Sampling Plan (FSP) (Appendix B). Waste characterization samples will be collected in accordance with the FSP.

If a RCRA compound is detected at a concentration 20 times greater than its corresponding RCRA toxicity characterization leaching procedure (TCLP) concentration (Table E-4-2), an additional sample will be submitted for TCLP analysis to determine whether the materials will require disposal as a hazardous waste.

8.2.2 Drum and Tank Content Management

Drums or tanks (empty or containing known or unknown contents) may be encountered at Fort Wainwright sites. Generally, the tank contents will previously have been characterized. However, if contents are unknown, tank contents may be managed similar to drums containing unknown contents, which will be managed using the basic principles described below.

Drum Characterization Methods Overview

The following provides an overview of the drum characterization method.

- Perform initial screening (e.g., sheen survey, pH test, PID screening, and inspection of surrounding soil and water for staining or sheen) on breached drums containing liquids, as outlined in Drum Handling Specification (Attachment E-4). If initial screening activities indicate drum contents are within acceptable limits (i.e., no sheen, pH between 3 and 10, PID screening results near background, and no staining), small quantities of fluids will be pumped from the drum into an onsite container using a hand-operated bilge pump. If initial screening results are outside acceptable limits, additional safety precautions will be evaluated and implemented. Small quantities of fluids will be sampled, characterized by HazCat®, tested for compatibility, and combined into a single waste stream for analytical testing and disposal purposes. Generally, the drum will be placed in the appropriate type of overpack drum and transported to the decontamination area for additional sampling and testing. If the drums contain significant quantities of fluid, the contents may be pumped into new and appropriate packaging.
- Perform sampling of solids/sludge in breached drums, as outlined in Drum Handling Specification (Attachment E-4) and the FSP (Appendix B). If HazCat® sampling results indicate contents are not hazardous, contents will be removed and placed in a container, and the emptied drum will be transported to the staging area. The contents will be transported to the decontamination area for bulking, sampling, and removal. If sampling results indicate that contents are potentially hazardous, the drum will be placed in an overpack (without removing the contents) and transported to the appropriate bulking area at the decontamination area.
- Carefully remove and transport intact drums with contents to the decontamination area for sampling, as outlined in Drum Handling Specification (Attachment E-4) and the FSP (Appendix B). Sample results will dictate handling and bulking of the drum and contents.

HazCat® Evaluation, Compatibility Testing, and Drum Sampling

HazCat® evaluations will be conducted on the contents of drums to determine the hazardous characteristics of the contents. Compatibility testing will be performed to evaluate the bulking, storage, and transfer of wastes identified as nonhazardous by testing results. Analytical sampling of drum contents will be performed to check results of field testing and to further determine the nature of waste materials. Safety precautions and procedures for performing these activities are detailed in the Site Safety and Health Plan (Appendix A) and the FSP (Appendix B).

Waste Bulking and Drum Handling

Once wastes have been field tested, they will be bulked in tanks or drums for analytical sampling, staging, transport, and final disposal.

8.3 MANIFESTS/BILLS OF LADING

The Waste Subcontractor (WSC) shall prepare all bills of lading and hazardous and nonhazardous waste manifests for shipment and final disposal. The WSC shall prepare hazardous and non-hazardous waste manifests for shipment from the point of origin to the final point of disposal and include all information required to comply with federal, state, and local regulations for labeling, transport, shipment, and disposal of wastes from the site. Nonhazardous waste manifests will be prepared for all nonhazardous wastes for tracking purposes. Table E-8-2 presents the potential transportation information for the typical waste streams encountered on FWA projects.

8.3.1 Nonhazardous Waste Requirements

Nonhazardous waste manifests will be used for transporting materials that are not regulated by 40 CFR 261 (RCRA wastes) or 40 CFR 761 (PCB wastes) to improve the tracking and documentation of materials. The nonhazardous waste manifests will be completed to meet the following regulatory requirements:

- 49 CFR 172 Subpart B (Table of Hazardous Materials and Provisions)

- 49 CFR 172 Subpart C (Shipping Papers)
- 49 CFR 172 Subpart G (Emergency Response Information)

Table E-8-2
Fort Wainwright Anticipated Transportation and Disposal

Shipping Description	Disposal Information		Shipping Considerations
Waste Stream DOT Proper Shipping Name	**Facility**	**Disposal Method**	
Metal			
Lead acid batteries Batteries wet, filled with acid, 8, UN2794 III	Interstate Batteries 727 134th Street SW Everett, WA 98204 425-743-7677	Recycle	• Intact batteries can be strapped to a pallet. • Never stack batteries on top of each other without proper support (posts may not be used to support upper tier of batteries). • Use 1-inch-thick corrugated cardboard sheets to support stacks of batteries.
Lead-shielded cable Not regulated by DOT	C&R Pipe 401 E Van Horn Road, Fairbanks, AK, 99707 907-456 8386	Recycle	• Either bundle on pallets or place in scrap metal bins. • If USAED prefers, the scrap metal may be stored for optimum shipping times.
Scrap metal ***Not regulated by DOT***	C&R Pipe 401 E Van Horn Road, Fairbanks, AK, 99707 907-456 8386	Recycle	• Either bundle on pallets or place in scrap metal bins. • If USAED prefers, the scrap metal may be stored for optimum shipping times.
Wood			
Felled trees and brush	Onsite natural decay, Fort Wainwright Landfill	NA	• Verify compliance with environmental protection plan if left on site
Non-contaminated wood	Onsite natural decay, Fort Wainwright Landfill	NA	• Verify appropriate waste determination prior to shipment or burning. • Evaluate appropriateness of obtaining burn permit.

Table E-8-2
Fort Wainwright Anticipated Transportation and Disposal (Continued)

Shipping Description	Disposal Information		Shipping Considerations
Waste Stream **DOT Proper Shipping Name**	**Facility**	**Disposal Method**	
Lead-based-paint-contaminated wood ***Not regulated by DOT***	CWMNW – Arlington 17629 Cedar Springs Lane Arlington, OR 97812 ORD 089 452 353 541-454-2643	Landfill	• If required to ship offsite, preferred methods are in bulk to limit effort of cutting and stacking. • If bulk bins are used, longest dimension should be 6 feet long.
Creosote-treated timbers ***Not regulated by DOT***	Likely Fort Wainwright Landfill or Allied Waste – Roosevelt Regional Landfill 500 Roosevelt Grade Road Roosevelt, WA 99356	Landfill	• Verify appropriate waste determination prior to shipment. • Creosote-soaked or treated lumber cannot be burned. • If must ship offsite, preferred methods are in bulk to limit effort of cutting and stacking. • If bulk bins are used, longest dimension of scrap should be 7 feet.
Contaminated Soil			
PCB-contaminated soil (TSCA) PCBs, solid, 9, UN2315 II	WMI - Columbia Ridge LF 18177 Cedar Springs Lane Arlington, OR 97812 ORD 987 173 457 541-454-2030	Landfill	• PCBs may be a marine pollutant at concentrations of 10,000 mg/kg or higher.
Lead-based-paint-contaminated soil and/or concrete ***Not regulated by DOT***	WMI - Columbia Ridge LF 18177 Cedar Springs Lane Arlington, OR 97812 ORD 987 173 457 541-454-2030	Landfill	• Verify appropriate waste determination prior to shipment. • If must ship offsite, preferred methods are in bulk intermodal containers to minimize handling costs.

Table E-8-2
Fort Wainwright Anticipated Transportation and Disposal (Continued)

Shipping Description	Disposal Information		Shipping Considerations
Waste Stream DOT Proper Shipping Name	**Facility**	**Disposal Method**	
POL-contaminated soil **Not regulated by DOT**	OIT Ltd 3520 Old Richardson Highway,Moose Creek, Alaska 99705 907-488 4899	Landfill	• Verify appropriate waste determination prior to shipment. • For smaller quantities, use overpacks or Super Sacks® but evaluate bulk bins.
Hazardous waste soil contaminated with lead Waste environmentally hazardous substances, solid, n.o.s., UN3077 III	CWMNW – Arlington 17629 Cedar Springs Lane Arlington, OR 97812 ORD 089 452 353 541-454-2643	Stabilization	• If removal is required, evaluate use of EcoBond or similar prior to removal to reduce likelihood of RCRA-regulated soil. • Verify appropriate waste determination prior to shipment. • Shipping soil is not cost effective by air. • If must ship offsite, preferred methods are in bulk intermodal containers to minimize handling costs.
Asphalt-contaminated soil and debris ***Not regulated by DOT***	OIT Ltd 3520 Old Richardson Highway,Moose Creek, Alaska 99705 907-488 4899	Landfill	• Verify appropriate waste determination prior to shipment. • For smaller quantities, use overpacks or Super Sacks® but evaluate bulk bins. • Consider that asphalt is solid in typical Alaska winter spring weather (< 65° F) but liquid in typical hot summer Fairbanks weather (> 70° F)
Other			
Asbestos-containing material *Asbestos, 9, NA2212 III*	Fort Wainwright Landfill POC Bob Gray DPW	Landfill	• Verify personnel packaging and handling asbestos are properly trained. • ACM typically packaged in double bags then placed in larger containers.

Table E-8-2
Fort Wainwright Anticipated Transportation and Disposal (Continued)

Shipping Description	Disposal Information		Shipping Considerations
Waste Stream DOT Proper Shipping Name	**Facility**	**Disposal Method**	
POL-contaminated Plastic, PPE and Debris ***Not regulated by DOT***	OIT Ltd 3520 Old Richardson Highway,Moose Creek, Alaska 99705 907-488-4899	Landfill	• Whenever possible, consolidate these materials with higher density material. • Occasionally, this waste stream may be appropriate for local landfills.
Tank cleaning sediment (sludge) and rinsate (D004 - 12) *Waste environmentally hazardous substances, liquid, UN3082 III*	ECC 1500 Post Road Anchorage, AK 99501 907-644-0428	Stabilization/ Treatment	• Sediments and waters can often be generated as part of the tank cleaning process. • Understand the former contents of the tanks to plan waste generation and reduce hazardous waste.
PCB Capacitors Polychlorinated biphenyls, liquid, 9, UN2315 II	ECC 1500 Post Road Anchorage, AK 99501 907-644-0428 Or directly through: CWMNW – Arlington 17629 Cedar Springs Lane Arlington, OR 97812 ORD 089 452 353 541-454-2643	Landfill	• PCBs may be a marine pollutant at concentrations of 10,000 mg/kg or higher. • Small capacitors can be landfilled. • Large capacitors cannot be landfilled.
PCB-Contaminated Plastic, PPE and Debris ***Polychlorinated biphenyls, liquid, 9, UN2315 II***	WMI - Columbia Ridge LF 18177 Cedar Springs Lane Arlington, OR 97812 ORD 987 173 457 (541) 454-2030	Landfill	• PCBs may be a marine pollutant at concentrations of 10,000 mg/kg or higher.

Table E-8-2
Fort Wainwright Anticipated Transportation and Disposal (Continued)

Shipping Description	Disposal Information		Shipping Considerations
Waste Stream DOT Proper Shipping Name	**Facility**	**Disposal Method**	
Spent immunoassay kits Methanol solutions, 3, UN1230 II	ECC 1500 Post Road Anchorage, AK 99501 907-644-0428 or directly through Pollution Control Industries 4343 Kennedy Avenue East Chicago, IN 46312 IND 000 646 943 (219) 397-3951	Fuels Blending	• Spent solutions must be managed and disposed/recycled appropriately. • Unused methanol may be beneficially used for an intended purpose.
Spent Hexane Hexanes, 3, UN1208 II	ECC 1500 Post Road Anchorage, AK 99501 907-644-0428 or directly through: Pollution Control Industries 4343 Kennedy Avenue East Chicago, IN 46312 IND 000 646 943 (219) 397-3951	Fuels Blending	• Spent solutions must be managed and disposed/recycled appropriately. • Unused hexanes may be beneficially used for an intended purpose.
RCRA Metal-contaminated plastic, PPE, and sampling equipment	CWMNW – Arlington 17629 Cedar Springs Lane Arlington, OR 97812 ORD 089 452 353 (541) 454-2643	Landfill	• Whenever possible, consolidate these materials with higher density material.

Table E-8-2
Fort Wainwright Anticipated Transportation and Disposal (Continued)

Shipping Description	Disposal Information		Shipping Considerations
Waste Stream DOT Proper Shipping Name	**Facility**	**Disposal Method**	
Characteristic Water (D004 - D012) Waste environmentally hazardous substances, liquid, UN3082 III	ECC 1500 Post Road Anchorage, AK 99501 907-644-0428 or directly through: Pollution Control Industries 4343 Kennedy Avenue East Chicago, IN 46312 IND 000 646 943 (219) 397-3951	Treatment/ Stabilization	• Understand the reason a solution is a characteristic waste to select appropriate waste suite characterization. • Some characteristic wastes may be treated onsite.
POL-contaminated water ***Not regulated by DOT***	ECC 1500 Post Road Anchorage, AK 99501 907-644-0428 or directly through: Emerald Petroleum 1500 Airport Way S Seattle, WA 98134 WAD 058 367 152 (206) 832-3000	Recycle/ Reuse	• Prior to shipping water offsite for treatment and disposal, evaluate the ability to treat and discharge water to the ground (a general permit is required). • Verify containers are adequate to contain liquids during variable temperatures.
PCB-contaminated water Polychlorinated biphenyls, liquid 9, UN2315 II	CWMNW - Arlington 17629 Cedar Springs Lane Arlington, OR 97812 ORD 089 452 353 (541) 454-2643	Solidification/ Landfill	• PCBs may be a marine pollutant at concentrations of 10,000 mg/kg or higher. • Cargo aircraft limitations of 220 liters per package. • Water with < 2 ppm may be handled as non-PCB.

Table E-8-2
Fort Wainwright Anticipated Transportation and Disposal (Continued)

Shipping Description	Disposal Information		Shipping Considerations
Waste Stream DOT Proper Shipping Name	**Facility**	**Disposal Method**	
RCRA-contaminated rinsate	CWMNW - Arlington 17629 Cedar Springs Lane Arlington, OR 97812 ORD 089 452 353 (541) 454-2643	Treatment/ Stabilization	• Prior to shipping water offsite for treatment and disposal, evaluate the ability to treat and discharge water to the ground (a general permit is required). • Verify containers are adequate to contain liquids during variable temperatures.
PCB fluids and oils Polychlorinated biphenyls, liquid, 9, UN2315 II	CWMNW - Arlington 17629 Cedar Springs Lane Arlington, OR 97812 ORD 089 452 353 (541) 454-2643	Landfill	• PCBs may be a marine pollutant at concentrations of 10,000 mg/kg or higher. • Transformers once containing oil > 500 ppm must be triple-rinsed and the rinsate properly managed.

Notes:
For definitions, see Acronyms and Abbreviations.

8.3.2 Hazardous Waste Requirements

Hazardous waste manifests (including Canadian manifests and transit notices if applicable) will be used for transporting materials that are regulated by 40 CFR 261 (RCRA wastes) or 40 CFR 761 (PCB wastes). The manifests will be completed to meet the following regulatory requirements:

- 40 CFR 262 Subpart B (Manifest)
- 49 CFR 172 Subpart B (Table of Hazardous Materials and Provisions)
- 49 CFR 172 Subpart C (Shipping Papers)
- 49 CFR 172 Subpart G (Emergency Response Information)

8.3.3 Hazardous Waste Manifest Procedures

The USAED-appointed signatory, on behalf of the waste generator, will sign all manifests after review and determination that manifests and attachments are complete and accurate. When a hazardous waste manifest is to be signed, Jacobs shall provide a minimum of 10 days notice to USAED. The proper shipping name and EPA waste codes will be included.

