PRELIMINARY SOURCE EVALUATION 1 NARRATIVE REPORT

FORMER COMMUNICATION SITE

FORT WAINWRIGHT, ALASKA

INTERIM FINAL REVISION 1

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Acronyms

ADEC	Alaska Department of Environmental Conservation
Alsib	Alaska Siberia
bgs	below ground surface
CEMML	Center for Environmental Management of Military Lands
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CRREL	Cold Regions Research and Engineering Laboratory
CSM	Conceptual Site Model
DMM	discarded military munition
DoD	Department of Defense
DPW	Directorate of Public Works
DRMO	Defense Reutilization and Marketing Office
DRO	diesel range organic compounds
EOD	explosive ordnance device
FCS	Former Communication Site
FFA	Federal Facility Agreement
HTRW	Hazardous, Toxic, and Radioactive Waste
LAAF	Ladd Army Airfield
LAFB	Ladd Air Force Base
MC	Munitions Constituents
MEC	Munitions and Explosives of Concern
NPL	National Priorities List
NWI	North Wind Inc.
PCBs	polychlorinated biphenyls
PID	photoionization detector
POL	petroleum, oil, and lubricants
PSE	Preliminary Source Evaluation
PX	Post Exchange
R&M	R&M Consultants, Inc.
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RRO	residual range organic compounds
SAS	School-Age Services
SOW	Statement of Work
TNT	2,4,6-trinitrotoluene
USACE	U.S. Army Corps of Engineers, Alaska District
USAF	U.S. Air Force
US Army	U.S. Army Garrison - Alaska
US EPA	U.S. Environmental Protection Agency

EXECUTIVE SUMMARY

This report presents the results of the Preliminary Source Evaluation (PSE) 1 of the Former Communication Site (FCS) also referred to as Taku Gardens, located at Fort Wainwright, Alaska. This FCS includes approximately 54 acres within the 915,000-acre Fort Wainwright Military Reservation.

This report summarizes available information on past activities that occurred at or near the FCS. Additionally, the report identifies, or attempts to identify areas where hazardous materials were stored or located at the FCS and where hazardous material impacts to soil and groundwater may exist.

The FCS was selected for future military family housing in 2002-2003. The activities initiated after this selection was made are as follows:

- Soil borings installed and sampled during a geophysical and geotechnical survey of the Source Area performed by the U.S. Army Corps of Engineers, Alaska District (USACE) and the Cold Regions Research and Engineering Laboratory (CRREL) in October 2003 documented the presence of metal debris at the FCS.
- Pre-construction soil boring sample results collected during the USACE geotechnical/chemical surveys (performed during November 2003 through February 2004 period) indicated low-level polychlorinated biphenyl compounds (PCBs) were present at the location of two soil borings. Additionally, metal debris was encountered in some of the geotechnical soil borings.
- R&M Consultants, Inc. (R&M) conducted a May 2004 geophysical survey (R&M 2004) for housing construction because metal debris was encountered during previous studies; the survey documented metallic debris was buried at several locations across the FCS.
- Site clearing activities in April 2004 uncovered extensive amounts of buried items, scrap metal, drums and discarded military Munitions and Explosives of Concern (MEC) in the northern section of the source area.
- A follow-up limited characterization performed in March and April 2005 did not confirm the presence of PCBs previously detected at two locations by the USACE geotechnical/chemistry surveys.
- In June 2005 petroleum contamination was discovered in the northwest corner of the FCS (in the area of Buildings 5 through 9) during housing construction. Soil boring and groundwater samples were collected and confirmed only fuel contamination was present.
- In late June 2005 during construction related activities, high levels of PCBs and associated chlorinated solvents were detected in the location of the original Building 52 foundation. A construction site clearance for PCBs resulted from the detection of high levels of chlorinated contamination in the surface and subsurface soil. Ongoing construction activities were using or moving the potentially contaminated soil at the construction site; therefore, influencing the decision to clear the construction site for PCBs before additional construction was completed.
- The FCS investigation initiated in August 2005 was focused on protection of FCS workers and nearby residents. Additionally, the stockpiled soil, trenches and

traffic areas were kept wet to minimize dust and air transport of contamination from the site. In addition to soil sampling, this FCS investigation included collection and testing of wipe samples collected from the adjacent residences west of the FCS and construction equipment left on-site when the US Army suspended construction activities and shallow groundwater testing. On-site field screening for Aroclor 1260 supplemented the off-site analytical testing.

During the PCB clearance for construction activities conducted in 2005, the US Army project team determined that military MEC and unknown chemicals were encountered and removed during the 2005 construction activities.

The results of the CRREL geophysical survey are provided in Appendix H, and the R&M survey results are presented on a 2005 aerial photograph provided in Appendix A on Figure 14 in Appendix A. Appendix A also presents the location of the USACE soil borings that were installed during the USACE geotechnical survey. Information not provided in the appendix is located on one of the CD-ROMs included as Appendix E.

The FCS was temporarily divided into five subareas in consultation with the Alaska Department of Environmental Conservation (ADEC) and U.S. Environmental Protection Agency (US EPA) based on potential chemicals of concern, historical activities and available non-classified information. The boundary of the source area was initially established by the construction site fence. The main focus of the first step in the FCS investigation was to clear the site for construction activities needed to finalize external building construction before onset of winter and to winterize utility systems. The source area is still considered a single investigative site even though it was divided by historical information. The perimeter bounds of the source area have not yet been established for future investigations. Historical records from the early 1900s to 2006 were reviewed. These records included: governmental and non-governmental reports and surveys, aerial photographs, and news media articles. Information gathered for this evaluation was also collected through discussions with personnel familiar with past activities. The information reviewed during preparation of this PSE is summarized in Appendix E. The subareas of potential concern are presented on Figure C-1 provided in Appendix C.

The boundaries and associated buildings for the five subareas are defined on Figure C-1 provided in Appendix C and briefly discussed in the following paragraphs.

Subarea A. This is the largest of the five areas. The potential contamination in this area appears to be related to buried metal debris, stored or spilled chemicals, training activities, discarded military MEC, and salvage of military materials and PCBs associated with transformers stored or used in the area.

Subarea B. The significant contaminant of concern at this area is petroleum related. Diesel range organic compounds (DRO) were detected in groundwater and subsurface soil at concentrations exceeding applicable ADEC cleanup criteria. Weathered fuel contamination appears to be from spills or leaks during the period when this area was occupied by a company headquarters and barracks.

Subarea C. Suspected contamination in this area may be related to activities conducted during the period when the company headquarters and barracks occupied the FCS. The runoff from the FCS and neighboring residential areas drains through this subarea as it flows toward the outfall to the Chena River.

Subarea D. Potential contamination in this area may be related to storage and or salvage activities in the northern section and transformers used or stored in the area. Potential contamination in the southern section may also include contaminants

associated with the seven structures of unknown use located in the southern section of the subarea from 1954-1958 as evident in aerial photographs.

Subarea E. A communication system was believed to have been operated in this subarea. The primary source of known contamination is from transformers used or stored at the FCS. High levels of PCBs and other chlorinated compounds were detected at concentrations exceeding ADEC residential cleanup criteria. A chain-link fence was placed around this subarea due to the extent and level of contamination detected.

The following conclusions have been made from the evaluation of each FSC subarea:

- The subarea is complicated by lack of conclusive information on past activities.
- River meanders that are apparent in 1947 aerial photographs appear to be less evident (filled in) leading to the assumption that disposal activities began prior to 1947.
- Evidence to document source area activities pre-date available aerial photographs (1947).
- Activities at this subarea in the late 1940s through the 1950s involved receiving, handling and disposal of salvage material.
- Drums and MEC, including explosive and non-explosive materials were buried. Some of the excavated material was not transferred to a location outside the source area; instead the material was placed in soil and debris piles across the FCS. The locations of MEC discovered in debris and stockpiles on-site are shown on Figure C-1 provided in Appendix C.
- During the 1950s all activities at the FCS appear to be connected to the presence of the company headquarters and barracks located in the northwest section of the FCS.
- The concrete batch plant was located in the northeast corner of site (current location of the Post Exchange [PX] Service Station) from as early as 1954 until 1957.
- Site clearing activities in April 2004 uncovered extensive amounts of buried military items, scrap metal, drums, and discarded MEC in the northern section of the source area.
- Groundwater is impacted by fuel contamination in one area.
- It is believed that sources of PCB contamination were related to leaking transformer(s), inadequate storage and disposal of transformers, and other historical installation activities. Other compounds associated with transformer oil are contaminants of concern.
- Significant amounts of metal debris were encountered during 2005 construction activities and some debris was removed. The three geophysical surveys performed to date indicate metallic anomalies are still present in surveyed areas.
- MEC were encountered during clearing activities for the housing construction site and during excavation associated construction activities. Military ordnance experts were mobilized to the FCS and were responsible for identification and disposal of the MEC.

This report may contain data gaps because some information may be considered classified or was not available at the time this report was written.

1.0 INTRODUCTION

This report presents the results of the Preliminary Source Evaluation (PSE) 1 of the Former Communication Site (FCS) also referred to as Taku Gardens, located at Fort Wainwright, Alaska. This FCS includes approximately 54 acres within the 917,000-acre Fort Wainwright Military Reservation. This report summarizes available information on past activities that occurred at or near the FCS. Additionally, the report identifies, or attempts to identify areas where hazardous materials were stored or located at the FCS, and where hazardous material impacts to soil and groundwater may exist.

The construction of family housing within the area of the FCS was proposed in 2002-2003. This initiated the following related actions that were completed before construction began:

- An Environmental Assessment (US Army June 2004) of all Fort Wainwright housing areas,
- Two Geophysical Surveys (limited survey performed by USACE Cold Regions Research and Engineering Laboratory [CRREL] in October 2003 and complete survey performed by R&M Consultants, Inc. [R&M] in May 2004), and
- Two Geotechnical and two Chemical Surveys performed by the U.S. Army Corps of Engineers, Alaska District (USACE) during the November 2003 through February 2004 time period.

A copy of the CRREL report and survey is included in Appendix H of this report. The USACE and R&M surveys are included on the CD-ROM provided in Appendix E. Information from these surveys was used to develop sampling and analysis plans for characterization of the FCS.

The USACE foundation geotechnical investigation detected the presence of polychlorinated biphenyls (PCBs) at the location of two soil borings installed by the USACE in 2003-2004 (AP-8934 and AP-8960). A follow-up sampling performed by North Wind Inc. (NWI) in March and April 2005 did not confirm the presence of PCBs at either of these two locations. The construction of the family housing began in the summer of 2004 with the excavation of utility trenches and building foundations (locations are provided in Appendix D drawings).

Petroleum contamination was discovered during June 2005 construction activities in the northern area of the FCS. Eighteen soil borings were advanced to the depth of groundwater and analyzed by an off-site laboratory for volatile and semi volatile compounds, diesel range contaminants, and PCBs to delineate and characterize fuel contamination in soil. Three temporary groundwater monitoring wells were installed in locations where soil contamination levels were the highest. These wells were analyzed for the same analytical parameters as those used for the soil boring samples. Only one contaminant was identified as a concern in soil and groundwater; this contaminant was diesel.

During excavation of the Building 52 foundation in June 2005 workers noted a solvent-like odor. An environmental field team investigated the source of this odor and determined PCBs (Aroclor 1260) and associated chlorinated compounds were present in the excavated soil. This discovery of high-level chlorinated contamination in the soil initiated the PCB construction site clearance of soil and construction equipment. The primary focus in 2005 was on the safety of on-site personnel and nearby residences. In

order to protect site workers and residences, dust control was implemented and PCB clearance of surface and subsurface soil was initiated. This construction site clearance was performed while construction excavation activities ceased and after construction workers were evacuated from the FCS. Workers were not allowed on site until the US Army project team determined it was safe to reenter an area. Recreational equipment at four areas (one inside the construction site, two in the adjacent residential neighborhood, and one at the School-Age Services [SAS] facility) and the adjacent houses were screened for potential PCB-contamination.

The US Army project team reviewed the construction subcontractors' field notes and photographs for information leading to identification of a potential source for the PCB-contamination in the original Building 52 excavation. During the review of field notes and photographs, the project team discovered military Munitions and Explosives of Concern (MEC) (projectiles, shipping tubes, shell casings, fins, drop tanks, etc.) empty/leaking/crushed drums dating back to the 1950s, stained soil, burned debris, unidentifiable materials (such as white powder and blue-grey granular material), building debris, airplane and automobile parts and unknown chemicals had been uncovered and most material had been removed from the FCS during construction activities performed in 2005. The table in Appendix B summarizes the information and provides the location relative to the associated building. Additional information on the 2005 construction activities is presented in two reports (*Field Report FTW 251 and 283* and *Fuel Transfer Spills Corrective Action Report*) and included in Appendix E (S&W 2006a and S&W 2006b).

The FCS was divided into five subareas in consultation with Alaska Department of Environmental Conservation (ADEC) and U.S. Environmental Protection Agency (US EPA) based on historical activities and on available non-classified information. Historical records from the early 1900s to 2006 were reviewed. These records included: governmental and non-governmental reports and surveys, aerial photographs, topographical surveys and news media articles. Information gathered for this evaluation was also collected through discussions with personnel familiar with past activities. The subareas of potential concern are presented on Figure C-1 provided in Appendix C.

2.0 PURPOSE

The purpose of this source evaluation is to collect and review available information regarding historical activities conducted at or near the FCS that may have contributed to contamination impacting soil and groundwater. Figure 2-1 provides the general location of Fort Wainwright and the FCS located on Fort Wainwright. This PSE report summarizes the findings of the evaluation to support future investigations.

The PSE as defined by the Federal Facility Agreement (FFA) (US Army 1991) is comprised of two processes, the PSE1 and PSE2. The PSE is conducted to determine if an unacceptable potential risk to public health or the environment exists. The scope of the PSE is intended to be significantly less than that of a remedial investigation/feasibility study. The PSE is used as a screening tool to summarize existing information. The evaluation requires a focused but limited field effort to determine qualitative risk.

The exposure pathways and the potential receptors for each subarea are clearly identified in the individual Conceptual Site Models (CSMs) provided in Appendix F of this report. The PSE2 will provide the results of the field investigations.

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Figure 2-1 Location and Site Map

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3.0 SITE HISTORY

3.1. Fort Wainwright

Fort Wainwright is an active installation covering approximately 915,000 acres in the Fairbanks North Star Borough, Alaska. It is approximately 120 miles south of the Arctic Circle, and 350 miles north of Anchorage, in the interior part of the state. Fort Wainwright lies within the flood plain of the Chena River, which is a tributary of the Tanana River. The Chena River meanders westward through the main post area forming several oxbows. The Chena River drains approximately 2,000 square miles and flows into the Tanana River approximately eight miles west-southwest of Fort Wainwright (ATSDR 2003).

Fort Wainwright has been used by the Department of Defense (DoD) for military operations continuously since 1938. It was originally named Ladd Army Airfield (LAAF) and authorized as the Alaska Experimental Air Base. This project was subsequently developed into three categories: a cold-weather test station, an air sub-depot for repair and testing of airplanes, and the central Alaskan station of the Alaskan Wing of the Air Transport Command system for transportation of air freight in Alaska and ferrying Alaska Siberia (Alsib) planes.

In 1947 LAAF was home to the 1st Unified command that allowed the US Army, Navy and Air Force elements to work together in Alaska. During World War II, LAAF served as a transfer point in the U.S.-Soviet Lend Lease Program. Between 1942 and 1945, almost 8,000 combat and transport aircraft were transferred to Soviet aircrews at LAAF. The newly-formed U.S. Air Force (USAF) assumed control of LAAF in 1947 and redesignated the post as Ladd Air Force Base (LAFB). The LAFB served as a resupply and maintenance base for the Remote Distant Early Warning sites and experimental ice stations in the Arctic Ocean.

Winter exercises involving joint task force training were conducted in the 1950s. In the 1950s, the installation was used as a supply and maintenance base for the Remote Distant Early Warning Radar sites and experimental ice stations in the Arctic Ocean. During the Korean Conflict and the Cold War, the post was an integral part of the national defense network. The US Army resumed control over LAFB on January 1, 1961 and renamed the installation Fort Wainwright. Fort Wainwright became the home of the 171st Infantry Brigade in 1963 and housed various US Army Brigades and divisions over the years.

Over the decades of military use, routine operations and storage practices resulted in accidental releases of chemicals to the ground and underlying groundwater or nearby surface water. Former waste disposal practices were also responsible for releases to the environment. Most non-hazardous waste was disposed in the sanitary landfill beginning in the late 1950s, located in the north-central portion of Fort Wainwright. Naturally occurring surface depressions (such as oxbows) were used for disposal of waste construction material and covered with fill. Other waste disposal practices at Fort Wainwright included using waste oils on post roads for dust control and for firefighting drills; spreading ash on icy roads, collecting hazardous waste in waste oil tanks and burning it for energy recovery in the power plant; and discharging or dispersing used oils, solvents, or fuel spills into floor drains in buildings across the installation (ATSDR 2003).

Fort Wainwright generated hazardous waste material in the past, including pesticides; PCBs; petroleum, oil, and lubricants (POL); and battery fluids. Such chemicals were

largely associated with spent solvents and ignitable wastes from aircraft and vehicle maintenance shops; contaminated motor vehicle and aviation fuels; painting waste; coal fly ash and spent non-recyclable vehicle batteries. Fort Wainwright also received small quantities of radioactive tritium waste and low-level radioactive materials (e.g., radium dials) (ATSDR 2003).

3.1.1. Remedial and Regulatory History

Fort Wainwright was placed on the National Priorities List (NPL) on August 1990, because of potential soil and groundwater contamination. The NPL is a listing maintained by the US EPA in accordance with the provisions of the 1980 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 USC 103), known as "Superfund." The two areas were used for the original EPA ranking (1) a 50-acre sanitary landfill used for hazardous waste disposal since the late 1940s and (2) the North Post Family Housing Area contaminated from past storage of petroleum products, solvents, and other chemicals (ATSDR 2003).

The US EPA, ADEC, and Army entered into a FFA (US Army 1991) with Fort Wainwright in 1992 to develop remedial action plans for environmental contamination at Fort Wainwright. Additionally, the US Army and ADEC signed a Two-Party Agreement in March 1992, to define the process by which the US Army agreed to investigate and clean up petroleum-contaminated areas (ATSDR 2003).

3.1.2. Natural Resources

Fort Wainwright natural resources include soil resources (such as off-road recreational usage), vegetation, forest, water resources (such as wetlands and surface water), groundwater (for drinking water), and wildlife and fisheries (for recreational hunting and fishing, trapping, subsistence, and maintenance of population and habitat, and preservation of biological diversity).

Forest management on Fort Wainwright emphasizes wildlife habitat improvement rather than commercial timber objectives. Most ponds and lakes on Fort Wainwright do not support fish populations during winter; however, a fish stocking program supports recreational fishing for the public during summer. The Tanana, Chena and Salcha rivers support seasonal populations of fish for recreation and provide spawning areas for salmon. Mammals found on the installation include grizzly bears, black bears, wolverines, Dahl sheep, caribou, fox, weasel, lynx, and beaver. The only amphibian found at Fort Wainwright is the wood frog. Several upland game species are found on the installation as well as many other bird species. The *Integrated Natural Resources Management Plan for U.S. Army Garrison Alaska* (Army 2006a) provides a complete list of natural resources specific to each area of the Fort Wainwright installation. This document is provided on the CD in Appendix E or can be found at http://www.usark.army.mil/conservation/NEPA_FWA.htm.

3.1.3. Hydrogeology

Fort Wainwright lies above a shallow groundwater aquifer, the Tanana Basin Alluvium Aquifer. The alluvium, or loose sediment largely consisting of sand and gravel, is distributed over a broad area, providing a large water storage capacity. The aquifer ranges in thickness from a few feet to at least 300 feet and possibly as much as 700 feet in some areas of the Tanana River Valley. The depth to groundwater is typically 10-20 feet.

Groundwater flows to the west-northwest in the Fort Wainwright area. The flow pattern at Fort Wainwright is similar to the Chena and Tanana Rivers (ATSDR 2003). Groundwater flow beneath Fort Wainwright, south of the Chena River, is generally to the northwest.

The flow is driven primarily by the difference in river stage between the Tanana and Chena Rivers. The Tanana River elevation is higher than the Chena River and during most of the year, groundwater flows from the Tanana River into the Chena River, flowing onto the base from the southern and eastern base boundaries, and exiting on the western border of the base. Groundwater gradients reverse with high stage conditions on the Chena River causing water to flow into the aquifer. This occurs during two periods annually, spring snowmelt and late-summer precipitation events. The river stage of the Chena River can vary as much as 8 to 10 feet throughout the year due to these events. Groundwater gradients resume to normal trends toward the Chena River after the river stage drops and groundwater flows back into the Chena River. The hydraulic conductance of the system and the hydraulic gradient are the primary factors that affect the maximum extent of surface water flows into the aquifer during bank recharge. The duration of high stage also contributes to the extent of bank recharge. The surface water movement ranges from 20 feet to less than 100 feet as measured during one investigation of bank recharge performed during spring melt (UAF 1997).

Groundwater flow varies across Fort Wainwright due to natural differences in the surface and subsurface soils. Zones of fine-grain sand and silt are intermingled with zones of coarser-grained sands. Fine-grained materials tend to retard groundwater flow while the coarser materials are more permeable and typically allow greater amounts of groundwater flow (ATSDR 2003).

The Fort Wainwright's main drinking water supply system wells are located in the area of Buildings 3559A and 3559B and approximately 100 feet from the FCS eastern perimeter fence. Two emergency backup wells are located at Buildings 3564 and 3565, also near the FCS. The downgradient emergency backup well closest to the FCS is located less than 1,000 feet northwest of the FCS at Building 4065 as shown on Figure C-1 provided in Appendix C and Figure 15 provided in Appendix A. The water supply well depths range from 80 to 182 feet deep (US Army 1997). The wells support a capacity of 1.5-2.5 million gallons of drinking water per day. The various wells on Fort Wainwright are sampled routinely to evaluate potential contamination. Five emergency standby wells are located at various locations on the facility. The depth of these wells range from 80-100 feet. Table 3-1 provides the required tests and sampling frequency for the Fort Wainwright drinking water program. The information provided in the following table was copied from the ADEC Drinking Water Watch (A the complete list of analytes and results for the Fort Wainwright water supply system samples can be found at http://map.dec.state.ak.us/eh/dww/index.jsp). Sampling points correspond to the above mentioned well locations as follows:

- Building 3565 is sampling point SPWL002 (backup well)
- Building 3564 is sampling point SPWL001 (backup well)
- Building 3563 is sampling point SPWL003 (backup well)
- The Main Treatment Plant (Building 3569) includes sampling points SPSS001, SPSF001, SPTP001, and SPEP001.

Appendix N provides the list of analytes and defines the types of sampling points included in the ADEC drinking water monitoring program for Fort Wainwright. For additional information or definitions please refer to the above mentioned link to the ADEC web site.

Table 3-1 Fort Wainwright Water Treatment Plant, Public Water System ID#AK2310918

Required Water Test and Location	Required Sampling Frequency	Comments
Total Coliform Bacteria (Distribution System)	10 samples monthly	
Lead and Copper (Distribution System)	30 samples every 3 Years	
Combined TTHM and HAAS (End of Distribution)	1 sample quarterly	
Arsenic (Entry Point)	1 sample per period	
Asbestos (Entry Point)	Waiver until 2008	
Phase II Old Inorganics (Entry Point)	1 sample per cycle	
Phase V New Inorganics (Entry Point)	1 sample per cycle	
Nitrate (Entry Point)	1 sample annually	
Pesticides and Other Organics (SOC/OOC) (Entry Point)	2 samples per period	PCBs results reported for one sampling event conducted 7-18-06 were all less than the indicator (MCL of 0.5 µg/L).
Revised Radionuclides (Gross Alpha, Radium, Uranium) (Entry Point)	1 sample per 6 year period	
Volatile Organic Compounds (Entry Point)	1 sample annually	
Annualized Benzene (Raw Water)	1 sample annually	
Chlorine Residual (Distribution System)	10 samples per month (same time and location as coliform sample)	
Fluoride (Entry Point)	1 sample 31 days a month	

1) Periods are defined as three years and start in 2002. The current period is 1/1/05-12/31/07 and the next period will be 1/1/08-12/31/10. Cycles are nine years in length and start in 2002. The current cycle is from 1/1/02 – 12/31/10. The next is1/1/11 – 12/31/19.

2) Entry Point – is the entry point to the distribution system. Distribution system – is the homes and buildings that receive water from a piped water

3) Water systems with multiple water sources that do not combine before entering the distribution have to take one sample from each entry point to the distribution and may do a composite sample according to 18 AAC 80.325 (17), 18 AAC 80.315 (4).

MCL- Maximum contaminant level for drinking water

3.1.4. Surface Water

Fort Wainwright lies entirely within the Tanana River drainage basin. The Tanana River, a major tributary of the Yukon River, flows east to west, approximately three miles south of the Fort Wainwright main cantonment area, encircling the northern and eastern boundaries of the Tanana Flats Training Area.

Fort Wainwright also lies within the flood plain of the Chena River, a tributary of the Tanana River. The Chena River is located 0.25 miles north of the site and drains an area of approximately 2,000 square miles. It meanders westward through the Main Post, forming several oxbows, flowing into the Tanana River approximately eight miles west-southwest of Fort Wainwright (ATSDR 2003). The Chena River is an influent system for most of the year; when the river is at normal and low stages, and groundwater is flowing into it. During high stages, when the melting snow and ice combine with rainfall, the surface water discharges into the groundwater. The banks of the Chena River have a capacity of 12,000 cubic feet of water per second.

Many creeks and smaller rivers located on Fort Wainwright eventually flow into the Chena or Tanana Rivers. None of the creeks or small rivers are located within the source area; however, a natural drainage located between the housing area west of the FCS drains into the Chena River.

The Chena River Aquatic Assessment was established to determine if impacts to the Chena River had occurred from releases at Fort Wainwright and to measure anticipated improvements in water and sediment quality over time. The program consists of sampling and analysis of surface water, sediments, and detritus; benthic macroinvertabrate toxicological studies and bioassays (US Army 2006b).

The post has a number of lakes that are sometimes used for fishing and other recreational purposes. The nearest lake is south of the site approximately, 0.25 miles from the northern most perimeter fence and the nearest wetland is less than 800 feet from the same boundary (US FWS 2007). Appendix C-3 and C-4 are figures from the US FWS 2007 data base showing the locations of various types of wetlands on Fort Wainwright.

3.1.5. Terrain and Climate

Fort Wainwright is located within two different topographical areas, the Tanana-Kuskokwim Lowlands and the Yukon-Tanana Uplands. The Main Post is primarily located on relatively flat terrain, with a typical elevation about 450 feet above mean sea level. The northern portion of the Main Post has higher terrain, with elevations rising to above 1,000 feet above mean sea level. The climate in the central part of Alaska is characterized by summer temperatures that range from 65 to 90 degrees (ATSDR 2003). Prevailing wind direction on Fort Wainwright is from the east during November through February, August and September, east-northeast during March, April, October, west during May and June and west-southwest in July. (Prevailing wind direction is defined as the direction wind is coming from; this was documented from 1996 to 2002 per the following web site: http://climate.gi.alaska.edu/Climate/Wind/mean_direction.html.)

Fort Wainwright and Fairbanks are in the Central Alaskan region of discontinuous permafrost. Discontinuous permafrost refers to a region in which some areas are underlain by permafrost and neighboring areas are not perennially frozen. The unfrozen zones can be isolated or interconnected (USGS 1999).

Permafrost (and seasonally frozen soil) can make it more difficult for rainwater and snow melt to infiltrate to deeper groundwater zones. Even so, unfrozen water will still pass

through porous permafrost. Permafrost also can alter groundwater flow patterns, causing erratic and unpredictable movement. Groundwater in areas of permafrost, such as north of Chena River at Fort Wainwright, is most likely to occur in (1) the active layer during the summer (frost-free) season; (2) in taliks (unfrozen zones) within the permafrost; and (3) in unfrozen zones below the permafrost layer (ATSDR 2003).

3.2. History of the Former Communication Site (Taku Gardens)

The 54-acre construction source area currently referred to as the FCS or Taku Gardens is located within the area of the main post and is south of the new hospital constructed in 2005. Activity at the FCS and surrounding areas is recorded by aerial photography, Master Plans, historical Post and unit activities and topographical surveys. Most of the information printed on the history of military activities of LAFB and military activities during the Cold War can only be extrapolated to be activities that occurred. Very little documentation has been located that conclusively describes activities conducted at the FCS. Therefore, considerable effort was focused on evaluation of aerial photographs dating from 1947-2005, 1958 Master Plans and geographical surveys. After construction activities led to the discovery of PCB contamination, extensive research and evaluation of multiple documents from higher Commands, other installations and Military history were used to help identify site structures and features. Many similar military operations, building configurations, construction and communication systems were built and operated across the United States. This information has led to identifying potential sources. A summary of this review is provided in Appendix A. Additionally, historical aerial documentation for this source area could not be located for the 1950-1953 time-period at the time this PSE1 was written.

3.2.1. Surface Water

Hoppe's Slough, one of several oxbows formed by the Chena River, curved through the middle of the FCS. Aerial photographs that document FCS conditions prior to 1947 are not available; however, the footprint of the slough and a second meander south of the slough is visible in a 1948 aerial photograph (Appendix A, Figure 3) and partially visible until the late 1960s.

Historical photographs document the eventual filling of meanders as the areas are developed. A geophysical survey performed in May 2004 (R&M 2004) indicates the material used to fill the slough included metallic objects. The western drainage at the FCS that leads to the Chena River follows the natural direction of this slough. Runoff from residential areas located west of the FCS flows into the modified drainage and under Neely Road where it meanders across the area of the new hospital built in 2005 before it flows into the Chena River. The construction contractor at the FCS was responsible for controlling off-site discharge of sediments during construction activities. The Directorate of Public Works (DPW) tests the outfall of this drainage to the Chena River annually (Adams 2006). The only documented occasion when this drainage contained actively flowing water was during dewatering activities performed by the construction contractor in the spring of 2005 (Adams 2006). Figure 12 in Appendix A shows the north drainage from the source area.

Runoff collects in a low area located in the southwest corner of the FCS (behind residential Building 4394) and may run into a wetland located in this area (Adams 2006). A settling pond was constructed in this area to collect runoff (snow melt) from the east and northeast areas during the 2006 spring break up. After reviewing analytical data from samples collected from the settling pond, the ADEC approved discharge of the water into the drainage ditch adjacent to the housing area near Alder Road. Figure 13 in

Appendix A shows the south drainage and areas of flooding during the spring snow melt. Figures C-2 and C-3 in Appendix C provide locations of surface water and wetlands near the source area on Fort Wainwright.

3.2.2. Hydrogeology

The groundwater studies at Fort Wainwright are extensive and documented in various reports and surveys available in the Fort Wainwright Administrative Record (Building 3023). These reports typically apply to the various Operable Units across the facility. Groundwater data was collected within the FCS in the fall of 2005 and during the summer of 2006. Groundwater samples collected in 2005 were used to evaluate contamination in select areas and results were reported by NWI in the Field Data Report (USACE 2006a). Figure C-1 in Appendix C provides the location of the permanent, temporary and supply wells.

Groundwater at the FCS flows in a west-northwest direction and was typically encountered at depths ranging from 13 to 15 feet below ground surface (bgs) in the soil borings and groundwater wells installed at the FCS.

A Post-Wide Well Survey of Fort Wainwright (US Army 2000/2006) shows the location of documented groundwater monitoring wells. The FCS is located on Plate 11 of this survey and provided in Appendix A of this report. The wells shown on this survey map are up gradient and east of the FCS. The Post-Wide Well Survey (US Army 2000/2006) is included on a CD-ROM provided in Appendix E. Figure 15 in Appendix A (The Fort Wainwright Water Distribution System figure from October 2002 was provided by Brian Adams Fort Wainwright DPW) shows the locations of wells in the vicinity of the FCS. The nearest down gradient well is located near Building 4065 but is not connected to the main supply well system.

Soil boring data collected in 1973, 2003, 2004, 2005, and 2006 document the geology of the construction site. The soil boring logs from the USACE (USACE 2004c and 2004d) and subsequent site investigation (CRREL 2003) provide supporting geological documentation. The geology is consistent with that previously described for Fort Wainwright. The USACE boring logs are provided on a CD-ROM in Appendix E. The boring logs and field report for the Shannon and Wilson investigation are provided in Appendix H to this report. The analytical data and CRREL geophysical survey are also included in Appendix H and on a CD-ROM provided in Appendix E.

3.2.3. Environmental Assessment

The Environmental Assessment, Construct Replacement Family Housing and Revitalize Family Housing Neighborhoods (US Army 2004), states that the effects to land use is related to changes from the relatively natural state of the site to a developed urban area. The effects would be made to visual resources for replacement housing sites during construction and a minor effect after development. This document is included on a CD-ROM provided in Appendix E.

3.2.4. Construction and Investigation Site History

This section discusses the surveys and investigations that are associated with the FCS or Taku Gardens.

Table 3-2 summarizes the current history of the FCS.

Table 3-2
Current History of Former Communication Site (Taku Gardens)

Event Date	Event	Location
Oct. 2003	Cold Regions Research and Engineering Laboratory (CRREL) Geophysical Survey of hydroaxed areas (Appendix [APP.] H). (CRREL 2003)	FCS
Oct. 2003	Shannon and Wilson Soil Boring Sample Collection (APP H)	FCS
Nov. 2003-Feb. 2004	USACE Geotechnical Investigation (USACE 2004a &b) Chemical Data surveys detect PCBs at two soil boring locations (AP-8934 and AP-8960) in FTW251 and FTW 283. Also noted metal anomalies.	FCS
Mar.-Apr.2004	North Wind collected soil boring samples from two locations where USACE detected PCBs in Mar. of 2004 but did not detect PCBs.	FCS
24 March 2004	Explosive ordnance device (EOD) Incident. Report No. 176-018-04 - Fort Wainwright DPW excavated a 155mm projectile from a “dig site”. One piece of ordnance disposed of by detonation. (APP. G)	North of FCS behind PX service station
8 April 2004	EOD Inc. Report No. 176-024-04 and 176-025-04 - Fort Wainwright DPW excavated an “8-inch, inert filled” “Casing, 75mm Recoilless Rifle” and an “8 inch, us, inert filled” from a “dig site”. Three pieces of ordnance disposed of by detonation. (APP. G)	North of FCS behind PX service station
9 April 2004	EOD Inc. Report No. 716-021-04 - Fort Wainwright DPW excavated an “8 inch, us, inert filled” from a “dig site”. Different projectile than previously identified. One piece of ordnance disposed of by detonation. (APP. G)	North of FCS behind PX service station
14 April 2004	EOD Inc. Report No. 716-027-04 - Fort Wainwright DPW excavated two 8-inch/155mm projectiles - inert from a “dig site”. One piece of ordnance disposed of by detonation. (APP. G)	North of FCS behind PX service station
May 2004	R&M Geophysical Site Investigation (R&M 2004)	FCS
June 2004	Environmental Assessment performed (US Army 2004)	FCS
Spring/Summer 2005	Construction began on housing project and documents in field notes and photographic record that MEC were present at the construction site and may still be present.	FCS
21 April 2005	EOD Inc. Report No. 176-8-05 - Fort Wainwright DPW excavated a piece of scrap metal, possibly an 8-inch projectile. No explosive ordnance found. (APP. G)	North of FCS behind PX service station
June 2005	North Wind collected soil samples from excavation and stockpiled soil in footprint of the original Building 52 location after solvent like odor is reported. No PCBs reported but trichlorophenols are detected.	Subarea E
July 2005	North Wind installed 18 soil borings and three temporary wells in Subarea B to delineate petroleum contamination. Only diesel range organic compounds (DRO) exceeded ADEC cleanup criteria.	Subarea B
July 2005	Additional samples were collected from the original Building 52 location to confirm laboratory notation that PCBs were present in previously analyzed samples and evaluate Dioxin/Dibenzofurans, and other associated solvents	Subarea E

Table 3-2 (continued)
Current History of Former Communication Site (Taku Gardens)

Event Date	Event	Location
Summer 2005	North Wind conducted emergency site investigation for PCBs, installs numerous soil borings, seven temporary wells, and three permanent wells as well as collects surface wipe samples from adjacent housing and on-site construction equipment.	FCS
30 August 2005	Fort Wainwright US Army evacuated the FCS with the exception of field investigation personnel. Water truck routinely on-site to control dust.	FCS
31 August 2005	Media Release disseminated to the public.	Fort Wainwright
August 2005	The area previously designated as Buildings 50-59 was secured with a chain-link fence. This is the area referred to as the "Exclusion Zone".	Subarea E
6 September 2005	Public Meeting to discuss concerns at the FCS and reason for construction shut down.	Fort Wainwright
20 September 2005	Fort Wainwright DPW transports 230 cubic yards of PCB-impacted soil from original the original location of Building 52 to off-site approved facility for disposal.	Subarea E
Fall 2005	North Wind Constructs Soil Stockpiles at DRMO Yard and transfers POL-contaminated soil excavated during 2005 construction activities. Soil was also tested for PCBs before transfer.	FCS
Feb 2006	North Wind publishes a data report of information collected during the 2005 field effort	FCS
Summer 2006	• Ordnance experts were on-site for all intrusive activities at the construction site. • Explosives constituents detected in subsurface soils. • EOD subcontractor identified MEC in test pits and soil stockpiles. • PSE2 initiated with collection of soil and groundwater data. • Third geophysical survey performed that focused on select areas.	FCS

3.2.4.1. Geotechnical Data

During a geophysical survey performed by CRREL in October 2003 to support development of permanent houses in the FCS and investigate the suspected landfill in what is now referred to as Subarea A, five soil borings were installed and sampled. The soil bore logs and analytical data reports from this brief investigation are provided in Appendix H (CRREL 2003). Photographs included in Appendix L show the actual clearing and grubbing of the FCS and early stages of the construction of the sound barrier on the eastern and southeastern boundaries of the construction site. These photographs were taken in April 2004.

The USACE installed soil borings across the FCS proposed to support military housing and collected both analytical and geological data in November 2003 through February 2004. The geotechnical data was documented in two separate reports, Geotechnical Findings Report, Family Housing Replacement, Fort Wainwright FTW251 and Geotechnical Findings Report, Family Housing Replacement, Fort Wainwright FTW283 Taku Gardens Site (USACE 2004a and 2004b). The analytical data is provided in the Chemical Data Report for FTW251 and the Chemical Data Report for FTW283 (USACE 2004c and 2004d).These reports are provided on a CD-ROM that is located at the back of this report.

3.2.4.2. Geophysical Surveys

A limited investigation including a geophysical survey and installation of soil borings was performed by CRREL and limited to a small area. The size of this investigation was due to funding constraints. The survey was completed on already cleared areas and a small hydroaxed area. Soil borings were installed to ground truth the geophysics. The field personnel observed areas of buried metal and surface metal anomalies that were further delineated in a second survey of the construction site. The second geophysical site investigation of the construction site was performed in May 2004 (R&M 2004) to detect buried debris or construction waste remaining from former site activities that was noted by the USACE geotechnical survey and site clearing activities by DPW in 2004. This survey identifies several areas where metal debris was buried and some that appeared to be spread across the surface in some areas. Large areas of buried metal debris were located in Subareas A, B, and C and wide spread surface anomalies found in Subareas A, C, and E. The buried metal anomalies that overlay construction excavations as seen in Appendix A Figure 14 were removed to the depth of the excavation. Some buried metal debris remained on the FCS in 2006 and was removed during FCS investigation activities supervised by ordnance experts. The geophysical information was overlaid on several aerial photographs of the construction site and provides correlation of buried metal anomalies to historical activities (in Appendix A Figures A-1 through A-4). The historical aerial photographs showing the location of the USACE soil borings and results of the geophysical surveys are provided in the Appendix E. The results of the CRREL survey are provided in Appendix H.

3.2.4.3. Previous Investigations and Removal Actions

The USACE geotechnical investigation for the construction activities indicated the presence of PCBs at the location of two soil borings. The PCB concentration (1.4 mg/kg) exceeded the EPA and ADEC residential cleanup standard (1 mg/kg) in one soil boring (AP-8934) at a depth of 2.5 to 4 feet and at levels ranging from 0.084 mg/kg to 0.27 mg/kg in samples collected from a depth of 0 to 1 foot near the location of this same soil boring. The same PCB (Aroclor 1260) was detected at a depth of 4.5 to 6 feet in soil boring AP-8960 but at a concentration (0.039 mg/kg) below the PCB standard of 1 mg/kg. The data collected from this step out sampling effort did not confirm the presence of PCBs as PCBs were not detected in any of the soil samples collected at the two locations.

Limited debris removals were performed by the Fort Wainwright DPW in March and April 2004 from an area behind the Post Exchange (PX) Service Station currently located northeast of the construction site. Because suspected MEC were identified during excavation of metal debris, military ordnance experts were contacted. Photographs of this removal and the Explosive Ordnance Incident Reports for the 2004 removal are provided in Appendix G and summarized in Table 3-2. The April 2005 report in Appendix G summarizes response to shell casing identified by the construction contractor during excavation near Building 24.

During the early stages of the construction project, dewatering activities were conducted to lower the level of the groundwater for excavation purposes. The draw-down well was located in the area where buried metal debris was identified (between Buildings 22 and 48). Groundwater was pumped into a trench that ran parallel to Buildings 1 through 13 and into the drainage ditch east of the fire station. Bales of straw were placed in this ditch to remove suspended material before the surface water left the FCS and before it entered a culvert under Neely Road. This water eventually discharged into the Chena River. Analytical samples were collected from this water discharge and reported to the

ADEC. Suspended solid concentrations exceeded an acceptable level established by ADEC for surface water. Dewatering reporting documents provided by the ADEC are included on a CD-ROM provided in Appendix E. The files included on a CD-ROM summarize the dewatering activities, analytical results, and provides photographs of the well installation and dewatering activities. These photographs document the presence of buried metal debris that was disturbed during excavation.

The construction of 64 military housing units began in April 2005. An on-site environmental subcontractor provided screening support in areas where contamination was suspected and collected soil samples for off-site analytical testing. The construction subcontractor used a photoionization detector (PID) to screen soils and debris to determine if material could be removed from the FCS. Soil and debris determined to be contaminated (assuming contamination was due to fuel constituents) were stockpiled on-site or behind the PX Service Station. Due to the size of the project, not all excavations and intrusive construction activities were screened.

Debris that was not considered contaminated was transported to the Fort Wainwright landfill. Debris was removed by the construction contractor when integrity of the road or building foundation was impacted. The construction contractor did not remove metal debris unless it was determined to affect constructability standards (Wentz 2006).

In the north area of the site soil and groundwater samples were collected from soil borings and temporary groundwater wells in June-July 2005. This area was investigated after petroleum contamination was discovered by the construction contractor. No chlorinated contamination was detected in the 18 soil boring or three monitoring well samples collected during this field investigation of Subarea B.

Unidentified solvent-like odors were noted by construction personnel on 30 June 2005 near the location of the original Building 52 when the building foundation was excavated. Initial testing to characterize the soil identified trichlorophenol contamination but did not conclusively detect PCBs. A second set of field samples collected from this same area detected PCBs (Aroclor 1260) at concentrations as high as 111,000 mg/kg. Additionally, chlorinated contaminants associated with PCBs in transformer oil were also detected at levels that exceed the EPA and ADEC residential risk screening criteria. These chlorinated contaminants associated with PCB contaminated soil include trichlorophenols, trichlorobenzenes, dichlorobenzenes, dioxins and dibenzofurans.

A time-critical removal action was implemented to transport a portion of the PCB-contaminated soil excavated from the original location of Building 52 (approximately 230 cubic yards) from the construction site in September. The excavation was filled with low level PCB-contaminated soil previously stockpiled near Building 54. Air monitoring samples were collected from personnel actively involved on-site and from the perimeter near the housing area located west of the construction site during this limited removal action. PCBs were not detected in any of the air samples collected.

The backfilled excavated area (former location of Building 52) remains covered by plastic sheeting. In addition to PCB removal, the time-critical removal action also included construction of a chain-link fence surrounding ten building footprints (Buildings 50 through 59) and placing signs around the perimeter of the area. Signage warned personnel on-site that this was a PCB contaminated area. This area is within what appears to be the previous location of an electrical grid and became the exclusion zone (Buildings 50 through 59). The exclusion zone is currently secured by a locked chain-link fence. Access is restricted and only allowed upon approval on an as-needed basis. The buildings in the exclusion zone were permanently removed from planned housing. The

decision to build “Building 52” at a new location in the northwest section of the FCS was made prior to this decision.

The construction workers were evacuated from the site in August 2005 to allow environmental field investigation workers to screen soil for PCBs so construction activities could continue. The intent of this field investigation was not to clear the entire construction site. The 2005 field investigation focused on the safety of on-site workers and nearby residences. During this investigation samples were collected from the following locations: surface and subsurface soils across the construction site, stockpiled soils, a nearby residence (Building 4394), three permanent groundwater monitoring wells and seven temporary groundwater monitoring wells, and from four outdoor recreational areas, adjacent residences, and equipment remaining on-site after construction workers were evacuated. Low level PCBs were detected in wipe samples collected from the recreational equipment located within the construction site boundaries but were not detected in samples collected from off-site recreational equipment and residences. The only areas where PCBs were detected at concentrations greater than US EPA and ADEC cleanup criteria are located within the exclusion zone. On-site field screening equipment was used to supplement samples tested by off-site analytical laboratories for PCBs.

Construction field notes and photographs were reviewed to identify the potential source of contamination found in the original location of Building 52 and identify other areas of impact. Table 2-1 of the NWI Work Plan Addendum (USACE 2005d) (Appendix B) summarizes this information. The construction subcontractor began collecting samples for off-site analytical testing for PCBs during the 2005 fall construction activities. These samples were provided to NWI and transferred to the NWI subcontracted laboratory for testing. The analytical results are reported in the FWA-102 Former Communication Site (Taku Gardens) Field Data Report (USACE 2006a). The data indicated PCBs were present in two locations sampled during the fall construction activities, but all results were less than the US EPA and ADEC action limit of 1 mg/kg. This report is provided on the CD-ROM located in the back of this report.

An interview with Fire Captain Scott Hunt documented in IMPA-FWA-PWE, Memorandum for the Record, 31 March 2006 (DPW 2006), reports a transformer was present in this area as observed during a response to a brush fire. Captain Hunt also stated that PCBs may be present in the area near the sound barrier east of the FCS. A map of subareas identified during this interview and the documented interview is provided on a CD-ROM provided in Appendix E.

The field notes and photographs provided by the construction subcontractor were closely evaluated and used to develop the work plan addendum (USACE 2006c) for the 2006 field investigation of the source area. The matrix developed from these notes and provided in the work plan addendum (USACE 2006) was based on comments provided by the ADEC, US EPA and Army reviewers. It was during the review of the matrix that the site was divided into five subareas. Each subarea had similar contaminant and physical characteristics that determined the sample collection approach and analytical requirements. The 2006 work plan addendum not only addressed the sampling and analytical approach but also discussed the on-site munitions technician team requirements. During the 2006 field investigation, the munitions team was present during all field activities due to the potential presence of MEC. Because site conditions were constantly changing during the 2005 season and anticipated to continue to change during the 2006 investigation, the ADEC, EPA and Army determined routine updates on the progress of the 2006 field investigation were necessary. In an effort to provide timely

information to all involved parties, weekly meetings were scheduled and meeting minutes were distributed to all participants. These meetings were used to evaluate progress of the weeks activities related to the site investigation and provide updates on construction activities.

The first phase of the 2006 Site Investigation was initiated with excavation of several test pits, in accordance with the Work Plan Addendum (USACE 2006d). Ordnance-qualified personnel were required when field activities disturbed soil not previously excavated (USACE 2004g). This investigation began in an area where the construction contractor identified potential munitions constituents (MC) in surface soils at Building 25. The term MC was used to describe munitions suspected in the area after review of FCS information and photographs. The term MC defines the materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown products of ordnance or munitions. During the early test pit excavation phase it became evident that some of the metal anomalies identified by the 2004 geophysical survey were no longer present at the FCS. This metal debris was removed by the construction contractor during 2005 activities. A third geophysical survey was scheduled to delineate locations of existing metal debris. The results of that survey will be provided in the PSE2.

The investigation focus transferred to the stockpiled soil and debris excavated during 2005 construction activities staged across the FCS. After various potentially explosive items were identified in the excavations and stockpiles, the terminology used to describe them changed. These items located at the FCS were hence referred to as materials and explosives of concern, previously defined as MEC. The term MEC (definition found in Military Munitions Center of Expertise Technical Update, Munitions Constituent Sampling, March 2005) (USACE 2005b) distinguishes specific categories of military munitions that may pose unique explosives safety risks and discarded military munitions (DMM), and MC such as those that may be present at high enough concentrations to pose an explosive hazard.

Even though information collected during summer 2006 field activities is not provided in the PSE1 narrative report, the information was taken into account during development of the conceptual site models provided in Appendix F.

3.3. Subareas Within the Former Communication Site Source Area

The FCS is discussed in this section as five separate subareas. The Areas of Concern Figure in Appendix C1 shows the approximate location of each subarea and associated buildings. Table 2-1 of the Work Plan Addendum (USACE 2006d), that is provided in Appendix B, summarizes FCS observations and available data used to temporarily divide the source area into separate subareas. A small section north of Subarea E and south of Subareas B and C is not included in the five areas of concern because existing information do not indicate this area is contaminated based on documented activities.

Separate CSMs and ADEC Ecological Scoping Forms were developed for each of the five subareas. Each CSM and scoping form identifies potential sources of contamination (soil, groundwater, surface water, leachate, air, etc.), release mechanisms, and receptor routes and identifies all potential pathways (including secondary pathways) and the media and receptors associated with each of these pathways. The tables and figures used to develop each of the CSMs and forms are provided in Appendix F. The ADEC CSM scoping guidance (ADEC 2005b), ADEC Ecoscoping Guidance (ADEC 2007 and the EPA Conceptual Site Model Summary guidance (US EPA July 1996) were used in

the development of the CSMs text, tables and figures and ecological scoping forms in this report and Appendix F.

3.3.1. Subarea A

From review of obtainable documentation, activities in this subarea began in the early 1940s. The 1947ax001 aerial photograph (Appendix A, Figure 2) indicates that the FCS may have been used for storage purposes. The 1953 Topographical Survey for Permanent Housing (Appendix A, Figures A-1 through A-7 overlaid on various year aerial photographs) confirms the 1958 Master Plan documentation that part of this area was fenced. The topographical survey figure shows this area was fenced with "*five strand barb wire on 4" X 6" posts. Top wire 4' above ground. Posts are in poor condition loose wire and broken loose posts"*. This fence extended east to the railroad tracks. The same survey records three additional activities: *"4th Infantry Area", "Concrete Batch Plant in this Area", and "Area Covered with Salvage Parts"* (Ladd Air Force Base Topography, July 27, 1953, (Appendix A-1 through A-4). Aerial photograph 9-20-1959 (Figure 7) clearly shows the location of a fence paralleling the rail road tracks east and northeast of the salvage area.

Aerial photographs document extensive movement of material around the subarea from the late 1940s to the late 1960s. During this period the company headquarters and barracks buildings occupy the western edge of the source area, a railroad spur in the southeast corner connects the railroad tracks to the salvage yard and fenced area and a concrete batch plant is operated near the railroad spur (shown on Figure 5). A fenced area of unknown activity is located east of the company headquarters and barracks and is the location of oblong buildings. Automobiles are not parked within this area but what appear to be drums or over-packed drum-like objects are visible inside the fenced yard (shown in Aerial Photograph 1956ax047 in Appendix E). It does not appear that this yard was used to store salvage parts. The 1958 Master Plan for Electrical Power and Lighting Facilities (Appendix A) show power poles and electrical cables provide electricity to the buildings in this area. Ten buildings are present in 1954 and one appears to have been removed by 1956 (Aerial Photograph Figure 5 and 1956ax047 on CD-ROM). By 1959 the fenced area is much smaller and surrounds the previous location of eight buildings; all but two buildings have been partially disassembled. At this time the concrete batch plant, railroad spur and most of the debris and buildings in the salvage yard has been removed.

A large stained area is evident as shown on Figures 7 and 8 where two circular areas indicate the presence of fire training activities. A dismantled USAF airplane is located within the training area. Drums are present near the training area and lower section near the railroad tracks. Appendix A Figure 8a presents these areas at a magnified view. Utility poles are still present in aerial photographs taken in 1960. Trench type disposal was conducted in this subarea over a large period of time.

A portion of this subarea south of the PX Service Station was used as a snow dump. This subarea appears to be devoid of vegetation in the 2002 aerial photograph. The CRREL EM61 geophysical survey was performed in this open area and in areas that were hydroaxed as shown on the CRREL generated FWA Housing Project 11/3/03 Figure provided in Appendix H. During this survey field personnel noted both buried and surface metallic debris. Five soil borings were installed at the time of the survey; four of these borings were located in Subarea A. The borelogs and associated analytical data are provided in Appendix H. Low level concentrations of lead were detected in all soil boring samples collected from this area. Concentrations of lead ranged from 2.15 mg/kg to 7.85 mg/kg, and PID results ranged from 0 mg/kg to 13.2 mg/kg. Volatile and semi

volatile compounds were not detected in the samples analyzed at the off-site laboratory. Residual range organic compounds (RRO) were detected in the boring located in the southeast corner of the FCS at a concentration of 79.9 mg/kg.

A Chemical Data Foundation Study was conducted in March of 2004 by the USACE and a second geotechnical survey was conducted by R&M in May 2004. Metal items were encountered during the drilling program associated with the Chemical Data Foundation Study performed by the USACE. Additionally, PCBs were detected in a soil boring (AP-8960) located in Subarea A during the March 2004 chemical data survey. NWI returned to the location in March 2005 and collected samples from four step-out soil borings but did not detect PCBs.

The second geophysical survey was more extensive than the first one performed by CRREL. Prior to the second survey, a 71-acre site was cleared and graded. Trees and brush removed from the site were piled in windrows on the east and south perimeters of the FCS. This survey was conducted using a Geometrics G858G cesium magnetometer/gradiometer and a Geonics EM-31 terrain conductivity meter (R&M 2004). This survey identified the location of several possible disposal areas and a wide area of scattered debris and metal anomalies.

One area (area A1 of the survey provided in Appendix A, Figure 14) located south of the PX Service Station on the northern perimeter of the FCS was the location of two excavations. The excavations were made during the site preparations when large pieces of metallic debris (car sized) and miscellaneous debris were removed. Photographs of this removal action are provided in Appendix G. The photographs capture the blue markings on the training rounds removed from this excavation. Additional confirmation that this was a disposal area for ordnance as well as miscellaneous metal debris was documented in explosive ordnance incident reports (included in Appendix G).

Additional confirmation that not only metal debris but intact ordnance was buried at the FCS was documented in the Construct Replacement Housing, Fort Wainwright, Statement of Work (SOW), page 5. Section 1.2.4 of the construction SOW states, *"The government has discovered intact ordnance on-site. To date, only training rounds (non-explosive) have been discovered."*

The field notes and photographs taken during construction activities in 2005 and NWI subcontracted EOD personnel on-site during 2006 field activities confirm MEC were buried at the FCS. The *NWI Chronology of Munitions and Explosives of Concern (MEC) Discoveries at Taku Site through July 2006* letter report documenting type and location of MEC related materials is provided in Appendix I. Additional photographs of debris are provided in Appendix L. The M47 Series 100 lb bombs found in the subarea were either empty or contained an inert material possibly indicating that the bombs were emptied and decontaminated (using procedures accepted at that time prior to disposal [*History of Decontamination]*).

The eastern edge of the oxbow (river meander) that loops through the FCS and defines the edge of salvage activities becomes less visible as early as 1948. By 1964 the meander appears to have been filled in with the exception of the southwest and southern drainage still visible. The geophysical survey results indicate that buried metal debris is present in the area of the previous drainage. Excavations performed during construction and the PSE2 site investigation encountered various types of metal debris indicative of the activities documented from this era. Low-level PCBs were detected across this subarea and only exceed 1 mg/kg in the noise barrier. A brief list of materials and some potential contaminants that were uncovered is provided in the CSM for Subarea A.

3.3.1.1. Conceptual Site Model Subarea A

The potential sources of contamination at Subarea A consist of:

Fire Training Area

- Drums of unknown chemicals used to fuel training activities
    - Solvents
    - Fuels
    - Waste Oil
- Stained Soil from spills and training activities
    - Chlorinated Solvents
    - Fuels
    - Metals
- Burn Pits (area near Buildings 21,22, 23, &24)
    - Unburned Fuel
    - Metals
    - Solvent breakdown products (such as Dioxins/Dibenzofurans)
    - PCBs
    - Explosives constituents
    - Fire-fighting foam constituents (fluorotelomer sulfonates)
    - Pesticides
    - Decontamination chemicals (such as STB)
    - Radiological components from gauges and dials
- Airplane debris
    - Metals
    - Fuels
    - Radiological components from gauges and dials

Fenced Secure area (Unknown use)

- Fuels
- Unknown chemicals
- Metals

Salvage Reclamation Yard

- Transformers
    - PCBs
- Drums
    - Solvents
    - Fuels
    - Chemicals used for agent decontamination (STB)
    - Chemical Warfare Materials
- Salvage material from airplanes, automobiles, etc.
    - Radiological components from gauges and dials
    - Fuel
    - Dioxin/Dibenzofurans
    - PCBs
    - Metals
    - Explosive constituents

Trenches

- MEC - Munitions storage boxes, munitions transport casings, fuse rocket dummies, test rockets, rockets, casings, flares, bombs, airplane wing tanks and drop tanks, artillery shells, anti-aircraft fragment sleeves, 50 caliber submachine gun shells, and 40 mm rounds
    - 2,4,6-trinitrotoluene (TNT) and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX), and other nitroaromatic/nitramine explosives,
    - Perchlorate,
    - Chemical agents (mustard or lewisite) and agent breakdown products,
    - White Phosphorous, and
    - Metals.
- Ballasts and pressure gauges
    - PCBs, and
    - Mercury.
- Drums
    - Chlorinated Solvents
    - Fuels
    - PCBs
    - MEC
    - Metals
    - Ethylene Glycol
    - STB
- Equipment tracks, vehicle debris, intact fork lift and train car, airplane debris or wreckage, fuel bladder, airplane drop tanks and wing tanks, metal wheel spokes on a rim, radiator, and crank case.
    - Magnesium-thorium(Mag/Thor) a metal allow found in airplane and munitions debris
    - Radium or radioactive thorium on luminescent painted dials, clocks and gauges
    - Fuel constituents
    - Explosive constituents
    - Metals

Noise Barrier

- Drums buried below berm
    - PCBs
    - Solvents
    - Fuels
- MEC in stockpiled soil
    - Explosive constituents
    - Fuels
    - Metals

Concrete Batch Plant

- Fuel from trucks in area

Railroad Spur

- Fuels
- Solvents
- Metals
- MEC and associated explosive constituents

Storage Structures

- Materials stored in this area are unknown
  - Chemical warfare material
  - Fuels

Snow Dump Area

- Metals
- PCBs
- Salts

POL-contaminated soil from spills, leaks, drums or decontamination processes, Propylene glycol release

3.3.1.2. Release and Transport Mechanisms

Contaminants have been released to soil by spills, leaks and burning.

Contaminants in soil have been transported to other areas and additional media by:

- Physical soil movement (excavation and accidental and deliberate movement),
- Construction dewatering activities,
- Breakdown resulting from burning and mixture with other chemicals in process,
- Fugitive dust emission,
- Volatilization,
- Biodegradation (breakdown chemicals),
- Surface runoff and overland flow (from spring thawing or flooding), and
- Leaching to groundwater.

3.3.1.3. Impacted Media

Surface and subsurface soil are confirmed impacted. Potentially impacted media are air and groundwater.

3.3.1.4. Uncertainties or Data Gaps

- Numerous MEC items have been found during clearing activities and excavation of building foundations. Extent of buried MEC has not been fully defined within the currently defined boundaries of the source area.
- There is a significant amount of unknown metal debris buried on and near the FCS that has not been fully identified.
- Surface and subsurface soil beneath the sound barrier have not been characterized.
- Metal debris and MEC may be located in or under the sound barrier soil berm.
- The soil in the sound barrier has not been fully characterized but limited data indicate PCBs are present at concentrations exceeding the ADEC ARAR of 1 mg/kg.

- Some debris and soils have been excavated, removed from the FCS and placed in the Fort Wainwright landfill, used to backfill excavations on-site (or as fill for building foundations or landscaping), and stockpiled or placed in the large berm surrounding the east and southeast half of the FCS without fully characterizing the contaminants of potential concern.
- Fires or intentional burning (fire training) may have mobilized, affected, and modified contaminants at the FCS.
- Unknown materials and substances have been identified but not fully characterized.
- Dewatering activities used by the construction contractor to lower the shallow water table may have moved contaminants.

3.3.1.5. Receptors and Pathways

Potentially exposed human receptors in Subarea A include current and future on-site and adjacent residents, construction workers, housing maintenance workers, and site visitors. Potential pathways include ingestion of soil and groundwater, inhalation of fugitive dust, dermal exposure to soil, inhalation of volatile compounds, and incidental contact with surface water.

Important considerations:

- Buried contamination and debris in subsurface soils may eventually become exposed through frost heaving completing a pathway in the future for physical and chemical residential exposure.
- A chain-link fence isolates the entire area from access to residents in adjacent housing areas.
- Residents, including children are currently present in adjacent residences.
- A school/childcare facility is located north and adjacent to the FCS.
- Residential runoff drains into the FCS before it is discharged to the Chena River. Potential flooding may cause runoff from the site to back up into the residential area.

Potential ecological receptors within the source area are unknown at this time. Current conditions at the site do not provide suitable habitat for ecological receptors. The chain-link fence limits access to the site, very little vegetation is available, and trees and shrubs have been removed limiting nesting habitat. The ADEC Ecological Scoping Form was used to evaluate the FCS. The completed form is provided in Appendix F.

3.3.2. Subarea B

The main contaminant of concern in this area is diesel range organic compounds (DRO) detected in groundwater and soil exceeding the ADEC Method 2, Migration to Groundwater, Under 40-Inch Zone Criteria (ADEC 2005a). The source of this contamination is likely related to fuel storage associated with the military activities during the 1950s. Fuel-contaminated soil was excavated from this area during construction activities and stockpiled at various locations on-site and behind the PX Service Station. This soil was eventually used as backfill (depending on concentrations) or transported to the long term stockpiles located in the Defense Reutilization and Marketing Office (DRMO) Yard. This soil was tested for fuel parameters and PCBs before it was transferred to the DRMO yard in 2005. Approximately 150 cubic yards of contaminated soil was transported to an off-site thermal treatment facility located in Fairbanks.

The temporary buildings in this area are part of the same company headquarters and barracks as previously discussed in Subsection 3.3.1.

3.3.2.1. Conceptual Model – Subarea B

The potential sources of contamination at Subarea B are associated with the company headquarters, barracks and motor pool activities. Waste types are as follows:

- POL-contaminated soil from spills, leaks, drums or decontamination processes,
  - Fuel constituents
  - Chlorinated Solvents
  - Metals
- Buried metal debris such as pipes, piping, communication cables, transformers and building construction material,
  - Metals
  - PCBs and associated chlorinated hydrocarbons
  - Chlorinated solvents
- Buried drums (empty and leaking),
  - Chlorinated solvents
  - STB
  - Fuels
  - PCBs
  - Explosive constituents
  - Pesticides
- MEC
  - Explosive constituents
  - Metals
  - Fuels

3.3.2.2. Release and Transport Mechanisms

Contaminants have been released to soil by spills and leaks.

Contaminants in soil have been transported to other areas and additional media by:

- Physical soil movement (excavation and accidental and deliberate movement),
- Construction dewatering activities,
- Breakdown resulting from mixture with other chemicals in process,
- Fugitive dust emission,
- Volatilization,
- Biodegradation (breakdown chemicals),
- Surface runoff and overland flow (from spring thawing or flooding), and
- Leaching to groundwater.

3.3.2.3. Impacted Media

Surface and subsurface soil are confirmed impacted by POL-constituents to depth of shallow groundwater (15-20 feet bgs). Potentially impacted media are air and groundwater.

3.3.2.4. Uncertainties or Data Gaps

- Numerous MEC items have been found during clearing activities and excavation of building foundations. Extent of buried MEC has not been fully defined within the currently defined boundaries of the source area.
- There is a significant amount of unknown metal debris buried on and near the FCS that has not been fully identified.

- The geophysical survey ends at the chain-link fence surrounding the SAS facility and does not cover the areas to the east or west of the facility. The survey indicates debris may extend north of the FCS.
- Metal debris on the surface and in subsurface where the construction contractor excavated soil to install utilities or building foundations was removed. However, debris in sidewall of excavations was not removed. The geophysical survey may have lost its value to identify location of buried debris when surface and subsurface areas were disturbed.
- The large soil mound in this area was removed and most likely used in construction of the soil berm surrounding the east and southeast boundary of the FCS.
- Site contaminants have been excavated, removed from the FCS and placed in a Fort Wainwright landfill, used to backfill excavations on-site (or as fill for building foundations or landscaping), and stockpiled or placed in the large berm surrounding the east and southeast half of the FCS without full characterization of the contaminants of potential concern.
- Unknown materials and substances have been identified but not fully characterized.
- Dewatering activities used by the construction contractor to lower the shallow water table may have moved contamination.

3.3.2.5. Receptors and Pathways

Potential human receptors in the FCS area include current and future on-site and adjacent residents, school age children while staying at the SAS facility, construction workers, housing maintenance workers, and site visitors. Potential pathways include ingestion of soil and groundwater, inhalation of fugitive dust, dermal exposure to soil, inhalation of volatile compounds, and incidental contact with surface water.

Important considerations:

- Buried contamination and debris in subsurface soils may eventually become exposed through frost heaving completing a pathway in the future for physical and chemical residential exposure.
- A chain-link fence isolates the entire area from access to residents in adjacent housing areas.
- Residents, including children are currently present in adjacent residences.
- A school/childcare facility is located north and adjacent to the FCS.
- Residential runoff drains into the FCS before it is discharged to the Chena River. Potential flooding may cause runoff from the site to back up into the residential area.

Potential ecological receptors within the source area are unknown at this time. Current conditions at the site do not provide suitable habitat for ecological receptors. The chain-link fence limits access to the site, very little vegetation is available, and trees and shrubs have been removed limiting nesting habitat. The ADEC Ecological Scoping Form was used to evaluate the FCS. The completed form is provided in Appendix F.

3.3.3. Subarea C

This area extends north to the edge of Neely Road and east to the SAS facility perimeter fence. The buildings in this area appear to have supported the company headquarters and barracks. Construction workers noted an odor while excavating around Building 3 and a sour milk odor during excavation near Building 12 where some of the workers

became ill (as noted in the construction field notes). Buried metal debris was identified north and east of Building 1 and under the footprint of Building 3. The metal debris was most likely removed by construction activities that required the excavation of soils in this area for building foundation development, drainage installation, and utility installation. Utility plans for the Family Housing Project are provided on a CD-ROM provided in Appendix E. A low level (less than 1 mg/kg) result for Aroclor 1260 was reported from a sample collected north of Building 1.

3.3.3.1. Conceptual Model – Subarea C

The potential sources of contamination at Subarea C are associated with Company Headquarters and Barracks Activities and waste types are as follows:

- Buried Metal Debris and building construction material
  - metals
- Transformers
  - PCBs
- Buried Drums
  - Chlorinated solvents
  - PCBs
  - Fuels
  - Metals
- Trenches (chemical drop tanks were found in this subarea)
  - Metals
  - PCBs
  - Chlorinated solvents
  - Pesticides
  - Explosive constituents

3.3.3.2. Release and Transport Mechanisms

Contaminants have been released to soil by spills, leaks and burning.

Contaminants in soil have been transported to other areas and additional media by:

- Physical soil movement (excavation and accidental and deliberate movement)
- Construction dewatering activities and discharge through area
- Breakdown resulting from mixture with other chemicals
- Fugitive dust emission
- Volatilization
- Biodegradation (breakdown chemicals)
- Surface runoff and overland flow (from spring thawing or flooding)
- Leaching to groundwater

3.3.3.3. Impacted Media

Surface and subsurface soil are confirmed. Potentially impacted media are air, surface water (during dewatering activities) and groundwater.

3.3.3.4. Uncertainties or Data Gaps:

- The SAS facility, formerly the Tanana Grade School, has been located adjacent to the site since 1964 and a permanent housing area has been located west of the FCS since 1959. A chain-link fence restricts access and separates the SAS and houses from the source area. Extent of buried debris and MEC outside the fenced area has not been defined

- There is some material buried on and near the FCS. A large area north and northwest of Buildings 1 through 4 was not included in the geophysical surveys. Some debris was encountered during excavation in this area during 2005 activities.
- Four large thick walled aluminum cylinders (see photograph 062405-283.5, taken near B-2 provided in Appendix L) were excavated and have been identified as chemical drop tanks. The material that may have been stored in these tanks is unknown.
- Site contaminants have been excavated, removed from the FCS and placed in a Fort Wainwright landfill, used to backfill excavations on-site (or as fill for building foundations or landscaping), and stockpiled or placed in the large berm surrounding the east and southeast half of the FCS without full characterization of the contaminants of potential concern.
- Unknown materials and substances may have been identified but not fully characterized.
- Dewatering activities used by the construction contractor to lower the shallow water table may have moved contamination. Discharge of the water flooded this area in April 2005.

