Final

Addendum 4 to the Remedial Investigation Work Plan

Groundwater Investigation

FWA 102 Former Communications Site
Fort Wainwright, Alaska

Prepared for

Department of the Army
U.S. Army Corps of Engineers,
Alaska District

P.O. Box 6898
Elmendorf AFB, Alaska 99506-6898

Contract No. W911KB-05-D-0010
Task Order 0009

18 September 2007

CH2MHILL
301 W. Northern Lights Boulevard, Suite 601
Anchorage, AK 99503

ADDENDUM 4

Groundwater Investigation

Purpose

This document serves as an addendum to the May 2007 *Remedial Investigation/Feasibility Study Management Plan FWA 102 Former Communications Site Fort Wainwright Alaska* (remedial investigation [RI] Management Plan). This addendum addresses the characterization of soil and groundwater at the Former Communication Site (FCS) for source identification and to support the baseline risk assessment. The groundwater investigation includes characterization of soils because soil samples will be collected during installation of the monitoring wells. Proposed monitoring well locations and analytical methods for groundwater and soil are presented in this addendum.

The U.S. Army, U.S. Environmental Protection Agency (EPA), and Alaska Department of Environmental Conservation (ADEC) have agreed to conduct the RI/feasibility study (FS) for the FCS using the Triad approach. The RI Management Plan addresses this approach and overall site management and includes the Quality Assurance Project Plan (QAPP) and Field Sampling Plan (FSP). This document is one of many addenda that provide detailed information about specific tasks of the RI/FS. This approach was determined to be the most effective, efficient, and appropriate method for investigating this site.

Area of Investigation

The FCS site has been divided into two primary areas that affect how the fieldwork for the RI is conducted: the Low Probability of Encountering Munitions and Explosives of Concern (MEC) Area and the Moderate to High Probability of Encountering MEC Area. Figure 4-1 depicts the location of these two areas. This addendum covers collection of groundwater samples in areas within the Low Probability MEC Area only. This addendum does not address plans for collection of groundwater samples within the Moderate-to-High MEC area. Additional wells will be installed in the Moderate-to-High MEC area upon completion of test pit activities that will clear the areas where wells will be installed. Plans for collection of groundwater samples within the Moderate-to-High MEC area will be included in the Interim Draft RI Management Plan.

Delineation of the Low and Moderate-to-High probability MEC areas, as shown on Figure 4-1, was accomplished by overlaying 2003, 2004, and 2007 geophysical data with 1949, 1956, 1982, and 2005 aerial photographs and digitizing polygons around areas that either had geophysical anomalies or surface debris. Historical photographs were used to identify areas where MEC disposal was most likely to have occurred. All of MEC uncovered to date has been within these areas. The boundary lines were conservatively expanded to the north of the tree line area and adjusted to the west to easily distinguish housing units in each area. The geophysical data shown on Figure 4-2 is from 2004, prior to construction of the housing. The 2004 data does not include anomalies generated during new construction. Figure 4-3 shows the geophysical data from 2007.

Previous Sampling Results

During the Preliminary Source Evaluation (PSE) II Investigation (Northwind, 2006), groundwater was sampled in 13 monitoring wells and analyzed for a wide range of organic and inorganic compounds. Ten of the wells sampled in 2006 were installed in 2006 and sampled only once, while three of the wells sampled in 2006 were installed during the 2005 field season and sampled in both the spring and fall of 2006. The three wells which were installed in 2005 and sampled twice in 2006 are located near the Building 52 polychlorinated biphenyl (PCB) hot spot.

Subsurface soil was sampled in 2005 and 2006 for polychlorinated biphenyls (PCBs), pesticides, metals, gasoline-range organic (GRO), diesel-range organic (DRO)/residual-range organic (RRO), volatile organic compound (VOC), semi-volatile organic compound (SVOC), and explosives. Petroleum, oil, and lubricant (POL)-contamination was identified in the northwest portion of the FCS site (Figure 4-2). Chlorinated solvents, pesticides, and explosives were also detected at the site. The coverage of previous subsurface soil and groundwater is not adequate to delineate the nature and extent of contamination for the RI. This addendum addresses collection of additional data required for source identification and for the baseline risk assessment.