Information required for the hazardous waste manifests includes the following:

- DOT shipping name
- Hazard class
- DOT identification number
- Packing group
- Quantity of containers
- Type of containers
- Weight and volume of containers
- Unit of measurement
- EPA hazard codes

The WSC shall complete and submit Canadian manifests and transit notices if applicable for shipments of hazardous waste that traverse the borders of Canada. The WSC will ensure these

documents are properly completed in accordance with the Transportation of Dangerous Goods Act and its regulations.

8.3.4 Hazardous Waste Manifest Procedures for PCBs

The WSC shall prepare the PCB Control Sheets. Jacobs will forward the sheets to USAED when they are complete and accurate. USAED will secure the signature of the waste generator (U.S. Army). The WSC shall attach PCB control sheets to each PCB waste manifest if applicable as required by 40 CFR 761.207, *Manifest General Requirements*. The control sheets are used to document PCB-containing items per each manifest and they contain the following information:

- Unique transformer or waste package identification number (or serial number)
- Date the transformer was taken out of service (if known)
- Analytical results
- The mass of each PCB-containing package (in kilograms)
- Other summary information about each waste package/transformer (make, gallons of oil, kilovolt amperes [KVA])

8.3.5 Manifest Reporting

The WSC shall provide Jacobs with a complete and accurate waste manifest package (including PCB and RCRA waste control sheets, if required). Jacobs shall complete and submit the following items to the USAED as a package:

- Uniform Hazardous Waste Manifests
- Manifest attachments, to include PCB and RCRA waste control sheets and land disposal restrictions (LDR) notifications
- Generator's Waste Material Profile Sheets
- Bills of lading

8.4 TRANSPORTATION

The WSC shall provide all materials required to secure drummed or containerized waste in CONEXes or other containers and will assist Jacobs in preparing the waste for shipment. The

WSC shall provide all labels and placards required for waste shipment from the site and will assist Jacobs in placing the labels and placards on the containers. The shipping containers will have placards on all four sides, in accordance with 49 CFR 172. Because transportation of regulated wastes from the project will be performed by EPA-approved transports, as required in 40 CFR 263, the type of placard used will depend on the types and quantities of the particular hazardous waste classes in each shipping container. The WSC will update and submit a copy of a waste profile and disposition worksheet (Attachment E-1) to Jacobs each week. Jacobs will review and submit the updated form to USAED.

8.5 DISPOSAL

The WSC will prepare hazardous waste manifests for disposal of hazardous waste at a properly permitted TSDF. The WSC will also provide Jacobs with waste certificates of disposal. Facilities will be selected based on the type of hazardous waste encountered.

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ATTACHMENT E-1

Waste Profile Worksheet and Instructions

Jacobs Field Waste Profile and Disposition Worksheet

This document introduces the Jacobs Field Waste Profile and Disposition Worksheet. The document shall describe the intent and methodology for utilizing this worksheet.

This worksheet has been developed as a "cradle-to-grave" two-page form to assist Jacobs and its subcontractors in managing any and all regulated and nonregulated wastes, recyclable materials, and special wastes on USAED projects. This worksheet is not designed to increase the amount of paperwork required on USAED projects. This worksheet is designed as a working document to aid Jacobs in proper management of identified waste materials.

Advantages of the Waste Profile and Disposition Worksheet

This worksheet will allow a steady flow of useful information from the field to the home office. Each USAED project should have a designated Regulatory Specialist at the home office. This flow of information will aid the project Regulatory Specialist in assisting the project team with timely decisions regarding disposition of materials.

This worksheet will contribute to developing effective waste management skills in the field. By filling out this worksheet, field personnel should become familiar with considerations that are common in waste management, including:

- Process generating material
- Sample information
- Physical descriptions
- Chemical descriptions
- Container specifications
- Federal, state and local disposal regulations
- Recommendations for ultimate disposition

This worksheet provides a valuable link between field waste management personnel and the Regulatory Specialist. This interactive process will aid in the development of qualified field waste management personnel.

This worksheet will also provide a permanent record of disposition for materials that are not manifested. The worksheet should be kept in site records and project files as documentation of effective waste management and regulatory performance by Jacobs and its subcontractors. Diligent use of this record keeping will also reduce the liability of Jacobs and its subcontractors when used properly.

Limitations of the Waste Disposition Worksheet

Filling out the worksheet increases the amount of paperwork on the project. This worksheet may not be used when other more effective waste management practices are developed at a site. This worksheet may not be appropriate when a professional waste management subcontractor is onsite. The WSC will typically use internal waste profiling and tracking systems.

This worksheet is not a legally defensible document. This worksheet is an instrument to aid in the proper management of waste and recyclable materials. This worksheet may be a useful tool in developing hazardous and regulated waste offsite treatment, storage, and disposal facility (TSDF) profiles. This worksheet is **not** designed to supersede or replace TSDF waste profile sheets for Resource Conservation and Recovery Act (RCRA) or Toxic Substances Control Act (TSCA) regulated wastes.

Instructions

Contact the project Regulatory Specialist for specific instructions when filling out a worksheet. Some sections may not be applicable to many materials.

When filling out the worksheet, please consider the following general instructions:

Container ID number: Assign a unique identification number to each waste container (bulk bin, drum, Super Sack®, portable tank, etc.). Assigning container identification numbers should also be done in accordance with the Waste Management Plan.

I. Generator Information

This section provides a physical description of the point of generation. The generator shall be the owner or operator of the facility or site the material was generated (not necessarily the USAED).

II. Description of the Process Generating Material

Describe the process that generated this material or waste and be as specific as possible. Field personnel should complete all of this section. The date of generation should include date that materials were first put into the container and date that container was closed.

III. Sample Information

This should be completed as available. Some nonregulated wastes may be relocated and sampled at a later date or by different personnel (i.e., purge water). Some recyclable materials may not be sampled (i.e., waste diesel, lead acid batteries). Any sampling information that is available should be included. When possible, consult the Regulatory Specialist prior to sampling. The Regulatory Specialist may be aware of specific analysis that should be requested based on disposition strategy for this material.

IV. Physical Description

This section provides a general physical description of the material (all phases). This section should be completed in the field. The section can be completed by visual observations, process knowledge, and basic HAZCAT® methods.

V. Chemical Description

This section is intended to describe any chemical hazards that are known or reasonably expected to be present in the material. This section is important in determining if the material is RCRA hazardous waste or TSCA-regulated waste. It is equally important in characterizing potential chemical contamination in nonregulated wastes and recyclable materials. For example, the presence of low levels of polychlorinated biphenyls or volatile organic compounds in nonregulated waters may accept the waters from discharge and disposal to a publicly owned treatment work. Another example: Many petroleum-contaminated materials and toxic (poisonous) materials are not RCRA-regulated wastes but would be illegal to dispose of in most Alaska landfills. The Regulatory Specialist is responsible for reviewing concentrations of all

chemicals present, or expected to be present, in the material prior to determining disposition. This section should be completed by the field personnel to the fullest extent possible.

VI. Container Information

This section should be completed by field personnel. United Nations Performance-Oriented Packaging (POP) markings on the container should be recorded in this section. For example, field personnel record that a steel drum has the United Nations Performance-Oriented Packaging markings 1A2/Y/1.1/330/98; then the Regulatory Specialist is responsible for reviewing and approving the correct container and package specifications. The Regulatory Specialist is responsible for reviewing and approving and/or specifying the correct labeling, marking, and placarding of containers. After this section is completed, field personnel shall sign the respective blocks in Section VIII of the worksheet and forward to the Jacobs Regulatory Specialist.

VII. Waste Disposition

This section should be completed by the Jacobs Regulatory Specialist, who is responsible for determination of the most appropriate disposition for the material after considering all applicable local, state, and federal regulations and project considerations. Only after the Regulatory Specialist has completed this section and returned it to the field personnel shall material be released to its appropriate disposition. The field personnel shall comply with any comments or requests for additional information by the Regulatory Specialist prior to material disposition.

VIII. Certification

This section shall identify all persons and entities participating in the management of this material. This section is completed during all phases of waste material management and ensures the participation and approval of the entire waste management process for all entities involved and will minimize the liability of Jacobs and its field personnel when the process is used properly. Signatures should be obtained in the order they appear on the worksheet. Blocks 1 and 2 should be completed when Sections I to VI are completed in the field. Blocks 3 and 4 should be completed when the Regulatory Specialist has reviewed and approved the form and completed Section VII. Block 5 should be completed upon material acceptance at the disposal/recycle facility.

When completed, submit this worksheet to the site Quality Control Facilitator or Jacobs' site representative. Jacobs will then forward copies of the worksheet to the project Regulatory Specialist, who shall have the responsibility of reviewing the worksheet and completing any required information. The Regulatory Specialist is responsible for designating and ensuring disposal/recycle facilities and the method of disposition of materials meet all applicable regulatory requirements. The Regulatory Specialist will maintain the files of completed worksheets by project.

Jacobs Field Waste Profile and Disposition Worksheet

This worksheet shall be filled out to the extent practical by the person(s) responsible for generating a waste material. This worksheet will aid Jacobs in determining correct ultimate disposition of this material.

Container ID number _____

I. Generator Information

Generator: _____

Point of generation: _____

Physical site address: _____

Site EPA Id number _____

II. Description of process generating material: _____

(be specific)

Date of generation: _____

MSDS available yes / no (circle applicable)

III. Sample Information:

Sample ID number(s) _____

Date sampled _____ Requested analysis _____

Lab _____

tat _____

Sampled by: _____

Company: _____

IV. Physical Description:

Physical state: Liquid / Solid / Gas / Other (circle applicable)

Describe each phase: _____

Specific Gravity: _____

pH Range: _____ flashpoint: _____

- ☐ Reactive?
- ☐ Radioactive?
- ☐ Oxidizer?
- ☐ Shock sensitive?
- ☐ Other? _____

V. Chemical Description:

	constituent	*range (% or ppm):*			*Specify Compounds:*
☐	PCBs	_____	to	_____	_____
☐	TOCs	_____	to	_____	_____
☐	VOCs	_____	to	_____	_____
☐	SVOCs	_____	to	_____	_____
☐	toxins	_____	to	_____	_____
☐	cyanides	_____	to	_____	_____
☐	phenolics	_____	to	_____	_____
☐	sulfides	_____	to	_____	_____
☐	metals	_____	to	_____	_____
☐	other	_____	to	_____	_____
☐	other	_____	to	_____	_____

Jacobs Field Waste Profile and Disposition Worksheet

This worksheet shall be filled out to the extent practical by the person(s) responsible for generating a waste material. This worksheet will aid Jacobs in determining correct ultimate disposition of this material.

Container ID number _____

VI. Container information:

Container type: _____
Container size: _____
Container type: _____
UN POP markings: _____
Other markings: _____

☐ Container labelled? Descriptions on label: _____

VII. Material Disposition:

Recommended disposition: _____

Disposal/Recycle facility: _____

Manifest/Bill of Lading number: _____

VIII. Certification:

1. Company generating waste: _____
   name position title date
2. Jacobs site representative: _____
   name position title date
3. Jacobs regulatory specialist: _____
   name position title date
4. Government site representative: _____
   name position title date
5. Agency disposing of material: _____
   name position title date

ATTACHMENT E-2

Fort Wainwright Landfill Prohibitions

FORT WAINWRIGHT LANDFILL

PROHIBITIONS AND SPECIAL RESTRICTIONS

A. Scavenging and Salvaging is prohibited.
B. Disposal of hazardous wastes, as defined by 40 CFR part 261 is prohibited. Ensure waste meeting this definition is disposed of in accordance with 40 CFR Part 262, Standards Applicable to Generators of Hazardous Waste.
C. Disposal of raw sewage, liquids, radioactive material, explosives, oil, solvents, strong acids, untreated sewage sludge, septage, untreated pathogenic, and other waste defined under 18AAC 60.910(28) is prohibited at this facility.
D. Disposal of lead-acid vehicle batteries is prohibited.
E. Disposal of polluted soil as defined by 18 AAC 60.025 & 330 is prohibited.
F. Disposal of trash other than ***construction debris*** is prohibited.
G. Drums must be empty and cleaned of fluids prior to crushing. All drums must be crushed and flattened prior to disposal.
H. Ensure that if scrap vehicles are accepted at the landfill, they are drained of all oil and petroleum products and lead-acid batteries removed prior to disposal.
I. Former is invalid FWA does not accept MSW.
J. Disposal of asbestos waste is allowed in accordance with the following requirements; submit to the landfill operator a completed asbestos manifest form with each load of ACM. ACM will be properly contained in leak-tight containers and labeled. Labeling will include description of contents, ACM source location (building number or utilidor location), and the contractor's name and contract number for identification purposes.

   Containers may be barrels, drums, or six-mil or thicker plastic bags. The ACM waste will be placed in approved locations only as directed by the landfill operator. All containers will have warning labels attached that state:

CAUTION
CONTAINS ASBESTOS
AVOID OPENING OR BREAKING CONTAINER
BREATHING ASBESTOS IS HAZARDOUS TO YOUR HEALTH

OR

CAUTION
CONTAINS ASBESTOS
AVOID OPENING OR BREAKING CONTAINER
BREATHING ASBESTOS DUST
MAY CAUSE SERIOUS BODILY HARM

K. Questions concerning disposal of solid waste at the Ft Wainwright Landfill can be addressed to the Fort Wainwright Environmental Office at 353-6249.
L. Authorization Cards need to be obtained from the Ft Wainwright Environmental Office, building 3023 phone 353-6249.

APVR-WPW-0 March 23, 2000

MEMORANDUM FOR: DPW Engineering Division

SUBJECT: Operational Changes at Fort Wainwright Landfill

The Fort Wainwright Landfill will no longer accept mixed municipal solid waste after Friday, March 31, 2000.

Contractors will be allowed limited access for disposal of items listed below subject to the conditions listed:

Construction Debris:

- Access must be coordinated at least one day in advance with DPW Grounds Maintenance Shop at 353-7192.
- Contents of the load must be construction materials only with no mixed garbage such as food containers or other household type refuse. Mixed loads will be refused.

Asbestos:

- Loads must be properly documented.
- Access must be coordinated at least one day in advance with DPW Grounds Maintenance Shop at 353-7192.
- Delivery time must be coordinated and must be early enough in the day to allow the operator to cover the material before the end of the day.

The landfill will be open by appointment only during the following hours (excluding federal holidays): Monday – Thursday 0800 to 1600 hours and Friday 0800 to 1500 hours.

A landfill card form DPW Environmental Division will be required for each contractor.

Load sheets will be required for each load at the landfill gate per current practice.

1.8.1 Landfill Cover Requirements

All construction and asbestos containing material (ACM) debris placed in the landfill by the Contractor's operations shall be covered daily. The Contractor shall provide all plant, labor, material, equipment and supervision necessary to cover all construction and ACM debris deposited in the landfill generated by this projects' construction operations. The Contractor shall be responsible for providing cover in accordance with the requirements listed below and in accordance with all local, state and federal regulations. This work is considered incidental to the project requirements and no separate payment will be made for this work.

1.8.1.1 Cover Layer Requirements

a. The material used to cover the construction debris and ACM cells shall be obtained from an approved source(s). See additional requirements listed in paragraph 1.8.1.2 below.

b. Material shall be spread in sufficient quantity and loose thickness to ensure that when compactive effort is applied that the cover material will consolidate easily and uniformly, and that all debris is covered. Loose cover material shall be spread in such a manner in a thickness so as to preclude damage to bagged ACM. Exposed debris or bagged ACM will not be allowed.

c. The maximum compacted thickness shall be 300 mm.

d. Compactive effort shall be applied uniformly across the entire surface employing equipment of a type specifically designed for use in this type of environment. Required compactive effort shall be equivalent to 3-passes of a D-6 dozer or heavier piece of equipment over the entire surface to be covered.

