APPENDIX A

# Recent Remedial Investigation Results

Source: IT, 1999 (Appendix A)

# *Appendix A*
# *Remedial Investigation Report*
# *for the Petroleum, Oil, and Lubricant Outparcel*

# Table of Contents

List of Tables ..... A-ii

List of Figures ..... A-ii

A.1 Introduction ..... A-1

A.2 Site Background and Environmental Setting ..... A-2
A.2.1 Hamilton Army Airfield Property Description ..... A-2
A.2.2 Facility Background and History ..... A-2
A.2.3 Petroleum, Oil, and Lubricant Outparcel Description ..... A-3
A.2.4 Climate ..... A-6
A.2.5 Geology ..... A-7
A.2.6 Hydrogeology ..... A-7
A.2.7 Surface Water Hydrology ..... A-8

A.3 Remedial Investigation Field Activities and Results ..... A-8
A.3.1 Soil Investigation ..... A-9
A.3.2 Bedrock Investigation ..... A-10
A.3.3 Groundwater Investigation ..... A-11
A.3.3.1 Monitoring Well Installation ..... A-11
A.3.3.2 Groundwater Monitoring ..... A-12

A.4 Conclusions ..... A-12

## List of Tables


| Table | Title |
|---|---|
| A-1 | Petroleum, Oil, and Lubricant Outparcel Subsurface Soil Organics Summary |
| A-2 | Petroleum, Oil, and Lubricant Outparcel Composite Surface Rock Organics Summary |
| A-3 | Petroleum, Oil, and Lubricant Outparcel Groundwater Organics Summary |


## List of Figures


| Figure | Title |
|---|---|
| A-1 | Former Tank Farm Area, POL Outparcel, BRAC Property, Hamilton Army Airfield |
| A-2 | Former AST-2 Plan Location Map, POL Outparcel, BRAC Property, Hamilton Army Airfield |
| A-3 | POL Outparcel Hydrogeologic Cross Section A-A', BRAC Property, Hamilton Army Airfield |
| A-4 | POL Outparcel Contaminant Concentrations in Soil, BRAC Property, Hamilton Army Airfield |
| A-5 | POL Suspected Outparcel Extent of TPH-Impacted Rock, BRAC Property, Hamilton Army Airfield |
| A-6 | POL Outparcel Groundwater Well Locations, BRAC Property, Hamilton Army Airfield |
| A-7 | Typical POL Outparcel Groundwater Elevation Contour Map |

## List of Acronyms

| | |
|---|---|
| AST | aboveground storage tank |
| bgs | below ground surface |
| BRAC | Base Realignment and Closure |
| BTEX | benzene, toluene, ethylbenzene, and xylenes |
| D.O. | dissolved solids |
| ESI | Engineering-Science, Inc. |
| ft | feet (foot) |
| gal | gallon |
| GSA | General Services Administration |
| HAAF | Hamilton Army Airfield |
| JP-4 | jet propellant |
| in. | inches |
| mg/kg | milligram(s) per kilogram |
| PCOC | potential contaminant(s) of concern |
| PNA | polynuclear aromatics |
| POL | Petroleum, Oil, and Lubricant |
| RCG | Residential Cleanup Goal(s) |
| TPH | total petroleum hydrocarbon(s) |
| USAF | U.S. Air Force |
| UST | underground storage tank |
| WCC | Woodward-Clyde Consultants |
| WCFS | Woodward-Clyde Federal Services |
| °F | degrees Fahrenheit |
| µg/kg | microgram(s) per kilogram |

## A.1 Introduction

This appendix presents the investigative activities and analytical results from the remedial investigation conducted at the Petroleum, Oil, and Lubricant (POL) Outparcel. The POL Outparcel was comprised of three main features (see Figure 1-3 in precious section):

- A former tank farm containing twenty 25,000-gallon (gal) underground storage tanks (USTs), one 25,000-gal aboveground storage tank (AST), and one 750-gal UST
- A former 850,000-gal AST and associated piping
- The Landfill 26 groundwater treatment facility.

The POL Outparcel lies within the upland portion of the Base Realignment and Closure (BRAC) Property at Hamilton Army Airfield (HAAF) on the a ridge known as Reservoir Hill and the immediate lowlands surrounding the hill. The investigation was conducted pursuant to the requirements set forth in the Comprehensive Remedial Investigation/Feasibility Study Work Plan (IT, 1997a) and the Comprehensive Remedial Investigation/Feasibility Study Work Plan Contractor Quality Control/Sampling and Analysis Plan (IT, 1997a). Previous remedial activities and investigations conducted at the POL Outparcel established that the area was impacted by the release of petroleum-hydrocarbons and related constituents from ASTs and USTs. Previous corrective actions performed at the POL Outparcel included the removal of all storage tanks and soil which exceeds total petroleum hydrocarbon (TPH) levels of 100 milligrams per kilogram (mg/kg). However, additional data were needed to assess the extent of residual contamination at the site and to support the selection of the most appropriate remedial action for the site. Therefore, additional remedial investigation activities were conducted at the site. The recent remedial investigation activities included

- Drilling five soil borings and collecting soil samples around the groundwater treatment facility to evaluate the extent of petroleum-hydrocarbon contamination previously detected during plant construction.
- Drilling six monitoring well borings and installing new monitoring wells in the borings, and coring two well borings.