Data Quality Objectives (DQOs)

A DQO process was used to determine the accuracy and quality specification that the collected data must meet to fill existing data gaps for the RI/FS. The objective of the groundwater sampling is to determine whether constituents present in site groundwater could migrate offsite at concentrations that pose a potential for unacceptable risks to base drinking supply wells, or impact offsite surface water, or cause an offsite vapor intrusion concern. The objective for soil sampling is to determine whether future site residents or excavation workers may be exposed to chemical concentrations in soil that pose a potential for unacceptable risk by direct contact.

Screening values used to assess which compounds are carried forward into the risk assessment are EPA Region 6 Risk Based Tables or 1/10th of the most conservative Alaska Department of Environmental Conservation (ADEC) soil and groundwater cleanup levels found in Title 18 Chapter 75 of the *Alaska Administrative Code* (AAC) (Tables B1, B2, and C) or in ADEC Technical Memorandum 01-007, (*Additional Cleanup Levels*.) Analytical methods have been selected with reporting limits low enough to meet these risk-based screening levels (see QAPP Section 5 Tables).

This investigation will generate soil and groundwater chemical results and water level data. Chemical data obtained from this investigation will be used with the results obtained from soil borings and soil gas investigations to determine the nature and extent of contamination on the FCS site. If constituents are detected in the soil and or groundwater at concentrations exceeding risk screening criteria these conditions will be evaluated in the baseline risk assessment and will be addressed in the Feasibility Study for the site as necessary. Groundwater quality parameters, including dissolved oxygen will be recorded for possible use in the Feasibility Study.

Groundwater Monitoring Well Locations

Figure 4-1 depicts the boundary of the "Low Probability of Encountering MEC Area" and the "Moderate to High Probability of Encountering MEC Area". The sampling locations covered in this addendum are restricted to the Low-Probability MEC Area. Additional wells will be installed in the "Moderate the High Probability of Encountering MEC Area" upon completion of test pit activities that will clear the areas where the wells will be installed. Plans for installation of wells within the Moderate-to-High MEC area will be included in the Interim Draft RI Management Plan.

Figure 4-2 shows the proposed location of 27 temporary monitoring wells in the Low Probability MEC Area. The proposed location of the 2 deep well locations are included on this figure, but since these wells are located in the Moderate to High MEC Area, the installation of these wells is not included in this addendum. Overall sample location rationale is as follows:

1. Site-wide coverage with approximately one monitoring every 0.75 acre
2. Additional monitoring wells in areas of known contamination (northwest portion of FCS) to delineate extent of contamination.
3. Monitoring wells located in former slough channel to identify potential preferential pathways.
4. Additional monitoring wells north of the FCS in the vicinity of the School Age Services (SAS) Facility.

Table 4-1 describes the number of proposed wells, and analyte groups by sub area. Sub areas are defined in the PSE 1 report (Oasis, 2007).

Well drilling, construction and development and soil and groundwater sampling procedures are provided in the *Field Sampling Plan* appendix of the *Draft RI Management Plan* (CH2M HILL, 2007). Installation of wells within the PCB exclusion zone will be scheduled to follow the PCB removal action.

Geophysical Anomaly and Utility Avoidance

Groundwater monitoring well locations will be selected to avoid geophysical anomalies and existing utilities. Careful review of as-built drawings, discussions with the construction contractor, and observations of utilities at the exposed slabs within the exclusion zone will be conducted to reduce the chances for affecting buried utilities during drilling.

GPS coordinates for monitoring well locations, shown on Figure 4-2, will be used to mark well locations in the field. Additional anomaly avoidance and location clearance with a magnetometer and current induction methods will be used if applicable. Personnel will follow *Health and Safety Plan* appendix of *Draft RI Management Plan* (CH2M HILL, 2007) and the *MEC Support Work Plan* (Jacobs Engineering Group, Inc.[JE], 2007) and use all required personal protective equipment when drilling.