1.8.1.2 Cover Material Source

At the option of the Contractor, suitable cover material may be provided from a source outside of Ft. Wainwright or from the material pit located on Old Badger Road.

If the Contractor elects to provide cover material from an outside source, the Contracting Officer prior to the start of any construction or demolition operations shall approve that source.

Should the Contractor elect to use the Old Badger Road material pit, the Contractor is advised that at least one other Contractor will be obtaining material from this site. It shall be the responsibility of the Contractor to coordinate his operations with that of the other Contractor(s).

Under either circumstance, the Contractor shall provide all plant, labor, equipment and supervision necessary for the acquisition, transport and off-loading of the cover material at the landfill.

1.8.1.3 On-site Equipment Storage

Storage of equipment associated with this effort may be stored within the boundary of the landfill. It is the Contractors' responsibility to safeguards against unauthorized access to the equipment during non-duty hours.

1.8.1.4 Environmental Protection

The Contractor shall provide the necessary safeguards for the prevention of POL spills, containment and cleanup, and for dust suppression.

CONSTRUCTION & DEMOLITION (C&D) DEBRIS DEFINITION

C&D debris is defined as those materials resulting from the alteration, construction, destruction, rehabilitation or repair of any manmade physical structure or surrounding site. Materials that can be disposed at the Fort Wainwright landfill are:

lumber to include light weight steel building studs
drywall
brick & concrete
metals
plaster
windows
roofing materials
plumbing fixtures
electrical wiring
heating equipment
asphalt
insulation
carpeting
human waste *(bagged and returned from field exercises)*
asbestos *(in it's own segregated cell - disposal is IAW State & Federal laws)*

The Fort Wainwright landfill **cannot** accept

regular household waste
hazardous waste/materials (except asbestos)
tires
light bulbs, tubes or PCB light ballasts
*mattresses
*excess/unserviceable TA-50, vehicle components, etc.
*wall lockers/bed frames
*desks
* refrigerators and white metals

*** Turned into the local DRMO for reuse or sale**

ATTACHMENT E-3

Fort Wainwright Waste Tracking Spreadsheet

Waste Tracking Summary

	Container Number	Date Container Delivered to Barge	Date Container Delivered (or current date if not yet delivered)	Total Days	Pass Pre-Fill Inspection	Date Filled, Inspected, and Shipped	Manifested Wt in Tons	Received Wt.	Manifest Number	Current Location	Date Rec'd a/final Dest.	Comments
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
Total Bin Days				**0**								

ATTACHMENT E-4

Drum Handling Specification

JACOBS

DRUM HANDLING
SECTION 02116

PART 1. GENERAL

Subcontractor shall provide adequate labor, training, materials, equipment, and incidentals necessary to handle drums and mitigate accidents and injuries. Hazards are inherent to drum-handling activities; establishing safe work practices and procedures, however, can minimize the risk of injury, during drum handling, to personnel working at hazardous waste sites.

1.1 REFERENCES

Questions about interpretation of standards shall be submitted to Jacobs for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.

***CODE OF FEDERAL REGULATIONS* (CFR)**	
Title 40 CFR	**Title 49 CFR**
Part 61 National Emission Standards for Hazardous Air Pollutants	Part 107 Hazardous Materials Program Procedures
Part 261 Identification and Listing of Hazardous Waste	Part 130 Oil Spill Prevention and Response Plans
Part 262 Standards Applicable to Generators of Hazardous Waste	Part 171 General Information, Regulations, and Definitions
Part 263 Standards Applicable to Transporters of Hazardous Waste	Part 172 Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	Part 173 Shippers-General Requirements for Shipments and Packaging
Part 265 Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	Part 174 Carriage by Rail
Part 266 Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities	Part 175 Carriage by Aircraft
Part 268 Land Disposal Restrictions	Part 176 Carriage by Vessel
Part 270 EPA Administered Permit Programs: The Hazardous Waste Permit Program	Part 177 Carriage by Public Highway
Part 273 Standards for Universal Waste	Part 178 Specifications for Packaging

***CODE OF FEDERAL REGULATIONS* (CFR)**	
Part 279 Standards for the Management of Used Oil	**Title 29 CFR**
Part 300 National Oil and Hazardous Substances Pollution Contingency Plan	Part 1910 Occupational Safety Health Standards
Part 302 Designation, Reportable Quantities, and Notification	Part 1926 Safety and Health Regulations for Construction
Part 761 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions	
***North American Emergency Response Guidebook* (1996)**	
EM 385-1-1-U.S. Army Corps of Engineers Safety and Health Requirements Manual (2003)	
National Fire Protection Association (NFPA), Hazardous Materials Response Handbook (1989)	
National Institute of Occupational Safety and Health (NIOSH), U.S. Occupational Health and Safety Administration (OSHA), U.S. Coast Guard (USCG), and U.S. Environmental Protection Agency (EPA), Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (October 1985)	

1.2 SUBMITTALS

The following submittals are required by this specification and shall be submitted in accordance with Section 5 of the Subcontract. Jacobs' approval is required for submittals with a "JA" designation; submittals having an "FIO" designation are for information only.

Submittal Item No.	Description	Designation	Comments
02116-2.2	Equipment list	JA	Prior to mobilization to the job site, submit list of all spill-containment, lifting, safety, and emergency equipment to be onsite during drum-handling activities.
02116-3.1.2	HAZMAT employee certifications	JA	Prior to mobilization to the job site, Subcontractor to submit a letter to Jacobs certifying that personnel (by name and function) have been trained and tested to perform the duties assigned, in accordance with 49 CFR.
02116-3.4.5	Packaging cut sheets	JA	Prior to mobilization to the job site, submit cut sheets, accompanied by types of materials allowed, for the packagings to be provided on the project.

1.3 DEFINITIONS

Hazardous substance	1. Any substance designated pursuant to 40 CFR part 302 AND/OR 2. A material, including its mixtures and solutions, as defined in 49 CFR 171.8.
Hazardous material	A substance or material that has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce and that has been so designated pursuant to the Hazardous Materials Transportation Act, 49 U.S. Code (U.S.C.) Appendix Section 1801 et seq. The term includes materials designated as hazardous materials under the provisions of 49 CFR 172, Parts .101 and .102 and materials that meet the defining criteria for hazard classes and divisions in 49 CFR 173. Those materials designated by the U.S. Environmental Protection Agency (EPA) as hazardous wastes are also hazardous materials.
Hazardous waste	A waste that meets criteria established in the Resource Conservation and Recovery Act (RCRA), specified by the EPA in 40 CFR 261, or that has been designated as hazardous by a RCRA-authorized state program.
Nonhazardous material	A substance or material that is not considered a hazardous material, as defined above.
Nonhazardous waste	A waste that does not meet the criteria of a hazardous waste, as defined above.

1.4 JOB CONDITIONS

Requirements of Specification Section 10, Safety, Health, and Emergency Response, shall be followed when planning and executing all drum-handling operations.

Subcontractor shall be prepared to manage drums in the following general condition(s) (check applicable condition):

- ☐ Properly packaged, labeled, and marked
- ☐ Properly packaged but requiring labels and markers
- ☐ Nonleaking but requiring placement in overpack or salvage drums
- ☐ Abandoned with uncertain integrity; located on ground surface
- ☐ Abandoned with uncertain integrity; located below the ground surface
- ☐ Abandoned drums in or under surface water

PART 2. PRODUCTS

2.1 PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

Personal protective equipment (PPE) requirements shall be in accordance with Specification Section 10, Safety, Health, and Emergency Response. Drums abandoned and lacking information or labels describing contents require a minimum protection of Level B

2.2 EQUIPMENT REQUIREMENTS

Subcontractor shall provide all equipment required to handle drums in the conditions identified in paragraph 1.4. Adequate equipment required to ensure activities are conducted safely and efficiently while containing material shall be onsite prior to conducting work; this includes spill-containment equipment, lifting equipment, safety equipment, and emergency equipment. Prior to mobilization to the job site, Subcontractor shall **submit a list of all equipment** to be onsite during drum-handling activities.

PART 3. EXECUTION

3.1 REVIEW OF SITE-SPECIFIC SAFETY AND HEALTH PLAN

Personnel involved in drum handling operations shall review the Site-Specific Health and Safety Plan (SSHP) in accordance with Specification Section 10, Safety, Health, and Emergency Response.

3.1.1 Certifications

Personnel who package, label, and/or mark hazardous materials drums shall possess experience and training sufficient to perform those duties. Subcontractor shall certify that Subcontractor employees are trained and have been tested in accordance with 49 CFR. Subcontractor shall **submit certifications for each HAZMAT employee** in accordance with the Subcontractor's Operator Training and Certification Program. Jacobs must approve this submittal prior to the Subcontractor's mobilization to the job site.

3.2 MOBILIZATION EXECUTION

All equipment provided on the list submitted under paragraph 2.2 shall be identified onsite and inventoried prior to commencing drum-handling activities.

3.3 DAILY EXECUTION

A site inspection shall be completed before handling drums at any site. Drums shall be visually inspected to determine their characteristics, physical condition, and contents and to obtain other pertinent information.

Until their contents have been characterized or Jacobs has provided other identification information, personnel should assume, as a precautionary measure, that unlabelled or unidentified drums contain hazardous materials or hazardous waste.

3.4 EXECUTION ELEMENTS

Subcontractor shall conduct inventories and inspections to ensure safety of workers, proper tracking of wastes, and identification of potential releases.

3.4.1 Site Inspection and Drum Inventory

During a preliminary site inspection conducted prior to drum-removal operations, pertinent information regarding the drums and their contents shall be obtained whenever

possible. Information can be obtained by means of interviews with personnel, chemical inventories, material safety data sheets, shipping papers, waste management records, and visual inspections. The following types of observations shall be noted:

- Drum size
- Special drum features
- Drum condition
- Drum composition
- U.S. Department of Transportations (DOT) drum specification
- Drum contents
- Drum top configuration
- Labels and markings
- Visible hazard indicators

A drum inventory shall be completed and a site map prepared. Observations shall be made of the conditions in the areas immediately adjacent to the drum locations. Visual checks for contaminated soil and water, stained ground surfaces, dead animals and vegetation, and other signs of drum leakage shall be completed. Monitoring instruments shall be used to test for the presence of hazardous atmospheres and ionizing radiation, as applicable.

3.4.2 Monitoring

To test for the presence of hazardous atmospheres and ionizing radiation, monitoring shall be completed prior to and during drum-handling operations, as applicable. The areas around the drums shall be checked with monitoring instruments to detect flammable, oxygen-deficiency, toxic, or radiological hazards.

3.4.3 Planning

Subcontractor shall review and reassess the Safe Plan of Action (SPA) for drum-handling sites based on the observations and monitoring conducted above. Subcontractor shall refer to Specification Section 10, Safety, Health, and Emergency Response, for additional information on SPA forms. Subcontractor shall verify that all safety, containment, and handling equipment and supplies are on hand prior to beginning site activities.

3.4.4 Drum Handling

Drum handling is commonly required for the management of hazardous materials and hazardous wastes on a site. Drum handling may be required to respond to immediate issues of worker safety, such as drum leakage, improper storage of incompatible materials, or the presence of explosive or reactive substances. Drum handling is usually implemented in the process of unstacking, orienting, and organizing drums into different areas onsite to facilitate sampling, waste characterization, and remedial action. Drum-handling activities could involve the following:

- Manual movement of drums
- Drum sampling
- Drum overpacking
- Labpack waste handling
- Mechanical movement of drums
- Drum transferring
- Drum crushing
- Drum marking and labeling
- Drum opening
- Drum excavating
- Shock-sensitive waste handling
- Shipping and transport

3.4.5 Material Transfer

1) General

Drum transfer is the process of transferring solid or liquid materials from drums into other drums or containers. This may be required when a drum cannot be moved without rupture, leaking, or spilling. Prior to mobilization to the job site, Subcontractor shall **submit cut-sheets for packagings** to be provided on the project. Subcontractor shall provide personnel who are knowledgeable and experienced in such transfer operations.

- Subcontractor shall provide proper equipment to transfer solid materials. Presence of windy conditions may have an impact on transfer operations. Use of water spray or other dust-control measures may be needed when transferring solid materials.
- Subcontractor shall provide equipment and personnel to transfer liquid materials with disposable, plastic hand pumps, "pogo" pumps, or pneumatic pumps. Subcontractor shall not overfill receiving containers during transfer activities; shall ensure that the pump, transfer hoses and fittings, and container selected are compatible with the material to be transferred; and shall ensure proper bonding and grounding techniques are employed when transferring flammable or combustible materials. Any electrical equipment used for the transfer of the flammable liquids must be of an approved type for such usage.

2) Transfer of Combustible or Flammable Liquids

Due to the potential fire hazard associated with combustible or flammable liquids, Subcontractor shall implement special procedures during the transfer of these materials. At a minimum, the following must be addressed:

- All ignition sources must be eliminated from areas where combustible or flammable liquids are stored or where transfer operations are to occur. No

smoking, hot work, or other spark-producing activity shall be allowed when transferring flammable or combustible liquids or when working in areas where flammable or combustible materials are present.

- A suitable discharge location shall be provided for vapor displaced from a container being filled.
- Portable multipurpose fire extinguishers shall be maintained onsite, kept fully charged, inspected monthly, and serviced annually.
- Portable multipurpose fire extinguishers shall be placed within 75 feet of active work areas where flammable or combustible materials are present.

3) Bonding and Grounding Procedures

Subcontractor is responsible for and required to establish and follow grounding and bonding procedures. Bonding and grounding of equipment producing static electricity shall be required whenever transferring flammable or combustible liquids or when working in areas where flammable or combustible materials are stored. Proper use of these procedures will prevent the occurrence of sparks by static electricity, which may be generated by transfer equipment and operations.

4) Containment of Drum Leaks

Subcontractor shall ensure full compliance with the Environmental Restoration Services (ERS) Standard and Site-Specific Addendum to the Environmental Protection Plan (EPP). Subcontractor shall ensure proper containment of all drums, fixed or mobile tanks, vessels, or other containers. Spill kits shall be made available onsite for fixed temporary storage of liquids or solids and for equipment operations.

5) Overpacking

Drum overpacking is the process of placing a leaking or damaged drum inside a larger drum for containment and shipping purposes. Subcontractor shall provide salvage or recovery drums (both common designations for overpack drums). Subcontractor shall submit cut-sheets for the drums to be used on the project, in accordance with the requirements of Item 1 under paragraph 3.4.5.

At a minimum, Subcontractor shall place a damaged drum in a slightly oversized, open-top salvage drum. The space between the damaged drum and the salvage drum shall be filled with a compatible cushioning and absorbent material; a tight-fitting lid shall be secured to the salvage drum. The salvage drum must be labeled and marked in accordance with DOT regulations for the hazardous material or waste it contains. Additional DOT requirements related to certification of salvage containers must be strictly followed.

6) Buried Drums

Subcontractor shall employ heavy equipment using straight edged buckets or use manual excavation methods to expose buried drums. If possible, Subcontractor shall determine the contents, characteristics, and hazards of buried drums prior to excavation.