- Collecting groundwater samples from the newly installed and existing wells to evaluate the extent of potential contaminants of concern (PCOCs) and if natural attenuation is occurring.

- Measuring water levels in the monitoring wells to evaluate groundwater flow patterns and rates.

- Sampling the rock outcrop to evaluate potential petroleum hydrocarbon contamination.

The remedial investigation was initiated in 1996 and much of the work was completed by mid-1997; however, additional groundwater sampling was undertaken starting in March 1998 and ended in January 1999. A summary of the objectives, activities, and results of the remedial investigation are presented in the following sections.

## A.2 Site Background and Environmental Setting

The following subsections present relevant background information, describe the general climatic, geologic, and hydrogeologic conditions, and summarize the results of investigations for the POL Outparcel.

### A.2.1 Hamilton Army Airfield Property Description

Hamilton Army Airfield is a 1,600-acre former military installation located approximately 22 miles north of San Francisco on San Pablo Bay in Marin County, California (see Figure 1-1). The HAAF is bounded on the north by state-owned open land, private agricultural lands, and a private residential community (Bel Marin Keys); on the east by state-owned land and San Pablo Bay; on the south by private agricultural lands; and on the west by Nave Drive.

The BRAC Property encompasses approximately 710 acres and is located primarily within the north and eastern portion of the HAAF (see Figure 1-2). To the southwest, the BRAC Property is bounded by the General Services Administration (GSA) Sale Areas and the U.S. Coast Guard-administered military housing, both of which are located within the current Base limits.

### A.2.2 Facility Background and History

Hamilton Army Airfield was constructed on reclaimed tidal mud flats by the Army Air Corps in 1932. The site, previously known as Marin Meadows, had been used as ranch and farm land since the Mexican Land Grant (USACE, undated). Military operations began in December 1932, first as a Base for bombers and later as a Base for transport and fighter aircraft. The Base played

a major role in World War II as a training field and staging area for Pacific operations. During the war, the Base hospital (i.e., Building No. 515 at Hospital Hill) served as an acute care and rehabilitation facility for thousands of war casualties per month.

The Base was renamed Hamilton Air Force Base in 1947 when it was transferred to the newly created U.S. Air Force (USAF). The USAF used the Base primarily as a training and fighter installation until 1975. The USAF ended military operations at the Base in 1976, and the property was declared surplus by the Department of Defense (Hamilton Field Association, Inc., 1988) as part of the Base Realignment and Closure Act of 1988. In 1976, the U.S. Department of the Army (Army) began aircraft operations at the airfield and supporting facilities with permission from the USAF. In 1984, the airfield property was officially transferred back to the Army and renamed Hamilton Army Airfield. The Army continued to use the airfield primarily for Army Reserve aircraft operations until March 1994 (USACE, 1994). Currently, the BRAC Property is managed by the Department of the Army, I Corps, at Fort Lewis, Washington.

### *A.2.3 Petroleum, Oil, and Lubricant Outparcel Description*

The POL Outparcel lies within the upland portion of HAAF, on the north side of a ridge known as Reservoir Hill and southwest of West Boundary Road (see Figure 1-3 in previous section). The POL Outparcel is separated from the main portion of the BRAC Property by approximately 200 feet (ft) and is bounded by the GSA Phase II Sale Area. The POL Outparcel contained three main environmental features (see Figure 1-2 in previous section):

- A former tank farm, which contained twenty 25,000-gal steel USTs, one 25,000-gal AST, and one 750-gal storage tank (Figure A-1)
- A former 850,000-gal AST and associated piping (i.e., AST-2) (Figure A-2)
- The Landfill 26 groundwater treatment facility.

Former AST-2

The POL Outparcel operated as the Base fuel-storage center from 1942 until prior to May 1986, when the storage tanks were removed. Aboveground Storage Tank-2 stood on the hillside bench (i.e., Reservoir Hill) and supplied the former tank farm area by gravity feed through a pipeline to a pump station located below the ridge. All tanks, except possibly the 750-gal storage tank, stored jet propellant (JP-4) fuel. The 25,000-gal AST was used to store JP-4; however, the age of

the tank is unknown. Discharges of jet fuel and other petroleum products may have impacted the soil and groundwater at the POL Outparcel.