TABLE 4-1

Proposed Wells and Analyte Groups by Sub Area

Sub Area	Proposed Number of Wells	Well Selection Rationale	PCOC for Soil and Groundwater	PCOC Selection Rationale
A	N/A	Area A is in the Moderate to High Probability for MEC Area and is not addressed in this Addendum	N/A (Area not sampled under this addendum)	N/A (Area not sampled under this addendum)
B[a]	12	Increased density of wells due to known POL plume in Area	GRO, DRO/RRO, Metals, Pesticides, Herbicides, VOC, SVOC, EPH, VPH, explosives	Known POL and chlorinated solvent contamination, possible pesticide and herbicide contamination, downgradient from known MEC disposal areas and past detections of explosive compounds
C	4	Increased density of wells due to known POL plume in Area	GRO, DRO/RRO, Metals, Pesticides, Herbicides, VOC, SVOC with TIC, EPH, VPH, Explosives	Known POL and chlorinated solvent contamination, possible pesticide and herbicide contamination, downgradient from known MEC disposal areas and past detections of explosive compounds
D	3	Target suspected source in northwest corner of electrical substation	GRO, DRO/RRO, Metals, Pesticides, Herbicides, VOC, SVOC with TIC, EPH, VPH, PCBs[b]	Potential POL, pesticide, herbicide, and VOC/SVOC contamination; uncharacterized anomaly recently identified[c]
E	8	Wells within and down gradient of known PCB contamination Includes wells installed in former slough channel area to identify potential preferential pathway.	GRO, DRO/RRO, Metals, Pesticides, Herbicides, VOC, SVOC, EPH, VPH, PCBs	Known PCB contamination, potential POL, pesticide, herbicide, and VOC/SVOC contamination

[a]Assume Area B extends to the south to meet the boundary of Area E and includes School Age Services (SAS) building and surrounding area.

[b]PCBs in water only at the proposed monitoring well downgradient from the recently identified anomaly at northwest corner of electrical substation.

[c]Recently identified anomaly at northwest corner of electrical substation

EPH = extractable petroleum hydrocarbons
DRO = diesel-range organic
GRO = gasoline-range organic
MEC = Munitions and explosives of concern
NA = Not applicable
PCB = polychlorinated biphenyl
PCOC = Potential contaminants of concern
POL = Petroleum, oil, and lubricant
RRO = residual-range organic
SVOC = semi-volatile organic compound
VOC = volatile organic compound
VPH = volatile petroleum hydrocarbons

Soil and Groundwater Sample Collection and Analyses

Monitoring wells will be installed using a truck- or an all terrain vehicle-mounted drill rig with a hollow stem auger drill. Installation methods will comply with *Recommended Practices for Monitoring Well Design, Installation, and Decommissioning* (ADEC, 1992).

The hollow-stem auger rig will be used to access the subsurface and collect soil cores for lithologic description and laboratory analysis. The water table at the FCS is expected to range from approximately 12 feet to 16 feet below ground surface (Northwind, 2007). For shallow wells, the screen will be placed such that approximately 5 feet is below water and 5 feet is above water table, or approximately 10 feet to 20 feet below ground surface.

Soil cores will be obtained continuously using decontaminated, 18–inch long, 3.4 inch outside diameter split barrel samplers. At a minimum, three soil samples will be collected in each monitoring well boring at the following depths: near the ground surface (approximately 2 to 3 feet below existing grade), in middle of the vadose zone at a location likely to contain contamination (e.g. clay lens, between approximately 4 and 10 feet below existing grade), and in the smear zone at depth of approximately 11 to 13 feet. A fourth sample may be collected, at the rig geologist's discretion where visual, photoionization detector (PID), or olfactory evidence of contamination is encountered. The field geologist or engineer will be responsible for directing activities, logging the lithology, and selecting the appropriate intervals for sampling. Proposed analyte groups are shown in Table 4-1.

Screening and collection of soil samples for laboratory analysis will be processed as follows:

- PID screening immediately upon opening the split-barrel sampler, followed by heated head space PID screening using procedures outlined in the *Field Sampling Plan* appendix of the *Draft RI Management Plan* (CH2M HILL, 2007).
- Samples to be analyzed for VOCs and GRO will be collected first, and quickly placed into prepared 4-ounce containers, followed by preservation with methanol.
- Samples to be analyzed for all other analytes will be homogenized prior to placing in the appropriate containers. These sample containers will be filled to the top, taking care to prevent soil from remaining in the lid threads prior to being sealed to prevent potential contaminant migration from or to the sample.