To prevent drum rupture, Subcontractor shall use caution when removing the soil or other material covering buried drums. Metal or fiberboard drums will likely not be intact because of their deterioration while in the ground; however, plastic liners containing drum contents may still be intact. It should be assumed that soil beneath and surrounding the buried drums would be contaminated from drum leakage. Should hand excavation be required, If workers are to enter excavations five feet or deeper, Subcontractor shall comply with OSHA excavation safety requirements.

3.4.6 Drum Staging and Tracking

Drums must be staged to facilitate drum sampling, waste characterization, and remedial action. The drum staging area(s) shall be identified in the Subcontractors site plan specified in Specification Section 01500, Temporary Construction Facilities. Subcontractor shall determine whether one staging area or multiple areas will be used for drum staging. Drum-staging areas shall be kept to the minimum number necessary to safely identify and classify materials and to prepare them for transport. Initial staging consideration should be to segregate incompatible containers and leaking containers. Subcontractor shall provide sufficient security to ensure drum-storage areas cannot be accessed by bystanders or criminals.

Drums shall be stored one high in rows of two with aisles (3-foot minimum width) left between rows to allow access by personnel. An initial staging area can be used to organize drums according to type, size, condition, suspected contents, compatibility, etc. A drum opening- or sampling-staging area is often used for the opening and sampling of drums. A secondary staging area may be needed as a holding area for temporary drum storage following drum sampling or characterization and pending transport. An additional staging area can be used for bulking materials.

The Subcontractor shall track all on-island movements and pre-shipment staging of waste in accordance with Specification Section 02111, Excavation and Handling of Contaminated Material.

3.4.7 Drum Opening

Subcontractor shall provide training and equipment to ensure drum-opening activities are conducted in a manner to eliminate hazards of flammable atmospheres, chemical exposure, chemical splashes, vapor releases, chemical reactions, and possible explosions that can be encountered during drum-opening operations. Subcontractor shall conduct the following to maintain a safe work area:

- Keep nonessential workers a safe distance from drum-opening operations.
- Provide protective clothing, respiratory protection, and air-monitoring equipment when opening drums whose contents have not been characterized.
- Establish an emergency eyewash and shower area and place a multipurpose fire extinguisher in the immediate area of drum-opening operations. Protect from physical damage and contamination any airline respirators that may be in use.
- Use remote drum-opening equipment and specialized blast shields when working with reactive or potentially explosive materials.

- Place equipment controls for drum opening, monitoring, and fire suppression upwind and behind explosion-resistance barriers.

3.4.8 Drum Sampling

The sampling of drum contents shall be completed according to the sampling procedure established in the FSP. Refer to Specification Section 02120, Offsite Transportation and Disposal of Hazardous Materials, for information related to labeling, packaging, and shipping of hazardous materials.

Subcontractor shall ensure that all stratified layers of the material being sampled are collected and represented in the sample. Sample characterization can be basic or extensive, depending on the amount and type of information needed. Basic hazard categorization (HAZCAT®) testing for the following waste types: flammability, corrosivity, and oxidation can be completed using a combustible gas indicator, pH paper, and potassium-iodide starch paper, respectively. Full characterization may involve laboratory analysis in accordance with disposal facility waste-profiling and -acceptance criteria.

After completing HAZCAT evaluation and compatibility testing, analytical samples will be taken from the first drum of each separate waste type to confirm field analyses (the waste types are described). These analytical results shall be made available within 14 days. Waste suspected of being RCRA hazardous characteristics or wastes regulated under the Toxic Substances Control Act (TSCA) will be analyzed for RCRA metals, PCBs, organochlorinated pesticides (OCPs), volatile organic compounds (VOCs), and oil-burning specifications (OBS). Waste determined to be non-RCRA, non-TSCA POL-type waste will be analyzed for OBS to determine if blending or recycling as fuel for thermal desorption is possible.

Only empty drums that are potentially RCRA- or TSCA-regulated waste, based on HAZCAT results, will be taken to the decontamination area and cleaned once using a high-pressure water rinse with a low-volume nozzle. The drums will be tripled rinsed with clean water. Each rinse shall consist of at least a volume of water equal to 10 percent of the drum volume. No visible residue will be left in the drums. Clean drums will be crushed by means of an excavator bucket and disposed of at a permitted solid-waste landfill.

Once these wastes are determined to be compatible through HAZCAT and compatibility testing, they will be bulked in DOT-approved isolation tanks for storage, transport, and disposal, according to the packaging requirements listed in 49 CFR, 130.21.

3.4.9 Drum Bulking

Subcontractor shall be responsible for combining wastes that have been characterized (by others) in bulk containers such as drums, intermodal tanks, or tanker trucks for shipment to a treatment, storage, and disposal facility. Bulking of hazardous wastes shall begin only after thorough characterization of the material and direction by Jacobs.

Subcontractor shall use the following general methods for bulking drums that contain solid (at ambient temperatures asphalt) that is not hazardous waste.

- Secure asphalt-containing drums to eliminate a release of contents.
- Line intermodal containers with polyethylene and place sorbing and/or solidifying material in the bottom of the container.
- Place asphalt-containing drums directly into prepared shipping container.
- Add additional sorbing and/or solidifying material to loaded shipping container.

3.4.10 Drum Crushing

Prior to mobilization to the job site, Subcontractor shall propose drum-crushing procedures to the Jacobs Project Manager for approval. Drums may be crushed only when they are empty, they do not contain residual materials that could ignite from a spark caused by the crushing process, and any possible spillage from the drum is contained.

3.4.11 Drum Shipping and Transport

Shipping and transport is the process of preparing drums for shipment and transport offsite. The drums to be transported shall be properly identified and classified through the waste-characterization process (completed by others). Subcontractor shall ensure materials are properly containerized and sealed in the applicable DOT-specification package and properly secured in the transport vehicles or units. Refer to Specification Section 02120, Offsite Transportation and Disposal of Hazardous Waste, for additional information.

-END OF SECTION-

APPENDIX F

Stockpile Construction Plan

FINAL

FORT WAINWRIGHT
POST WIDE WORK PLAN

APPENDIX F
Stockpile Construction Plan

FORT WAINWRIGHT, ALASKA

MARCH 2011

U.S. Army Corps of Engineers, Alaska District
Environmental Remediation Services
Contract No. W911KB-06-D-0006
Task Order No. 20

JACOBS

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Attachment F-1 Technical Specifications for the Construction of Long-Term Soil Stockpiles

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
COPC	contaminants of potential concern
Jacobs	Jacobs Engineering Group Inc.
SCP	Stockpile Construction Plan

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1.0 INTRODUCTION

Many of the sites within Fort Wainwright, Alaska (FWA) will be excavating and removing soil. Storage of these materials is regulated by the Alaska Department of Environmental Conservation (ADEC). This document describes the plans and procedures that will be followed when constructing stockpiles to ensure compliance with these regulations. This Stockpile Construction Plan (SCP) presents the design of the contaminated soil stockpile containment cells and identifies the requirements for constructing, maintaining, monitoring, and decommissioning the cells. It also provides guidance for testing the ground surface for potential contamination before the cells are constructed and after they are removed. The containment cells are designed to meet or exceed the requirements of the Alaska Administrative Code (AAC), Title 18, Section 75.370, and the guidance contained in *Guidance for Cleanup of Petroleum Contaminated Sites* (ADEC 2008).

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2.0 TECHNICAL APPROACH

This section describes guidelines that will be used in constructing, monitoring, and decommissioning the long-term soil stockpiles.

2.1 DESIGN AND CONSTRUCTION OF LONG TERM STOCKPILES

Whenever possible, the stockpile cells will be constructed on concrete pads. If a portion or all of the cell is to be constructed on soil, baseline preconstruction surface soil samples will be collected within the footprint of the planned stockpile. The samples will be analyzed for contaminants of potential concern (COPC) identified in each site-specific work plan addendums. These data will be used to document baseline contaminant concentrations prior to cell construction. After the stockpiled soil is removed and the cells are decommissioned, the preconstruction soil sample locations will be located and resampled to determine any impacts from stockpiling activities (Section 2.5).

Figure F-1 illustrates a typical cross-section of the containment cell design and notes regarding preparation and construction requirements. The cells will be constructed with dimensions applicable to their locations and positions based on the estimated quantity of soil to be excavated and stockpiled. The design addresses ADEC requirements by including the following activities:

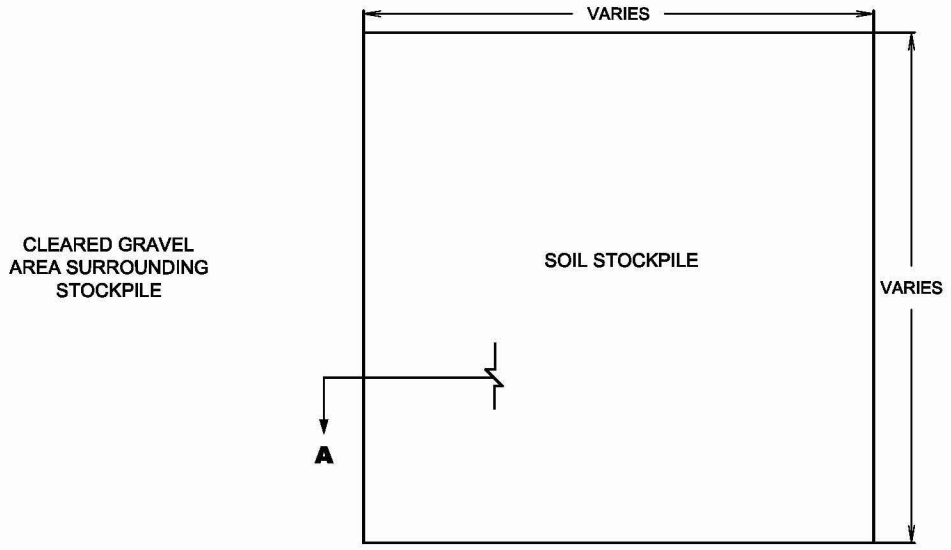
- Preparation of the subgrade including grading/brushing and berming the area
- Placement of a sand base or similar material as necessary to prevent damage to the liner
- Placement of a bermed petroleum-resistant bottom liner of sufficient thickness (minimum 20-mil) to withstand puncturing or tearing during soil stockpiling activities
- Placement of a layer of clean sand between the liner and contaminated materials
- Stockpile of soil in a configuration designed to shed water
- Placement of a top cover (minimum 10-mil thickness) and manufacturer- or field-sealed edges
- Securing the top cover by using either rope or netting and sandbags to protect stockpiles from storm events and to ensure that the top cover will be secured for the duration of the stockpile

- Lapping the top cover over the bottom liner to prevent water from infiltrating into the contaminated soils

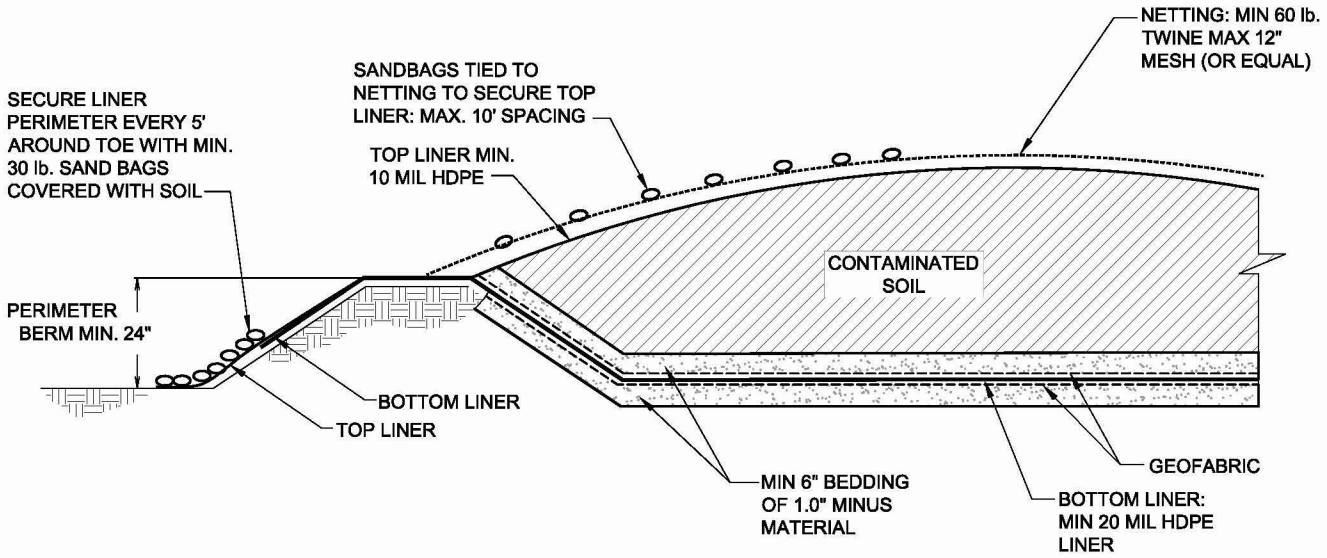
2.2 DESIGN AND CONSTRUCTION OF TEMPORARY STOCKPILES

Temporary stockpiles may be used and will be constructed with the same design outlined above, but will require only a minimum 10-mil bottom liner. Temporary stockpiles will only be used in the following circumstances:

- Protecting clean backfill from water, freezing, or cross-contamination
- Staging limited quantities of soil at a given location for a short period of time (2 weeks or less) due to restrictions of space or availability of bins to transport the material off-site
- Containing minimally contaminated soil that may be considered clean (and used as backfill) pending receipt and review of lab data



PLAN VIEW



SECTION A

LINER SYSTEM DETAIL FOR CONTAINMENT BERM

NOTE:

NETTING EXTENDS TO WITHIN 10' OF PERIMETER BERM

LEGEND:

- CONTAMINATED SOIL
- NATIVE SOIL
- 1.0" MINUS BEDDING MATERIAL

STOCKPILE CONSTRUCTION DIAGRAM		
KODIAK ISLAND, ALASKA		
PROJECT MANAGER: T. Heikkila	FILE NAME: Fig F-1 Stockpile Diagram.dwg	DATE: June 06, 07
	LAYOUT TAB: Fig F-1 Stockpile Diagram	FIGURE NO.: F-1
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2.3 LEACHATE MANAGEMENT

Leachate collected from the soil stockpiles will be analyzed by appropriate laboratory methods based on COPCs encountered at the soil excavation sites. If leachate collects in the stockpile, it will be filtered and pumped to an onsite storage tank or drums as appropriate to the volume to be transferred. Storage tanks and drums will be maintained within a lined, bermed area. The stored liquids will be characterized and disposed of based on the contaminant. Active stockpiles will be covered nightly during project execution. The stockpiles may remain uncovered during working hours except during times of high wind or precipitation.

2.4 MONITORING

After soil stockpile construction is complete, Jacobs Engineering Group Inc. (Jacobs) or a subcontractor will inspect the stockpile for integrity. Inspections will be conducted following weather events that could damage the stockpile liners including severe winds or heavy rains. The inspector will provide a report to Jacobs of any required repair, and the stockpile will be repaired as quickly as possible to minimize the potential for contaminant migration from the stockpile.

2.5 DECOMMISSIONING

The soil will be removed from the containment cell in a manner that prevents spillage. Liner and cover material determined to be unsalvageable and free of loose visible contamination will be disposed of at the Fort Wainwright Landfill as construction debris.

If any stained soil is observed beneath the area of the bottom liner, the soil will be removed and its location noted. Samples will be collected and analyzed for COPCs to confirm removal of contaminated soils resulting from stockpile activities. Post-construction samples will be collected from locations as close as reasonably achievable to the location of the preconstruction characterization samples.