Former Tank Farm

The former tank was located adjacent to West Boundary Road near the west end of the runway (Figure A-1). The twenty 25,000-gal tanks had been used to store JP-4 jet fuel for aircraft operations. The original use of the 750-gal storage tank is unknown.

The 20 USTs were located in the active fuel storage area (Figure A-1). The USTs were arranged in two rows of ten tanks each and were supported by four 3-ft high concrete strip footings built on the original grade. The USTs had been covered with approximately 20 ft of soil which totally buried the tanks and formed a hill that blended into a natural rock outcrop on both the southeast and southwest sides of the site. A water control pit and a water separator house (Building No. 717) were located above the buried tanks.

Following tank removal in 1987, each tank was transported to the on-site cutting area. The tanks showed no signs of rusting, corrosion, or penetrations. However, the bottom of each of the tanks' external tar coatings had deteriorated. The tanks were cut into sections and removed from the site to a scrap metal recycler.

To determine the extent of the soil contamination beneath the original grade, an investigative trenching program was undertaken.

The investigative trenching program indicated some lenses of stained soil in the removed tank area with concentrations of fuel hydrocarbons greater than 1,000 mk/kg. It also identified several areas along the west boundary fence and adjacent to the drainage ditch in which soil contained fueled hydrocarbons at levels greater than 1,000 mg/kg. The contamination in these areas appears to be due to pipe leaks or spills and not to be directly related to any leaks from the removed tanks. Soils with hydrocarbon concentrations greater than 1,000 mg/kg were excavated and transported to a Class I landfill for disposal. Subsequently, an additional investigation was conducted in 1991 in which the contaminated soil was further removed if it exceeded the 100 mg/kg concentration. All excavated areas were backfilled with clean fill.

The former AST was a steel 850,000-gal bulk storage tank with a floating cover. The AST, which was located on a ridge overlooking the tank farm area, had been used to store JP-4 fuel (Figure A-2). The AST was supplied fuel by pipes and a pump station located below the ridge at the tank farm area.

The AST was surrounded with an earthen berm which was covered with a thin layer of asphalt. The surface area between the tank and the berm did not indicate evidence of soil discoloration or petroleum hydrocarbons.

Northwest of the tank, the ground sloped 4 ft to a low area near the base of the berm where a concrete drain box, approximately 3 ft square and 4 ft deep, was located. The drain box contained a heavy steel grate which was built on top of the box. A 4-inch (in.) diameter asbestos cement pipe ran from the drain box, through the berm, to the outer edge of the berm. At the end of the pipe was a gate valve, which when opened could be used to drain any liquids collected in the berm.

Inspection of the outside of the AST and its foundation showed no signs of failure or leaks. The ASTs interior showed no substantial rusting, pitting, or corrosion.

Following tank removal, soil samples were collected to determine if any contamination existed around the removed AST. Trenches were dug to bedrock north and west of where tank had been located. These were the only areas where the depth to rock was greater than 1 ft.

Based on the subsurface investigation soil contaminated with hydrocarbons at levels greater than 1,000 mg/kg were removed. A subsequent investigation removed soils which exceeded 100 mg/kg or to the extent practicable. All excavations were backfilled with clean material.

A pilot aeration program was conducted during the soil removal activities to determine if petroleum hydrocarbons in the soils could be reduced to the required cleanup level by aeration. The aviation gasoline contaminated soils proved to aerate readily; however, the soils contaminated with JP-4, diesel, kerosene, or oil resulted in unfavorable results.

Since JP-4 is the main contaminant of concern at the POL Outparcel and the JP-4 does not aerate easily, approximately 13,000 cubic yards of impacted soil had to be disposed at a Class I landfill

and 4,000 cubic yards of material was aerated and re-used as non-contaminated backfill (IT, 1987).

Several small buildings (Building Nos. 736, 737, and 738) existed at the POL Outparcel and were last used for temporary storage of waste oil (see Figure 1-3). These buildings were demolished prior to construction of the Landfill 26 groundwater treatment facility. The groundwater treatment facility was constructed northwest of Reservoir Hill in a low-relief area that is partially paved with asphalt. The facility was to provide service for Landfill 26, but has never been used. Construction activities at the groundwater treatment facility revealed that contamination existed. Therefore, soil samples were collected along a grid system surrounding the facility footprint. Soil in excess of 100 mg/kg was removed to the extent practicable (i.e., to bedrock).