Pertinent observations made during sampling, such as the presence of odor or staining, or presence of debris or non-native fill soil will be recorded in the field logbook and on sample record forms.

Groundwater samples will be collected from each monitoring well using low-flow sampling methods. Field parameters will be monitored during well purging and samples will be collected when parameters stabilize. Well drilling, construction and development and soil and groundwater sampling procedures are provided in the *Field Sampling Plan* appendix of the *Draft RI Management Plan* (CH2M HILL, 2007).

Tables 4-2 and 4-3 present the sample collection summary for soil and groundwater samples to be collected from FCS during the groundwater investigation.

References

Alaska Department of Environmental Conservation (ADEC). 1992. *Recommended Practices: Recommended Practices for Monitoring Well Design, Installation, and Decommissioning*. April.

Alaska Department of Environmental Conservation (ADEC). 2001. *Clean-Up Levels: Calculated Cleanup Levels for Compounds without Tabular Values in Site Cleanup Rule,* Technical Memorandum 01-007.

CH2M HILL. 1996. *Groundwater Modeling at Building 3564, Delivery Order 5, Fort Wainwright, Alaska*.

CH2M HILL. 2007. *Remedial Investigation Management Plan (Draft).* May.

CH2M HILL. 2007 *Field Sampling Plan (Draft).* July.

CH2M HILL. 2007. *Quality Assurance Project Plan (Draft).* July.

Jacobs Engineering Group, Inc. (JE). 2007. *Munitions and Explosives of Concern Support Work Plan.*

Oasis Environmental Inc. (Oasis). 2007. *Preliminary Source evaluation 1, Narrative Report.* Interim Final. March.

Northwind, Inc. (Northwind). 2007. *Preliminary Source Evaluation II Report. Taku Gardens Fort Wainwright, Alaska (Final)*. May.

U.S. Environmental Protection Agency (EPA). 2005. U.S. EPA Region 6 Human Health Medium-Specific Screening Levels.

TABLE 4-2
Sample Collection Summary–Soil/sediment

Parameter	Analytical Method[a]	Container[b,c]	Preservative	Maximum Holding Times
GRO	AK101	1 x 4-oz wide-mouth amber glass	Add 25 grams sample to 4-oz jar. Add 25 mls methanol that is prespiked with surrogate, 4°C (VOC – SW8260 analyzed from same container)	28 days to analysis
DRO/RRO	AK102/AK103	1 x 4-oz. wide-mouth amber glass	4°C	14 days to extraction 40 days to analysis
Metals	SW6010/SW6020/SW7000	1 x 8-oz. glass	4°C	28 days for mercury; 6 months for all others
Organochlorine Pesticides	SW8081A	1 x 4-oz. glass	4°C	14 days to extraction 40 days to analysis
Chlorinated Herbicides	SW8151	1 x 4-oz. glass	4°C	14 days to extraction 40 days to analysis
VOCs and TICs	SW8260B	1 x 4-oz wide-mouth amber glass	Add 25 grams sample to 4-oz jar. Add 25 mls methanol that is prespiked with surrogate, 4°C (GRO – AK101 analyzed from same container)	14 days to analysis
Low-level VOCs	SW8260B	2 x 40 mL VOA vials	Add 5 grams sample to 40-mL VOA vial pre-preserved with 1 gram sodium bisulfate/5 mL water, 4°C	14 days to analysis
Semivolatile Organic Compounds	SW8270C SW8270C-SIM	1 x 4-oz. glass	4°C	14 days to extraction 40 days to analysis
Extractable Hydrocarbon Speciation	NW EPH	1 x 4-oz. wide-mouth amber glass	4°C	14 days to extraction 40 days to analysis
Volatile Hydrocarbon Speciation	NW VPH	2 x 40-mL VOA vial, septa lid	Add 5 grams sample to 40-mL VOA vial with methanol	14 days to analysis
Explosives	SW8321	1 x 4-oz. glass	4°C	14 days to extraction 40 days to analysis

[a]Unless otherwise specified, method numbers refer to U.S. Environmental Protection Agency *Test Methods for Evaluation of Solid Waste, Physical and Chemical Methods*, SW-846, 3rd edition, Revision 4, 1996.
[b]All glass containers have polytetrafluoroethylene-lined lids.
[c]Triple the amount per laboratory for samples designated for matrix spike/matrix spike duplicate.