3.3.3.5. Receptors and Pathways

Potential human receptors in the FCS area include current and future on-site and adjacent residents, construction workers, housing maintenance workers, and site visitors. Potential pathways include ingestion of soil and groundwater, inhalation of fugitive dust, dermal exposure to soil, inhalation of volatile compounds, and incidental contact with surface water.

Important considerations:

- Buried contamination and debris in subsurface soils may eventually become exposed through frost heaving completing a pathway in the future for physical and chemical residential exposure.
- Residents, including children are currently present in adjacent residences.
- A school/childcare facility is located north and adjacent to the FCS.
- Residential runoff drains into the FCS before it is discharged to the Chena River. Potential flooding may cause runoff from the FCS to back up into the residential area.

Potential ecological receptors within the source area are unknown at this time. Current conditions at the site do not provide suitable habitat for ecological receptors. The chain-link fence limits access to the site, very little vegetation is available, and trees and shrubs have been removed limiting nesting habitat. The ADEC Ecological Scoping Form was used to evaluate the FCS. The completed form is provided in Appendix F.

3.3.4. Subarea D

Military activity in this area began in the 1940s as shown on the 1947 aerial photograph (Figure 1 in Appendix A) where the salvage yard extends into and south of this subarea. Information available for this area is provided in aerial photographs, 1958 Master Plans, and a 1953 topographical survey. The 1958 Master Plan for the Central Heating System provided in Appendix A as plate G-6 shows the presence of a water line passing through this area to the Heating Plant located east of the FCS, an existing fence, a proposed fence and two semi-permanent structures. The 1953 topographical survey shows the location of two ammunition storage areas and one live ammunition storage area

(Appendix A, A-1 through A-7 overlaid on aerial photographs); very little conclusive information is available on past activities. Figure A-1 in Appendix A presents an overlay of the topographical survey depicting the three ammunition storage locations on the 1948ax020 historical aerial photograph.

During the 1940s (reference Aerial Photograph 1948ax020, Figure 3 in Appendix A) a second meander extended southeast from the Hoppe Slough oxbow and loops northwest. A road leads from the southern edge of the salvage yard to this meander. Long rectangular structures are also present south of the salvage yard in this area. It appears that this drainage began to be filled during the early 1940 period. These appear to be trailers or covered storage shelters similar to those used in the DRMO Yard. A storage structure and unidentifiable objects are visible in this aerial photograph near the southern edge of the second meander. This appears to be in the general location of the open field west of the GVEA Substation and between the southern edge of the noise barrier and Alder Avenue.

A road that appears to connect the square structures in the southeast corner to the garden plots is visible in the 1950s. The large area devoid of vegetation from the early 1950s until the late 1960s is also the area where the GVEA Substation was built in 1978. Additionally, the noise barrier covers a portion of this area.

3.3.4.1. Conceptual Site Model – Subarea D

The potential sources of contamination at Subarea D are associated with the following activities:

- Three areas where munitions and live ammo were stored as depicted on the 1953 topography drawing created by USACE.
- Seven Concrete Structures unknown usage
- Drum Cache east of the subarea
- Noise Berm
  - MEC
    - Explosive constituents
    - Metals
    - Fuels
  - PCB-contaminated soil from storage of transformers (area identified during interview with Fire Captain Scott Hunt). Pink oblong area shows location on figure attached to Memorandum for the Record, IMPA-FWA-PWE,
    - PCBs
    - Chlorinated Solvents associated with transformers
- Power poles (potentially with transformers) on east perimeter of the FCS as shown in the Electrical Power and Lighting Facilities, Ladd Air Force Base 1958, Master Plan, G-8 (EPLF G-8),
  - PCBs
  - Chlorinated Solvents associated with transformers

<u>Salvage Reclamation Yard</u>

- Transformers
  - PCBs
- Drums
  - Solvents
  - Fuels
  - Chemicals used for agent decontamination (STB)

- Salvage material from airplanes, automobiles, etc.
  - Radiological components from gauges and dials
  - Fuel
  - Dioxin/Dibenzofurans
  - PCBs
  - Metals
  - Explosive constituents
- Ground scars from unknown activities in this subarea appear in historical aerial photographs from 1948 until the GVEA substation was constructed in 1978 over the area.

3.3.4.2. Release and Transport Mechanisms

Contaminants have been released to soil by spills, leaks and brush fires.

Contaminants in soil have been transported to other areas and additional media by:

- Physical soil movement (excavation and accidental and deliberate movement),
- Breakdown resulting from mixture with other chemicals or brush fires;
- Fugitive dust emission,
- Volatilization,
- Biodegradation (breakdown chemicals),
- Surface runoff and overland flow (from spring thawing or flooding), and
- Leaching to groundwater.

3.3.4.3. Impacted Media

Surface and subsurface soil impact has not been fully determined. Additionally, air, and groundwater are potentially impacted media.

3.3.4.4. Uncertainties or Data Gaps

- PCBs at concentrations greater than the ADEC action limit of 1 mg/kg were detected in the soil berm on the east and south perimeter of the FCS. This soil was placed in this berm in 2005.
- There is some material buried on and near the FCS. During 2005 field activities, North Wind identified and photographed an olive green shipping cylinder in a stockpile near this area. The photograph is provided in Appendix L.
- This area has not been fully characterized; but appears to have been used as a salvage storage area (as visible in the 1947 and 1948 aerial photographs Figures 3 and 4).
- Concrete reinforced structures present in the aerial photographs from 1954 to 1959 are similar to those used to store live munitions. No records have been located to identify usage; but similar structures at other installations were used to store active bombs.
- The 1953 topographical survey of Ladd Army Airfield Appendix A Figures A-1 through A-4 shows the location of live ammo storage as an overlay to aerial photographs. This survey also shows the location of two areas designated Munition Storage with contours indicated the area may have been elevated above ground surface (topographic figures are provided on a CD-ROM provided in Appendix E).
- Records from 2005 field activities indicate that soil excavated from the exclusion zone (Subarea E) was mixed with clean fill material, stockpiled near Building 60 and used to fill the building excavations in Subarea D. PCBs were

detected at a concentration of 0.161 mg/kg in sample 05FTW-TGSP-A60-N4-SO collected from the stockpiled soil (soil was allegedly removed from Subarea E). PCBs were not detected in limited surface samples collected from the gravel mixture used to construct building footprints in this area. However, the PCB concentration in the subsurface sample 05FTW-TG-BHA62N2-24-48-SO was 0.5 mg/kg.

- Site contaminants have been excavated, removed from the FCS and placed in a Fort Wainwright landfill, used to backfill excavations on-site (or as fill for building foundations or landscaping), and stockpiled or placed in the large berm surrounding the east and southeast half of the FCS without full characterization of the contaminants of potential concern.

3.3.4.5. Receptors and Pathways

Potential human receptors in the FCS area include current and future on-site and adjacent residents, construction workers, housing maintenance workers, and site visitors. Potential pathways include ingestion of soil and groundwater, inhalation of fugitive dust, dermal exposure to soil, inhalation of volatile compounds, and incidental contact with surface water.

Important considerations:

- Buried contamination and debris in subsurface soils may eventually become exposed through frost heaving completing a pathway in the future for physical and chemical residential exposure.
- Residents, including children are currently present in adjacent residences.
- Explosive residues will migrate to groundwater.

Potential ecological receptors within the source area are unknown at this time. Current conditions at the site do not provide suitable habitat for ecological receptors. The chain-link fence limits access to the site, very little vegetation is available, and trees and shrubs have been removed limiting nesting habitat. The ADEC Ecological Scoping Form was used to evaluate the FCS. The completed form is provided in Appendix F.

3.3.5. Subarea E

This area includes the current “Exclusion Zone”. Communication and radar systems were previously located in Subarea E. The 1958 Electrical Power and Lighting Facilities Master Plan provide the location of power poles, voltage and amperage, and size and number of wires extending to each pole. Aerial photographs confirm the location of these power poles. It can be assumed that a transformer would be required to step down the voltage to a usable level. The FCS characterization/investigation began in this subarea when PCBs were detected in the excavation footprint of the original Building 52 location. This subarea and the sound barrier are the only two locations where PCB concentrations exceeded the ADEC criteria of 1 mg/kg for PCBs in soil.

Activity in this area began about the same time as the activity in the area where the seven structures were constructed in Subarea D. Small structures are barely visible in aerial photographs (1957ax133 and 1957oc003 on CD-ROM) for Subarea E. PCB results were reported from this area at concentrations greater than any other area of the FCS. The power poles in this area may be directly related to the high concentration of PCBs in The original location of Building 52. A guy wire and piece of a wooden power pole were found in the original Building 52 excavation. The Fort Wainwright Environmental staff conducted an interview with the Fire Captain Scott Hunt to discuss potential locations of brush fires and transformers at the FCS. The figure provided with

Memorandum for the Record, IMPA-FWA-PWE shows the alleged location of a transformer and two 55-gallon drums of oil in the Subarea E and location of drums in other subareas.

3.3.5.1. Conceptual Site Model – Subarea E

The potential sources of contamination at Subarea E are associated with the following activities or physical structures:

- Communication System (radar, security lighting, etc.)
  - Contaminated soil from handling and storage of transformers,
    - PCBs
    - Chlorinated Solvents associated with transformer oil
  - Metal debris associated with structures on the site, pipes, and piping
    - Metals
- Multiple above ground structures that are present in the footprint of the Communication System.
  - Potential storage of live ammunition, weapons, and rockets
    - Explosive constituents
    - Radiological Chemicals
    - STB
    - Metals
- Snow Dump Area
  - Metals
  - PCBs

3.3.5.2. Release and Transport Mechanisms

Contaminants have been released to soil by spills, leaks and brush fires.

Contaminants in soil have been transported to other areas and additional media by:

- Physical soil movement (excavation and accidental and deliberate movement),
- Breakdown resulting from mixture with other chemicals and fires,
- Fugitive dust emission,
- Volatilization,
- Biodegradation (breakdown chemicals),
- Surface runoff and overland flow (from spring thawing or flooding), and
- Leaching to groundwater.

3.3.5.3. Impacted Media

Surface and subsurface soil are confirmed impacted to depth of shallow groundwater (15-20 feet bgs). Potentially impacted media are air, surface water (during dewatering activities) and groundwater.

3.3.5.4. Uncertainties or Data Gaps

- Occupied housing is within 200 feet of the PCB contaminated area.
- There is some material buried on and near the FCS. During 2005 field activities some debris was photographed but not fully identified. Some of these photographs are provided in Appendix L and the construction photographs are provided on a CD-ROM provided in Appendix E.
- The activities in this area that directly caused impact to the subarea were short term (1954-1959) and the structures and utilities were temporary.

Activity in this area appears to be linked to the concrete structures located in Subarea D and salvage activities at the FCS.

- The area used as a laydown yard by the Construction Contractor was also used as a snow dump. Surface contaminants found here could have been brought into the FCS with the snow removed from areas across Fort Wainwright (i.e. coal ash used on roads or salts used for deicing).
- The 1953 survey of Ladd Army Air Field (Figures A-1 through A-4) shows the location of ”Live Ammo Storage” and two areas designated “Munition Storage” with contours indicating the area was elevated above ground surface (See topographical drawings A-1 through A-7 in Appendix A and on a CD-ROM provided in Appendix E).
- Site contaminants have been excavated, removed from the FCS and placed in a Fort Wainwright landfill, used to backfill excavations on-site (or as fill for building foundations or landscaping), and stockpiled or placed in the large berm surrounding the east and southeast half of the FCS without full characterization of the contaminants of potential concern.

3.3.5.5. Receptors and Pathways

Potential human receptors in the FCS area include current and future on-site and adjacent residents, construction workers, housing maintenance workers, and site visitors. Potential pathways include ingestion of soil and groundwater, inhalation of fugitive dust, dermal exposure to soil, inhalation of volatile compounds, and incidental contact with surface water.

Important considerations:

- Buried contamination and debris in subsurface soils may eventually become exposed through frost heaving completing a pathway in the future for physical and chemical residential exposure.
- Chlorinated contaminants are persistent in subsurface soil and groundwater.
- Residents, including children are currently present in adjacent residences.

Potential ecological receptors within the source area are unknown at this time. Current conditions at the site do not provide suitable habitat for ecological receptors. The chain-link fence limits access to the site, very little vegetation is available, and trees and shrubs have been removed limiting nesting habitat. The ADEC Ecological Scoping Form was used to evaluate the FCS. The completed form is provided in Appendix F.

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APPENDIX A

Historical Aerial Photographs, Master Plans, and Topographical Surveys

APPENDIX A
Historical Aerial Photographs, Master Plans and Topographical Surveys

Electrical Power and Lighting
Real Estate Map
Maximum Capabilities Study
Central Heating System
Taku Gardens Historic Imagery

Figure 1: 1947 Aerial Photography Ladd Airfield Overview
Figure 2: 1947 Aerial Photography Ladd Airfield Enlargement
Figure 3:1948: Aerial Photography
Figure 4: 1954: Aerial Photography
Figure 5: 1956: Aerial Photography
Figure 6: 1957 Aerial Photography
Figure 7: 1959 Aerial Photography
Figure 8: 1960 Aerial Photography
Figure 8a: 1960 Aerial Photography – Enhanced view of Fire Training Area
Figure 9: 1964 Aerial Photography Ladd Airfield Overview
Figure 10: 1964 Aerial Photography Ladd Airfield Enlargement
Figure 11: 1967 Aerial Photography
Figure 12: 2005 Aerial Photography North Drainage Area
Figure 13: 2005 Aerial Photography South Drainage Area

Rev. 1

A-1: Former Communication Site Aerial Photo 1948 with 1953 Topographical Survey overlay
A-2: Former Communication Site Aerial Photo 1956 with 1953 Topographical Survey overlay
A-3: Former Communication Site Aerial Photo 1959 with 1953 Topographical Survey overlay
A-4: Former Communication Site Aerial Photo 1964 with 1953 Topographical Survey overlay
A-5: Former Communication Site Aerial Photo 2005 with 1953 Topographical Survey overlay
A-6: Former Communication Site 1953 Topographical Survey showing munitions storage locations
A-7: Former Communication Site 1953 Topographical Survey showing location of fence, batch plant, salvage area, and ammunition storage areas

Figure 14 R&M Geophysical Survey overlaying Former Communication Site Map
Figure 15 Water Distribution System showing location of supply wells relative to the location of the Former Communication Site

The following document discusses features found on master plans and aerial photographs reviewed during planning of the Preliminary Source Evaluation Narrative Report.

Master Plans

Real Estate Map from 1958 shows the site in Section 13 designated as "USE PERMIT" and the proposed location of:

- Hodge Field
- Ammo Storage in the southwest area as indicated on the topographical survey figure.
- Salvage Reclamation Yard west side of site where most of the metal debris has been identified and/or removed. Geophysical Survey confirms debris was buried in this area as well as the river meander of the oxbow that runs through the center of the site.
- Various housing units

- Maximum Capabilities Study Ladd 1958
  - The only existing permanent structure appears to be in the area of the fire station. No proposed structures are identified. This figure does indicate the existence of two fenced areas on the east side of the site that comprises more than two-thirds the total area of the site. One surrounds the southeast location of the current power plant and the second fence separates a large section from the other fenced area to the south and from the unfenced area that surrounds it.
- Central Heating System
  - This figure defines the location of a proposed fence that is more clearly defined with the internal fenced area shaded.
  - An existing permanent 24-inch HP 10-inch water line is shown on this figure that extends across the south section of the site that begins near current location of Building 4385 and continues east crossing the railroad tracks and angling north toward where it connects with the line going to the central heat plant
- Electrical Power and Lighting
  - Three sets of existing transformers are shown on this figure. Two sets (3-25 KVA and 3-10 KVA) are located west of the SAS facility and one set (3-25 KVA) is southwest of the facility. This plan does not indicate that transformers existed or were proposed for the Taku site. However, transformers would be needed to step down from the voltage provided by these transformers to the voltage typically used in homes or offices.
  - The location of numerous utility poles and overhead cables across the west side of the site and east following the railroad are indicated. Most lines are number 4 or 6 gauge wire and carry 2,400 volts.

Historical Aerial Photographs

The aerial photographs listed below were reviewed:

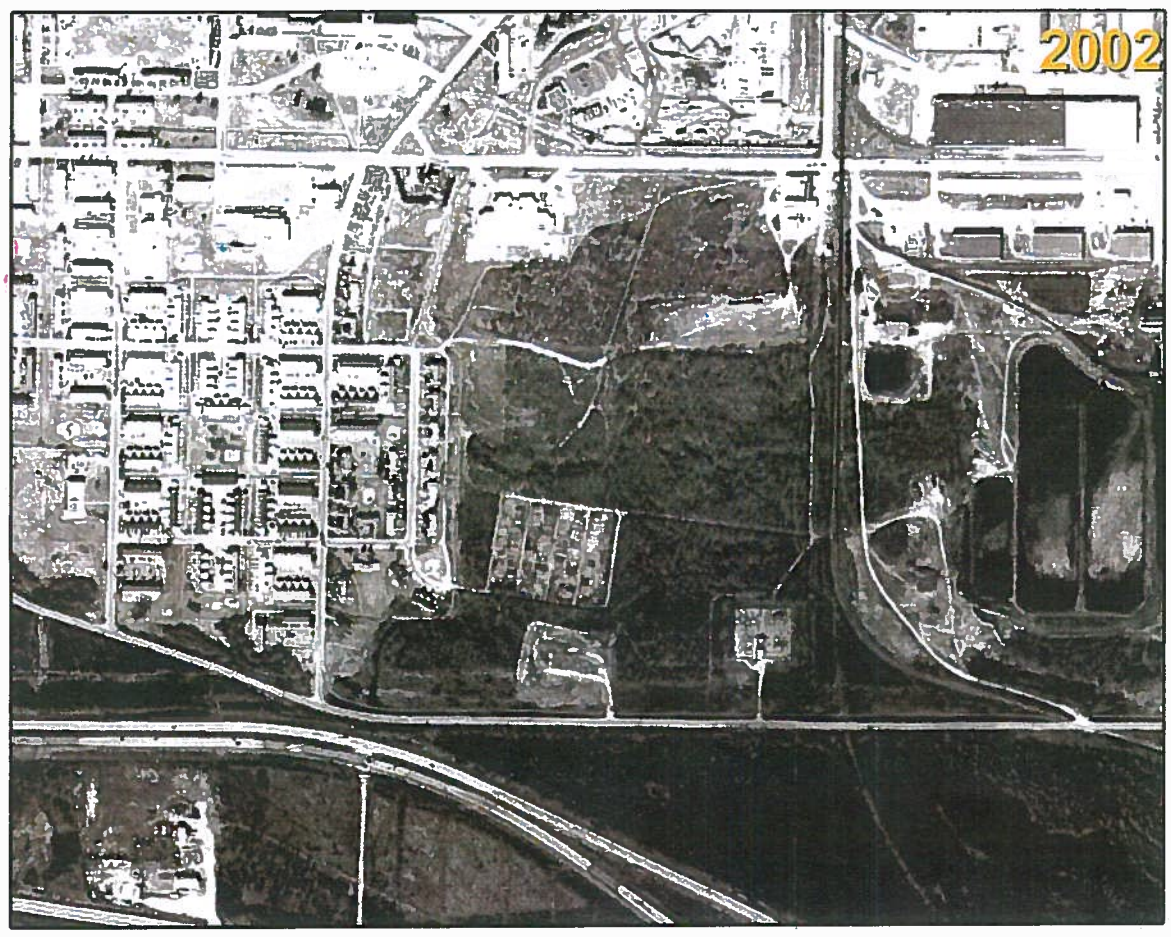
- Aerial Photograph 1947
  - This photograph shows the salvage reclamation yard activity has not reached the Chena River meander that extends across the southwest corner of the site. At least half of the site appears to be vegetated.
- Aerial Photograph 1948
  - This photograph taken 20 May 1948 indicated the vegetation up to the east side of the meander has been removed and material is stored along the edge of this clearing. The clarity of this photograph indicates salvaged material is staged in rows and piles on-site. The east side of the drainage appears to be filling in and salvage activities extend beyond the current location of Neely Road.
- Aerial Photograph 1954
  - The 7 August 1954 photograph documents that a temporary camp and office buildings or maintenance buildings exist at the site. Layouts of buildings follow the existing power poles and lines in the 1958 Master Plan. The lower loop of the river meander is still evident and the garden areas become defined at the time of this photograph. Buildings 4350, 4351, 4352, and 4353 appear in this photograph.
- Aerial Photograph 1956
  - This provides a clear idea of the number of buildings and occupancy of the site at this time.
  - A large white structure was present within the gardens area near Building 4330 in 1956 but, was not present in the 1957 photograph.
  - The existing power poles are observable by location of shadows in this photograph. A power pole with a dark object at its base is evident in the area of Area 52 contamination. Power poles correlate with 1958 Power and Light Master Plan.
  - The west side of the oxbow loop appears to provide continuous drainage into the Chena River. The drainage on the east side is no longer evident but the bottom loop is still present.
  - What appears to be a railroad spur with several box cars can be observed in the northeast corner near the location of the PX Station. Salvage material appears to be denser and less organized near this location. A silo with a conveyer system and ramp is also located near this railroad spur.
  - Another potential contamination source located south of the existing chain link fence and west of the existing substation is a group of seven square objects or buildings (similar to concrete hardened shelters). The objects appear to be constructed with thick concrete walls, surrounding buildings with arched roofs, and a thick concrete barrier blocking the building entrance. The structures appear to be for storage purposes and are not supplied with power or utilities. These objects appear to have been located in what is now a cleared field.
  - Small storage structures line the area of the high power transmitter site and current garden plot areas.

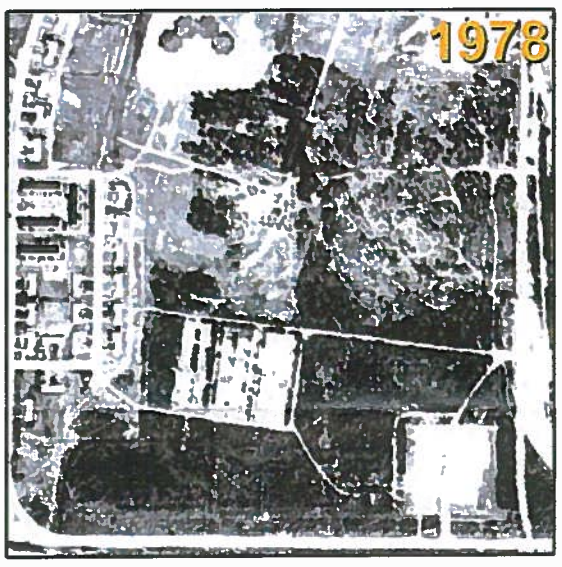
- An area that is void of vegetation as early as 1954 is also obvious in this photograph that remains clear of vegetation 25 years later in the 1969 photograph. This area is the present location of the substation.

- Aerial Photographs 1957
  - Some buildings are no longer present at the site but the locations are still evident by the shadow of the building footprints.
  - The salvage yard also appears to have less material. Most material is stored near the end of the railroad spur (north of Buildings 15 and 17) and west of the southern loop of the oxbow (between Buildings 48 and 22).
  - The seven concrete structures and garden storage structures are still present at this time.
- Aerial Photographs 1959
  - Very few buildings are present but utility poles are still present on the site.
  - The large area of debris identified in the geophysical survey is visible near Building 48. Similar visible anomalies are present in the area between Buildings 48 and 22, also identified by the geophysical survey.
  - What appears to be debris is present in the area between Buildings 7 and 9 and north of Building 8.
  - The salvage pile located between Buildings 21, 22 and 23 is reduced to what appears to be more than a hundred drum-like objects scattered over three areas.
  - Utility poles are still present as indicated by shadows across the site. What appears to be transformer shadows are evident on some of the poles. Three pole mounted transformers can be seen on aerial photographs of this subarea north of the large T-shaped buildings and located southeast of the fire station. One of these buildings was located near the present location of Building 1 and also in an area where the geophysical survey shows the location of buried metal debris.
  - Surface soil staining is evident in several areas of the salvage yard where materials were previously stored (north of Buildings 21, 23, and 24).
  - Buildings 4330 through 4373 west of White Street were constructed between the period when the 1958 and 1959 photographs were taken.
  - A cleared area is present between Buildings 22 and 25, also an area where the geophysical survey located buried debris.
  - Multiple circular patterns (similar to fire training exercise pits) are visible in the area extending over an area that covers the footprints of Buildings 22, 25, 27, and 28. The geophysical survey identified numerous small anomalies of scattered debris in this area. Metal anomalies appear to be shallow or surface debris.
  - The garden area appears to be heavily vegetated and not used as garden plots.
  - The seven concrete structures are no longer present. The footprints of the structures are still evident.

  - The railroad spur has been removed.
- Aerial Photograph 1960
  - Very few visible changes to the site.
  - What appears to be an orange fence can be seen in the area where the railroad spur was previously located.
  - Some clearing is evident in the gardens area.
  - A USAF B-52 bomber aircraft north of the present location of Buildings 21 and 23. The wings are not attached to the fuselage. Several drum caches are visible in the 5/24/60 photograph.
  - These drums were present in 1959 but are neatly grouped in 1960 near Building 23.
- Aerial Photograph 1964
  - Two sections of the SAS facility north of the site are present.
  - The oxbow is not as obvious as it was in 1960. All but the small west loop appears to have been filled.
  - All buildings and most of the salvage material has been removed.
  - Dark shadows indicate some salvage materials are still located in the area between Buildings 21 and 23, trenches cross the area of metal anomalies near Building 24, east of Building 31 and near the rail road tracks east of Building 27.
  - A broad area extending from the bottom loop of the oxbow to the east of SAS facility appears to have been the location of the original river meander that was filled in. The geophysical survey indicates that this area contains metal anomalies up to the location of Building 12.
  - A patch work of garden plots is evident, with what appears to be a small shed or dumpster located northwest of Building 57.
- Aerial Photograph 1967
  - The SAS facility is complete.
  - Salvage material observed in 1964 is no longer on the site.
  - There appears to be some activity on the site southeast of SAS facility but image quality makes it difficult to determine what is present.
  - The original location of Building 52 does not resemble other garden plots. It appears that the gardens do not extend into the location of Building 52 in this photograph.
- Taku Gardens Multiple Years Layout for 1948, 1949, 1954, 1959, 1964, 1966, 1969, 1978, 1979, and 2002 documents the changes to the subareas over a 64 year period. This figure is provided in Appendix A.

Taku Gardens





USAGAK GIS
Fort Richardson, Alaska
384-3058

0 1,000 2,000 4,000
Feet
0 250 500 1,000
Meters
1:10,000

DATE: 8/4/2005
DRAWN: MAD/TAR
FILE:/GIS_Projects/Fort_Wainwright/Restoration Taku_Gardens/Historic_Imagery.mxd

Oct. 31 2006	oasis ENVIRONMENTAL 825 W 8TH Avenue, Suite 200 Anchorage, Alaska 99501	**FORMER COMMUNICATIONS SITE** **Aerial Photo 1948**	APPENDIX
CHKD:		0 50 100 200 Meters	A-1
DRAWN: TAR		0 125 250 500 Feet	
PROJ. NO.		N	

Oct. 31 2006	oasis ENVIRONMENTAL 825 W 8TH Avenue, Suite 200 Anchorage, Alaska 99501	**FORMER COMMUNICATIONS SITE** **Aerial Photo 1956**	APPENDIX
CHKD:		0 50 100 200 Meters	A-2
DRAWN: TAR		0 125 250 500 Feet	
PROJ. NO.		N	

Oct. 31 2006	oasis ENVIRONMENTAL 825 W 8TH Avenue, Suite 200 Anchorage, Alaska 99501	**FORMER COMMUNICATIONS SITE** **Aerial Photo 1959**	APPENDIX
CHKD:		0 50 100 200 Meters	A-3
DRAWN: TAR		0 125 250 500 Feet	
PROJ. NO.		N	

Oct. 31 2006	oasis ENVIRONMENTAL 825 W 8TH Avenue, Suite 200 Anchorage, Alaska 99501	**FORMER COMMUNICATIONS SITE Aerial Photo 1964**	APPENDIX
CHKD:		0 50 100 200 Meters	A-4
DRAWN: TAR		0 125 250 500 Feet	
PROJ. NO.		N	

Oct. 31 2006	oasis ENVIRONMENTAL 825 W 8TH Avenue, Suite 200 Anchorage, Alaska 99501	**FORMER COMMUNICATIONS SITE** **Aerial Photo 2005**	APPENDIX
CHKD:		0 50 100 200 Meters	A-5
DRAWN: TAR		0 125 250 500 Feet	
PROJ. NO.		N	

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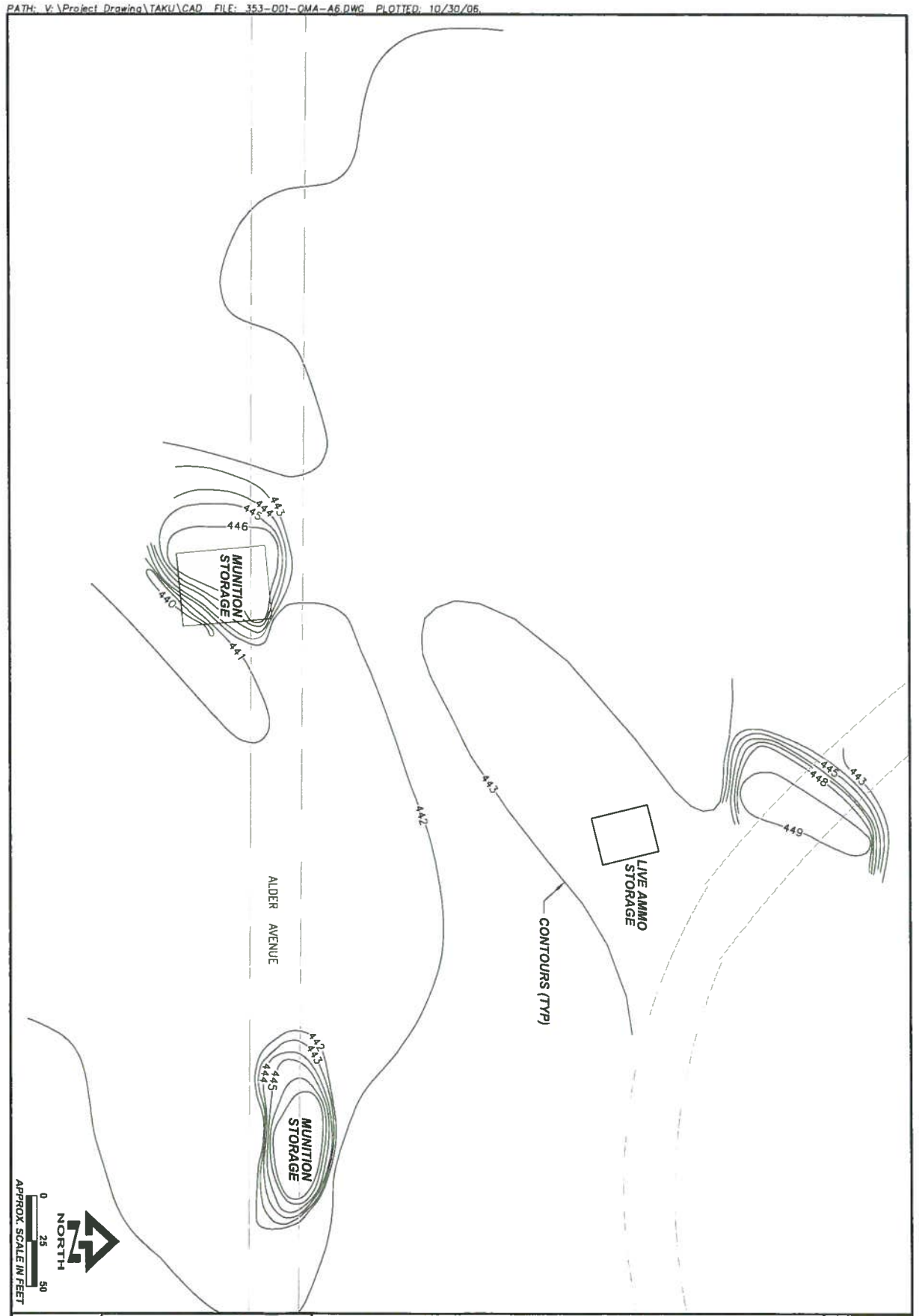

DATE OCT. 2006 CHKD G.B. DRAWN C.E.H. PROJ. NO 353-001	ENVIRONMENTAL 825 W. 8TH AVENUE, SUITE 200 ANCHORAGE, ALASKA 99501	**OVERLAY OF 1953 MUNITIONS AREA** TAKU GARDENS Ft. Wainwright, Alaska	FIGURE **A-6**

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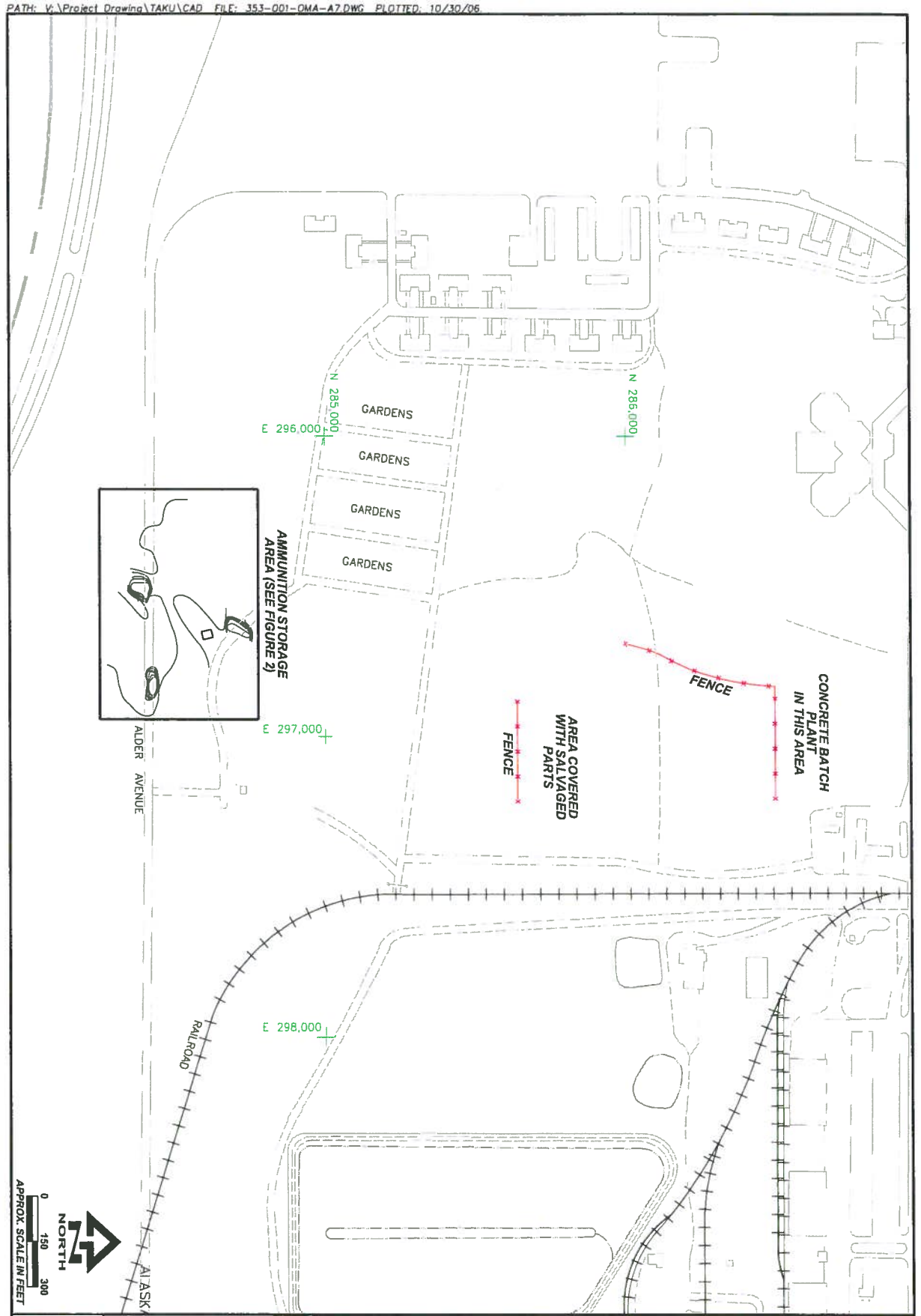


DATE OCT. 2006 CHKD S.B. DRAWN C.E.H. PROJ. NO 353-001	ENVIRONMENTAL 825 W. 8TH AVENUE, SUITE 200 ANCHORAGE, ALASKA 99501	**OVERLAY OF 1953 SITE FEATURES** TAKU GARDENS Ft. Wainwright, Alaska	FIGURE **A-7**

FIGURE 1
1947 AERIAL PHOTOGRAPHY
LADD AIRFIELD OVERVIEW

FIGURE 2
1947 AERIAL PHOTOGRAPHY
LADD AIRFIELD ENLARGEMENT

FIGURE 4
1954 AERIAL PHOTOGRAPHY
LADD AIRFIELD

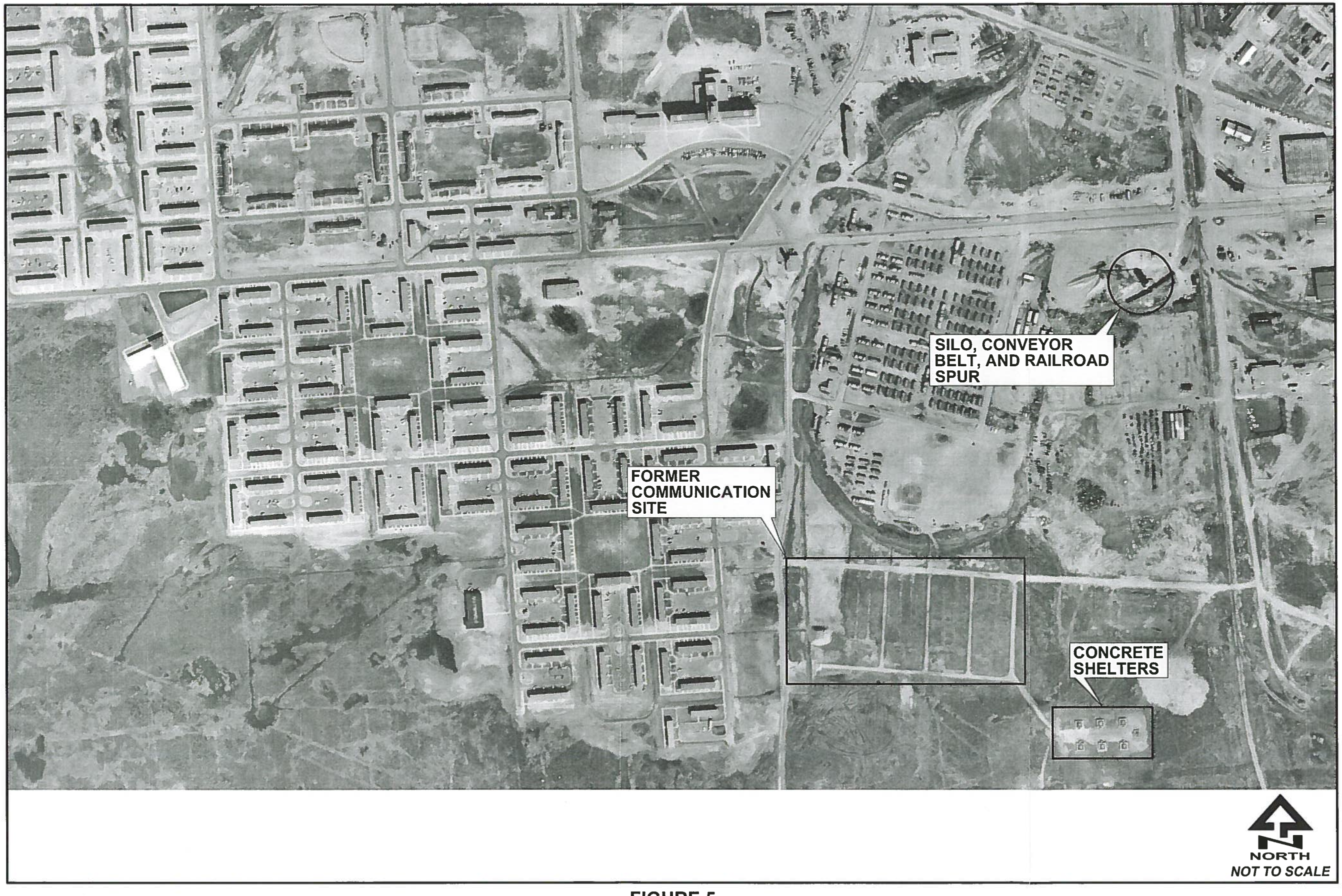


FIGURE 5
1956 AERIAL PHOTOGRAPHY
LADD AIRFIELD

FIGURE 6
1957 AERIAL PHOTOGRAPHY
LADD AIRFIELD

FIGURE 7
1959 AERIAL PHOTOGRAPHY
LADD AIRFIELD

FIGURE 8
1960 AERIAL PHOTOGRAPHY
LADD AIRFIELD

FIGURE 8A
1960 AERIAL PHOTOGRAPHY
FORT WAINWRIGHT

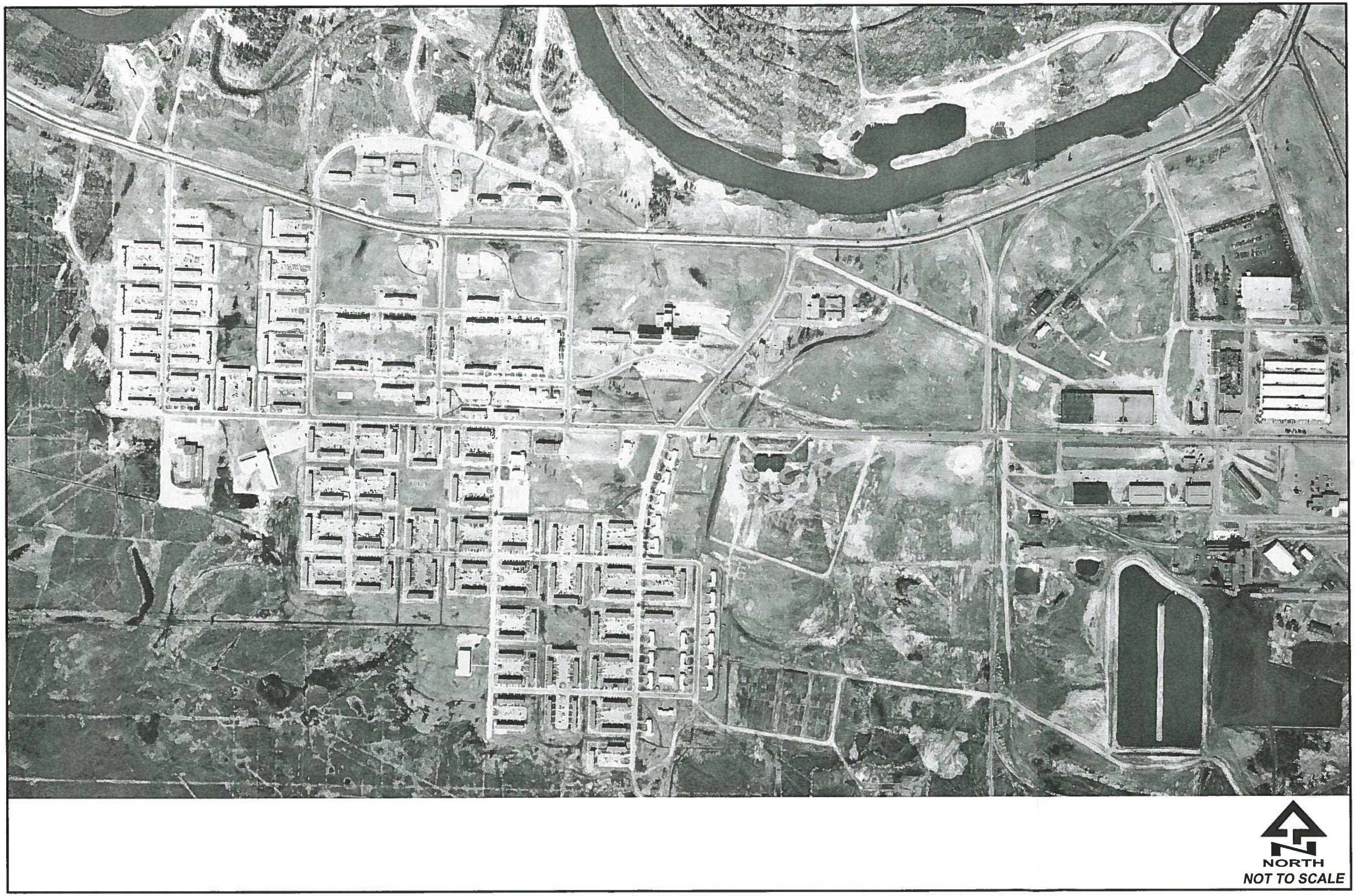


FIGURE 9
1964 AERIAL PHOTOGRAPHY
LADD AIRFIELD OVERVIEW

FIGURE 10
1964 AERIAL PHOTOGRAPHY
LADD AIRFIELD ENLARGEMENT

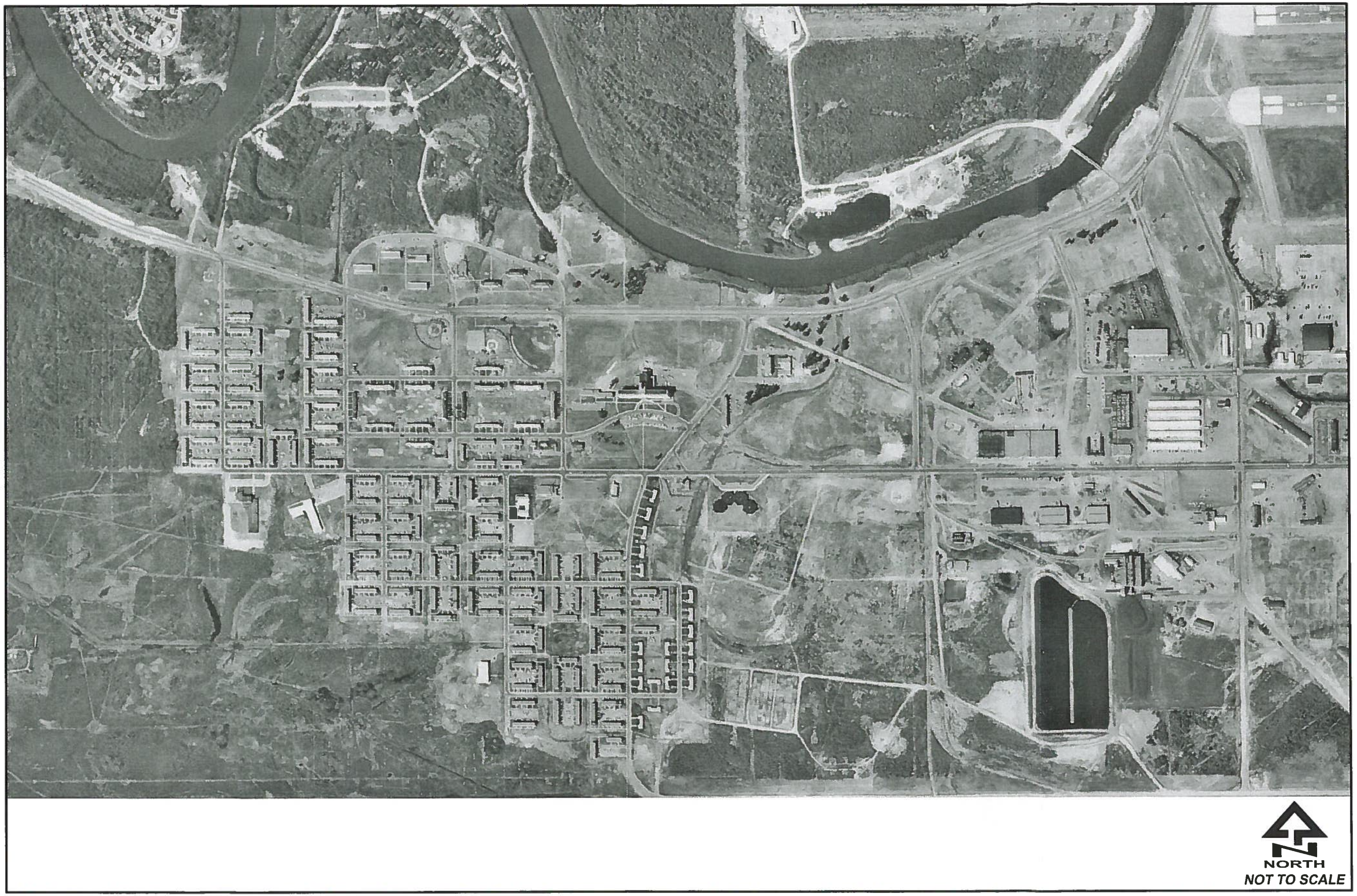


FIGURE 11
1967 AERIAL PHOTOGRAPHY
LADD AIRFIELD

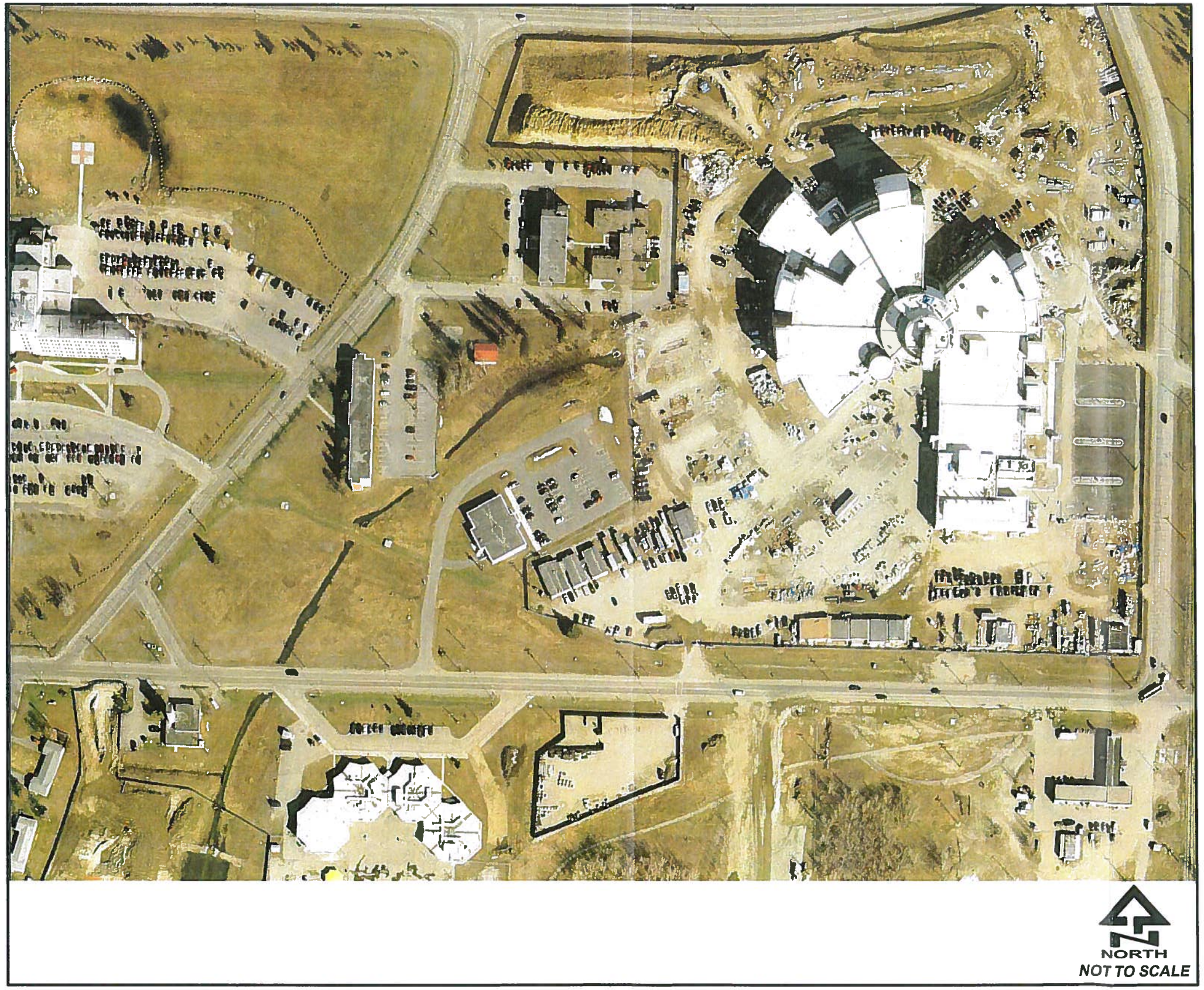
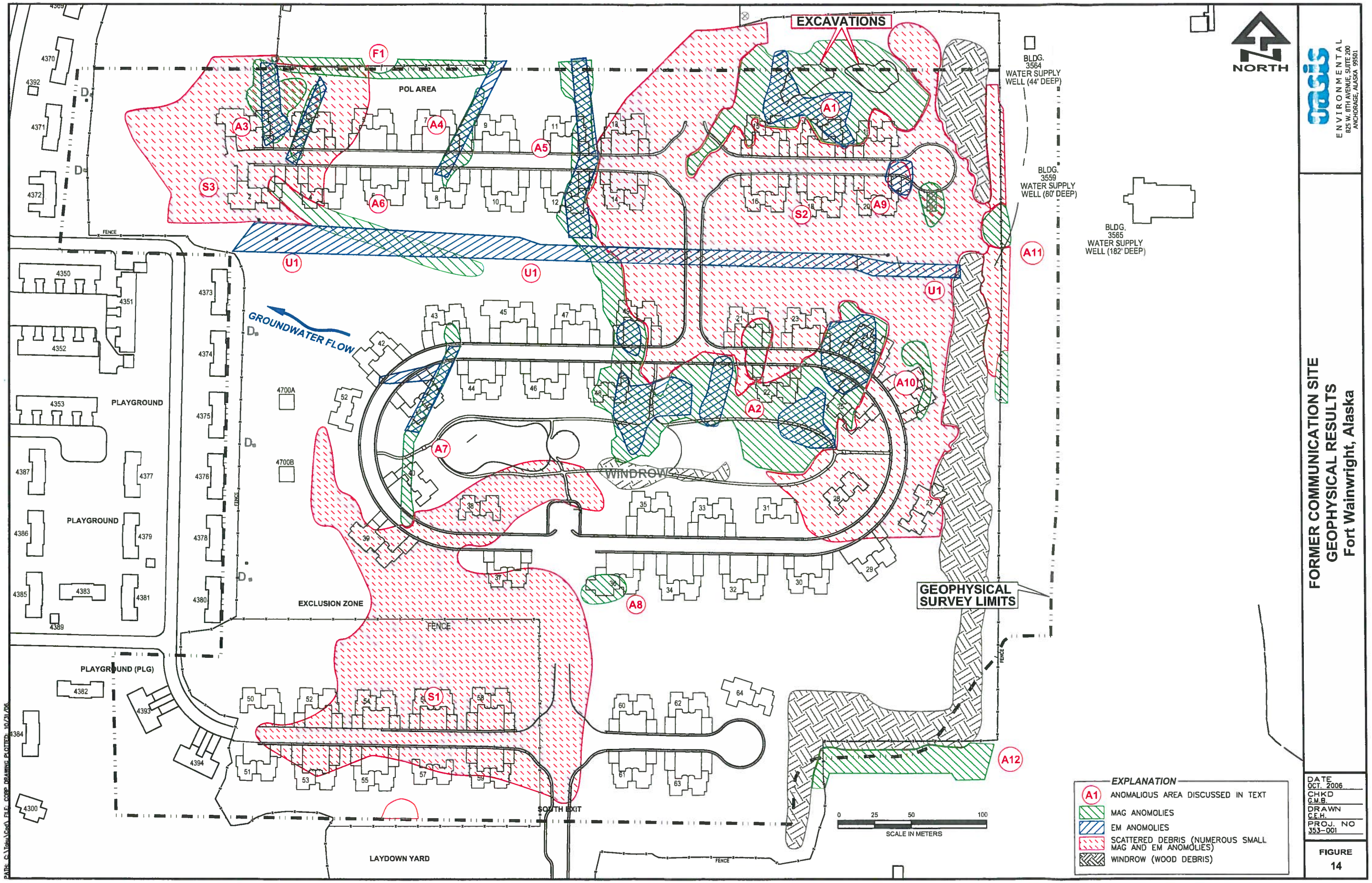


FIGURE 12
2005 AERIAL PHOTOGRAPHY
NORTH DRAINAGE AREA

FIGURE 13
2005 AERIAL PHOTOGRAPHY
SOUTH DRAINAGE AREA

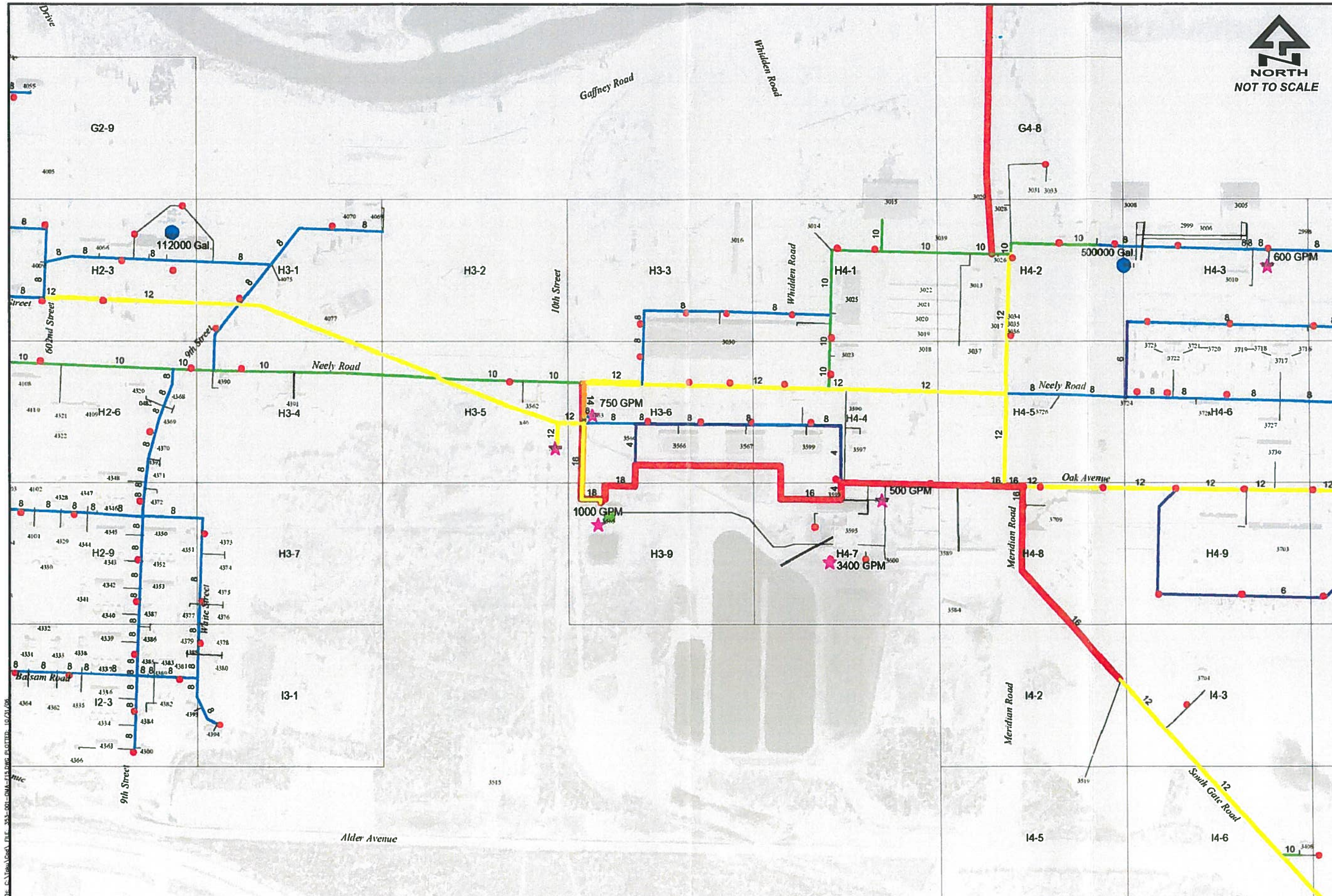


oasis ENVIRONMENTAL
825 W. 8TH AVENUE, SUITE 200
ANCHORAGE, ALASKA 99501

FORMER COMMUNICATION SITE
GEOPHYSICAL RESULTS
Fort Wainwright, Alaska

DATE OCT. 2006
CHKD G.M.B.
DRAWN C.E.H.
PROJ. NO 353-001

FIGURE 14



oasis
ENVIRONMENTAL
825 W. 8TH AVENUE, SUITE 200
ANCHORAGE, ALASKA 99501

WATER DISTRIBUTION SYSTEM
Fort Wainwright, Alaska

DATE	OCT. 2006
CHKD	G.M.B.
DRAWN	C.E.H.
PROJ. NO	353-001

FIGURE
15

APPENDIX B

Table 2-1, Areas of Concern, Sample Test Methods, and Rationale by Phase from FTW-102 Work Plan Addendum

Table 2-1 Sample Type, Location, Test Methods, and Rationale

Project Phase	Area	Method of Characterization	Concern	Magnetometer Indicates Metal Debris at Depth	Photo of Debris	Analytical Suite
PHASE 1 & 2	**B.1**	Test Pit E, S, and N of Bldg	1) Odor noted during construction activities at culvert location, 2) S&W field personnel became ill after working in this area, 3) location of 3 transformers noted in early photos of site, 4) contaminated soil removed (15 truck loads)	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels
PHASE 1 & 2	**B.2**	Test Pit E, S, and N of Bldg	1) Photoionization detector (PID) hits in field not confirmed by analytical data, 2) POL odor SW corner, 3) W. of B.2 fine sand, 4) hydraulic oil spill	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels
PHASE 1 & 2	**B.3**	Test Pit S and N of Bldg	1) Odor noted during construction activities, 2) S&W field personnel became ill after working in this area Sewer trench worse	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels
PHASE 1 & 2	**B.4**	Test Pit S and N of Bldg	Contamination associated with buried debris not documented in field construction notes	Yes	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels
NONE	**B.5**	NONE	NONE	NONE	NONE	NONE
NONE	**B.6**	Test Pit S and N of Bldg	NONE	Yes	NONE	NONE
NONE	**B.7**	Fully Characterized in 2005	1) POL soil and GW contamination exceeds ADEC criteria, 2) leaking drum removed with excavator bucket and placed in POL-stockpile, 3) debris left in sidewalls PID 80, 4) POL contamination, 5) timber between B.7 and B.8	Yes	NONE	NONE
NONE	**B.8**	Fully Characterized in 2005	POL soil and GW contamination exceeds ADEC criteria PID 1100, POL soil removed	NONE	Yes	NONE
NONE	**B.9**	Fully Characterized in 2005	1) POL soil and GW contamination exceeds ADEC criteria, 2) sweet odor noted during construction 3) strong odor PID insitu 5ppm hydrocarbon odor	Yes	Yes	NONE
NONE	**B.10**	Fully Characterized in 2005	1) POL soil and GW contamination exceeds ADEC criteria, 2) metal debris in SW sidewall	NONE	NONE	NONE
PHASE 1	**B.11**	Test Pit S and N of Bldg	1) WWII trench runs through area of B.11, 12, 13, and 14, 2) electrical contractor noted strange odor NE of B.11, 3) burned debris and 6X6 cylinder, PID 777 hydrocarbon odor, 4) crushed drums, 5) soil removed and transferred to stockpile (70 cy)	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue
PHASE 1	**B.12**	Test Pit S and N of Bldg	1) Sour milk odor noted S of building during construction, 2) decaying wood debris and burned wood	Yes		PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue
PHASE 1	**B.13**	Test Pit S and N of Bldg	1) Burnt wood NE side of area, ash appearance to soil, 2) crushed drums, 3/4" steel pipe, concrete pipe, 3) PID 71,000	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue
PHASE 1	**B.14**	Test Pit S and N of Bldg	WWII trench runs through area of B.11, 12, 13, and 14	Yes		PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue
PHASE 1	**B.15**	Test Pit N of Bldg	1) Crushed fuel drum w/ orange paint product or moisture in drum, 2) debris voids in side walls 3) canisters and other debris, 4) PID indicates fuel contamination, 5) septic odor, 6) debris left in sidewall	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue
PHASE 1	**B.16**	Test Pit N of Bldg	Septic odor	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue
PHASE 1	**B.17**	Test Pit N of Bldg	1) Crushed drum w/ orange paint	Yes	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue
NONE	**B.18**	NONE	NONE	NONE	NONE	NONE
PHASE 1	**B.19**	Test Pit N and E of Bldg	1) Bricks in excavation side wall, 2) sandy soils, 3) metal debris in walls, 4) airplane pieces removed, 5) POL detected during construction	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue, herbicides
PHASE 1	**B.20**	Test Pit N, S, and E of Bldg	Metal debris in NE wall	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue, herbicides
PHASE 1	**B.21**	Test Pit N, S, and W of Bldg	1) Foul odor, 2) spent artillery shells in excavation; 3) Fire Captain Scott Hunt indicated that drums were found in this area in response to a brush fire.	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.22**	Test Pit S and W of Bldg	1) Blue granular material, 2) drums and corroded metal in sidewall3) Fire Captain Scott Hunt indicated that drums were found in this area in response to a brush fire. 4) location of previous debris pile, 5) sample taken by USACE indicates PCBs and metals are present, 6) crushed drum with liquid inside and non-POL sheen, PID zero, 7) spent artillery shells, 8) stiff brown silt	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.23**	Test Pit S and N of Bldg	1) Spent artillery shells in excavation 6 inch diameter and 3 ft long, 2) drum with yellow paint, 3) 30 ft of orange staining and septic odor, 4) debris in sidewall of ramp	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions

Table 2-1 Sample Type, Location, Test Methods, and Rationale (Continued)

Project Phase	Area	Method of Characterization	Concern	Magnetometer Indicates Metal Debris at Depth	Photo of Debris	Analytical Suite
PHASE 1	**B.24**	Test Pit S and N of Bldg	1) Shells and debris in sidewall, 2) photo of cylinder leaking yellow frothy liquid into excavation, PID zero, 3) fine wet sand, 4) hydrocarbon odor, 5) crushed fuel tank	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.25**	Test Pit SW, SE, and N of Bldg	Debris between B.22 and B.25, drum storage area	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.26**	Test Pit SE, E, and N of Bldg	1) Burn area with burnt wood and black ash, 2) no building in place, 3) Fire Captain indicated drums containing transformers were stored east of this area and noting leakage during response to a brush fire, 4) foul odor	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.27**	Test Pit N, SE, and E of Bldg	1) layered fill and fine sand, 2) fuse rocket dummies N or B.27 near glycol line in stockpile; 3) Fire Captain indicated drums containing transformers were stored east of this area and noting leakage during response to a brush fire	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.28**	Test Pit NW and NE of Bldg	1) Analytical data report presence of TICS associated with 2005 sample, 2) sulfate 101 ppm and chloride 5.32 ppm, 3) Fire Marshal indicated drums were stored west of this area and may have contained transformers, 4) crushed 55 gal drum leaking oil, PID 38, 5) PID 45, chemical odor or septic odor not POL, 6) fine sand	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.29**	Test Pit N, S, and SE of Bldg	Fine sand, metal debris MH-6, septic odor	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.30**	Test Pit N and S of Bldg	1) Drums, 2) soft white-pinkish powder, 3) sulfate 701 ppm	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.31**	Test Pit N, SE, and E of Bldg	1) 5-gal and 55-gal containers of white powder with chlorine odor, 2) drums with one leaking oil onto ground, 3) PID reading of 235 ppm and soil was removed	NONE	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.32**	Test Pit N of Bldg	PID readings indicated volatile contaminants in area potential POL	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
NONE	**B.33**	NONE	PID 93	NONE	NONE	NONE
PHASE 1	**B.34**	Test Pit N of Bldg	NONE	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.35**	Test Pit N and W of Bldg	1) Burnt debris, 2) stiff fine sand	Yes	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.36**	Test Pit N and W of Bldg	1) Concrete pipe line and small metal piping, 2) foul decaying matter, septic odor, 3) burnt debris, 4) concrete pipe and 15 ft long 1ft dia pipe	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
NONE	**B.37**	NONE	(Fine sand)	NONE	NONE	NONE
PHASE 1	**B.38**	Test Pit N and S of Bldg	Several low level PCB hits in 2005 (0-4 ft bgs)	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1	**B.39**	Test Pit N and S of Bldg	Mothball odor, orange silt, clay, fine sand	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1	**B.40**	Test Pit between Bldgs 38 and 40	Low PCB hits in 2005 (near B.38)	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF
NONE	**B.41**	NONE	NONE	Yes	NONE	NONE
NONE	**B.42**	NONE	Fine sandy material in excavation	Yes	NONE	NONE
NONE	**B.43**	NONE	Brown/grey patches of silt	Yes	NONE	NONE
NONE	**B.44**	NONE	NONE	NONE	NONE	NONE
NONE	**B.45**	NONE	Found pad	NONE	NONE	NONE
NONE	**B.46**	NONE	Fine sand	NONE	NONE	NONE
PHASE 3	**B.47**	Test Pit N and S of Bldg	Fine sand	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue
PHASE 3	**B.48**	Test Pit N and S of Bldg	1) 2 crushed drums, 2) one drum mostly intact with white residue on bottom, 3) one drum with liquid draining from within, low PID reading, 4) foul septic odor, metal debris, 5) location of fuel bladder with strange odor, 6) gas cylinder, 7) orange paint on crushed drum, 8) cables	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue
PHASE 3	**B.49**	Test Pit N and S of Bldg	Buried cables under overhead power lines	Yes	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue

Table 2-1 Sample Type, Location, Test Methods, and Rationale (Continued)

Project Phase	Area	Method of Characterization	Concern	Magnetometer Indicates Metal Debris at Depth	Photo of Debris	Analytical Suite
PHASE 1& 2	**B.50**	Test Pits and Soil Borings	PCBs detected in 2005 surface samples and subsurface (include playground area)	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.51**	Test Pits and Soil Borings	Decomposing organic material odor, anaerobic odor, PCBs detected in 2005 surface samples; Aroclor 1254 was detected in this area at a concentration of 0.5 mg/kg. Aroclor 1260 was the common PCB detected in all other areas.	NONE	Yes	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.52**	Test Pits and Soil Borings	Mothball solvent odor, foul smell, PCBs detected 20065 utilitiy pole and cable in excavation as well as other unidentified debris; Fire Captain responded to a fire in an area involving drums oil orproduct and located an abandoned transformer near dumpsters in this area	Numerous Scattered Debris	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.53**	Test Pits and Soil Borings	Septic odor metal in sidewall, elevated PID not odor,	Numerous Scattered Debris	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.54**	Test Pits and Soil Borings	PCBs detected in 2005	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.55**	Test Pits and Soil Borings	High septic odor, organics, large Magnetomer Anomaly SE of building	Numerous Scattered Debris	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.56**	Test Pits and Soil Borings	S. B.56 WCC spilled oil and salt from a drum	Numerous Scattered Debris	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.57**	Test Pits and Soil Borings	1)Layer of black foul smelling organic material south side of B.52, 2) stiff silt, large, Magnetometer Anomoly SW of Bldg	Numerous Scattered Debris	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.58**	Test Pits and Soil Borings	MH-2 E of B.58 drum with small artillery w/powder, PID 7100 ppm W. wall stiff silty fine sand, organic staining	Numerous Scattered Debris	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.59**	Test Pits and Soil Borings	Stiff dark brown silt	Numerous Scattered Debris	NONE	PCBs, VOCs, SVOCs, Metals, DF
NONE	**B.60**	NONE	Debris, organics, garbage PERMAFROST	NONE	NONE	NONE
NONE	**B.61**	NONE	PERMAFROST	NONE	NONE	NONE
NONE	**B.62**	NONE	Organics in sidewall PERMAFROST	NONE	NONE	NONE
NONE	**B.63**	NONE	PERMAFROST	NONE	NONE	NONE
NONE	**B.64**	NONE	White (creamy) powder clump in sidewall of trench E of area PERMAFROST	NONE	NONE	NONE
PHASE 1	**Corridor W of SAS**	Test Pit along W fenced area extending to B.1	Previous location of transformers	NONE	Yes	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1	**Area E of SAS**	Test Pit on E side in area where metal debris was buried in river meander	Metal debris in meander extends above Taku Gardens	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1	**Corridor W of Sound Barrier**	Multiple Trenches	UNKNOWN AREA POSSIBLE AREA OF DRUM AND TRANSFORMER STORAGE	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue, herbicides, anions
PHASE 21	**SW Drainage**	Surface Soil Samples	Runoff and snow melt may have impacted surface soil	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue, herbicides, anions
PHASE 2	**Effluent to Chena**	Sediment Samples	Sediments impacted by dewatering activities	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue, herbicides, anions
PHASE 3	4700A	SB		NONE	Yes	PCBs, VOCs, SVOCs, Metals, DF
	MH-N		Photo of discolored soil in utilidor excavation	NONE	NONE	NONE
	MH-L		Anaerobic odor	NONE	NONE	NONE

B.# - Building represents footprint area for building construction

DF DIOXIN FURAN

SB SOIL BORING

NOTES:

Analytical suite may be modified to include pesticides, herbicides, anions, and other methods as data on past activities become available.