### *A.2.4 Climate*

The climate at HAAF and the surrounding area is Mediterranean, which is characterized by warm, dry summers and cool, wet winters. The temperature is moderated by HAAF's proximity to San Pablo Bay and the Pacific Ocean. The deflection of the sea breeze and fog by coastal mountains gives the region an entirely different temperature regime from areas west of the mountains and in San Francisco. Daily variation in temperature is relatively small. Daytime temperatures are more moderate than those of most Bay Area cities (January and July mean maximum temperatures are 56 degrees Fahrenheit [°F] and 80°F, respectively); however, 100°F days occur occasionally in late summer. The frequent clear skies (40 percent of the days over the course of a year) and light winds of the area enhance radiative cooling at night. Thus, nighttime temperatures are relatively low (January and July mean minimum temperatures are 36°F and 50°F, respectively). The average maximum temperature is 72°F, and the average minimum temperature is 47°F.

The rainy season extends from roughly November through March; during these months, rainfall averages between 4 to 7 in. per month. The mean annual precipitation is 28 in. The winter influx of rain has a dramatic effect upon this area, resulting in an elevated groundwater table and some surface flooding. During summer months, rainfall averages less than 0.1 in. per month. This results in the evaporation of surface waters, a drop in the groundwater table, and extensive desiccation of shallow soil horizons (WCFS, 1996).

### A.2.5 Geology

Reservoir Hill lies within the San Francisco-Marin structural block of the northern Coast Range geomorphic province of California. The Coast Range province is characterized by a series of nearly parallel mountain ranges and intermountain alluvial valleys that trend obliquely to the coastline in a northwesterly direction. The higher relief areas to the west and south of HAAF are generally underlain by serpentinite and sandstone bedrock from the Franciscan Complex of Jurassic to Cretaceous age. The hills surrounding the airfield are composed primarily of sandstone, which exhibits varying degrees of tectonic deformation. This bedrock is locally overlain by Tertiary alluvium and colluvium deposits.

Five distinct geologic units have been identified in the POL Outparcel from well boring logs: two bedrock units, Bay Mud, and two artificial fill units (ESI, 1993). The lower bedrock unit is a grey, highly indurated, fractured Franciscan sandstone that was encountered to the total depth of the borings. The upper bedrock unit is described as a friable, yellow-to-buff colored, interbedded sandstone, siltstone, and shale. An older fill unit of pebbly, sandy clay is present to a depth of approximately 7 ft below ground surface (bgs) along the northern boundary of the POL Outparcel (WCC, 1987). Where not disturbed by excavation and fill activities, a thin layer of Bay Mud overlies the upper bedrock unit along the northeastern perimeter of the site. A younger fill consisting of clayey, sand gravel is present in the former tank farm area and at the bench where AST-2 was located. It is typically less than 10 ft thick.

A geologic cross section for the POL Outparcel is presented in Figure A-3. The cross section is based on excavation logs and the geologic logs for six monitoring wells installed as part of the remedial investigation. The logs are contained in Appendix B.

### A.2.6 Hydrogeology

Groundwater occurs in the weathered bedrock along the flanks of Reservoir Hill. Recharge occurs from rainfall on the top and slopes of the hill with groundwater percolating into the weathered material and into fractures in the bedrock. Flow within the bedrock is assumed to be controlled by fractures similar to conditions. Production rates are generally less than 2 gal/day (see Appendix F).

Groundwater in the vicinity of AST-2 occurs in the bedrock at approximately 25 ft bgs and in the fill material at increasingly shallower depths away from Reservoir Hill. Groundwater data near

the drainage ditch suggest that an upward hydraulic gradient exists between the shallower and deeper units of the area (ESI, 1993).

### *A.2.7 Surface Water Hydrology*

Hamilton Army Airfield is situated within the Novato Creek drainage basin, which is comprised of an area of about 44 square miles. This basin is bounded by the Petaluma River basin to the north, San Pablo Bay to the east, the Coast Range hills to the west and southwest, and the Las Gallinas Creek drainage system to the south. The Coast Range hills act as the principal source of groundwater recharge and surface water drainage for the basin.

Prior to the construction of the perimeter levees, the airfield area was part of the Novato Creek flood plain. Much of the area is topographically below mean sea level due to subsidence, which may be due to drainage and loading by structures. The POL Outparcel is drained by a storm drain network that discharges to San Pablo Bay.

The only perennial surface water feature in the area is the drainage ditch that lies outside the northern boundary of the POL Outparcel. It originated east of the POL Outparcel and drains toward the northwest under Aberdeen Road.