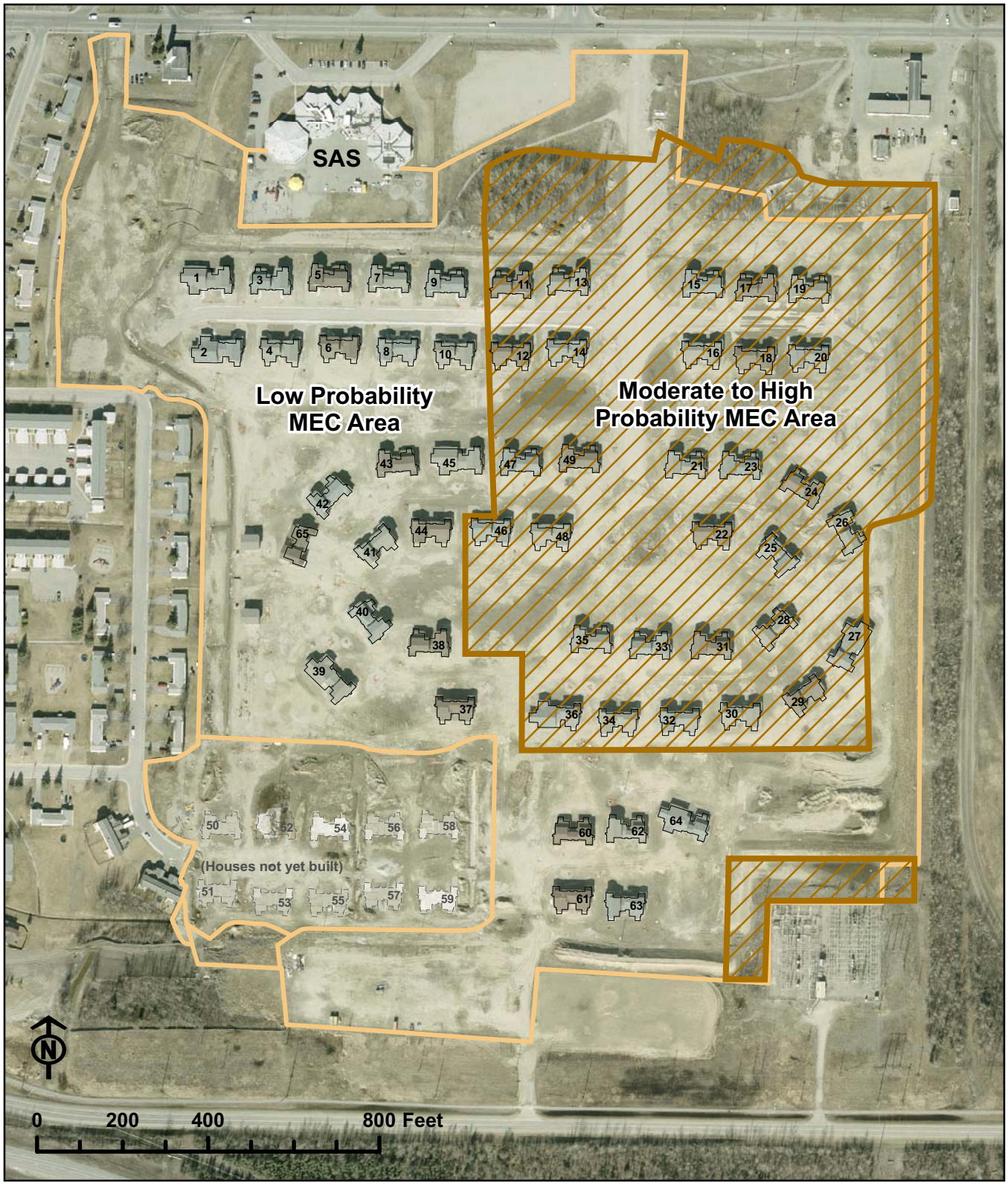
°C = degrees Celsius
EPH = extractable petroleum hydrocarbons
DRO = diesel-range organic
GRO = gasoline-range organic
mL = milliliter
RRO = residual-range organic
TICs = Tentatively Identified Compounds
VOA = volatile organic analysis
VOC = volatile organic compound
VPH = volatile petroleum hydrocarbons