All changes to analytical suite will be approved by the USACE, DPW, EPA, and ADEC before samples are tested.

FUELS	GRO/ DRO/RRO
ANIONS	phosphate, chloride, sulfate, nitrate/nitrite
	PCB AREA
	PERMAFROST AREA
	MEANDER DEBRIS
	WWII DEBRIS
	BURN AREA
	TRANSFORMERS

Extra containers of soil and water may be collected and held at the laboratory or on-site refrigerator until decisions are made.

Analytical procedures and reporting requirements are provided in the QAPP, Section 2.0 of the Work Plan SAP.
SAS – the after school activity building located to North of Taku Gardens

APPENDIX B

Table 2-1, Areas of Concern, Sample Test Methods, and Rationale by Phase from FTW-102 Work Plan Addendum

Table 2-1 Sample Type, Location, Test Methods, and Rationale

Project Phase	Area	Method of Characterization	Concern	Magnetometer Indicates Metal Debris at Depth	Photo of Debris	Analytical Suite
PHASE 1 & 2	**B.1**	Test Pit E, S, and N of Bldg	1) Odor noted during construction activities at culvert location, 2) S&W field personnel became ill after working in this area, 3) location of 3 transformers noted in early photos of site, 4) contaminated soil removed (15 truck loads)	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels
PHASE 1 & 2	**B.2**	Test Pit E, S, and N of Bldg	1) Photoionization detector (PID) hits in field not confirmed by analytical data, 2) POL odor SW corner, 3) W. of B.2 fine sand, 4) hydraulic oil spill	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels
PHASE 1 & 2	**B.3**	Test Pit S and N of Bldg	1) Odor noted during construction activities, 2) S&W field personnel became ill after working in this area Sewer trench worse	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels
PHASE 1 & 2	**B.4**	Test Pit S and N of Bldg	Contamination associated with buried debris not documented in field construction notes	Yes	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels
NONE	**B.5**	NONE	NONE	NONE	NONE	NONE
NONE	**B.6**	Test Pit S and N of Bldg	NONE	Yes	NONE	NONE
NONE	**B.7**	Fully Characterized in 2005	1) POL soil and GW contamination exceeds ADEC criteria, 2) leaking drum removed with excavator bucket and placed in POL-stockpile, 3) debris left in sidewalls PID 80, 4) POL contamination, 5) timber between B.7 and B.8	Yes	NONE	NONE
NONE	**B.8**	Fully Characterized in 2005	POL soil and GW contamination exceeds ADEC criteria PID 1100, POL soil removed	NONE	Yes	NONE
NONE	**B.9**	Fully Characterized in 2005	1) POL soil and GW contamination exceeds ADEC criteria, 2) sweet odor noted during construction 3) strong odor PID insitu 5ppm hydrocarbon odor	Yes	Yes	NONE
NONE	**B.10**	Fully Characterized in 2005	1) POL soil and GW contamination exceeds ADEC criteria, 2) metal debris in SW sidewall	NONE	NONE	NONE
PHASE 1	**B.11**	Test Pit S and N of Bldg	1) WWII trench runs through area of B.11, 12, 13, and 14, 2) electrical contractor noted strange odor NE of B.11, 3) burned debris and 6X6 cylinder, PID 777 hydrocarbon odor, 4) crushed drums, 5) soil removed and transferred to stockpile (70 cy)	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue
PHASE 1	**B.12**	Test Pit S and N of Bldg	1) Sour milk odor noted S of building during construction, 2) decaying wood debris and burned wood	Yes		PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue
PHASE 1	**B.13**	Test Pit S and N of Bldg	1) Burnt wood NE side of area, ash appearance to soil, 2) crushed drums, 3/4" steel pipe, concrete pipe, 3) PID 71,000	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue
PHASE 1	**B.14**	Test Pit S and N of Bldg	WWII trench runs through area of B.11, 12, 13, and 14	Yes		PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue
PHASE 1	**B.15**	Test Pit N of Bldg	1) Crushed fuel drum w/ orange paint product or moisture in drum, 2) debris voids in side walls 3) canisters and other debris, 4) PID indicates fuel contamination, 5) septic odor, 6) debris left in sidewall	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue
PHASE 1	**B.16**	Test Pit N of Bldg	Septic odor	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue
PHASE 1	**B.17**	Test Pit N of Bldg	1) Crushed drum w/ orange paint	Yes	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue
NONE	**B.18**	NONE	NONE	NONE	NONE	NONE
PHASE 1	**B.19**	Test Pit N and E of Bldg	1) Bricks in excavation side wall, 2) sandy soils, 3) metal debris in walls, 4) airplane pieces removed, 5) POL detected during construction	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue, herbicides
PHASE 1	**B.20**	Test Pit N, S, and E of Bldg	Metal debris in NE wall	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue, herbicides
PHASE 1	**B.21**	Test Pit N, S, and W of Bldg	1) Foul odor, 2) spent artillery shells in excavation; 3) Fire Captain Scott Hunt indicated that drums were found in this area in response to a brush fire.	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.22**	Test Pit S and W of Bldg	1) Blue granular material, 2) drums and corroded metal in sidewall3) Fire Captain Scott Hunt indicated that drums were found in this area in response to a brush fire. 4) location of previous debris pile, 5) sample taken by USACE indicates PCBs and metals are present, 6) crushed drum with liquid inside and non-POL sheen, PID zero, 7) spent artillery shells, 8) stiff brown silt	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.23**	Test Pit S and N of Bldg	1) Spent artillery shells in excavation 6 inch diameter and 3 ft long, 2) drum with yellow paint, 3) 30 ft of orange staining and septic odor, 4) debris in sidewall of ramp	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions

Table 2-1 Sample Type, Location, Test Methods, and Rationale (Continued)

Project Phase	Area	Method of Characterization	Concern	Magnetometer Indicates Metal Debris at Depth	Photo of Debris	Analytical Suite
PHASE 1	**B.24**	Test Pit S and N of Bldg	1) Shells and debris in sidewall, 2) photo of cylinder leaking yellow frothy liquid into excavation, PID zero, 3) fine wet sand, 4) hydrocarbon odor, 5) crushed fuel tank	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.25**	Test Pit SW, SE, and N of Bldg	Debris between B.22 and B.25, drum storage area	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.26**	Test Pit SE, E, and N of Bldg	1) Burn area with burnt wood and black ash, 2) no building in place, 3) Fire Captain indicated drums containing transformers were stored east of this area and noting leakage during response to a brush fire, 4) foul odor	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.27**	Test Pit N, SE, and E of Bldg	1) layered fill and fine sand, 2) fuse rocket dummies N or B.27 near glycol line in stockpile; 3) Fire Captain indicated drums containing transformers were stored east of this area and noting leakage during response to a brush fire	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.28**	Test Pit NW and NE of Bldg	1) Analytical data report presence of TICS associated with 2005 sample, 2) sulfate 101 ppm and chloride 5.32 ppm, 3) Fire Marshal indicated drums were stored west of this area and may have contained transformers, 4) crushed 55 gal drum leaking oil, PID 38, 5) PID 45, chemical odor or septic odor not POL, 6) fine sand	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.29**	Test Pit N, S, and SE of Bldg	Fine sand, metal debris MH-6, septic odor	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.30**	Test Pit N and S of Bldg	1) Drums, 2) soft white-pinkish powder, 3) sulfate 701 ppm	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.31**	Test Pit N, SE, and E of Bldg	1) 5-gal and 55-gal containers of white powder with chlorine odor, 2) drums with one leaking oil onto ground, 3) PID reading of 235 ppm and soil was removed	NONE	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.32**	Test Pit N of Bldg	PID readings indicated volatile contaminants in area potential POL	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
NONE	**B.33**	NONE	PID 93	NONE	NONE	NONE
PHASE 1	**B.34**	Test Pit N of Bldg	NONE	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.35**	Test Pit N and W of Bldg	1) Burnt debris, 2) stiff fine sand	Yes	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
PHASE 1	**B.36**	Test Pit N and W of Bldg	1) Concrete pipe line and small metal piping, 2) foul decaying matter, septic odor, 3) burnt debris, 4) concrete pipe and 15 ft long 1ft dia pipe	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue, anions
NONE	**B.37**	NONE	(Fine sand)	NONE	NONE	NONE
PHASE 1	**B.38**	Test Pit N and S of Bldg	Several low level PCB hits in 2005 (0-4 ft bgs)	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1	**B.39**	Test Pit N and S of Bldg	Mothball odor, orange silt, clay, fine sand	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1	**B.40**	Test Pit between Bldgs 38 and 40	Low PCB hits in 2005 (near B.38)	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF
NONE	**B.41**	NONE	NONE	Yes	NONE	NONE
NONE	**B.42**	NONE	Fine sandy material in excavation	Yes	NONE	NONE
NONE	**B.43**	NONE	Brown/grey patches of silt	Yes	NONE	NONE
NONE	**B.44**	NONE	NONE	NONE	NONE	NONE
NONE	**B.45**	NONE	Found pad	NONE	NONE	NONE
NONE	**B.46**	NONE	Fine sand	NONE	NONE	NONE
PHASE 3	**B.47**	Test Pit N and S of Bldg	Fine sand	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue
PHASE 3	**B.48**	Test Pit N and S of Bldg	1) 2 crushed drums, 2) one drum mostly intact with white residue on bottom, 3) one drum with liquid draining from within, low PID reading, 4) foul septic odor, metal debris, 5) location of fuel bladder with strange odor, 6) gas cylinder, 7) orange paint on crushed drum, 8) cables	Yes	Yes	PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue
PHASE 3	**B.49**	Test Pit N and S of Bldg	Buried cables under overhead power lines	Yes	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, explosive residue

Table 2-1 Sample Type, Location, Test Methods, and Rationale (Continued)

Project Phase	Area	Method of Characterization	Concern	Magnetometer Indicates Metal Debris at Depth	Photo of Debris	Analytical Suite
PHASE 1& 2	**B.50**	Test Pits and Soil Borings	PCBs detected in 2005 surface samples and subsurface (include playground area)	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.51**	Test Pits and Soil Borings	Decomposing organic material odor, anaerobic odor, PCBs detected in 2005 surface samples; Aroclor 1254 was detected in this area at a concentration of 0.5 mg/kg. Aroclor 1260 was the common PCB detected in all other areas.	NONE	Yes	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.52**	Test Pits and Soil Borings	Mothball solvent odor, foul smell, PCBs detected 20065 utilitiy pole and cable in excavation as well as other unidentified debris; Fire Captain responded to a fire in an area involving drums oil orproduct and located an abandoned transformer near dumpsters in this area	Numerous Scattered Debris	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.53**	Test Pits and Soil Borings	Septic odor metal in sidewall, elevated PID not odor.	Numerous Scattered Debris	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.54**	Test Pits and Soil Borings	PCBs detected in 2005	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.55**	Test Pits and Soil Borings	High septic odor, organics, large Magnetomer Anomaly SE of building	Numerous Scattered Debris	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.56**	Test Pits and Soil Borings	S. B.56 WCC spilled oil and salt from a drum	Numerous Scattered Debris	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.57**	Test Pits and Soil Borings	1)Layer of black foul smelling organic material south side of B.52, 2) stiff silt, large, Magnetometer Anomoly SW of Bldg	Numerous Scattered Debris	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.58**	Test Pits and Soil Borings	MH-2 E of B.58 drum with small artillery w/powder, PID 7100 ppm W. wall stiff silty fine sand, organic staining	Numerous Scattered Debris	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1& 2	**B.59**	Test Pits and Soil Borings	Stiff dark brown silt	Numerous Scattered Debris	NONE	PCBs, VOCs, SVOCs, Metals, DF
NONE	**B.60**	NONE	Debris, organics, garbage PERMAFROST	NONE	NONE	NONE
NONE	**B.61**	NONE	PERMAFROST	NONE	NONE	NONE
NONE	**B.62**	NONE	Organics in sidewall PERMAFROST	NONE	NONE	NONE
NONE	**B.63**	NONE	PERMAFROST	NONE	NONE	NONE
NONE	**B.64**	NONE	White (creamy) powder clump in sidewall of trench E of area PERMAFROST	NONE	NONE	NONE
PHASE 1	**Corridor W of SAS**	Test Pit along W fenced area extending to B.1	Previous location of transformers	NONE	Yes	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1	**Area E of SAS**	Test Pit on E side in area where metal debris was buried in river meander	Metal debris in meander extends above Taku Gardens	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF
PHASE 1	**Corridor W of Sound Barrier**	Multiple Trenches	UNKNOWN AREA POSSIBLE AREA OF DRUM AND TRANSFORMER STORAGE	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue, herbicides, anions
PHASE 21	**SW Drainage**	Surface Soil Samples	Runoff and snow melt may have impacted surface soil	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue, herbicides, anions
PHASE 2	**Effluent to Chena**	Sediment Samples	Sediments impacted by dewatering activities	NONE	NONE	PCBs, VOCs, SVOCs, Metals, DF, Fuels, perchlorate, explosive residue, herbicides, anions
PHASE 3	**4700A**	SB		NONE	Yes	PCBs, VOCs, SVOCs, Metals, DF
	MH-N		Photo of discolored soil in utilidor excavation	NONE	NONE	NONE
	MH-L		Anaerobic odor	NONE	NONE	NONE

B.# - Building represents footprint area for building construction

DF DIOXIN FURAN

SB SOIL BORING

NOTES:

Analytical suite may be modified to include pesticides, herbicides, anions, and other methods as data on past activities become available.

All changes to analytical suite will be approved by the USACE, DPW, EPA, and ADEC before samples are tested.

FUELS	GRO/ DRO/RRO
ANIONS	phosphate, chloride, sulfate, nitrate/nitrite
	PCB AREA
	PERMAFROST AREA
	MEANDER DEBRIS
	WWII DEBRIS
	BURN AREA
	TRANSFORMERS

Extra containers of soil and water may be collected and held at the laboratory or on-site refrigerator until decisions are made.

Analytical procedures and reporting requirements are provided in the QAPP, Section 2.0 of the Work Plan SAP.
SAS – the after school activity building located to North of Taku Gardens

APPENDIX C

Areas of Potential Concern Figures

C – Original Areas of Concern FCS (2005 Aerial)

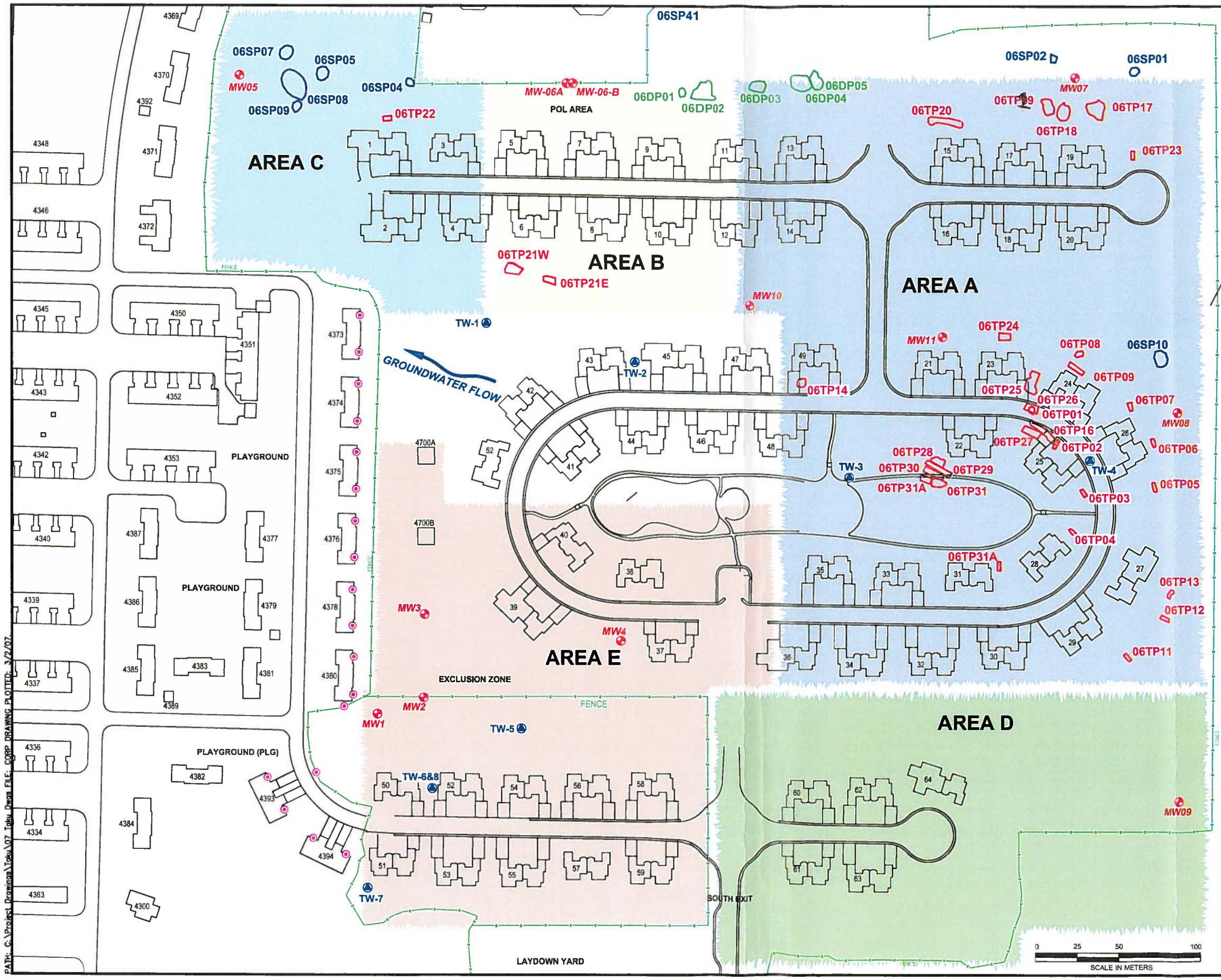
C1 – Former Communication Site Areas of Investigation

C2 – USFWS figures showing locations of wetlands near the source area

C3 – USFWS figures showing locations of wetlands near the source area

PATH: C:\Project Drawings\Taku FILE: 353-001-FT-F2.DWG PLOTTED: 8/3/06.

DATE AUGUST 2006	oasis ENVIRONMENTAL 825 W. 8TH AVENUE, SUITE 200 ANCHORAGE, ALASKA 99501	**SOURCE AREAS**	APPENDIX
CHKD G.M.B.		PRELIMINARY SOURCE EVALUATION NARRATIVE REPORT TAKU FAMILY HOUSING SITE Fort Wainwright, Alaska	**C**
DRAWN C.E.H.			
PROJ. NO 353-001			



06DP02:
LOCATION OF 20# FRAGMENTATION BOMB.

06DP04:
LOCATION OF M47 SERIES CHEMICAL BOMB.

06TP25: (3–4' BGS)
LOCATION OF 3.5" DIAMETER ROCKET (MOTOR WITH PROPELLANT).

06TP27: (3' BGS)
LOCATION OF M47 SERIES CHEMICAL BOMB.

06TP28: (1–1.5' BGS)
LOCATION OF 8" M106 ARTILLERY ROUND.

06TP29: (3–3.5' BGS)
LOCATION OF 8" M106 ARTILLERY ROUND.

06TP31: (3–5' BGS)
LOCATION OF M47 SERIES CHEMICAL BOMB.

EXPLANATION

- MW1 PERMANENT MONITORING WELL
- TW-1 TEMPORARY MONITORING WELL
- PCB WIPE SAMPLES
- TEMPORARY BOUNDARY
- MUNITION/METAL DEBRIS AREA
- PETROLEUM/OIL/LUBRICANT AREA
- POTENTIAL FUEL/CHEMICAL/PCB DEBRIS AREA
- UNKNOWN STORAGE AREA
- PCB AREA

oasis ENVIRONMENTAL
825 W. 8TH AVENUE, SUITE 200
ANCHORAGE, ALASKA 99501

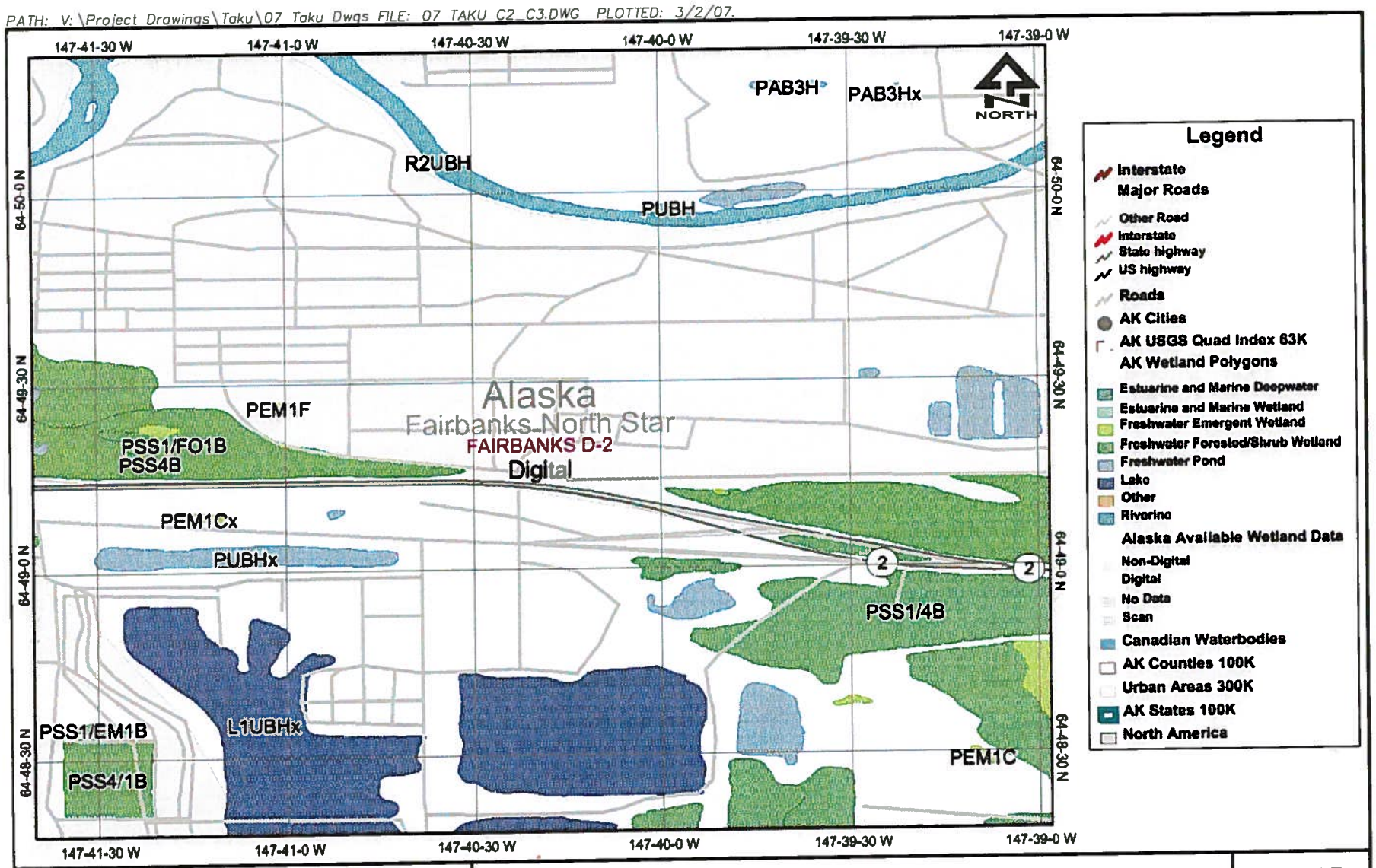
FORMER COMMUNICATION SITE
Fort Wainwright, Alaska

DATE MARCH 2007
CHKD G.M.B.
DRAWN C.E.H.
PROJ. NO 353-001

FIGURE C-1

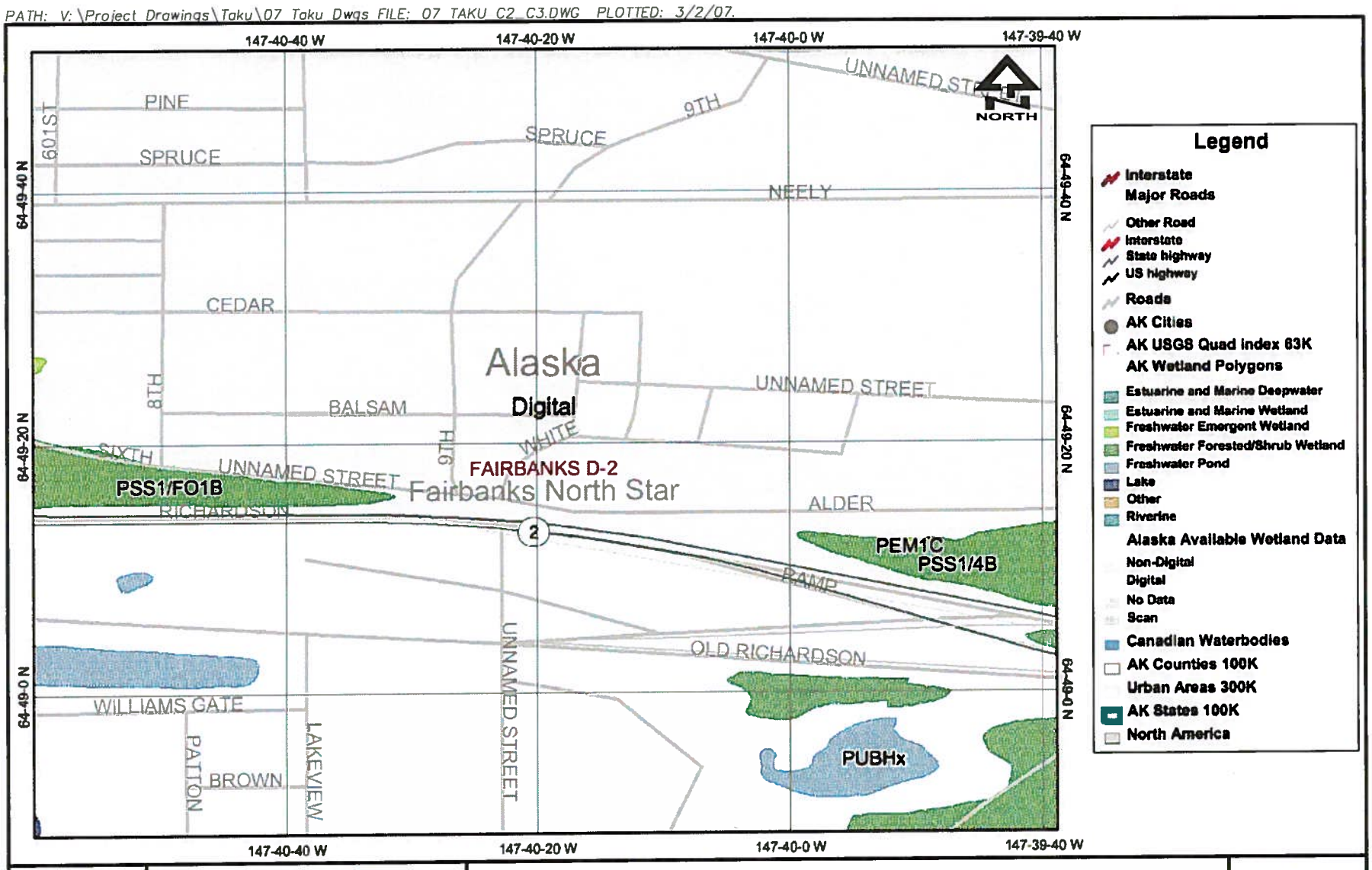
PATH: C:\Project Drawings\Toku\07 Toku Deca FILE: CORP DRAWING PLOTTED: 3/2/07

PATH: V:\Project Drawings\Taku\07 Taku Dwgs FILE: 07 TAKU C2_C3.DWG PLOTTED: 3/2/07.



DATE MARCH 2007 CHKD G.M.B. DRAWN C.E.H. PROJ. NO 353-001	oasis ENVIRONMENTAL 825 W. 8TH AVENUE, SUITE 200 ANCHORAGE, ALASKA 99501	**SURFACE WATER LOCATIONS** FORMER COMMUNICATION SITES Fort Wainwright, Alaska	FIGURE **C2**

PATH: V:\Project Drawings\Taku\07 Taku Dwgs FILE: 07 TAKU C2 C3.DWG PLOTTED: 3/2/07.

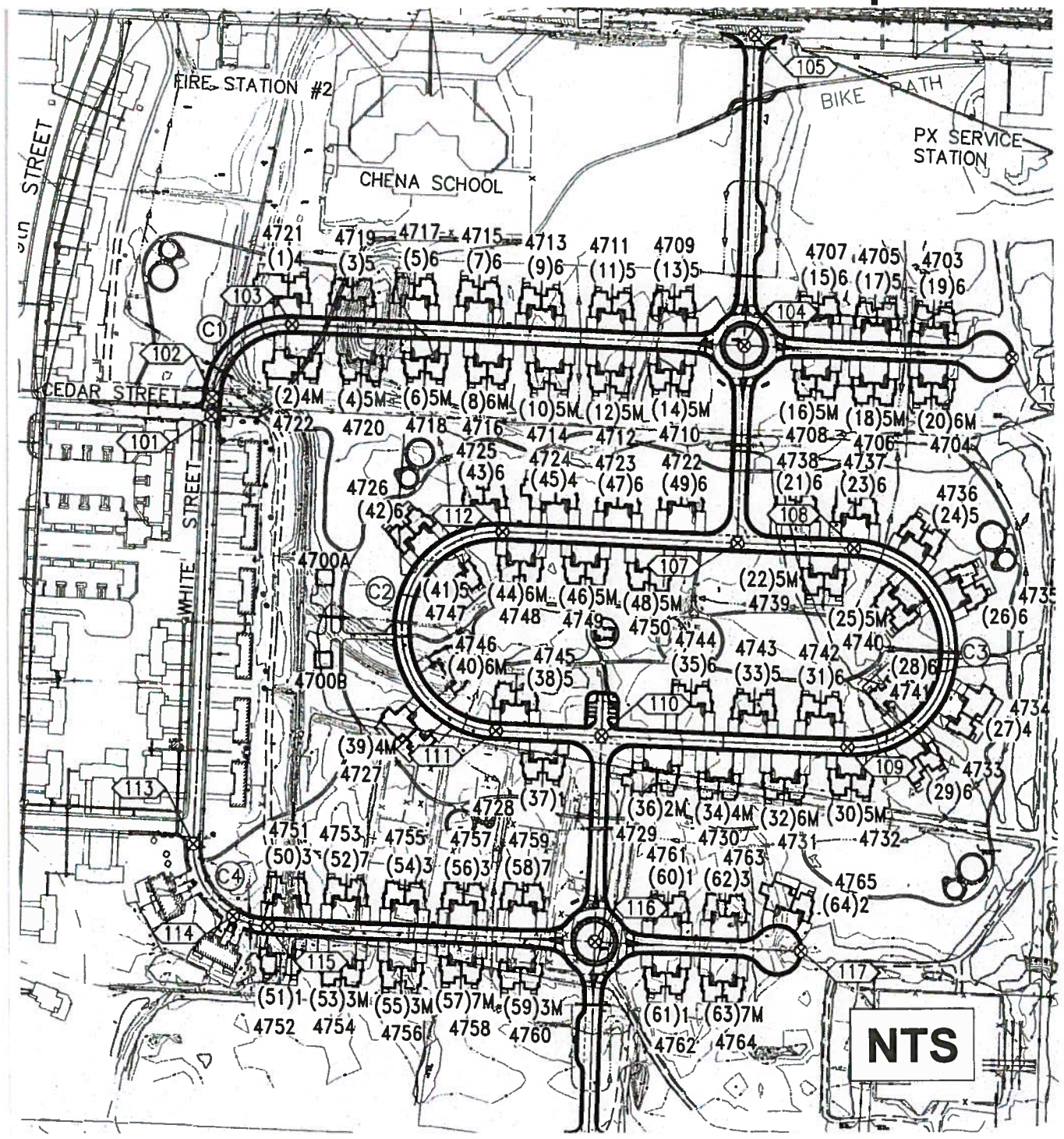


DATE MARCH 2007 CHKD G.M.B. DRAWN C.E.H. PROJ. NO 353-001	oasis ENVIRONMENTAL 825 W. 8TH AVENUE, SUITE 200 ANCHORAGE, ALASKA 99501	**WETLANDS LOCATIONS** FORMER COMMUNICATION SITES Fort Wainwright, Alaska	FIGURE **C3**

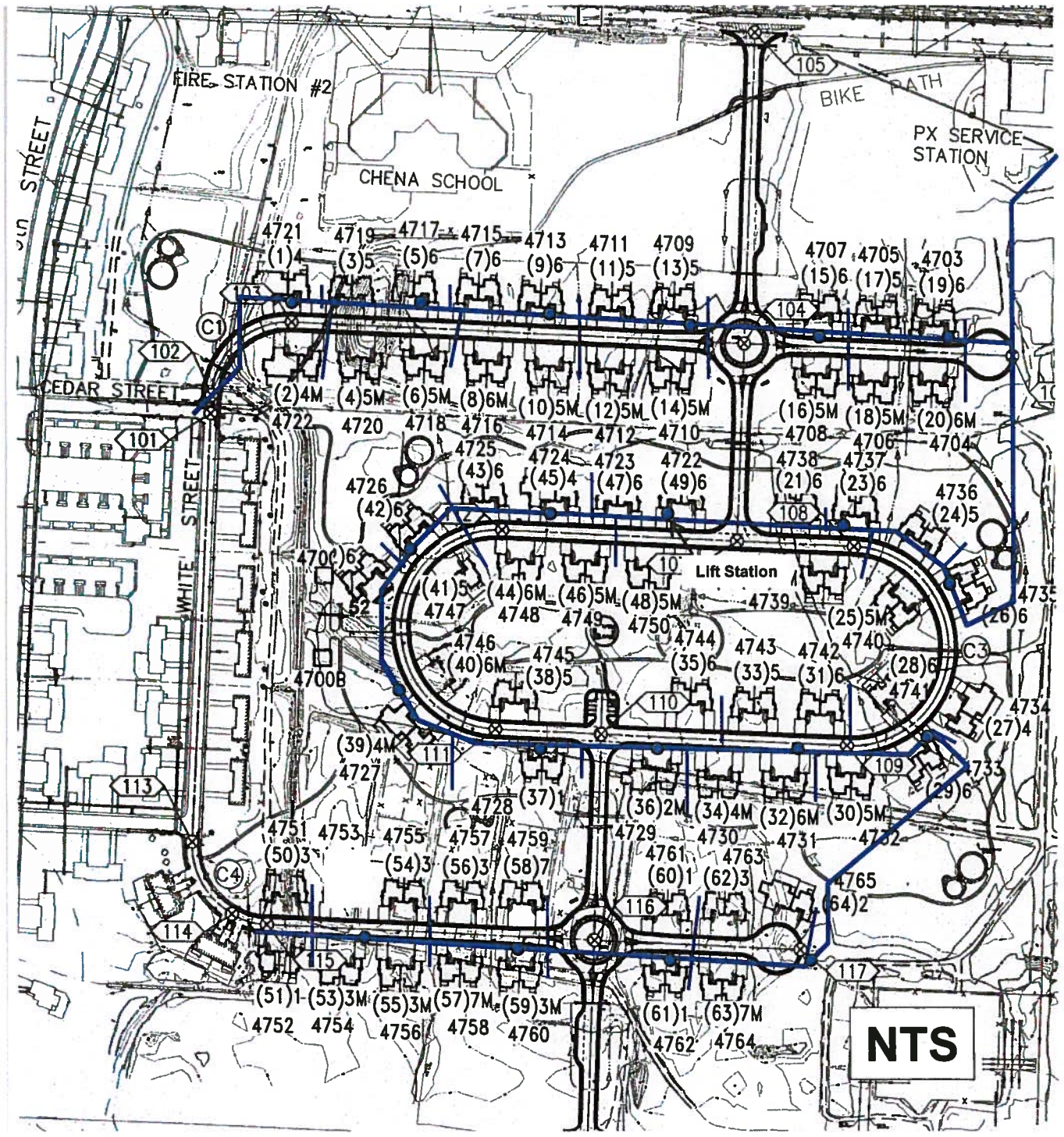
APPENDIX D

Construction Proposed Location Maps for Housing Utilities and Manholes

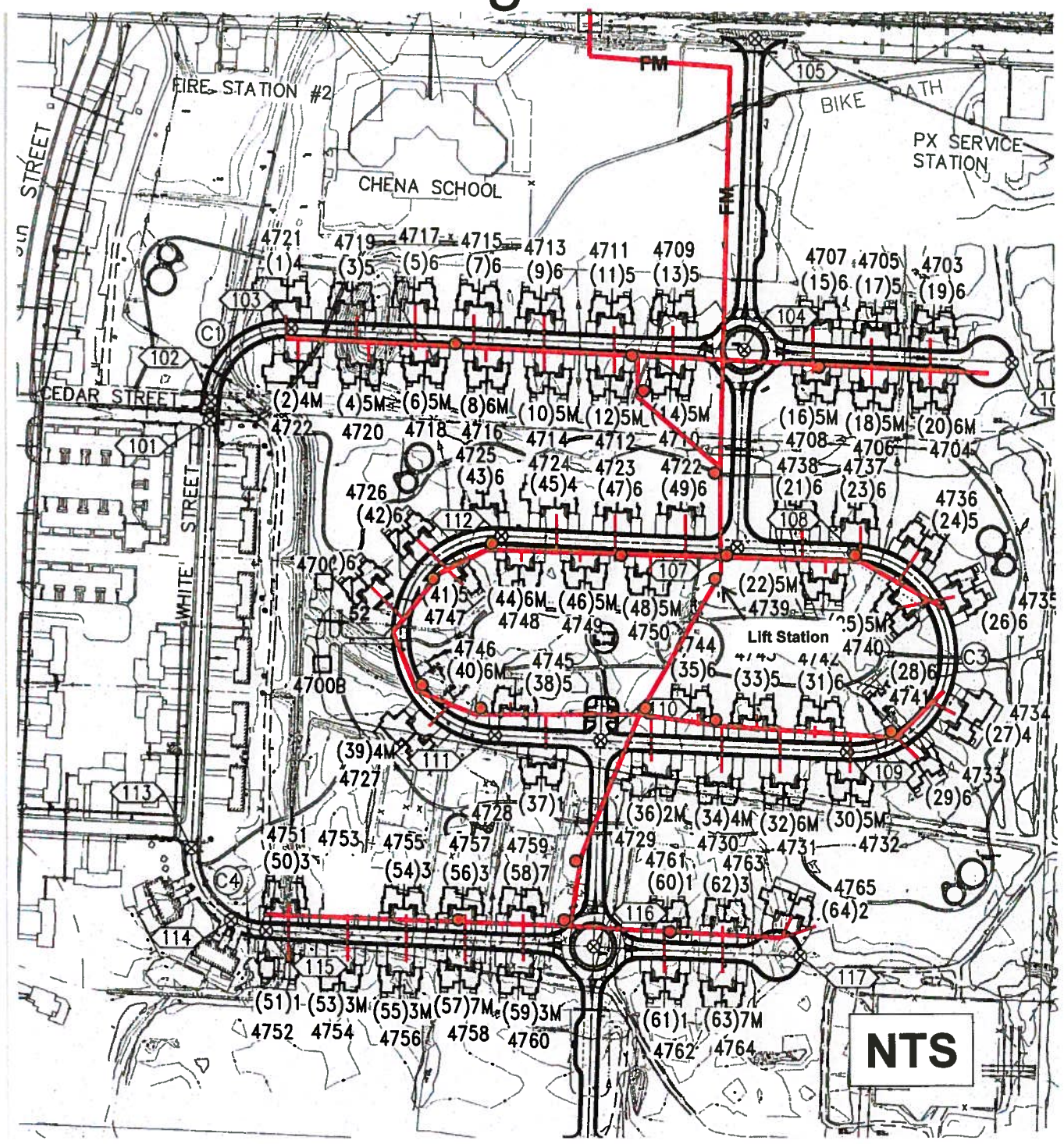
Taku Gardens Site Map



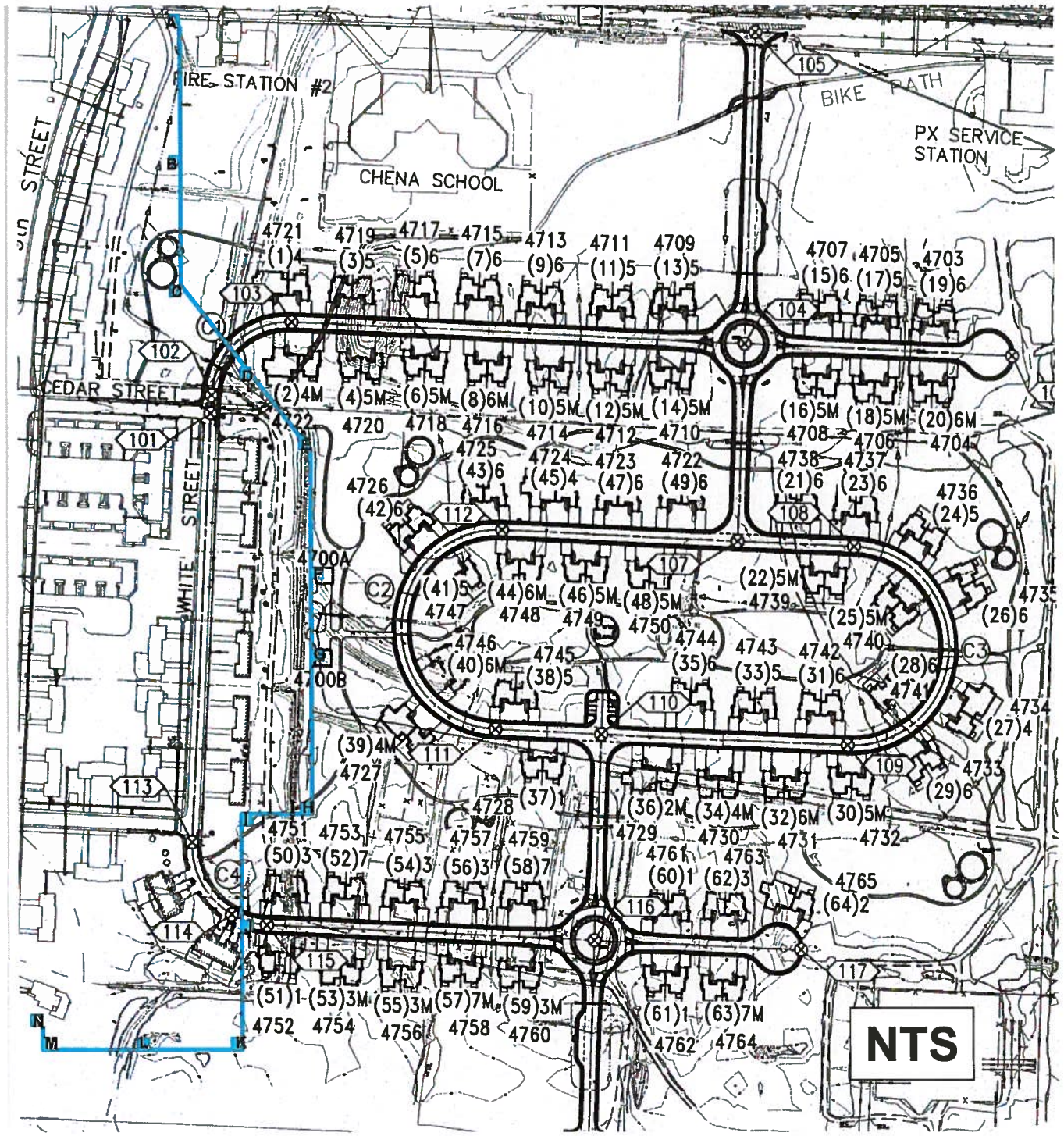
Water Lines


FIRE STATION #2
CHENA SCHOOL
BIKE PATH
PX SERVICE STATION
CEDAR STREET
WHITE STREET
Lift Station
NTS

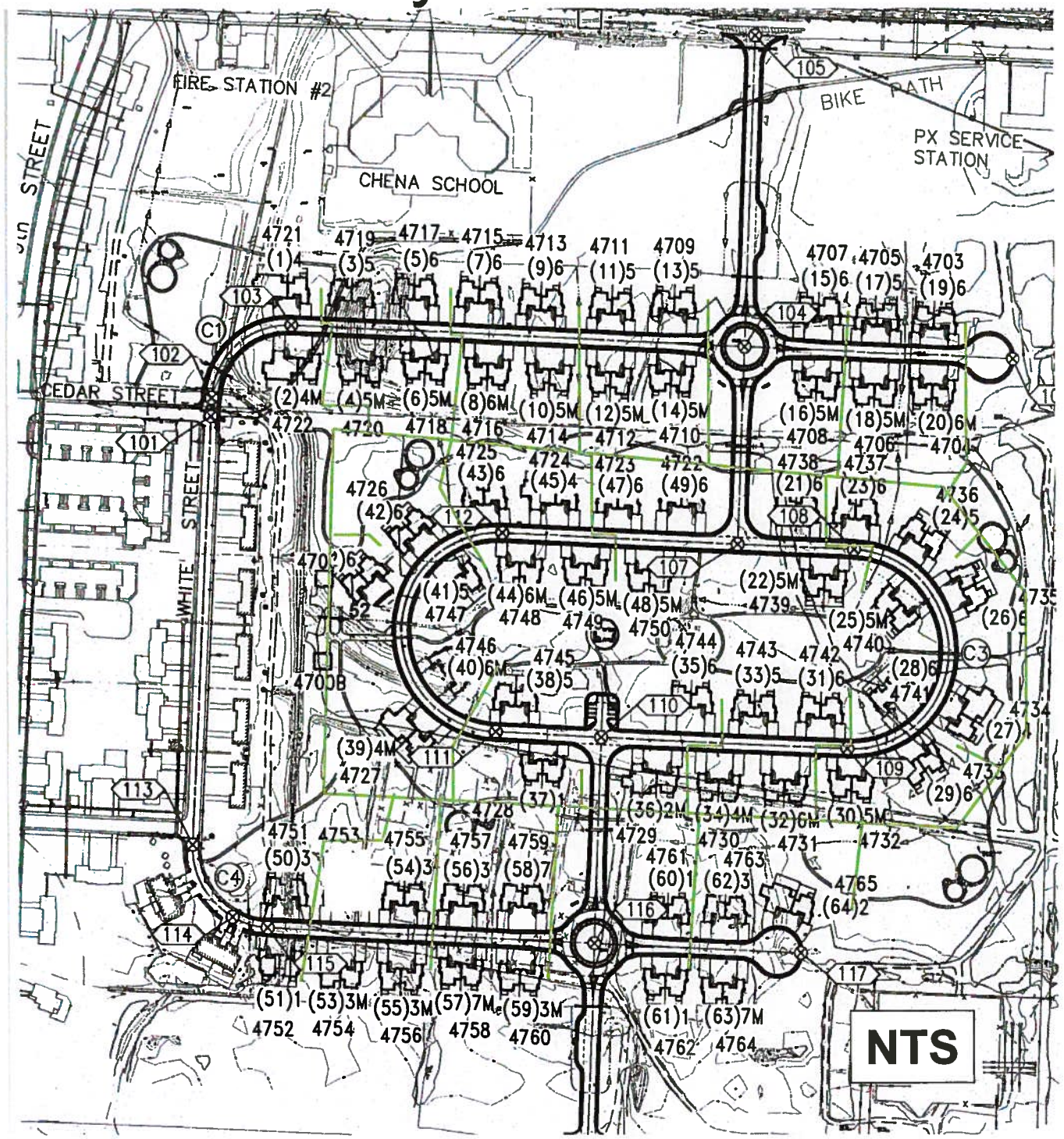
Sewage Lines



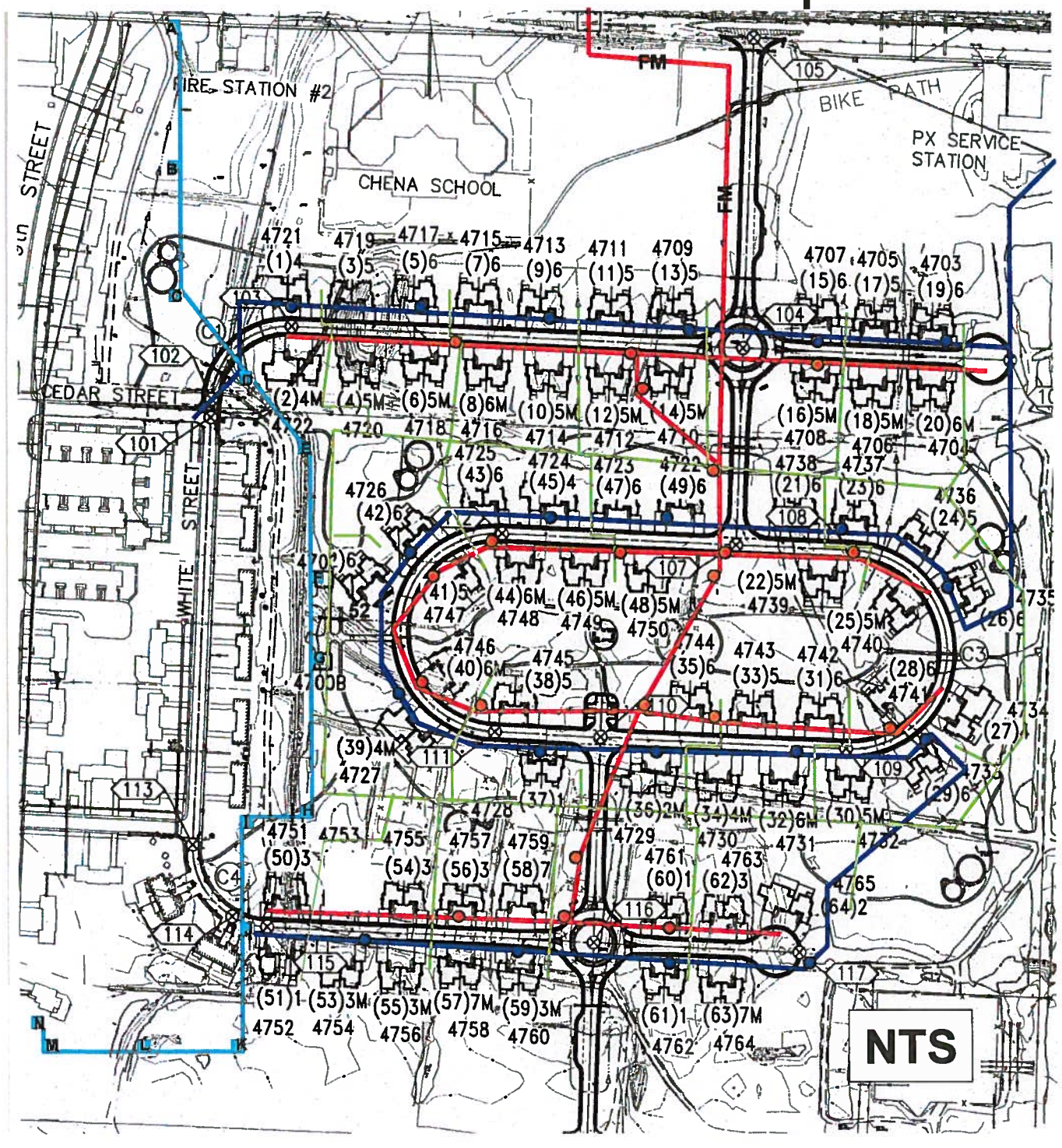
Steam lines & Man Holes



Glycol Lines



Combined Site Map



APPENDIX E

CD-ROM Containing Supporting Documents (Information on 2 CDs)

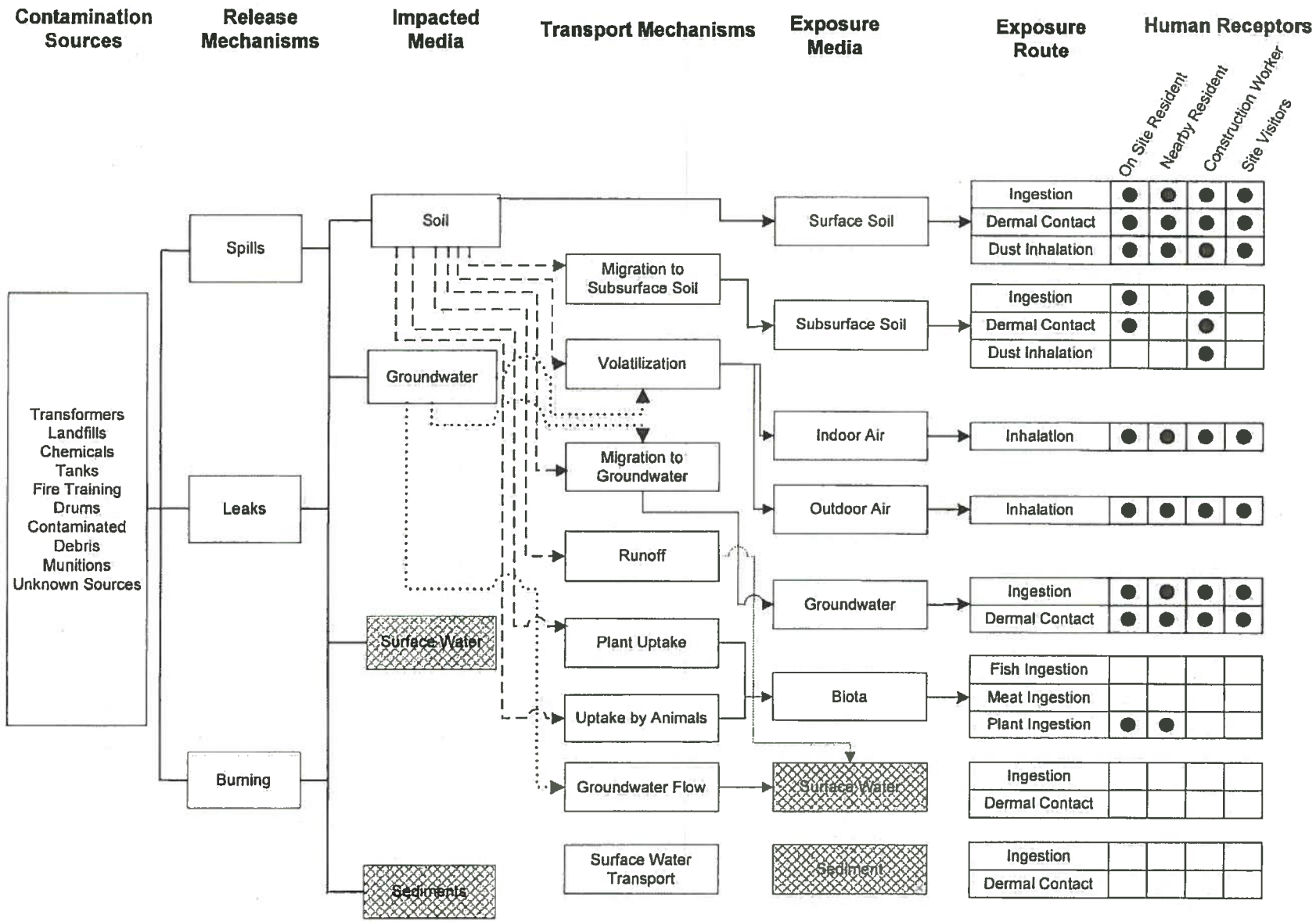
Great Northwest Dewatering Activities Report	MC Technical Update
FTW Fire Marshal Interview	Ladd Field History
USGS Aquifer Properties	Narrative Report of AK Construction 1941-1944
CH2M Hill Post Well Evaluation 1998	Aerial Photographs of the FCS
PDC Well Evaluation	WCC Underground Line Site Maps
USGS Hydrologic Work Plan	Aerial Photographs of the FCS
CH2M Hill 2000 Post Well Evaluation.	Analytical Data Summarized by Subarea
HLA Source Evaluation Report	FTW251&283 Geotechnical and Chemistry Reports
PX Service Station Reports	Topographical Surveys
FTW 1997 Well Head Protection Plan	Aerial Photographs cropped to show areas of concern
1994 Background Metals	Training Ammunition Mgmt
FTW NPL Website	Construction Site Photographs
FTW Homesteads	Construction Field Notes
PACAF Report installations in AK	Transient Groundwater and Surface-water interactions at Fort Wainwright, AK
S&W Fuel Transfer Spills Corrective Action Report	S&W Field Report FTW 251 – 283 Replacement Housing
Army Munitions Mgmt System	Taku 2005 Figure with Hits
FTW Well Location Map	EP-75-1-2
Northern Defenders of the Cold War	FFA Agreement
Taku Work Plan Addendum	NEPA EA Construction Family Housing
FTW 5 year Review	FTW Second 5 Year Review
ERDC-TR-01-5	Coal Ash Data

APPENDIX F

Conceptual Site Model Scoping Tables and Figures

ADEC EcoRisk Forms

Former Communication Site - Subarea A



- Potentially Complete Pathway
  Line patterns are only to provide clarity for reader

Figure A
Conceptual Site Model

Human Health Conceptual Site Model
Scoping Form

Site Name: Former Communication Site - Area A

File Number: _____

Completed by: Gloria Beckman

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, a CSM graphic and text must be submitted with the site characterization work plan.

General Instructions: Follow the italicized instructions in each section below.

1. *General Information:*

Sources *(check potential sources at the site)*

- [x] USTs
- [x] ASTs
- [x] Dispensers/fuel loading racks
- [x] Drums
- [x] Vehicles
- [x] Landfills
- [x] Transformers
- [x] Other: _____

Release Mechanisms *(check potential release mechanisms at the site)*

- [x] Spills
- [x] Leaks
- [x] Direct discharge
- [x] Burning
- [ ] Other: _____

Impacted Media *(check potentially-impacted media at the site)*

- [x] Surface soil (0-2 feet bgs*)
- [x] Subsurface Soil (>2 feet bgs)
- [x] Air
- [x] Groundwater
- [ ] Surface water
- [ ] Other: _____

Receptors (*check receptors that could be affected by contamination at the site)*

- [x] Residents (adult or child)
- [x] Commercial or industrial worker
- [x] Construction worker
- [ ] Subsistence harvester (i.e., gathers wild foods)
- [ ] Subsistence consumer (i.e., eats wild foods)
- [x] Site visitor
- [x] Trespasser
- [ ] Recreational user
- [ ] Farmer
- [ ] Other: _____

* bgs – below ground surface

2. **Exposure Pathways:** *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) **Direct Contact –**

1 Incidental Soil Ingestion

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

If both boxes are checked, label this pathway complete: COMPLETE

2 Dermal Absorption of Contaminants from Soil

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

Can the soil contaminants permeate the skin? (Contaminants listed below, or within the groups listed below, should be evaluated for dermal absorption). ☑

Arsenic	Lindane
Cadmium	PAHs
Chlordane	Pentachlorophenol
2,4-dichlorophenoxyacetic acid	PCBs
Dioxins	SVOCs
DDT	

If all of the boxes are checked, label this pathway complete: _____

b) **Ingestion –**

1 Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, OR are contaminants expected to migrate to groundwater in the future? ☑

Could the potentially affected groundwater be used as a current or future drinking water source? *Please note, only leave the box unchecked if ADEC has determined the groundwater is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350.* ☐

If both the boxes are checked, label this pathway complete: _____

2 Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water OR are contaminants expected to migrate to surface water in the future? ☑

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? *Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).* ☐

If both boxes are checked, label this pathway complete: _____

3 Ingestion of Wild Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild food? ☐

Do the site contaminants have the potential to bioaccumulate (*see* Appendix A)? ☐

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. the top 6 feet of soil, in groundwater that **could be** connected to surface water, etc.) ☑

If all of the boxes are checked, label this pathway complete: _____

c) Inhalation

1 Inhalation of Outdoor Air

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

Are the contaminants in soil volatile (*See Appendix B*)? ☑

If all of the boxes are checked, label this pathway complete: COMPLETE

2 Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be placed on the site in an area that could be affected by contaminant vapors? (i.e., within 100 feet, horizontally or vertically, of the contaminated soil or groundwater, <u>or</u> subject to "preferential pathways" that promote easy airflow, like utility conduits or rock fractures) ☑

Are volatile compounds present in soil or groundwater (*See Appendix C*)? ☑

If both boxes are checked, label this pathway complete: COMPLETE

3. Additional Exposure Pathways: *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

Dermal Exposure to Contaminants in Groundwater and Surface Water

Exposure from this pathway may need to be assessed only in cases where DEC water-quality or drinking-water standards are not being applied as cleanup levels. Examples of conditions that may warrant further investigation include:

- Climate permits recreational use of waters for swimming,
- Climate permits exposure to groundwater during activities, such as construction, without protective clothing, or
- Groundwater or surface water is used for household purposes.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Volatile Compounds in Household Water

Exposure from this pathway may need to be assessed only in cases where DEC water-quality or drinking-water standards are not being applied as cleanup levels. Examples of conditions that may warrant further investigation include:

- The contaminated water is used for household purposes such as showering, laundering, and dish washing, and
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix B)

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Fugitive Dust

Generally DEC soil ingestion cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway, although this is not true in the case of chromium. Examples of conditions that may warrant further investigation include:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers. This size can be inhaled and would be of concern for determining if this pathway is complete.

Check the box if further evaluation of this pathway is needed: ☑

Comments:

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during recreational or some types of subsistence activities. People then incidentally **ingest** sediment from normal hand-to-mouth activities. In addition, **dermal absorption of contaminants** may be of concern if people come in contact with sediment and the contaminants are able to permeate the skin (see dermal exposure to soil section). This type of exposure is rare but it should be investigated if:

- Climate permits recreational activities around sediment, and/or
- Community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

ADEC soil ingestion cleanup levels are protective of direct contact with sediment. If they are determined to be over-protective for sediment exposure at a particular site, other screening levels could be adopted or developed.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.*)

APPENDIX A

BIOACCUMULATIVE COMPOUNDS

Table A-1: List of Compounds of Potential Concern for Bioaccumulation

Organic compounds are identified as bioaccumulative if they have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5. Inorganic compounds are identified as bioaccumulative if they are listed as such by EPA (2000). Those compounds in Table X of 18 AAC 75.345 that are bioaccumulative, based on the definition above, are listed below.

Aldrin	DDT	Lead
Arsenic	Dibenzo(a,h)anthracene	Mercury
Benzo(a)anthracene	Dieldrin	Methoxychlor
Benzo(a)pyrene	Dioxin	Nickel
Benzo(b)fluoranthene	Endrin	PCBs
Benzo(k)fluoranthene	Fluoranthene	
Cadmium	Heptachlor	Pyrene
Chlordane	Heptachlor epoxide	Selenium
Chrysene	Hexachlorobenzene	Silver
Copper	Hexachlorocyclopentadiene	Toxaphene
DDD	Indeno(1,2,3-c,d)pyrene	Zinc
DDE		

Because BCF values can relatively easily be measured or estimated, the BCF is frequently used to determine the potential for a chemical to bioaccumulate. A compound with a BCF greater than 1,000 is considered to bioaccumulate in tissue (EPA 2004b).

For inorganic compounds, the BCF approach has not been shown to be effective in estimating the compound's ability to bioaccumulate. Information available, either through scientific literature or site-specific data, regarding the bioaccumulative potential of an inorganic site contaminant should be used to determine if the pathway is complete.

The list was developed by including organic compounds that either have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5 and inorganic compounds that are listed by the United States Environmental Protection Agency (EPA) as being bioaccumulative (EPA 2000). The BCF can also be estimated from a chemical's physical and chemical properties. A chemical's octanol-water partitioning coefficient (K_{ow}) along with defined regression equations can be used to estimate the BCF. EPA's Persistent, Bioaccumulative, and Toxic (PBT) Profiler (EPA 2004) can be used to estimate the BCF using the K_{ow} and linear regressions presented by Meylan et al. (1996). The PBT Profiler is located at http://www.pbtprofiler.net/. For compounds not found in the PBT Profiler, DEC recommends using a log K_{ow} greater than 3.5 to determine if a compound is bioaccumulative.

APPENDIX B

VOLATILE COMPOUNDS

Table B-1: List of Volatile Compounds of Potential Concern
Common volatile contaminants of concern at contaminated sites. A chemical is defined as volatile if the Henry's Law constant is 1×10^{-5} atm-m^3/mol or greater and the molecular weight less than 200 g/mole (g/mole; EPA 2004a). Those compounds in Table X of 18 AAC 75.345 that are volatile, based on the definition above, are listed below.