## *A.3 Remedial Investigation Field Activities and Results*

This section describes the results of field investigation and sampling activities implemented by IT Corporation and its subcontractors during the remedial investigation at the POL Outparcel. For this investigation, quantitation of TPH contaminants identified by the laboratory as "unknown hydrocarbon" was performed using the following convention. If the unknown fell in the gasoline range ($C_7$ to $C_{12}$), the result was quantitated against the gasoline standard. If the unknown fell in the ranges for diesel ($C_{10}$ to $C_{24}$), JP-4 ($C_8$ to $C_{13}$), or motor oil ($C_{24}$ to $C_{36}$), the result was quantitated against the diesel standard. The primary objective of the POL Outparcel remedial investigation is to obtain data supporting site closure. Specific objectives of the recent remedial investigation activities at the POL Outparcel were to

- Improve groundwater monitoring coverage
- Evaluate the extent of TPH contamination in soil and groundwater near the Landfill 26 groundwater treatment facility

- Determine the nature and extent of petroleum contamination observed in fractures in the bedrock in the immediate vicinity of the former AST-2 location

- Perform slug or specific capacity testing to evaluate groundwater plume stability and the potential for TPH plume migration

- Perform groundwater monitoring and sampling to assess concentrations of TPH and related constituents and the current size of the plume and determine if the concentrations and mass of the TPH plume are being reduced through natural attenuation

- Perform groundwater monitoring to evaluate if intrinsic bioremediation is occurring.

The field activities supporting these objectives and their results are summarized below.

### *A.3.1 Soil Investigation*

Five soil borings (SB-POLA-101 through -104 and SB-POLA-118) were drilled around the perimeter of the groundwater treatment facility for Landfill 26 to assess the extent of petroleum hydrocarbons detected in soils during construction of the facility (Figure A-4). The borehole coordinate locations are presented on the boring logs in Appendix B. Contingent soil boring locations identified in the work plan were determined to be unnecessary based on the analytical results from the five primary borings and were not drilled. The five soil borings were drilled to the water table or bedrock refusal. A total of 12 soil samples were collected from the soil boring at approximately 2.5-ft intervals at depths ranging from 1.5 to 10.5 ft bgs; however, the presence of weathered bedrock resulted in poor sample recovery in SB-POLA-102, -103, and -118. As many as four samples per boring were collected and analyzed for extractable (diesel-range) and purgeable (gasoline-range) TPH; benzene, toluene, ethylbenzene, and xylenes (BTEX); polynuclear aromatics (PNA) compounds; and lead.

With one exception, all soil sample results for TPH compounds were below the GSA Phase I Residential Cleanup Goal (RCG) for TPH measured as diesel of 200 mg/kg. The analytical results are presented in Table A-1. One sample, HB-4071, collected from a depth of 2 ft in boring SB-POLA-101, yielded an estimated unknown hydrocarbon concentration of 260 mg/kg. A soil action level has not been established for unknown hydrocarbons, but this concentration slightly exceeded the RCG for TPH measured as diesel. Total petroleum hydrocarbon compounds were not detected in the sample collected from the 6.5-ft depth in this boring, indicating that the unknown hydrocarbon contamination detected at the 2-ft depth did not extend downward significantly.

Several PNA compounds were detected at low levels in sample HB-4061, collected from a depth of 1.5 ft in soil boring SB-POLA-104. Only one of these compounds (dibenz(a,h)anthracene) was detected at a concentration (0.041 mg/kg) that exceeded the GSA Phase I RCG (0.037 mg/kg). Neither dibenz(a,h)anthracene nor any of the other PNAs detected in sample HB-4061 were detected at depths of 6 and 8.5 ft from this boring. Polynuclear aromatic compounds were not detected in any of the other soil borings.

The levels of lead (5.4 to 16.6 mg/kg) detected in all soil samples were below applicable soil action level (190 mg/kg).

### *A.3.2 Bedrock Investigation*

In June 1996, during a site visit conducted by IT Corporation as part of the Comprehensive Remedial Investigation/Feasibility Study scoping effort, an oil coating was observed in fractures within the bedrock exposed adjacent to the location of former AST-2. The nature and origin of the oil was not known, but it was suspected to be related to an asphalt berm that was constructed around AST-2. A thin (1- to 2-in.) asphaltic crust was also observed to cover a portion of the ground in the vicinity of AST-2. This crust appeared to be the erosional remnant of the berm that was constructed around the AST.

A composite rock sample (Figure A-5) was collected and analyzed to assess the oil coating. Two locations along the outcrop approximately 20 ft apart were chosen for sampling. At one sample location, a black coating was observed within fractures in the bedrock. At the other location, a black, earthy coating was present on the exposed face of the outcrop. The samples were collected in 4-ounce glass jars, which were composited by the laboratory. The composite sample was analyzed for extractable TPH, PNAs, and polychlorinated biphenyls.