TABLE 4-3
Sample Collection Summary–Aqueous/Liquid

Parameter	Analytical Method[a]	Container[b,c]	Preservative	Maximum Holding Times
Gasoline-Range Organics	AK101	3 x 40-mL amber glass, septa lid	No headspace HCl to pH<2 4°C	14 days to analysis
Diesel Range Organics/Residual Range Organics	AK102/AK103	1 x 1-liter amber glass	HCl to pH<2 4°C	14 days to extraction 40 days to analysis
Metals[d] (except Chromium VI)	SW6010/SW6020/ SW7000	1 x 500-mL HDPE	HNO_3 to pH<2 4°C	28 days for mercury 6 months for all others
Organochlorine Pesticides	SW8081A	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis
Polychlorinated Biphenyls[e]	SW8082	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis
Chlorinated Herbicides	SW8151	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis
Volatile Organic Compounds	SW8260B	3 x 40-mL amber glass, septa lid	HCl to pH<2, 4°C; no headspace	14 days to analysis
Semivolatile Organic Compounds	SW8270C/ SW8270C-SIM	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis
Transitional Explosives	SW8321	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis
Explosives	SW8330	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis

[a]Unless otherwise specified, method numbers refer to U.S. Environmental Protection Agency *Test Methods for Evaluation of Solid Waste, Physical and Chemical Methods*, SW-846, 3rd edition, Revision 4. 1996.
[b]All glass containers have polytetrafluoroethylene-lined lids.
[c]Triple the amount per laboratory for samples designated for matrix spike/matrix spike duplicate.
[d]Water samples will be analyzed for total metals (unfiltered samples). With low-flow sampling, filtering is not necessary.
[e]Only from wells within or down gradient of the PCB exclusion zone.

°C = degrees Celsius
HCl = hydrochloric acid
HDPE = high-density polyethylene
HNO_3 = nitric acid
H_2SO_4 = sulfuric acid
mL = milliliter



\\miner\proj\USACE\357465TakuGardens\GIS\MapFiles\Fig_3-1_TakuChemRisk.mxd 9/19/2007 21:00:50PM

Figure 4-1
MEC Areas and Security Fences
Former Communications Site
Fort Wainwright, Alaska