Acenaphthene	1,4-dichlorobenzene	Pyrene
Acetone	1,1-dichloroethane	Styrene
Anthracene	1,2-dichloroethane	1,1,2,2-tetrachloroethane
Benzene	1,1-dichloroethylene	Tetrachloroethylene
Bis(2-chlorethyl)ether	Cis-1,2-dichloroethylene	Toluene
Bromodichloromethane	Trans-1,2-dichloroethylene	1,2,4-trichlorobenzene
Carbon disulfide	1,2-dichloropropane	1,1,1-trichloroethane
Carbon tetrachloride	1,3-dichloropropane	1,1,2-trichloroethane
Chlorobenzene	Ethylbenzene	Trichloroethylene
Chlorodibromomethane	Fluorene	Vinyl acetate
Chloroform	Methyl bromide	Vinyl chloride
2-chlorophenol	Methylene chloride	Xylenes
Cyanide	Naphthalene	GRO
1,2-dichlorobenzene	Nitrobenzene	DRO

APPENDIX C

COMPOUNDS OF CONCERN FOR VAPOR MIGRATION

Table C-1: List of Compounds of Potential Concern for the Vapor Migration

A chemical is considered sufficiently toxic if the vapor concentration of the pure component poses an incremental lifetime cancer risk greater than 10-6 or a non-cancer hazard index greater than 1. A chemical is considered sufficiently volatile if it's Henry's Law constant is 1 x 10^{-5} atm-m^3/mol or greater.

Acenaphthene	Dibenzofuran	Hexachlorobenzene
Acetaldehyde	1,2-Dibromo-3-chloropropane	Hexachlorocyclopentadiene
Acetone	1,2-Dibromoethane (EDB)	Hexachloroethane
Acetonitrile	1,3-Dichlorobenzene	Hexane
Acetophenone	1,2-Dichlorobenzene	Hydrogen cyanide
Acrolein	1,4-Dichlorobenzene	Isobutanol
Acrylonitrile	2-Nitropropane	Mercury (elemental)
Aldrin	N-Nitroso-di-n-butylamine	Methacrylonitrile
alpha-HCH (alpha-BHC)	n-Propylbenzene	Methoxychlor
Benzaldehyde	o-Nitrotoluene	Methyl acetate
Benzene	o-Xylene	Methyl acrylate
Benzo(b)fluoranthene	p-Xylene	Methyl bromide
Benzylchloride	Pyrene	Methyl chloride chloromethane)
beta-Chloronaphthalene	sec-Butylbenzene	Methylcyclohexane
Biphenyl	Styrene	Methylene bromide
Bis(2-chloroethyl)ether	tert-Butylbenzene	Methylene chloride
Bis(2-chloroisopropyl)ether	1,1,1,2-Tetrachloroethane	Methylethylketone (2-butanone)
Bis(chloromethyl)ether	1,1,2,2-Tetrachloroethane	Methylisobutylketone
Bromodichloromethane	Tetrachloroethylene	Methylmethacrylate
Bromoform	Dichlorodifluoromethane	2-Methylnaphthalene
1,3-Butadiene	1,1-Dichloroethane	MTBE
Carbon disulfide	1,2-Dichloroethane	m-Xylene
Carbon tetrachloride	1,1-Dichloroethylene	Naphthalene
Chlordane	1,2-Dichloropropane	n-Butylbenzene
2-Chloro-1,3-butadiene (chloroprene)	1,3-Dichloropropene	Nitrobenzene
Chlorobenzene	Dieldrin	Toluene
1-Chlorobutane	Endosulfan	trans-1,2-Dichloroethylene
Chlorodibromomethane	Epichlorohydrin	1,1,2-Trichloro-1,2,2-trifluoroethane
Chlorodifluoromethane	Ethyl ether	1,2,4-Trichlorobenzene
Chloroethane (ethyl chloride)	Ethylacetate	1,1,2-Trichloroethane
Chloroform	Ethylbenzene	1,1,1-Trichloroethane
2-Chlorophenol	Ethylene oxide	Trichloroethylene
2-Chloropropane	Ethylmethacrylate	Trichlorofluoromethane
Chrysene	Fluorene	1,2,3-Trichloropropane
cis-1,2-Dichloroethylene	Furan	1,2,4-Trimethylbenzene
Crotonaldehyde (2-butenal)	Gamma-HCH (Lindane)	1,3,5-Trimethylbenzene
Cumene	Heptachlor	Vinyl acetate
DDE	Hexachloro-1,3-butadiene	Vinyl chloride (chloroethene)

Source: EPA 2002.

HUMAN HEALTH CONCEPTUAL SITE MODEL

Site: Former Communication Site Source Area A

Completed By: Gloria Beckman

Date Completed: 1 October 2006

Follow the directions below. Do not consider engineering or land use controls when describing pathways.

(1) *Check the media that could be directly affected by the release.*

(2) *For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Briefly list other mechanisms or reference the report for details.*

(3) *Check exposure media identified in (2).*

(4) *Check exposure pathways that are complete or need further evaluation. The pathways identified must agree with Sections 2 and 3 of the CSM Scoping Form.*

(5) *Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors, "F" for future receptors, or "C/F" for both current and future receptors.*

Media	Transport Mechanisms	Exposure Media	Exposure Pathways	Current & Future Receptors: Residents (adults or children)	Commercial or industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
☑ Surface Soil (0-2 ft bgs)	☑ Direct release to surface soil → check soil	☑ soil	☑ Incidental Soil Ingestion	F		C/F	C/F			
	☑ Migration or leaching to subsurface → check soil		☑ Dermal Absorption of Contaminants from Soil	F		C/F	C/F			
	☑ Migration or leaching to groundwater → check groundwater	☑ groundwater	☑ Ingestion of Groundwater	F						
	☑ Volatilization → check air		☑ Dermal Absorption of Contaminants in Groundwater	F						
	☐ Runoff or erosion → check surface water		☑ Inhalation of Volatile Compounds in Tap Water	F						
	☐ Uptake by plants or animals → check biota	☑ air	☑ Inhalation of Outdoor Air	F		C/F	C/F			
	☐ Other (list):		☑ Inhalation of Indoor Air	F		C/F	C/F			
☑ Subsurface Soil (2-15 ft bgs)	☑ Direct release to subsurface soil → check soil		☑ Inhalation of Fugitive Dust	F		C/F	C/F			
	☑ Migration to groundwater → check groundwater	☐ surface water	☐ Ingestion of Surface Water							
	☑ Volatilization → check air		☐ Dermal Absorption of Contaminants in Surface Water							
	☐ Other (list):		☐ Inhalation of Volatile Compounds in Tap Water							
☑ Ground-water	☑ Direct release to groundwater → check groundwater	☐ sediment	☐ Direct Contact with Sediment							
	☑ Volatilization → check air	☐ biota	☐ Ingestion of Wild Foods							
	☐ Flow to surface water body → check surface water									
	☐ Flow to sediment → check sediment									
	☐ Uptake by plants or animals → check biota									
	☐ Other (list):									
☐ Surface Water	☐ Direct release to surface water → check surface water									
	☐ Volatilization → check air									
	☐ Sedimentation → check sediment									
	☐ Uptake by plants or animals → check biota									
	☐ Other (list):									
☐ Sediment	☐ Direct release to sediment → check sediment									
	☐ Resuspension, runoff, or erosion → check surface water									
	☐ Uptake by plants or animals → check biota									
	☐ Other (list):									

Revised 3/21/06

Human Health Conceptual Site Model
Scoping Form

Site Name: Former Communication Site - Area B

File Number: _____

Completed by: Gloria Beckman

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, a CSM graphic and text must be submitted with the site characterization work plan.

General Instructions: Follow the italicized instructions in each section below.

1. *General Information:*

Sources *(check potential sources at the site)*

- [x] USTs
- [x] ASTs
- [x] Dispensers/fuel loading racks
- [x] Drums
- [x] Vehicles
- [x] Landfills
- [x] Transformers
- [x] Other: _____

Release Mechanisms *(check potential release mechanisms at the site)*

- [x] Spills
- [x] Leaks
- [x] Direct discharge
- [x] Burning
- [ ] Other: _____

Impacted Media *(check potentially-impacted media at the site)*

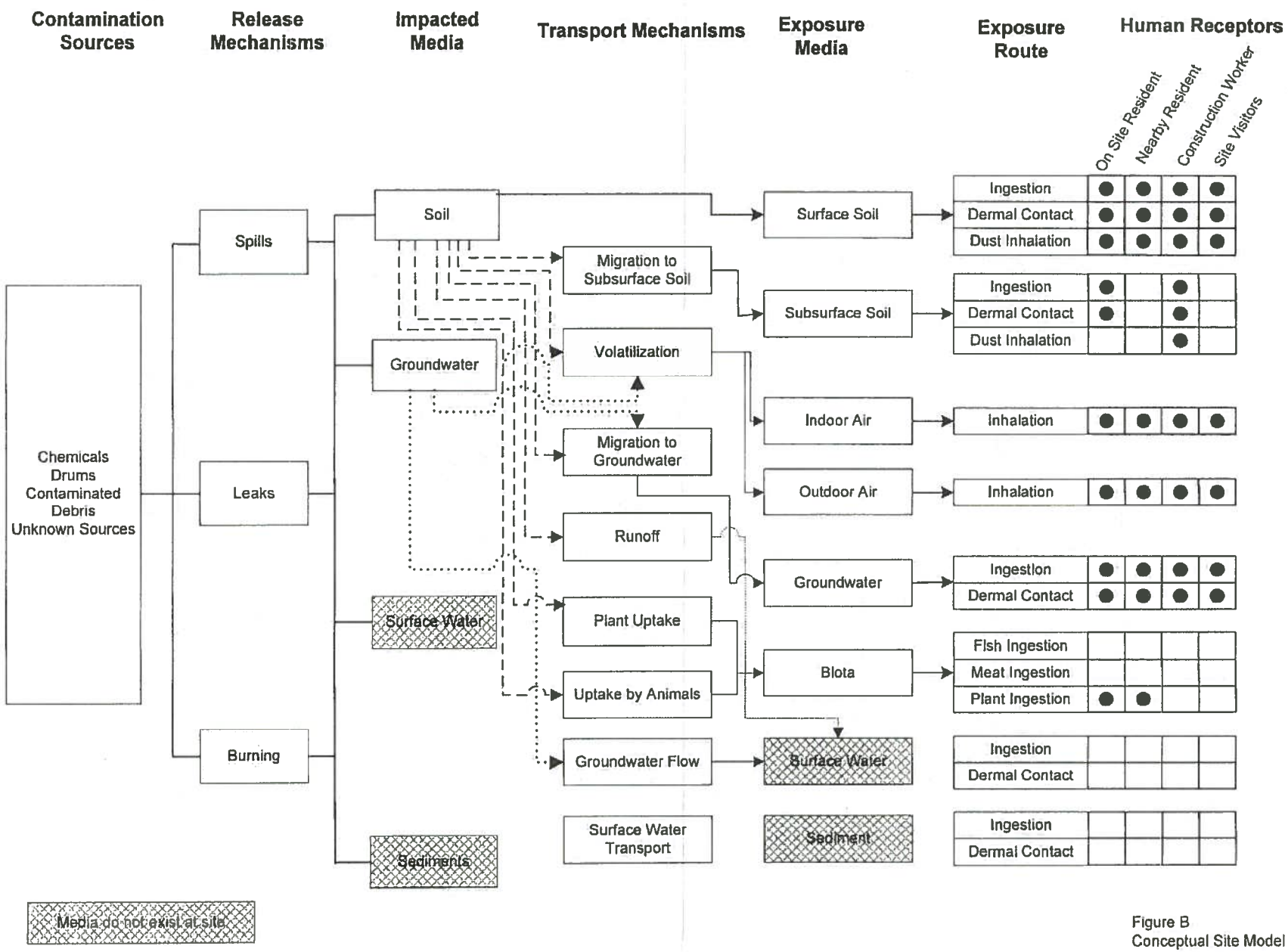
- [x] Surface soil (0-2 feet bgs*)
- [x] Subsurface Soil (>2 feet bgs)
- [x] Air
- [x] Groundwater
- [ ] Surface water
- [ ] Other: _____

Receptors (*check receptors that could be affected by contamination at the site)*

- [x] Residents (adult or child)
- [x] Commercial or industrial worker
- [x] Construction worker
- [ ] Subsistence harvester (i.e., gathers wild foods)
- [ ] Subsistence consumer (i.e., eats wild foods)
- [x] Site visitor
- [x] Trespasser
- [ ] Recreational user
- [ ] Farmer
- [ ] Other: _____

* bgs – below ground surface

Former Communication Site - Subarea B



- Potentially Complete Pathway
  Line patterns are only to provide clarity for reader

Figure B
Conceptual Site Model

2. **Exposure Pathways:** *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) **Direct Contact –**

1 Incidental Soil Ingestion

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

If both boxes are checked, label this pathway complete: COMPLETE

2 Dermal Absorption of Contaminants from Soil

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

Can the soil contaminants permeate the skin? (Contaminants listed below, or within the groups listed below, should be evaluated for dermal absorption). ☑

Arsenic	Lindane
Cadmium	PAHs
Chlordane	Pentachlorophenol
2,4-dichlorophenoxyacetic acid	PCBs
Dioxins	SVOCs
DDT	

If all of the boxes are checked, label this pathway complete: _____

b) **Ingestion –**

1 Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, OR are contaminants expected to migrate to groundwater in the future? ☑

Could the potentially affected groundwater be used as a current or future drinking water source? *Please note, only leave the box unchecked if ADEC has determined the groundwater is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350.* ☐

If both the boxes are checked, label this pathway complete: _____

2 Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water OR are contaminants expected to migrate to surface water in the future? ☑

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? *Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).* ☐

If both boxes are checked, label this pathway complete: _____

3 Ingestion of Wild Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild food? ☐

Do the site contaminants have the potential to bioaccumulate (*see* Appendix A)? ☐

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. the top 6 feet of soil, in groundwater that **could be** connected to surface water, etc.) ☑

If all of the boxes are checked, label this pathway complete: _____

c) Inhalation

1 Inhalation of Outdoor Air

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

Are the contaminants in soil volatile (*See Appendix B*)? ☑

If all of the boxes are checked, label this pathway complete: COMPLETE

2 Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be placed on the site in an area that could be affected by contaminant vapors? (i.e., within 100 feet, horizontally or vertically, of the contaminated soil or groundwater, <u>or</u> subject to "preferential pathways" that promote easy airflow, like utility conduits or rock fractures) ☑

Are volatile compounds present in soil or groundwater (*See Appendix C*)? ☑

If both boxes are checked, label this pathway complete: COMPLETE

3. Additional Exposure Pathways: *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

Dermal Exposure to Contaminants in Groundwater and Surface Water

Exposure from this pathway may need to be assessed only in cases where DEC water-quality or drinking-water standards are not being applied as cleanup levels. Examples of conditions that may warrant further investigation include:

- Climate permits recreational use of waters for swimming,
- Climate permits exposure to groundwater during activities, such as construction, without protective clothing, or
- Groundwater or surface water is used for household purposes.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Volatile Compounds in Household Water

Exposure from this pathway may need to be assessed only in cases where DEC water-quality or drinking-water standards are not being applied as cleanup levels. Examples of conditions that may warrant further investigation include:

- The contaminated water is used for household purposes such as showering, laundering, and dish washing, <u>and</u>
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix B)

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Fugitive Dust

Generally DEC soil ingestion cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway, although this is not true in the case of chromium. Examples of conditions that may warrant further investigation include:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers. This size can be inhaled and would be of concern for determining if this pathway is complete.

Check the box if further evaluation of this pathway is needed: ☑

Comments:

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during recreational or some types of subsistence activities. People then incidentally **ingest** sediment from normal hand-to-mouth activities. In addition, **dermal absorption of contaminants** may be of concern if people come in contact with sediment and the contaminants are able to permeate the skin (see dermal exposure to soil section). This type of exposure is rare but it should be investigated if:

- Climate permits recreational activities around sediment, and/or
- Community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

ADEC soil ingestion cleanup levels are protective of direct contact with sediment. If they are determined to be over-protective for sediment exposure at a particular site, other screening levels could be adopted or developed.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.)*

APPENDIX A

BIOACCUMULATIVE COMPOUNDS

Table A-1: List of Compounds of Potential Concern for Bioaccumulation
Organic compounds are identified as bioaccumulative if they have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5. Inorganic compounds are identified as bioaccumulative if they are listed as such by EPA (2000). Those compounds in Table X of 18 AAC 75.345 that are bioaccumulative, based on the definition above, are listed below.

Aldrin	DDT	Lead
Arsenic	Dibenzo(a,h)anthracene	Mercury
Benzo(a)anthracene	Dieldrin	Methoxychlor
Benzo(a)pyrene	Dioxin	Nickel
Benzo(b)fluoranthene	Endrin	PCBs
Benzo(k)fluoranthene	Fluoranthene	
Cadmium	Heptachlor	Pyrene
Chlordane	Heptachlor epoxide	Selenium
Chrysene	Hexachlorobenzene	Silver
Copper	Hexachlorocyclopentadiene	Toxaphene
DDD	Indeno(1,2,3-c,d)pyrene	Zinc
DDE		

Because BCF values can relatively easily be measured or estimated, the BCF is frequently used to determine the potential for a chemical to bioaccumulate. A compound with a BCF greater than 1,000 is considered to bioaccumulate in tissue (EPA 2004b).

For inorganic compounds, the BCF approach has not been shown to be effective in estimating the compound's ability to bioaccumulate. Information available, either through scientific literature or site-specific data, regarding the bioaccumulative potential of an inorganic site contaminant should be used to determine if the pathway is complete.

The list was developed by including organic compounds that either have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5 and inorganic compounds that are listed by the United States Environmental Protection Agency (EPA) as being bioaccumulative (EPA 2000). The BCF can also be estimated from a chemical's physical and chemical properties. A chemical's octanol-water partitioning coefficient (K_{ow}) along with defined regression equations can be used to estimate the BCF. EPA's Persistent, Bioaccumulative, and Toxic (PBT) Profiler (EPA 2004) can be used to estimate the BCF using the K_{ow} and linear regressions presented by Meylan et al. (1996). The PBT Profiler is located at http://www.pbtprofiler.net/. For compounds not found in the PBT Profiler, DEC recommends using a log K_{ow} greater than 3.5 to determine if a compound is bioaccumulative.

APPENDIX B

VOLATILE COMPOUNDS

Table B-1: List of Volatile Compounds of Potential Concern
Common volatile contaminants of concern at contaminated sites. A chemical is defined as volatile if the Henry's Law constant is 1×10^{-5} atm-m^3/mol or greater and the molecular weight less than 200 g/mole (g/mole; EPA 2004a). Those compounds in Table X of 18 AAC 75.345 that are volatile, based on the definition above, are listed below.

Acenaphthene	1,4-dichlorobenzene	Pyrene
Acetone	1,1-dichloroethane	Styrene
Anthracene	1,2-dichloroethane	1,1.2,2-tetrachloroethane
Benzene	1,1-dichloroethylene	Tetrachloroethylene
Bis(2-chlorethyl)ether	Cis-1,2-dichloroethylene	Toluene
Bromodichloromethane	Trans-1,2-dichloroethylene	1,2,4-trichlorobenzene
Carbon disulfide	1,2-dichloropropane	1,1,1-trichloroethane
Carbon tetrachloride	1,3-dichloropropane	1,1,2-trichloroethane
Chlorobenzene	Ethylbenzene	Trichloroethylene
Chlorodibromomethane	Fluorene	Vinyl acetate
Chloroform	Methyl bromide	Vinyl chloride
2-chlorophenol	Methylene chloride	Xylenes
Cyanide	Naphthalene	GRO
1,2-dichlorobenzene	Nitrobenzene	DRO

APPENDIX C

COMPOUNDS OF CONCERN FOR VAPOR MIGRATION

Table C-1: List of Compounds of Potential Concern for the Vapor Migration

A chemical is considered sufficiently toxic if the vapor concentration of the pure component poses an incremental lifetime cancer risk greater than 10-6 or a non-cancer hazard index greater than 1. A chemical is considered sufficiently volatile if it's Henry's Law constant is 1 x 10^{-5} atm-m^3/mol or greater.

Acenaphthene	Dibenzofuran	Hexachlorobenzene
Acetaldehyde	1,2-Dibromo-3-chloropropane	Hexachlorocyclopentadiene
Acetone	1,2-Dibromoethane (EDB)	Hexachloroethane
Acetonitrile	1,3-Dichlorobenzene	Hexane
Acetophenone	1,2-Dichlorobenzene	Hydrogen cyanide
Acrolein	1,4-Dichlorobenzene	Isobutanol
Acrylonitrile	2-Nitropropane	Mercury (elemental)
Aldrin	N-Nitroso-di-n-butylamine	Methacrylonitrile
alpha-HCH (alpha-BHC)	n-Propylbenzene	Methoxychlor
Benzaldehyde	o-Nitrotoluene	Methyl acetate
Benzene	o-Xylene	Methyl acrylate
Benzo(b)fluoranthene	p-Xylene	Methyl bromide
Benzylchloride	Pyrene	Methyl chloride chloromethane)
beta-Chloronaphthalene	sec-Butylbenzene	Methylcyclohexane
Biphenyl	Styrene	Methylene bromide
Bis(2-chloroethyl)ether	tert-Butylbenzene	Methylene chloride
Bis(2-chloroisopropyl)ether	1,1,1,2-Tetrachloroethane	Methylethylketone (2-butanone)
Bis(chloromethyl)ether	1,1,2,2-Tetrachloroethane	Methylisobutylketone
Bromodichloromethane	Tetrachloroethylene	Methylmethacrylate
Bromoform	Dichlorodifluoromethane	2-Methylnaphthalene
1,3-Butadiene	1,1-Dichloroethane	MTBE
Carbon disulfide	1,2-Dichloroethane	m-Xylene
Carbon tetrachloride	1,1-Dichloroethylene	Naphthalene
Chlordane	1,2-Dichloropropane	n-Butylbenzene
2-Chloro-1,3-butadiene (chloroprene)	1,3-Dichloropropene	Nitrobenzene
Chlorobenzene	Dieldrin	Toluene
1-Chlorobutane	Endosulfan	trans-1,2-Dichloroethylene
Chlorodibromomethane	Epichlorohydrin	1,1,2-Trichloro-1,2,2-trifluoroethane
Chlorodifluoromethane	Ethyl ether	1,2,4-Trichlorobenzene
Chloroethane (ethyl chloride)	Ethylacetate	1,1,2-Trichloroethane
Chloroform	Ethylbenzene	1,1,1-Trichloroethane
2-Chlorophenol	Ethylene oxide	Trichloroethylene
2-Chloropropane	Ethylmethacrylate	Trichlorofluoromethane
Chrysene	Fluorene	1,2,3-Trichloropropane
cis-1,2-Dichloroethylene	Furan	1,2,4-Trimethylbenzene
Crotonaldehyde (2-butenal)	Gamma-HCH (Lindane)	1,3,5-Trimethylbenzene
Cumene	Heptachlor	Vinyl acetate
DDE	Hexachloro-1,3-butadiene	Vinyl chloride (chloroethene)

Source: EPA 2002.

HUMAN HEALTH CONCEPTUAL SITE MODEL

Site: Former Communication Site Source Area B

Completed By: Gloria Beckman

Date Completed: 1 October 2006

Follow the directions below. Do not consider engineering or land use controls when describing pathways.

(1) *Check the media that could be directly affected by the release.*

(2) *For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Briefly list other mechanisms or reference the report for details.*

Media	Transport Mechanisms	
☑ Surface Soil (0-2 ft bgs)	☑ Direct release to surface soil	check soil
	☑ Migration or leaching to subsurface	check soil
	☑ Migration or leaching to groundwater	check groundwater
	☑ Volatilization	check air
	☐ Runoff or erosion	check surface water
	☐ Uptake by plants or animals	check biota
	☐ Other (list):	
☑ Subsurface Soil (2-15 ft bgs)	☑ Direct release to subsurface soil	check soil
	☑ Migration to groundwater	check groundwater
	☑ Volatilization	check air
	☐ Other (list):	
☑ Ground-water	☑ Direct release to groundwater	check groundwater
	☑ Volatilization	check air
	☐ Flow to surface water body	check surface water
	☐ Flow to sediment	check sediment
	☐ Uptake by plants or animals	check biota
	☐ Other (list):	
☐ Surface Water	☐ Direct release to surface water	check surface water
	☐ Volatilization	check air
	☐ Sedimentation	check sediment
	☐ Uptake by plants or animals	check biota
	☐ Other (list):	
☐ Sediment	☐ Direct release to sediment	check sediment
	☐ Resuspension, runoff, or erosion	check surface water
	☐ Uptake by plants or animals	check biota
	☐ Other (list):	

(3) *Check exposure media identified in (2).*

(4) *Check exposure pathways that are complete or need further evaluation. The pathways identified must agree with Sections 2 and 3 of the CSM Scoping Form.*

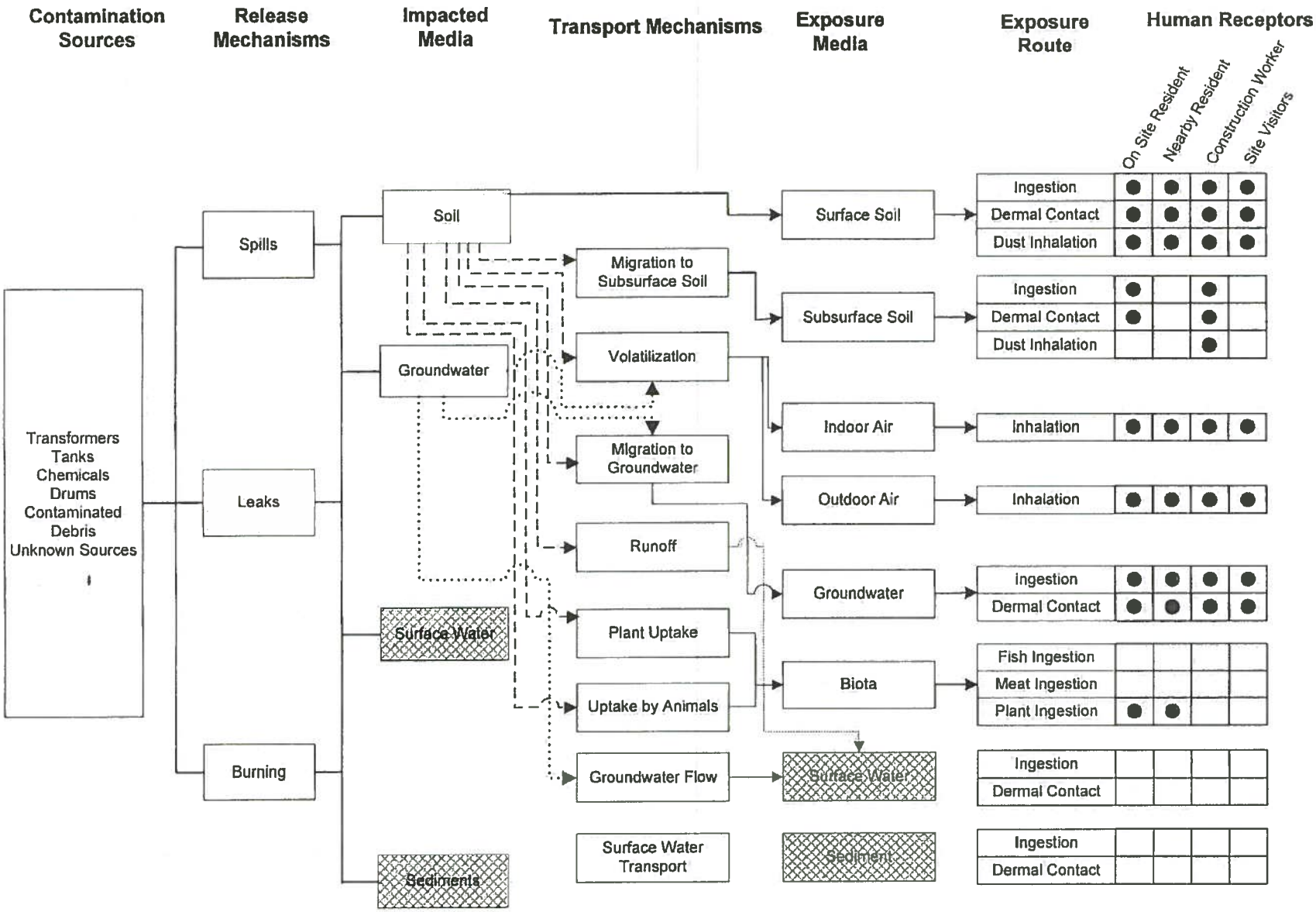
(5) *Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors, "F" for future receptors, or "C/F" for both current and future receptors.*

Current & Future Receptors

Exposure Media	Exposure Pathways	Residents (adults or children)	Commercial or industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
☑ soil	☑ Incidental Soil Ingestion	F		C/F	C/F			
	☑ Dermal Absorption of Contaminants from Soil	F		C/F	C/F			
☑ groundwater	☑ Ingestion of Groundwater	F						
	☑ Dermal Absorption of Contaminants in Groundwater	F						
	☑ Inhalation of Volatile Compounds in Tap Water	F						
☑ air	☑ Inhalation of Outdoor Air	F		C/F	C/F			
	☑ Inhalation of Indoor Air	F		C/F	C/F			
	☑ Inhalation of Fugitive Dust	F		C/F	C/F			
☐ surface water	☐ Ingestion of Surface Water							
	☐ Dermal Absorption of Contaminants in Surface Water							
	☐ Inhalation of Volatile Compounds in Tap Water							
☐ sediment	☐ Direct Contact with Sediment							
☐ biota	☐ Ingestion of Wild Foods							

Revised 3/21/06

Former Communication Site - Subarea C



- Potentially Complete Pathway
  Line patterns are only to provide clarity for reader

Figure C
Conceptual Site Model

Human Health Conceptual Site Model
Scoping Form

Site Name: Former Communication Site - Area C

File Number: _____

Completed by: Gloria Beckman

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, a CSM graphic and text must be submitted with the site characterization work plan.

General Instructions: Follow the italicized instructions in each section below.

1. *General Information:*

Sources *(check potential sources at the site)*

- [x] USTs
- [x] ASTs
- [x] Dispensers/fuel loading racks
- [x] Drums
- [x] Vehicles
- [ ] Landfills
- [x] Transformers
- [x] Other: _____

Release Mechanisms *(check potential release mechanisms at the site)*

- [x] Spills
- [x] Leaks
- [x] Direct discharge
- [ ] Burning
- [ ] Other: _____

Impacted Media *(check potentially-impacted media at the site)*

- [x] Surface soil (0-2 feet bgs*)
- [x] Subsurface Soil (>2 feet bgs)
- [x] Air
- [x] Groundwater
- [ ] Surface water
- [ ] Other: _____

Receptors *(check receptors that could be affected by contamination at the site)*

- [x] Residents (adult or child)
- [x] Commercial or industrial worker
- [x] Construction worker
- [ ] Subsistence harvester (i.e., gathers wild foods)
- [ ] Subsistence consumer (i.e., eats wild foods)
- [x] Site visitor
- [x] Trespasser
- [ ] Recreational user
- [ ] Farmer
- [ ] Other: _____

* bgs – below ground surface

2. Exposure Pathways: *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) Direct Contact –

1 Incidental Soil Ingestion

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

If both boxes are checked, label this pathway complete: COMPLETE

2 Dermal Absorption of Contaminants from Soil

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

Can the soil contaminants permeate the skin? (Contaminants listed below, or within the groups listed below, should be evaluated for dermal absorption). ☑

Arsenic	Lindane
Cadmium	PAHs
Chlordane	Pentachlorophenol
2,4-dichlorophenoxyacetic acid	PCBs
Dioxins	SVOCs
DDT	

If all of the boxes are checked, label this pathway complete: _____

b) Ingestion –

1 Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, OR are contaminants expected to migrate to groundwater in the future? ☑

Could the potentially affected groundwater be used as a current or future drinking water source? *Please note, only leave the box unchecked if ADEC has determined the groundwater is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350.* ☐

If both the boxes are checked, label this pathway complete: _____

2 Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water OR are contaminants expected to migrate to surface water in the future? ☑

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? *Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).* ☐

If both boxes are checked, label this pathway complete: _____

3 Ingestion of Wild Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild food? ☐

Do the site contaminants have the potential to bioaccumulate (*see* Appendix A)? ☐

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. the top 6 feet of soil, in groundwater that **could be** connected to surface water, etc.) ☑

If all of the boxes are checked, label this pathway complete: _____

c) Inhalation

1 Inhalation of Outdoor Air

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

Are the contaminants in soil volatile (*See Appendix B*)? ☑

If all of the boxes are checked, label this pathway complete: COMPLETE

2 Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be placed on the site in an area that could be affected by contaminant vapors? (i.e., within 100 feet, horizontally or vertically, of the contaminated soil or groundwater, <u>or</u> subject to "preferential pathways" that promote easy airflow, like utility conduits or rock fractures) ☑

Are volatile compounds present in soil or groundwater (*See Appendix C*)? ☑

If both boxes are checked, label this pathway complete: COMPLETE

3. Additional Exposure Pathways: *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

Dermal Exposure to Contaminants in Groundwater and Surface Water

Exposure from this pathway may need to be assessed only in cases where DEC water-quality or drinking-water standards are not being applied as cleanup levels. Examples of conditions that may warrant further investigation include:

- Climate permits recreational use of waters for swimming,
- Climate permits exposure to groundwater during activities, such as construction, without protective clothing, or
- Groundwater or surface water is used for household purposes.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Volatile Compounds in Household Water

Exposure from this pathway may need to be assessed only in cases where DEC water-quality or drinking-water standards are not being applied as cleanup levels. Examples of conditions that may warrant further investigation include:

- The contaminated water is used for household purposes such as showering, laundering, and dish washing, <u>and</u>
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix B)

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Fugitive Dust

Generally DEC soil ingestion cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway, although this is not true in the case of chromium. Examples of conditions that may warrant further investigation include:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers. This size can be inhaled and would be of concern for determining if this pathway is complete.

Check the box if further evaluation of this pathway is needed: ☑

Comments:

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during recreational or some types of subsistence activities. People then incidentally **ingest** sediment from normal hand-to-mouth activities. In addition, **dermal absorption of contaminants** may be of concern if people come in contact with sediment and the contaminants are able to permeate the skin (see dermal exposure to soil section). This type of exposure is rare but it should be investigated if:

- Climate permits recreational activities around sediment, and/or
- Community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

ADEC soil ingestion cleanup levels are protective of direct contact with sediment. If they are determined to be over-protective for sediment exposure at a particular site, other screening levels could be adopted or developed.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.)*

APPENDIX A

BIOACCUMULATIVE COMPOUNDS

Table A-1: List of Compounds of Potential Concern for Bioaccumulation

Organic compounds are identified as bioaccumulative if they have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5. Inorganic compounds are identified as bioaccumulative if they are listed as such by EPA (2000). Those compounds in Table X of 18 AAC 75.345 that are bioaccumulative, based on the definition above, are listed below.

Aldrin	DDT	Lead
Arsenic	Dibenzo(a,h)anthracene	Mercury
Benzo(a)anthracene	Dieldrin	Methoxychlor
Benzo(a)pyrene	Dioxin	Nickel
Benzo(b)fluoranthene	Endrin	PCBs
Benzo(k)fluoranthene	Fluoranthene	
Cadmium	Heptachlor	Pyrene
Chlordane	Heptachlor epoxide	Selenium
Chrysene	Hexachlorobenzene	Silver
Copper	Hexachlorocyclopentadiene	Toxaphene
DDD	Indeno(1,2,3-c,d)pyrene	Zinc
DDE		

Because BCF values can relatively easily be measured or estimated, the BCF is frequently used to determine the potential for a chemical to bioaccumulate. A compound with a BCF greater than 1,000 is considered to bioaccumulate in tissue (EPA 2004b).

For inorganic compounds, the BCF approach has not been shown to be effective in estimating the compound's ability to bioaccumulate. Information available, either through scientific literature or site-specific data, regarding the bioaccumulative potential of an inorganic site contaminant should be used to determine if the pathway is complete.

The list was developed by including organic compounds that either have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5 and inorganic compounds that are listed by the United States Environmental Protection Agency (EPA) as being bioaccumulative (EPA 2000). The BCF can also be estimated from a chemical's physical and chemical properties. A chemical's octanol-water partitioning coefficient (K_{ow}) along with defined regression equations can be used to estimate the BCF. EPA's Persistent, Bioaccumulative, and Toxic (PBT) Profiler (EPA 2004) can be used to estimate the BCF using the K_{ow} and linear regressions presented by Meylan et al. (1996). The PBT Profiler is located at http://www.pbtprofiler.net/. For compounds not found in the PBT Profiler, DEC recommends using a log K_{ow} greater than 3.5 to determine if a compound is bioaccumulative.

APPENDIX B

VOLATILE COMPOUNDS

Table B-1: List of Volatile Compounds of Potential Concern
Common volatile contaminants of concern at contaminated sites. A chemical is defined as volatile if the Henry's Law constant is 1×10^{-5} atm-m^3/mol or greater and the molecular weight less than 200 g/mole (g/mole; EPA 2004a). Those compounds in Table X of 18 AAC 75.345 that are volatile, based on the definition above, are listed below.

Acenaphthene	1,4-dichlorobenzene	Pyrene
Acetone	1,1-dichloroethane	Styrene
Anthracene	1,2-dichloroethane	1,1,2,2-tetrachloroethane
Benzene	1,1-dichloroethylene	Tetrachloroethylene
Bis(2-chlorethyl)ether	Cis-1,2-dichloroethylene	Toluene
Bromodichloromethane	Trans-1,2-dichloroethylene	1,2,4-trichlorobenzene
Carbon disulfide	1,2-dichloropropane	1,1,1-trichloroethane
Carbon tetrachloride	1,3-dichloropropane	1,1,2-trichloroethane
Chlorobenzene	Ethylbenzene	Trichloroethylene
Chlorodibromomethane	Fluorene	Vinyl acetate
Chloroform	Methyl bromide	Vinyl chloride
2-chlorophenol	Methylene chloride	Xylenes
Cyanide	Naphthalene	GRO
1,2-dichlorobenzene	Nitrobenzene	DRO

APPENDIX C

COMPOUNDS OF CONCERN FOR VAPOR MIGRATION

Table C-1: List of Compounds of Potential Concern for the Vapor Migration

A chemical is considered sufficiently toxic if the vapor concentration of the pure component poses an incremental lifetime cancer risk greater than 10-6 or a non-cancer hazard index greater than 1. A chemical is considered sufficiently volatile if it's Henry's Law constant is 1×10^{-5} atm-m^3/mol or greater.

Acenaphthene	Dibenzofuran	Hexachlorobenzene
Acetaldehyde	1,2-Dibromo-3-chloropropane	Hexachlorocyclopentadiene
Acetone	1,2-Dibromoethane (EDB)	Hexachloroethane
Acetonitrile	1,3-Dichlorobenzene	Hexane
Acetophenone	1,2-Dichlorobenzene	Hydrogen cyanide
Acrolein	1,4-Dichlorobenzene	Isobutanol
Acrylonitrile	2-Nitropropane	Mercury (elemental)
Aldrin	N-Nitroso-di-n-butylamine	Methacrylonitrile
alpha-HCH (alpha-BHC)	n-Propylbenzene	Methoxychlor
Benzaldehyde	o-Nitrotoluene	Methyl acetate
Benzene	o-Xylene	Methyl acrylate
Benzo(b)fluoranthene	p-Xylene	Methyl bromide
Benzylchloride	Pyrene	Methyl chloride chloromethane)
beta-Chloronaphthalene	sec-Butylbenzene	Methylcyclohexane
Biphenyl	Styrene	Methylene bromide
Bis(2-chloroethyl)ether	tert-Butylbenzene	Methylene chloride
Bis(2-chloroisopropyl)ether	1,1,1,2-Tetrachloroethane	Methylethylketone (2-butanone)
Bis(chloromethyl)ether	1,1,2,2-Tetrachloroethane	Methylisobutylketone
Bromodichloromethane	Tetrachloroethylene	Methylmethacrylate
Bromoform	Dichlorodifluoromethane	2-Methylnaphthalene
1,3-Butadiene	1,1-Dichloroethane	MTBE
Carbon disulfide	1,2-Dichloroethane	m-Xylene
Carbon tetrachloride	1,1-Dichloroethylene	Naphthalene
Chlordane	1,2-Dichloropropane	n-Butylbenzene
2-Chloro-1,3-butadiene (chloroprene)	1,3-Dichloropropene	Nitrobenzene
Chlorobenzene	Dieldrin	Toluene
1-Chlorobutane	Endosulfan	trans-1,2-Dichloroethylene
Chlorodibromomethane	Epichlorohydrin	1,1,2-Trichloro-1,2,2-trifluoroethane
Chlorodifluoromethane	Ethyl ether	1,2,4-Trichlorobenzene
Chloroethane (ethyl chloride)	Ethylacetate	1,1,2-Trichloroethane
Chloroform	Ethylbenzene	1,1,1-Trichloroethane
2-Chlorophenol	Ethylene oxide	Trichloroethylene
2-Chloropropane	Ethylmethacrylate	Trichlorofluoromethane
Chrysene	Fluorene	1,2,3-Trichloropropane
cis-1,2-Dichloroethylene	Furan	1,2,4-Trimethylbenzene
Crotonaldehyde (2-butenal)	Gamma-HCH (Lindane)	1,3,5-Trimethylbenzene
Cumene	Heptachlor	Vinyl acetate
DDE	Hexachloro-1,3-butadiene	Vinyl chloride (chloroethene)

Source: EPA 2002.

HUMAN HEALTH CONCEPTUAL SITE MODEL

Site: Former Communication Site Source Area C

Completed By: Gloria Beckman

Date Completed: 1 October 2006

Follow the directions below. Do not consider engineering or land use controls when describing pathways.

(1) *Check the media that could be directly affected by the release.*

(2) *For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Briefly list other mechanisms or reference the report for details.*

(3) *Check exposure media identified in (2).*

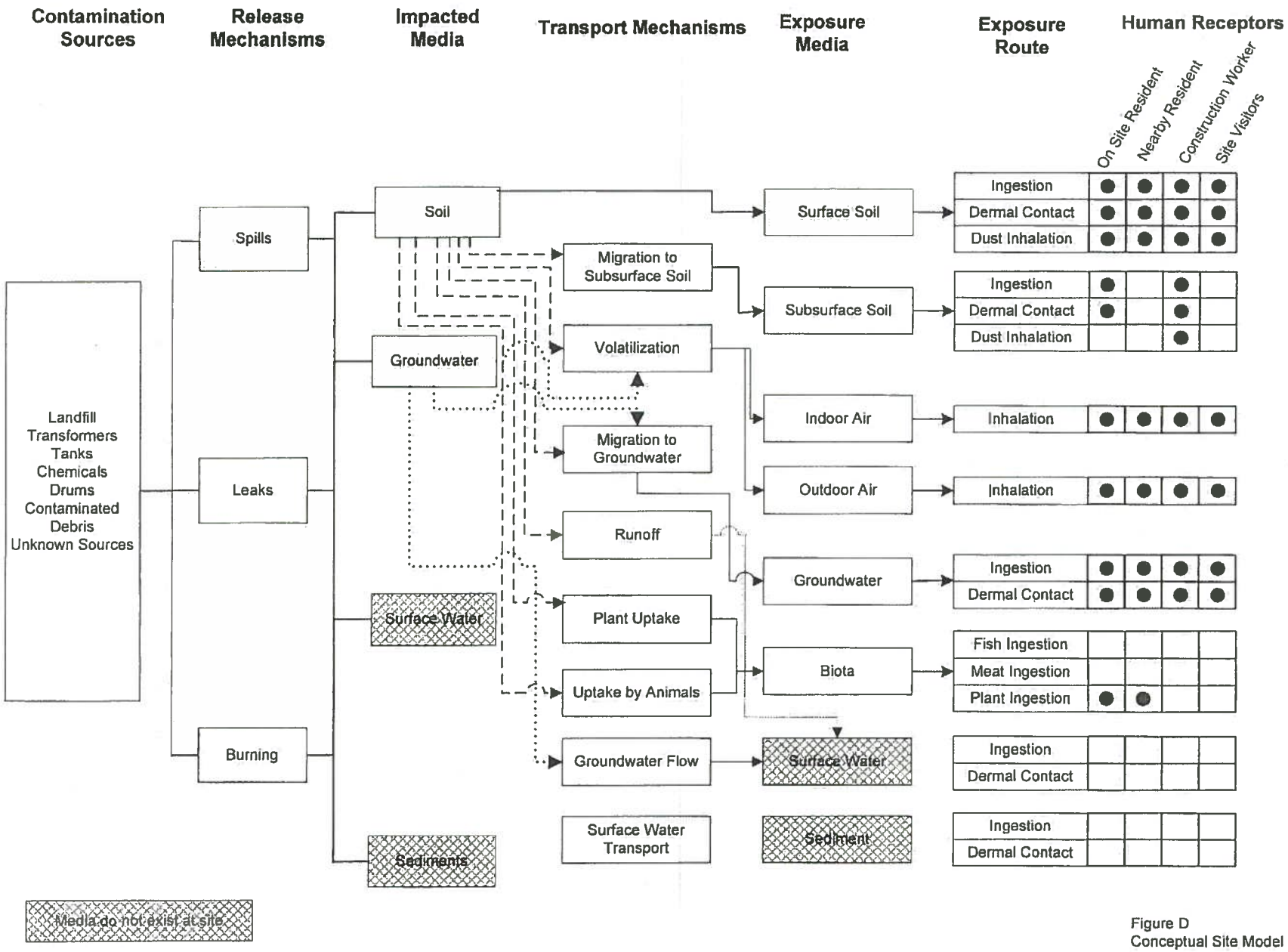
(4) *Check exposure pathways that are complete or need further evaluation. The pathways identified must agree with Sections 2 and 3 of the CSM Scoping Form.*

(5) *Identify the receptors potentially affected by each exposure pathway. Enter "C" for current receptors, "F" for future receptors, or "C/F" for both current and future receptors.*

Media	Transport Mechanisms	Exposure Media	Exposure Pathways	Current & Future Receptors: Residents (adults or children)	Commercial or industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
☑ Surface Soil (0-2 ft bgs)	☑ Direct release to surface soil — check soil	☑ soil	☑ Incidental Soil Ingestion	F		C/F	C/F			
	☑ Migration or leaching to subsurface — check soil		☑ Dermal Absorption of Contaminants from Soil	F		C/F	C/F			
	☑ Migration or leaching to groundwater — check groundwater	☑ groundwater	☑ Ingestion of Groundwater	F						
	☑ Volatilization — check air		☑ Dermal Absorption of Contaminants in Groundwater	F						
	☐ Runoff or erosion — check surface water		☑ Inhalation of Volatile Compounds in Tap Water	F						
	☐ Uptake by plants or animals — check biota	☑ air	☑ Inhalation of Outdoor Air	F		C/F	C/F			
	☐ Other (list):		☑ Inhalation of Indoor Air	F		C/F	C/F			
☑ Subsurface Soil (2-15 ft bgs)	☑ Direct release to subsurface soil — check soil		☑ Inhalation of Fugitive Dust	F		C/F	C/F			
	☑ Migration to groundwater — check groundwater	☐ surface water	☐ Ingestion of Surface Water							
	☑ Volatilization — check air		☐ Dermal Absorption of Contaminants in Surface Water							
	☐ Other (list):		☐ Inhalation of Volatile Compounds in Tap Water							
☑ Ground-water	☑ Direct release to groundwater — check groundwater	☐ sediment	☐ Direct Contact with Sediment							
	☑ Volatilization — check air	☐ biota	☐ Ingestion of Wild Foods							
	☐ Flow to surface water body — check surface water									
	☐ Flow to sediment — check sediment									
	☐ Uptake by plants or animals — check biota									
	☐ Other (list):									
☐ Surface Water	☐ Direct release to surface water — check surface water									
	☐ Volatilization — check air									
	☐ Sedimentation — check sediment									
	☐ Uptake by plants or animals — check biota									
	☐ Other (list):									
☐ Sediment	☐ Direct release to sediment — check sediment									
	☐ Resuspension, runoff, or erosion — check surface water									
	☐ Uptake by plants or animals — check biota									
	☐ Other (list):									

Revised 3/21/06

Former Communication Site - Subarea D



- Potentially Complete Pathway
  Line patterns are only to provide clarity for reader

Figure D
Conceptual Site Model

Human Health Conceptual Site Model
Scoping Form

Site Name: Former Communication Site - Area D

File Number: _____

Completed by: Gloria Beckman

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, a CSM graphic and text must be submitted with the site characterization work plan.

General Instructions: Follow the italicized instructions in each section below.

1. *General Information:*

Sources *(check potential sources at the site)*

- [x] USTs
- [x] ASTs
- [x] Dispensers/fuel loading racks
- [x] Drums
- [x] Vehicles
- [x] Landfills
- [x] Transformers
- [x] Other: _____

Release Mechanisms *(check potential release mechanisms at the site)*

- [x] Spills
- [x] Leaks
- [x] Direct discharge
- [x] Burning
- [ ] Other: _____

Impacted Media *(check potentially-impacted media at the site)*

- [x] Surface soil (0-2 feet bgs*)
- [x] Subsurface Soil (>2 feet bgs)
- [x] Air
- [x] Groundwater
- [ ] Surface water
- [ ] Other: _____

Receptors (*check receptors that could be affected by contamination at the site)*

- [x] Residents (adult or child)
- [x] Commercial or industrial worker
- [x] Construction worker
- [ ] Subsistence harvester (i.e., gathers wild foods)
- [ ] Subsistence consumer (i.e., eats wild foods)
- [x] Site visitor
- [x] Trespasser
- [ ] Recreational user
- [ ] Farmer
- [ ] Other: _____

* bgs – below ground surface

2. Exposure Pathways: *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) Direct Contact –

1 Incidental Soil Ingestion

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

If both boxes are checked, label this pathway complete: COMPLETE

2 Dermal Absorption of Contaminants from Soil

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

Can the soil contaminants permeate the skin? (Contaminants listed below, or within the groups listed below, should be evaluated for dermal absorption). ☑

Arsenic	Lindane
Cadmium	PAHs
Chlordane	Pentachlorophenol
2,4-dichlorophenoxyacetic acid	PCBs
Dioxins	SVOCs
DDT	

If all of the boxes are checked, label this pathway complete: _____

b) Ingestion –

1 Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, OR are contaminants expected to migrate to groundwater in the future? ☑

Could the potentially affected groundwater be used as a current or future drinking water source? *Please note, only leave the box unchecked if ADEC has determined the groundwater is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350.* ☐

If both the boxes are checked, label this pathway complete: _____

2 Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water OR are contaminants expected to migrate to surface water in the future? ☑

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? *Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).* ☐

If both boxes are checked, label this pathway complete: _____

3 Ingestion of Wild Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild food? ☐

Do the site contaminants have the potential to bioaccumulate (*see* Appendix A)? ☐

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. the top 6 feet of soil, in groundwater that **could be** connected to surface water, etc.) ☑

If all of the boxes are checked, label this pathway complete: _____

c) Inhalation

1 Inhalation of Outdoor Air

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

Are the contaminants in soil volatile (*See Appendix B*)? ☑

If all of the boxes are checked, label this pathway complete: COMPLETE

2 Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be placed on the site in an area that could be affected by contaminant vapors? (i.e., within 100 feet, horizontally or vertically, of the contaminated soil or groundwater, <u>or</u> subject to "preferential pathways" that promote easy airflow, like utility conduits or rock fractures) ☑

Are volatile compounds present in soil or groundwater (*See Appendix C*)? ☑

If both boxes are checked, label this pathway complete: COMPLETE

3. Additional Exposure Pathways: *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

Dermal Exposure to Contaminants in Groundwater and Surface Water

Exposure from this pathway may need to be assessed only in cases where DEC water-quality or drinking-water standards are not being applied as cleanup levels. Examples of conditions that may warrant further investigation include:

- Climate permits recreational use of waters for swimming,
- Climate permits exposure to groundwater during activities, such as construction, without protective clothing, or
- Groundwater or surface water is used for household purposes.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Volatile Compounds in Household Water

Exposure from this pathway may need to be assessed only in cases where DEC water-quality or drinking-water standards are not being applied as cleanup levels. Examples of conditions that may warrant further investigation include:

- The contaminated water is used for household purposes such as showering, laundering, and dish washing, and
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix B)

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Fugitive Dust

Generally DEC soil ingestion cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway, although this is not true in the case of chromium. Examples of conditions that may warrant further investigation include:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers. This size can be inhaled and would be of concern for determining if this pathway is complete.

Check the box if further evaluation of this pathway is needed: ☑

Comments:

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during recreational or some types of subsistence activities. People then incidentally **ingest** sediment from normal hand-to-mouth activities. In addition, **dermal absorption of contaminants** may be of concern if people come in contact with sediment and the contaminants are able to permeate the skin (see dermal exposure to soil section). This type of exposure is rare but it should be investigated if:

- Climate permits recreational activities around sediment, and/or
- Community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

ADEC soil ingestion cleanup levels are protective of direct contact with sediment. If they are determined to be over-protective for sediment exposure at a particular site, other screening levels could be adopted or developed.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

4. Other Comments (*Provide other comments as necessary to support the information provided in this form.)*

APPENDIX A

BIOACCUMULATIVE COMPOUNDS

Table A-1: List of Compounds of Potential Concern for Bioaccumulation
Organic compounds are identified as bioaccumulative if they have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5. Inorganic compounds are identified as bioaccumulative if they are listed as such by EPA (2000). Those compounds in Table X of 18 AAC 75.345 that are bioaccumulative, based on the definition above, are listed below.

Aldrin	DDT	Lead
Arsenic	Dibenzo(a,h)anthracene	Mercury
Benzo(a)anthracene	Dieldrin	Methoxychlor
Benzo(a)pyrene	Dioxin	Nickel
Benzo(b)fluoranthene	Endrin	PCBs
Benzo(k)fluoranthene	Fluoranthene	
Cadmium	Heptachlor	Pyrene
Chlordane	Heptachlor epoxide	Selenium
Chrysene	Hexachlorobenzene	Silver
Copper	Hexachlorocyclopentadiene	Toxaphene
DDD	Indeno(1,2,3-c,d)pyrene	Zinc
DDE		

Because BCF values can relatively easily be measured or estimated, the BCF is frequently used to determine the potential for a chemical to bioaccumulate. A compound with a BCF greater than 1,000 is considered to bioaccumulate in tissue (EPA 2004b).

For inorganic compounds, the BCF approach has not been shown to be effective in estimating the compound's ability to bioaccumulate. Information available, either through scientific literature or site-specific data, regarding the bioaccumulative potential of an inorganic site contaminant should be used to determine if the pathway is complete.

The list was developed by including organic compounds that either have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5 and inorganic compounds that are listed by the United States Environmental Protection Agency (EPA) as being bioaccumulative (EPA 2000). The BCF can also be estimated from a chemical's physical and chemical properties. A chemical's octanol-water partitioning coefficient (K_{ow}) along with defined regression equations can be used to estimate the BCF. EPA's Persistent, Bioaccumulative, and Toxic (PBT) Profiler (EPA 2004) can be used to estimate the BCF using the K_{ow} and linear regressions presented by Meylan et al. (1996). The PBT Profiler is located at http://www.pbtprofiler.net/. For compounds not found in the PBT Profiler, DEC recommends using a log K_{ow} greater than 3.5 to determine if a compound is bioaccumulative.

APPENDIX B

VOLATILE COMPOUNDS

Table B-1: List of Volatile Compounds of Potential Concern
Common volatile contaminants of concern at contaminated sites. A chemical is defined as volatile if the Henry's Law constant is 1×10^{-5} atm-m^3/mol or greater and the molecular weight less than 200 g/mole (g/mole; EPA 2004a). Those compounds in Table X of 18 AAC 75.345 that are volatile, based on the definition above, are listed below.

Acenaphthene	1,4-dichlorobenzene	Pyrene
Acetone	1,1-dichloroethane	Styrene
Anthracene	1,2-dichloroethane	1,1,2,2-tetrachloroethane
Benzene	1,1-dichloroethylene	Tetrachloroethylene
Bis(2-chlorethyl)ether	Cis-1,2-dichloroethylene	Toluene
Bromodichloromethane	Trans-1,2-dichloroethylene	1,2,4-trichlorobenzene
Carbon disulfide	1,2-dichloropropane	1,1,1-trichloroethane
Carbon tetrachloride	1,3-dichloropropane	1,1,2-trichloroethane
Chlorobenzene	Ethylbenzene	Trichloroethylene
Chlorodibromomethane	Fluorene	Vinyl acetate
Chloroform	Methyl bromide	Vinyl chloride
2-chlorophenol	Methylene chloride	Xylenes
Cyanide	Naphthalene	GRO
1,2-dichlorobenzene	Nitrobenzene	DRO

APPENDIX C

COMPOUNDS OF CONCERN FOR VAPOR MIGRATION

Table C-1: List of Compounds of Potential Concern for the Vapor Migration

A chemical is considered sufficiently toxic if the vapor concentration of the pure component poses an incremental lifetime cancer risk greater than 10-6 or a non-cancer hazard index greater than 1. A chemical is considered sufficiently volatile if it's Henry's Law constant is 1×10^{-5} atm-m^3/mol or greater.

Acenaphthene	Dibenzofuran	Hexachlorobenzene
Acetaldehyde	1,2-Dibromo-3-chloropropane	Hexachlorocyclopentadiene
Acetone	1,2-Dibromoethane (EDB)	Hexachloroethane
Acetonitrile	1,3-Dichlorobenzene	Hexane
Acetophenone	1,2-Dichlorobenzene	Hydrogen cyanide
Acrolein	1,4-Dichlorobenzene	Isobutanol
Acrylonitrile	2-Nitropropane	Mercury (elemental)
Aldrin	N-Nitroso-di-n-butylamine	Methacrylonitrile
alpha-HCH (alpha-BHC)	n-Propylbenzene	Methoxychlor
Benzaldehyde	o-Nitrotoluene	Methyl acetate
Benzene	o-Xylene	Methyl acrylate
Benzo(b)fluoranthene	p-Xylene	Methyl bromide
Benzylchloride	Pyrene	Methyl chloride chloromethane)
beta-Chloronaphthalene	sec-Butylbenzene	Methylcyclohexane
Biphenyl	Styrene	Methylene bromide
Bis(2-chloroethyl)ether	tert-Butylbenzene	Methylene chloride
Bis(2-chloroisopropyl)ether	1,1,1,2-Tetrachloroethane	Methylethylketone (2-butanone)
Bis(chloromethyl)ether	1,1,2,2-Tetrachloroethane	Methylisobutylketone
Bromodichloromethane	Tetrachloroethylene	Methylmethacrylate
Bromoform	Dichlorodifluoromethane	2-Methylnaphthalene
1,3-Butadiene	1,1-Dichloroethane	MTBE
Carbon disulfide	1,2-Dichloroethane	m-Xylene
Carbon tetrachloride	1,1-Dichloroethylene	Naphthalene
Chlordane	1,2-Dichloropropane	n-Butylbenzene
2-Chloro-1,3-butadiene (chloroprene)	1,3-Dichloropropene	Nitrobenzene
Chlorobenzene	Dieldrin	Toluene
1-Chlorobutane	Endosulfan	trans-1,2-Dichloroethylene
Chlorodibromomethane	Epichlorohydrin	1,1,2-Trichloro-1,2,2-trifluoroethane
Chlorodifluoromethane	Ethyl ether	1,2,4-Trichlorobenzene
Chloroethane (ethyl chloride)	Ethylacetate	1,1,2-Trichloroethane
Chloroform	Ethylbenzene	1,1,1-Trichloroethane
2-Chlorophenol	Ethylene oxide	Trichloroethylene
2-Chloropropane	Ethylmethacrylate	Trichlorofluoromethane
Chrysene	Fluorene	1,2,3-Trichloropropane
cis-1,2-Dichloroethylene	Furan	1,2,4-Trimethylbenzene
Crotonaldehyde (2-butenal)	Gamma-HCH (Lindane)	1,3,5-Trimethylbenzene
Cumene	Heptachlor	Vinyl acetate
DDE	Hexachloro-1,3-butadiene	Vinyl chloride (chloroethene)

Source: EPA 2002.

HUMAN HEALTH CONCEPTUAL SITE MODEL

Site: Former Communication Site Source Area D

Completed By: Gloria Beckman

Date Completed: 1 October 2006

Follow the directions below. Do not consider engineering or land use controls when describing pathways.

(1) *Check the media that could be directly affected by the release.*

(2) *For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Briefly list other mechanisms or reference the report for details.*

(3) *Check exposure media identified in (2).*

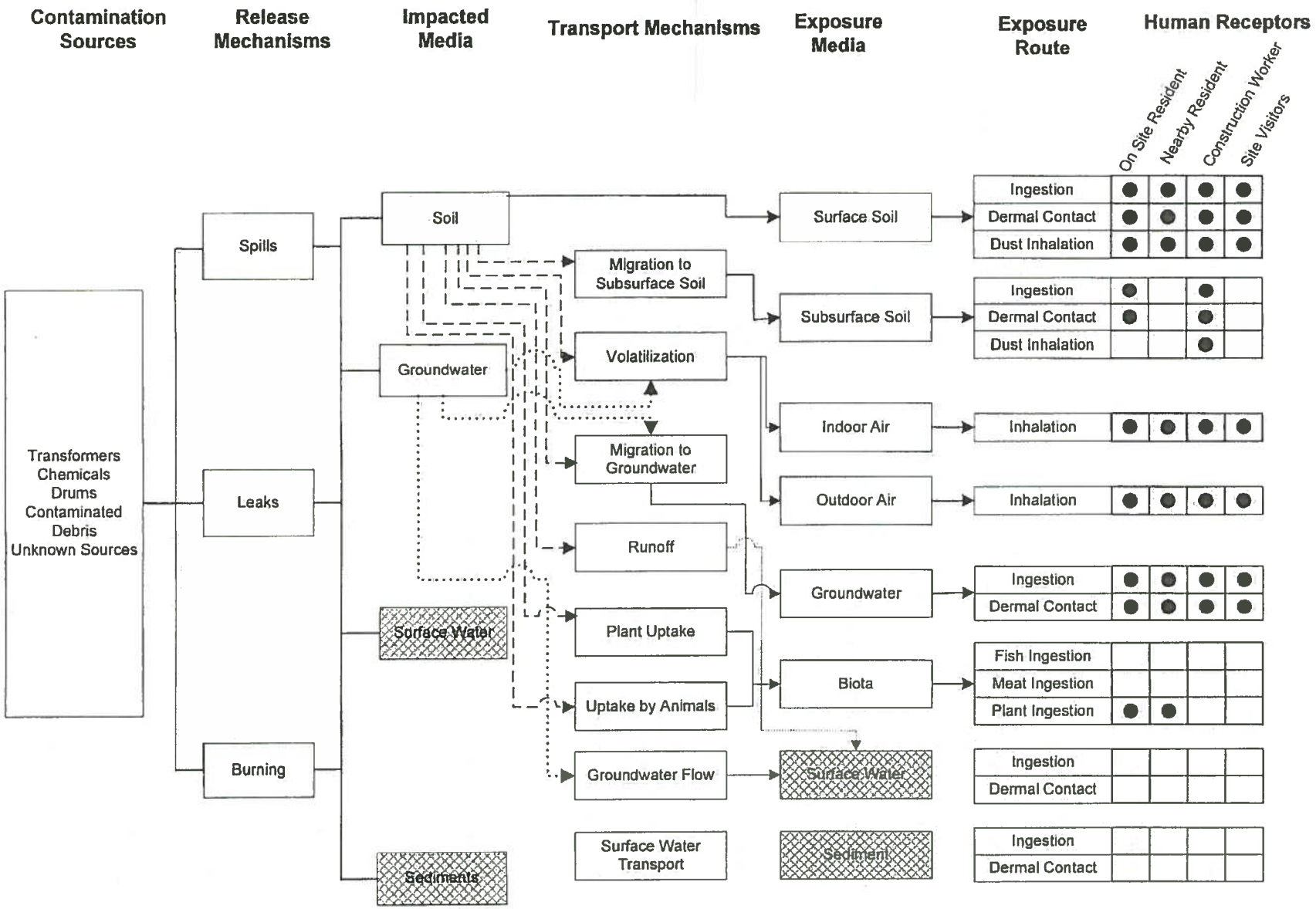
(4) *Check exposure pathways that are complete or need further evaluation. The pathways identified must agree with Sections 2 and 3 of the CSM Scoping Form.*

(5) *Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors, "F" for future receptors, or "C/F" for both current and future receptors.*

Media	Transport Mechanisms	Exposure Media	Exposure Pathways	Current & Future Receptors: Residents (adults or children)	Commercial or industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
☑ Surface Soil (0-2 ft bgs)	☑ Direct release to surface soil — check soil	☑ soil	☑ Incidental Soil Ingestion	F		C/F	C/F			
	☑ Migration or leaching to subsurface — check soil		☑ Dermal Absorption of Contaminants from Soil	F		C/F	C/F			
	☑ Migration or leaching to groundwater — check groundwater									
	☑ Volatilization — check air									
	☐ Runoff or erosion — check surface water									
	☐ Uptake by plants or animals — check biota									
	☐ Other (list):									
☑ Subsurface Soil (2-15 ft bgs)	☑ Direct release to subsurface soil — check soil	☑ groundwater	☑ Ingestion of Groundwater	F						
	☑ Migration to groundwater — check groundwater		☑ Dermal Absorption of Contaminants in Groundwater	F						
	☑ Volatilization — check air		☑ Inhalation of Volatile Compounds in Tap Water	F						
	☐ Other (list):									
☑ Ground-water	☑ Direct release to groundwater — check groundwater	☑ air	☑ Inhalation of Outdoor Air	F		C/F	C/F			
	☑ Volatilization — check air		☑ Inhalation of Indoor Air	F		C/F	C/F			
	☐ Flow to surface water body — check surface water		☑ Inhalation of Fugitive Dust	F		C/F	C/F			
	☐ Flow to sediment — check sediment									
	☐ Uptake by plants or animals — check biota									
	☐ Other (list):									
☐ Surface Water	☐ Direct release to surface water — check surface water	☐ surface water	☐ Ingestion of Surface Water							
	☐ Volatilization — check air		☐ Dermal Absorption of Contaminants in Surface Water							
	☐ Sedimentation — check sediment		☐ Inhalation of Volatile Compounds in Tap Water							
	☐ Uptake by plants or animals — check biota									
	☐ Other (list):									
☐ Sediment	☐ Direct release to sediment — check sediment	☐ sediment	☐ Direct Contact with Sediment							
	☐ Resuspension, runoff, or erosion — check surface water									
	☐ Uptake by plants or animals — check biota	☐ biota	☐ Ingestion of Wild Foods							
	☐ Other (list):									

Revised 3/21/06

Former Communication Site - Subarea E



- Potentially Complete Pathway
  Line patterns are only to provide clarity for reader

Figure E
Conceptual Site Model

Human Health Conceptual Site Model
Scoping Form

Site Name: Former Communication Site - Area E

File Number:

Completed by: Gloria Beckman

Introduction

The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, a CSM graphic and text must be submitted with the site characterization work plan.

General Instructions: Follow the italicized instructions in each section below.

1. *General Information:*

Sources *(check potential sources at the site)*

- ☐ USTs
- ☐ ASTs
- ☐ Dispensers/fuel loading racks
- ☑ Drums
- ☑ Vehicles
- ☐ Landfills
- ☑ Transformers
- ☑ Other: _____

Release Mechanisms *(check potential release mechanisms at the site)*

- ☑ Spills
- ☑ Leaks
- ☑ Direct discharge
- ☐ Burning
- ☐ Other: _____

Impacted Media *(check potentially-impacted media at the site)*

- ☑ Surface soil (0-2 feet bgs*)
- ☑ Subsurface Soil (>2 feet bgs)
- ☑ Air
- ☑ Groundwater
- ☐ Surface water
- ☐ Other: _____

Receptors (*check receptors that could be affected by contamination at the site)*

- ☑ Residents (adult or child)
- ☑ Commercial or industrial worker
- ☑ Construction worker
- ☐ Subsistence harvester (i.e., gathers wild foods)
- ☐ Subsistence consumer (i.e., eats wild foods)
- ☑ Site visitor
- ☑ Trespasser
- ☐ Recreational user
- ☐ Farmer
- ☐ Other: _____

* bgs – below ground surface

2. **Exposure Pathways:** *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) **Direct Contact –**

1 Incidental Soil Ingestion

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

If both boxes are checked, label this pathway complete: COMPLETE

2 Dermal Absorption of Contaminants from Soil

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

Can the soil contaminants permeate the skin? (Contaminants listed below, or within the groups listed below, should be evaluated for dermal absorption). ☑

Arsenic	Lindane
Cadmium	PAHs
Chlordane	Pentachlorophenol
2,4-dichlorophenoxyacetic acid	PCBs
Dioxins	SVOCs
DDT	

If all of the boxes are checked, label this pathway complete: _____

b) **Ingestion –**

1 Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, OR are contaminants expected to migrate to groundwater in the future? ☑

Could the potentially affected groundwater be used as a current or future drinking water source? *Please note, only leave the box unchecked if ADEC has determined the groundwater is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350.* ☐

If both the boxes are checked, label this pathway complete: _____

2 Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water OR are contaminants expected to migrate to surface water in the future? ☑

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? *Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities).* ☐

If both boxes are checked, label this pathway complete: _____

3 Ingestion of Wild Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild food? ☐

Do the site contaminants have the potential to bioaccumulate (*see* Appendix A)? ☐

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. the top 6 feet of soil, in groundwater that **could be** connected to surface water, etc.) ☑

If all of the boxes are checked, label this pathway complete: _____

c) Inhalation

1 Inhalation of Outdoor Air

Is soil contaminated anywhere between 0 and 15 feet bgs? ☑

Do people use the site or is there a chance they will use the site in the future? ☑

Are the contaminants in soil volatile (*See Appendix B*)? ☑

If all of the boxes are checked, label this pathway complete: COMPLETE

2 Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be placed on the site in an area that could be affected by contaminant vapors? (i.e., within 100 feet, horizontally or vertically, of the contaminated soil or groundwater, <u>or</u> subject to "preferential pathways" that promote easy airflow, like utility conduits or rock fractures) ☑

Are volatile compounds present in soil or groundwater (*See Appendix C*)? ☑

If both boxes are checked, label this pathway complete: COMPLETE

3. Additional Exposure Pathways: *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

Dermal Exposure to Contaminants in Groundwater and Surface Water

Exposure from this pathway may need to be assessed only in cases where DEC water-quality or drinking-water standards are not being applied as cleanup levels. Examples of conditions that may warrant further investigation include:

- Climate permits recreational use of waters for swimming,
- Climate permits exposure to groundwater during activities, such as construction, without protective clothing, or
- Groundwater or surface water is used for household purposes.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Volatile Compounds in Household Water

Exposure from this pathway may need to be assessed only in cases where DEC water-quality or drinking-water standards are not being applied as cleanup levels. Examples of conditions that may warrant further investigation include:

- The contaminated water is used for household purposes such as showering, laundering, and dish washing, and
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix B)

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Inhalation of Fugitive Dust

Generally DEC soil ingestion cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway, although this is not true in the case of chromium. Examples of conditions that may warrant further investigation include:

- Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- Dust particles are less than 10 micrometers. This size can be inhaled and would be of concern for determining if this pathway is complete.