The composite rock sample yielded a detection of 1,800 mg/kg (estimated) for TPH measured as diesel (above the RCG of 200 mg/kg) and 0.96 mg/kg for chrysene (below the GSA Phase I RCG of 1.1 mg/kg) (Table A-2). When TPH was detected, mapping the TPH-impacted rock and estimating the volume was added to scope of work for the remedial investigation. The lateral extent of affected rock was measured and mapped ,and limited hand excavation was performed to assess the depth of impact (Figure A-5). The area of TPH-impacted rock and earthy coatings was determined to be approximately 3,500 square feet. The maximum depth of impact in fractures within the bedrock, noted from hand excavations, was 6 in. From these measurements, a rough

volume estimate of TPH-impacted rock and earthy coating was determined, using the maximum depth of 6 in., to be approximately 1,750 cubic feet (65 cubic yards).

### *A.3.3 Groundwater Investigation*

Because TPH and fuel-related constituents were detected in the POL Outparcel groundwater samples collected in 1992 and 1994, additional data were required to further define the lateral and vertical extent of the petroleum-hydrocarbon plume. Evaluation of the groundwater monitoring program is presented in Section 4.0 of the main portion of this report. Data on TPH concentrations and other hydrogeochemical parameters were also necessary to determine if natural attenuation of the petroleum-hydrocarbon plume is occurring. The evaluation of natural attenuation at the POL Outparcel is presented in Section 5.0 of the main portion of this report.

#### *A.3.3.1 Monitoring Well Installation*

To improve the coverage of the monitoring well network, six new monitoring wells (MW-POLA-117A, -117B, -118, -119, -120, and -121) were installed at the locations shown on Figure A-6. Well construction details, including total depths of borings and screen intervals, are provided in Appendix B. The rationale for the well locations was as follows:

- Two nested wells, MW-POLA-117A and -117B, were installed along the drainage ditch between PL-MW-111 A/B and -112 A/B to provide additional well coverage along the northern edge of the area. MW-POLA-117A was screened across the water table whereas MW-POLA-117B was screened to monitor for the presence of TPH in slightly deeper groundwater.

- MW-POLA-118 was installed on the northwest side of the groundwater treatment facility and screened across the water table. This well location was selected to determine if petroleum hydrocarbons, detected in soil during construction of the facility, were also present in the groundwater in that vicinity.

- The location of water table well MW-POLA-119 was selected to replace PL-MW-110, which was abandoned in approximately 1994 to accommodate construction of Landfill 26.

- Water table well MW-POLA-120 was located to the southwest of Well PL-MW-115 to provide additional lateral definition of the TPH plume.

- Water table well MW-POLA-121 was located near existing well PL-MW-101 to assess contaminant levels across the water table. Existing well PL-MW-101 is screened below the water table.

The borings for wells MW-POLA-120 and -121 were cored to provide information on the fracture density of the bedrock in the POL Outparcel. The borings were cored using a split tube, single-wall core barrel to preserve the fracture pattern. The core was photographed and stored in labeled core boxes.

### *A.3.3.2 Groundwater Monitoring*

A groundwater monitoring and sampling program, including quarterly, semiannual, and annual sampling schedules, was developed for the POL Outparcel in 1997 (IT, 1999). Due to delays in the installation of the new wells for remedial investigation, the initial sampling round of all POL Outparcel wells (new and existing) was not completed until February 1997; and a second round was performed as scheduled in March 1997. Table A-3 presents the results of the initial remedial investigation sampling effort. Following consensus on a decision for additional activities at the POL Outparcel, the monitoring program was resumed in March 1998 and subsequent rounds of samples were collected during September/October 1998 and January 1999.

All groundwater samples were analyzed for TPH measured as purgeable and extractable, BTEX, lead, and PNAs. However, the January 1999 samples were only analyzed for TPH since that was the only constituent detected above GSA Phase I RCGs. An additional suite of samples was collected in March/April 1998 and September/October 1998 and analyzed for hydrogeochemical indicators of biodegradation of petroleum hydrocarbons.

Water-level measurements were taken from new and previously existing wells during February, March, and May 1997; March/April and September/October 1998; and January 1999. A typical groundwater elevation contour map is presented as Figure A-7. Monitoring was conducted for immiscible phases, but none was observed in any well.

## *A.4 Conclusions*

Soil, bedrock, and groundwater media at the POL Outparcel were investigated to assess the extent of contamination from petroleum hydrocarbons released to the area from fuel storage tanks that formerly existed at the site. The following tasks were completed as part of the remedial investigation:

- Drilling five soil borings and collecting soil samples around the groundwater treatment facility to evaluate the extent of petroleum-hydrocarbon contamination previously detected during facility installation

- Drilling six monitoring well borings and coring two of the borings
- Installing new monitoring wells in the six borings (MW-POLA-117A, -117B, -118, -119, -120, and -121)
- Collecting groundwater samples from the newly installed and existing wells to evaluate the extent of PCOCs
- Collecting groundwater samples from the newly installed and existing wells to evaluate if natural attenuation is occurring
- Measuring water levels in the monitoring wells to evaluate groundwater flow patterns and rates
- Collecting samples of the rock outcrop surrounding Reservoir Hill to evaluate the absence or presence of petroleum-hydrocarbon contamination.