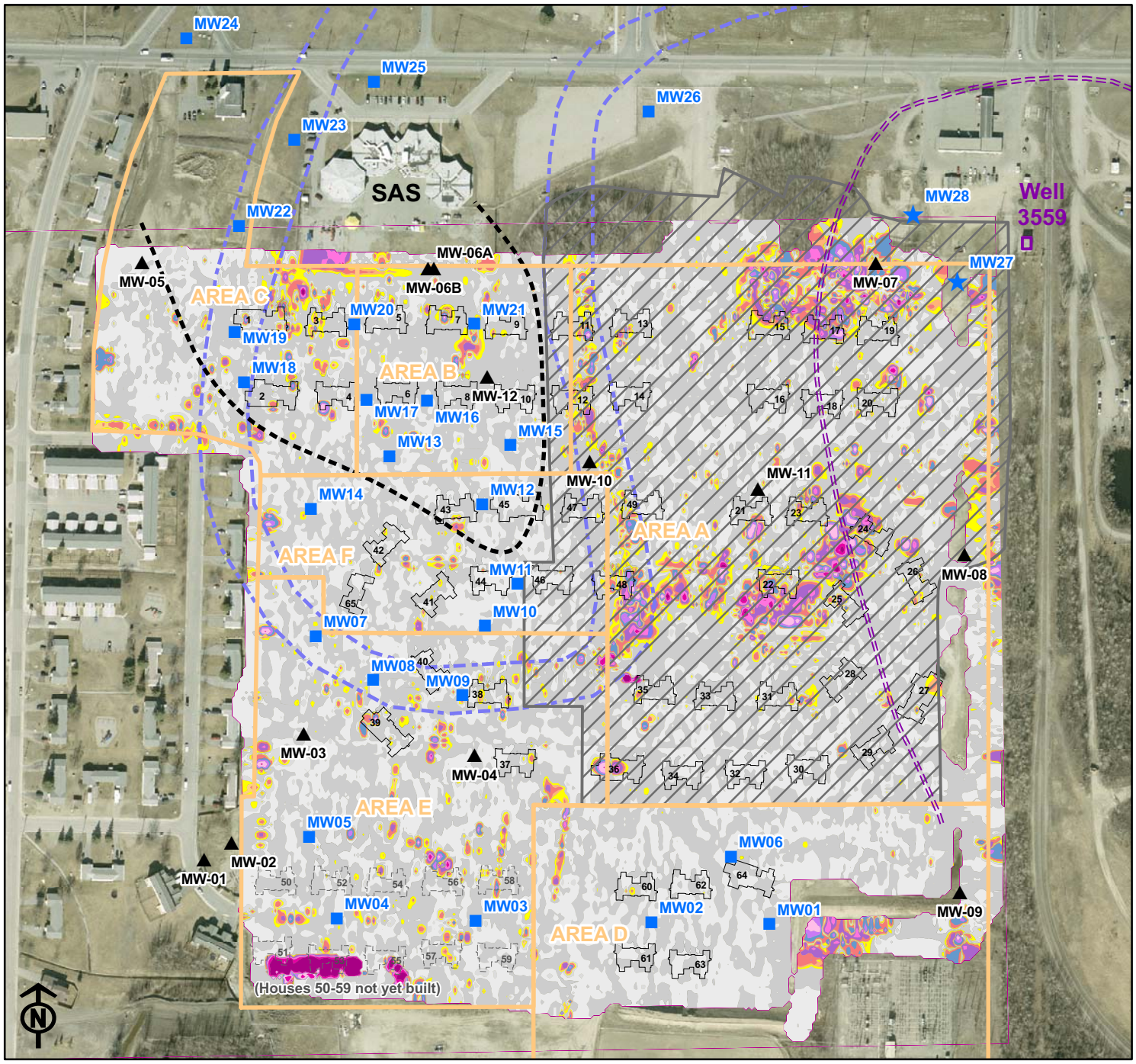


Figure 4-2
Former Communications Site
Fort Wainwright, Alaska
Monitoring Well Locations

Legend

- Moderate to High probability MEC area
- Former slough channel
- Area within elevated VOC/POL concentrations
- Capture Zone, Well 3559
- Existing monitoring well locations
- Proposed monitoring well locations
- Proposed deep monitoring locations Not addressed in Addendum 4

2004 Magnetic Data Vertical Gradient

- -4000
- -1000
- -500
- -200
- -100
- -75
- -50
- -20
- 0
- 40
- 75
- 100
- 200
- 500
- 1000
- 2000
- 4000

0 100 200 300 400 Feet

\\miner\proj\USACE\357465TakuGardens\GIS\MapFiles\Fig_4-2_MonWellsMagAnom2004.mxd 8/15/2007 15:25:50PM