Check the box if further evaluation of this pathway is needed: ☑

Comments:

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during recreational or some types of subsistence activities. People then incidentally **ingest** sediment from normal hand-to-mouth activities. In addition, **dermal absorption of contaminants** may be of concern if people come in contact with sediment and the contaminants are able to permeate the skin (see dermal exposure to soil section). This type of exposure is rare but it should be investigated if:

- Climate permits recreational activities around sediment, and/or
- Community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

ADEC soil ingestion cleanup levels are protective of direct contact with sediment. If they are determined to be over-protective for sediment exposure at a particular site, other screening levels could be adopted or developed.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

4. Other Comments *(Provide other comments as necessary to support the information provided in this form.)*

APPENDIX A

BIOACCUMULATIVE COMPOUNDS

Table A-1: List of Compounds of Potential Concern for Bioaccumulation

Organic compounds are identified as bioaccumulative if they have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5. Inorganic compounds are identified as bioaccumulative if they are listed as such by EPA (2000). Those compounds in Table X of 18 AAC 75.345 that are bioaccumulative, based on the definition above, are listed below.

Aldrin	DDT	Lead
Arsenic	Dibenzo(a,h)anthracene	Mercury
Benzo(a)anthracene	Dieldrin	Methoxychlor
Benzo(a)pyrene	Dioxin	Nickel
Benzo(b)fluoranthene	Endrin	PCBs
Benzo(k)fluoranthene	Fluoranthene	
Cadmium	Heptachlor	Pyrene
Chlordane	Heptachlor epoxide	Selenium
Chrysene	Hexachlorobenzene	Silver
Copper	Hexachlorocyclopentadiene	Toxaphene
DDD	Indeno(1,2,3-c,d)pyrene	Zinc
DDE		

Because BCF values can relatively easily be measured or estimated, the BCF is frequently used to determine the potential for a chemical to bioaccumulate. A compound with a BCF greater than 1,000 is considered to bioaccumulate in tissue (EPA 2004b).

For inorganic compounds, the BCF approach has not been shown to be effective in estimating the compound's ability to bioaccumulate. Information available, either through scientific literature or site-specific data, regarding the bioaccumulative potential of an inorganic site contaminant should be used to determine if the pathway is complete.

The list was developed by including organic compounds that either have a BCF equal to or greater than 1,000 or a log K_{ow} greater than 3.5 and inorganic compounds that are listed by the United States Environmental Protection Agency (EPA) as being bioaccumulative (EPA 2000). The BCF can also be estimated from a chemical's physical and chemical properties. A chemical's octanol-water partitioning coefficient (K_{ow}) along with defined regression equations can be used to estimate the BCF. EPA's Persistent, Bioaccumulative, and Toxic (PBT) Profiler (EPA 2004) can be used to estimate the BCF using the K_{ow} and linear regressions presented by Meylan et al. (1996). The PBT Profiler is located at http://www.pbtprofiler.net/. For compounds not found in the PBT Profiler, DEC recommends using a log K_{ow} greater than 3.5 to determine if a compound is bioaccumulative.

APPENDIX B

VOLATILE COMPOUNDS

Table B-1: List of Volatile Compounds of Potential Concern
Common volatile contaminants of concern at contaminated sites. A chemical is defined as volatile if the Henry's Law constant is 1×10^{-5} atm-m^3/mol or greater and the molecular weight less than 200 g/mole (g/mole; EPA 2004a). Those compounds in Table X of 18 AAC 75.345 that are volatile, based on the definition above, are listed below.

Acenaphthene	1,4-dichlorobenzene	Pyrene
Acetone	1,1-dichloroethane	Styrene
Anthracene	1,2-dichloroethane	1,1,2,2-tetrachloroethane
Benzene	1,1-dichloroethylene	Tetrachloroethylene
Bis(2-chlorethyl)ether	Cis-1,2-dichloroethylene	Toluene
Bromodichloromethane	Trans-1,2-dichloroethylene	1,2,4-trichlorobenzene
Carbon disulfide	1,2-dichloropropane	1,1,1-trichloroethane
Carbon tetrachloride	1,3-dichloropropane	1,1,2-trichloroethane
Chlorobenzene	Ethylbenzene	Trichloroethylene
Chlorodibromomethane	Fluorene	Vinyl acetate
Chloroform	Methyl bromide	Vinyl chloride
2-chlorophenol	Methylene chloride	Xylenes
Cyanide	Naphthalene	GRO
1,2-dichlorobenzene	Nitrobenzene	DRO

APPENDIX C

COMPOUNDS OF CONCERN FOR VAPOR MIGRATION

Table C-1: List of Compounds of Potential Concern for the Vapor Migration

A chemical is considered sufficiently toxic if the vapor concentration of the pure component poses an incremental lifetime cancer risk greater than 10-6 or a non-cancer hazard index greater than 1. A chemical is considered sufficiently volatile if it's Henry's Law constant is 1×10^{-5} atm-m^3/mol or greater.

Acenaphthene	Dibenzofuran	Hexachlorobenzene
Acetaldehyde	1,2-Dibromo-3-chloropropane	Hexachlorocyclopentadiene
Acetone	1,2-Dibromoethane (EDB)	Hexachloroethane
Acetonitrile	1,3-Dichlorobenzene	Hexane
Acetophenone	1,2-Dichlorobenzene	Hydrogen cyanide
Acrolein	1,4-Dichlorobenzene	Isobutanol
Acrylonitrile	2-Nitropropane	Mercury (elemental)
Aldrin	N-Nitroso-di-n-butylamine	Methacrylonitrile
alpha-HCH (alpha-BHC)	n-Propylbenzene	Methoxychlor
Benzaldehyde	o-Nitrotoluene	Methyl acetate
Benzene	o-Xylene	Methyl acrylate
Benzo(b)fluoranthene	p-Xylene	Methyl bromide
Benzylchloride	Pyrene	Methyl chloride chloromethane)
beta-Chloronaphthalene	sec-Butylbenzene	Methylcyclohexane
Biphenyl	Styrene	Methylene bromide
Bis(2-chloroethyl)ether	tert-Butylbenzene	Methylene chloride
Bis(2-chloroisopropyl)ether	1,1,1,2-Tetrachloroethane	Methylethylketone (2-butanone)
Bis(chloromethyl)ether	1,1,2,2-Tetrachloroethane	Methylisobutylketone
Bromodichloromethane	Tetrachloroethylene	Methylmethacrylate
Bromoform	Dichlorodifluoromethane	2-Methylnaphthalene
1,3-Butadiene	1,1-Dichloroethane	MTBE
Carbon disulfide	1,2-Dichloroethane	m-Xylene
Carbon tetrachloride	1,1-Dichloroethylene	Naphthalene
Chlordane	1,2-Dichloropropane	n-Butylbenzene
2-Chloro-1,3-butadiene (chloroprene)	1,3-Dichloropropene	Nitrobenzene
Chlorobenzene	Dieldrin	Toluene
1-Chlorobutane	Endosulfan	trans-1,2-Dichloroethylene
Chlorodibromomethane	Epichlorohydrin	1,1,2-Trichloro-1,2,2-trifluoroethane
Chlorodifluoromethane	Ethyl ether	1,2,4-Trichlorobenzene
Chloroethane (ethyl chloride)	Ethylacetate	1,1,2-Trichloroethane
Chloroform	Ethylbenzene	1,1,1-Trichloroethane
2-Chlorophenol	Ethylene oxide	Trichloroethylene
2-Chloropropane	Ethylmethacrylate	Trichlorofluoromethane
Chrysene	Fluorene	1,2,3-Trichloropropane
cis-1,2-Dichloroethylene	Furan	1,2,4-Trimethylbenzene
Crotonaldehyde (2-butenal)	Gamma-HCH (Lindane)	1,3,5-Trimethylbenzene
Cumene	Heptachlor	Vinyl acetate
DDE	Hexachloro-1,3-butadiene	Vinyl chloride (chloroethene)

Source: EPA 2002.

HUMAN HEALTH CONCEPTUAL SITE MODEL

Site: Former Communication Site Source Area E

Completed By: Gloria Beckman

Date Completed: 1 October 2006

Follow the directions below. Do not consider engineering or land use controls when describing pathways.

(1) *Check the media that could be directly affected by the release*

(2) *For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Briefly list other mechanisms or reference the report for details.*

(3) *Check exposure media identified in (2).*

(4) *Check exposure pathways that are complete or need further evaluation. The pathways identified must agree with Sections 2 and 3 of the CSM Scoping Form.*

(5) *Identify the receptors potentially affected by each exposure pathway. Enter "C" for current receptors, "F" for future receptors, or "C/F" for both current and future receptors.*

Media	Transport Mechanisms	Exposure Media	Exposure Pathways	Current & Future Receptors: Residents (adults or children)	Commercial or industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
☑ Surface Soil (0-2 ft bgs)	☑ Direct release to surface soil → check soil	☑ soil	☑ Incidental Soil Ingestion	F		C/F	C/F			
	☑ Migration or leaching to subsurface → check soil		☑ Dermal Absorption of Contaminants from Soil	F		C/F	C/F			
	☑ Migration or leaching to groundwater → check groundwater	☑ groundwater	☑ Ingestion of Groundwater	F						
	☑ Volatilization → check air		☑ Dermal Absorption of Contaminants in Groundwater	F						
	☐ Runoff or erosion → check surface water		☑ Inhalation of Volatile Compounds in Tap Water	F						
	☐ Uptake by plants or animals → check biota	☑ air	☑ Inhalation of Outdoor Air	F		C/F	C/F			
	☐ Other (list):		☑ Inhalation of Indoor Air	F		C/F	C/F			
☑ Subsurface Soil (2-15 ft bgs)	☑ Direct release to subsurface soil → check soil		☑ Inhalation of Fugitive Dust	F		C/F	C/F			
	☑ Migration to groundwater → check groundwater	☐ surface water	☐ Ingestion of Surface Water							
	☑ Volatilization → check air		☐ Dermal Absorption of Contaminants in Surface Water							
	☐ Other (list):		☐ Inhalation of Volatile Compounds in Tap Water							
☑ Ground-water	☑ Direct release to groundwater → check groundwater	☐ sediment	☐ Direct Contact with Sediment							
	☑ Volatilization → check air	☐ biota	☐ Ingestion of Wild Foods							
	☐ Flow to surface water body → check surface water									
	☐ Flow to sediment → check sediment									
	☐ Uptake by plants or animals → check biota									
	☐ Other (list):									
☐ Surface Water	☐ Direct release to surface water → check surface water									
	☐ Volatilization → check air									
	☐ Sedimentation → check sediment									
	☐ Uptake by plants or animals → check biota									
	☐ Other (list):									
☐ Sediment	☐ Direct release to sediment → check sediment									
	☐ Resuspension, runoff, or erosion → check surface water									
	☐ Uptake by plants or animals → check biota									
	☐ Other (list):									

Revised 3/21/06

ADEC Ecoscoping Form

Subarea A

Name: Former Communication Site (Taku Gardens)
Fort Wainwright, Alaska

Completed by: Gloria Beckman
Date: February 31, 2007

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? *Check the appropriate box.*

☐ Yes – *describe observations below and evaluate all of the remaining sections without taking any off-ramps.*
√ No – *go to next section.*

Comments: The site was cleared of most vegetation before the construction activities began. The topsoil was removed to approximately 12 inches below ground surface and stockpiled along the eastern edge of this subarea. The sparse vegetation that remained in the subarea did not appear to be stressed.

2. Receptor-Pathway Interactions

Check each terrestrial and aquatic pathways that could occur at the site.

Terrestrial Pathway Interactions

☐ Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water
☐ Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water
√ Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or water body)
√ Contaminant uptake by terrestrial plants whose roots are in contact with groundwater present within the root zone
√ Particulates deposited on plants directly or from rain splash
√ Contaminants dissolved into moisture in the soil, making them available to roots
√ Incidental ingestion and/or exposure while animals grub for food, burrow or groom
√ Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities

√ Bioaccumulatives (see Appendix C) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms

☐ Other site-specific exposure pathways

Aquatic Pathway Interactions

☐ Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow

☐ Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters

☐ Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water

☐ Deposition into sediments from upwelling of contaminated groundwater

☐ Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.

☐ Aquatic plants rooted in contaminated sediments

☐ Bioaccumulatives (see Appendix C) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms

☐ Other site-specific exposure pathways

If any of the above boxes are checked go on to the next section. If none are checked, end the evaluation and check the box below.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Low level PCBs were detected in soil samples collected from the stockpiled soil in the sound barrier. The vegetation was beginning to grow on the sound barrier by the 2006 summer.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

☐ Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity)

☐ Critical habitat or anadromous stream in an area that could be affected by the contamination

☐ Habitat that is important to the region that could be affected by the contamination

☐ Contamination is in a park, preserve, or wildlife refuge

If any of the above boxes are checked go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

√ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments: A chain-link fence surrounds the site and limits access to the construction site by terrestrial organisms. Limited vegetation across the area would not provide adequate food source or habitat for avian species in the area.

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

- ☐ Endangered-, threatened-, or species of special concern are present
- ☐ The aquatic environment is or could be affected
- ☐ Non-petroleum contaminants may be present, or the total area of petroleum-contaminated surface soil exceeds one-half acre

If any of the above boxes are checked go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

- ☐ Bioaccumulative chemicals are present (see Appendix C)
- ☐ Contaminants exceed benchmark levels (see Table ???)

If either box is checked complete a detailed Ecologcial Conceptual Site Model (see DEC's Conceptual Site Model Guidance) and submit it with the form to you DEC Project Manager.

If neither box is checked, check the box below and submit this form to your DEC Project Manager..

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

ADEC Ecoscoping Form

Subarea B

Name: Former Communication Site (Taku Gardens)
Fort Wainwright, Alaska

Completed by: Gloria Beckman
Date: February 31, 2007

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? *Check the appropriate box.*

☐ Yes – *describe observations below and evaluate all of the remaining sections without taking any off-ramps.*
√ No – *go to next section.*

Comments: The site was cleared of most vegetation before the construction activities began. The topsoil was removed to approximately 12 inches below ground surface and stockpiled along the eastern edge of the source area. The sparse vegetation that remained in the subarea did not appear to be stressed.

2. Receptor-Pathway Interactions

Check each terrestrial and aquatic pathways that could occur at the site.

Terrestrial Pathway Interactions

√ Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water
V Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water
√ Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or water body)
√ Contaminant uptake by terrestrial plants whose roots are in contact with groundwater present within the root zone
√ Particulates deposited on plants directly or from rain splash
√ Contaminants dissolved into moisture in the soil, making them available to roots
√ Incidental ingestion and/or exposure while animals grub for food, burrow or groom
√ Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities

√ Bioaccumulatives (see Appendix C) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms

☐ Other site-specific exposure pathways

Aquatic Pathway Interactions

√ Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow

☐ Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters

☐ Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water

☐ Deposition into sediments from upwelling of contaminated groundwater

☐ Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.

☐ Aquatic plants rooted in contaminated sediments

☐ Bioaccumulatives (see Appendix C) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms

☐ Other site-specific exposure pathways

If any of the above boxes are checked go on to the next section. If none are checked, end the evaluation and check the box below.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

An east to west drainage is located north of the buildings located in this area. Diesel contamination is present in this ditch. This ditch was used during dewatering activities performed in 2005 to transfer groundwater to a connecting drainage leading to the Chena River.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

☐ Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity)

☐ Critical habitat or anadromous stream in an area that could be affected by the contamination

☐ Habitat that is important to the region that could be affected by the contamination

☐ Contamination is in a park, preserve, or wildlife refuge

If any of the above boxes are checked go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

√ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments: A chain-link fence surrounds the site and limits access to the construction site by terrestrial organisms. Limited vegetation across the area would not provide adequate food source or habitat for avian species in the area.

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

- ☐ Endangered-, threatened-, or species of special concern are present
- ☐ The aquatic environment is or could be affected
- ☐ Non-petroleum contaminants may be present, or the total area of petroleum-contaminated surface soil exceeds one-half acre

If any of the above boxes are checked go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

- ☐ Bioaccumulative chemicals are present (see Appendix C)
- ☐ Contaminants exceed benchmark levels (see Table ???)

If either box is checked complete a detailed Ecologcial Conceptual Site Model (see DEC's Conceptual Site Model Guidance) and submit it with the form to you DEC Project Manager.

If neither box is checked, check the box below and submit this form to your DEC Project Manager..

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

ADEC Ecoscoping Form

Subarea C

Name: Former Communication Site (Taku Gardens)
Fort Wainwright, Alaska

Completed by: Gloria Beckman
Date: February 31, 2007

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? *Check the appropriate box.*

☐ Yes – *describe observations below and evaluate all of the remaining sections without taking any off-ramps.*
√ No – *go to next section.*

Comments: The site was cleared of most vegetation before the construction activities began. The topsoil was removed to approximately 12 inches below ground surface and stockpiled along the eastern edge of the source area. The sparse vegetation that remained in the subarea did not appear to be stressed.

2. Receptor-Pathway Interactions

Check each terrestrial and aquatic pathways that could occur at the site.

Terrestrial Pathway Interactions

√ Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water
V Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water
√ Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or water body)
√ Contaminant uptake by terrestrial plants whose roots are in contact with groundwater present within the root zone
√ Particulates deposited on plants directly or from rain splash
√ Contaminants dissolved into moisture in the soil, making them available to roots
√ Incidental ingestion and/or exposure while animals grub for food, burrow or groom
√ Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities

√ Bioaccumulatives (see Appendix C) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms

☐ Other site-specific exposure pathways

Aquatic Pathway Interactions

√ Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow

☐ Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters

☐ Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water

☐ Deposition into sediments from upwelling of contaminated groundwater

☐ Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.

☐ Aquatic plants rooted in contaminated sediments

☐ Bioaccumulatives (see Appendix C) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms

☐ Other site-specific exposure pathways

If any of the above boxes are checked go on to the next section. If none are checked, end the evaluation and check the box below.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

An east to west drainage is located north of the buildings located in this area. Diesel contamination is present in this ditch. This ditch was used during dewatering activities performed in 2005 to transfer groundwater to a connecting south to north drainage leading to the Chena River. Bales of straw were placed into this drainage to remove the sediment in the water before it traversed off-site and eventually to the Chena River.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

☐ Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity)

☐ Critical habitat or anadromous stream in an area that could be affected by the contamination

☐ Habitat that is important to the region that could be affected by the contamination

☐ Contamination is in a park, preserve, or wildlife refuge

If any of the above boxes are checked go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

√ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments: A chain-link fence surrounds the site and limits access to the construction site by terrestrial organisms. Limited vegetation across the area would not provide adequate food source or habitat for avian species in the area.

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

☐ Endangered-, threatened-, or species of special concern are present
☐ The aquatic environment is or could be affected
☐ Non-petroleum contaminants may be present, or the total area of petroleum-contaminated surface soil exceeds one-half acre

If any of the above boxes are checked go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

☐ Bioaccumulative chemicals are present (see Appendix C)
☐ Contaminants exceed benchmark levels (see Table ???)

If either box is checked complete a detailed Ecologcial Conceptual Site Model (see DEC's Conceptual Site Model Guidance) and submit it with the form to you DEC Project Manager.

If neither box is checked, check the box below and submit this form to your DEC Project Manager..

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

ADEC Ecoscoping Form

Subarea D

Name: Former Communication Site (Taku Gardens)
Fort Wainwright, Alaska

Completed by: Gloria Beckman
Date: February 31, 2007

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? *Check the appropriate box.*

☐ Yes – *describe observations below and evaluate all of the remaining sections without taking any off-ramps.*
√ No – *go to next section.*

Comments: The site was cleared of most vegetation before the construction activities began. The topsoil was removed to approximately 12 inches below ground surface and stockpiled along the eastern and southern edge of this subarea. The sparse vegetation that remained in the subarea did not appear to be stressed.

2. Receptor-Pathway Interactions

Check each terrestrial and aquatic pathways that could occur at the site.

Terrestrial Pathway Interactions

☐ Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water
☐ Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water
√ Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or water body)
√ Contaminant uptake by terrestrial plants whose roots are in contact with groundwater present within the root zone
√ Particulates deposited on plants directly or from rain splash
√ Contaminants dissolved into moisture in the soil, making them available to roots
√ Incidental ingestion and/or exposure while animals grub for food, burrow or groom
√ Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities

√ Bioaccumulatives (see Appendix C) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms

☐ Other site-specific exposure pathways

Aquatic Pathway Interactions

☐ Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow

☐ Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters

☐ Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water

☐ Deposition into sediments from upwelling of contaminated groundwater

☐ Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.

☐ Aquatic plants rooted in contaminated sediments

☐ Bioaccumulatives (see Appendix C) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms

☐ Other site-specific exposure pathways

If any of the above boxes are checked go on to the next section. If none are checked, end the evaluation and check the box below.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Low level PCBs were detected in soil samples collected from the stockpiled soil in the sound barrier. The vegetation was beginning to grow on the sound barrier by the 2006 summer.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

☐ Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity)

☐ Critical habitat or anadromous stream in an area that could be affected by the contamination

☐ Habitat that is important to the region that could be affected by the contamination

☐ Contamination is in a park, preserve, or wildlife refuge

If any of the above boxes are checked go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

√ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments: A chain-link fence surrounds the site and limits access to the construction site by terrestrial organisms. Limited vegetation across the area would not provide adequate food source or habitat for avian species in the area.

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

- ☐ Endangered-, threatened-, or species of special concern are present
- ☐ The aquatic environment is or could be affected
- ☐ Non-petroleum contaminants may be present, or the total area of petroleum-contaminated surface soil exceeds one-half acre

If any of the above boxes are checked go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

- ☐ Bioaccumulative chemicals are present (see Appendix C)
- ☐ Contaminants exceed benchmark levels (see Table ???)

If either box is checked complete a detailed Ecologcial Conceptual Site Model (see DEC's Conceptual Site Model Guidance) and submit it with the form to you DEC Project Manager.

If neither box is checked, check the box below and submit this form to your DEC Project Manager..

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

ADEC Ecoscoping Form

Subarea E

Name: Former Communication Site (Taku Gardens)
Fort Wainwright, Alaska

Completed by: Gloria Beckman
Date: February 31, 2007

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? *Check the appropriate box.*

☐ Yes – *describe observations below and evaluate all of the remaining sections without taking any off-ramps.*
√ No – *go to next section.*

Comments: The site was cleared of most vegetation before the construction activities began. The topsoil was removed to approximately 12 inches below ground surface and stockpiled along the eastern and southern edge of this subarea. The sparse vegetation that remained in the subarea did not appear to be stressed. Abundant mushroom growth was noted in this subarea trenches and excavations. This is one of the few subarea where grass was undisturbed and did not appear to be visually impacted from high level PCBs near the former location of Building 52.

2. Receptor-Pathway Interactions

Check each terrestrial and aquatic pathways that could occur at the site.

Terrestrial Pathway Interactions

√ Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water

√ Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water

√ Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or water body)

√ Contaminant uptake by terrestrial plants whose roots are in contact with groundwater present within the root zone

√ Particulates deposited on plants directly or from rain splash

√ Contaminants dissolved into moisture in the soil, making them available to roots

√ Incidental ingestion and/or exposure while animals grub for food, burrow or groom

√ Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities

√ Bioaccumulatives (see Appendix C) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms

☐ Other site-specific exposure pathways

Aquatic Pathway Interactions

√ Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow

☐ Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters

☐ Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water

☐ Deposition into sediments from upwelling of contaminated groundwater

☐ Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.

☐ Aquatic plants rooted in contaminated sediments

☐ Bioaccumulatives (see Appendix C) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms

☐ Other site-specific exposure pathways

If any of the above boxes are checked go on to the next section. If none are checked, end the evaluation and check the box below.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments: During spring breakup, snow melt runoff accumulated in the southwest corner of this subarea. The runoff from adjacent housing development also drains into this subarea before entering the south to north drainage that parallels the western section of the source area. A settling pond was constructed in the spring of 2006 southwest of the area with seasonal flooding. Surface water and sediment samples were collected and analyzed by the off-site laboratory. Organic compounds were not detected in the water and sediment samples; only low-level metals were detected. This data confirmed that runoff from snow melt was not causing contamination from the exclusion zone to migrate off-site.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

☐ Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity)

- ☐ Critical habitat or anadromous stream in an area that could be affected by the contamination
- ☐ Habitat that is important to the region that could be affected by the contamination
- ☐ Contamination is in a park, preserve, or wildlife refuge

If any of the above boxes are checked go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

√ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments: A chain-link fence surrounds the site and limits access to the construction site by terrestrial organisms.

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

- ☐ Endangered-, threatened-, or species of special concern are present
- ☐ The aquatic environment is or could be affected
- ☐ Non-petroleum contaminants may be present, or the total area of petroleum-contaminated surface soil exceeds one-half acre

If any of the above boxes are checked go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

- ☐ Bioaccumulative chemicals are present (see Appendix C)
- ☐ Contaminants exceed benchmark levels (see Table ???)

If either box is checked complete a detailed Ecologcial Conceptual Site Model (see DEC's Conceptual Site Model Guidance) and submit it with the form to you DEC Project Manager.

If neither box is checked, check the box below and submit this form to your DEC Project Manager..

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

APPENDIX G

716th EOD Detachment Incident Reports (2004 and 2005) and Photographs

EXPLOSIVE ORDNANCE INCIDENT REPORT

For use of this form, see FM 9-15; the proponent agency is US Army Training and Doctrine Command.

Incident Number: 176-18-04

Control Number:

Unusual ☐

Routine ☐

Reported:	24-Mar-04 15:00
Departed Unit:	24-Mar-04 16:03
Arrived Site:	24-Mar-04 20:30
Depart Site:	25-Mar-04 15:18
Arrived Unit:	25-Mar-04 17:44
Travel Hours:	6.88
Air Hours:	4.00
Miles:	0
Man Hours:	51.37
Adjust Hours:	0

Incident Location:
FT. WAINWRIGHT,GAS STATION

FT WAINWRIGHT, AK (US)

Grid:
Latitude:
Longitude:

Supported:
FWA MILITARY POLICE
SSG BROCKMAN
FWA

FT. WAINWRIGHT, AK

Phone: (907) 353-7535
Other Contact:

Item(s) Reported:
155mm Projectile

Personnel Dispatched
SFC Morrison, Neil J.
SSG Wilson, Jay P.

Ordnance Item(s) Identification and Disposition

Quantity:	UI:	Description / Fuze Condition / Lot Number	NEW (lbs):	Initial Disposition:	Final Disposition:
1	EA	Old style bomb box fins (N/A) Lot Unkown	0	OTHER	SCRAP
2	EA	37MM RECOILESS RIFLE GRENADE CASING (Inert) Lo	0	OTHER	SCRAP
1	EA	3.5 inch rocket training warhead (Unarmed) Lot Unkow	0	OTHER	SCRAP
1	EA	3.5 inch rocket with rkt motor expended (Training) Lot	0	OTHER	SCRAP
1	EA	8" artillry round (Unarmed) Lot Unkown	0	TRANS SDA	DISP BY DET
		Total Net Explosive Weight (lbs):	0.00		

Test Form 52-1

EXPLOSIVE ORDNANCE INCIDENT REPORT

Incident Number: 176-18-04

Categories:

- ☐ News Media Coverage
- ☐ Civil Law Enforcement
- ☐ Chemical Response
- ☐ Nuclear Response
- ☐ Transportation Accident
- ☐ USACOE Supported
- ☐ Reserve Component Support
- ☐ Formerly Used Defense Site
- ☐ Injuries
- ☐ Death(s)
- ☐ Drug Related

Threat:

- ☐ Imminent Threat
- ☐ Threat
- ☐ Extended Threat

SecDef Approval

- ☐ Yes
- ☒ No

Demolition Materials Used:

DODIC:	Quantity:	UI:	Description / Lot Number:	NEW (lbs):	Total NEW (lbs):
MN06 (1375-1233)	4	EA	CAP, BLASTING, DELAY, M14 Lot SHK97M001-001	0.01	0.04
M766 (1375-1671)	4	EA	IGNITER, TIME BLASTING FUSE M60 Lot SGK86F011-004	0.0001	0.0004
M023 (1375-7040)	4	EA	CHG DEMO, M112 COMP C-4 Lot LOP77L 007-002	1.25	5

Total Net Explosive Weight (lbs): 5.04

Environmental Protection Agency Coordination:

Agency: FWA Environmental (DPW)
Person Contacted: CATHY
Phone: (907) 353-6249
Contact Date/Time:

On-Site Dispoal Approve ☐
Permit Granted:
EPA Permit #:

Additional Information:

Telephoned the EPA agency at Ft Wainwright and got their answering service. A message was left regarding the incident and the unit phone numbers and SSG Wilson and SFC Morrison as a point of contact.

Signature of Unit Commander: (Record Copy Only) Douglas B Guard

Guard, Douglas B., Cpt, OD, Commanding

Date: 3-29-04

Test Form 52-1 (Reverse)

EXPLOSIVE ORDNANCE INCIDENT REPORT

For use of this form, see FM 9-15; the proponent agency is US Army Training and Doctrine Command.

Incident Number: 176-21-04

Control Number:

Unusual ☐

Routine ☐

Reported:	09-Apr-04 09:25
Departed Unit:	09-Apr-04 09:25
Arrived Site:	09-Apr-04 09:30
Depart Site:	09-Apr-04 12:10
Arrived Unit:	09-Apr-04 12:10
Travel Hours:	0.08
Air Hours:	0.00
Miles:	0
Man Hours:	5.50
Adjust Hours:	0

Incident Location:
FT. WAINWRIGHT,GAS STATION

FT WAINWRIGHT, AK (US)

Grid:
Latitude:
Longitude:

Supported:
FWA MILITARY POLICE
FWA MP DESK SERGEANT
1066 GAFFNEY ROAD
BUILDING 3446
FT. WAINWRIGHT, AK

Phone: (907) 353-7535
Other Contact:

Item(s) Reported:
1 ea Projo

Personnel Dispatched

CPT Guard, Douglas B.

SFC Ferris, Thomas L.

Ordnance Item(s) Identification and Disposition

Quantity:	UI:	Description / Fuze Condition / Lot Number	NEW (lbs):	Initial Disposition:	Final Disposition:
1	EA	8" us, inert filled (Inert) Lot #unknown	0	TRANS SDA	DISP BY DET
		Total Net Explosive Weight (lbs):	0.00		

Test Form 52-1

EXPLOSIVE ORDNANCE INCIDENT REPORT

Incident Number: 176-21-04

Categories:

- ☐ News Media Coverage
- ☐ Civil Law Enforcement
- ☐ Chemical Response
- ☐ Nuclear Response
- ☐ Transportation Accident
- ☐ USACOE Supported
- ☐ Reserve Component Support
- ☐ Formerly Used Defense Site
- ☐ Injuries
- ☐ Death(s)
- ☐ Drug Related

Threat:

- ☐ Imminent Threat
- ☐ Threat
- ☐ Extended Threat

SecDef Approval

- ☐ Yes
- ☒ No

Demolition Materials Used:

DODIC:	Quantity:	UI:	Description / Lot Number:	NEW (lbs):	Total NEW (lbs):
M766 (1375-1671)	2	EA	IGNITER, TIME BLASTING FUSE M60 Lot SGK86F011-004	0.0001	0.0002
MN06 (1375-1233)	2	EA	CAP, BLASTING, DELAY, M14 Lot SHK97M001-001	0.01	0.02
M023 (1375-7040)	2	EA	CHG DEMO, M112 COMP C-4 Lot LOP77L 007-002	1.25	2.5

Total Net Explosive Weight (lbs): 2.52

Environmental Protection Agency Coordination:

Agency: Fort Wainwright Environmental
Person Contacted: Kate Siftar
Phone: (907) 353-6249
Contact Date/Time:

On-Site Disposal Approve ☐
Permit Granted:
EPA Permit #:

Additional Information:
Left Message

Signature of Unit Commander: (Record Copy Only)
Guard, Douglas B., Cpt, OD, Commanding

Date:

Test Form 52-1 (Reverse)

EXPLOSIVE ORDNANCE INCIDENT REPORT

For use of this form, see FM 9-15; the proponent agency is US Army Training and Doctrine Command.

Incident Number: 176-24-04

Control Number:

Unusual ☐
Routine ☐

Reported:	08-Apr-04 10:30
Departed Unit:	08-Apr-04 06:30
Arrived Site:	08-Apr-04 10:30
Depart Site:	08-Apr-04 12:30
Arrived Unit:	08-Apr-04 19:00
Travel Hours:	10.50
Air Hours:	2.00
Miles:	0
Man Hours:	25.00
Adjust Hours:	0

Incident Location:
FT. WAINWRIGHT,GAS STATION

FT WAINWRIGHT, AK (US)

Grid:
Latitude:
Longitude:

Supported:
FWA MILITARY POLICE
FWA MP DESK SERGEANT
1066 GAFFNEY ROAD
BUILDING 3446
FT. WAINWRIGHT, AK

Phone: (907) 353-7535
Other Contact:

Item(s) Reported:
1ea 8 inch projectile
1ea 75mm casing (expended)

Personnel Dispatched
CPT Guard, Douglas B.
SGT Jinks, David A.

Ordnance Item(s) Identification and Disposition

Quantity:	UI:	Description / Fuze Condition / Lot Number	NEW (lbs):	Initial Disposition:	Final Disposition:
1	EA	8 inch, inert filled (inert) (Unarmed) Lot #unknown	0	TRANS SDA	DISP BY DET
1	EA	Casing, 75mm Recoiless Rifle (expended) (Unarmed)	0	TRANS SDA	DISP BY DET
		Total Net Explosive Weight (lbs):	0.00		

Test Form 52-1

EXPLOSIVE ORDNANCE INCIDENT REPORT

Incident Number: 176-24-04

Categories:

- [ ] News Media Coverage
- [ ] Civil Law Enforcement
- [ ] Chemical Response
- [ ] Nuclear Response
- [ ] Transportation Accident
- [ ] USACOE Supported
- [ ] Reserve Component Support
- [ ] Formerly Used Defense Site
- [ ] Injuries
- [ ] Death(s)
- [ ] Drug Related

Threat:

- [ ] Imminent Threat
- [ ] Threat
- [ ] Extended Threat

SecDef Approval

- [ ] Yes
- [x] No

Environmental Protection Agency Coordination:

Agency: Fort Wainwright Environmental
Person Contacted: Kate Siftar
Phone: (907) 353-6249
Contact Date/Time:

On-Site Dispoal Approve [ ]
Permit Granted:
EPA Permit #:

Additional Information:
Left Message

Signature of Unit Commander: (Record Copy Only)
Guard, Douglas B., Cpt, OD, Commanding

Date: 9-13-04

Test Form 52-1 (Reverse)

EXPLOSIVE ORDNANCE INCIDENT REPORT

For use of this form, see FM 9-15; the proponent agency is US Army Training and Doctrine Command.

Incident Number: 176-27-04

Control Number:

Unusual ☐

Routine ☐

Reported:	12-Apr-04 10:00
Departed Unit:	12-Apr-04 11:00
Arrived Site:	12-Apr-04 14:00
Depart Site:	14-Apr-04 17:00
Arrived Unit:	14-Apr-04 19:00
Travel Hours:	5.00
Air Hours:	0.00
Miles:	0
Man Hours:	112.00
Adjust Hours:	0

Incident Location:
FT. WAINWRIGHT,GAS STATION

FT WAINWRIGHT, AK (US)

Grid:
Latitude:
Longitude:

Supported:
FWA MILITARY POLICE
FWA MP DESK SERGEANT
FWA

FT. WAINWRIGHT, AK

Phone: (907) 353-7535
Other Contact:

Item(s) Reported:
2ea 8" projectiles

Personnel Dispatched

SSG Cullia, Michael A.

SGT Jinks, David A.

Ordnance Item(s) Identification and Disposition

Quantity:	UI:	Description / Fuze Condition / Lot Number	NEW (lbs):	Initial Disposition:	Final Disposition:
2	EA	8" Projectile (Unarmed) Lot Unkown	0	TRANS SDA	DISP BY DET

Total Net Explosive Weight (lbs): 0.00

Test Form 52-1

EXPLOSIVE ORDNANCE INCIDENT REPORT

Incident Number: 176-27-04

Categories:

- [ ] News Media Coverage
- [ ] Civil Law Enforcement
- [ ] Chemical Response
- [ ] Nuclear Response
- [ ] Transportation Accident
- [ ] USACOE Supported
- [ ] Reserve Component Support
- [ ] Formerly Used Defense Site
- [ ] Injuries
- [ ] Death(s)
- [ ] Drug Related

Threat:

- [ ] Imminent Threat
- [ ] Threat
- [ ] Extended Threat

SecDef Approval

- [ ] Yes
- [x] No

Demolition Materials Used:

DODIC:	Quantity:	UI:	Description / Lot Number:	NEW (lbs):	Total NEW (lbs):
MN06 (1375-1233)	2	EA	CAP, BLASTING, DELAY, M14 Lot SHK97M001-001	0.01	0.02
M766 (1375-1671)	2	EA	IGNITER, TIME BLASTING FUSE M60 Lot SGK 86F 011 004	0.0001	0.0002
M023 (1375-7040)	6	EA	CHG DEMO, M112 COMP C-4 Lot LOP77L 007-002	1.25	7.5
			Total Net Explosive Weight (lbs):		7.52

Environmental Protection Agency Coordination:

Agency: Fort Wainwright Environmental
Person Contacted: Kate Siftar
Phone: (907) 353-6249
Contact Date/Time:

On-Site Dispoal Approve [ ]
Permit Granted:
EPA Permit #:

Additional Information:
Left Voice Message

Signature of Unit Commander: (Record Copy Only)
Guard, Douglas B., Cpt, OD, Commanding

Date:

Test Form 52-1 (Reverse)

EXPLOSIVE ORDNANCE INCIDENT REPORT

For use of this form, see FM 9-15; the proponent agency is US Army Training and Doctrine Command.

Incident Number: 176-8-05

Control Number:

Unusual ☐
Routine ☐

Reported:	20-Apr-05 17:30
Departed Unit:	21-Apr-05 03:30
Arrived Site:	21-Apr-05 07:30
Depart Site:	21-Apr-05 09:30
Arrived Unit:	21-Apr-05 15:00
Travel Hours:	9.50
Air Hours:	2.00
Miles:	0
Man Hours:	23.00
Adjust Hours:	0

Incident Location:
FWA GAS STATION

FORT WAINRIGHT, AK (US)

Grid:
Latitude:
Longitude:

Supported:
FWA MILITARY POLICE
SGT MUAR
BLDG 3446

FORT WAINRIGHT, AK

Phone: (907) 353-7535
Other Contact:

Item(s) Reported:
1 Ea. 8 Inch projo

Personnel Dispatched
CPT Guard, Douglas B.
SFC Grotkin, David

Ordnance Item(s) Identification and Disposition

Quantity:	UI:	Description / Fuze Condition / Lot Number	NEW (lbs):	Initial Disposition:	Final Disposition:
0	EA	Scrap Items (N/A) Lot Unkown	0	OTHER	SCRAP

Total Net Explosive Weight (lbs): 0.00

Test Form 52-1

EXPLOSIVE ORDNANCE INCIDENT REPORT

Incident Number: 176-8-05

Categories:

- [ ] News Media Coverage
- [ ] Civil Law Enforcement
- [ ] Chemical Response
- [ ] Nuclear Response
- [ ] Transportation Accident
- [ ] USACOE Supported
- [ ] Reserve Component Support
- [ ] Formerly Used Defense Site
- [ ] Injuries
- [ ] Death(s)
- [ ] Drug Related

Threat:

- [ ] Imminent Threat
- [ ] Threat
- [ ] Extended Threat

SecDef Approval

- [ ] Yes
- [x] No

Environmental Protection Agency Coordination:

Agency:
Person Contacted:
Phone:
Contact Date/Time:

On-Site Disposal Approve [ ]
Permit Granted:
EPA Permit #:

Additional Information:

Signature of Unit Commander: (Record Copy Only)
Guard, Douglas B., Cpt, OD, Commanding

Date: 1 Aug 05

Test Form 52-1 (Reverse)

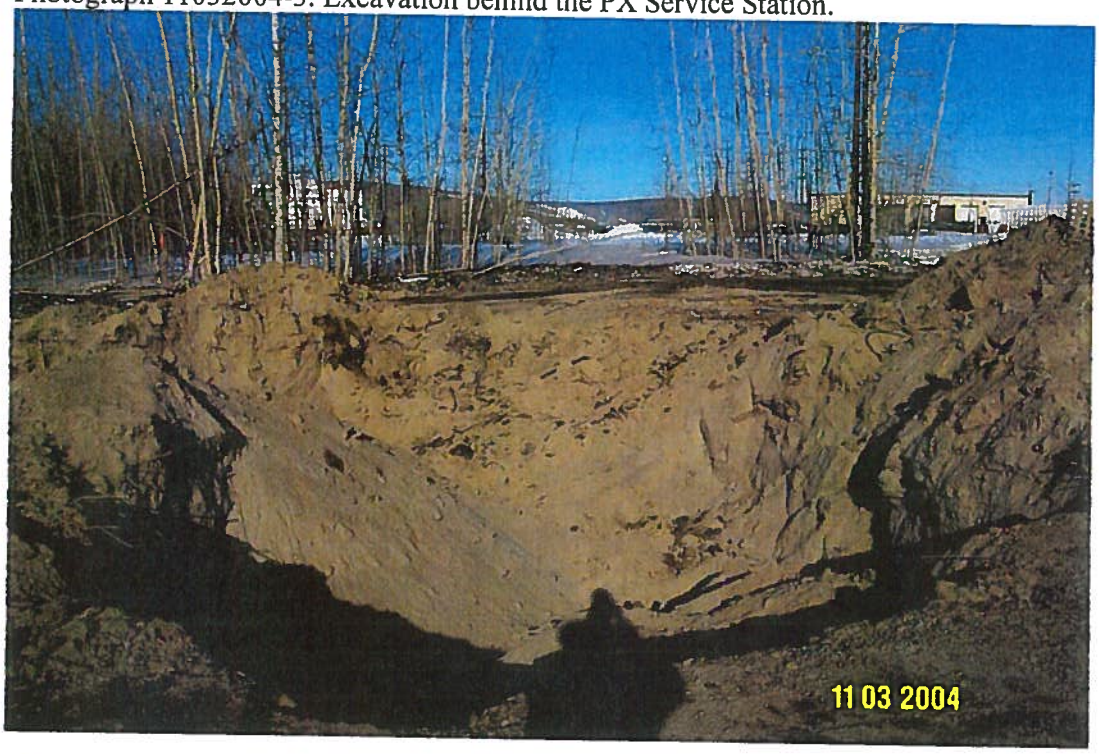
Photograph 09042004-1. Metal debris removed from excavation behind PX Service Station.

Photograph 09042004-2. Metal debris removed from excavation behind PX Service Station (close-up view of Photograph 09042004-1).

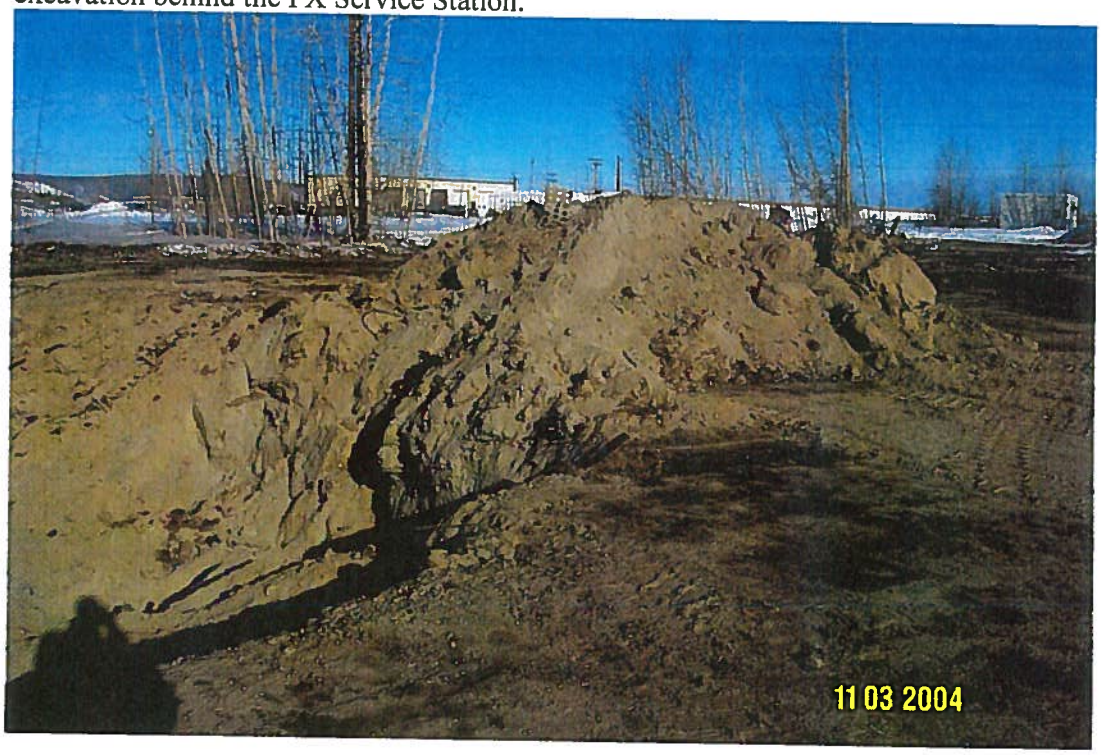
Photograph 11032004-1. Debris removed from excavation behind the PX Service Station.

Photograph 11032004-2. Debris Removed from excavation behind the PX Service Station.

Photograph 11032004-3. Excavation behind the PX Service Station.



Photograph 11032004-4. Debris removed from excavation and stained soil from excavation behind the PX Service Station.



Photograph 11032004-5. Blue marking indicates training munitions.

Photograph 11032004-6. Blue marking indicates training munitions.

APPENDIX H

CRREL,
and Shannon and Wilson
Geophysical and Site Characterization

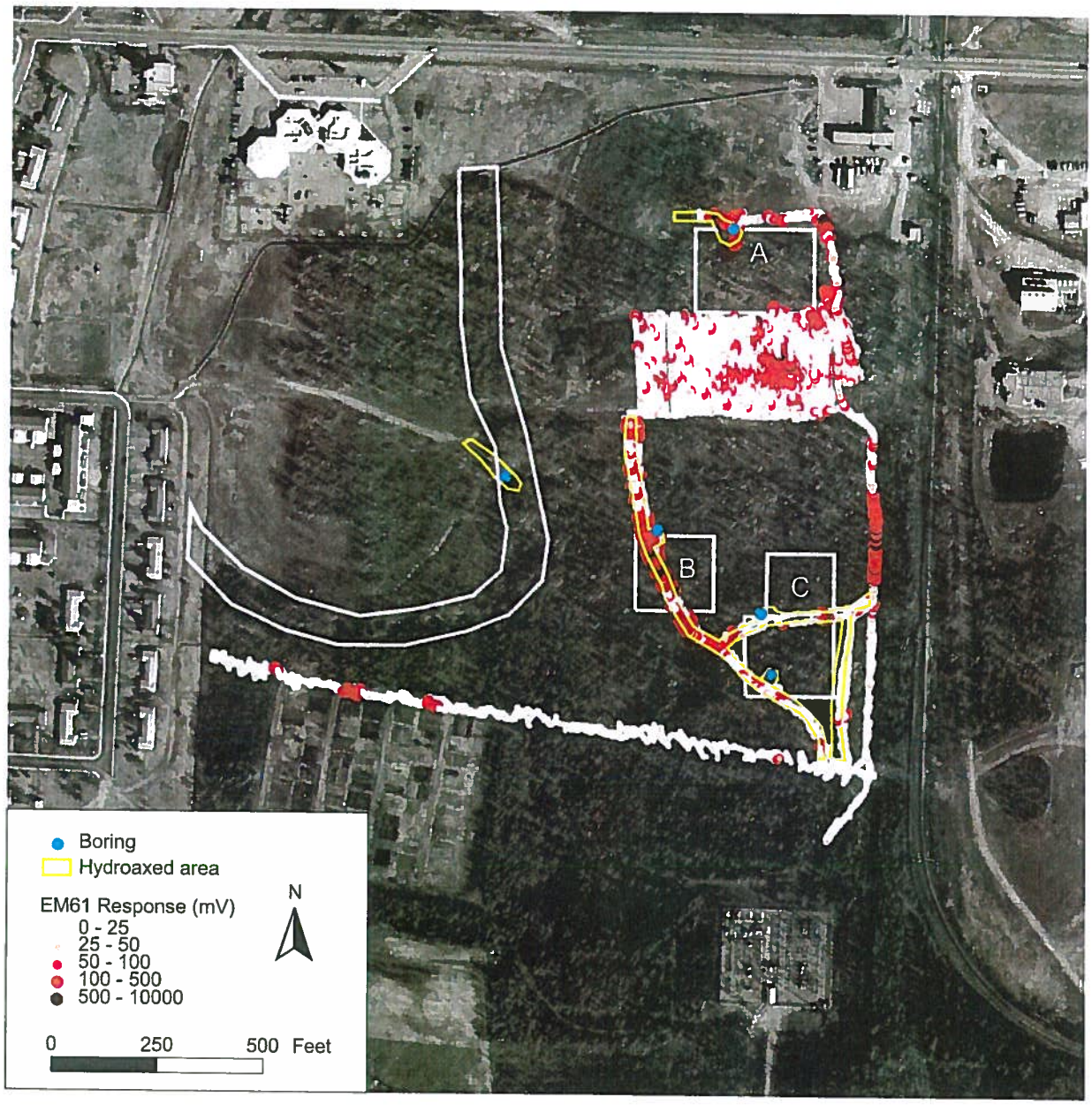
FWA Suspect Landfill

Created 10/22/03
Sarah Epps 384-0527

1956

0 25 50 100 150 200 Meters

FWA Housing Project 11/3/03



Areas hydroaxed on 10/29/03 are outlined in yellow. Boring locations that were drilled on 10/31/03 are shown in blue. Buried metal objects that were detected by CRREL using an EM61 are shown in red with larger anomolies as darker red.

CONTENTS

PAGE	REFERENCE	DATE

10/28/03

1530 get call from Ben Ashley, Corps, to meet at Ft Wrd.
1550 @ CRREL bldg 4070.
Ben Ashley
Ann Staples
Major Anderson

1605 - drive to DPW environmental bldg, coordinate land clearing priorities.
Karen Dearborn

Hydro area:

None in Area B - Trail use trail system to use EM-61

Area C - select trail enlargement, clear routes to boring locations

Area A - eastern 3/4 to be cleared

Clifton

Field notes, Fort Wainwright Family Housing Drilling

2

10/28/03

By end of meeting w/ Beth, Karen, Maj. Anderson, 5 boring locations were selected, areas to be hydroaxed also selected.

17:00 lv. base

Chester Ashley

3

10/29/03

Beth Ashley
353-5459

cell # 229-5312

0820 @ gas station on post:
TJ's unloading their hydroaxe.

I meet w/ Pete, operator for TJs Land Clearing and Beth Ashley & Ann Staples.
We traverse areas to be hydroaxed. All in agreement; several paths in vicinity of Areas C, B.

Also clear access to each of 5 boring locations.

Chester Ashley

Field notes, Fort Wainwright Family Housing Drilling

Pages 2 and 3 of 6

4

10/29/03

1530 - lv. office to meet w/ base telephone staff.

All 5 boring locations ~~are~~ clear w/ respect to base telephone; buried line is parallel to E-W overhead power line south of ~~also~~ open area brown Areas A & B/C.

1630 lv. base

10/30/03

0830 meet w/ AES at site. Their buried cable in same location as base telephone line: Parallel to E-W overhead power. No conflicts w/ our drill locations.

I take completed dig permit to DPW for signature - responsible signor is in meeting. I leave permit w/ secretary and will pick it up later this morning.

0905 - lv. post

1030 Return to post get sample jars from SGS get drill permit.

1105 - @ B-1 w/ drill crew

Soil boring logs used to document ~~soil~~ CDO subsurface conditions, sample info.

Field notes, Fort Wainwright Family Housing Drilling

Pages 4 and 5 of 6

6

10/30/03

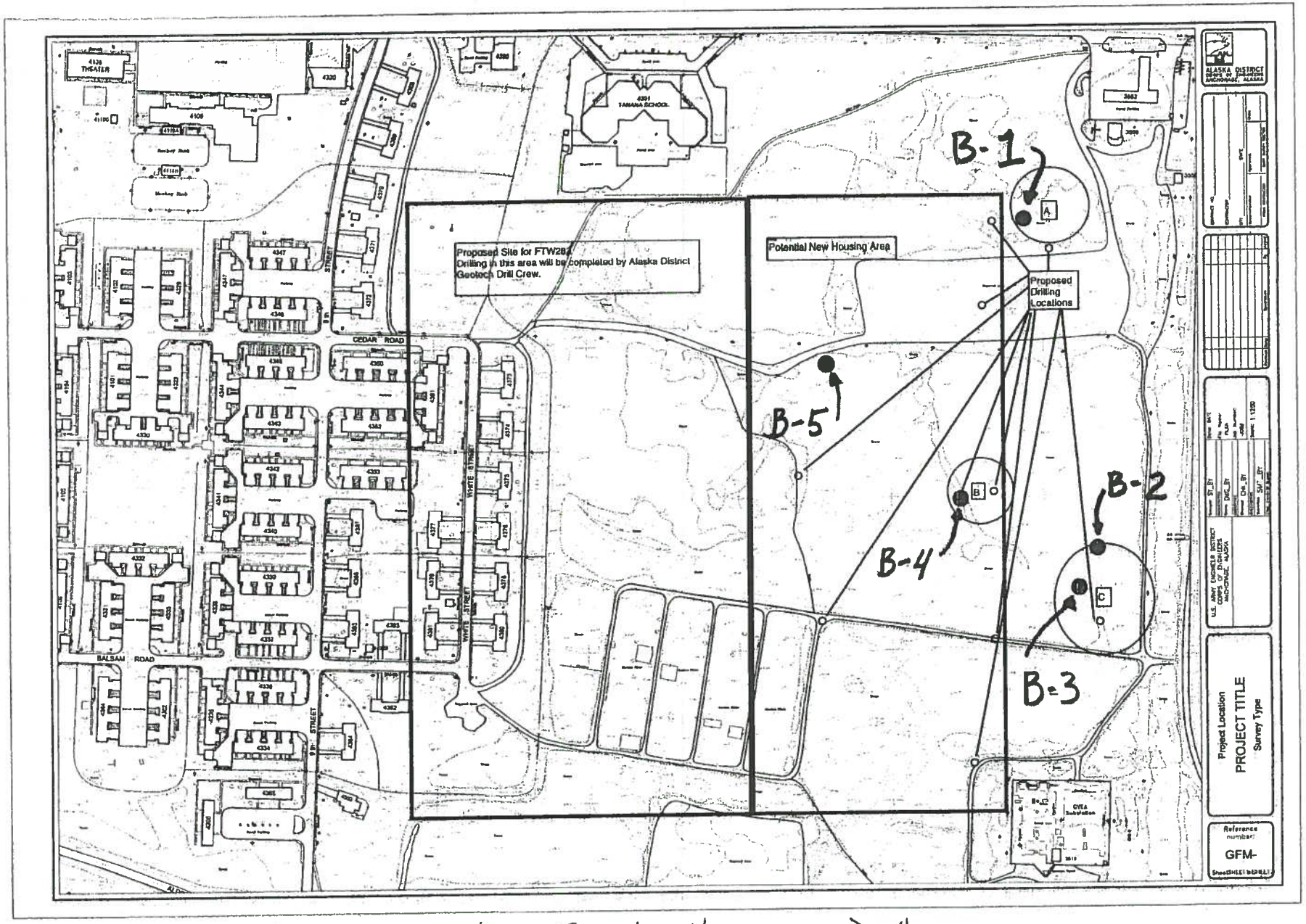
1500 finish drilling last boring - I leave site while drill crew decons drill tools.

1530 Conduct PID headspace screening of all soil samples:

Each sample interval was handled as follows:

- Open split spoon sampler,
- Collect headspace sample in Ziplock bag, VOC/GRO sample in 4 oz jar w/ MeOH, DRO/RRO/Lead in 8 oz jar
- Describe soil classification, observations
- Decontaminate split spoon

Field notes, Fort Wainwright Family Housing Drilling



Fort Wainwright Family Housing Drilling
Soil Boring Locations

SHANNON & WILSON, INC.
Geotechnical Consultants

FIELD LOG OF BORING

JOB NO. 31-1-11195-002

LOGGED BY CBD
DRILL CONTRACTOR STW
DRILLER Mike TYPE DRILL
SIZE & TYPE OF CASING 4" ID HSA

JOB Family Housing / Ft Wainwright
BORING NO. B-1 ELEV.
LOCATION
DATE 10/30/03 WEATHER Clear, 30°F

SAMPLE DATA

SAMPLE NO. / TYPE	DEPTH FROM / TO	DRIVING RESISTANCE BLOWS/6 IN.	LENGTH / NO. SAVED	DRILL ACTION	CONTACTS/ GROUNDWATER	FIELD CLASSIFICATION
1-1	0	10/6/6/8	18"	PID:		Top 6" wood chips
11:15 SPT	2'		1	0.0		Brown, sl silty F-M SAND. silty sand in bottom 4"
11 24 1-2	5'	2/3/3/3	20"	0.0		Loose, gray, clean F SAND! gray
SPT	7'		1		▽ 12'	
1-3	13'	2/3/5/4	18"	0.0		Same as 1-2 but wet
11 32 SPT	15'		1			
		Sample	1-3		submitted	for analysis

DEPTH FROM	DEPTH TO	FIELD LOG OF BORING
0	0.4'	Organics
0.4'	4'	Brown, slightly silty to silty fine to medium SAND
4'	15'	Gray, well graded fine SAND

REMARKS
No visual or odor indications of contamination

HAMMER WT. STROKE
HAMMER LIFT SAMPLER
ROD DIA. NO. OF TURNS

WATER LEVEL	TIME	DATE

FOOTAGE DRILLED
NO. SAMPLES: ATTEMPTED RECOVERED

TIME DISTRIBUTION THIS HOLE
ON HOLE DONE DRILLING
DRILLING OFF HOLE

BORING NO. B-1 SHEET 1 OF 1

F-2-85

SHANNON & WILSON, INC.
Geotechnical Consultants

FIELD LOG OF BORING

JOB NO. 317-11195-002

LOGGED BY CBD
DRILL CONTRACTOR STW
DRILLER Mike TYPE DRILL
SIZE & TYPE OF CASING 4" ID HSA

JOB Family Housing / Ft Wainwright
BORING NO. B-2 ELEV.
LOCATION
DATE 10/20/03 WEATHER clear 30°F

SAMPLE DATA

	SAMPLE NO. / TYPE	DEPTH FROM / TO	DRIVING RESISTANCE BLOWS/6 IN.	LENGTH / NO. SAVED	DRILL ACTION	CONTACTS/ GROUNDWATER	FIELD CLASSIFICATION
	2-1	0	3/4/5/4	18"	PID=	0.0	Top 4" wood fragments then Brown F-sandy SILT loam. dry
11:55	SPT	2'		1			
	2-2	5'	3/6/5/6	24"	3-10' possibly PID	gravelly 0.0	Top 4" as above. Possibly slough. Then gray clean F-m SAND. dry. w/ occasional gravel
1201	SPT	7'		1			
	2-3	13'	8/10/13/10	24"		▽ 14'	Gray clean F-m sand w/ occasional piece of gravel. Top half dry. bottom half wet.
1215	SPT	15'		1	PID=	1.0	
			Sample	2-3	submitted	for analysis	

FIELD LOG OF BORING

DEPTH FROM	DEPTH TO	FIELD LOG OF BORING
0	0.4'	Organics
0.4'	5.5'	Brown, fine sandy SILT
5.5'	15'	Gray, well graded SAND with gravel.

REMARKS

No visual or odor indication of contamination.

HAMMER WT. STROKE
HAMMER LIFT SAMPLER
ROD DIA. NO. OF TURNS

WATER LEVEL	TIME	DATE

FOOTAGE DRILLED
NO. SAMPLES: ATTEMPTED RECOVERED

TIME DISTRIBUTION THIS HOLE
ON HOLE DONE DRILLING
DRILLING OFF HOLE

BORING NO. B-2 SHEET 1 OF 1

F-2-85

SHANNON & WILSON, INC.
Geotechnical Consultants

FIELD LOG OF BORING

JOB NO. 31-1-11195-002

LOGGED BY CBD
DRILL CONTRACTOR STW
DRILLER Mike TYPE DRILL
SIZE & TYPE OF CASING 4" ID HSA

JOB Family Housing / Ft Wainwright
BORING NO. B-3 ELEV.
LOCATION
DATE 10/20/03 WEATHER Clear 30°F

	SAMPLE NO. / TYPE	DEPTH FROM / TO	DRIVING RESISTANCE BLOWS/6 IN.	LENGTH / NO. SAVED	DRILL ACTION	CONTACTS/ GROUNDWATER	FIELD CLASSIFICATION
1238	3-1 SPT	0 / 2'	3/4/5/5	8" / 1	PID= 2.5		Brown, silty F-SAND. trace roots. dry
1244	3-2 SPT	5' / 7'	3/5/5/6	20" / 1	0.0		Brown, silty F-SAND. dry
1252	3-3 SPT	13' / 15'	3/7/14/18	26" / 1	0.0	▽ 13.5'	Top 8" as above. Then gray, sl. silty F-M SAND Bottom 18" wet.
			Sample	3-1	submitted		for analysis

DEPTH FROM	DEPTH TO	FIELD LOG OF BORING
0	0.4'	Organics
0.4'	13.5'	Brown, silty fine SAND. Trace roots to 2 feet bgs.
13.5'	15'	Gray, slightly silty fine to medium SAND.

REMARKS
No visual or odor indication of contamination.

HAMMER WT. STROKE
HAMMER LIFT SAMPLER
ROD DIA. NO. OF TURNS

WATER LEVEL	TIME	DATE

FOOTAGE DRILLED
NO. SAMPLES: ATTEMPTED RECOVERED

TIME DISTRIBUTION THIS HOLE
ON HOLE DONE DRILLING
DRILLING OFF HOLE

BORING NO. B-3 SHEET 1 OF 1

F-2-85

SHANNON & WILSON, INC.
Geotechnical Consultants

FIELD LOG OF BORING

JOB NO. 317-11195-002

LOGGED BY CBD
DRILL CONTRACTOR STW
DRILLER Mike TYPE DRILL
SIZE & TYPE OF CASING 4" ID HSA

JOB Family Housing / Ft Wainwright
BORING NO. B-4 ELEV.
LOCATION
DATE 10/20/03 WEATHER Clear 32°F

	SAMPLE NO. / TYPE	DEPTH FROM / TO	DRIVING RESISTANCE BLOWS/6 IN.	LENGTH / NO. SAVED	DRILL ACTION	CONTACTS/ GROUNDWATER	FIELD CLASSIFICATION
1318	4-1	0	4/3/4/4	24"	PID= 0.5		Brown F-sandy SILT/ silty F. SAND. trace roots. Dry ~~Moist~~
	SPT	2'		1			
1323	4-2	5'	3/4/4/4	20"	PID=2.0 possibly gravelly at 11'		Brown, sl. silty F. SAND. Dry
	SPT	7'		1			
1333	4-3	13'	3/5/16/16	18"		▽ 13'	Brown gravelly SAND. Wet.
	SPT	15'		1	PID=0.0		
			Sample	4-2	submitted		for analysis

DEPTH FROM	DEPTH TO	FIELD LOG OF BORING
0	0.4'	Organics
0.4'	11'	Brown, slightly silty fine SAND
11'	15'	Brown, gravelly SAND.

REMARKS

HAMMER WT. STROKE
HAMMER LIFT SAMPLER
ROD DIA. NO. OF TURNS

WATER LEVEL	TIME	DATE

FOOTAGE DRILLED
NO. SAMPLES: ATTEMPTED RECOVERED

TIME DISTRIBUTION THIS HOLE
ON HOLE DONE DRILLING
DRILLING OFF HOLE

BORING NO. B-4 SHEET 1 OF 1

F-2-85

SHANNON & WILSON, INC.
Geotechnical Consultants

FIELD LOG OF BORING

JOB NO. 317-11195-002

LOGGED BY CBD
DRILL CONTRACTOR STW
DRILLER Mike TYPE DRILL
SIZE & TYPE OF CASING 4" ID HSA

JOB Family Housing / Fr Wainwright
BORING NO. B-5 ELEV.
LOCATION
DATE 10/30/03 WEATHER clear, 32°F

	SAMPLE NO. / TYPE	DEPTH FROM / TO	DRIVING RESISTANCE BLOWS/6 IN.	LENGTH / NO. SAVED	DRILL ACTION	CONTACTS/ GROUNDWATER	FIELD CLASSIFICATION
1410	5-1	0	5/5/7/8	20"	PID=2.3		Brown, silty F-SAND, trace roots. moist
	SPT	2'		1			
1414	5-2	5'	2/5/6/8	16"	PID=1.7		Brown, sl. silty F-SAND moist
	SPT	7'		1			
1419	5-3	13'	7/15/10/13	18"	PID=13.2	▽ 13.5	Top 8" as above. Bottom 10" sandy gravel gravelly SAND, wet
	SPT	15'		2			
			Field Duplicate 5-4, collocated with 5-3.				

DEPTH FROM	DEPTH TO	FIELD LOG OF BORING
0	0.4'	Organics
0.4'	13.5'	Brown, silty fine SAND, trace roots to 2' bgs
13.5'	15'	Brown sandy GRAVEL / gravelly SAND

REMARKS

HAMMER WT. STROKE
HAMMER LIFT SAMPLER
ROD DIA. NO. OF TURNS

WATER LEVEL	TIME	DATE

FOOTAGE DRILLED
NO. SAMPLES: ATTEMPTED RECOVERED

TIME DISTRIBUTION THIS HOLE
ON HOLE DONE DRILLING
DRILLING OFF HOLE

BORING NO. B-5 SHEET 1 OF 1

F-2-85

EXCAVATION CLEARANCE REQUEST
DIRECTORATE OF PUBLIC WORKS, FORT WAINWRIGHT, ALASKA

NOTE: Locates require 72-hour notice
(Except where indicated)

Request clearance to proceed with work at Housing, East of White St.
(Specific location)

Work Order/Contract #: DACA85-03-D-1003-0004 **Contractor:** Shannon & Wilson **POC Name/Phone:** Scott Mayhrier David McDowell 479-0600

TYPE OF WORK REQUIRED: (provide brief but complete description of work to be performed)
install 10 - ~15' monitoring wells

Project Dates: 10/29/03 thru _____

Above Excavation Checked for Conflicts with the Following:

Department	Conflict	Signing Official	Date
Facility Management Specialist (Electric), Bldg 3015 353-6172 (Buried Electric)	Yes No	[signature]	10/29/03
Alarm Controls, Bldg 3022 (East) 353-6254 (Alarms)	Yes No	[signature]	10/29/03
Utility Distribution, Bldg 3022 (West) 353-7139 (Steam, Water, Sewer)	Yes No	[signature]	10/29/03
High Voltage, Bldg 3022 (West) 353-6130 (Overhead Power Lines)	(2) Yes No	[signature]	10/29/03
Roads & Grounds, Bldg 3021 (West) 353-6056	Yes No	[signature]	10/29/03
Environmental, Bldg 3023 353-9886	Yes No	(1) [signature]	29 OCT 03
Fire Dept, Bldg 1054 353-6485 (Use of Hydrant Sys/Road Closure)	Yes No	[signature]	29 OCT 03
Telephone System, Bldg 1060 353-6101 (507th Signal Co)	Yes No	[signature]	29 OCT 03
Alaska Dig Line 1-800-478-3121 (48 hour notice required)	Yes No	GCI notified per phone 10/29/03 ACS GARY PARSONS	10/30/03

Explanation of Conflicts Identified Above (annotate on drawings):
(1) NO KNOWN CONTAMINATION. IF ANY FOUND OR SUSPECTED, STOP WORK & CONTACT DPW ENV.
(2) Overhead power lines in area

If Required:
Alaska Railroad - if excavating within 100 feet of railroad right of way: 907-265-2465 (10 day notice required)
Ammunition Areas, Bldg 1900 & 2200: 353-6440 (Security Only)
Provost Marshall, Bldg 3028: 353-7535 (Road Closure Only)
Customer Service Desk, Bldg 3015: 353-7870 (Utility Outages Only)

Special Requirements Note:

☐ **INSTITUTIONAL CONTROLS AREA - POTENTIALLY CONTAMINATED AREA, SPECIAL PRECAUTIONS APPLY - SEE SOP and NOTE REQUIREMENTS #6 AND #7 BELOW**

1. This clearance authorizes commencement of excavation work only and IS NOT A NOTICE TO PROCEED OR WORK AUTHORIZATION.
2. This excavation clearance is effective upon the date of signature by DPW official below; EXCAVATION SHALL COMMENCE WITHIN 30 CALENDAR DAYS.
3. Requester will provide two (2) copies of required work site drawings with excavation clearance request. DPW will retain one (1) copy of these drawings.
4. Requester will retain original completed excavation clearance request onsite during excavation activities. DPW will retain one (1) copy of the request.
5. Boring locations must be marked on a 1/100 scale drawing.
6. All soil to be removed from the work site shall be disposed of in accordance with guidance from the DPW Environmental Resources Department.
7. An after action report (AAR) concerning work at sites where institutional controls are in place shall be submitted to DPW Environmental Resources Department NLT 30 days following completion of work.