The results of these activities are summarized below.

Results of 12 soil samples collected from the perimeter of the Landfill 26 groundwater treatment facility indicated that, with one exception, all soil sample results for TPH compounds were below the GSA Phase I RCG for TPH measured as diesel of 200 mg/kg. One sample, collected from a depth of 2 ft, yielded an estimated unknown TPH concentration of 260 mg/kg. One PNA compound, dibenz(a,h)anthracene, was detected in one sample (41 micrograms per kilogram [µg/kg]) at a concentration slightly above the GSA Phase I RCG (37 µg/kg). Total petroleum hydrocarbon and PNA compounds were not detected in samples collected from greater depths in these borings, indicating that the hydrocarbon contamination does not extend downward significantly.

One composite rock sample was collected to assess the composition of a black, oily substance that was observed in fractures in the bedrock exposed near the location of the former AST-2. This sample yielded a detection of 1,800 mg/kg TPH measured as diesel, which exceeded the RCG of 200 mg/kg. As a result of this TPH detection, the lateral extent and depth of contamination was measured and the volume of contaminated rock estimated. Based on visual examination, it appears that the oily substance has penetrated down to a depth of approximately 6 in., resulting in an estimated 1,750 cubic feet (65 cubic yards) of contaminated rock. The oily substance contained in the fractures is believed to be related to an asphalt berm that once covered the pad around and beneath AST-2. The environmental impact of this asphaltic crust is probably

comparable to that of any of the paved surfaces (i.e., roads, parking lots, and runways) on HAAF Property and is not considered to be significant.

Six new monitoring wells (MW-POLA-117A, -117B, -118, -119, -120, and -121) were installed at the POL Outparcel, to improve the groundwater monitoring well network coverage, and sampled. Five rounds of groundwater sampling were conducted since installation (February 1997, March 1997, March/April 1998, September/October 1998, and January 1999). These samples were analyzed for TPH measured as purgeable and extractable, BTEX, lead, and PNAs. Results of these samples indicate that only two wells, PL-MW-101 and MW-POLA-121, yielded consistent TPH detections that exceeded the GSA Phase I RCG of 1,200 micrograms per liter. Both of these wells are located within approximately 80 ft of the former AST-2 location. Downgradient wells did not detect TPH or yielded lower TPH concentrations.

The groundwater TPH concentration data collected during this remedial investigation indicate that TPH concentrations are highest near the source (PL-MW-101 and MW-POLA-121) and decrease to below the RCG within a short distance (approximately 100 ft). Total petroleum hydrocarbon concentrations at individual wells appear, within the limitations of the available data, to be gradually decreasing over time. These trends indicate that the concentrations and size of the plume are declining and natural attenuation is occurring at the POL Outparcel (see Sections 4.0 and 5.0).

Groundwater data collected for biodegradation indicator parameters strongly indicate that biodegradation has occurred within the POL Outparcel groundwater plume (see Section 5.0). Almost all samples yielded temperatures between 16 and 20 degrees Celsius and pH readings between 6 and 8, the ranges most favorable to the occurrence of biodegradation. Dissolved oxygen (D.O.) levels were very low at wells PL-MW-101 and -104 and MW-POLA-121 and indicate that D.O. has been depleted within the TPH plume through hydrocarbon oxidation. Redox potential measurements indicate reducing conditions in these three wells, resulting from the removal of D.O. These results provide a strong indication that aerobic biodegradation of the hydrocarbons has occurred within the TPH plume. In all other wells, D.O. concentrations are significantly higher, and redox conditions are oxidizing. These trends indicate that the groundwater in areas downgradient from the petroleum-hydrocarbon plume has the capacity for further aerobic biodegradation should the plume migrate to these areas.

Elevated methane levels in wells PL-MW-101 and MW-POLA-121 and elevated ferrous iron in PL-MW-101, relative to other wells, indicate that anaerobic biodegradation of hydrocarbons is occurring in the reducing environment of the POL Outparcel TPH plume. The data show the typical progression from aerobic to anaerobic biodegradation as oxygen is depleted in the area of highest TPH concentrations. Because biodegradation is a TPH-consuming process, and TPH is no longer being released at the site, it can be inferred that the mass of the TPH plume at the POL Outparcel is being reduced through natural attenuation.