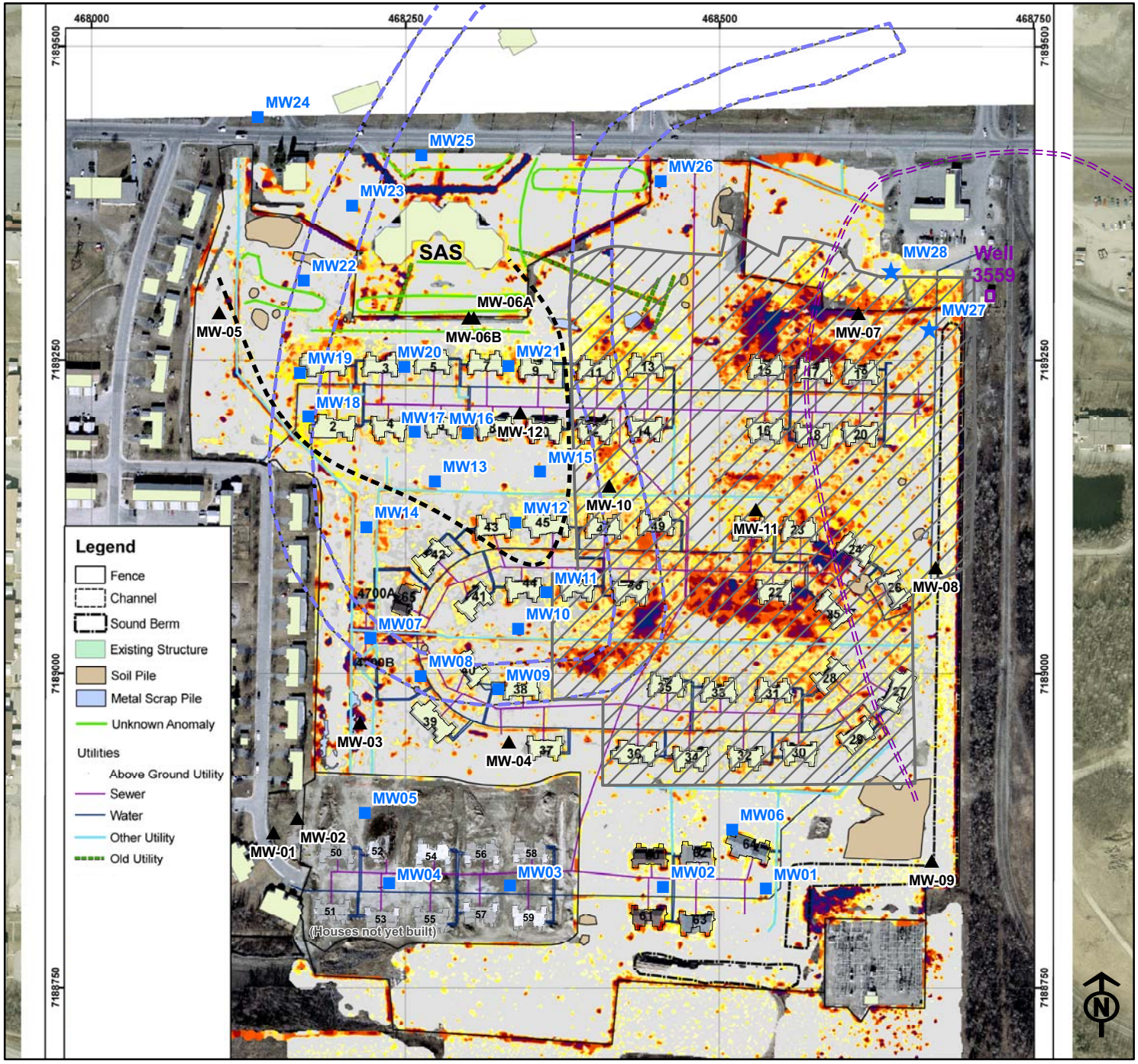


Figure 4-3

Former Communications Site
Fort Wainwright, Alaska
Monitoring Well Locations

Legend

- Moderate to High probability MEC area
- Former slough channel
- Area within elevated VOC/POL concentrations
- Capture Zone, Well 3559
- Existing monitoring well locations
- Proposed monitoring well locations
- Proposed deep monitoring locations Not addressed in Addendum 4

March 2007
Magnetic Data
EM61 Results (mV)

- No Data
- -1500
- -20
- 20
- 30
- 50
- 75
- 100
- 200
- 300
- 500
- 1000
- 2000

0 100 200 300 400 Feet

\\miner\proj\USACE\357465TakuGardens\GIS\MapFiles\Fig_4-3_MonWellsMagAnom2007.mxd 8/15/2007 15:42:50PM