[signature]
Requester's Signature Date

APPROVED: Monica A. Stephenson 10-30-03
Monica A. Stephenson; Chief, Facilities Management, DPW Date

Laboratory Analysis Report

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301
Web: http://www.sgsenvironmental.com

Chris Darrah
Shannon & Wilson-Fairbanks
2355 Hill Rd
Fairbanks, AK 99709

Work Order:	1036882
	31-1-11195-002 FTWW Housing
Client:	Shannon & Wilson-Fairbanks
Report Date:	November 10, 2003

Enclosed are the analytical results associated with the above workorder.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintained by SGS. A copy of our Quality Control Manual that outlines this program is available at your request. The laboratory ADEC certification numbers are AK08-03 (DW), UST-005 (CS) and AK00971 (Micro).

Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS Quality Assurance Program Plan and the National Environmental Laboratory Accreditation Conference.

If you have any questions regarding this report or if we can be of any other assistance, please call your SGS Project Manager at (907) 562-2343.

The following descriptors may be found on your report which will serve to further qualify the data.

PQL	Practical Quantitation Limit (reporting limit).
U	Indicates the analyte was analyzed for but not detected.
F	Indicates an estimated value that falls below PQL, but is greater than the MDL.
J	The quantitation is an estimation.
B	Indicates the analyte is found in a blank associated with the sample.
*	The analyte has exceeded allowable regulatory or control limits.
GT	Greater Than
D	The analyte concentration is the result of a dilution.
LT	Less Than
!	Surrogate out of control limits.
Q	QC parameter out of acceptance range.
M	A matrix effect was present.
JL	The analyte was positively identified, but the quantitation is a low estimation.
E	The analyte result is high outside of calibrated range.

Note: Soil samples are reported on a dry weight basis unless otherwise specified.

SGS

SGS Ref.#	1036882001	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 11:32
Client Sample ID	1195-1-3	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede
		Released By	Stephen C. Ede

Sample Remarks:

8260 - LCS recovery for 1,2-dibromo-3-chloropropane is low and does not meet laboratory QC goals. Results are estimated in the associated samples.

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Metals Department									
Lead	2.15	0.487	mg/Kg	SW7421	B		11/04/03	11/05/03	JMP
Volatile Fuels Department									
Gasoline Range Organics	2.12 U	2.12	mg/Kg	AK101 GRO	A		10/30/03	11/01/03	JLB
Surrogates									
4-Bromofluorobenzene <surr>	66		%	AK101 GRO	A	50-150	10/30/03	11/01/03	JLB
Semivolatile Organic Fuels Department									
Diesel Range Organics	37.6 U	37.6	mg/Kg	AK102 103			11/10/03	11/10/03	MCM
Residual Range Organics	37.6 U	37.6	mg/Kg	AK102 103			11/10/03	11/10/03	MCM
Surrogates									
n-Triacontane-d62 <surr>	84		%	AK102 103		50-150	11/10/03	11/10/03	MCM
5a Androstane <surr>	72.9		%	AK102 103		50-150	11/10/03	11/10/03	MCM
Volatile Gas Chromatography/Mass Spectroscopy									
Dichlorodifluoromethane	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Chloromethane	0.106 U	0.106	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Vinyl chloride	0.0110 U	0.0110	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Bromomethane	0.0850 U	0.0850	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Chloroethane	0.0850 U	0.0850	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Trichlorofluoromethane	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,1-Dichloroethene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Carbon disulfide	0.0850 U	0.0850	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Methylene chloride	0.0850 U	0.0850	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
trans-1,2-Dichloroethene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE

SGS

SGS Ref.#	1036882001	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 11:32
Client Sample ID	1195-1-3	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Gas Chromatography/Mass Spectroscopy									
2-Butanone (MEK)	0.212 U	0.212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
2,2-Dichloropropane	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,1,1-Trichloroethane	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,1-Dichloroethane	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
cis-1,2-Dichloroethene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Bromochloromethane	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Chloroform	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Carbon tetrachloride	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Benzene	0.0110 U	0.0110	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,2-Dichloroethane	0.0110 U	0.0110	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,1-Dichloropropene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Trichloroethene	0.0170 U	0.0170	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,2-Dichloropropane	0.0110 U	0.0110	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Dibromomethane	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Bromodichloromethane	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,1,2-Trichloroethane	0.0110 U	0.0110	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
2-Chloroethyl Vinyl Ether	0.212 U	0.212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
cis-1,3-Dichloropropene	0.0170 U	0.0170	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
4-Methyl-2-pentanone (MIBK)	0.212 U	0.212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Toluene	0.0425 U	0.0425	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
trans-1,3-Dichloropropene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Tetrachloroethene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,3-Dichloropropane	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
2-Hexanone	0.212 U	0.212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Dibromochloromethane	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,1,1,2-Tetrachloroethane	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,2-Dibromoethane	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Chlorobenzene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Ethylbenzene	0.0425 U	0.0425	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
P & M -Xylene	0.0425 U	0.0425	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
o-Xylene	0.0425 U	0.0425	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Styrene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Bromoform	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Isopropylbenzene (Cumene)	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE

SGS

SGS Ref.#	1036882001	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 11:32
Client Sample ID	1195-1-3	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Gas Chromatography/Mass Spectroscopy									
Bromobenzene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,2,3-Trichloropropane	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,1,2,2-Tetrachloroethane	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
n-Propylbenzene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
2-Chlorotoluene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
4-Chlorotoluene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,3,5-Trimethylbenzene	0.0425 U	0.0425	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
tert-Butylbenzene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,2,4-Trimethylbenzene	0.0425 U	0.0425	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
sec-Butylbenzene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,3-Dichlorobenzene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
4-Isopropyltoluene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,4-Dichlorobenzene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,2-Dichlorobenzene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
n-Butylbenzene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,2-Dibromo-3-chloropropane	0.0850 U	0.0850	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,2,4-Trichlorobenzene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Hexachlorobutadiene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Naphthalene	0.0425 U	0.0425	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
1,2,3-Trichlorobenzene	0.0212 U	0.0212	mg/Kg	SW8260B	A		10/30/03	11/03/03	TJE
Surrogates									
Dibromofluoromethane <surr>	97.2		%	SW8260B	A	83-119	10/30/03	11/03/03	TJE
1,2-Dichloroethane-D4 <surr>	91.6		%	SW8260B	A	83-122	10/30/03	11/03/03	TJE
Toluene-d8 <surr>	111		%	SW8260B	A	87-115	10/30/03	11/03/03	TJE
4-Bromofluorobenzene <surr>	75.5		%	SW8260B	A	46-133	10/30/03	11/03/03	TJE
Solids									
Total Solids	80.6		%	SM20 2540G	B			11/01/03	JGL

SGS

SGS Ref.#	1036882002
Client Name	Shannon & Wilson-Fairbanks
Project Name/#	31-1-11195-002 FTWW Housing
Client Sample ID	1195-2-3
Matrix	Soil/Solid

All Dates/Times are Alaska Standard Time

Printed Date/Time	11/10/2003 12:42
Collected Date/Time	10/30/2003 12:15
Received Date/Time	10/31/2003 14:50
Technical Director	Stephen C. Ede
Released By	Stephen C. Ede

Sample Remarks:

8260 - LCS recovery for 1,2-dibromo-3-chloropropane is low and does not meet laboratory QC goals. Results are estimated in the associated samples.

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Metals Department									
Lead	3.57	0.453	mg/Kg	SW7421	B		11/04/03	11/05/03	JMP
Volatile Fuels Department									
Gasoline Range Organics	1.82 U	1.82	mg/Kg	AK101 GRO	A		10/30/03	11/01/03	JLB
Surrogates									
4-Bromofluorobenzene <surr>	78.9		%	AK101 GRO	A	50-150	10/30/03	11/01/03	JLB
Semivolatile Organic Fuels Department									
Diesel Range Organics	32.1 U	32.1	mg/Kg	AK102 103			11/10/03	11/10/03	MCM
Residual Range Organics	32.1 U	32.1	mg/Kg	AK102 103			11/10/03	11/10/03	MCM
Surrogates									
n-Triacontane-d62 <surr>	89.1		%	AK102 103		50-150	11/10/03	11/10/03	MCM
5a Androstane <surr>	76.6		%	AK102 103		50-150	11/10/03	11/10/03	MCM
Volatile Gas Chromatography/Mass Spectroscopy									
Dichlorodifluoromethane	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloromethane	0.0911 U	0.0911	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Vinyl chloride	0.00947 U	0.00947	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromomethane	0.0729 U	0.0729	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloroethane	0.0729 U	0.0729	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Trichlorofluoromethane	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloroethene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Carbon disulfide	0.0729 U	0.0729	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Methylene chloride	0.0729 U	0.0729	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
trans-1,2-Dichloroethene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE

SGS

SGS Ref.#	1036882002	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 12:15
Client Sample ID	1195-2-3	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Gas Chromatography/Mass Spectroscopy									
2-Butanone (MEK)	0.182 U	0.182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2,2-Dichloropropane	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,1-Trichloroethane	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
cis-1,2-Dichloroethene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloroethane	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromochloromethane	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloroform	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Carbon tetrachloride	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Benzene	0.00947 U	0.00947	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloropropene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichloroethane	0.00947 U	0.00947	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Trichloroethene	0.0146 U	0.0146	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichloropropane	0.00947 U	0.00947	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Dibromomethane	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromodichloromethane	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Chloroethyl Vinyl Ether	0.182 U	0.182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,2-Trichloroethane	0.00947 U	0.00947	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
cis-1,3-Dichloropropene	0.0146 U	0.0146	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Methyl-2-pentanone (MIBK)	0.182 U	0.182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Toluene	0.0364 U	0.0364	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
trans-1,3-Dichloropropene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Tetrachloroethene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3-Dichloropropane	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Hexanone	0.182 U	0.182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Dibromochloromethane	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,1,2-Tetrachloroethane	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dibromoethane	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chlorobenzene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Ethylbenzene	0.0364 U	0.0364	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
P & M -Xylene	0.0364 U	0.0364	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
o-Xylene	0.0364 U	0.0364	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Styrene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromoform	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Isopropylbenzene (Cumene)	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE

SGS

SGS Ref.#	1036882002	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 12:15
Client Sample ID	1195-2-3	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Gas Chromatography/Mass Spectroscopy									
Bromobenzene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,3-Trichloropropane	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,2,2-Tetrachloroethane	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
n-Propylbenzene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Chlorotoluene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Chlorotoluene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3,5-Trimethylbenzene	0.0364 U	0.0364	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
tert-Butylbenzene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,4-Trimethylbenzene	0.0364 U	0.0364	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
sec-Butylbenzene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3-Dichlorobenzene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Isopropyltoluene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,4-Dichlorobenzene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichlorobenzene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
n-Butylbenzene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dibromo-3-chloropropane	0.0729 U	0.0729	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,4-Trichlorobenzene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Hexachlorobutadiene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Naphthalene	0.0364 U	0.0364	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,3-Trichlorobenzene	0.0182 U	0.0182	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Surrogates									
Dibromofluoromethane <surr>	96.1		%	SW8260B	A	83-119	10/30/03	11/04/03	TJE
1,2-Dichloroethane-D4 <surr>	86.5		%	SW8260B	A	83-122	10/30/03	11/04/03	TJE
Toluene-d8 <surr>	100		%	SW8260B	A	87-115	10/30/03	11/04/03	TJE
4-Bromofluorobenzene <surr>	81.1		%	SW8260B	A	46-133	10/30/03	11/04/03	TJE
Solids									
Total Solids	86.8		%	SM20 2540G	B			11/01/03	JGL

SGS

SGS Ref.#	1036882003
Client Name	Shannon & Wilson-Fairbanks
Project Name/#	31-1-11195-002 FTWW Housing
Client Sample ID	1195-3-1
Matrix	Soil/Solid

All Dates/Times are Alaska Standard Time

Printed Date/Time	11/10/2003 12:42
Collected Date/Time	10/30/2003 12:38
Received Date/Time	10/31/2003 14:50
Technical Director	Stephen C. Ede

Released By Stephen C. Ede

Sample Remarks:

8260 - LCS recovery for 1,2-dibromo-3-chloropropane is low and does not meet laboratory QC goals. Results are estimated in the associated samples.

RRO - Unknown hydrocarbon with several peaks is present.

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Metals Department									
Lead	7.85	0.928	mg/Kg	SW7421	B		11/04/03	11/05/03	JMP
Volatile Fuels Department									
Gasoline Range Organics	2.41 U	2.41	mg/Kg	AK101 GRO	A		10/30/03	11/01/03	JLB
Surrogates									
4-Bromofluorobenzene <surr>	76.5		%	AK101 GRO	A	50-150	10/30/03	11/01/03	JLB
Semivolatile Organic Fuels Department									
Diesel Range Organics	34.7 U	34.7	mg/Kg	AK102 103			11/10/03	11/10/03	MCM
Residual Range Organics	79.9	34.7	mg/Kg	AK102 103			11/10/03	11/10/03	MCM
Surrogates									
5a Androstane <surr>	93.1		%	AK102 103		50-150	11/10/03	11/10/03	MCM
n-Triacontane-d62 <surr>	128		%	AK102 103		50-150	11/10/03	11/10/03	MCM
Volatile Gas Chromatography/Mass Spectroscopy									
Dichlorodifluoromethane	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloromethane	0.120 U	0.120	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Vinyl chloride	0.0125 U	0.0125	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromomethane	0.0962 U	0.0962	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloroethane	0.0962 U	0.0962	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Trichlorofluoromethane	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloroethene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Carbon disulfide	0.0962 U	0.0962	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Methylene chloride	0.0962 U	0.0962	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE

SGS

SGS Ref.#	1036882003	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 12:38
Client Sample ID	1195-3-1	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Gas Chromatography/Mass Spectroscopy									
trans-1,2-Dichloroethene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Butanone (MEK)	0.241 U	0.241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2,2-Dichloropropane	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,1-Trichloroethane	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloroethane	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
cis-1,2-Dichloroethene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromochloromethane	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloroform	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Carbon tetrachloride	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Benzene	0.0125 U	0.0125	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichloroethane	0.0125 U	0.0125	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloropropene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Trichloroethene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichloropropane	0.0125 U	0.0125	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Dibromomethane	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromodichloromethane	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,2-Trichloroethane	0.0125 U	0.0125	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Chloroethyl Vinyl Ether	0.241 U	0.241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
cis-1,3-Dichloropropene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Methyl-2-pentanone (MIBK)	0.241 U	0.241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Toluene	0.0481 U	0.0481	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
trans-1,3-Dichloropropene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Tetrachloroethene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3-Dichloropropane	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Hexanone	0.241 U	0.241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Dibromochloromethane	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,1,2-Tetrachloroethane	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dibromoethane	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chlorobenzene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Ethylbenzene	0.0481 U	0.0481	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
P & M -Xylene	0.0481 U	0.0481	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
o-Xylene	0.0481 U	0.0481	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Styrene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromoform	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE

SGS

SGS Ref.#	1036882003	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 12:38
Client Sample ID	1195-3-1	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Gas Chromatography/Mass Spectroscopy									
Isopropylbenzene (Cumene)	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromobenzene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,3-Trichloropropane	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,2,2-Tetrachloroethane	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
n-Propylbenzene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Chlorotoluene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Chlorotoluene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3,5-Trimethylbenzene	0.0481 U	0.0481	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
tert-Butylbenzene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,4-Trimethylbenzene	0.0481 U	0.0481	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
sec-Butylbenzene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3-Dichlorobenzene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Isopropyltoluene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,4-Dichlorobenzene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichlorobenzene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
n-Butylbenzene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dibromo-3-chloropropane	0.0962 U	0.0962	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,4-Trichlorobenzene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Hexachlorobutadiene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Naphthalene	0.0481 U	0.0481	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,3-Trichlorobenzene	0.0241 U	0.0241	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Surrogates									
Dibromofluoromethane <surr>	97.9		%	SW8260B	A	83-119	10/30/03	11/04/03	TJE
1,2-Dichloroethane-D4 <surr>	90		%	SW8260B	A	83-122	10/30/03	11/04/03	TJE
Toluene-d8 <surr>	103		%	SW8260B	A	87-115	10/30/03	11/04/03	TJE
4-Bromofluorobenzene <surr>	85.8		%	SW8260B	A	46-133	10/30/03	11/04/03	TJE
Solids									
Total Solids	85.0		%	SM20 2540G	B			11/01/03	JGL

SGS

SGS Ref.#	1036882004
Client Name	Shannon & Wilson-Fairbanks
Project Name/#	31-1-11195-002 FTWW Housing
Client Sample ID	1195-4-2
Matrix	Soil/Solid

All Dates/Times are Alaska Standard Time

Printed Date/Time	11/10/2003 12:42
Collected Date/Time	10/30/2003 13:23
Received Date/Time	10/31/2003 14:50
Technical Director	Stephen C. Ede
Released By	Stephen C. Ede

Sample Remarks:

8260 - LCS recovery for 1,2-dibromo-3-chloropropane is low and does not meet laboratory QC goals. Results are estimated in the associated samples.

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Metals Department									
Lead	4.01	2.38	mg/Kg	SW7421	B		11/04/03	11/05/03	JMP
Volatile Fuels Department									
Gasoline Range Organics	2.60 U	2.60	mg/Kg	AK101 GRO	A		10/30/03	11/01/03	JLB
Surrogates									
4-Bromofluorobenzene <surr>	89.2		%	AK101 GRO	A	50-150	10/30/03	11/01/03	JLB
Semivolatile Organic Fuels Department									
Diesel Range Organics	25.9 U	25.9	mg/Kg	AK102 103			11/10/03	11/10/03	MCM
Residual Range Organics	25.9 U	25.9	mg/Kg	AK102 103			11/10/03	11/10/03	MCM
Surrogates									
5a Androstane <surr>	77.7		%	AK102 103		50-150	11/10/03	11/10/03	MCM
n-Triacontane-d62 <surr>	83.1		%	AK102 103		50-150	11/10/03	11/10/03	MCM
Volatile Gas Chromatography/Mass Spectroscopy									
Dichlorodifluoromethane	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloromethane	0.130 U	0.130	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Vinyl chloride	0.0135 U	0.0135	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromomethane	0.104 U	0.104	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloroethane	0.104 U	0.104	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Trichlorofluoromethane	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloroethene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Carbon disulfide	0.104 U	0.104	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Methylene chloride	0.104 U	0.104	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
trans-1,2-Dichloroethene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE

SGS

SGS Ref.#	1036882004	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 13:23
Client Sample ID	1195-4-2	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Gas Chromatography/Mass Spectroscopy									
2-Butanone (MEK)	0.260 U	0.260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2,2-Dichloropropane	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,1-Trichloroethane	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
cis-1,2-Dichloroethene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloroethane	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromochloromethane	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloroform	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Carbon tetrachloride	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Benzene	0.0135 U	0.0135	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloropropene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichloroethane	0.0135 U	0.0135	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Trichloroethene	0.0208 U	0.0208	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichloropropane	0.0135 U	0.0135	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Dibromomethane	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromodichloromethane	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Chloroethyl Vinyl Ether	0.260 U	0.260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,2-Trichloroethane	0.0135 U	0.0135	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
cis-1,3-Dichloropropene	0.0208 U	0.0208	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Methyl-2-pentanone (MIBK)	0.260 U	0.260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Toluene	0.0521 U	0.0521	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
trans-1,3-Dichloropropene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Tetrachloroethene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3-Dichloropropane	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Hexanone	0.260 U	0.260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Dibromochloromethane	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,1,2-Tetrachloroethane	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dibromoethane	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chlorobenzene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Ethylbenzene	0.0521 U	0.0521	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
P & M -Xylene	0.0521 U	0.0521	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
o-Xylene	0.0521 U	0.0521	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Styrene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromoform	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Isopropylbenzene (Cumene)	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE

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SGS Ref.#	1036882004	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 13:23
Client Sample ID	1195-4-2	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Gas Chromatography/Mass Spectroscopy									
Bromobenzene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,3-Trichloropropane	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,2,2-Tetrachloroethane	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
n-Propylbenzene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Chlorotoluene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Chlorotoluene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3,5-Trimethylbenzene	0.0521 U	0.0521	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
tert-Butylbenzene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,4-Trimethylbenzene	0.0521 U	0.0521	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
sec-Butylbenzene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3-Dichlorobenzene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Isopropyltoluene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,4-Dichlorobenzene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichlorobenzene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
n-Butylbenzene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dibromo-3-chloropropane	0.104 U	0.104	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,4-Trichlorobenzene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Hexachlorobutadiene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Naphthalene	0.0521 U	0.0521	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,3-Trichlorobenzene	0.0260 U	0.0260	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Surrogates									
Dibromofluoromethane <surr>	97.9		%	SW8260B	A	83-119	10/30/03	11/04/03	TJE
1,2-Dichloroethane-D4 <surr>	90.1		%	SW8260B	A	83-122	10/30/03	11/04/03	TJE
Toluene-d8 <surr>	105		%	SW8260B	A	87-115	10/30/03	11/04/03	TJE
4-Bromofluorobenzene <surr>	96.6		%	SW8260B	A	46-133	10/30/03	11/04/03	TJE
Solids									
Total Solids	82.6		%	SM20 2540G	B			11/01/03	JGL

SGS

SGS Ref.#	1036882005	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 14:19
Client Sample ID	1195-5-3	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede
		Released By	Stephen C. Ede

Sample Remarks:

8260 - LCS recovery for 1,2-dibromo-3-chloropropane is low and does not meet laboratory QC goals. Results are estimated in the associated samples.

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Metals Department									
Lead	4.36	0.469	mg/Kg	SW7421	B		11/04/03	11/05/03	JMP
Volatile Fuels Department									
Gasoline Range Organics	1.94 U	1.94	mg/Kg	AK101 GRO	A		10/30/03	11/01/03	JLB
Surrogates									
4-Bromofluorobenzene <surr>	80.8		%	AK101 GRO	A	50-150	10/30/03	11/01/03	JLB
Semivolatile Organic Fuels Department									
Diesel Range Organics	24.9 U	24.9	mg/Kg	AK102 103			11/10/03	11/10/03	MCM
Residual Range Organics	24.9 U	24.9	mg/Kg	AK102 103			11/10/03	11/10/03	MCM
Surrogates									
n-Triacontane-d62 <surr>	93.1		%	AK102 103		50-150	11/10/03	11/10/03	MCM
5a Androstane <surr>	81.4		%	AK102 103		50-150	11/10/03	11/10/03	MCM
Volatile Gas Chromatography/Mass Spectroscopy									
Dichlorodifluoromethane	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloromethane	0.0969 U	0.0969	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Vinyl chloride	0.0101 U	0.0101	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromomethane	0.0775 U	0.0775	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloroethane	0.0775 U	0.0775	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Trichlorofluoromethane	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloroethene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Carbon disulfide	0.0775 U	0.0775	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Methylene chloride	0.0775 U	0.0775	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
trans-1,2-Dichloroethene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE

SGS

SGS Ref.#	1036882005	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 14:19
Client Sample ID	1195-5-3	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Gas Chromatography/Mass Spectroscopy									
2-Butanone (MEK)	0.194 U	0.194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2,2-Dichloropropane	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,1-Trichloroethane	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
cis-1,2-Dichloroethene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloroethane	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromochloromethane	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloroform	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Carbon tetrachloride	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Benzene	0.0101 U	0.0101	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloropropene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichloroethane	0.0101 U	0.0101	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Trichloroethene	0.0155 U	0.0155	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichloropropane	0.0101 U	0.0101	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Dibromomethane	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromodichloromethane	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,2-Trichloroethane	0.0101 U	0.0101	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Chloroethyl Vinyl Ether	0.194 U	0.194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
cis-1,3-Dichloropropene	0.0155 U	0.0155	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Methyl-2-pentanone (MIBK)	0.194 U	0.194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Toluene	0.0387 U	0.0387	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
trans-1,3-Dichloropropene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Tetrachloroethene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3-Dichloropropane	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Hexanone	0.194 U	0.194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Dibromochloromethane	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,1,2-Tetrachloroethane	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dibromoethane	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chlorobenzene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Ethylbenzene	0.0387 U	0.0387	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
P & M -Xylene	0.0387 U	0.0387	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
o-Xylene	0.0387 U	0.0387	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Styrene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromoform	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Isopropylbenzene (Cumene)	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE

SGS

SGS Ref.#	1036882005	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 14:19
Client Sample ID	1195-5-3	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Gas Chromatography/Mass Spectroscopy									
Bromobenzene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,3-Trichloropropane	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,2,2-Tetrachloroethane	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
n-Propylbenzene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Chlorotoluene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Chlorotoluene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3,5-Trimethylbenzene	0.0387 U	0.0387	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
tert-Butylbenzene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,4-Trimethylbenzene	0.0387 U	0.0387	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
sec-Butylbenzene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3-Dichlorobenzene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Isopropyltoluene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,4-Dichlorobenzene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichlorobenzene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
n-Butylbenzene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dibromo-3-chloropropane	0.0775 U	0.0775	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,4-Trichlorobenzene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Hexachlorobutadiene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Naphthalene	0.0387 U	0.0387	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,3-Trichlorobenzene	0.0194 U	0.0194	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Surrogates									
Dibromofluoromethane <surr>	99.2		%	SW8260B	A	83-119	10/30/03	11/04/03	TJE
1,2-Dichloroethane-D4 <surr>	89.9		%	SW8260B	A	83-122	10/30/03	11/04/03	TJE
Toluene-d8 <surr>	100		%	SW8260B	A	87-115	10/30/03	11/04/03	TJE
4-Bromofluorobenzene <surr>	95.3		%	SW8260B	A	46-133	10/30/03	11/04/03	TJE
Solids									
Total Solids	81.8		%	SM20 2540G	B			11/01/03	JGL

SGS

SGS Ref.#	1036882006	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 14:25
Client Sample ID	1195-5-4	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede
		Released By	Stephen C. Ede

Sample Remarks:

8260 - LCS recovery for 1,2-dibromo-3-chloropropane is low and does not meet laboratory QC goals. Results are estimated in the associated samples.

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Metals Department									
Lead	3.54	0.441	mg/Kg	SW7421	B		11/04/03	11/05/03	JMP
Volatile Fuels Department									
Gasoline Range Organics	1.92 U	1.92	mg/Kg	AK101 GRO	A		10/30/03	11/01/03	JLB
Surrogates									
4-Bromofluorobenzene <surr>	80.4		%	AK101 GRO	A	50-150	10/30/03	11/01/03	JLB
Semivolatile Organic Fuels Department									
Diesel Range Organics	23.7 U	23.7	mg/Kg	AK102 103			11/10/03	11/10/03	MCM
Residual Range Organics	23.7 U	23.7	mg/Kg	AK102 103			11/10/03	11/10/03	MCM
Surrogates									
n-Triacontane-d62 <surr>	92.6		%	AK102 103		50-150	11/10/03	11/10/03	MCM
5a Androstane <surr>	74.7		%	AK102 103		50-150	11/10/03	11/10/03	MCM
Volatile Gas Chromatography/Mass Spectroscopy									
Dichlorodifluoromethane	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloromethane	0.0960 U	0.0960	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Vinyl chloride	0.00998 U	0.00998	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromomethane	0.0768 U	0.0768	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloroethane	0.0768 U	0.0768	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Trichlorofluoromethane	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloroethene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Carbon disulfide	0.0768 U	0.0768	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Methylene chloride	0.0768 U	0.0768	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
trans-1,2-Dichloroethene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE

SGS

SGS Ref.#	1036882006	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 14:25
Client Sample ID	1195-5-4	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Gas Chromatography/Mass Spectroscopy									
2-Butanone (MEK)	0.192 U	0.192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2,2-Dichloropropane	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,1-Trichloroethane	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
cis-1,2-Dichloroethene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloroethane	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromochloromethane	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloroform	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Carbon tetrachloride	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Benzene	0.00998 U	0.00998	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichloroethane	0.00998 U	0.00998	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloropropene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Trichloroethene	0.0154 U	0.0154	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichloropropane	0.00998 U	0.00998	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Dibromomethane	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromodichloromethane	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Chloroethyl Vinyl Ether	0.192 U	0.192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,2-Trichloroethane	0.00998 U	0.00998	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
cis-1,3-Dichloropropene	0.0154 U	0.0154	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Methyl-2-pentanone (MIBK)	0.192 U	0.192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Toluene	0.0384 U	0.0384	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
trans-1,3-Dichloropropene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Tetrachloroethene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3-Dichloropropane	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Hexanone	0.192 U	0.192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Dibromochloromethane	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,1,2-Tetrachloroethane	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dibromoethane	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chlorobenzene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Ethylbenzene	0.0384 U	0.0384	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
P & M -Xylene	0.0384 U	0.0384	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
o-Xylene	0.0384 U	0.0384	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Styrene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromoform	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Isopropylbenzene (Cumene)	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE

SGS

SGS Ref.#	1036882006	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 14:25
Client Sample ID	1195-5-4	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Gas Chromatography/Mass Spectroscopy									
Bromobenzene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,3-Trichloropropane	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,2,2-Tetrachloroethane	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
n-Propylbenzene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Chlorotoluene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Chlorotoluene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3,5-Trimethylbenzene	0.0384 U	0.0384	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
tert-Butylbenzene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,4-Trimethylbenzene	0.0384 U	0.0384	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
sec-Butylbenzene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3-Dichlorobenzene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Isopropyltoluene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,4-Dichlorobenzene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichlorobenzene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
n-Butylbenzene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dibromo-3-chloropropane	0.0768 U	0.0768	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,4-Trichlorobenzene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Hexachlorobutadiene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Naphthalene	0.0384 U	0.0384	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,3-Trichlorobenzene	0.0192 U	0.0192	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Surrogates									
Dibromofluoromethane <surr>	102		%	SW8260B	A	83-119	10/30/03	11/04/03	TJE
1,2-Dichloroethane-D4 <surr>	92.9		%	SW8260B	A	83-122	10/30/03	11/04/03	TJE
Toluene-d8 <surr>	107		%	SW8260B	A	87-115	10/30/03	11/04/03	TJE
4-Bromofluorobenzene <surr>	89.2		%	SW8260B	A	46-133	10/30/03	11/04/03	TJE
Solids									
Total Solids	82.9		%	SM20 2540G	B			11/01/03	JGL

SGS

SGS Ref.#	1036882007	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 0:00
Client Sample ID	Trip Blank	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede
		Released By	Stephen C. Ede

Sample Remarks:

8260 - LCS recovery for 1,2-dibromo-3-chloropropane is low and does not meet laboratory QC goals. Results are estimated in the associated samples.

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Fuels Department									
Gasoline Range Organics	2.53 U	2.53	mg/Kg	AK101 GRO	A		10/30/03	11/01/03	JLB
Surrogates									
4-Bromofluorobenzene <surr>	95.5		%	AK101 GRO	A	50-150	10/30/03	11/01/03	JLB
Volatile Gas Chromatography/Mass Spectroscopy									
Dichlorodifluoromethane	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloromethane	0.126 U	0.126	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Vinyl chloride	0.0132 U	0.0132	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromomethane	0.101 U	0.101	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloroethane	0.101 U	0.101	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Trichlorofluoromethane	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloroethene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Carbon disulfide	0.101 U	0.101	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Methylene chloride	0.101 U	0.101	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
trans-1,2-Dichloroethene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Butanone (MEK)	0.253 U	0.253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2,2-Dichloropropane	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,1-Trichloroethane	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
cis-1,2-Dichloroethene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloroethane	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromochloromethane	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chloroform	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Carbon tetrachloride	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Benzene	0.0132 U	0.0132	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichloroethane	0.0132 U	0.0132	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1-Dichloropropene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Trichloroethene	0.0202 U	0.0202	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dichloropropane	0.0132 U	0.0132	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE

SGS

SGS Ref.#	1036882007	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 0:00
Client Sample ID	Trip Blank	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Gas Chromatography/Mass Spectroscopy									
Dibromomethane	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromodichloromethane	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Chloroethyl Vinyl Ether	0.253 U	0.253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,2-Trichloroethane	0.0132 U	0.0132	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
cis-1,3-Dichloropropene	0.0202 U	0.0202	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Methyl-2-pentanone (MIBK)	0.253 U	0.253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Toluene	0.0506 U	0.0506	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
trans-1,3-Dichloropropene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Tetrachloroethene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3-Dichloropropane	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Hexanone	0.253 U	0.253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Dibromochloromethane	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,1,2-Tetrachloroethane	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dibromoethane	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Chlorobenzene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Ethylbenzene	0.0506 U	0.0506	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
P & M -Xylene	0.0506 U	0.0506	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
o-Xylene	0.0506 U	0.0506	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Styrene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromoform	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Isopropylbenzene (Cumene)	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Bromobenzene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,3-Trichloropropane	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,1,2,2-Tetrachloroethane	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
n-Propylbenzene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
2-Chlorotoluene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Chlorotoluene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3,5-Trimethylbenzene	0.0506 U	0.0506	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
tert-Butylbenzene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,4-Trimethylbenzene	0.0506 U	0.0506	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
sec-Butylbenzene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,3-Dichlorobenzene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
4-Isopropyltoluene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,4-Dichlorobenzene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE

SGS

SGS Ref.#	1036882007	All Dates/Times are Alaska Standard Time	
Client Name	Shannon & Wilson-Fairbanks	Printed Date/Time	11/10/2003 12:42
Project Name/#	31-1-11195-002 FTWW Housing	Collected Date/Time	10/30/2003 0:00
Client Sample ID	Trip Blank	Received Date/Time	10/31/2003 14:50
Matrix	Soil/Solid	Technical Director	Stephen C. Ede

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Volatile Gas Chromatography/Mass Spectroscopy									
1,2-Dichlorobenzene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
n-Butylbenzene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2-Dibromo-3-chloropropane	0.101 U	0.101	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,4-Trichlorobenzene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Hexachlorobutadiene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Naphthalene	0.0506 U	0.0506	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
1,2,3-Trichlorobenzene	0.0253 U	0.0253	mg/Kg	SW8260B	A		10/30/03	11/04/03	TJE
Surrogates									
Dibromofluoromethane <surr>	101		%	SW8260B	A	83-119	10/30/03	11/04/03	TJE
1,2-Dichloroethane-D4 <surr>	90.2		%	SW8260B	A	83-122	10/30/03	11/04/03	TJE
Toluene-d8 <surr>	103		%	SW8260B	A	87-115	10/30/03	11/04/03	TJE
4-Bromofluorobenzene <surr>	112		%	SW8260B	A	46-133	10/30/03	11/04/03	TJE
Solids									
Total Solids	100		%	SM20 2540G	A			11/01/03	JGL

APPENDIX I

North Wind Inc.
Chronology of Munitions and Explosives of Concern (MEC)
Letter Report

North Wind

Corporate Headquarters
1425 Higham Street
Idaho Falls, ID 83402

Robert Brock
Department of the Army
U.S. Army Corps of Engineers, Alaska District
Elmendorf AFB, AK 99506-6898

July 31, 2006

Subject: Chronology of Munitions and Explosives of Concern (MEC) Discoveries at Taku Site through July 2006

One objective of the Preliminary Source Evaluation (PSE) at the Fort Wainwright Taku Housing Development is to determine whether physical or chemical hazards are associated with the debris found buried at the site. The PSE investigation commenced June 6, 2006 with the inspection of debris/soil piles and excavation of test pits. As of July 31 2006, 23 debris/soil piles and 30 test pits have been completed. The following chronology documents the most significant MEC related items discovered:

Date	Number	Location	Description
6/11/06	1	Debris Pile 02; original location unknown	20 lb fragmentation bomb
6/25/06	1	Debris Pile 04; original location unknown	M47 Series 100 lb chemical bomb
7/21/06	1	Test Pit 25; SE corner Bld 23; 3-4 ft below ground surface	3.5 inch diameter rocket (motor with propellant)
7/26/06	1	Test Pit 27; NW corner Bld 25; 3 ft below ground surface	M47 Series 100 lb chemical bomb
7/28/06	1	Test Pit 28; SW corner Bld 22; 1 – 1.5 ft below ground surface	8 inch M106 artillery round
7/29/06	1	Test Pit 29; SW corner Bld 22; 3 – 3.5 ft below ground surface	8 inch M106 artillery round
7/31/06	2	Test Pit 31; SW corner Bld 22; 3 - 4 ft below ground surface	M47 Series 100 lb chemical bomb

All of the above items were turned over to Fort Richardson or Eielson EOD teams for removal and destruction. Other OE scrap items including ammo cans, shipping tubes, shipping plugs, casings of various calibers, frag sleeves, 50 cal ammo links, recoilless rifle shell casings, etc. were certified for disposal by the contractor UXO technicians and disposed of at the Fort Wainwright solid waste landfill.

Sincerely,

Aran T. Armstrong

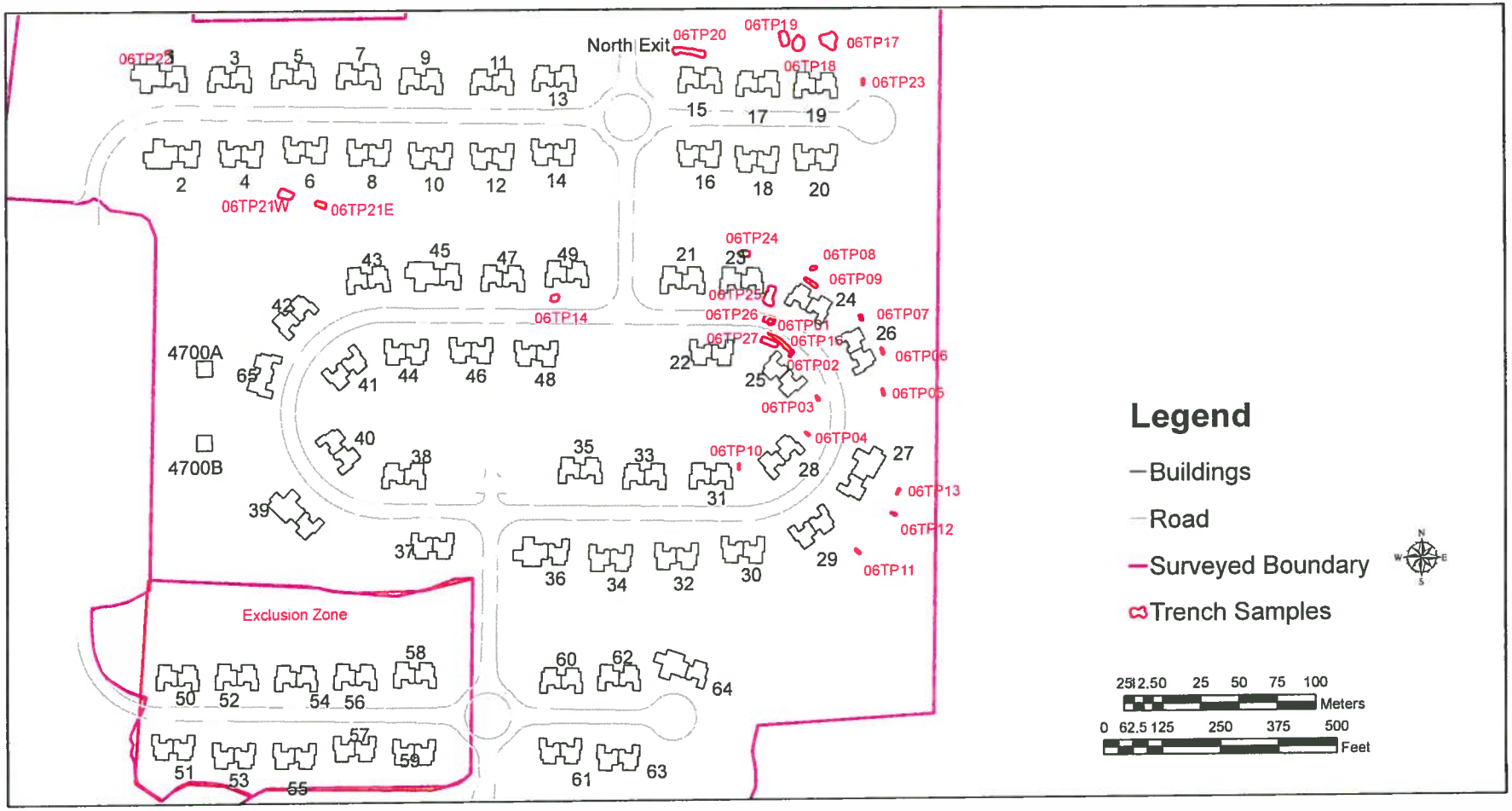
Digitally signed by Aran T. Armstrong
DN: CN = Aran T. Armstrong, C = US, O = North Wind, Inc.
Reason: I am the author of this document
Date: 2006.08.01 00:37:09 -08'00'

Aran Armstrong,
Project Manager

Cc: B. Miller, NWI

Attachments:

1) Test Pit Map
2) Debris Pile Map
3) Photo log



Prepared for the Department of the Army, U.S. Army Corps of Engineers, Alaska District

DATE: 7-31-2006		SCALE:	
DESIGNED BY:	TF	DESIGN PHASE:	
DRAWN BY:	TF		
CHECKED BY:	AA	NWI FILE NAME: Taku.mxd	
APPROVED BY:			

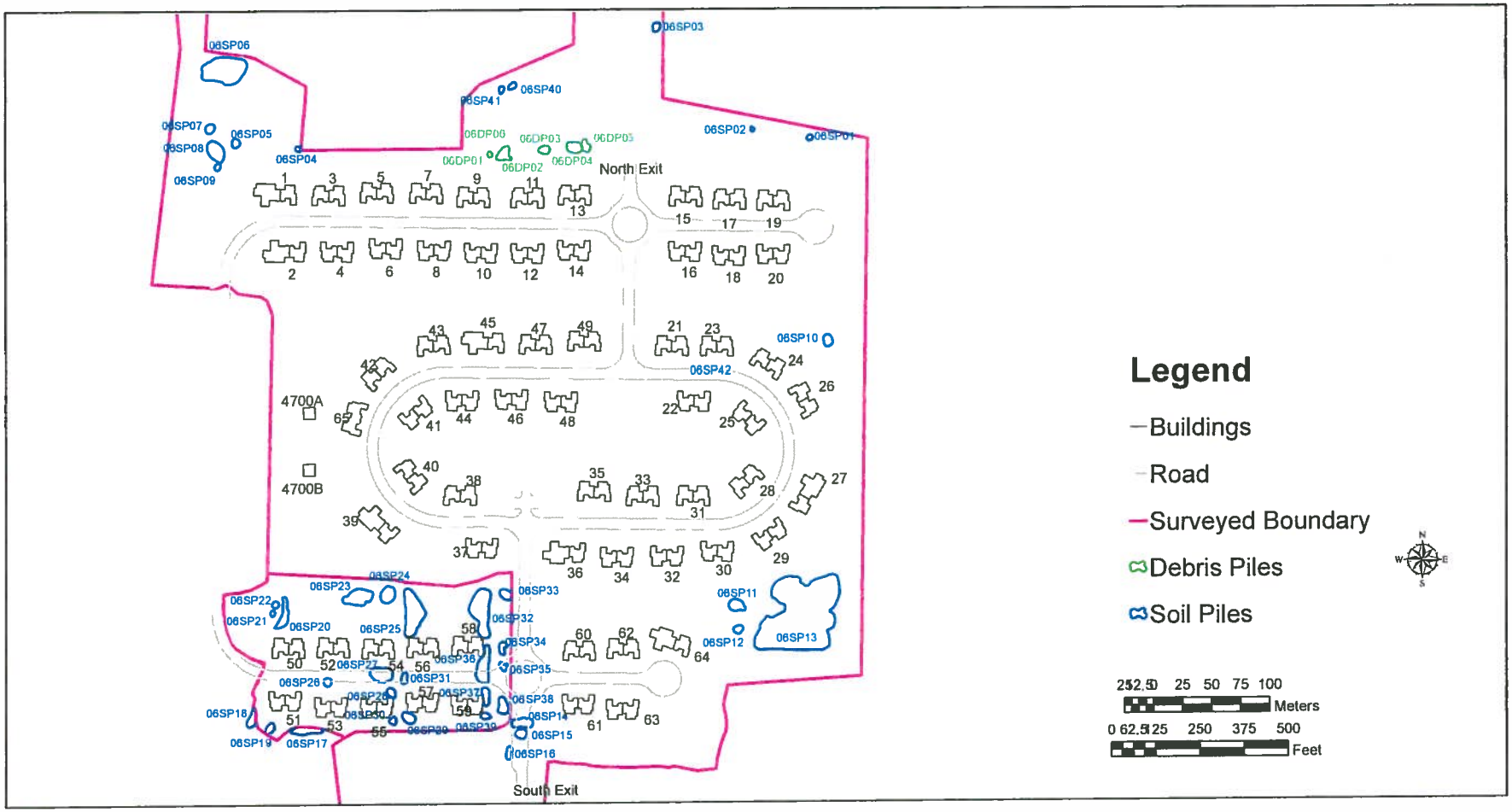
TAKU GARDENS TRENCH SAMPLES

JOB NUMBER 2316

SHEET NO. 1

REV NO. 0

North Wind, Inc.
1425 HIGHAM ST.
IDAHO FALLS, ID 83402
WEB: www.nwinderw.com
Phone: (208) 528-8718 FAX: (208) 528-8714



Prepared for the Department of the Army, U.S. Army Corps of Engineers, Alaska District	DATE: 7-31-2006		SCALE:	TAKU GARDENS SOIL/DEBRIS PILES	JOB NUMBER 2316
	DESIGNED BY:	TF	DESIGN PHASE:		SHEET NO. 1
	DRAWN BY:	TF			REV NO. 0
	CHECKED BY:	AA	NWI FILE NAME: Taku.mxd		
	APPROVED BY:				

North Wind
North Wind, Inc.
1425 HIGHAM ST.
IDAHO FALLS, ID 83402
WEB: www.nwindenv.com
Phone: (208) 528-8718 FAX: (208) 523-8714

Figure 1. 20 lb Fragmentation Bomb from Debris Pile 02.

Figure 2. 100 lb Chemical Bomb from Debris Pile 04.

Figure 3. 3.5 in rocket from Test Pit 25.

Figure 4. 100 lb chemical bomb from Test Pit 27.

Figure 5. 8 in projectile from Test Pit 28.

Figure 6. 8 in projectile from Test Pit 29.

Figure 7. 100 lb chemical bomb from Test Pit 30.

Figure 8. Second 100 lb chemical bomb from Test Pit 31.

APPENDIX J

Sources for Photographs and Figures

Photographs and Figures Sources

Name of File or Description	Archive and/or Source
1947 ax001.tif	DOT, Fairbanks
1948ax020	Nat'l Archives and Records Administration DIA (NARA)
1948ax021	Nat'l Archives and Records Administration DIA (NARA)
1948oc001	U.S. AF
1948x009	DOT
1949ax001	U.S. Geological Survey, EROS Data Center, Sioux Falls, South Dakota
1949ax002	CRREL, Fairbanks
1954ax001	U.S. Geological Survey, EROS Data Center, Sioux Falls, South Dakota
1954ax002	U.S. Geological Survey, EROS Data Center, Sioux Falls, South Dakota
1956ax001	Nat'l Archives and Records Administration DIA (NARA)
1956ax032	Nat'l Archives and Records Administration DIA (NARA)
1956ax047	Nat'l Archives and Records Administration DIA (NARA)
1957ax133	Nat'l Archives and Records Administration DIA (NARA)
1957ox001	Nat'l Archives and Records Administration DIA (NARA)
1959ax048	DOT
9-20-59 1-201 48mb 800ppi	Aero-Metric, Anchorage Alaska
1960ax002	DOT
5-20-60 16-0 51mb 800ppi	Aero-Metric, Anchorage Alaska
5-24-60 60-9 58mb 800ppi	Aero-Metric, Anchorage Alaska
7-17-62 12-23 12mb 400 ppi	Aero-Metric, Anchorage Alaska
1964ax007	DOT
1967ax003	U.S. Geological Survey, EROS Data Center, Sioux Falls, South Dakota
9-2-68 15 48mb 800ppi	Aero-Metric, Anchorage Alaska
1969ax006	DOT
1976ax001	DOT
1979ax005	DOT
1993ax006	DOT
Topo_F-15_1965	USACE Anchorage Alaska Survey Section, Tony Miller
Topo_F-15_1973-Feb	USACE Anchorage Alaska Survey Section, Tony Miller
Topo_F-15_1973-October	USACE Anchorage Alaska Survey Section, Tony Miller
Topo_F-15_1991	USACE Anchorage Alaska Survey Section, Tony Miller
Topo_F-16_1965	USACE Anchorage Alaska Survey Section, Tony Miller
Topo_F-16_1973	USACE Anchorage Alaska Survey Section, Tony Miller
Topo_F-16_1973-Feb	USACE Anchorage Alaska Survey Section, Tony Miller
Topo_G-14	USACE Anchorage Alaska Survey Section, Tony Miller
Topo_G-14_1984	USACE Anchorage Alaska Survey Section, Tony Miller
Topo_G-14_1986	USACE Anchorage Alaska Survey Section, Tony Miller
Topo_G-14_1996	USACE Anchorage Alaska Survey Section, Tony Miller
Topo_G-16	USACE Anchorage Alaska Survey Section, Tony Miller
Topo_H-14-1985	USACE Anchorage Alaska Survey Section, Tony Miller
Topo_H-14-1994	USACE Anchorage Alaska Survey Section, Tony Miller
Topo_H-14-1996	USACE Anchorage Alaska Survey Section, Tony Miller
Topo_H-16_1963	USACE Anchorage Alaska Survey Section, Tony Miller
Field Photographs 2005 (Appendix H) provided to USACE by Shannon and Wilson/WCC	Shannon and Wilson under subcontract to Watterson Construction Company

APPENDIX K

Resources for Research

The following individuals provided support to OASIS Environmental during the development of the Former Communication Site Preliminary Evaluation Narrative Report.

Individual	Telephone Number	Organization
Brian Adams	(907) 353-6623	U.S. Army Garrison, Alaska Directorate of Public Works
Kenneth Andraschko	(907) 753-5647	USACE, Alaska District
Beth Astley	(907) 384-0513	Cold Regions Research Engineering Lab
Greg Bachand	(907) 258-4880	OASIS (Former U.S. Air Force)
Robert Brock	(907) 753-5612	USACE, Alaska District
Karen Dearborn	(907) 384-2694	U.S. Army Garrison, Alaska Directorate of Public Works (CSU)
Therese Deardorff	(907) 384-2716	U.S. Army Garrison, Alaska Directorate of Public Works
Cristal Fosbrook	(907) 384-2713	U.S. Army Garrison, Alaska Directorate of Public Works
Rielle Markey	(907) 353-6160	U.S. Army Garrison, Alaska Directorate of Public Works (CSU)
National Archives and Records Administration	(907) 271-2443	Pacific Alaska Region Anchorage, Alaska
Sharon Richmond	(907) 451-2158	ADEC
Julie-Sharp-Dahl	(907) 753-5689	USACE, Alaska District
Wayne Tolliver	(907) 353-7724	U.S. Army Garrison, Alaska Directorate of Public Works
John Wentz	(907) 353-4433	USACE, Northern Area Office
Stan Wharry	(719) 549-4220	Army Chemical Depot in Pueblo, CO

APPENDIX L

Photographs

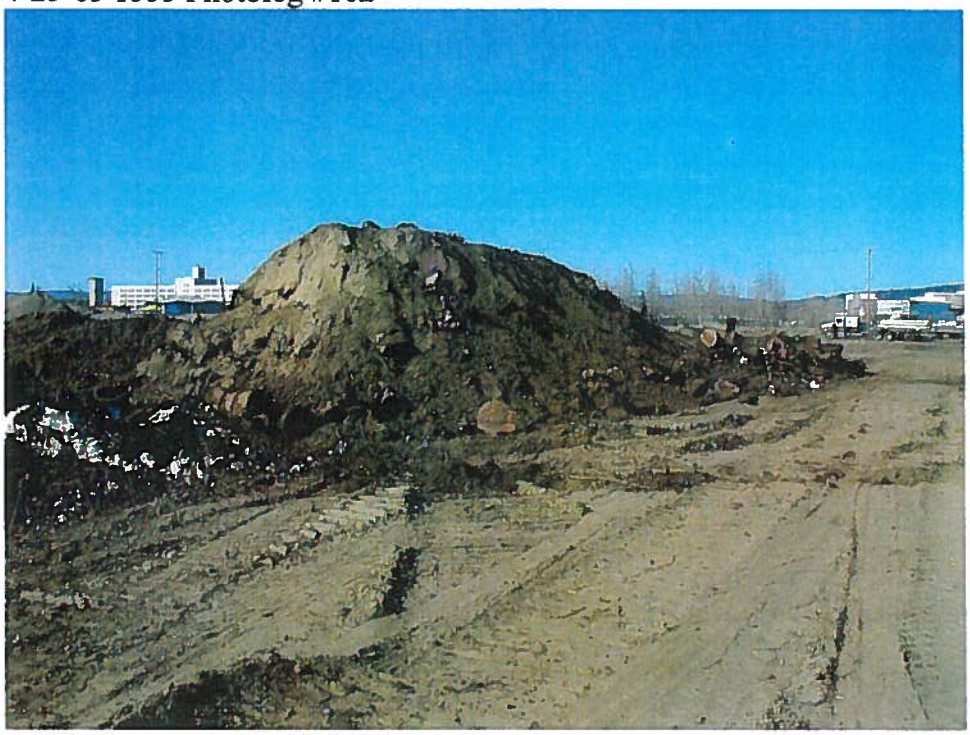
4-16-0916 Photolog #114

Debris removed from Building 17 excavation

4-20-05 Photolog #141

Debris in Building 24 excavation

4-25-05 1555 Photolog #162



Debris removed from Building 48 Excavation

5-2-05 0820 Photolog #184

Liguid leaking from suspected chemical bomb found in excavation of Building 24.

5-7-05 1620 Photolog #227

A Manhole-K facing north; exclusion zone is on located to the right of this utility trench. Building 4394 is in background

5-17-05 1620 Photolog #228

At Manhole K facing Manhole L; this is the area where the settling pond was constructed in the spring of 2006.

052105 0755 Photolog #240

Two buckets of white powder were excavated north of Building 30

062405 0925 Photolog #283.5

Aluminum drop tanks. Drop tanks were used for aerial distribution of chemicals.

062905 1300 Photolog #285

Fuze Rocket Dummies found near glycol trench north of Building 27. They are positioned upright in a soil stockpile.

103005 1750 Photolog #320

Debris and cylinders excavated from Building 48

072805 1300 Photolog #299

Bomb fin in background and drum (containing a water-like liquid) found in trench southwest of Building 22.

Cylinder found in Area D near utility trench near Building 64.

View of cylinder and soil sample location.

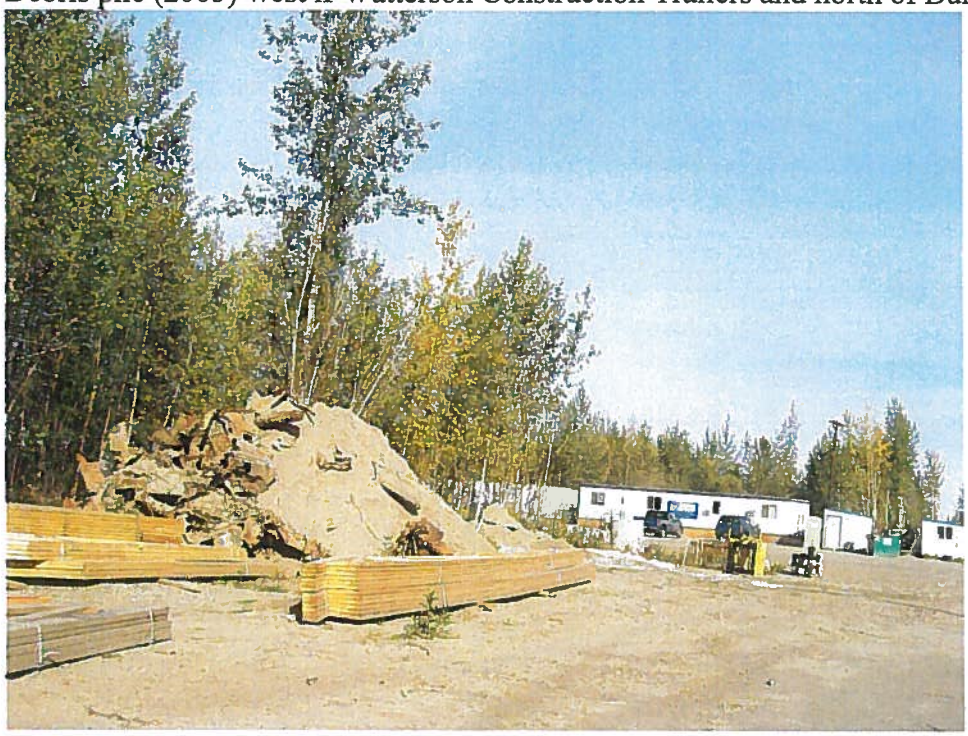
Photographs provided by Gloria Beckman

Cylinder location relative to utility trench (2005).

Drop tank in debris pile north of Building 9 (2005).

Photographs provided by Gloria Beckman

Debris pile (2005) west if Watterson Construction Trailers and north of Building 13.



North Wind Inc. removing drums from the excavation near Buildings 24 and 25 (2006). Strong chemical odor noted in this excavation. Fuel-like residue on drum with frost on side.

Photographs provided by Gloria Beckman

Same drum cache as previous; this drum has writing on the end (2006).

Wooden post in Area 52 excavation after PCB contaminated soil was removed (2005).

Photographs provided by Gloria Beckman

May 2004

Photograph shows soil scraped from surface of the FCS.

May 2004

FCS surface preparation for construction.

Photographs provided by Julie Sharp-Dahl USACE from R&M Geophysical Survey

APPENDIX M

History of Munitions and Explosives

HISTORY OF MUNITIONS AND EXPLOSIVES OF CONCERN

The risks presented by munitions and explosives of concern, including unexploded ordnance, buried munitions, and reactive or ignitable soil can be explosive as well as non-explosive in nature. The explosive hazards depend on the type of constituent present and the nature and condition of the explosive fillers and fuses. Standard military explosives are reactive to conditions of storage and environmental exposure. Munitions are designed to be free of moisture because of the reactions of the explosives to water. Munitions that are not properly stored may be more unstable and unpredictable (Handbook on the Management of Munitions Response Actions EPA 505-B-01-001, May 2005. A few of these reactions are as follows:

- Lead azide reacts with copper in the presence of water and carbon dioxide to form copper azide which is a more sensitive explosive,
- Ammonium nitrate reacts with iron or aluminum in the presence of water to form ammonia and metal oxide,
- TNT reacts with alkalis to form dangerously sensitive compounds, and
- Picric acid easily forms metallic compounds that are very shock sensitive.

This section provides an overview of some of the information that may be taken into consideration when planning to investigate MEC.

The earliest known explosive mixture is known as black powder and is a mixture of potassium nitrate, sulfur, and powdered charcoal or coal.

During WWI, the following chemicals were produced:

- Lead azide (introduced as an initiator),
- TNT substitutes,
- Mixtures of TNT,
- Ammonium nitrate, and
- Aluminum.

Following WWI and prior to WWII, the production of lead azide continued but new military explosives were developed as follows:

- RDX,
- Penta erythrite tetranitrate (PETN) was used in mixtures of TNT for loading small caliber projectiles and grenades. It was also used in detonating fuzes, boosters, and detonators,
- Lead styphnate, and
- Diethylene glycol dinitrate (DEGDN).

During WWII, the development of synthetic toluene from petroleum provided an almost limitless supply of the chemical precursor of TNT. As a result TNT was used on a wide scale during WWII. Other chemicals that were developed or used during this war are as follows:

- TNT,
- Nitrocellulose,
- Nitroglycerine,

- DEGDN,
- Tetryl was used as a binary bursting charge explosive (contains tetryl and TNT),
- Picratol was used as a binary bursting charge explosive (contains ammonium picrate and TNT),
- RDX,
- Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX),
- Plastic explosives,
- Powered aluminum increased explosives power,
- Tritonal (a mixture of TNT and flaked aluminum),
- Torpex (a mixture of RDX, TNT and aluminum), and
- Minol (a mixture of TNT, ammonium nitrate, and aluminum).

During the post-1945 era, military researchers determined that RDX, TNT and HMX would not be replaced as explosives of choice for military applications.

Classification of Explosives

This section describes the chemicals that are associated with various classes of explosives:

- Pyrotechnics
  - Aluminum, Barium, Chromium, Hexachlorobenzene, Hexachloroethane, Iron, Magnesium, Manganese, Titanium, Tungsten, Zirconium, Boron, Carbon, Silicon, Sulfur, White Phosphorous, and Zinc, and
  - Chlorates, Chromates, Dichromates, Halocarbons, Iodates, Nitrates, Oxides, and Perchlorates.
- Propellants (such as gun propellents or projectiles)
  - Dinitrotoluenes (2,4 and 2,6),
  - Diphenylamine,
  - Ethyl centralite,
  - N-nitroso-diphenylamine,
  - Nitrocellulose,
  - Nitroglycerine,
  - Nitroguanidine, and
  - Phthalates.
- Primary explosives
  - Lead azide,
  - Lead styphnate,
  - Mercury fulminate,
  - Tetrazene, and
  - Diazodinitrophenol.
- Booster explosives
  - RDX,
  - Tertyl,
  - PETN,
  - TNT,
  - RDX compositions,
  - HMX, and

    - Explosive D.
- Incendiaries are flammable materials, such as napalm, thermite, magnesium or zirconium, used as fillers for the purpose of destroying a target by fire.

Areas most likely to contain MEC include:

- Munitions manufacturing plants,
- Load assemble and packing operations,
- Military supply depots,
- Ammunition depots,
- Proving grounds,
- Open detonation and open burning grounds,
- Range impact areas,
- Range buffer zones,
- Explosive ordnance disposal sites, live-fire areas,
- Training ranges, and
- Ordnance test and evaluation facilities and ranges.

APPENDIX N

Fort Wainwright Drinking Water Information
(ADEC WEB DATA)

APPENDIX N

Type of Sampling Point

The following table defines the Type of Sampling Point or location or function of the sampling point used in the ADEC Groundwater data base.

DS Distribution System—the location is in the distribution system of the water system. Examples of this type of sampling point include sampling points for Total Coliform, lead and copper, and perhaps disinfection by-products (see several of the types below for more precise ways to define disinfection by-products sampling points).

EP Entry Point—location at which water enters the distribution system of a public water system. This is intended to correspond to the regulatory definition of an entry point to the distribution system representative of one or more sources of water. These should not be associated to Distribution System facilities but rather to the facility from which the water is flowing (e.g., a treatment plant, a well (if not treated prior to distribution), a common header).

MD Midpoint in the Distribution System—the Unregulated Contaminant Monitoring Rule location at which the chlorine residual would be expected to be typical for the system. This could also be used to designate those sampling points that are considered "representative points in the distribution system" under the Disinfection By-Products Rules.

MR Point of Maximum Retention—the location that represents the maximum residence time of disinfectants within the distribution system under the Disinfection By-Products Rules. This can also be used as the Unregulated Contaminant Monitoring Rule location in the distribution system that is furthest from the entry point to the distribution.

PC Process Control—locations normally associated with treatment plants or storage water system facilities. This sampling point type is used to demonstrate compliance with contact time or other disinfectant or treatment requirements.

RW Raw Water Source—locations normally associated with intake or well water system facilities. Raw water monitoring is triggered by the detection of a contaminant at an entry point to the distribution system. This Sampling Point type can also be used to designate the raw water sampling point for precursor removal.

SR Source Water Point—defined in the Unregulated Contaminant Monitoring Rule as the location at which untreated water is collected at the source.

UP Unit Process—a sampling point used to evaluate the effectiveness of a unit process. This type might be used, for instance, to determine the contact time under the Surface Water Treatment Rule for a single unit process.

WS Water System Facility point.

Five types of Water System Facilities are found within the data base. These are defined as follows: SF001 (ST) storage; TP001 (TP) treatment plant; WL001, WL002, and WL003 (WL) well; DS001 (DS) distribution system; and SS001 (SS) sample station.