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3.0 SCHEDULE AND REPORTING

Within 2 years of construction, the soil will be removed for treatment or disposal, and the soil stockpiles will be decommissioned. Once decommissioned, the following information will be provided:

- **Maintenance Log:** All repairs to the liner and operations that remove water from the liner will be recorded. A copy of the inspection report(s) will be in the after-action report.
- **Analytical Data:** The results of preconstruction and post-construction soil sampling will be evaluated and provided in the After-Action Report.
- **Certificates of Disposal:** Certificates of disposal will be provided in the After-Action Report upon completion of treatment or offsite transportation and disposal.

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4.0 REFERENCES

ADEC (Alaska Department of Environmental Conservation). 2008 (October). *Oil and Other Hazardous Pollution Control Regulations – Discharge Reporting, Cleanup, and Disposal of Oil and Other Hazardous Substances*. 18 AAC 75.

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ATTACHMENT F-1

Technical Specifications for the Construction of Long-Term Soil Stockpiles

JACOBS

STOCKPILE CONSTRUCTION AND MAINTENANCE
SECTION 02302

PART 1. GENERAL

SUBCONTRACTOR shall provide labor, materials, equipment, and incidentals needed to construct and maintain soil stockpiles in accordance with the specifications presented in subsequent text.

1.1 REFERENCES

Subcontractor shall ensure that equipment and materials satisfy the specifications, as measured by the stated test methods, and shall verify that the containment system, including the bottom liner and top liner, is adequately installed and sealed to minimize the migration of contaminants.

The following publications form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

Alaska Department of Environmental Conservation	
18 AAC 78	*Underground Storage Tank Regulations*
U. S. Environmental Protection Agency	
EPA-5601	*Verification of PCB Spill Cleanup by Sampling and Analysis* (EPA-560/5-85-026). 1985.
Federal Aviation Administration	
	Quality Assurances Program Plan
American Society for Testing and Materials (ASTM) standards	
D4873	Identifications, Storage and Handling of Geosynthetics
D3776	Weight
D1777	Thickness
D4632	Grab Tensile Strength
D4533	Grab Tensile Elongation
D4833	Trapezoid Tear Strength
D4491	Puncture Resistance
D4751	Permeability
D1603	Apparent Opening Size
D2136	Cold Crack
D1603	Black Carbon Content
D3015	Carbon Dispersion
D751A	Tensile Strength for Coated Fabric Liner
D882	One-Inch Tensile Strength
D471	Oil Resistance

1.2 SUBMITTALS

The following submittals are required by this specification and shall be submitted in accordance with Section 5 of the Subcontract. Jacobs must approve submittals with a

"JA" designation. Submittals having an "FIO" designation are for information only. The following shall be submitted:

Specification Paragraph No.	Description	Designation	Comments
02302-2.2	Cut sheet for nonwoven geotextile	JA	Required to be submitted and approved before Subcontractor's mobilization to the job site
02302-2.3	Cut sheet for high-density polyethylene liner	JA	Required to be submitted and approved before Subcontractor's mobilization to the job site
02302-2.3	Cut sheet for high-density polyethylene cover	JA	Required to be submitted and approved before Subcontractor's mobilization to the job site

1.3 DEFINITIONS (not used)

1.4 DELIVERY, STORAGE, AND HANDLING OF FACTORY-MANUFACTURED LINERS AND COVERS

- Factory-manufactured liners and covers shall be supplied in rolls wrapped in relatively impermeable and opaque protective covers.
- Rolls of factory-manufactured liners and covers shall be marked or tagged in accordance with ASTM D4873 and with the following information:
  - Manufacturer's name
  - Production date
  - Product identification
  - Roll number
  - Roll dimensions
- Jacobs will inspect all factory-manufactured liners and covers for damage.
- Subcontractor shall store and protect factory-manufactured liner rolls from dirt, excessive temperatures, water, exposure to ultraviolet light, and other potential sources of damage, in accordance with ASTM D4873.
- Subcontractor shall protect from damage the rolls of factory-manufactured liners during unloading or handling.

PART 2. PRODUCTS

2.1 EQUIPMENT

Equipment proposed shall be capable of properly installing liners and placing soils to avoid damage to the liner materials. Equipment must also comply with Specification Section 0351, Safety, Health, and Emergency Response.

2.2 NONWOVEN GEOTEXTILE LINER

Prior to mobilization, Subcontractor shall **submit** a **cut sheet for the nonwoven geotextile** to be provided. The nonwoven geotextile liner material shall meet the following minimum specifications:

- Weight (ASTM D3776): 8 ounces per square yard
- Thickness (ASTM D1777): 110 mil
- Grab tensile strength (ASTM D4632): 150 pounds
- Grab tensile elongation (ASTM D4632): 20 percent
- Trapezoid tear strength (ASTM D4533): 80 pounds
- Puncture resistance (ASTM D4833): 130 pounds
- Permeability (ASTM D4491): 0.10 centimeters per second (cm/sec)
- Apparent opening size (AOS) (ASTM D4751): 70 U.S. standard sieve size

2.3 BOTTOM LINER AND TOP COVER

Prior to mobilization Subcontractor shall **submit** a **cut sheet for the high-density polyethylene liner and the high-density polyethylene cover** to be provided. The reinforced high-density polyethylene (or equivalent) liners and covers shall meet the following minimum specifications:

- Cold crack (ASTM D2136): -60 degrees Fahrenheit or less
- Black carbon content (ASTM D1603): 2 percent
- Carbon dispersion (ASTM D3015): A-2 range
- Tensile strength (ASTM D751A) (for coated fabric liner only): 300 pounds (warp)
- Mullen burst (ASTM D751A) (for coated fabric liner only): 500 pounds per square inch
- One-inch tensile strength (ASTM D882) (for extruded fabric liner only): 45 pounds (warp)
- One-inch elongation MA (machine direction) (for extruded fabric liner only): 625 percent
- Nominal thickness: 20 mil for bottom liner; 10-mil minimum for top liner
- Oil resistance (ASTM D471): No signs of deterioration and more than 80 percent retention of tensile and seam strength after immersion for 30 days at 73° F

2.4 NETTING

For its defined application, the netting material shall be capable of withstanding 50-mph winds. The material shall be UV-resistant and shall not significantly degrade if used for as long as two years. All netting shall be secured by sandbags or other

means to prevent removal by high winds. Subcontractor shall be responsible for providing and maintaining this anchoring system throughout the project.

2.5 STAKES

Stakes shall be a minimum of 2 feet in length, be a minimum of 2 inches by 2 inches with a square cross-section, and have a sharpened end to allow insertion into earthen materials.

PART 3. EXECUTION

3.1 GENERAL

- Subcontractor shall comply with the requirements of Chapter 18 of the Alaska Administrative Code (AAC), Chapter 78, Section 311 (18 AAC 78.311; Soil Storage and Disposal) for the long-term storage of soils contaminated with petroleum, oil, and lubricants (POL).
- Subcontractor shall make a field decision for the precise location of the storage area.
- Subcontractor shall provide bottom-liner and top-cover sizing to ensure that liner material extends at least 4 feet beyond the external bermed boundary.

3.2 PREPARATION OF GROUND SURFACE

- The area that will provide the foundation for the bottom liner shall be relatively level. All pointed rocks and other pointed materials that may puncture the liner shall be removed.
- The external boundary of the containment cell shall be made of berms approximately 18 inches high and 36 inches wide.
- A minimum of 3 inches of sand or other suitable material shall be placed on the ground surface inside the berms as a foundation for the bottom liner.

3.3 GEOTEXTILE AND LINER INSTALLATION

Subcontractor shall handle geotextiles in a manner to ensure they are not damaged and are used in accordance with manufacturer's instructions. Subcontractor shall comply with the following:

- Nonwoven Geotextile Liner
  - Anchor geotextile securely and deploy it in a controlled manner to keep geotextile c/s are not damaged, minimal slippage of geotextile on underlying layers occurs, no excess tensile stresses occur in the geotextile, and overlapping of adjacent edges is maintained.
  - Place geotextile liner within the perimeter of the constructed berm and on top of foundation layer.
  - In the presence of wind, weight geotextile with sandbags or equivalent. Do not remove weight from geotextile liner until it is replaced with bottom liner.

  - Prevent damage to underlying layers during placement of geotextile.
  - During geotextile deployment, do not entrap stones or excessive fine material that could cause clogging of drains or filters in or beneath geotextile fabric.
  - Visually examine entire geotextile surface. Ensure that no potentially harmful foreign objects are present. Remove foreign objects encountered or replace geotextile.
  - Overlap adjacent edges at least 12 inches. Top edges shall face downgrade. Seaming is not required.
  - Repair holes or tears in geotextile as directed by manufacturer's instructions.
  - When placing soil materials on top of geotextile, ensure that geotextile and underlying liner materials are not damaged, minimal slippage of geotextile on underlying layers occurs, no excess tensile stresses occur in the geotextile, and overlapping of adjacent edges is maintained.
- Bottom Liner
  - Handle bottom liner in a manner to ensure it is not damaged and is employed in accordance with manufacturer's instructions.
  - Use a single piece of bottom liner that has been preseamed by the manufacturer. No seaming shall be performed in the field. Place bottom liner on top of nonwoven geotextile liner and surrounding berm.
  - Anchor bottom of liner securely and deploy in a controlled manner to keep liner bottom continually in tension to prevent overlap.
  - In the presence of wind, weight bottom liner with sandbags or equivalent.
  - Ensure bottom liner extends a minimum of 4 feet over the containment cell berms and beyond the external berm boundary on all sides
  - During deployment of bottom liner, do not entrap stones or excessive fine material that could damage the bottom liner.
  - Visually examine entire surface of bottom liner. Ensure no potentially harmful foreign objects are present. Remove foreign objects encountered or replace bottom liner.
  - Place at least 3 inches of clean sand on top of bottom liner in a manner that prevents damage to liner. Colored warning tape (at least 1-inch in length) may be placed on top of clean sand to mark boundary.
  - Place contaminated soil in stockpile-containment cell in a manner that prevents damage to the liner system.
  - Lift edges of bottom liner from berm and place onto reposed surface of stockpiled soil.
  - Repair holes or tears in bottom liner as directed by manufacturer's instructions.
- Top Cover
  - Anchor top cover securely and deploy it in a controlled manner to keep cover continually in tension. To cover soil and the lifted bottom liner, extend cover to footing of stockpiled soil.

  - Until the netting material has been placed and anchored, weight top liner with sandbags or equivalent.
  - Overlap adjacent edges of the top liner according to manufacturer's instructions. Unsecured overlaps shall have sandbags or equivalent placed every 5 feet to prevent wind damage to liner.
  - Repair holes or tears in top liner as directed by manufacturer's instructions.
- Netting
  - Netting shall be placed over top liner to hold the top liner in place during periods of high winds (as much as 50 mph) and to mitigate any wind damage to the high-density polyethylene (HDPE) liner.
  - Netting seams shall be overlapped by at least 1 foot.
  - Sandbags shall be secured at 5-foot intervals along the entire perimeter of the netting.

3.4 RAMPS

If heavy equipment is needed to construct or maintain a stockpile, Subcontractor shall ensure that the ramp for driving into the containment area is constructed following the same placement sequence and materials described in the preceding paragraphs of this specification section.

3.5 FINAL BERMING AND CLOSEOUT

Subcontractor shall place clean soil to surround the perimeter of the bermed stockpile area. Following placement of the top liner against the sides of the bottom liner lying against the stockpile, Subcontractor shall use equipment to place the berm against the outer side of the top liner in a manner that forces the top liner against the bottom liner and maintains the integrity of the top liner.

3.6 STOCKPILE MAINTENANCE

Subcontractor shall inspect stockpiles for damage or deterioration on a daily basis while contaminated soils are being placed into the cell. Subcontractor shall inspect dormant stockpiles (those not being opened and used) weekly during the period of performance. These inspections shall be documented in the Subcontractor Daily Quality Control Report. Stockpile damage shall be repaired by the Subcontractor as soon as possible after discovery and corrective action implemented to prevent recurrence.

-END OF SECTION-

APPENDIX G

Geophysical and Survey Plan

FINAL

FORT WAINWRIGHT
POST WIDE WORK PLAN

APPENDIX G
Geophysics Investigation Plan

FORT WAINWRIGHT, ALASKA

MARCH 2011

U.S. Army Corps of Engineers, Alaska District
Environmental Remediation Services
Contract No. W911KB-06-D-0006
Task Order No. 20

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ACRONYMS AND ABBREVIATIONS

EM	Electromagnetic
FTP	file transfer protocol
FWA	Fort Wainwright, Alaska
GPS	Global Positioning System
Jacobs	Jacobs Engineering Group Inc.
MEC	munitions and explosives of concern
mV	millivolt
nT	nanoTesla
QC	quality control
TDEM	Time Domain Electromagnetic
UXO	unexploded ordnance
µsec	microseconds

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1.0 INTRODUCTION

The geophysical instruments listed below are used to detect different anomalies and for different types of surveys. One or more of these instruments may be used at the Fort Wainwright, Alaska (FWA) sites to detect surface and/or subsurface anomalies. The type of instrument(s) used will be selected based upon several factors: terrain characteristics, type of anomalies to be detected, and the survey objective. In all cases, the geophysical instrument(s) selected will be the type most effective to detect the objective anomaly. The following geophysical instruments are described in detail in the following Sections 2.1 through 2.4.

- Single EM61-MKII or towed array
- Single G-858 Cesium Magnetometer
- Schonstedt GA-52Cx in a “detect and dig” or “detect and flag”
- All metals handheld detector in a “detect and dig” or “detect and flag”

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2.0 EQUIPMENT

2.1 EM61-MKII

The EM61-MKII is a Time Domain Electromagnetic (TDEM) system. This detector is capable of detecting sub-surface ferrous and non-ferrous metals. The EM61-MKII generates 16 electromagnetic (EM) pulses per second and measures during the off time between pulses. After each pulse, secondary EM fields are induced briefly in moderately conductive soils and for a longer time in metallic objects. Between each pulse, the EM61-MKII waits until the response from the conductive earth dissipates and then measures the prolonged buried metal response. This response is recorded in millivolts (mV). The EM61-MKII measures multiple time gates (216, 366, 660, and 1266 microseconds [µsec]) to provide a more accurate measurement of the response decay rate. The EM61-MKII can record up to 16 records per second with four time gates per record. If the top coil is used, one time gate is eliminated. To maximize the response of the instrument using the sum total, data will be collected using the bottom coil four time gates.

The Geonics EM61-MKII single metal detector with Global Positioning System (GPS) or "Wheel Mode" will be used to collect data points at 20-centimeter intervals along the grid using one 3-meter coil sensor line spacing. Data points may also be collected at intervals less than 20 centimeters if required.

2.2 G-858G CESIUM MAGNETOMETER

The G-858G Cesium Magnetometer is a self-oscillating split beam cesium vapor magnetometer sensor. The sensitivity of the instrument is typically 0.05 nanoTesla (nT) and can take up to 10 readings per second. The sensor is operated as a gradiometer with two sensors collecting magnetic field intensity data separated by a vertical distance of 2 feet. The difference between the two sensor readings is recorded as the magnetic gradient at the measurement location. The G-858G can be integrated with a GPS system.

When using the G-858G Cesium Magnetometer with GPS or "Auto Mode," data points will be collected at 20-centimeter intervals or less along the grid using 1-meter sensor line spacing.

2.3 SCHONSTEDT GA-52CX

The Schonstedt GA-52Cx will be used for "detect and flag" or "detect and dig" investigations. The GA-52Cx locator detects the magnetic field of ferrous objects and energized power lines. The GA-52Cx provides audio detection signals that peak in frequency when the locator's tip is held directly over the target.

Unexploded ordnance (UXO) personnel will remain within their lane and search the areas directly in front of themselves. To ensure that each lane is adequately searched, and that the instrument responds correctly to surface and subsurface anomalies, both the forward movement of the UXO personnel and the swing of the instruments should be performed at a controlled pace. When the UXO personnel reach the grid boundary, they will move to the next lane that has not been searched and proceed back in the opposite boundary. This procedure will continue until the entire grid is cleared. If required, anomalies will be investigated to a depth of detection. All munitions and explosives of concern (MEC) and metallic items that resemble the shape and/or size of MEC shall be removed.

2.4 ALL METALS DETECTOR

To detect both ferrous and non-ferrous objects, an "All Metals" Detector will be used at the FWA Sites. Several models of all-metal detectors are available from various manufactures. The model selected will be based on the terrain characteristics, type of anomalies to be detected, survey objective, and model availability.

2.5 GPS

The GPS points for the project data will be surveyed with a Trimble® 5800/R8 or equivalent system. Coordinate systems will be defined by each site requirement. The GPS will only be

used with digital geophysics. MEC located using the Schonstedt GA-5Cx will be land surveyed or described in the field notes.

2.6 INITIAL SURVEY INVESTIGATION

Initial survey investigations will incorporate square grids measuring 100 feet by 100 feet aligned in a North-South and East-West direction. Grid dimensions and layout may be modified to accommodate site conditions, but the total acreage initially investigated will remain the same.

2.7 QUALITY CONTROL SURVEY

The data will be inspected for quality. Poor quality data (e.g., positioning accuracy problems, instrument response, or other related issues) will be removed by a combination of visual, filtering processes or re-collection of data for that area.

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3.0 PERSONNEL

An experienced geophysicist with experience using the geophysical instruments described above will manage all digital geophysical activities. Specific field activities, such as setting up grids, data collection, and anomaly reacquisition, shall be supervised by a person well trained in geophysical field operations. For the FWA Sites, UXO-qualified personnel who meet or exceed the qualifications requirements of Technical Paper 18 will perform all excavation actives if MEC is suspected to be present.

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4.0 PRODUCTION RATES

Production rates will vary greatly depending upon the terrain, type of instrument used, and the type and size of anomalies detected.

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5.0 DATA SPATIAL DENSITY

The single coil EM61-MKII and G-858 survey will be performed by collecting data at intervals of approximately 20 centimeters along lines spaced approximately 1 meter apart. Depending on terrain and project objectives, data collection may exceed 1 meter line spacing. Large data gaps will be subsequently filled in after initial data processing if needed. A minimum of four readings per second will be taken while traversing the site at speeds less than 3 miles per hour using GPS.

The Schonstedt GA-52Cx will have operators separated by 1 meter. Data collection is not possible with the Schonstedt GA-52Cx.

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6.0 INSTRUMENT STANDARDIZATION

6.1 DATA PROCESSING

Data recorded with the geophysical instruments will be downloaded to processing computers and copied to storage media for backup purposes. Once copied to the processing computers, the data will be imported to Geosoft® Oasis Montaj, which is a geophysical data processing and mapping software package created by Geosoft, Inc. This software package will be used to process, analyze, and present the findings of the geophysical surveys. The processing and analysis will consist of applying standard corrections to the data and producing color contour maps for data interpretation.

The data analyses performed by the project geophysicist or data processor will focus on identifying anomaly responses that could be associated with individual anomalies that represent MEC or environmental concerns. These interpretations will be compared with historical and site information that includes the locations of historical and current building, structures, and utilities.

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7.0 INITIAL FIELD PROCESSING

Geophysical data will be downloaded with Dat61® or Geometrics MagLog software and then verified for completeness by the field geophysicist. The following activities will be performed during initial field processing:

- Collect location and site specific conditions on field notes.
- Note line numbers, survey direction, fiducial locations (if used), start and end points of field notes.

7.1 STANDARD DATA ANALYSIS

The primary geophysical data processing and interpretation software will be: Geosoft® Oasis Montaj with the UX-Detect extension for the EM61 MK2 and G-858. First, the UX-Detect will find large anomalies that may represent an MEC item. The data processor will then analyze the data to find smaller and more difficult to identify anomalies by reviewing each line profile and the mapped data. The following activities will be typically performed during standard data analysis:

- Removal of spikes and physical feature interference sources
- Positional offset correction
- Sensor bias, background leveling, and/or standardization
- Sensor drift removal
- Latency correction
- Geophysical noise identification and removal (if possible)

Gridding of data will be accomplished by using Geosoft® Oasis Montaj and UX-Detect extension. Search criteria will be completed by manual interpretation of each profile and using the UX-Detect extension.

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8.0 ADVANCED DATA PROCESSING, DIGITAL FILTERING AND ENHANCEMENT

Advanced data processing is not anticipated to be required for the geophysical survey at the FWA sites.

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9.0 ANOMALY SELECTION AND DECISION CRITERIA

The threshold magnitude will depend on the area of investigation. For the site area, the average sum of all four time gates may be used to pick anomalies. During the quality control (QC) process, the Site Geophysicist will determine the priority of anomalies for investigation, if required.

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10.0 DIG SHEET DEVELOPMENT

Dig Sheets will be developed if required.

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11.0 ANOMALY REACQUISITION (IF REQUIRED)

Jacobs will perform anomaly reacquisition with the same positioning equipment that was used during data collection. The EM61-MKII and G-858 configuration will be used once the Anomaly Investigation Sheet (Dig Sheet) has been developed and reviewed by the Jacobs geophysics staff. Instruments will be tested before daily use.

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12.0 FEEDBACK PROCESS

Target information from the re-acquisition activities will be reviewed by the Project Geophysicist. This information will be evaluated and used to refine the target pick criteria.

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13.0 QUALITY CONTROL

The following digital geophysics procedures will be implemented to ensure the project objectives are achieved.

13.1 SCHONSTEDT QUALITY CONTROL TEST

The Schonstedt GA-52Cx does not have a measured output, so in addition to response, batteries, and sensor alignment tests, no other pre-operation QC tests will be performed.

Before operation, a battery check will be conducted to ensure the batteries are correctly installed, followed by a sharp shake to ensure there are no loose parts in the instrument. Loose parts are cause for rejection; if found, the instrument will sent to the manufacture for repairs.

Schonstedt Magnetometers will be field-tested on a known target each day to ensure that they are operating properly. The Schonstedt magnetometer does not require calibration; the instrument has a simple "Go/No Go" field operational check. This check is performed by locating a buried target 1-inch by 1-inch buried at a depth of 1 foot below ground surface (bgs) and used to test the response of the Schonstedt magnetometer. Failure to detect the test target is cause to reject the instrument.

The Schonstedt Magnetometer will be tested for proper operation and response by turning the sensitivity setting to high then moving the tip of the instrument over the buried item and noting the response. Failure to detect the buried item is cause for instrument rejection.

To properly test sensor alignment, the operator will locate an anomaly-free area, hold the instrument in a vertical position by the battery case, and rest the tip of the instrument on the ground. With the sensitivity on high, he or she will hold the instrument by the shaft just below the battery case, rotate the instrument 360 degrees, (90 degrees at a time) with the free hand, and listen for a significant increase or decrease in tone. A significant change in tone is cause for rejection.

13.2 EQUIPMENT/ELECTRONICS WARM-UP

Equipment/electronics warm-up will be conducted to minimize sensor drift due to thermal stabilization. Most instruments need a few minutes to warm up before data collection begins. Follow the manufacturer's instructions or, if none are given, observe the data readings until they stabilize. In weather colder than 0 degrees Fahrenheit, the G-858 magnetometer will not be used.

13.3 RECORD RELATIVE SENSOR POSITIONS

The purpose of recording relative sensor positions is to document relative navigation and sensor offsets, detector separation, and detector heights above the ground surface. This will ensure that detector offset corrections can be done correctly and that the surveys are repeatable. Acceptance criteria of ±1 inch will be used.

13.4 PERSONNEL TEST

Personnel tests will be conducted to ensure that survey personnel have removed all potential interference sources from their person. Common interference sources are ballpoint pens in the operator's pocket, steel-toed boots, or large metallic belt buckles which can produce data anomalies similar to MEC targets. All personnel who will be within close proximity of the sensor during survey operations must approach the sensor and have a second person monitor and record the results. Acceptance criteria is ±2 mV for the EM61-MKII and ±3 nT for the G-858 magnetometer system.

13.5 VIBRATION TEST (CABLE SHAKE)

The purpose of the vibration test is to identify and replace shorting cables and broken pin-outs on connectors. With the instrument held in a static position and collecting data, shake all cables to test for shorts and broken pin-outs. If shorts are found, the cable should be immediately repaired or replaced. After repair, cables need to be rigorously tested before use. If the data profile exhibits data spike responses, the malfunctioning equipment must be replaced.

13.6 STATIC BACKGROUND AND STATIC STANDARD RESPONSE (SPIKE) TEST

The operator will perform a static background and static standard response test for the following purposes:

- Quantify instrument background readings.
- Check for electronic drift.
- Locate potential interference spikes in the time domain.
- Determine impulse response and repeatability of the instrument to a standard test item.

A minimum 3-minute static background collection will be performed after instrument warm-up, followed by a 1-minute standard (spike) test, and then a 1-minute static background data.

A standard wooden board with a piece of metal pipe will be fitted in a marked spot over the coils of the EM61-MKII. The operator will monitor the readings to confirm their stability prior to continuing with the geophysical survey. Acceptance criteria for the EM61-MKII is ±2.5 mV (±4 mV towed array), ±1 nT, and ±20 percent of standard item response after background correction for the G-858 magnetometer system.

13.7 GPS POSITIONING CHECK

A GPS positioning test will be performed prior to collecting data and once at the end of the data collection day. The GPS check will be performed over a known point and the position of the point can not vary more than 1 meter in any direction. Geophysical data will not be collected until acceptable GPS accuracy can be achieved. Results will be recorded in the field notes.

13.8 RECORDS MANAGEMENT

All raw data files, final processed data files, hard copies, and field notes will be maintained for the duration of the project. If required, Jacobs will upload the geophysical data to a designated File Transfer Protocol (FTP) site.

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14.0 INTERIM REPORTING

Geophysical mapping data will be provided as soon as practical after collection. The geophysical field data will be provided for delivery in delineated fields as x, y, z, v(1), v(2). After completion of survey and processing activities, all final geophysical maps, dig sheets, and supporting geophysical interpretations will be provided by e-mail or posted on the designated FTP site when requested. Maps displaying the geophysical anomalies with annotated, interpreted, and identified physical features shall be delivered in JPG or PDF compatible format.

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15.0 MAP FORMAT

All geophysical maps will be in standard map format or a format requested by the client.

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16.0 MEC DETECTION USING GEOPHYSICAL METHODS

The primary geophysical data processing and interpretation software used to identify anomalies suspected to be MEC will be Geosoft® Oasis Montaj with the UX-Detect extension for the EM61-MKII, EM61- MKII towed array, and G-858. A threshold cutoff magnitude will be determined by the Project Geophysicist prior to starting the survey. Completed Dig Sheets (if available) will be reviewed and analyzed to revise the threshold cut-off values throughout the length of the project. Maximum depth of detection for the discussed detectors is calculated using the following formula:

Estimated Detection Depth (meters) = 11 × diameter (millimeters of UXO item)) / 1,000

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APPENDIX H

Munitions and Explosives of Concern Support Plan

FINAL

FORT WAINWRIGHT
POST WIDE WORK PLAN

APPENDIX H
Munitions and Explosives of Concern Support Plan

FORT WAINWRIGHT, ALASKA

MARCH 2011

U.S. Army Corps of Engineers, Alaska District
Environmental Remediation Services
Contract No. W911KB-06-D-0006
Task Order No. 20

Prepared by
Jacobs Engineering Group Inc.
4300 B Street, Suite 600
Anchorage, Alaska 99503

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ACRONYMS AND ABBREVIATIONS

AHA	activity hazard analysis
DDESB	Department of Defense Explosives Safety Board
DMM	discarded military munitions
DPW	Directorate of Public Works
DTA	Donnelly Training Area
EM	Engineer Manual
EOD	explosive ordnance disposal
EP	Engineer Pamphlet
FWA	Fort Wainwright, Alaska
Jacobs	Jacobs Engineering Group Inc.
MEC	munitions and explosives of concern
MMR	military munitions response
MPPEH	material potentially presenting an explosive hazard
MRS	munitions response site
MSDS	Material Safety Data Sheet
PAED	public access exclusion distance
POL	petroleum, oil, and lubricants
RRD	range-related debris
SPA	Safe Plan of Action
SUXOS	Senior UXO Supervisor
TP	Technical Paper
USACE	U.S. Army Corps of Engineers
USAED	U.S. Army Engineer District, Alaska
UXO	unexploded ordnance
YTA	Yukon Training Area

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1.0 INTRODUCTION

1.1 GENERAL

Fort Wainwright, Alaska (FWA) is an active military installation. Military training has been conducted throughout the post since it was established in 1941. This Work Plan describes the procedures used to support various military munitions response (MMR) actions that can be provided throughout the post. This work will be performed by Jacobs Engineering Group Inc. (Jacobs) for the U.S. Army Engineer District, Alaska (USAED) under the Environmental Restoration Services Contract No.W911KB-06-D-0006, Task Order Number 20, Fort Wainwright Environmental Support.

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2.0 MUNITIONS AND EXPLOSIVES OF CONCERN ACTIVITIES

2.1 PERSONNEL

Unexploded ordnance (UXO)-qualified personnel will be onsite during the initial phase of any intrusive activity performed by Jacobs or other contractors assigned under this contract when working in an area known or suspected to contain military munitions. This requirement may be removed, on a site-by-site basis, after the UXO Technician(s) has inspected the site and determined that no munitions and explosives of concern (MEC) are present and on-call construction support is sufficient. If there is a potential for MEC to be present at a specific site, a qualified UXO Technician(s) will be on site during all intrusive activities.

2.2 FIELDWORK

MEC activities will be conducted only during daylight hours. In areas where vehicular traffic and/or pedestrian traffic has access to the MEC work area, regardless of whether an exclusion zone is established or not, restricted area signs and/or caution tape should be used to warn the public. If an exclusion zone is established and re-routing of vehicles and/or pedestrians is required, Directorate of Public Works (DPW) environmental office shall be notified. Prior to closing any public access routes, permission must be obtained from the DPW environmental office.

Access into the operating area(s) will be limited to those personnel necessary to accomplish specific activities as determined by the Senior UXO Supervisor (SUXOS). All intrusive activities, such as soil sampling, borings, and monitoring well installation will be supported by UXO personnel conducting anomaly avoidance if the presence of MEC is suspected.

MEC items will be handled only by qualified UXO Technicians. The SUXOS will make the final identification and classification of all munitions and determine if the item(s) is acceptable to move.

All site-specific field activities shall include a combined Activity Hazard Analysis (AHA) and Safe Plan of Action (SPA). This document shall be prepared by the UXO Safety Officer and/or the SUXOS and reviewed, discussed, and signed by all personnel involved in the specific field task. A separate AHA/SPA shall be written, reviewed, and discussed for each significant task at each site. See the FWA UXO Team Quick Reference Folder for a sample AHA/SPA.