Appendix N
ADEC Drinking Water Program

Water System No.:AK2310918
FT Wainwright/Water Treatment Plant
Fairbanks North Star

Analyte Code	Analyte Name	MCL	Number of Sample(s)
2981	1,1,1-TRICHLOROETHANE	5.0000000000000001E-4 MG/L	50
2981	1,1,1-TRICHLOROETHANE	0.20000000000000001 MG/L	50
2985	1,1,2-TRICHLOROETHANE	5.0000000000000001E-4 MG/L	49
2985	1,1,2-TRICHLOROETHANE	5.0000000000000001E-3 MG/L	49
2977	1,1-DICHLOROETHYLENE	5.0000000000000001E-4 MG/L	49
2977	1,1-DICHLOROETHYLENE	7.0000000000000001E-3 MG/L	49
2378	1,2,4-TRICHLOROBENZENE	5.0000000000000001E-4 MG/L	54
2378	1,2,4-TRICHLOROBENZENE	7.0000000000000007E-2 MG/L	54
2980	1,2-DICHLOROETHANE	5.0000000000000001E-4 MG/L	49
2980	1,2-DICHLOROETHANE	5.0000000000000001E-3 MG/L	49
2983	1,2-DICHLOROPROPANE	5.0000000000000001E-4 MG/L	49
2983	1,2-DICHLOROPROPANE	5.0000000000000001E-3 MG/L	49
2063	2,3,7,8 TCDD (DIOXIN)	0.0 MG/L	13
2063	2,3,7,8 TCDD (DIOXIN)	3.0000000000000004E-8 MG/L	13
2111	2,4,5-T		7
2110	2,4,5-TP (SILVEX)	2.0000000000000001E-4 MG/L	24
2110	2,4,5-TP (SILVEX)	5.0000000000000003E-2 MG/L	24
2106	2,4,DB		7
2105	2,4-D	0.0001 MG/L	24
2105	2,4-D	7.0000000000000007E-2 MG/L	24
2270	2,4-DINITROTOLUENE		5
2260	ACENAPHTHYLENE		11
2108	ACIFLUORFEN		4
2051	ALACHLOR (LASSO)	2.0000000000000001E-4 MG/L	20

Appendix N
ADEC Drinking Water Program

Water System No.:AK2310918
FT Wainwright/Water Treatment Plant
Fairbanks North Star

Analyte Code	Analyte Name	MCL	Number of Sample(s)
2051	ALACHLOR (LASSO)	0.002 MG/L	20
2047	ALDICARB	5.0000000000000001E-4 MG/L	15
2047	ALDICARB	3.0000000000000001E-3 MG/L	15
2044	ALDICARB SULFONE	5.0000000000000001E-4 MG/L	15
2044	ALDICARB SULFONE	0.002 MG/L	15
2043	ALDICARB SULFOXIDE	8.0000000000000004E-4 MG/L	15
2043	ALDICARB SULFOXIDE	4.0000000000000001E-3 MG/L	15
1002	ALUMINUM	0.20000000000000001 MG/L	1
2280	ANTHRACENE		11
1074	ANTIMONY	6.0000000000000001E-3 MG/L	6
2388	AROCLOR 1016 (PCB)		1
2390	AROCLOR 1221 (PCB)		1
2392	AROCLOR 1232 (PCB)		1
2394	AROCLOR 1242 (PCB)		1
2396	AROCLOR 1248 (PCB)		1
2398	AROCLOR 1254 (PCB)		1
2400	AROCLOR 1260 (PCB)		1
1005	ARSENIC	0.01 MG/L	5
1094	ASBESTOS	7.0 MFL	2
2050	ATRAZINE	0.0001 MG/L	20
2050	ATRAZINE	3.0000000000000001E-3 MG/L	20
1010	BARIUM	2.0 MG/L	5
2625	BENTAZON (BASAGRAN)		7
2990	BENZENE	5.0000000000000001E-4 MG/L	57
2990	BENZENE	5.0000000000000001E-3 MG/L	57
2300	BENZO (A) ANTHRACENE		11
2306	BENZO (A) PYRENE	0.0001 MG/L	20
2306	BENZO (A) PYRENE	2.0000000000000001E-4 MG/L	20
2302	BENZO (B) FLUORANTHENE		11
2312	BENZO (G,H,I) PERYLENE		11
2304	BENZO (K) FLUORANTHENE		5
1075	BERYLLIUM	4.0000000000000001E-3 MG/L	6
2348	BHC-ALPHA		8
2350	BHC-BETA		8
2354	BHC-DELTA		8

Appendix N
ADEC Drinking Water Program

Water System No.:AK2310918
FT Wainwright/Water Treatment Plant
Fairbanks North Star

Analyte Code	Analyte Name	MCL	Number of Sample(s)
2010	BHC-GAMMA (LINDANE)	1.9999999999999998E-5 MG/L	31
2010	BHC-GAMMA (LINDANE)	2.0000000000000001E-4 MG/L	31
2098	BROMACIL		5
2455	BROMOCHLOROACETIC ACID		1
2943	BROMODICHLOROMETHANE	0.10000000000000001 MG/L	65
2942	BROMOFORM	0.10000000000000001 MG/L	65
2294	BUTYLBENZYL PHTHALATE		11
1015	CADMIUM	5.0000000000000001E-3 MG/L	5
2046	CARBOFURAN	9.0000000000000008E-4 MG/L	15
2046	CARBOFURAN	4.0000000000000001E-2 MG/L	15
2982	CARBON TETRACHLORIDE	5.0000000000000001E-4 MG/L	49
2982	CARBON TETRACHLORIDE	5.0000000000000001E-3 MG/L	49
2959	CHLORDANE	2.0000000000000001E-4 MG/L	23
2959	CHLORDANE	0.002 MG/L	23
2944	CHLORODIBROMOMETHANE	0.10000000000000001 MG/L	65
2941	CHLOROFORM	0.10000000000000001 MG/L	65
1020	CHROMIUM	0.10000000000000001 MG/L	5
2296	CHRYSENE		11
2380	CIS-1,2-DICHLOROETHYLENE	5.0000000000000001E-4 MG/L	49
2380	CIS-1,2-DICHLOROETHYLENE	7.0000000000000007E-2 MG/L	49
2228	CIS-1,3-DICHLOROPROPENE		22
1022	COPPER	0.02 MG/L	1
1024	CYANIDE	0.20000000000000001 MG/L	5
2031	DALAPON	0.10000000000000001 MG/L	16
2031	DALAPON	0.20000000000000001 MG/L	16
2101	DCPA DI ACID DEGRADATE		4
2100	DCPA MONO ACID DEGRADATE		4
2071	DDD, PARA-PARA		9
2069	DDE, PARA-PARA		9
2075	DDT, PARA-PARA		9
2035	DI(2-ETHYLHEXYL) - ADIPATE	6.0000000000000006E-4 MG/L	20
2035	DI(2-ETHYLHEXYL) - ADIPATE	0.40000000000000002 MG/L	20
2039	DI(2-ETHYLHEXYL) - PHTHALATE	6.0000000000000006E-4 MG/L	20

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Analyte Code	Analyte Name	MCL	Number of Sample(s)
2039	DI(2-ETHYLHEXYL) - PHTHALATE	6.0000000000000001E-3 MG/L	20
2290	DI-N-BUTYL PHTHALATE		11
2056	DIAZINON (SPECTRACIDE)		5
2310	DIBENZO (A,H) ANTHRACENE		11
2454	DIBROMOACETIC ACID		11
2931	DIBROMOCHLOROPROPANE (DBCP)	1.9999999999999998E-5 MG/L	21
2931	DIBROMOCHLOROPROPANE (DBCP)	2.0000000000000001E-4 MG/L	21
2451	DICHLOROACETIC ACID		11
2964	DICHLOROMETHANE	5.0000000000000001E-4 MG/L	49
2964	DICHLOROMETHANE	5.0000000000000001E-3 MG/L	49
2206	DICHLORPROP		4
2284	DIETHYL PHTHALATE		11
2221	DIMETHOATE		5
2282	DIMETHYL PHTHALATE		11
2041	DINOSEB	2.0000000000000001E-4 MG/L	16
2041	DINOSEB	7.0000000000000001E-3 MG/L	16
2032	DIQUAT	4.0000000000000002E-4 MG/L	15
2032	DIQUAT	0.02 MG/L	15
2068	ENDOSULFAN I (ALPHA)		8
2072	ENDOSULFAN II (BETA)		8
2074	ENDOSULFAN SULFATE		8
2033	ENDOTHALL	9.0000000000000011E-3 MG/L	13
2033	ENDOTHALL	0.10000000000000001 MG/L	13
2005	ENDRIN	9.9999999999999991E-6 MG/L	32
2005	ENDRIN	0.002 MG/L	32
2372	ENDRIN ALDEHYDE		8
2992	ETHYLBENZENE	5.0000000000000001E-4 MG/L	58
2992	ETHYLBENZENE	0.70000000000000007 MG/L	58
2946	ETHYLENE DIBROMIDE (EDB)	9.9999999999999991E-6 MG/L	37
2946	ETHYLENE DIBROMIDE (EDB)	4.9999999999999996E-5 MG/L	37
2286	FLUORANTHENE		5
2264	FLUORENE		11
1025	FLUORIDE	4.0 MG/L	4

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Analyte Code	Analyte Name	MCL	Number of Sample(s)
2034	GLYPHOSATE	6.0000000000000001E-3 MG/L	13
2034	GLYPHOSATE	0.70000000000000007 MG/L	13
4000	GROSS ALPHA, INCLDNG RA, EXCLDNG RN & U	3.0 PIC/L	5
4000	GROSS ALPHA, INCLDNG RA, EXCLDNG RN & U	15.0 PIC/L	5
2065	HEPTACHLOR	3.9999999999999996E-5 MG/L	23
2065	HEPTACHLOR	4.0000000000000002E-4 MG/L	23
2067	HEPTACHLOR EPOXIDE	1.9999999999999998E-5 MG/L	23
2067	HEPTACHLOR EPOXIDE	2.0000000000000001E-4 MG/L	23
2274	HEXACHLOROBENZENE	0.0001 MG/L	24
2274	HEXACHLOROBENZENE	0.001 MG/L	24
2042	HEXACHLOROCYCLOPENTADIENE	0.0001 MG/L	30
2042	HEXACHLOROCYCLOPENTADIENE	5.0000000000000003E-2 MG/L	30
2308	INDENO (1,2,3-CD) PYRENE		11
1028	IRON	0.29999999999999999 MG/L	1
2262	ISOPHORONE		5
1030	LEAD	0.001 MG/L	1
1032	MANGANESE	5.0000000000000003E-2 MG/L	1
1035	MERCURY	0.002 MG/L	5
2024	METHIOCARB		4
2015	METHOXYCHLOR	0.0001 MG/L	32
2015	METHOXYCHLOR	4.0000000000000001E-2 MG/L	32
2251	METHYL TERT-BUTYL ETHER (MTBE)		23
2626	MOLINATE (ORDRAM)		5
2453	MONOBROMOACETIC ACID		11
2450	MONOCHLOROACETIC ACID		11
2989	MONOCHLOROBENZENE	5.0000000000000001E-4 MG/L	54
2989	MONOCHLOROBENZENE	0.10000000000000001 MG/L	54
1036	NICKEL	0.10000000000000001 MG/L	6
1040	NITRATE (AS N)	10.0 MG/L	15
1038	NITRATE+NITRITE (AS N)	10.0 MG/L	9
1041	NITRITE (AS N)	1.0 MG/L	9

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Analyte Code	Analyte Name	MCL	Number of Sample(s)
2968	O-DICHLOROBENZENE	5.0000000000000001E-4 MG/L	54
2968	O-DICHLOROBENZENE	0.59999999999999998 MG/L	54
2036	OXAMYL (VYDATE)	0.002 MG/L	15
2036	OXAMYL (VYDATE)	0.20000000000000001 MG/L	15
2969	P-DICHLOROBENZENE	5.0000000000000001E-4 MG/L	54
2969	P-DICHLOROBENZENE	7.4999999999999997E-2 MG/L	54
2028	PARAQUAT		5
2326	PENTACHLOROPHENOL	3.9999999999999996E-5 MG/L	22
2326	PENTACHLOROPHENOL	0.001 MG/L	22
2278	PHENANTHRENE		11
2040	PICLORAM	0.0001 MG/L	16
2040	PICLORAM	0.5 MG/L	16
2383	POLYCHLORINATED BIPHENYLS (PCB)	0.0001 MG/L	19
2383	POLYCHLORINATED BIPHENYLS (PCB)	5.0000000000000001E-4 MG/L	19
2023	PROPOXUR (BAYGON)		4
2288	PYRENE		11
4010	RADIUM, COMBINED (226, 228)	1.0 PIC/L	5
4010	RADIUM, COMBINED (226, 228)	5.0 PIC/L	5
4020	RADIUM-226	1.0 PIC/L	5
4020	RADIUM-226	5.0 PIC/L	5
4030	RADIUM-228	1.0 PIC/L	5
4030	RADIUM-228	5.0 PIC/L	5
1045	SELENIUM	5.0000000000000003E-2 MG/L	5
1050	SILVER	0.10000000000000001 MG/L	1
2037	SIMAZINE	6.9999999999999994E-5 MG/L	19
2037	SIMAZINE	4.0000000000000001E-3 MG/L	19
2996	STYRENE	5.0000000000000001E-4 MG/L	54
2996	STYRENE	0.10000000000000001 MG/L	54
2987	TETRACHLOROETHYLENE	5.0000000000000001E-4 MG/L	54
2987	TETRACHLOROETHYLENE	5.0000000000000001E-3 MG/L	54
1085	THALLIUM	0.002 MG/L	6
2727	THIOBENCARB (BOLERO)		5

Appendix N
ADEC Drinking Water Program

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Analyte Code	Analyte Name	MCL	Number of Sample(s)
2991	TOLUENE	5.0000000000000001E-4 MG/L	58
2991	TOLUENE	1.0 MG/L	58
2456	TOTAL HALOACETIC ACIDS (HAA5)		11
2950	TOTAL TRIHALOMETHANES (TTHM)	0.10000000000000001 MG/L	62
2020	TOXAPHENE	0.001 MG/L	27
2020	TOXAPHENE	3.0000000000000001E-3 MG/L	27
2979	TRANS-1,2-DICHLOROETHYLENE	5.0000000000000001E-4 MG/L	49
2979	TRANS-1,2-DICHLOROETHYLENE	0.10000000000000001 MG/L	49
2224	TRANS-1,3-DICHLOROPROPENE		22
2273	TRANS-NONACHLOR		5
2452	TRICHLOROACETIC ACID		11
2984	TRICHLOROETHYLENE	5.0000000000000001E-4 MG/L	53
2984	TRICHLOROETHYLENE	5.0000000000000001E-3 MG/L	53
2904	TRICHLOROTRIFLUOROETHANE (FREON 113)		3
2055	TRIFLURALIN		14
4006	URANIUM, COMBINED		5
2976	VINYL CHLORIDE	5.0000000000000001E-4 MG/L	49
2976	VINYL CHLORIDE	0.002 MG/L	49
2955	XYLENES	5.0000000000000001E-4 MG/L	58
2955	XYLENES	10.0 MG/L	58
1095	ZINC	5.0 MG/L	1

Notes:

APPENDIX O

Response to USACE Comments

Army, EPA, and ADEC Comments

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DIVISION OF SPILL PREVENTION AND RESPONSE
CONTAMINATED SITES PROGRAM

File: 108.38.085

January 12, 2007

Ms. Therese Deardorff
Remedial Project Manager
US Army Alaska
ATTN: IMPC-FRA-PW (Deardorff)
724 Postal Service Loop #4500
Fort Richardson, AK 99505-4500

Re: Fort Wainwright Former Communications Site (Taku Gardens) Preliminary Source Evaluation I

Dear Ms. Deardorff:

Thank you for submitting a copy of the above-referenced document (PSEI) to the Alaska Department of Environmental Conservation for review. This report contains a great deal of valuable information regarding historical activities at this site and a summary of information available to date. The Department appreciates the effort taken to accumulate, review and compile this information in a useful format and expects that it will be very helpful reference during future site investigations. In the interest of time, the Department will not substantive comment on general organization or provide editorial comments to this document. The more general comments below represent the most important items that must be addressed and/or resolved in the final document. Other State recommendations regarding a future site investigation will be addressed under separate cover.

In general, the Department agrees with the comments submitted by the Environmental Protection Agency (EPA) so, for simplicity, some of the comments in this letter are organized to reflect this agreement. Please note that, unlike the EPA, the State will not provide comments on the PSEII handout distributed during the November 2006 Federal Facilities Meeting. Comments for the PSEII will be withheld until the actual document is released.

1) Currently available information is insufficient to fully characterize the nature and extent of contamination at this site. The Department agrees that:
   a) potentially hazardous munitions-related debris has been documented in surface and subsurface debris;
   b) drums buried at depth are indicative of intentional disposal;
   c) the Department does not necessarily agree that drums or munitions were intentionally disposed of beneath permafrost, however the possibility exists that frost heaving could cause

buried items to be brought to the ground surface or to migrate into areas which were previously believed to be free of debris, including former excavations and areas subjected to geophysical investigations and;

d) the origin of munitions-related items and buried drums is unknown. Every effort should be made to determine whether classified documents describing historical activities and munitions handled at this site still exist. If additional documents exist, they should be made available to the greatest extent possible.

2) The Department strongly agrees with the EPA's determination that the current site boundaries have not been adequately delineated. As previously expressed, the State maintains that site boundaries identified throughout this document reflect *construction site boundaries*, not known boundaries of contamination or munitions-related debris. All figures showing site boundaries should be changed to indicate this uncertainty and/or should include the rationale used to define the proposed boundaries with the notation that they are subject to revision pending additional information. This determination is supported by the following:
   a) Several figures indicate that live ammunition storage facilities were located to the south of the current construction boundaries. The Department acknowledges that the mere existence of ammunition storage facilities does not constitute proof that munitions-related debris or contaminants are present in these areas. However, past practices (as supported by the discovery of partially decommissioned munitions-related items and propellant- and explosive-contaminants within and/or outside of the current construction boundaries) suggest that the possibility for munitions-related debris and/or contamination exists in the former ammunition storage areas. This possibility should be considered when planning future site investigations;
   b) Appendix G contains partial copies of the 716th Explosive and Ordnance Demolition (EOD) Detachment Incident reports from 2004 and 2005. These reports describe the discovery and disposal of munitions-related items that were apparently similar to those discovered during exploratory trenching and characterization of debris piles at the Taku Gardens housing site in 2006. Items discovered in 2004 and 2005 were located within the Taku Gardens Housing construction boundaries and during excavation at the Former PX Gas Station, which is located to the northeast of Taku Gardens and outside of the housing construction site boundaries. To the best of my knowledge, munitions-related items discovered *outside* of Taku Gardens were not reported to the State until this document was released.
      i) *Note: The fact that munitions-related items were discovered outside of the Taku Gardens construction boundaries and were not reported is disconcerting. During the summer 2006 construction season, EPA and State project managers were asked to approve excavation to the immediate north of Taku Gardens in order to complete communication lines. This approval was granted with the general understanding that munitions-related items had not been discovered outside of the Taku Gardens housing site.*

3) The EPA made numerous recommendations regarding the use of existing data for determining future site use and suggestions regarding cost/benefit analyses. The State agrees that these data might be useful for making a determination regarding future site use but cautions that additional data could very likely be necessary before a final determination can be made. Also, the State has no comment or recommendations regarding any cost analyses the Army chooses to perform for the existing housing or future land use at this site.

4) The Department agrees that the geophysical, groundwater, and soil investigation has not yet been completed. It is expected that additional geophysical, hydrologic, and analytical sampling work will be included in future site investigations and that work will be focused on mitigating potential immediate exposure hazards and pathways.

5) The EPA's recommendation to hold a multi-day planning meeting for a site investigation is sound and the Department is willing to participate. The time for planning work for the 2007 field season is growing short and the Department strongly encourages the Army to consider hosting this type of meeting.

6) Appendix C contains the FWA-102 Former Communications Site Field Data Report. This document includes copies of the Uniform Hazardous Waste Manifests for disposal of 230 cubic yards of soil contaminated with polychlorinated biphenyls (PCBs). These documents indicate that soil contaminants were limited to PCBs at concentrations <4,999 mg/kg. Soil containing significantly higher concentrations of PCBs and other contaminants, including dioxin/furans and chlorinated benzenes and phenols, was removed from the original Building 52 footprint. The disposal documentation in this Appendix is confusing with regards to the actual contaminant concentrations and final disposition of all contaminated soil. Please provide clarification.

7) There does not appear to be sufficient evidence to dismiss the possibility that historical and/or recent activities at this site might have affected surface water and/or sediment quality in the Chena River. This possibility should be considered when planning future site investigations.

8) Some of the EPA's comments were directed toward addressing contamination in the drinking water wells located cross-gradient and to the northeast of this site. The State of Alaska Drinking Water Program requires regular testing of water from these wells. Analytes include inorganic and volatile/semivolatile organic compounds, and a variety of biological and physical analyses. It is important to recognize that regular testing has shown that these wells do not exceed drinking water standards for all analytes tested and that they are only used as a "back-up" drinking water source. The Department is open to discussion as to whether these wells should be tested for other compounds not typically included in the suite of drinking water parameters. Testing other drinking water wells can be considered on a case-by-case basis.

9) Inclusion of prevailing wind data would be helpful. Future discussion should address the potential need for covering remaining stockpiles.

The Department's risk assessor has also reviewed the conceptual site models (CSMs) and offers the following comments. These comments will be considered during future discussions.

1) For all the sub-areas, exposure pathways including nearby residents and site visitors were not considered complete. There is insufficient definitive data to dismiss these possible receptors. For one, the nature & extent of contamination has not been definitively defined as contained within the construction area. For the purposes of a preliminary Conceptual Site Model (CSM), I would consider these pathways as potentially complete until otherwise demonstrated by historical data or additional characterization data. Although surface wipe

samples were taken from nearby residents, I do not have a high degree of confidence that this data is adequately representative.

2) The CSMs are a little generic in that there are multiple contaminant sources (drums, transformers, tanks, etc.) within a given sub-area. This makes it look like a "shotgun" approach is being taken for each sub-area without possibly adequately characterizing a single source area. Also, the CSMs do not indicate the Contaminants of Potential Concern (COPCs) at each sub-area which leaves the reader to dig for them in the text only to find that the COPCs list may be deficient, given the site information.

3) As it appears that several source areas have been identified as old "disposal areas", it is unrealistic to think that these areas may be adequately characterized without extensive removal and characterization of the entire area given the considerable heterogeneity. This is consistent with ADEC's approach to characterizing unpermitted landfills.

4) Initial screening may not have adequately characterized contaminants. Photo ionization detectors (PIDs) are generally used as only crude field screening devices for total petroleum hydrocarbons and are not sensitive enough to detect most volatile organic contaminants let alone other contaminants of potential concern.

5) Surface soil data should not be considered definitive for site characterization decision making on nature & extent of contamination. Surface soil has been disturbed and many COPCs readily degrade at the surface, but may persist in the subsurface (i.e. volatiles and PCBs).

6) A limited list of COPCs were initially evaluated and, considering new information about the sites (historical data & photos, unearthed debris, and geophysical data), there is potential for significant data gaps.

7) Potential groundwater at depth data gap exists. Although the drinking water source is located upgradient of the site, no site groundwater data at the depth of drinking water usage is available.

8) Ephemeral water traversing the site (snow melt, flooding) is dismissed as a potential for exposure and soil screening is considered protective. Given the disturbance of surface soils, potential for contaminants to accumulate, and lack of definitive data for this media, this transport mechanism may warrant further investigation.

9) Although the Chena River is considered far enough away that no significant impact from site contamination are expected, the site being in the flood zone and the seasonal variability in flow should be further considered to dismiss the potential for impact.

Again, thank you for providing the State with the opportunity to participate in reviewing this document. This information will be very useful when planning future remedial investigations.

Please contact me at (907) 451-2158 or sharon_richmond@dec.state.ak.us if you have any questions or comments.

Sincerely,

Sharon Richmond
Environmental Program Specialist

Comments for EPA
FCS PSE1, PSE2 (Preview), PA and other materials
Fort Wainwright, Alaska
December 18, 2006

Opening Remarks

1) Existing information is not sufficient to fully characterize the nature and extent of contamination at the Former Communications Site (FCS). {The dollar cost to sufficiently characterize the FCS such that an engineered remediation would support the intended future residential land-use for this site is likely to be extremely high. This conclusion is based on the following findings:
    a. munitions have been documented in the surface and subsurface debris,
    b. drums were buried at a depth bgs indicative of intentional disposal below permafrost
    c. significant frost heave is likely
    d. there is a lack of historical records clarifying the origin of the munitions and the buried drums
    e. lateral boundaries of the hazardous source areas at FCS have not been sufficiently delineated but are likely to exceed the current bounds of the 54 acre parcel .
2) 100% delineation and removal of all "heavable" debris and potential hazards such as buried MEC is unlikely to be achievable and if it were attempted, no timetable for completion can be reliably made. It is advisable to consider non-residential uses for this site.
3) It is possible that the existing analytical data are of sufficient quantity and quality that they might be used to complete a series of risk projections that could clarify the best future land use for this parcel.
4) Cost projections based on existing data and the risk projections should be completed to determine how best to resolve both the short-term and long term hazards at the FCS. This should include a variety of alternatives, including removing the current buildings and relocating them on a parcel suitable for residential habitation.
5) Previous investigations at the FCS have been of limited scope, apparently based on the incorrect assumption that sufficient pre-construction evaluation had been completed to allow residential development. Review of the chronological history of site activities since 2002 strongly suggests that limited interpretations were made using limited data which, not surprisingly, has produced limited understanding. It is highly recommended that all previous assumptions based on these limited interpretations be used with great care. Continued investigatory planning based on presumed source footprints (i.e. lateral boundaries), prescribed sub-area boundaries, and incomplete historical records will perpetuate the generation of poorly supported characterizations. A first step toward breaking this cycle is to find resolution on future land use. It is hoped that all stakeholders will make efforts to plan ahead and find a resolution that is technically achievable, fiscally responsible and protective of both human health and ecological resources.

Comments for EPA
FCS PSE1, PSE2 (Preview), PA and other materials
Fort Wainwright, Alaska
December 18, 2006

Recommendations (General)

1) Complete cost projections for future land use scenarios. The Army needs to decide soon on future land use for this area. A decision to maintain "residential land use" will affect future study objectives, and present some substantial health and safety issues that will need to be addressed. The presence of onsite buildings will impact the performance of future site sampling and data interpretation. It may be cheaper to develop a residential neighborhood elsewhere, and demolish the onsite buildings (or possibly move them).
2) Complete human health risk projections.
3) Combine cost and risk projections based on currently available data (and conservative assumptions of site conditions) to select an achievable and protective future land use.
4) It does not appear that the site data management plan (if it exists) and the site database have been QC reviewed. If not, they should be reviewed now, prior to making significant site risk management decisions with those data, and then at appropriate later periods.
5) If not already in existence, the Army should develop a series of planning documents that will describe the objectives, the data quality objectives, and the basis for future site activities (including the 2007 field season). These documents should be consistent with EPA RI/FS, and associated guidance documents, particularly a Site Management Plan (including the decision process on what to do with current onsite housing), appendices to the Site Management Plan should include:
    a. Regulatory Plan,
    b. Sampling and Analysis Plan (including DQOs and QAPP),
    c. Risk Assessment Plan (including human health and ecology),
    d. Remedial Action Plan (including opportunities for early actions),
    e. Health and Safety Plan,
    f. Community Relations Plan,
    g. Data Management Plan, etc.
6) Design future work plans based on immediate hazards and work in the short-term to mitigate impacts to all potentially affected pathways and receptors (see detailed comments below).
7) The schedule is getting tight for planning for the 2007 field season. Rather than losing time associated with formal review cycles of the PSE2 report, the Army could consider a planning session of a few days with stakeholders to develop the transition from the PSE2 to the 2007 field season.
    a. Focus work in the 2007 field season on mitigating all immediate hazards, including, installing and/or restoring all institutional controls to limit unauthorized access to the current 54 acre parcel
    b. Collect environmental samples from all four migration pathways beginning at the current perimeter of the 54 acre parcel and proceeding as far off-site, down-gradient, down-stream or down-wind as necessary to determine extent of migration. Current information on the direction of

down-gradient, down-stream and down-wind is inadequate to predefine the directions, thus sampling to define extent of migration should proceed radially from the perimeter until a boundary is found.

c. All environmental samples collected during the 2007 season should be analyzed for a comprehensive suite of analyses that are not limited by incomplete information of site use or previous "analyte biased" sampling. Because historical records have been specifically sought (in PSE1) to define the historical site activities that produced the current conditions without apparent success, a presumed suite of target analytes can not be prescribed. Despite considerable effort, the PSE 1 was not able to sufficiently document historical site activities that corroborate current field findings of MEC and other hazardous materials. It does, however, explicitly indicate that classified materials were not reviewed, thus it is necessary to close this "apparent" data gap as soon as possible. It is not clear whether classified materials actually exist, but the matter should be definitively resolved one way or another in order to ensure protectiveness and encourage the public trust. Confidence in the completeness of all future work, not to mention the confidence of health and safety planning for onsite workers and the protectiveness for all potential receptors is fully dependent on the Army definitively determining and ensuring whether classified documents exist and if so, making the information available such that protective measures can be implemented.

8) Proceed to complete the RI/FS as expeditiously as possible; recognizing that there may be significant opportunities for early actions, prior to the complete sequence of RI/FS/RD/RA

   a. For example, Area A has substantial metal debris. If the site is going to be maintained for residential land use, then virtually all the metal may have to be removed, based on the concern for residual munitions, regardless of the levels of chemical contamination. It may be possible to minimize *in situ* soil sampling to characterize the nature and extent of chemical contamination, except for health and safety decisions and confirmation samples, which would reduce sampling and analysis costs and time. It may only be necessary to sample and analyze the excavated soil for chemicals to support disposal decisions. The PCB slides in the North Wind "Taku Gardens Communication Site" PowerPoint presentation seem to suggest a substantial investigation for PCBs in Area E, and the discovery of a fairly-well defined area of contamination. Assuming metal debris and other contaminants have been sufficiently defined in this area, PSE2 data may be sufficient to move forward with removing contaminated soil in this area.

9) The PSE 1 captures a large body of information that is undeniably important to the success of implementing protective solutions at FCS. That being said, the organization of the PSE 1 is not as user-friendly as it could be. Revision of the PSE1 to improve cross-referencing of maps, figures, tables and other previously existing materials would significantly improve its practical use and complement

the significant efforts made to compile the information. (Some recommendations for accomplishing this are available under separate cover if desired).

10) The PSE 2 also appears to include significant and valuable information that, while limited in scope, can contribute to both short and long-term planning. It remains to be seen whether the previewed results and preliminary interpretations will remain viable after data validation. A complete review of assumptions made during the planning of PSE 2 (e.g. spatially biased sampling based on expected findings from sub-areas A, B, C, D, and E.) is recommended so that any inconsistencies can be identified and assumptions reset. For example, it is not clear whether the currently defined bounds of the sub-areas (or the FCS in general) are helping or hindering investigative planning. These boundaries should be carefully reconsidered and potentially discarded as they may be introducing a "false positive" indicator of lateral source boundaries.

11) Data Gaps and Specific Planning Recommendations:

Source Areas and Documentation of Release

1. Classified documents on the history, use, and potential contaminants on the site, if they exist, should be declassified. The potential presence of chemical agent munitions is too critical. The source areas have not been adequately delineated. It is apparent that previous investigations were spatially constrained by arbitrary boundaries of the FCS. All pre-existing boundaries should be reconsidered and soil samples explicitly collected to delineate the full spatial extent of contamination, both within the FCS and extending radially in all directions until the ND boundary can be either explicitly determined or inferred from concentration trends. Source delineation should include sampling with depth, beginning with samples representing the following depth intervals (0"-3", 3"-6", 6"-12", 12"-18" and 18"-24"). Soil sampling with depth should proceed using hand augers or other depth sampling devises until either the analytical results indicate no detectable concentrations of any hazardous substances or the ND boundary can be inferred from concentration trends.
2. **[PSE 2, Slide # 17, TCE & PCE Soil Gas Results.]** The data presented on this slide indicate a significant increase in concentrations of PCE and TCE near Buildings #2 and #4 that potentially extend both south and east of these buildings into a portion of the site that has not been designated as an area of interest. The Army should describe what additional sampling activities will be conducted to the south and southeast of Area C to determine the source of the TCE and PCE detected in the vadose zone.
3. Planning of source delineation should take advantage of the analytical results of the PSE 2 groundwater samples collected from the 13 currently installed shallow (water table) wells. The water table footprint of contamination can be used to support delineation sample locations and define specific breaks in the source boundary confirmation sampling.
4. The geophysical surveys conducted to date are incomplete. The limited coverage completed as part of the PSE 2 has significant gaps in very important locations. This can be seen by comparing the preliminary results of the groundwater contamination

footprints, and the known location of buried drums near building #49. Full coverage of the FCS with one or more multi-method geophysical surveys that are carefully designed to meet all phase focused DQOs (e.g. specific depth of penetration parameters and relevant MEC size estimates) would be very useful. However, a determination of future land uses should be made prior to embarking on extensive geophysical surveys. One exception to this might be in determining the extent of metallic debris in "off-site" locations, particularly where historical records are not available. Specifically, it may be more useful to run geophysical surveys in the occupied residential areas west of the FCS to determine the western-most lateral boundary of metal debris (or lack there of). The non-intrusive nature of the geophysical surveys may be particularly effective off-site, where little information is currently available and impacts to neighborhood properties should be minimalized.

Waste Characteristics

1. The lack of historical records clarifying the source of MEC at the FCS and the incomplete identification of structures and uses noted on various versions of the aerial photographs is strong evidence that the full range of waste characteristics has not been adequately documented. All environmental samples collected should be analyzed for a full suite of chemical parameters, including, but not limited to VOCs, SVOCs, inorganics, phosphorus, explosives, dyes, drinking water parameters (where appropriate), water quality parameters, as well as all hydrogeological parameters including conductivity, ph, ORP, etc. Tentatively identified compounds (TICs) should also be evaluated for all samples.
2. An effort should be made to estimate waste quantities to support phased cost estimates for any necessary Rapid Removal Actions (RRAs) or other, longer-term removals. Cost-benefit evaluations should be conducted as necessary to guide the extent of source delineation within the bounds of the current FCS boundaries. Outside the bounds, all sampling should be guided first by protectiveness with costs as a secondary guidance consideration.

Fate and Transport

A strategy for examining the potential impact on environmental pathways associated with each of the individual 5 sub-areas A thru E, as well as for the FCS as a whole should be developed. Extent of contamination, however, must be defined first so that appropriate mitigation strategies can then be developed.

Groundwater Pathway

1. The hydrogeologic investigation activities described in the PSE 2 report at the Former Communication Site (FCS) do not describe a sufficiently robust investigation to determine the extent of the contaminant plumes in groundwater, the potential threat to the Chena River by groundwater-to-surfacewater discharge, or examine the impact on contaminant migration as a result of high volume drinking water production well

pumping. Additional investigation activities to address these issues are recommended and are described in specific comment section that follows.

2. **[Groundwater Investigation, Slide 22, First Bullet.]** This slide describes the ground water monitoring network as a "Total monitoring network of 13 wells." In light of the groundwater plumes depicted in subsequent slides such as #25, #26, #27and #28, it appears that additional monitoring well locations will be necessary to determine the extent of contamination and complete the FCS ground water monitoring network. Recommendation for additional groundwater monitoring should be included in the full report and consider for example, a multi depth completion between FCS and the potable water production wells, the center of FCS south of Building #48, east of Building #42, and locations north of FCS toward the Chena River.
3. **[Groundwater Investigation, Slide 22, Last Bullet.]** The slide states that the first round of groundwater sampling data has been collected. The analytical results along with regulatory concentration exceedances should be presented on a location map to concisely describe the most recent groundwater contaminant concentrations in the vicinity of FCS.
4. **Slide # 23, Upgradient Results.]** This slide indicates the presence of COCs such as DRO, RRO, Cyclohexane, and Dichlorodifluoromethane in "upgradient" groundwater monitoring locations. The PSE 2 report should include discussion of the potential sources of these contaminants and whether or not these are in fact upgradient monitoring location to the FCS.
5. **Groundwater Results Slide 23, Downgradient Results.]** The slide should include the specific wells that are being reported as either upgradient or downgradient for clarity. Considering the truncated plumes moving off site to the north of FCS (Slides #24 thru#27) and the previously reported groundwater flow direction as east, northeast a clear indication of which wells are being referred to as downgradient should be made.
6. In addition, groundwater elevations and contoured gradients should be presented on a site map with the well locations depicted and include tabulated groundwater contaminant concentrations either on the map or in tables in the text.
7. The existence of debris filled meanders is direct evidence of a likely preferential flow pathway. The RI should include enough geologic mapping to delineate these structures and determine the extent to which they influence migration of contaminants in the groundwater and as a groundwater-to-surface water conduit.
8. All existing sample results from all groundwater drinking water supplies within 4 miles (regardless of downgradient direction) should be obtained and evaluated for potential impacts from FCS sources. Until a full hydrogeologic evaluation of groundwater flow is completed, all receptor wells should be closely monitored. The monitoring sample frequencies should be tightly spaced (weekly for nearby wells, or more frequently if indicated by analytical results). Monitoring frequencies and analytical parameters should be revisited for all onsite monitoring wells on a quarterly basis and recalibrated against new soil sampling analytical data as necessary.

Surface Water Pathway

Comments for EPA
FCS PSE1, PSE2 (Preview), PA and other materials
Fort Wainwright, Alaska
December 18, 2006

1. The hydrogeologic investigation activities described in the PSE 2 report do not describe a sufficiently robust investigation to determine the potential threat to the Chena River by groundwater discharge or by preferential flow through the backfilled meanders directly to the river .
2. The RI should include a complete assessment of impact on surface water and sediment. Overland flow may be negligible relative to migration via groundwater-to-surface water discharge. This interaction should be assumed to be seasonally varying and thus surface water pathway sampling should be carefully defined to temporally sample all relevant flow regimes.
3. Surface water sampling should consider the impact of FCS related contamination on all receptors 15 miles downstream (which again, is likely to require determination from the potential angle of groundwater-to-surface water migration at all end-member variations of the hydrologic system. That is, the 15 mile evaluation range should extend from the furthest-most upstream groundwater-surface water interaction to the furthest downstream groundwater-to-surface water interaction. The geometry of the River meanders will be critical at both the FCS extent of the pathway as well as the downstream extent (i.e. groundwater-surface water exchange is likely both at the FCS end as well as in the vicinity of any down-stream drinking water intakes (including hydrologically connected groundwater supply wells).

Soil Exposure

1. The extent of exposure to contaminated soils will remain undefined until the lateral extents of the sources are fully defined. In the meantime, consideration should be given to past exposures to PCBs (including all exposure routes; inhalation, ingestion, etc).

Air Pathway

1. The PSE 1 and PSE2 reports at do not adequately define prevailing wind conditions and other meteorological information that are necessary to assess likelihood of release to the air (particularly of PCB contaminated particulates and the unidentified vapors mentioned in PSE 1). The analytical results of the wipe samples appear inconclusive, given the lack of documentation regarding prevailing winds. It is also curious that documented percent concentrations of PCBs in soils immediately adjacent to occupied residences would yield few positive wipe sample results. This data should be carefully reviewed and assessed for robustness and included as part of a work plan for 2007 field activities.

Comments Specific to the "FFA meeting Preview" of the PSE 2

1. The PSE 2 presentation slides provide an outline reporting of the 2006 sampling activities. The actual PSE 2 Draft Report, complete with analytical results, a list of additional data needs, and suggested field season 2007 activities to be performed in order to accomplish them, will be required to advance the FCS investigation

efficiently. Please provide the anticipated delivery date of a complete report incorporating data summaries and recommendations for additional investigation activities.

2. There appear to be several data gaps at this time: site boundaries, nature and extent of contamination, fate and transport processes, ecological risks, surface water and indoor air human exposure routes, and possible site impact on base water wells and Chena River. This situation may be improved with the PSE2 report. In any case, the remaining gaps need to be addressed during the planning for the 2007 field season.
3. **[PSE 2, Slide #2, Third Bullet.]** The stated objectives for PSE 2 include "Qualitatively evaluate potential risk." The data collected thus far, however indicate that additional geophysical surveys and groundwater monitoring locations are necessary to determine the extent of contamination at the FCS. What is the current evaluation of potential risk, given the shortfall in the data collected thus far?
4. **[PSE 2, Slide#2, Fourth Bullet.]** This objective states that PSE 2 will "Make recommendations for further actions." Please include a timeframe for making recommendations to lead additional investigations at FCS, and state where these recommendations will be recorded, for example, in the completed report of the 2006 field activities.
5. **[Summary, Slides #44 and #45.]** The Summary Section of the PSE 2 field activities should include an estimate of the present status or percentage completed for the each of the activities. In addition, based on the groundwater quality data presented in Slides #24 thru #27 offsite migration of the groundwater COCs is apparent. This should be noted in the Third Bullet of Slide45 describing groundwater.
6. **[Remaining Areas of Concern, Slide #47.]** The extent of contaminant plumes offsite, the drinking water pathway, and ecological threat to the Chena River, are in the opinion of the reviewer, significant remaining areas of concern. Please include them on Slide #47 or note them elsewhere as unresolved.

Comments Specific to the PSE 1 – Narrative Summary

General Comments:

1) **Data Gaps:** The hydrogeologic investigation activities conducted in the PSE 1 report at the Former Communication Site (FCS) does not describe a sufficiently robust investigation to determine the extent of the contaminant plumes in groundwater, the potential threat to the Chena River by groundwater discharge, or examine the impact on contaminant migration as a result of high volume drinking water production well pumping. Additional investigation activities to address these issues are recommended and are described in specific comment section that follows. **Data Gaps:** A strategy for examining the potential impact on environmental pathways associated with each of the individual 5 sub-areas A thru E, as well as for the FCS as a whole should be developed. Extent of contamination, however, must first be defined so that appropriate mitigation strategies can then be developed. **HYDRO GAPS:** The Preliminary Source Evaluation - Narrative Report (PSE-NR) does not describe in sufficient detail the

results of the site hydrgeologic investigation. The Hydrogeologic Section of this report does not provide specific groundwater elevations, groundwater quality analytical results or detailed groundwater gradient data in either graphic or discussion formats to support the text of this report.

2) There appears to be little formal planning for field activities. For example, planning documents discussing DQOs and QAPPs for the 2005 and 2006 field seasons have not been available. This likely affects the appropriateness and the quality of the data for decisionmaking purposes. Recommendation: Implement planning for 2007 field season.
3) The site nature and extent of contamination have substantial data gaps.
    a. It does not appear that the debris and soil contamination have yet been bounded geographically. Debris and contamination may exist beyond the current definition of the FCS. Indeed, the PSE1 even notes that there is a "significant amount of unknown material buried on and **near** [emphasis added] the FCS" [for example, see Important Considerations, Sec. 3.3.2.4, first bullet, p. 3-18] and "debris may extend north of the FCS" [Important Considerations, Sec. 3.3.2.4, fourth bullet, p. 3-18].
    b. "Unknown materials" have not been fully characterized in Subarea A, for example [Important Considerations, Sec. 3.3.1.4, sixth bullet, p. 3-16].
    c. CSMs in Appendix F note the potential for current "nearby residents" (and at the SAS) to be exposed to site contaminants via indoor air, but there does not appear to have been any effort to sample the houses.
    d. Chemical munitions may be at the site (see Executive Summary [fifth bullet], Figure C-2, and Appendix I), but it is not obvious that chemical agents were included in any of the sampling. No explanation for this gap was found.
    e. Radioactive materials may be present at the site (see Site History [Table 3-1, p. 3-1], Fort Wainwright [Sec. 3.1, last sentence, p. 3.3]), but it is not obvious that radioactivity was included in any of the sampling. No explanation for this gap was found.
    f. Vapors may move through channels in the permafrost and along utility corridors and pipes. This pathway was not discussed.
    g. Contamination has been moved elsewhere [Important Considerations, Sec. 3.3.1.4, fourth bullet, for example; Important Considerations, Sec. 3.3.2.4, sixth and seventh bullets].
    h. Soil in on and around the sound barrier has not been characterized [Important Considerations, Section 3.3.1.4, second and third bullets].
    i. Toxic breakdown products have not been characterized [for example, Important Considerations, Sec. 3.3.4.4, last bullet, p. 3-24].
    j. The area around Buildings 41-48 and the new Building 52 is not included in any of the designated Subareas [Figure C-2].
    k. Recommendation: Review PSE2, and address remaining gaps in the planning for the 2007 field season.
4) No apparent effort has been made to consider ecological receptors, perhaps with the belief that the site itself is developed and no surrounding areas (e.g., Chena

River) will be affected. The PSE1 states the Chena River is not affected by the site contaminants, but offers no supporting documentation [for example, see Impacted Media, Sec. 3.3.1.3, second paragraph, p. 3-16, and the CSMs in Appendix F]. Recommendation: Review the PSE2, and address data gaps in the planning for the 2007 field season. The timing sequence of field activities, construction, and removal actions needs to be clarified in order to determine which data represent current conditions. If construction or removals affect the debris and soil, then earlier geophysics and sampling may be irrelevant in those areas. Indeed, the PSE1 notes this as a potential problem for the geophysical results [Important Considerations, Section 3.3.2.4, fifth bullet, p. 3-18]. Recommendation: Identify what data are still applicable to current site conditions in the PSE2 report. PSE1 mentions the possibility of classified data for the FCS [for example, Executive Summary, p. vi]. It is unclear whether it is known that there are classified data for the site history or conditions, and they are not available, or it is not even known whether there are classified data. If the former, then some effort should be made to declassify the data. If the latter, then some effort should be made to check for classified data and get it declassified. Recommendation: Resolve the issue during the planning for the 2007 field season.

5) The intermingled zones (Section 3.1.3), permafrost (Section 3.1.5), seasonally frozen soil (Section 3.1.5), seasonal changes in flow direction (Section 3.1.3), site dewatering (Section 3.2.5.3, for example), and oxbows (Section 3.2.3, for example) would seem to create a complex hydrogeological regime, making conclusions on what resources (Chena River and the drinking water wells) will be affected difficult. Yet the PSE1 does not seem to be concerned about these resources. Hydrogeology discussion also does not consider the enhanced groundwater pathways via the new subsurface utility corridors and pipes. Recommendation: Reconsider the PSE1 conclusion.
6) The 2005 and 2006 field seasons included substantial collections of environmental samples and chemical analyses. Until the PSE2 is available, it is difficult to identify specific data gaps in the risk assessment. Some general gaps are identified above and below, however. Recommendation: Review PSE2 and address remaining data gaps during the planning for the 2007 field season.
7) Specific risks associated with the use of the gardens were not discussed, although the CSM does address the exposure route. Recommendation: Identify data gaps for this exposure route during the planning for the 2007 field season, and assess in the subsequent report. Some onsite actions suggest insufficient site control, and potential contributors to risks:
    a. Important Considerations [Sec. 3.3.4.4, second bullet, p. 3-23], for example. There are no site controls to control dust or run-off from the stockpiled soil.
    b. Previous Investigations and Removal Actions [Sec. 3.2.5.3, paragraph 8, p. 3-10]. Excavation was filled with "low level PCB-contaminated soil".

Recommendation: Review site management practices and implement appropriate controls.

Comments for EPA
FCS PSE1, PSE2 (Preview), PA and other materials
Fort Wainwright, Alaska
December 18, 2006

Specific Comments:

1. **Executive Summary [Page v, Second Bullet.]** The summary presented in the first section of the report mentions the "...two oxbow features..." or paleo-channels visible in the aerial photographs from the 1940s but does not discuss these features as preferential flow paths for groundwater movement and contaminant transport off site. The hydrogeologic section of this report likewise does not discuss the potential for contaminant migration along the potential flow channels. Hydrogeologic investigation of the FCS must include examination of the potential groundwater flow velocity, direction and groundwater contaminant concentration both in the vicinity of, and downgradient of the paleo-channels.
2. **Executive Summary [Page vi, Fourth Bullet.]** This portion of the summary states that, "Decontamination materials (super tropical bleach) were found at the FCS." Please include the specific materials that would require use super tropical bleach decontamination procedures in the text.
3. **Executive Summary [Page vi, Sixth Bullet.]** The information provided in this portion of the summary states that the post drinking water supply wells are located "...adjacent to the FCS but upgradient and at depths of 80-182 feet."

   The proximity of these wells to the contaminant sources and the impact of high capacity pumping may, in the opinion of the reviewer, cause localized reversal of the groundwater gradients. Geologic logs and construction details for the production wells should be included in this report for evaluation of the potential for buried contaminants leaching to the production zones of these wells. Groundwater gradients, both horizontal and vertical should be measured in the vicinity the drinking water supply wells to insure drinking water quality.

   In addition, any potable water wells (private, community, or base associated) to the north and east on the FCS, both on and off base, should be inventoried and sampled to verify the drinking water quality.

4. **Hydrogeology [Section 3.1.3, page 3-3, Second Paragraph.]** This portion of the text discusses the relationship of groundwater and surface water (Chena River) and the potential for groundwater gradient fluctuation and reversal in response to seasonal flood stage events of the Chena River. In the opinion of the reviewer, groundwater and surface water elevation data should be collected and evaluated in the vicinity of the FCS in order to determine what, if any, impact the surface-groundwater relationship has on contaminant migration from the FCS.

   In addition, the Chena River is a potential receptor for contaminants migrating from the FCS and monitoring of the groundwater quality between FCS and the river should be initiated.
5. **Hydrogeology [Section 3.1.3, Page 3-3, Third Paragraph]** This paragraph discusses groundwater flow as a function of the sand grain size and silts in the

subsurface sediments underlying Fort Wainwright. The description of groundwater movement should include discussion of the lens shape, and limited lateral extent, of the fine-grained silts that "…tend to retard groundwater flow…", and the high energy course-grained channel sediments that increase groundwater velocities. Aquifer velocities at other locations along the Chena River have been estimated conservatively in the 400 to 500 feet per year range.

The paleo-channels noted in the aerial photographs from the 1940s potential to divert groundwater flow and contaminant migration away from the assumed regional groundwater flow direction should also be discussed.

6. **Hydrogeology [Section 3.1.3, Page 3-4, Last Paragraph.]** This section of the text discusses Fort Wainwright' main potable water supply wells, which are just west, less than 200 feet, of the FCS Area A western boundary. The text discusses monthly sampling of the wells but does not provide specific information, for example, of how the samples are collected from the water supply system, the list of analytes, detection levels and analytical methodologies. Also, while it appears to be assumed, there is no definitive statement in the text that there have, or have not, been any detections above or approaching of the MCL's for drinking water.

   As mentioned previously in Specific Comment **##3** one of these wells is only 80 feet in depth and vertical gradients should be measured in the aquifer adjacent to the production wells to provide data supporting the assumption that downward migration of contaminants from Area A will not occur.
7. **Hydrogeology [Sec. 3.1.3, last paragraph, p. 3-4]**. PSE1 does not appear to be concerned about the eventual possibility of contamination of the base drinking water wells, but some concern is expressed later [Sec. 3.3.2.4, second to last bullet, p. 3-19]. Recommendation: Reconsider the PSE1 conclusion.
8. **Hydrogeology [Sec. 3.1.3, last paragraph, first sentence, p. 3-4].** It is not apparent what water supply wells are "west "of the FCS in Figure C-2. The cited buildings are east of the FCS, but perhaps the report authors had some other wells in mind. Recommendation: Clarify this sentence.
9. **Surface Water [Section 3.2.2, Page 3-5, Last Paragraph.]** The report states that analytical data was collected from a settling pond constructed to collect runoff from during 2006 spring breakup. A list of the analytes should be included in this discussion.
10. **Hydrogeology [Section 3.2.3, Page3-6, First Paragraph.]** First, please explain the rational for a second hydrogeology section appearing here in section 3.2 as well as the one in section 3.1 on page 3-3.

    The text discusses the groundwater sampling activities of 2005 and 2006 but does not provide any tabulated results. The statement in the text that"…samples collected in 2005 were used to evaluate contamination in select areas and results were reported by NWI in the Field Data Report (USACE 2006a)." provides no information as to what the nature and location of the contaminants in groundwater

were in 2005 and there is no mention of the 2006 results. Please include the analytical results, corresponding sample and well locations and a discussion of the findings of the groundwater monitoring well sampling in future reports.
Hydrogeology [Section 3.2.3, Page 3-6, Second Paragraph.] This paragraph states that the "Groundwater at the FCS flows in a west-northwest direction ..." The groundwater elevation data should be presented on a monitoring well location map, including contoured groundwater elevations and the text should include a discussion describing any analytical treatment or modeling used to generated the groundwater contours.
Hydrogeology [Section 3.2.3, Page 3-6, Third Paragraph.] This paragraph discusses the groundwater monitoring well network for the FCS and while it refers to soil boring logs included in Appendix E there is no mention of, or that these are the logs associated with the monitoring well installation. There are no as built diagrams of the wells and there is no mention of any hydrologic testing, for example, specific capacity or transmissivity performed on the wells.

In addition, there is no evaluation of the adequacy of the current monitoring well system, and no discussion of additional areas of interest, for example wells between the extent of contaminant plumes and the Chena River. The text should include all these details in the discussion of the current FCS groundwater monitoring system.

There are several areas of the FCS that, in the opinion of the reviewer, should be considered for additional groundwater monitoring well installations. Several examples are north of FCS towards the Chena River to determine the extent of groundwater contamination towards the river, north of MW03 east of Building 42 and then further east of that location to determine the eastern extent of groundwater contamination.

11. **Conceptual Site Model Subarea A [Sec. 3.3.1.1, sixth bullet].** Change "allow" to "alloy".

12. **Important Considerations [Sec. 3.3.1.4, eleventh bullet, p. 3-16], and elsewhere.** PSE1 cites two documents in support of its statement on the degradation of PCBs by sunlight. The California Water Institute document (note that California has a different level of sunlight compared to Alaska) only states that PCBs are degraded "fairly readily in sunlight", but provides no rate. The INCHEM document only says "photolysis of PCBs on surface soil may occur." Additional analysis on PCB degradation in Alaskan conditions would be useful. Recommendation: Make the PSE1 conclusion more tentative at this time, and cover fate and transport issues in the report following the 2007 field season.

13. **Impacted Media [Sec. 3.3.5.3, second paragraph].** There is a lack of concern about surface water, but little supporting analysis was provided. Recommendation: Reconsider conclusion or provide stronger documentation in the PSE1.

14. **Appendix F, Conceptual Site Models.** CSMs should also address ecological concerns. Recommendation: Add some language to the appendix to note the focus on human health, and address data gaps during the planning for the 2007 field season.

15. **Appendix F, Conceptual Site Models.** The CSMs do not appear to be concerned about surface water, yet the PSE1 notes that there is runoff from the FCS to the adjacent residential areas [Receptors, Sec. 3.3.1.5, sixth bullet, p. 3-17, for example). It is unclear what the concerns are for groundwater in the CSMs because the PSE1 did not seem to be all that concerned about the base wells. Since ecological concerns at the Chena River have not been addressed rigorously, the CSM should at least consider fish ingestion as a potential exposure route of concern. Recommendation: Modify the text and CSM figures in the PSE1 for a consistent approach.

Tables Comments:

1. The report format would be strengthened if tables of the various data being discussed appeared in the text with highlighted detections for ease of reference.

DRAFT COMMENTS
THERESE AND CRISTAL
DECEMBER 2006

PRELIMINARY SOURCE EVALUATION

NARRATIVE REPORT

FORMER COMMUNICATION SITE

FORT WAINWRIGHT, ALASKA

DRAFT REVISION 1

OCTOBER 2006

Department of the Army
U.S. Army Corps of Engineers, Alaska District
P.O. Box 6898
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ENVIRONMENTAL

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Contract No. W911KB-06-P-0060

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Acronyms

ADEC	Alaska Department of Environmental Conservation
Alsib	Alaska Siberia
bgs	below ground surface
CEMML	Center for Environmental Management of Military Lands
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CRREL	Cold Regions Research and Engineering Laboratory
CSM	Conceptual Site Model
DoD	Department of Defense
DPW	Directorate of Public Works
DRMO	Defense Reutilization and Marketing Office
DRO	diesel range organic compounds
EOD	explosive ordnance device
FCS	Former Communication Site
FFA	Federal Facility Agreement
HLA	Harding Lawson and Associates
HTRW	Hazardous, Toxic, and Radioactive Waste
LAAF	Ladd Army Airfield
LAFB	Ladd Air Force Base
MC	Munitions Constituents
MEC	Munitions and Explosives of Concern
NPL	National Priorities List
NWI	North Wind Inc.
PCBs	polychlorinated biphenyls
PID	photoionization detector
POL	petroleum, oil, and lubricants
PSE	Preliminary Source Evaluation
PX	Post Exchange
R&M	R&M Consultants, Inc.
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RRO	residual range organic compounds
SAS	School Age Services
SOW	Statement of Work
TNT	2,4,6-trinitrotoluene
USACE	U.S. Army Corps of Engineers, Alaska District
USAF	U.S. Air Force
US Army	U.S. Army Garrison - Alaska
US EPA	U.S. Environmental Protection Agency
UXO	Unexploded Ordnance

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GLOBAL
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Change reference from temporary camp to Company Headquarters and Barracks (or similar term)
All munitions material should be consistently referred to as MEC.

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EXECUTIVE SUMMARY

This report presents the results of the Preliminary Source Evaluation (PSE) of the Former Communication Site (FCS) also referred to as Taku Gardens, located at Fort Wainwright, Alaska. This FCS includes approximately 54 acres within the 917,000-acre Fort Wainwright Military Reservation.

Deleted: This source evaluation was performed by OASIS for the U.S. Army Corps of Engineers, Alaska District (USACE) under Contract No. W911KB-06-P-0060.

This report summarizes available information on past activities that occurred at or near the FCS. Additionally, the report identifies, or attempts to identify areas where hazardous materials were stored or located at the FCS and where hazardous material impacts to soil and groundwater may exist.

The FCS was selected for future military family housing in 2002-2003. Soil borings installed and sampled during a geophysical and geotechnical survey of the Source Area performed by the USACE and the Cold Regions Research and Engineering Laboratory (CRREL) in October 2003 documented the presence of metal debris at the FCS. Pre-construction soil boring sample results collected during the USACE geotechnical/chemical surveys (performed during November 2003 through February 2004 period) indicated low-level polychlorinated biphenyl compounds (PCBs) were present at the location of two soil borings. Additionally, metal debris was encountered in some of the geotechnical soil borings. R&M Consultants, Inc. (R&M) conducted a May 2004 geophysical survey (R&M 2004) of the construction FCS because metal debris was encountered during previous studies; the survey documented metallic debris was buried at several locations across the FCS. Site clearing activites in 2004 unconvered extensive amounts of buried military items, scrap metal, drums, and discarded military in the northen areas of the source.

A follow-up limited characterization performed in March and April 2005 did not confirm the presence of PCBs previously detected at two locations by the USACE geotechnical/chemistry surveys. A preconstruction geophysical investigation indicated large areas of buried metal anamolies on the site.

In June 2005 petroleum contamination was discovered in the northwest corner of the FCS (in the area of Buildings 5 through 9) during housing construction. Soil and groundwater samples confirmed that only fuel contamination was present.

In late June 2005 durring construction activites in the southern area (in the area of Building 51) , discovered the presence of high-levels of Aroclor 1260 and associated chlorinated solvents in one area. Due to the construction activites and movement of soil around the construction site the high level of chlorinated contamination in the soil initiated a PCB site clearance of the construction related movement of the surface/subsurface soils on the 54-acre construction site. The FCS investigation initiated in August 2005 was focused on protection of FCS workers and nearby residents. In addition to soil sampling, this FCS investigation

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included collection and testing of wipe samples collected from the adjacent residences west of the FCS and construction equipment left on-site when the US Army suspended construction activities and shallow groundwater testing. On-site field screening for Aroclor 1260 supplemented the off-site analytical testing. During the PCB clearance from construction activities in 2005, the US Army project team discovered that military munitions and unknown chemicals were encountered and removed during the 2005 construction activities.

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The results of the CRREL geophysical survey are provided in Appendix H, and the second survey results are presented on a 2005 aerial photograph provided on Figure 14 and included in Appendix A. Appendix A also presents the location of the USACE soil borings that were installed during the Geotechnical Survey. Information not provided in the appendix is located on one of the CD-ROMs included as Appendix E.

The FCS was divided into five subareas based on historical activities and available non-classified information. Historical records from the early 1900s to 2006 were reviewed. These records included: governmental and non-governmental reports and surveys, aerial photographs, and news media articles. Information gathered for this evaluation was also collected through discussions with personnel familiar with past activities. The information reviewed during preparation of this PSE is summarized in Appendix E. The subareas of potential concern are presented on Figure Appendix C-2.

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The boundaries and associated buildings for the five subareas are defined on Figure Appendix C-2 and briefly discussed in the following paragraphs.

Subarea A. This is the largest of the five areas. The potential contamination in this area appears to be related to buried metal debris, stored or spilled chemicals, training activities, discarded military munitions and constituents and transformers stored or used in the area.

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Subarea B. The significant contaminant of concern at this area is petroleum related. Diesel range organic compounds (DRO) were detected in groundwater and subsurface soil at concentrations exceeding applicable ADEC cleanup criteria. Weathered fuel contamination appears to be from spills or leaks during the period when 1950's era quancet hut barracks, company headquarters were located on this site.

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Subarea C. Suspected contamination in this area may be related to activities conducted during the period when 1950's era quancet hut barracks, company headquarters were located on this site. The runoff from the FCS and neighboring residential areas drains through this subarea as it flows toward the outfall to the Chena River.

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Subarea D. Potential contamination in this area may be related to storage and or salvage activities and transformers used or stored in the area. Potential contamination in the southern section may also include contaminants associated with the seven structures located in the subarea from 1954-1958.?????????

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Subarea E. A communication system was previously operated in this subarea. (we are only talking about what caused potential contamination not future use) The primary source of known contamination is from transformers used or stored

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at the FCS. High level of PCB and other solvent compouds were detected at concentrations exceeded residential stardard cleanup. This subarea was fenced due to the extent and level of contamination found.

The following conclusions have been made from the evaluation of each FSC subarea:

- The subarea is complicated by lack of conclusive information on past activities.
- Disposal activities appear to pre-date the available aerial photographs (1947), with filling in of the two oxbow meanders apparent in this earliest photograph.
- Activities at this site in the late 1940s through the 1950's involved receiving, handling and disposal of salvage material.
- Drums and munitions constituents, including explosive and non-explosive materials were buried. Some of the excavated material was not transferred to an off-site location; instead the material was placed in soil and debris piles across the FCS. The locations of munitions and munitions constituent discovered in debris and stockpiles on-site are shown on Figure Appendix C-2.
- During the 1950s all activities at the FCS appear to be connected to the presence of a military company with barracks, motorpools and headquarter buildings.
- The concrete batch plant was located in the north-east corner between 195?-????.
- The secure area east of the temporary camp appears to have been used for handling of material requiring special consideration.
- Decontamination materials (super tropical bleach) were found at the FCS.
- Groundwater is impacted by fuel contamination in one area.
- The post drinking water supply wells are located adjacent to the FCS but upgradient and at depths of 80-182 feet. Well locations are presented on Figure Appendix C-2.

A communication type system consisting of antennae, electrical array and transmitters were located on the site.

-
- It is believed that the sources of PCB contamination were related to leaking transformer(s), inadequate storage and disposal of transformers, and other historical installation activities. Other compounds associated with transformer oil are contaminants of concern.
- Significant amounts of metal debris were encountered during 2005 construction activities and some debris was removed. The three geophysical surveys performed to date indicate metallic anomalies are still present in surveyed areas.
- Military munitions and items were encountered during FCS clearing and construction excavation. Military ordnance experts were mobilized to the FCS and were responsible for identification and disposal of the item.

The information presented in this report may be incomplete due to classifiedreword activities conducted within the FCS and information that was not available at the time this report was written.

1.0 INTRODUCTION

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This report presents the results of the Preliminary Source Evaluation (PSE) of the Former Communication Site also referred to as Taku Gardens (FCS), located at Fort Wainwright, Alaska. This FCS includes approximately 54 acres within the 917,000-acre Fort Wainwright Military Reservation. This report summarizes available information on past activities that occurred at or near the FCS. Additionally, the report identifies, or attempts to identify areas where hazardous materials were stored or located at the FCS, and where hazardous material impacts to soil and groundwater may exist.

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The construction of family housing within the area of the FCS was proposed in 2002 2003. This initiated the following related actions that were completed before construction began: an Environmental Assessment (US Army June 2004) of all Fort Wainwright housing areas, two Geophysical Surveys (limited survey performed by USACE Cold Regions Research and Engineering Laboratory [CRREL] in October 2003 and complete survey performed by R&M Consultants, Inc. [R&M] in May 2004), and two Geotechnical and Chemical Surveys performed by the USACE during the November 2003 through February 2004 time period. A copy of the CRREL report and survey is included in Appendix H of this report. The USACE and R&M surveys are included on the CD-ROM provided in Appendix E. Information from these surveys was used to develop sampling and analysis plans for characterization of the FCS.appears out of order and disjointed bullet important events in order of date.

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The USACE foundation geotechnical investigation detectedthe presence of polychlorinated biphenyls (PCBs) at the location of two soil borings installed by the USACE in 2003-2004 (AP-8934 and AP8960). A follow-up sampling performed by North Wind Inc. (NWI) in March and April 2005 did not confirm the presence of PCBs at either of these two locations. (?I thought it was found at low levels?) The construction of the family housing began in summer of 2004 with ground clearing. Actual construction of the housing area began in April 2005 with the excavation of utility trenches and building foundations (locations are provided in Appendix D drawings).

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Petroleum contamination was discovered during June 2005 construction activities in the northern area of the FCS. Eighteen soil borings were advanced to the depth of groundwater and analyzed by an off-site laboratory for volatile and semivolatile compounds, diesel range contaminants, and PCBs to delineate and characterize fuel contamination in soil. Three temporary groundwater monitoring wells were installed in this subarea in locations where soil contamination levels were the highest. These wells were analyzed for the same analytical parameters as those used for the soil boring samples. Only one contaminant was identified as a concern in soil and groundwater; this contaminant was diesel.

During excavation of the Building 52 foundation in June 2005 workers noted a solvent-like odor. An environmental field team investigated the source of this odor and determined PCBs (Aroclor 1260) and associated chlorinated compounds were present in the excavated soil. This discovery of chlorinated contamination in the soil initiated the PCB FCS clearance of the surface and subsurface soil and construction equipment on the 54-acre construction site to determine if the FCS was safe for the continuation of construction at the FCS. The primary focus in 2005 was on the safety of on-site personnel and nearby residences. In order to protect site workers and residences dust control was implemented and PCB FCS clearance of surface and subsurface soil was initiated. This FCS clearance was

performed while construction excavation activities ceased and after construction workers were evacuated from the FCS. Workers were not allowed on-site until the US Army project team determined it was safe to reenter an area. Recreational equipment at four areas (one inside the construction site, two in adjacent residential neighbor hood, and on at the School Age Services facility) and the adjacent houses were screened for potential PCB-contamination.

The US Army project team reviewed the construction subcontractors' field notes and photographs for information leading to identification of a potential source for the PCB-contamination in the original Building 52 excavation. During the review of field notes and photographs the project team discovered military munitions constituents, munitions debris (projectiles, shipping tubes, shell casings, fins, drop tanks, etc.) empty/leaking/crushed drums dating back to the 1950s, stained soil, burned debris, unidentifiable materials (such as white powder and blue-grey granular material), building debris, airplane and automobile parts and unknown chemicals had been uncovered and most material had been removed from the FCS during construction activities performed in 2005. The table in Appendix B summarizes the information and provides the location relative to the associated building.

The FCS was divided into five subareas based on historical activities and on available non-classified information. Historical records from the early 1900s to 2006 were reviewed. These records included: governmental and nongovernmental reports and surveys, aerial photographs, topographical surveys and news media articles. Information gathered for this evaluation was also collected through discussions with personnel familiar with past activities. The subareas of potential concern are presented on Figure Appendix C-2.

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2.0 PURPOSE

The purpose of this source evaluation is to collect and review available information reguarding historical activities conducted at or near the FCS that may have contributed to contamination impacting soil and groundwater. Figure 2-1 provides the general location of Fort Wainwright and the FCS located on Fort Wainwright. This PSE report summarizes the findings of the evaluation to support future investigations.

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The PSE as defined by the Federal Facility Agreement (FFA) (US Army 1991) is comprised of two processes, the PSE1 and PSE2. The PSE1 will be used as a screening tool to summarize and evaluate existing information and determine qualitative risk. The exposure pathways and the potential receptors for each subarea are clearly identified in the individual Conceptual Site Models (CSMs) provided in Appendix G of this report. The PSE2 provides the results of the field investigations.

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Figure 2-1 Location and Site Map

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3.0 SITE HISTORY

The history of military activities at Fort Wainwright, previously known as Ladd Army Airfield (LAAF) and Ladd Air Force Base (LAFB), played an important role in identification of the potential sources of contamination at the FCS. Tables 3-1 and 3-2 summarize historical dates and activities that may directly or indirectly relate to sources of contamination on Fort Wainwright and the FCS. Delete this

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section and start with FWA history.

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3.1. Fort Wainwright

Fort Wainwright is an active installation covering approximately 917,000 acres in the Fairbanks North Star Borough, Alaska. It is approximately 120 miles south of the Arctic Circle, and 350 miles north of Anchorage, in the interior part of the state. Fort Wainwright lies within the flood plain of the Chena River, which is a tributary of the Tanana River. The Chena River meanders westward through the main post area forming several oxbows. The Chena River drains approximately 2,000 square miles and flows into the Tanana River approximately eight miles west-southwest of Fort Wainwright (ATSDR 2003).

Fort Wainwright has been used by the Department of Defense (DoD) for military operations continuously since 1938. It was originally named Ladd Army Airfield (LAAF) and authorized as the Alaska Experimental Air Base. This project was subsequently developed into three categories: a cold weather test station, an air sub-depot for repair and testing of airplanes, and the central Alaskan station of the Alaskan Wing of the Air Transport Command system for transportation of air freight in Alaska and ferrying Alaska Siberia (Alsib) planes.

In 1947 LAAF was home to the 1st Unified command that allowed the US Army, Navy and Air Force elements to work together in Alaska. During World War II, LAAF served as a transfer point in the U.S.-Soviet Lend Lease Program. Between 1942 and 1945, almost 8,000 combat and transport aircraft were transferred to Soviet aircrews at LAAF. The newly-formed U.S. Air Force (USAF) assumed control of LAAF in 1947 and redesignated the post as Ladd Air Force Base (LAFB). The LAFB served as a resupply and maintenance base for the Remote Distant Early Warning sites and experimental ice stations in the Arctic Ocean.

Winter exercises involving joint task force training were conducted in the 1950's. In the 1950s the installation was used as a supply and maintenance base for the Remote Distant Early Warning Radar sites and experimental ice stations in the Arctic Ocean. During the Korean Conflict and the Cold War, the post was an integral part of the national defense network. The US Army resumed control over LAFB on January 1, 1961 and renamed the installation Fort Wainwright. Fort Wainwright became the home of the 171st Infantry Brigade in 1963 and has housed various US Army Brigades and divisions over the years.

Over the decades of military use, routine operations and storage practices resulted in accidental releases of chemicals to the ground and underlying groundwater or nearby surface water. Former waste disposal practices were also responsible for releases to the environment. Most non-hazardous waste was disposed in the sanitary landfill beginning in the late 1950s, located in the north-central portion of Fort Wainwright. Naturally occurring surface depressions (such as oxbows) were used for disposal of waste construction material and covered with fill. Other waste disposal practices at Fort Wainwright included using waste oils on post roads for dust control and for firefighting drills; spreading ash on icy roads, collecting hazardous waste in waste oil tanks and burning it for energy recovery in the power plant; and discharging or dispersing used oils, solvents, or fuel spills into floor drains in buildings across the installation (ATSDR 2003).

Fort Wainwright generated hazardous waste material in the past, including pesticides; PCBs; petroleum, oil, and lubricants (POL); and battery fluids. Such chemicals were largely associated with spent solvents and ignitable wastes from aircraft and vehicle maintenance shops; contaminated motor vehicle and aviation fuels; painting waste; coal fly ash and spent non-recyclable vehicle batteries. Fort Wainwright also received small quantities of radioactive tritium waste and low-level radioactive materials (e.g., radium dials) (ATSDR 2003).

3.1.1. Remedial and Regulatory History

Fort Wainwright was placed on the National Priorities List (NPL) on August 1990, because of potential soil and groundwater contamination. The NPL is a listing maintained by the US EPA in accordance with the provisions of the 1980 Comprehensive Environmental Response, Compensation, and Liability Act

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(CERCLA, 42 USC 103), known as "Superfund." The two areas were used for the original EPA ranking. They include:

(1) a 50-acre sanitary landfill used for hazardous waste disposal since the late 1940s; (2) the North Post Family Housing Area contaminated from past storage of petroleum products, solvents, and other chemicals; and (3)

The US EPA, ADEC, and Department of the Army entered into a FFA (US Army 1991) with Fort Wainwright in 1992 to develop remedial action plans for environmental contamination at Fort Wainwright. Additionally, the US Army and ADEC signed a Two-Party Agreement in March 1992, to define the process by which the US Army agreed to investigate and clean up petroleum-contaminated areas (ATSDR 2003).