The following documents may be used as a reference to support MEC activities:

- Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP) 16, Appendix B, *Fragmentation Distances*
- Engineering Manual (EM) 385 1-1, 3 November 2003 (applicable version for the basic contract)
- EM 385 1-1, 15 September 2008 (applicable version for contracts awarded after 12 Jan 2009)
- EM 385 1-97, 15 September 2008
- U.S. Army Corps of Engineers (USACE) Engineer Pamphlet (EP) 75-1-2, *Munitions and Explosives of Concern (MEC) Support during Hazardous, Toxic and Radioactive Waste and Construction Activities* (USACE 2004a)
- USACE Engineering Regulation 1110-1-8153, *Engineering and Design – Ordnance and Explosive Response* (USACE 1999), with Errata Sheet No. 1 dated 1/31/2006
- USACE Engineer Pamphlet (EP) 385-1-95a, *Basic Safety Concepts and Considerations for Munitions and Explosives of Concern (MEC) Response Action Operations* (USACE 2004b), with Errata Sheets No. 1 and 2
- FWA UXO Team Quick Reference Folder

3.0 SUPPORT PERFORMED ON ACTIVE RANGES

3.1 GENERAL

MEC maintenance support on FWA active ranges, such as the Yukon Training Area (YTA) and Donnelly Training Area (DTA), has additional hazards for fieldwork; therefore additional safety precautions and procedures may be added to those AHA/SPA that apply. All UXO fieldwork performed at FWA ranges shall include only surface investigations to identify and mark the locations of UXO and discarded military munitions (DMM). Munitions debris and range-related debris (RRD) may be staged for disposal after being inspected for UXO, DMM, or explosive residues. Material potentially presenting an explosive hazard (MPPEH) may be staged with UXO and/or DMM for disposal by military explosive ordnance disposal (EOD) personnel.

3.2 COMMUNICATIONS

All access to work sites within the YTA or DTA will be coordinated through the Range Control office for the subject area. Range radios will be checked out from the Range Control Office for communications and all team members will be briefed on radio protocol before field activities begin. Radio calls to Range Control will be made, at a minimum, upon entry and exit to the range area. Other radio calls will be made as directed by Range Control.

3.3 PERSONNEL

Active ranges have the highest likelihood of encountering UXO. Personnel exposure will be kept to a minimum. Non-UXO-qualified personnel will only enter an active range when accompanied by a UXO Technician, and only when their presence is required to accomplish a specific task.

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4.0 MEC DISPOSAL

4.1 DISPOSAL OF UXO, DISCARDED MILITARY MUNITIONS, AND MATERIAL POTENTIALLY PRESENTING AN EXPLOSIVE HAZARD

Disposal of explosive-filled military munitions, munitions containing explosive residues, or demilitarization of military munitions will not be performed by Jacobs. All activities related to explosive munitions disposal, venting, or demilitarization will be performed by the U.S. Army EOD team at Fort Richardson or the U.S. Air Force EOD team at Eielson Air Force Base. In the event EOD support is required for munitions disposal, the FWA DPW Environmental Office or FWA Range Control will be notified; FWA Range Control will then contact EOD (Table H-4-1). Jacobs will notify the USAED Project Manager of all disposal activities.

4.2 SCRAP TURN-IN

Munitions that present no explosive hazard but retain the shape of military munitions will be turned over to a local scrap dealer for smelting. See the FWA UXO Team Quick Reference Folder for a sample letter.

Table H-4-1
Contact Personnel

Name	Office Phone	Cellular Phone
Mr. Joe Malen, DPW (Primary Contact)	907-361-4512	907-388-7518
Mr. Dave Beistel, DPW	907-361-7724	907-460-7703
Mr. Gene Clare, DPW	907-361-9689	907-687-6334
Mr. Greg Swallows, Range Control	907-590-3564	None available
Ms Karen Dearborn, USAED Project Manager	907-753-5718	907-240-6494
FOR DPW USE ONLY		
US Army EOD, Fort Richardson, AK	907-384-7600	907-384-7602
US Air Force EOD, Eielson AFB, AK	907-377-1650	None available

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5.0 UXO PERSONNEL RESPONSE

5.1 UXO RESPONSE TO MATERIAL POTENTIALLY HAZARDOUS TO THE ENVIRONMENT

At sites where material or items (liquid or solid) potentially hazardous to the environment are discovered and intrusive activities are required to investigate and/or remove the item(s), Jacobs will provide UXO Technicians and/or Environmental Technicians to support the activity. If the senior UXO Technician on site determines that no MEC hazard exists, the Environmental Technician will take control and conduct appropriate measures to stop or contain any leaking fluid. If potential exists for MEC to impede access to the leaking item, the senior UXO Technician on site will assume control and direct all site activities.

5.2 SITE ACTIVITIES

After mobilizing to the site, the UXO Technicians will visually inspect the area for MEC and the Environmental Technicians will inspect the area for potential environmental hazards. If the presence of munitions, munitions fragments, or other significant evidence of MEC is present, the site will be treated as a munitions response site (MRS). If environmental hazards, such as stained or leaking drums/containers, stained soil, possible asbestos material, or other visible contaminants are present, the Environmental Technician will advise the senior UXO Technician onsite of the potential hazards and the procedures to mitigate the environmental hazards. If the mitigation priority is not clearly evident, the SUXOS and/or Project Manager will be notified.

5.3 RECOMMENDED EQUIPMENT, TOOLS, AND MATERIAL FOR RESPONSE

Table H-5-1 lists the equipment to be included for site mobilization.

Table H-5-1
Tools and Equipment

Radio	Rubber Gloves
Cellular Phone	Plastic Trash Bags
Camera	Zip Lock Bags
Global Positioning System (GPS)	Absorbent Pads for POL and non-POL
Pen and Paper	Duct Tape
Tape Measure or Wheel Tape	Marking Paint
Magnetometer	Wooden Stakes or Pin Flags
All Metals Detector	Hammer
Extra Personal Protective Equipment	Photoionization Detector
Paper Towels	Spill Containment Basin
Rubber Gloves	Overpack Drum(s) (have on standby)
Plastic Trash Bags	

6.0 MECHANICAL EQUIPMENT

6.1 USE OF MECHANICAL EQUIPMENT

If mechanical equipment is being used, the equipment operator will be briefed by the senior UXO Technician as to the planned activities and if the equipment will be used to support site activities. Prior to using the equipment, hand and radio signals will be reviewed. The operator will take direction from the senior UXO Technician on site. If soil or debris removal is necessary to gain access to the item(s), the operator shall carefully remove the overburden in 6-inch lifts as directed by the senior UXO Technician. As the overburden is removed, the UXO team will visually observe the activity and determine when mechanical activity should stop. If debris other than soil prevents access to the item, the equipment operator and senior UXO technician onsite shall determine the best approach to gain access to the item while protecting the environment.

6.2 OVERBURDEN INSPECTION

If visual inspection is not sufficient to ensure that the overburden is free of MEC prior to removal, the UXO team will use geophysical instruments to assist in their visual inspection. After removal, if the soil cannot be visually inspected as it is staged; the soil will be spread on the ground in a manner to facilitate the use of geophysical instruments by the UXO team to search the soil.

6.3 MUNITIONS LOCATED

If MEC is located, it will be inspected, classified, and staged for further disposition. If UXO or DMM is located that is not acceptable to move, all site activities will be suspended and an exclusion zone will be established in accordance with DDESB TP-16, Appendix B. All nonessential personnel at the site will depart to a safe area outside the exclusion zone and the site will be secured. The senior UXO Technician on site will notify the SUXOS or Jacobs Project Manager, who will then advance to the site and notify the DPW environmental office. No munitions response activities will begin until direction is received from the SUXOS.

6.4 MECHANICAL EQUIPMENT NOT USED

If mechanical equipment is not used, the UXO Technicians will use magnetometers or all-metals detectors to search the immediate area around the item(s) and mark all sub-surface anomalies suspected of being munitions with flags, stakes, or paint. If possible, the marked anomalies will be avoided during removal of the environmental hazard. If a sub-surface anomaly(s) impedes access to or removal of the hazard, the UXO Technicians will investigate the anomaly and remove it if safe to do so. If MEC is located, it will be inspected, classified, and if acceptable to move, staged for further disposition. If UXO or DMM is located that is not acceptable to move, all site activities will be suspended. Non-UXO personnel at the site will depart to a safe area and the site will be secured. The senior UXO Technician will notify the SUXOS or Jacobs project manager, who will then advance to the site and notify the USACE project manager and the DPW environmental office.

7.0 RESPONSE TO MEC DISCOVERY

7.1 RESPONSE TO MEC DISCOVERY

If Jacobs is requested by the USACE to respond to a site and identify an item suspected to be MEC, a senior UXO supervisor will accompany the response team to inspect and classify the item (Table H-7-1). If the item is not MEC, the item will be photographed, identified as non-MEC, and site activities will resume. If the item is MEC, it will be classified as one of the categories in the Table H-7-1 and appropriate actions will be taken. The Jacobs project manager or SUXOS will initiate a follow-up call to the USACE project manager, who will describe the actions taken at the site.

7.2 UNIDENTIFIED ITEM

If an item(s) is located that cannot be identified by the response team, the SUXOS shall be notified and will then go to the site. If the item(s) is suspected to be a chemical munition or suspected to contain an unknown liquid, the team shall perform the following actions if safe to do so:

- Secure the area
- Notify DPW environmental office
- Photograph the item with identification features and/or references
- Take measurements of the item(s)
- Cover the item(s) with plastic

Table H-7-1
MEC Classification

Classification	Action
UXO	Secure the area and contact DPW, see Table H-1-1
DMM	Secure the area, determine if the item is acceptable to move, contact DPW (refer to Table H-4-1)
Munitions Debris	Remove the item to a designated storage area, contact DPW
MPPEH	Contact DPW and transport the item to the ArMag at the Post ASP
Unknown	Secure the area, notify DPW, take photographs of the item, cover the item with plastic

8.0 MUNITION RESPONSE SITE (MRS)

8.1 RESPONSE TO A MUNITIONS RESPONSE SITE

When Jacobs is requested by the USACE to mobilize to an MRS, an initial surface survey of the site will be performed by UXO team to characterize the site. Based on the results of the surface survey and the proposed future land use, the following actions will be performed.

- MEC activities will be conducted only during daylight hours.
- If the area can be secured from the public and military, it will be secured and a Time Critical Removal Action will be proposed.
- The SUXOS will establish a public access exclusion distance (PAED) to control access into operating areas and will limit access to only those personnel necessary to accomplish the specific activities. If the exclusion zone crosses a public road, sidewalk, or any public access route, the DPW environmental office must be notified prior to limiting public access or beginning any intrusive fieldwork.
- MEC items will be handled only by qualified UXO Technicians and only if the senior UXO Technician identifies the item(s) as acceptable to move.
- If UXO or DMM not acceptable to move is located on the surface, an exclusion zone will be established in accordance with DDESB TP 16, Appendix B. The DPW environmental office and the USACE Alaska District project manager will be notified. All site activities will be suspended until the SUXOS determines that field activities can safely resume.
- If munitions are determined acceptable to move, the item(s) will be removed and staged in an appropriate area or explosive storage magazine at the post ASP.
- If MEC is located that cannot be positively identified, the item will be photographed, and if possible without disturbing the item, detailed measurements will be taken, and the item covered with plastic and secured (Table H-7-1). The USACE, DPW environmental office, and the Project Manager will be notified.
- If an intrusive removal action is required, the necessary plans and procedures must be in place prior to performing any intrusive activities.

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9.0 ANOMALY AVOIDANCE

9.1 ANOMALY AVOIDANCE

Anomaly avoidance is defined as techniques employed on property known or suspected to contain UXO, other munitions that may have experienced abnormal environments (e.g., DMM), munitions constituents in high enough concentrations to pose an explosive hazard, or chemical agent, regardless of configuration, to avoid contact with potential surface or subsurface explosive or chemical agent hazards, to allow entry to the area for the performance of required operations.

9.2 REQUIREMENTS

These techniques must be performed by UXO-qualified technicians when intrusive sampling, ground penetrating, soil borings, or working in an area that is known or suspected to contain MEC.

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10.0 CONSTRUCTION SUPPORT

10.1 GENERAL

Construction support is defined as assistance provided by Department of Defense EOD or UXO-qualified personnel and/or by personnel trained and qualified for operations involving chemical agents, regardless of configuration, during intrusive construction activities on property known or suspected to contain UXO, other munitions that may have experienced abnormal environments (e.g., DMM), munitions constituents in high concentrations to pose an explosive hazard, or chemical agents, regardless of configuration, to ensure the safety of personnel or resources from potential explosive or chemical agent hazards.

10.2 ON-CALL CONSTRUCTION SUPPORT

On-call construction support is defined as construction support provided on an as needed basis, where the probability of encountering UXO, other munitions that may experience abnormal environments (e.g., DMM), munitions constituents in high enough concentrations to pose an explosive hazard, or chemical agents, regardless of configuration, has been determined to be low. This support can respond from off site when called, or be on site and available to provide required construction support.

10.3 ONSITE CONSTRUCTION SUPPORT

Onsite construction support is defined as dedicated construction support, where the probability of encountering UXO, other munitions that may experience abnormal environments (e.g., DMM), munitions constituents in high enough concentrations to pose an explosive hazard, or chemical agents, regardless of configuration, has been determined to be moderate to high.

If any activity within the FWA boundary is known or suspected of MEC contamination and support is requested by the USACE Alaska District, the Jacobs Project Manager, in consultation with the SUXOS, will assign the appropriate level of UXO and/or environmental support.

Depending upon the potential for MEC contamination and the planned activity(s) at the site, the UXO team may conduct surface clearance prior to any work in the area. In the event that MEC is discovered, the SUXOS will be notified. The SUXOS will then determine the appropriate actions to be taken and notify the Project Manager.

APPENDIX I

Responses to Comments

REVIEW COMMENTS

PROJECT: FTR256
DOCUMENT: SSHP- Post Wide, June 2010 Location: Fort Wainwright, Alaska

U.S. ARMY CORPS OF ENGINEERS	DATE: 06/07/10 REVIEWER: Stephen O'Neill PHONE: 753-2681	Action taken on comment by: Jacobs Engineering

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USACE RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.		Section 1.0 Introduction and Purpose- references older version of EM 385-1-1. The current version is dated 15 September 2008.	A	The reference will be updated	
2.		Section 3.2.4 Ambient Air Temperature Monitoring- references older version of the ACGIH TLV Manual. The current version is 2010.	A	The reference will be updated.	
3.		Section 7.0 Air Monitoring Plan- references using a multi-gas meter to monitor for the LEL. Should there be an actual explosion hazard a PID or other more sensitive instrument should be used.	A	The text will be updated to express that a PID will be used in conjunction with a multi-gas meter for actual explosions hazards.	
4.		----- End of Comments ----			
5.					
6.					
7.					
8.					
9.					
10.					

REVIEW COMMENTS **PROJECT: Fort Wainwright Environmental Support**
DOCUMENT: Work Plan

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	DATE: 7 June 2010 REVIEWER: Mike Utley PHONE: 907-753-2691	Action taken on comment by:

Item No.	Drawing Sht. No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	Figure 1-1	That's a large area for a field office, encompassing may buildings. Please provide additional detail.	A	Accepted - Jacobs field office will be indicated more clearly.	
2.	Table 3-1	Please identify JE project chemist that will be monitoring this work; also, please identify Mike Utley as USACE project chemist, backup is Sean Benjamin.	A	Accepted - Project Chemist Angela Elmore will be added to Table 3-1. Mike Utley and Sean Benjamin will also be added.	
3.	Table 3-2	Please add USACE Project chemist as contact for sample results event and newly discovered contamination event.	A	Accepted - USACE Project Chemist will be added under "Sample results" and "Newly discovered contamination event" in Table 3-2	
4.	Section 3.1	Please a include valid, government approved operator's license as part of the list of required certificates	A	Accepted - Bullet 4 will be updated to, "Valid government approved operator's license and proof of insurance for…"	
5.	Section 4.2	Section 4.2 of the workplan indicates the following: "All data will be collected in Universal Transverse Mercator Zone 3N, World Geodetic System 1984. The vertical reference will be North American Vertical Datum 1988." However, the Zone is incorrect, it should be Zone 6N. The units of the measurement should also be stipulated (meters).	A	Accepted – The zone will be changed to Zone 6N and meters will be specified as the appropriate unit of measurement.	
6.	Section 4.4.3	2nd para – reference to ADEC regulation is out of date. Please update.	A	Accepted - Reference will be changed to "18 AAC 78 (ADEC 2006)"	

REVIEW COMMENTS **PROJECT: Fort Wainwright Environmental Support**
DOCUMENT: Work Plan

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	DATE: 7 June 2010 REVIEWER: Mike Utley PHONE: 907-753-2691	Action taken on comment by:

Item No.	Drawing Sht. No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
7.	Section 4.4.4	1st para – please indicate that field screening is discussed further below.	A	Accepted – This sentence will be added to the beginning of the paragraph: "Field screening will be used to guide the excavation. Field screening procedures are discussed in the FSP."	
		2nd paragraph in this section discusses sampling if excavation proceeds below water table. However, Section 4.5 indicates that all FWA excavations will not proceed below the water table (unless debris viable above the water table is being removed). Please adjust wording so that these sections are in agreement. Also, please note that site specific situations may require excavation below the water table or adjacent to building foundations.	A	Accepted - The second paragraph will be changed to, "Soil samples will not be collected from below the groundwater table unless specified in the site-specific work plan addendum. In those cases, soil samples will be…". The first bullet in Section 4.5 will be modified to match the text in Section 4.4.4.	
8.	Section 4.5	3rd from last para – Text indicates that test pit excavations may continue up to 2 feet below groundwater, but earlier text indicates that excavations will not proceed into groundwater. Please evaluate and revise as necessary.	A	Accepted – This text will be modified to read: "…, and will not extend below groundwater unless otherwise specified in the site-specific work plan addendum."	
9.	Section 6	Reference to 18 AAC 78 is out of date. Please update.	A	Accepted - Reference will be changed to "18 AAC 78 (ADEC 2006)"	
10.	Appendix B (FSP)				

REVIEW COMMENTS **PROJECT: Fort Wainwright Environmental Support**
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11.	Table B-3-1	Please correct holding time for pesticides (SW8081A)	A	Accepted - Soil Pesticides (SW8081) holding time will be changed to 14 days.	
		Please either use most current method (e.g. SW8081B, SW8082A, 8260C, 8270D, 8290A, 8321B, 9060A) or drop the letter designation and include a reference to indicate that the most current method will be utilized (or will be specified in the data generated for the project).	A	Accepted - The letter designation will be dropped and the note "Method version will be specified in the data generated for the project."	
		TOC holding time is typically listed at 30 days instead of 14. Please evaluate and revise as necessary.	A	Accepted - TOC holding time will be changed to 28 days	
		Water holding time for mercury is incorrect (should be 28 days, not 180 days)	A	Accepted - Mercury water holding time will be changed to 28 days.	
		SW846 does not list a holding time for PCBs or Dioxins/Furans. Suggest a uniform holding time for these methods of 30 days to extraction, 40 days to analysis (after extraction)	A	Accepted - Holding time for PCBs and Dioxins/Furans will be changed to "30 days to extraction, 40 days to analysis".	

REVIEW COMMENTS **PROJECT: Fort Wainwright Environmental Support**
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Item No.	Drawing Sht. No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
12.	Section 3.1.1	4th para – last sentence of this paragraph isn't consistent with rest of text. Either you will use bentonite to fill the boreholes, or you will use the drill cuttings. Please revise so that the paragraph correctly indicates what will typically be done. Bulleted sections – ADEC does not allow the exclusion of waste samples from the duplicate requirement. The QSM does not allow the exclusion of waste samples from the MS/MSD requirement. Please remove references to these allowances. Duplicate and MS/MSDs are required for **all matrices.**	A	Accepted – The last sentence of the paragraph will be changed to, "If approved, drill cuttings may be placed back down the borehole from which they were removed instead of bentonite grout. If the drill cuttings are not sufficient to fill the borehole the additional area will be filled with bentonite grout." Noted – Duplicate waste samples are not required by RCRA or TSCA and are generally not required by the disposal facilities. Per Deb Caillouet, duplicate waste samples need not be collected unless required by the disposal facility. For MS/MSDs, the text will be added "MS/MSD samples may be collected for waste characterization unless adequate sample volume is unavailable or safety concerns impact sample collection."	
13.	Section 3.1.4	Please note that TCLP samples are a waste characterization procedure. As such, the waste sample would consist of more than just the paint chips. It seems a wasted effort to collect 100 grams of paint chips (only). The sample must consist of the entirety of the waste (including gypsum board, wood backing, framing materials, etc.) for an accurate characterization of the waste being sampled.	A	Accepted – The sentence "If toxicity characteristic leaching procedure (TCLP) is a required analysis, a **minimum** of 100 grams of paint chips must be collected." will be changed to "If toxicity characteristic leaching procedures (TCLP) is a required analysis, the sampling procedures will be included in the site-specific work plan addendum."	

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14.	Section 3.2.3	Please provide reference for development completion criteria.	A	Accepted – A reference to USACE EM 1110-1-4000 "(USACE 1998)" will be added to this section.	
		Development procedures – water is to be added to a well only as a last resort. Once a well is purged dry, consider a waiting period to see if the well will recover before adding water.	A	Accepted - Text will be changed to "If the well purges dry wait 2 hours to determine if the well recovers before adding water. If the well has not recovered to 80 percent of the original volume potable water may be added as described in *Monitoring Well Guidance* (ADEC 2009)".	
15.	Table B-3-2	USACE sampling procedures allow ± 1° C and ± 0.2 pH units for stabilization criteria.	A	Accepted - Criteria will be updated accordingly.	

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16.	Section 3.2.5	ADEC 2009 specifies that direct push wells are usable as long as proper development occurs (see pages 21, 22 of ADEC manual). This section indicates that groundwater grab samples will be collected without development. Please rectify this inconsistency.	A	Accepted – SP16 wells are installed using direct-push technology. Distribution of this work plan was prior to the introduction of the *Draft 2010 Field Sampling Guidance*. ADEC approved of the 2010 FWA Work Plan and as comments on the Draft guidance are still being accepted Section 3.2.5, second paragraph, third sentence will be revised to read: "Development of these temporary sampling points may not be required. If it is not necessary to take groundwater parameters at the site, it may be specified in the site specific work plan addendum."	
		2nd to last bullet in section: Text indicates the following: "Designate MS/MSD on the CoC form for each sample shipment/lab batch, or at a frequency of one per 20 samples per matrix, whichever is less." However, text in earlier sections (Soil sample collection) indicate the following: "Collect one matrix spike/matrix spike duplicate (MS/MSD) sample for each sample shipment/laboratory batch, or at a frequency of one per 20 samples per matrix, whichever is more." Please rectify this inconsistency. **Note that a MS/MSD is required per laboratory batch.**	A	Accepted - Section 3.2.5 bullet will be changed to "Designate MS/MSD on the CoC form for each sample shipment/lab batch, or at a frequency of one per 20 samples per matrix, whichever is more."	

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17.	Section 6.6	Second to last bullet – use of duct tape to seal coolers is not recommended due to the presence of volatile organics in the adhesive used on the tape. 2nd para after bulleted section – please also note that USACE chemist will be notified of any discrepancies as well. Suggest you add USACE chemist to contact list.	A A	Accepted - Bullet will be changed to "Seal the cooler shut with strapping tape." Accepted - Sentence will be changed to "The Project Chemist and the USACE chemist will be notified of all discrepancies by the laboratory within 24 hours. USACE chemist will be added to the contact list.	
18.	Appendix C				
19.	Section 3.1.2	Analytical methods list includes EPA 504.1, which is not an ADEC method, nor is it SW-846 method. Please update program methods list to include other programs as applicable.	A	Accepted - Text will be changed to "Definitive data will be generated by using analytical methods defined by the ADEC *Underground Storage Tanks Procedures Manual* (ADEC 2002), EPA *Test Methods for Evaluating Solid Waste SW-846* (EPA 1996) and/or subsequent updates, and EPA *Methods for Determination of Organic Compounds in Drinking Water Supplement III* (EPA 1995). Additional methods may be utilized and specified in the site-specific work plan addendum." Section 8.0 (References) will be updated.	
20.	Section 3.3	ADEC does not allow the exclusion of waste samples from the duplicate requirement. The QSM does not allow the exclusion of waste samples from the MS/MSD requirement. Please remove references to these allowances. Duplicate and MS/MSDs are required for **all matrices.**		Noted – Please see response to comment No. 12.	

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	DATE: 7 June 2010 REVIEWER: Mike Utley PHONE: 907-753-2691	Action taken on comment by:

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21.	Section 3.4	The listed references are outdated. Regions 3, 6, 9 and the ORNL data have been combined into comprehensive Regional Screening Levels. Please evaluate and updated text accordingly. Note that full suite 8260 and 8270 analyses are against the intent of the EDQW and QSM. The intent is to target specific analytes which are of concern. Thus, listing analytes that may not meet cleanup criteria is meaningless. If results for these analytes are required, alternate methods or laboratories will be required to meet the regulatory goals.		Noted – Per the Army DPW, references to ORNL data for sediment screening levels will be deleted in text and tables. In addition Region 9 PRGs for soil gas will be updated to ADEC soil gas criteria. Noted – Per Army DPW the criteria here are presented for general consideration during site investigations. If a specific analyte of concern does not meet cleanup criteria, other methodologies would be indicated in the site-specific work plan addendum.	
22.	Section 4.1	Please note that waste data is not exempt from data evaluation. Please modify text accordingly. Last sentence: Please change "contractor" to "project team" JM qualifier: this is the first mention of the fact that MS/MSD recoveries will not be evaluated if the spiked concentration is less than 2 times the native sample concentration. Please amend this section to indicate that MS/MSD recoveries will not be evaluated (flagged) if the spiked concentration is less than the native sample concentration. List of situations where qualification is not necessary (MS/MSD): Please amend this bullet to indicate that MS/MSD recoveries will not be flagged if the spiked concentration is less than the native sample concentration.	A A A A	Accepted - Sentence "Waste data will be presented but not evaluated." will be deleted. Accepted – In the last sentence "contractor" will be changed to "project team". Accepted - Text will be changed to "The MS sample recoveries were not evaluated (flagged) if the spiked concentration is less than the native sample concentration." Accepted - Bullet will be added "MS spiked concentration was less than the native sample concentration."	
23.	Section 4.2	Please include LOD as well.	A	Accepted – Bullet LOQ will be replaced with the following. "LOD (When LOD is not available, LOQ will be presented)"	

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24.	Section 5	USACE Hard copy requirements include only the laboratory summary forms and sample receiving documentation. The PDF contents must match the QSM Appendix A for definitive data (all aspects). Please include text to indicate that laboratory qualifications (as listed) will be included with each tech memo work plan.	A	Accepted - Text will be changed to "Hard copy laboratory summary forms and sampling receiving documentation and complete electronic deliverables will be provided to Jacobs by the subcontracted laboratory and submitted to the client." Noted - Laboratory qualifications will be included if laboratory procurement has been completed before the technical memorandum is completed. Often laboratory procurement occurs concurrently with technical memorandum work plan publication in response to emergency site investigations. If lab certification is not available at the time of distribution it will be provided upon contract award.	
25.	Section 7.4	Please change "US Army Engineer District, Alaska (USAED)" to US Army Corps of Engineers (USACE).	A	Accepted - "US Army Engineer District, Alaska (USAED)" will be changed to "US Army Corps of Engineers (USACE)".	
26.		■ END			

REVIEW COMMENTS

PROJECT: Fort Wainwright

DOCUMENT: 2010 Post Wide Work Plan, Draft April 2010

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-EE-TE	**DATE: 3/17/2011** **REVIEWER: Deb Caillouet** **PHONE:** (907) 269-0298	**Action taken on comment by:**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1	Table 3-1	The Spill Response Hot Line should be called, not a specific person. Also Paul Lhotka 451-2175 will be generally responsible for Ft Wainwright.	A	The Paul Lhotka's name and number were added to the table along with the following line *In case of a spill, the Spill Response Hot Line will be called* 907-451-2121 Outside normal business hours 1-800-478-9300	
2	Page 4-7, 4th bullet	The person listed here for waste is not the person shown in Table 3-2.	A	The table contains the correct information. Therefore the contact for DPW will be changed from 'Ms. Kat Gannon' to 'Bob Gray' throughout the 4th bullet on page 4-7.	
3	Section 6.0	There are several references listed that do not apply. PRG for Residential Soil, TetraTech, Information Sheet MMRP.	A	References not called out in the text were removed with the following exceptions ADEC (Alaska Department of Environmental Conservation). 2010 (January). *Draft Field Sampling Guidance.* ADEC. 2009 (September). *Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites.* USACE (U.S. Army Corps of Engineers). 2007 (June). *Engineering and Design – Military Munitions Response Actions*. EM 110-1-4009.	

REVIEW COMMENTS

PROJECT: Fort Wainwright
DOCUMENT: 2010 Post Wide Work Plan, Draft April 2010

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-EE-TE	DATE: 3/17/2011 REVIEWER: Deb Caillouet PHONE: (907) 269-0298	Action taken on comment by:

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
				As these documents were used as general guidance.	
4	Page b-3-6, Section 3.1.1	Please include the container used for homogenizing and how it will be cleaned between samples.	A	Since this is a Post Wide Work Plan, we would like to leave the option open to use either a disposable or non-disposable homogenizing container. The text has been updated to say the following "Uncover fresh soil and homogenize using disposable sampling equipment, such as a pie pan and plastic spoon (or equivalent) or a stainless steel bowl and spoon (or equivalent) that will be decontaminated in the following fashion: wiped out with a paper towel (or equivalent), decontaminated using a mixture of Alconox and DI water, then rinsed with DI water. Collect the soil sample in the appropriate sample jar."	
5	Page B-3-15 Section 3.3	Please review the Draft Vapor Intrusion Guidance For Contaminated Sites, July 2009 that can be found at: http://dec.alaska.gov/spar/csp/guidance/draft-vi-guidance.pdf. The sampling methods outlined should be	A	The text will be updated to comply with regulations. Additional procedures will be added for passive soil gas sampling and active soil gas sampling: sub slab, near slab and exterior, using	

REVIEW COMMENTS

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		used.		the draft ADEC guidance.	
6	Page C-3-6, Section 3.4	Please review the Draft Vapor Intrusion Guidance For Contaminated Sites, July 2009 that can be found at: http://dec.alaska.gov/spar/csp/guidance/draft-vi-guidance.pdf. The screening levels in the guidance should be used.	A	Screening levels will be changed to ADEC criteria.	
7	Attachment 3-C	The groundwater cleanup level for Bromodichloromethane is 0.014 mg/l; please review the entire table for accuracy.	A	The table will be updated and checked	
8	Attachment C-5	Please see comments 5 and 6.	A	See comment 6	
9	Page E-7-2	Typo, Directorate of Public Workplace.	A	Text will be updated. Thanks for catching that.	