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3.1.2. Natural Resources

Fort Wainwright natural resources include groundwater for drinking water, surface water bodies for recreational uses, and hunting and fishing of local biota. Add language on the natural resources!!

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3.1.3. Hydrogeology

Fort Wainwright lies above a shallow groundwater aquifer, the Tanana Basin Alluvium Aquifer. The alluvium, or loose sediment largely consisting of sand and gravel, is distributed over a broad area, providing a large water storage capacity. The aquifer ranges in thickness from a few feet to at least 300 feet and possibly as much as 700 feet in some areas of the Tanana River Valley. The depth to groundwater is typically 10-20 feet.

Groundwater flows to the west-northwest in the Fort Wainwright area. The flow pattern at Fort Wainwright is similar to the Chena and Tanana Rivers (ATSDR 2003). Groundwater flow beneath Fort Wainwright, south of the Chena River, is generally to the northwest. The flow is driven primarily by the difference in river stage between the Tanana and Chena Rivers. During most of the year, groundwater flows from the Tanana River toward the Chena River, flowing onto the base from the southern and eastern base boundaries, and exiting on the western border of the base. At some times of the year, however, the groundwater flow paths near the Chena River are essentially reversed. This occurs when the Chena River stage suddenly increases from the increased flow caused by precipitation and snow melt.This has been updated since the ASTDR. Reversals only occur near the Chena River.

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Groundwater flow varies across Fort Wainwright due to natural differences in the surface and subsurface soils. Zones of fine-grain sand and silt are intermingled with zones of coarser-grained sands. Fine-grained materials tend to retard groundwater flow while the coarser materials are more permeable and typically allow greater amounts of groundwater flow (ATSDR 2003).

The Fort Wainwright's main drinking water supply system wells located in the area of Buildings 3559A, 3559B and Building 3565 and isn't this east/northeast? of the FCS as shown on Figure Appendix C-2. These wells are 80 and 182 feet deep, respectively (US Army 1997). The wells support a capacity of 1.5-2.5 million gallons of drinking water per day. These wells are tested monthly to evaluate potential contamination against drinking water standards. Five emergency standby wells are located at various locations on the facility. The depth of these wells range from 80-100 feet. (how far is the closest supply well?)

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These wells were historically sampled each month with the testing of the main supply wells. However, a less frequent testing schedule has been implemented (Adams 2006).

3.1.4. Surface Water

Fort Wainwright lies entirely within the Tanana River drainage basin. The Tanana River, a major tributary of the Yukon River, flows east to west, approximately three miles south of the Fort Wainwright main cantonment area, encircling the northern and eastern boundaries of the Tanana Flats Training Area.

Fort Wainwright also lies within the flood plain of the Chena River, a tributary of the Tanana River. The Chena River drains an area of approximately 2,000 square miles. It meanders westward through the Main Post, forming several oxbows, flowing into the Tanana River approximately eight miles west-southwest of Fort Wainwright (ATSDR 2003). The Chena River is an influent system for most of the year; when the river is at normal and low stages, and groundwater is flowing into it. During high stages, when the melting snow and ice combine with rainfall, the surface water discharges into the groundwater. The banks of the Chena River have a capacity of 12,000 cubic feet of water per second.

Many creeks and smaller rivers located on Fort Wainwright eventually flow into the Chena or Tanana Rivers. The post also has a number of lakes that are sometimes used for fishing and other recreational purposes (ATSDR 2003). How far are they located to FCS??)

3.1.5. Terrain and Climate

Fort Wainwright is located within two different topographical areas, the Tanana-Kuskokwim Lowlands and the Yukon-Tanana Uplands. The Main Post is primarily located on relatively flat terrain, with a typical elevation about 450 feet above mean sea level. The northern portion of the Main Post has higher terrain, with elevations rising to above 1,000 feet above mean sea level. The climate in the central part of Alaska is characterized by summer temperatures that range from 65 to 90 degrees (ATSDR 2003).

Fort Wainwright and Fairbanks are in the Central Alaskan region of discontinuous permafrost. Discontinuous permafrost refers to a region in which some areas are underlain by permafrost and neighboring areas are not perennially frozen. The unfrozen zones can be isolated or interconnected (USGS 1999).

Permafrost (and seasonally frozen soil) can make it more difficult for rainwater and snow melt to infiltrate to deeper groundwater zones. Even so, unfrozen water will still pass through porous permafrost. Permafrost also can alter groundwater flow patterns, causing erratic and unpredictable movement. Groundwater in areas of permafrost, such as north of Chena River at Fort Wainwright, is most likely to occur in (1) the active layer during the summer (frost-free) season; (2) in taliks (unfrozen zones) within the permafrost; and
(3) in unfrozen zones below the permafrost layer (ATSDR 2003).

3.2. History of the Former Communication Site (Taku Gardens)

The 54-acre site referred to as the FCS or Taku Gardens is located within the area of the main post and is south of the new hospital constructed in 2005. Activity at the FCS and surrounding areas is recorded by aerial photography, Master Plans, historical Post and unit activities and topographical surveys. Most of the information printed on the history of military activities of LAFB and military

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activities during the Cold War can only be extrapolated to be activities that occurred. Very little documentation has been located that conclusively describes activities conducted at the FCS. Therefore, considerable effort was focused on evaluation of aerial photographs dating from 1947-2005, 1958 Master Plans and graphical surveys. Extensive research and evaluation of multiple documents from higher Commands, other installations and Military unit history were used to help identify site structures and features. Many military operations, building configurations, construction and communication systems were built and operated across the United States. This information has led to identifying potential sources. A summary of this review is provided on Appendix A. Additionally, historical aerial documentation for this source area could not be located for the 1950-1953 time period.

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3.2.2. Surface Water

Deleted: *3.2.1. Early Homesteads* ¶ Fort Wainwright was the location of as many as 90 homesteads that were eventually acquired by Ladd Army Airfield. The history of the homestead owners is reported in *Homesteads on Fort Wainwright, Alaska* (September 2002, Center for Environmental Management of Military Lands [CEMML] CEMML TPS 02-9,CSU, CO). The original homestead located in the vicinity of the FCS was owned by Otto Hoppe who relinquished the property to Ida May Joy. The property was eventually passed to the Buzby family before it became part of the original Ladd Army Airfield. Prior to the late 1940s, the FCS does not appear to have been impacted by military activities. ¶

Hoppe's Slough, one of several oxbows formed by the Chena River, curved through the middle of the FCS. Aerial photographs that document FCS conditions prior to 1947 are not available; however, the footprint of the slough and a second meander south of the slough is visible in a 1947 aerial photograph (Figure 2) and partially visible until the late 1960s.

Historical photographs document the eventual filling of meanders as the areas are developed. A geophysical survey performed in May 2004 (R&M 2004) indicates the material used to fill the slough included metallic objects. The western drainage at the FCS that leads to the Chena River follows the natural direction of this slough. Runoff from residential areas located west of the FCS flows into the modified drainage and under Neely Road where it meanders across the area of the new hospital built in 2005 before it flows into the Chena River. The Directorate of Public Works (DPW) tests the outfall of this drainage to the Chena River annually (Adams 2006). The only occasion when this drainage contained actively flowing water was during dewatering activities performed by the construction contractor in the spring of 2005 (Adams 2006).

Deleted: The construction contractor at the FCS is currently responsible for controlling off-site discharge of sediments.

Runoff collects in a low area located in the southwest corner of the FCS (behind residential Building 4394) and may run into a wetland located in this area (Adams 2006). A settling pond was constructed in this area to collect runoff (snow melt) from the east and northeast areas during the 2006 spring break up. The settling pond was discharged into the drainage ditch adjacent to the construction site after confirmation that the analytical data was below ADEC allowable standards for discharge.

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3.2.3. Hydrogeology

The groundwater studies at Fort Wainwright are extensive and documented in various reports and surveys available in the Fort Wainwright Administrative Record (Building 3023). These reports typically apply to the various Operable Units across the facility. Groundwater data was collected within the FCS in the fall of 2005 and during the summer of 2006. Groundwater samples collected in 2005 were used to evaluate contamination in select areas and results were reported by NWI in the Field Data Report (USACE 2006a). Figure Appendix C-2 provides the location of the permanent, temporary and supply wells.

Groundwater at the FCS flows in a west-northwest direction and was typically encountered at depths ranging from 13 to 15 feet below ground surface (bgs) in the soil borings and groundwater wells installed at the FCS.

A Post-Wide Well Survey of Fort Wainwright (US Army 2000/2006) shows the location of documented groundwater monitoring wells. The FCS is located on Plate 11 of this survey and provided in Appendix A of this report. The wells shown on this survey map are up gradient and east of the FCS. The Post-Wide Well Survey (US Army 2000/2006) is included on a CD-ROM provided in Appendix E. Figure 15 (The Fort Wainwright Water Distribution System figure from October 2002 was provided by Brian Adams Fort Wainwright DPW) shows the locations of wells in the vicinity of the FCS. The nearest down gradient well is located near Building 4065 but is not connected to the main supply well system.

Soil boring data collected in 1973, 2003, 2004, 2005, and 2006 document the geology of the construction site. The soil boring logs from the USACE (USACE 2004c and 2004d) and subsequent site investigation (CRREL 2003) provide supporting geological documentation. The geology is consistent with that previously described for Fort Wainwright. The USACE boring logs are provided on a CD-ROM in Appendix E. The boring logs and field report for the Shannon and Wilson investigation are provided in Appendix H to this report. The analytical data and CRREL geophysical survey are also included in Appendix H and on a CD-ROM provided in Appendix E.

3.2.4. Environmental Assessment

The Environmental Assessment, Construct Replacement Family Housing and Revitalize Family Housing Neighborhoods (US Army 2004), states that the effects to land use is related to changes from the relatively natural state of the site to a developed urban area. The effects would be made to visual resources for replacement housing sites during construction and a minor effect after development. This document is included on a CDROM provided in Appendix E.

3.2.5. Construction and Investigation Site History

This section discusses the surveys and investigations that are associated with the FCS or Taku Gardens.

Table 3-2 summarizes the current history of the FCS. These appear to be more historic information. Also, only some figures are listed so start with the history of Taku as we know it.

Table 3-2 Current History of Former Communication Site (Taku Gardens)

Event Date	Event Location
Oct. 2003	Cold Regions Research and Engineering Laboratory (CRREL) Geophysical Survey of hydroaxed areas (Appendix [APP.] H). (CRREL 2003) FCS
Oct. 2003	Shannon and Wilson Soil Boring Sample Collection (APP H) FCS

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Deleted: Topographical Survey shows location of salvage yard, batch plant, 4th Infantry, fence, and munition storage areas. (Reference Appendix A, Figures A-1 through A-7.) FCS

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Deleted: Master Plans show location of electrical facilities, heating systems, and physical structures both existing and planned. FCS

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Deleted: Aerial photograph shows location of fence north and east of salvage yard, fire training pits, drums, and soil staining. Subarea A

Nov. 2003-Feb. 2004	USACE Geotechnical Investigation (USACE 2004a &b) Chemical Data survey detects PCBs at two soil boring locations (AP-8934 and AP-8960) in FTW251 and FTW 283. Also noted metal anomalies. FCS
24 March 2004	EOD Inc. Report No. 176-018-04 - Fort Wainwright DPW excavated a 155mm projectile from a "dig site". One piece of ordnance disposed of by detonation. (APP. G) North of FCS behind PX service station
8 April 2004	EOD Inc. Report No. 176-024-04 and 176-025-04 - Fort Wainwright DPW excavated an "8-inch, inert filled" "Casing, 75mm Recoilless Rifle" and an "8 inch, us, inert filled" from a "dig site". Three pieces of ordnance disposed of by detonation. (APP. G) North of FCS behind PX service station
9 April 2004	EOD Inc. Report No. 716-021-04 - Fort Wainwright DPW excavated an "8 inch, us, inert filled" from a "dig site". Different projectile than previously identified. One piece of ordnance disposed of by detonation. (APP. G) North of FCS behind PX service station
14 April 2004	EOD Inc. Report No. 716-027-04 - Fort Wainwright DPW excavated two 8-inch/155mm projectiles - inert from a "dig site". One piece of ordnance disposed of by detonation. (APP. G) North of FCS behind PX service station
21 April 2005	EOD Inc. Report No. 176-8-05 - Fort Wainwright DPW excavated a piece of scrap metal, possibly an 8-inch projectile. No explosive ordnance found. (APP. G) North of FCS behind PX service station
May 2004	R&M Geophysical Site Investigation (R&M 2004) FCS
June 2004	Environmental Assessment performed (US Army 2004) FCS
Mar.-Apr.2005	North Wind collected soil boring samples from two locations where USACE detected PCBs in Mar. of 2004 but did not detect PCBs. FCS
Spring/Summer 2005	Construction begins on housing project and documents in field notes and photographic records that munitions constituents were present at the construction site and may still be present. FCS
July 2005	North Wind installed 18 soil borings and three temporary wells in Subarea B to delineate petroleum contamination. Only diesel range organic compounds (DRO) exceeded ADEC cleanup criteria. Subarea B
June 2005	North Wind collected soil samples from excavation and stockpiled soil in footprint of the original Building 52 location after solvent like odor is reported. No PCBs reported but trichlorophenols are detected. Subarea E
July 2005	Additional samples were collected from the original Building 52 location to confirm laboratory notation that PCBs were present in previously analyzed samples and evaluate Dioxin/Dibenzofurans, and other associated solvents Subarea E

Table 3-2 (continued) Current History of Former Communication Site (Taku Gardens)

Event Date	Event Location
Summer 2005	North Wind conducted emergency site characterization for PCBs, installs numerous soil borings, seven temporary wells, and three permanent wells as well as collects surface wipe samples from adjacent housing and on-site construction equipment. FCS
30 August 2005	Fort Wainwright US Army evacuated the FCS with the exception of field investigation personnel. Water truck routinely on-site to control dust. FCS
31 August 2005	Media Release disseminated to the public. Fort Wainwright

August 2005	The area previously designated as Buildings 50-59 was secured with a chain link fence. This is the area referred to as the "Exclusion Zone". Subarea E
6 September 2005	Public Meeting to discuss concerns at the FCS and reason for construction shut down. Fort Wainwright
20 September 2005	Fort Wainwright DPW transports 230 cubic yards of PCB-impacted soil from original the original location of Building 52 to off-site approved facility for disposal. Subarea E
Fall 2005	North Wind Constructs Soil Stockpiles at DRMO Yard and transfers POL-contaminated soil excavated during 2005 construction activities. Soil was also tested for PCBs before transfer. FCS
Feb 2006	North Wind publishes a data report of information collected during the 2005 field effort FCS
Summer 2006	• Ordnance experts were on-site for all intrusive activities at the construction site. • Explosives constituents detected in subsurface soils. • EOD subcontractor identified munitions constituents and UXO in test pits and soil stockpiles. • PSE2 initiated with collection of soil and groundwater data. • Third geophysical survey performed that focused on select areas. FCS

3.2.5.1. Geotechnical Data

During a geophysical survey performed by CRREL in October 2003 to support development of permanent houses in the FCS and investigate the suspected landfill in what is now referred to as Subarea A, five soil borings were installed and sampled. The soil bore logs and analytical data reports from this brief investigation are provided in Appendix H (CRREL 2003). Photographs included in Appendix L show the actual clearing and grubbing of the FCS and early stages of the construction of the sound barrier on the eastern and southeastern boundaries of the construction site. These photographs were taken in April 2004.

The USACE installed soil borings across the FCS proposed to support military housing and collected both analytical and geological data in November 2003 through February 2004. The geotechnical data was documented in two separate reports, Geotechnical Findings Report, Family Housing Replacement, Fort Wainwright FTW251 and Geotechnical Findings Report, Family Housing Replacement, Fort Wainwright FTW283 Taku Gardens Site (USACE 2004a and 2004b). These reports are provided on a CDROM that is located at the back of this report.

3.2.5.2. Geophysical Surveys

A limited investigation including a geophysical survey and installation of soil borings was performed by CRREL and limited to a small area. The size of this investigation was due to funding constraints. The survey was completed on already cleared areas and a small hydroaxed area. Soil borings were installed to ground truth the geophysics. The field personnel observed areas of buried metal and surface metal anomalies that were further delineated in a second survey of the construction site. The second geophysical site investigation of the construction site was performed in May 2004 (R&M 2004) to detect buried debris or construction waste remaining from former site activities that was noted by the USACE geotechnical survey and site clearing activites by DPW in 2004. This survey identifies several areas where metal debris was buried and some that

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appeared to be spread across the surface in some areas. Large areas of buried metal debris were located in Subareas A, B, and C and wide spread surface anomalies found in Subareas A, C, and E. The buried metal anomalies that overlay construction excavations as seen in Figure 14 were removed to the depth of the excavation. Some buried metal debris remained on the FCS in 2006 and was removed during FCS investigation activities supervised by ordnance experts. The geophysical information was overlaid on several aerial photographs of the construction site and provides correlation of buried metal anomalies to historical activities (Appendix A-1 through A-4). The historical aerial photographs showing the location of the USACE soil borings and results of the geophysical surveys are provided in the Appendix E. The results of the CRREL survey are provided in Appendix H.

3.2.5.3. Previous Investigations and Removal Actions

The USACE geotechnical investigation for the construction activities, indicated the presence of PCB's, at levels above EPA and ADEC residential cleanup standard in borings, AP-8934 and AP8960. In March 2005, a direct push drilling unit was mobilized to confirm the findings by collecting step out samples from four points near each of the previous soil boring locations. The data collected from this step out sampling effort did not confirm the presence of PCBs. (were there any detects at all, or if so, at what levels???)

Debris removals were performed by the Fort Wainwright DPW in March and April 2004 and April 2005 from an area behind the PX Service Station currently located northeast of the construction site. Military munition items were identified during excavation of metal debris, military ordnance experts were contacted. Photographs of this removal and the Explosive Ordnance Incident Reports for the 2004 removal are provided in Appendix G and summarized in Table 3-2.

During the early stages of the construction project, dewatering activities were conducted to lower the level of the groundwater for excavation purposes. The draw-down well was located in the area where buried metal debris was identified (between Buildings 22 and 48). Groundwater was pumped into a trench that ran parallel to Buildings 1 through 13 and into the drainage ditch east of the fire station. Bales of straw were placed in this ditch to remove suspended material before the surface water left the FCS and before it entered a culvert under Neely Road. This water eventually discharged into the Chena River. Analytical samples were collected from this water discharge and reported to the ADEC. Suspended solid concentrations exceeded an acceptable level established by ADEC for surface water. Dewatering reporting documents provided by the ADEC are included on a CD-ROM provided in Appendix E. The files included on a CD-ROM summarize the dewatering activities, analytical results, and provides photographs of the well installation and dewatering activities. These photographs document the presence of buried metal debris that was disturbed during excavation.

The construction of 64 military housing units began in April 2005. An on-site environmental subcontractor provided screening support (is this true?? I thought the screening was completed at every house, or every house possible ??)in areas where contamination was suspected and collected soil samples for off-site analytical testing. The environmental subcontractor used a photoionization detector (PID) to screen soils and debris to determine if material could be removed from the FCS. Soil and debris determined to be contaminated (assuming contamination was due to fuel constituents) were stockpiled on-site or

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behind the PX Service Station. Due to the size of the project, not all excavations and intrusive construction activities were screened.

Debris that was not considered contaminated was transported to the Fort Wainwright landfill. Debris was removed by the construction contractor when integrity of the road or building foundation was impacted. The construction contractor did not remove metal debris unless it was determined to affect constructability standards (Wentz 2006).

In the northern area of the site, soil and groundwater samples were collected from soil borings and temporary groundwater wells in June-July 2005 when an area of petroleum contamination was discovered during construction activities. No chlorinated contamination was detected in the 18 soil boring or three monitoring well samples collected during this field investigation of Subarea B.

Unidentified solvent-like odors were noted by construction personnel on 30 June 2005 near the location of the original Building 52 when the building foundation was excavated. Initial testing to characterize the soil identified high trichlorophenols contamination but did not conclusively detect PCBs. A second set of field samples collected from this same area detected PCBs (Aroclor 1260) at concentrations as high as 111,000 mg/kg. Additionally, chlorinated contaminants associated with PCBs in transformer oil were also detected at levels that exceed the EPA and ADEC residential risk screening criteria?????. These chlorinated contaminants associated with the polychlorinated biphenyl (PCB) contaminated soil include trichlorophenols, trichlorobenzenes, dichlorobenzenes, dioxins and dibenzofurans. Looking at the photos, it appears this was moved after the original excavation.

A time-critical removal action removed a portion of the PCB-contaminated soil excavated from the original location of Building 52 (approximately 230 cubic yards) was removed from the construction site in September, and the excavation was filled with low level PCB-contaminated soil previously stockpiled near Building 54. This area remains covered by plastic sheeting. In addition to PCB removal, the time-critical removal action also included signing and constructing a fence around this building foundation as well as the area that appears to be an electrical grid. This included nine other building foundations, this area is known as the exclusion zone (buildings 50-59). The exclusion zone is currently secured by a locked chain link fence and posted with PCB warning signs. Access is restricted and only allowed upon approval on an as-needed basis. The buildings in the exclusion zone were permanently removed from planned housing. A new location was determined for Building 52 prior to this decision. Building 52 is now located in the northwest area of the construction site.

Construction field notes and photographs were reviewed to identify the potential source of contamination found in the original location of Building 52 and identify other areas of impact. Table 2-1 of the NWI Work Plan Addendum (USACE 2005d) (Appendix B) summarizes this information. The construction subcontractor began collecting samples for off-site analytical testing for PCBs during the 2005 fall construction activities. These samples were provided to NWI and transferred to the NWI subcontracted laboratory for testing. The analytical results are reported in the FWA-102 Former Communication Site (Taku Gardens) Field Data Report (USACE 2006a). The data indicated PCBs were present in two locations sampled during the fall construction activities, but all results were less

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than the US EPA and ADEC action limit of 1 mg/kg. This report is provided on the CD-ROM located in the back of this report.This seems out of place. This occurred only after construction was resumed

The construction site was evacuated in August 2005 of all site personnel with the exception of the environmental field investigation workers. The 2005 field investigation focused on the safety of on-site workers and nearby residences. During this investigation samples were collected from the following locations: surface and subsurface soils across the construction site, stockpiled soils, a nearby residence (Building 4394), three permanent groundwater monitoring wells and seven temporary groundwater monitoring wells, and from four outdoor recreational areas, adjacent residences, and equipment remaining on-site after construction workers were evacuated. Low level PCBs were detected in wipe samples collected from the recreational equipment located within the construction site boundaries but were not detected in samples collected from off-site recreational equipment and residences. The only areas where PCBs were detected at concentrations greater than US EPA and ADEC cleanup criteria are located within the exclusion zone. On-site field screening equipment were used to supplement samples tested by off-site analytical laboratories.This should be clear that for this sampling event, it was done only for PCB screening to allow continuing construction activities and did not clear the entire site of PBC's

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An interview with Fire Captain Scott Hunt documented in IMPA-FWA-PWE, Memorandum for the Record, 31 March 2006 (DPW 2006), reports a transformer was present (where, and was it in the dumpster?) in this area as observed during a response to a brush fire. Captain Hunt also stated that PCBs may be present in the area near the sound barrier east of the FCS. A map of subareas identified during this interview and the documented interview is provided on a CD-ROM provided in Appendix E.

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Need to explain that the notes led to developing the matrix, developing plan with ADEC/EPA etc. It appears something is missing-all the work that was conducted from Nov 2005-March 2006 when the UXO plan was developed. Dividing into sub-areas, first workplans, conference calls just after evacutation as well as the initiation of the weekly calls, regulatory approval process for construction work on an as-needed basis, etc. It appears that we just jumped from PCB's in area 52 to the entire site; link the above paragraph to the below paragraph.

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The first phase of the 2006 Site Investigation was initiated with excavation of several test pits, in accordance with the Work Plan Addendum (USACE 2006d). UXO-qualified personnel were available to provide support while activities disturbing soil not previously excavated during construction were performed (USACE 2004g). This investigation an area where the construction contractor identified potential munitions constituents (MC) in surface soils at Building 25. The term MC was used to describe munitions suspected in the area after review of FCS information and photographs. The term MEC defines the materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown products of ordnance or munitions. During the early test pit excavation phase it became evident that some of the metal anomalies

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identified by the 2004 geophysical survey were no longer present at the FCS. This metal debris was removed by the construction contractor during 2005 activities. A third geophysical survey was scheduled to delineate locations of existing metal debris. The results of that survey will be provided in the PSE2.

The investigation focus transferred to the stockpiled soil and debris excavated during 2005 construction activities staged across the FCS. After various potentially explosive items were identified in the excavations and stockpiles, the terminology used to describe them changed. These items located at the FCS were hence referred to as materials and explosives of concern (MEC). The term MEC (definition found in Military Munitions Center of Expertise Technical Update, Munitions Constituent Sampling, March 2005) (USACE 2005b) distinguishes specific categories of military munitions that may pose unique explosives safety risks and means UXO, discarded military munitions (DMM), and MC such as those that may be present at high enough concentrations to pose an explosive hazard.

Even though information collected during summer 2006 field activities is not provided in the PSE1 narrative report, the information was taken into account during development of the conceptual site models provided in Appendix F.

3.3. Subareas Within the Former Communication Site Source Area

The FCS is discussed in this section as five separate subareas. The Areas of Concern Figure in Appendix C shows the approximate location of each subarea and associated buildings. Table 2-1 of the Work Plan Addendum (USACE 2006d), that is provided in Appendix B, summarizes FCS observations and some of the available data that was used to divide the source area into separate subareas.

Separate conceptual site models (CSMs) were developed for each of the five subareas. Each CSM identifies potential sources of contamination (soil, groundwater, surface water, leachate, air, etc.), release mechanisms, and receptor routes and identifies all potential pathways (including secondary pathways) and the media and receptors associated with each of these pathways. The tables and figures used to develop each of the CSMs are provided in Appendix F. The EPA? ADEC CSM scoping guidance (ADEC 2005c) was used in the development of these tables and figures.

3.3.1. Subarea A

From review of obtainable documentation, activities in this areabegan first began in the early 1940s. The 1947ax001 aerial photograph indicats that the FCS may have been used for storage purposes. The 1953 Topographical Survey for Permanent Housing (Appendix A) confirms the 1953 Master Plan documentation that part of this area was fenced. The topographical survey figure shows this area was fenced with "*five strand barb wire on 4" X 6" posts. Top wire 4' above ground. Posts are in poor condition loose wire and broken loose posts*". This fence extended east to the railroad tracks. The same survey records three additional activities: "*4th Infantry Area*", "*Concrete Batch Plant in this Area*", and "*Area Covered with Salvage Parts*" (Ladd Air Force Base Topography, July 27, 1953, (Appendix A-1 through A-4). Aerial photograph 9-20-1959 clearly shows the location of a fence paralleling the rail road tracks east and northeast of the salvage area.

Deleted: 3.2.5.4. PX Neely Road Gasoline Station, Building 3562 ¶
Information on the PX Gasoline Station, constructed in 1972 and located at the corner of Neely Road and 10th Street, is documented in several reports located in the Fort Wainwright Administrative Record, located in the DPW office building and in the PSE1 provided to the USACE by Harding Lawson and Associates (HLA) in 1992. ¶
A railroad train derailment of two cars occurred in 1975 spilling approximately 100-200 gallons of an unknown type of fuel. This information was provided in interviews with Fire Chief Joseph King and Assistant Fire Chief Joseph Shadley conducted by HLA for the PSE1 of Fort Wainwright. ¶
A removal action and off-site thermal treatment of fuel contaminated soil was initiated upon the release of 1,300 gallons of unleaded gasoline from a punctured underground pipe reported 7 June 1985. ¶
The Corrective Action Plan for the PX Service Station, (E&E 1993) states that soil contamination from the release at the former underground storage tank piping has not migrated in subsurface soil or groundwater beyond the gasoline pump islands. Additionally, it states that surface, subsurface soil, and groundwater contamination detected at the PX Service Station has not impacted off-site human health or the environment. ¶
The post main groundwater supply wells are located near this FCS as shown on the *Postwide Well Survey* Map Plate Number 11. Groundwater data were reviewed to evaluate the likelihood of contamination from the release at the PX Service Station impacting the FCS. This source for contamination was eliminated as a potential concern. ¶

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Aerial photographs document extensive movement of material around the subarea from the late 1940s to the late 1960s. During this period the some Quonset buildings occupy the western edge of the source area, a railroad spur and concrete batch plant appear at the FCS within Subarea A (shown on Figure 5). The buildings on the western border are oblong and in an area of the area that appears to be surrounded by a fence. Automobiles are not parked within this area but what appear to be drums or overpacked drum-like objects are visible inside the fenced yard (shown in Aerial Photograph 1956ax047). It does not appear that this yard was used to store salvage parts. The 1953 Master Plan for Electrical Power and Lighting Facilities (Appendix A) show power poles and electrical cables provide electricity to the buildings in this area. Ten buildings are present in 1954 and one appears to have been removed by 1956 (Aerial Photograph 1956ax047). By 1959 the fenced area is much smaller and surrounds the previous location of eight buildings; all but two buildings have been partially disassembled. At this time the concrete batch plant, railroad spur and most of the debris and buildings in the salvage yard has been removed. A large stained area is evident as shown on Figure 7 where two circular areas indicate the presence of fire training activities. Drums are present near the training area and lower section near the railroad tracks. Figure 7a presents these areas at a magnified view. Utility poles are still present in aerial photographs taken in 1960. List that areas of trench type disposal was conducted over the years in sub area A.

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A portion of this area south of the PX Service Station was used as a snow dump. This area appears to be devoid of vegetation in the 2002 aerial photograph. The CRREL EM61 geophysical survey was performed in this open area and in areas that were hydroaxed as shown on the FWA Housing Project 11/3/03 Figure in Appendix H. During this survey field personnel noted both buried and surface metallic debris. Five soil borings were installed at the time of the survey; four of these borings were located in Subarea A. The borelogs and associated analytical data are provided in Appendix H. Low level concentrations of lead were detected in all soil boring samples collected from this area. Concentrations of lead ranged from 2.15 mg/kg to 7.85 mg/kg, and photoionization detector (PID) results ranged from 0 mg/kg to 13.2 mg/kg. Volatile and semivolatile compounds were not detected in the samples analyzed at the off-site laboratory. Residual range organic compounds (RRO) were detected in the boring located in the southeast corner of the FCS at a concentration of 79.9 mg/kg.

A Chemical Data Foundation Study was conducted in March of 2004 by the USACE and a second geotechnical survey was conducted by R&M in May 2004. Metal items were encountered during the drilling program associated with the Chemical Data Foundation Study performed by the USACE. Additionally, PCBs were detected in a soil boring (AP8960) located in Subarea A during the March 2004 chemical data survey. NWI returned to the previous location of this soil boring in March 2005 and collected samples from four soil borings but did not detect PCBs.

The second geophysical survey was more extensive than the first one performed by CRREL. Prior to the second survey, a 71-acre site was cleared and graded. Trees and brush removed from the site were piled in windrows on the east and south perimeters of the FCS. This survey was conducted using a Geometrics G858G cesium magnetometer/gradiometer and a Geonics EM-31 terrain conductivity meter (R&M 2004). This survey identified the location of several

possible disposal areas and a wide area of scattered debris and metal anomalies.

One area (A1 of the survey) located south of the PX Service Station on the northern perimeter of the FCS was the location of two excavations. The excavations were made during the site preparations when large pieces of metallic debris (car sized) and miscellaneous debris were removed. Photographs of this removal action and a figure showing the location of the anomalies are provided in Appendix I. The photographs capture the blue markings on the training rounds removed from this excavation. Additional confirmation that this was a disposal area for ordnance as well as miscellaneous metal debris was documented in an explosive ordnance incident reports (included in Appendix I).

Additional confirmation that not only metal debris but intact ordnance was buried at the FCS was documented in the Construct Replacement Housing, Fort Wainwright, Statement of Work (SOW), page 5. Section 1.2.4 of the construction SOW states, *"The government has discovered intact ordnance on-site. To date, only training rounds (nonexplosive) have been discovered."*

The field notes and photographs taken during construction activities in 2005 and NWI subcontracted EOD personnel on-site during 2006 field activities confirm munitions constituents and UXO-type materials were buried at the FCS. The *NWI Chronology of Munitions and Explosives of Concern (MEC) Discoveries at Taku Site through July 2006*
letter report documenting type and location of MEC related materials is provided in Appendix I. Photographs of debris are provided in Appendix L. The M47 Series 100 lb chemical bombs found in the subarea were either empty or contained an inert material possibly indicating that the bombs were emptied and decontaminated (using procedures accepted at that time) prior to disposal.

The eastern edge of the oxbow (river meander) that loops through the FCS and defines the edge of salvage activities becomes less visible as early as 1948. By 1964 the meander appears to have been filled in with the exception of the southwest and southern drainage still visible. The geophysical survey results indicate that buried metal debris is present in the area of the previous drainage. Excavations performed during construction and the PSE2 site investigation encountered various types of metal debris indicative of the activities documented from this era. Low-level PCBs were detected across this subarea and only exceed 1 mg/kg in the noise barrier. A brief list of materials and some potential contaminants that were uncovered is provided in the CSM for Subarea A.

Make all CSM formats be similar. Need to discuss what the potential source is vs the types of items found in the individual areas; they should not all be the same, one of the reasons they were broken down into subareas.

3.3.1.1. Conceptual Site Model Subarea A –discuss only Area A

The potential sources of contamination at Subarea A consist of:

The list should include main item: i.e. metal, drums, fire training area- then list some of the items that were found

- Bedsprings, locker doors, utilidors, concrete culverts, wood stave pipe, building debris, metal pipes, metal piping, and Yukon Heater.

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- Metals
- Drums (some from the early 1950s), paint cans, buckets (small drums)
  - Stoddard solvent (chlorinated era)
  - Super tropical bleach
  - Fuel constituents
  - Chlorinated solvents
  - PCBs
  - Ethylene glycol, and
  - Metals
- Munitions storage boxes, munitions transport casings, fuse rocket dummies, test rockets, rockets, casings, flares, chemical bombs, airplane wing tanks and drop tanks, artillery shells, anti-aircraft fragment sleeves, 50 caliber submachine gun shells, and 40 mm rounds
  - 2,4,6-trinitrotoluene (TNT) and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX), and other nitroaromatic/nitramine explosives
  - Perchlorate
  - Chemical agents (mustard or lewisite) and agent breakdown products
  - White Phosphorous, and
  - Metals
- Ballasts and pressure gauges
  - PCBs, and
  - Mercury
- Area where materials were burned such as fire training areas
  - Fuels
  - Chlorinated solvents, and
  - Dioxin/dibenzofurans
- Equipment tracks, vehicle debris, intact fork lift and train car, airplane debris or wreckage, fuel bladder, airplane drop tanks and wing tanks, metal wheel spokes on a rim, radiator, and crank case
  - Magnesium-thorium(Mag/Thor) a metal allow found in airplane and munitions debris
  - Radium or radioactive thorium on luminescent painted dials, clocks and gauges
  - Fuel constituents, and
  - Metal
- Wood debris (vegetation and building) and concrete
- Fragmented power poles, cables, wires, and unidentified metal debris
- Salts and fly ash from snow dump south of the PX Service Station
- POL-contaminated soil from spills, leaks, drums or decontamination processes
- PCB-contaminated soil from transformers or other PCB-containing materials, and
- Propylene glycol release.

3.3.1.2. Release and Transport Mechanisms

Contaminants have been released to soil by spills, leaks and burning.

Contaminants in soil have been transported to other areas and additional media by:

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- Physical soil movement (excavation and accidental and deliberate movement),
- Construction dewatering activities,
- Breakdown resulting from burning and mixture with other chemicals in process,
- Fugitive dust emission,
- Volatilization,
- Biodegradation (breakdown chemicals),
- Surface runoff and overland flow (from spring thawing or flooding), and
- Leaching to groundwater.

3.3.1.3. Impacted Media

Surface and subsurface soil are confirmed impacted. Potentially impacted media are air and groundwater.

3.3.1.4. Uncertainties or Data Gaps

- Numerous MEC items have been found during clearing activities and excavation of building foundations.
- There is a significant amount of unknown material buried on and near the FCS.
- Surface and subsurface soil beneath the sound barrier have not been characterized.
- The soil in the sound barrier has not been fully characterized but limited data indicate PCBs are present at concentrations exceeding the ADEC ARAR of 1 mg/kg.
- Some debris and soils have been excavated, removed from the FCS and placed in the Fort Wainwright landfill, used to backfill excavations on-site (or as fill for building foundations or landscaping), and stockpiled or placed in the large berm surrounding the east and southeast half of the FCS without fully characterizing the contaminants of potential concern.
- Fires or intentional burning mobilized, affected, and modified contaminants at the FCS.
- Unknown materials and substances have been identified but not fully characterized.
- Dewatering activities used by the construction contractor to lower the shallow water table may have moved contaminants.

3.3.1.5. Receptors and Pathways

The most exposed human receptors in the Sub-area A include present and future on-site and adjacent residents, construction workers, housing maintenance workers, and site visitors.

- Buried contamination and debris in subsurface soils may eventually become exposed through frost heaving completing a pathway in the future for physical and chemical residential exposure.
- Currently a chain link fence isolated the entire area from access to residents in adjacent housing areas.
- Residents, including children are currently present in adjacent residences.
- A school/childcare facility is located north and adjacent to the FCS.
- Residential runoff drains into the FCS before it is discharged to the Chena River. Potential flooding may cause runoff from the FCS to back up into the

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adjacent residential areas.

3.3.2. Subarea B –make changes similar to Area A

The main contaminant of concern in this area is diesel range organic compounds (DRO) detected in groundwater and soil exceeding the ADEC Method 2, Migration to Groundwater, Under 40-Inch Zone Criteria (ADEC 2005a). The source of this contamination is likely related to fuel storage associated with the military activities during the 1950s. Fuel-contaminated soil was excavated from this area during construction activities and stockpiled at various locations on-site and behind the PX Service Station. This soil was eventually used as backfill (depending on concentrations) or transported to the long term stockpiles located in the Defense Reutilization and Marketing Office (DRMO) Yard. This soil was tested for fuel parameters and PCBs before it was transferred to the DRMO yard in 2005.

The temporary buildings in this area are part of the same temporary camp as previously discussed in Subsection 3.3.1.

3.3.2.1. Conceptual Model – Subarea B

The potential sources of contamination at Subarea B consist of:

- POL-contaminated soil from spills, leaks, drums or decontamination processes,
- Buried metal debris,
- Buried drums (empty and leaking),
- Temporary camp.

3.3.2.2. Release and Transport Mechanisms

Contaminants have been released to soil by spills and leaks.

Contaminants in soil have been transported to other areas and additional media by:

- Physical soil movement (excavation and accidental and deliberate movement),
- Construction dewatering activities,
- Breakdown resulting from mixture with other chemicals in process,
- Fugitive dust emission,
- Volatilization,
- Biodegradation (breakdown chemicals),
- Surface runoff and overland flow (from spring thawing or flooding), and
- Leaching to groundwater.

3.3.2.3. Impacted Media

Surface and subsurface soil are confirmed impacted by POL-constituents to depth of shallow groundwater (15-20 feet bgs). Potentially impacted media are air and groundwater.

No lakes or streams are present on the FCS. The Chena River is far enough away to not be affected by site contaminants. The North Drainage figure provided as Figure 12 to Appendix A shows the indirect route to the Chena River with the current outfall north of the new hospital location. There may be occasional ephemeral surface water (snow melt, flooding); however, evaluating regular

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exposure to surface soil should be protective of minor exposure to snow melt water.

3.3.2.4. Uncertainties

- There is a significant amount of unknown material buried on and near the FCS.
- The geophysical survey ends at the chain link fence surrounding the School Age Services (SAS) facility and does not cover the areas to the east or west of the facility. The survey indicates debris may extend north of the FCS.
- Metal debris on the surface and in subsurface where the construction contractor excavated soil to install utilities or building foundations was removed. However, debris in sidewall of excavations was not removed. The geophysical survey may have lost its value to identify location of buried debris when surface and subsurface areas were disturbed.
- The large soil mound in this area was removed and most likely used in construction of the soil berm surrounding the east and southeast boundary of the FCS.
- Site contaminants have been excavated, removed from the FCS and placed in a Fort Wainwright landfill, used to backfill excavations on-site (or as fill for building foundations or landscaping), and stockpiled or placed in the large berm surrounding the east and southeast half of the FCS without full characterization of the contaminants of potential concern.
- Unknown materials and substances have been identified but not fully characterized.
-
- Dewatering activities used by the construction contractor to lower the shallow water table may have moved contamination.

3.3.2.5. Receptors

The most exposed human receptors in the FCS area include present and future on-site and adjacent residents, school age children while staying at the SAS facility, construction workers, housing maintenance workers, and site visitors.

Important considerations:

- Buried contamination and debris in subsurface soils may eventually become exposed through frost heaving completing a pathway in the future for physical and chemical residential exposure.
- Currently a chain link fence isolates the entire area from access to residents in adjacent housing areas.
- Residents, including children are currently present in adjacent residences.
- A school/childcare facility is located north and adjacent to the FCS.
- Residential runoff drains into the FCS before it is discharged to the Chena River. Potential flooding may cause runoff from the site to back up into the residential area.

3.3.3. Subarea C

This area extends north to the edge of Neely Road and east to the SAS facility perimeter fence. The buildings in this area appear to have supported the temporary camp. Construction workers noted a sour milk odor during excavation near Building 3 and some of the workers became ill (as noted in the construction field notes). Buried metal debris was identified north and east of Building 1 and under the footprint of Building 3. The metal debris was most likely removed by

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construction activities that required the excavation of soils in this area for building foundation development, drainage installation, and utility installation. Utility plans for the Family Housing Project are provided on a CDROM provided in Appendix E. A low level (less than 1 mg/kg) result for Aroclor 1260 was reported from a sample collected north of Building 1.

3.3.3.1. Conceptual Model – Subarea B

The potential sources of contamination at Subarea C consist of:

- POL-contaminated soil from spills, leaks, and drums from garrison activities,
- PCB-contaminated soil from transformers (identified in aerial photograph of the FCS taken in 1959 Figure 7) or other PCB-containing materials,
- Unidentified buried chemicals, and
- Buried metal debris, including housing material, vehicles, munitions and steel and aluminum containers or drums.

3.3.3.2. Release and Transport Mechanisms

Contaminants have been released to soil by spills, leaks and burning.

Contaminants in soil have been transported to other areas and additional media by:

- Physical soil movement (excavation and accidental and deliberate movement),
- Construction dewatering activities and discharge through area,
- Breakdown resulting from mixture with other chemicals,
- Fugitive dust emission,
- Volatilization,
- Biodegradation (breakdown chemicals),
- Surface runoff and overland flow (from spring thawing or flooding), and
- Leaching to groundwater.

3.3.3.3. Impacted Media

Surface and subsurface soil are confirmed. Potentially impacted media are air, surface water (during dewatering activities) and groundwater.

No lakes or streams are present on the FCS; however, a drainage ditch runs through this area between the SAS facility and the Fire Station. The Chena River is far enough away to not be affected by site contaminants. The North Drainage figure provided as Figure 12 to Appendix A shows the indirect route to the Chena River with the current outfall north of the new hospital location. There may be occasional ephemeral surface water (snow melt, flooding); however, evaluating regular exposure to surface soil should be protective of minor exposure to snow melt water.

3.3.3.4. Important Considerations:

- The chain link fence currently surrounding the FCS area is temporary and will be removed when construction is complete.
- The SAS facility, formerly the Tanana Grade School, has been located adjacent to the site since 1964 and a permanent housing area has been located west of the FCS since 1959.
- The fence surrounding the SAS facility playground is a permanent fence.
- PCBs are known to breakdown in the presence of sunlight; therefore,

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finding PCBs on ground surface soil or other surfaces at the FCS is not expected unless contamination was recent (reference documents California Water Institute Report TP 02-06, Organochlorine Pesticide, PCB and Dioxin/Furan Excessive Bioaccumulation Management Guidance and INCHEM Document 55, Polychlorinated Biphenyls: Human Health Aspects on a CD-ROM provided in Appendix E).

- Other chlorinated contaminants associated with the PCBs such as those detected in the original Building 52 location are toxic at levels below those established for PCBs (chemicals include but are not limited to: dioxin/dibenzofurans, trichlorobenzenes, dichlorobenzenes, and trichlorophenols).
- There is some material buried on and near the FCS. A large area north and northwest of Buildings 1 through 4 was not included in the geophysical surveys. Some debris was encountered during excavation in this area during 2005 activities.
- Four large thick walled aluminum cylinders (see photograph 062405-283.5, taken near B-2 provided in Appendix L) were excavated and have been identified as chemical drop tanks.
- Site contaminants have been excavated, removed from the FCS and placed in a Fort Wainwright landfill, used to backfill excavations on-site (or as fill for building foundations or landscaping), and stockpiled or placed in the large berm surrounding the east and southeast half of the FCS without full characterization of the contaminants of potential concern.
- Unknown materials and substances may have been identified but not fully characterized.
- Unidentified odors noted by construction subcontractors indicate volatile contaminants were present and were released to the atmosphere during construction activities. Field personnel may have been exposed to unknown contaminants that could not be identified or detected by field screening (PID) or analytical procedures used to test for contaminants limited to fuel constituents. Future maintenance personnel may be exposed to unidentified chemicals should intrusive subsurface repairs be required in the future.
- Dewatering activities used by the construction contractor to lower the shallow water table may have moved contamination. Discharge of the water flooded this area in April 2005.
- Toxic breakdown products of known contaminants may present additional risk.
- The drinking water source for FCS is upgradient of contaminated areas of the FCS. It is unknown whether site contaminants have impacted downgradient groundwater or groundwater in deeper aquifer (>20 feet) downgradient of the source area.

3.3.3.5. Receptors

The most exposed human receptors in the FCS area include present and future on-site and adjacent residents, construction workers, housing maintenance workers, and site visitors.

Important considerations:

- Buried contamination and debris in subsurface soils may eventually become exposed through frost heaving completing a pathway in the future for physical and chemical residential exposure.

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- Residents, including children are currently present in adjacent residences.
- Playgrounds are present near the FCS.
- A school/childcare facility is located north and adjacent to the FCS.
- Residential runoff drains into the FCS before it is discharged to the Chena River. Potential flooding may cause runoff from the FCS to back up into the residential area.

3.3.4. Subarea D there is more detail in this area than the others where we know information.

Military activity in this area begins in the 1940s as shown on the 1947 aerial photograph where the salvage yard extends into and south of this subarea. Information available for this area is provided in aerial photographs, 1958 Master Plans, and a 1953 topographical survey. The 1958 Master Plan for the Central Heating System shows the presence of a water line passing through this area to the Heating Plant located east of the FCS, an existing fence, a proposed fence and two semi-permanent structures. The 1953 topographical survey shows the location of two ammunition storage areas and one live ammunition storage area (Appendix A); very little conclusive information is available on past activities. Figure A-1 presents an overlay of the topographical survey depicting the three ammunition storage locations on the 1948ax020 historical aerial photograph.

During the 1940s (reference Aerial Photograph 1948ax020) a second meander extended southeast from the Hoppe Slough oxbow and loops northwest. A road leads from the southern edge of the salvage yard to this meander. Long rectangular structures are also present south of the salvage yard in this area. It appears that this drainage began to be filled during the early 1940 period. These appear to be trailers or covered storage shelters similar to those used in the DRMO Yard. A storage structure and unidentifiable objects are visible in this aerial photograph near the southern edge of the second meander. This appears to be in the general location of the open field west of the GVEA Substation and between the southern edge of the noise barrier and Alder Avenue.

A road that appears to connect the square structures in the southeast corner to the garden plots is visible in the 1950s. The large area devoid of vegetation from the early 1950s until the late 1960s is also the area where the GVEA Substation was built in 1978. Additionally, the noise barrier covers a portion of this area.

3.3.4.1. Conceptual Site Model – Subarea D

The potential sources of contamination at Subarea D consist of:

- Munitions storage areas as depicted on 1953 topography drawing created by USACE and updated in 1956, how can these be shown on a map after they were removed?
Is this the same area?Power poles (potentially with transformers) on east perimeter of the FCS as shown in the Electrical Power and Lighting Facilities, Ladd Air Force Base 1958, Master Plan, G-8 (EPLF G-8).
- Unknown activities at two temporary structures on east perimeter and south east corner of the FCS as depicted in EPLF G-8.
- Apparent salvage activities extending into and south of this area as observed on aerial photographs from 1948ax020, Figure 3, and
- Ground scars from unknown activities in this subarea appear in historical aerial photographs from 1948 until the GVEA substation was constructed in 1978

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over the area.

3.3.4.2. Release and Transport Mechanisms

Contaminants have been released to soil by spills, leaks and brush fires.

Contaminants in soil have been transported to other areas and additional media by:

- Physical soil movement (excavation and accidental and deliberate movement),
- Breakdown resulting from mixture with other chemicals or brush fires;
- Fugitive dust emission,
- Volatilization,
- Biodegradation (breakdown chemicals),
- Surface runoff and overland flow (from spring thawing or flooding), and
- Leaching to groundwater.

3.3.4.3. Impacted Media

Surface and subsurface soil impact has not been fully determined. Additionally, air, and groundwater are potentially impacted media.

No lakes or streams are present on the FCS. The Chena River is far enough away to not be affected by site contaminants. The South Drainage figure provided as Figure 13 to Appendix A shows the western perimeter drainage for the FCS that sometimes drains south of the FCS and eventually drains to the Chena River with the current outfall north of the new hospital location. Surface and groundwater appears to drain west to northwest. There may be occasional ephemeral surface water (snow melt, flooding); however, evaluating regular exposure to surface soil should be protective of minor exposure to snow melt water.

3.3.4.4. Important Considerations

- The chain link fence currently surrounding the FCS area is temporary and will be removed when construction is complete.
- PCBs at concentrations greater than the ADEC action limit of 1 mg/kg were detected in the soil berm on the east and south perimeter of the FCS. This soil was placed in this berm in 2005. Site controls do not include controlling dust or run-off from the stockpiled soil.
- PCBs are known to breakdown in the presence of sunlight; therefore, finding PCBs on ground surface soil or other surfaces at the FCS is not expected unless contamination was recent (reference documents California Water Institute Report TP 02-06, Organochlorinated Pesticides, PCB and Dioxin/Furan Excessive Bioaccumulation Management Guidance and INCHEM Document 55, Polychlorinated Biphenyls: Human Health Aspects on a CD-ROM provided in Appendix E).
- Other chlorinated contaminants associated with the PCBs such as those detected in The original location of Building 52 are toxic at levels below those established for PCBs (chemicals include but are not limited to: dioxin/dibenzofurans, trichlorobenzenes, dichlorobenzenes, and trichlorophenols).
- There is some material buried on and near the FCS. During 2005 field activities, North Wind identified and photographed an olive green shipping

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cylinder in a stockpile near this area. The photograph is provided in Appendix L.

- This area has not been fully characterized; but appears to have been used as a salvage storage area (as visible in the 1947 and 1948 aerial photographs Figures 3 and 4).
- Concrete reinforced structures present in the aerial photographs from 1954 to 1959 are similar to those used to store live munitions.
- The 1953 survey of Ladd Army Airfield Figures A-1 through A-4 shows the location of live ammo storage. This survey also shows the location of two areas designated Munition Storage with contours indicated the area may have been elevated above ground surface (topographic figures are provided on a CD-ROM provided in Appendix E).
- Records from 2005 field activities indicate that soil excavated from the exclusion zone (Subarea E) was mixed with clean fill material, stockpiled near Building 60 and used to fill the building excavations in Subarea D. PCBs were detected at a concentration of 0.161 mg/kg in sample 05FTW-TGSP-A60-N4.
- SO collected from the stockpiled soil (soil was allegedly removed from Subarea E). PCBs were not detected in limited surface samples collected from the gravel mixture used to construct building footprints in this area. However, the PCB concentration in the subsurface sample 05FTW-TGBHA62N2-24-48-SO was 0.5 mg/kg.
- Site contaminants have been excavated, removed from the FCS and placed in a Fort Wainwright landfill, used to backfill excavations on-site (or as fill for building foundations or landscaping), and stockpiled or placed in the large berm surrounding the east and southeast half of the FCS without full characterization of the contaminants of potential concern.
- Toxic breakdown products of known contaminants may present additional risk.

3.3.4.5. Receptors

The most exposed human receptors in the FCS area include present and future on-site and adjacent residents, construction workers, housing maintenance workers, and site visitors.

Important considerations:

- Buried contamination and debris in subsurface soils may eventually become exposed through frost heaving completing a pathway in the future for physical and chemical residential exposure.
- Residents, including children are currently present in adjacent residences.
- Explosive residues will migrate to groundwater.

3.3.5. Subarea E

This area includes the current "Exclusion Zone". Communication and radar systems were previously located in Subarea E. The 1958 Electrical Power and Lighting Facilities Master Plan provide the location of power poles, voltage and amperage, and size and number of wires extending to each pole. Aerial photographs confirm the location of these power poles. It can be assumed that a transformer would be required to step down the voltage to a usable level. The FCS characterization/investigation began in this subarea when PCBs were detected in the excavation footprint of the original Building 52 location. This

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subarea and the sound barrier are the only two locations where PCB concentrations exceeded the ADEC criteria of 1 mg/kg for PCBs in soil.

Activity in this area began about the same time as the activity in the area where the seven structures were constructed in Subarea D. Small structures are barely visible in aerial photographs (1957ax133 and 1957oc003) for Subarea E. PCB results were reported from this area at concentrations greater than any other area of the FCS. The power poles in this area may be directly related to the high concentration of PCBs in The original location of Building 52. A guy wire and piece of a wooden power pole were found in the original Building 52 excavation. The Fort Wainwright Environmental staff conducted an interview with the Fire Captain Scott Hunt to discuss potential locations of brush fires and transformers at the FCS. The figure provided with Memorandum for the Record, IMPA-FWA-PWE shows the alleged location of a transformer and two 55-gallon drums of oil in the Subarea E and location of drums in other subareas.

3.3.5.1. Conceptual Site Model – Subarea E

The potential sources of contamination at Subarea E consist of:

- PCB-contaminated soil from storage of transformers,
- Buried chemical waste and debris,
- Decommissioning activities or leaking transformers; power poles, and
- Activities involving storage of ammunition and potential leaks or spills.

3.3.5.2. Release and Transport Mechanisms

Contaminants have been released to soil by spills, leaks and brush fires.

Contaminants in soil have been transported to other areas and additional media by:

- Physical soil movement (excavation and accidental and deliberate movement),
- Breakdown resulting from mixture with other chemicals and fires,
- Fugitive dust emission,
- Volatilization,
- Biodegradation (breakdown chemicals),
- Surface runoff and overland flow (from spring thawing or flooding), and
- Leaching to groundwater.

3.3.5.3. Impacted Media

Surface and subsurface soil are confirmed impacted to depth of shallow groundwater (15-20 feet bgs). Potentially impacted media are air, surface water (during dewatering activities) and groundwater.

No lakes or streams are present on the FCS; however, a drainage ditch runs through this subarea between the SAS facility and the Fire Station. The Chena River is far enough away to not be affected by FCS contaminants. The South Drainage figure provided as Figure 13 to Appendix A shows the western perimeter drainage for the FCS that sometimes drains south and eventually drains into the Chena River with the current outfall north of the new hospital location. Surface and groundwater appears to drain west to northwest. There may be occasional ephemeral surface water (snow melt, flooding); however, evaluating regular exposure to surface soil should be protective of minor

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exposure to snow melt water.

3.3.5.4. Important Considerations

- PCBs are known to breakdown in the presence of sunlight; therefore, finding PCBs on ground surface soil or other surfaces at the subarea is not expected unless contamination was recent (reference documents California Water Institute Report TP 02-06, Organochlorinated Pesticide, PCB and Dioxin/Furan Excessive Bioaccumulation Management Guidance and INCHEM Document 55, Polychlorinated Biphenyls: Human Health Aspects on a CD-ROM provided in Appendix E).
- The chain link fence currently surrounding the FCS area is temporary and will be removed when construction is complete.
- Occupied housing is within 200 feet of the PCB contaminated area.
- Other chlorinated contaminants associated with the PCBs such as those detected in The original location of Building 52 are toxic at levels below those established for PCBs (chemicals include but are not limited to: dioxin/dibenzofurans, trichlorobenzenes, dichlorobenzenes, and trichlorophenols).
- There is some material buried on and near the FCS. During 2005 field activities some debris was photographed but not fully identified. Some of these photographs are provided in Appendix L and the construction photographs are provided on a CD-ROM provided in Appendix E.
- The activities in this area that directly caused impact to the subarea were short term (1954-1959) and the structures and utilities were temporary. Activity in this area appears to be linked to the concrete structures located in Subarea D and salvage activities at the FCS.
- The area used as a laydown yard by Construction Contractor was also used as a snow dump. Surface contaminants found here could have been brought into the FCS with the snow removed from areas across Fort Wainwright (i.e. coal ash used on roads or salts used for deicing).
- The 1953 survey of Ladd Army Air Field (Figures A-1 through A-4) shows the location of "Live Ammo Storage" and two areas designated "Munition Storage" with contours indicating the area was elevated above ground surface (See topographical drawings A-1 through A-7 in Appendix A and on a CD-ROM provided in Appendix E).
- Site contaminants have been excavated, removed from the FCS and placed in a Fort Wainwright landfill, used to backfill excavations on-site (or as fill for building foundations or landscaping), and stockpiled or placed in the large berm surrounding the east and southeast half of the FCS without full characterization of the contaminants of potential concern.

3.3.5.5. Receptors

The most exposed human receptors in the FCS area include present and future on-site and adjacent residents, construction workers, housing maintenance workers, and site visitors.

Important considerations:

- Buried contamination and debris in subsurface soils may eventually become exposed through frost heaving completing a pathway in the future for physical and chemical residential exposure.
- Chlorinated contaminants are persistent in subsurface soil and

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groundwater.

- Residents, including children are currently present in adjacent residences.

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Event Date		
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1898		
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Homestead Act		
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Alaska		
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1906-1914		
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Otto Hoppe Homestead		
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Area South of Chena		
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1914-1918		
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WWI		
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Europe		
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1938		
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Ladd Army Airfield established (LAAF) operated by Department of Defense (DoD)		
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1939		
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WWII begins		
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World Wide		
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1939		
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Construction began		
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LAAF		
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1940		
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1st Air Corp assigned to Alaska		
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Fairbanks		

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1942		
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The first Chemical Warfare Units activated in Alaska		
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Alaska		
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1942-1945		
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U.S.-Soviet Lend Lease Program		
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LAAF		
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1943		
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Air Depot Housing construction project authorized		
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1945		
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WWII ends		
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Post WWII		
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Congress enacted the Salvage Facilities Act, P.L. 80513, 10 U.S.C. §§ 7361-7367" established policy for salvage and reclamation of excess materials.		
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1947		
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LAAF transferred to U.S. AF and renamed Ladd Air Force Base (LAFB)		
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Fort Wainwright		
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1950-1953		
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Korean War		
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Korea		
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1950s		
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Large-scale winter exercises		
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LAFB		

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1958

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Master Plans developed for LAFB; plans show location of electrical facilities, heating systems, and physical structures (existing and planned).

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LAFB

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1950-1980

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Arctic Surplus Salvage yard owner purchases excess military material from Fort Wainwright

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Arctic Surplus

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1959-1975

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Vietnam War

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South Vietnam

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1961

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LAFB transferred to U.S. Army and renamed Fort Wainwright

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Fort Wainwright

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1961

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Defense Reutilization and Marketing Office (DRMO) Yard converted to a salvage yard

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1989

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Propose addition to Comprehensive Environmental Response, Priorities, and Liability Act (CERCLA) National Priorities List (NPL)

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Fort Wainwright

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1990

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Fort Wainwright added to CERCLA NPL

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Fort Wainwright

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Feb. 1992

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Records Search PSE performed by Harding Lawson and Associates (HLA)

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Fort Wainwright (includes Post Exchange [PX] Service Station)		
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2002		
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Arctic Surplus removal action discovers unexploded ordnance (UXO) and low-level radioactive waste in addition to PCBs and other hazardous chemicals		
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Arctic Surplus		
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No lakes or streams are present on the FCS. The Chena River is far enough away to not be affected by FCS contaminants that drain into the river. The North Drainage figure provided as Figure 12 to Appendix A shows the indirect route to the Chena River with the current outfall north of the new hospital location. There may be occasional ephemeral surface water (snow melt, flooding); however, evaluating regular exposure to surface soil should be protective of minor exposure to snow melt water.

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This soil has not been covered or contained and provides a potential airborne pathway.

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Unidentified odors noted by construction subcontractors indicate volatile contaminants were present and were released to the atmosphere during construction activities. Field personnel may have been exposed to unknown contaminants that could not be identified or detected by field screening or analytical procedures used to test for fuel constituents.

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Toxic breakdown products of known contaminants may present additional risk.
The drinking water source for FCS is upgradient of contaminated areas of the FCS. It is unknown whether site contaminants have impacted downgradient groundwater or groundwater in deeper aquifer (>20 feet).

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PCBs are known to breakdown in the presence of sunlight; therefore, finding PCBs on ground surface soil or other surfaces at the FCS is not expected unless contamination was recent (reference documents California Water Institute Report TP 02-06,

Organochlorinated Pesticides, PCB and Dioxin/Furan Excessive Bioaccumulation Management Guidance and INCHEM Document 55, Polychlorinated Biphenyls: Human Health Aspects on a CD-ROM provided in Appendix E).
Other chlorinated contaminants associated with the PCBs such as those detected in the original location of Building 52 are toxic at levels below those established for PCBs (chemicals include but are not limited to:

dioxin/dibenzofurans, trichlorobenzenes, dichlorobenzenes, and trichlorophenols).

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PCBs are known to breakdown in the presence of sunlight; therefore, finding PCBs on ground surface soil or other surfaces at the FCS is not expected unless contamination was recent (reference documents California Water Institute Report TP 02-06, Organochlorinated Pesticides, PCB and Dioxin/Furan Excessive Bioaccumulation Management Guidance and INCHEM Document 55, Polychlorinated Biphenyls: Human Health Aspects on a CD-ROM provided in Appendix E).

Other chlorinated contaminants associated with the PCBs such as those detected in the original location of Building 52 are toxic at levels below those established for PCBs (chemicals include but are not limited to: dioxin/dibenzofurans, trichlorobenzenes, dichlorobenzenes, and trichlorophenols).

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Unidentified odors noted by construction subcontractors indicate volatile contaminants were present and were released to the atmosphere during construction activities. Field personnel may have been exposed to contaminants that could not be identified or detected by field screening or analytical procedures used to test for contaminants limited to fuel constituents. (Field notes indicate personnel smelled a sweet odor.) Future maintenance personnel may be exposed to unidentified chemicals should intrusive subsurface repairs be required in the future.

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Toxic breakdown products of known contaminants may present additional risk.
The drinking water source for FCS is upgradient of contaminated areas of the FCS. It is unknown whether site contaminants have impacted downgradient groundwater or groundwater in deeper aquifer (>20 feet) used for drinking water.
Even though 18 soil borings were advanced to groundwater and three temporary monitoring wells (approximately 15 feet bgs) were installed and sampled; contamination at the depth of the drinking water supply aquifer (80182 feet bgs) downgradient of the source area has not been evaluated.

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This is a temporary fence that will be removed when the construction activities are complete.

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There are playgrounds present on and near the FCS.

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REVIEW COMMENTS

PROJECT: Former Communications Site (Taku Gardens)
DOCUMENT: PSE 1
LOCATION: Fort Wainwright, Alaska

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-EE	DATE: 12/20/06 REVIEWER: Julie Sharp-Dahl PHONE: 753-5689	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
General	1	Document layout very good and text easy to follow. Some of the referenced items were missing, or the references to items were not clear enough to easily locate the items in Appendices or on CD. Per discussions at FFA meeting 8 Nov. 2006, please modify the reference to the 100# chemical bombs to something else- such as "M47 series" or other benign yet accurate name. The term UXO could also be altered to a more benign yet accurate term (MC?) – the use of "UXO technicians" is appropriate since that is the proper terminology for these folks.	Thanks. The Interim Final will be a complete document (not add in material as previous modifications were distributed) Bomb call out and UXO references have been changed. Use of terms such as M47 series 100# bomb and MEC		
Sec. 1.0, p. 1-2, 2nd to last paragraph	2	Reference a table in App. B which is not provided in App. B. please provide table.	Table was included in first draft, no changes were made; therefore table was not resubmitted in an effort to reduce cost.		
Sec. 2.0, last sentence last paragraph	3	Conceptual site models are provided in App. F, not App. G as stated in the text. Revise.	Change will be made.		
Sec. 3.2.2, 1st paragraph	4	Unable to locate the Figure 2 referenced in this paragraph.	Complete set of figures will be submitted with Interim Final.		
Sec. 3.2.3, 1st paragraph	5	The figure in App. C that provides the location of the wells is missing MW 9. Please include MW 9 on this figure.	This change was made.		
Sec. 3.2.3, 3rd paragraph	6	No "plate 11" in App. A; App. A is missing figures: A-8 through A-13. Please include all figures.	Complete set of figures will be submitted with Interim Final.		
Sec. 3.2.4	7	Paragraph states the EA is included on the CD, App. E. however this document was not included on my CD. Please include.	Complete set of document swill be submitted on a single disk with Interim Final.		
Sec. 3.2.5.1	8	Section titled Geotechnical Data and references the USACE goetech reports, but does not reference the chemical data reports- two sections later (3.2.5.3) discusses the analytical results of the geotech reports- but the analytical data is not in the geotech reports, rather it is in the chemical data reports. Please clarify this section and make sure to reference the chemical data reports, not the geotech reports, when discussing analytical data.	The text will be changed to clarify that two separate reports were written.		

REVIEW COMMENTS

PROJECT: Former Communications Site (Taku Gardens)
DOCUMENT: PSE 1
LOCATION: Fort Wainwright, Alaska

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-EE	DATE: 12/20/06 REVIEWER: Julie Sharp-Dahl PHONE: 753-5689	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
Sec. 3.2.5.3, 2nd paragraph, p. 3-9	9	FTW DPW did not perform a debris removal in April 2005 behind the PX station; the DPW removed debris in 2004 only. The EOD report from April 2005 was the result of WCC encountering shell casings at the building 24 area.	This reference will be corrected.		

REVIEW COMMENTS

PROJECT: Former Communications Site (Taku Gardens)
DOCUMENT: PSE 1
LOCATION: Fort Wainwright, Alaska

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-EE	DATE: 12/20/06 REVIEWER: Julie Sharp-Dahl PHONE: 753-5689	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
pp. 3-10 & 3-11	10	Switch the last paragraph of p. 3-10 with the first paragraph of p. 3-11in order to let the story unfold along the timeline; present organization talks about WCC's sub (S&W) collecting samples for PCB analysis for NWI (which is an Oct 2005 event) prior to the paragraph discussing the Aug evacuation of the site for PCB site-wide sampling (which was a Aug/Sept 2005 event). Also, the Work Plan addendum was not present in my App. B, nor is it on the CD.	Change will be made. Two CDs have been submitted with past changes to the report making locating the documents confusing. All files will be provided on a singe disk with the interim final document.		
p.3-11, 3rd paragraph middle	11	After reference (USACE 2004g): "This investigation an area where the construction contractor…" Missing a word between' investigation' and 'an'. Fix.	Change will be made		
Sec. 3.3.1, 1st paragraph	12	The 1953 topo survey is not in App. A, nor is it on the CD. Include it.	Two CDs have been submitted with past changes to the report making locating the documents confusing. All files will be provided on a singe disk with the interim final document.		
p.3-13	13	Aerial photo 9-20-1959- where is this located? Aerial photo 1956ax047- where located? Figure 7- where located? Figure 7a- where located? (Are the figure 7's suppose to be A-7s?) This is a good section-just need to make very clear exactly where each discussion item is located. I had trouble finding some of the referenced items.	Two CDs have been submitted with past changes to the report making locating the documents confusing. All files will be provided on a singe disk with the interim final document. Text will clearly identify location of figures.		
Sec.3.3.1, p. 3-14, top of page	14	Mid to bottom portion of first paragraph discusses the disposal area and incorrectly references App. I. The reference should be to App. G; App. I contains NWIs 2006 MEC chronology.	Change will be made		
Sec. 3.3.3, 1st paragraph	15	Sour milk odor was not at B3; B3 did have stinky odor, but not identified as sour milk in any of the field notes associated with the time period of the sick-feeling workers (7-15-05). The sour milk odor was noted south of B12.	Change will be made		
Sec. 3.3.4	16	Please provide more information on where all of these referenced documents are provided, so that the reader can view the photos/plans/figures while reading the text. Same for section 3.3.5.	Two CDs have been submitted with past changes to the report making locating the documents confusing. All files will be provided on a singe disk with the interim final document. Text will clearly identify location of figures.		

REVIEW COMMENTS

PROJECT: Former Communications Site (Taku Gardens)
DOCUMENT: PSE 1
LOCATION: Fort Wainwright, Alaska

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-EE	DATE: 12/20/06 REVIEWER: Julie Sharp-Dahl PHONE: 753-5689	Action taken on comment by:_____

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General	17	Make sure ***all*** items referenced in the text are provided either in the Appendices or on the final CD. There were items missing in this submission.	Two CDs have been submitted with past changes to the report making locating the documents confusing. All files will be provided on a singe disk with the interim final document. Text will clearly identify location of figures.		
end					