Slug tests were performed in wells MW-POLA-117A, -118, -119, and -121, PL-MW-101, -103, -104, -106, -108, -112B, -113A, and -113C. Drawdown and recovery pump tests were performed in wells MW-POLA-117B and -120. Hydraulic conductivity at the site ranges from $7.4 \times 10^{-4}$ ft/day in MW-POLA-121 to 5.3 ft/day in PL-MW-108. Further details are provided in Appendix F.

# *Tables*

# Table A-1. Petroleum, Oil, and Lubricant Outparcel
## Subsurface Soil Organics Summary
(Page 1 of 2)

| Sample Number / Depth / Type / Location / Soil | HB-4071 SB-POLA-101 2' Bedrock | HB-4073 SB-POLA-101 6.5' Bedrock | HB-4074 SB-POLA-101 7.5' Bedrock | HB-4065 POLA-102 Bedrock | SB 2' | HB-4067 SB-POLA-103 2.5' Bedrock | HB-4068 SB-POLA-103 4' FD[a] Bedrock | GSA[b] Phase I Residential Cleanup Goals for Soil |
|---|---|---|---|---|---|---|---|---|
| ANALYTE | Results in milligrams per kilogram | | | | | | | |
| 2-Methylnaphthalene | ND[c] (0.035) | ND (0.035) | ND (0.036) | ND (0.036) | | ND (0.035) | ND (0.035) | NA[d] |
| Acenaphthene | ND (0.035) | ND (0.035) | ND (0.036) | ND (0.036) | | ND (0.035) | ND (0.035) | NA |
| Anthracene | ND (0.035) | ND (0.035) | ND (0.036) | ND (0.036) | | ND (0.035) | ND (0.035) | 9,376 |
| Benzo(a)anthracene | ND (0.035) | ND (0.035) | ND (0.036) | ND (0.036) | | ND (0.035) | ND (0.035) | 0.11 |
| Benzo(a)pyrene | ND (0.035) | ND (0.035) | ND (0.036) | ND (0.036) | | ND (0.035) | ND (0.035) | 0.186 |
| Benzo(b)fluoranthene | ND (0.035) | ND (0.035) | ND (0.036) | ND (0.036) | | ND (0.035) | ND (0.035) | 0.11 |
| Benzo(k)fluoranthene | ND (0.035) | ND (0.035) | ND (0.036) | ND (0.036) | | ND (0.035) | ND (0.035) | 0.11 |
| Chrysene | ND (0.035) | ND (0.035) | ND (0.036) | ND (0.036) | | ND (0.035) | ND (0.035) | 1.1 |
| Dibenz(a,h)anthracene | ND (0.035) | ND (0.035) | ND (0.036) | ND (0.036) | | ND (0.035) | ND (0.035) | 0.037 |
| Fluoranthene | ND (0.035) | ND (0.035) | ND (0.036) | ND (0.036) | | ND (0.035) | ND (0.035) | 1,250 |
| Fluorene | ND (0.035) | ND (0.035) | ND (0.036) | ND (0.036) | | ND (0.035) | ND (0.035) | 1,250 |
| Indeno(1,2,3-cd)pyrene | ND (0.035) | ND (0.035) | ND (0.036) | ND (0.036) | | ND (0.035) | ND (0.035) | 0.11 |
| Naphthalene | ND (0.035) | ND (0.035) | ND (0.036) | ND (0.036) | | ND (0.035) | ND (0.035) | 1,240 |
| Phenanthrene | ND (0.035) | ND (0.035) | ND (0.036) | ND (0.036) | | ND (0.035) | 0.071 | NA |
| Pyrene | ND (0.035) | ND (0.035) | ND (0.036) | ND (0.036) | | ND (0.035) | ND (0.035) | 938 |
| Benzene | ND (0.0011) | ND (0.0011) | ND (0.0011) | ND (0.0011) | | ND (0.0011) | ND (0.0011) | 0.84 |
| Ethylbenzene | ND (0.0011) | ND (0.0011) | ND (0.0011) | ND (0.0011) | | ND (0.0011) | ND (0.0011) | 3,400 |
| Toluene | ND (0.0011) | ND (0.0011) | ND (0.0011) | ND (0.0011) | | ND (0.0011) | ND (0.0011) | 2,700 |
| Xylenes | ND (0.0011) | ND (0.0011) | ND (0.0011) | ND (0.0011) | | ND (0.0011) | ND (0.0011) | 980 |
| TPH[e] Gasoline | ND (1.1) | ND (1.1) | ND (1.1) | ND (1.1) | | ND (1.1) | ND (1.1) | 100 |
| Unknown HC[f] (purgeable)[g] | ND (1.1) | ND (1.1) | ND (1.1) | ND (1.1) | | ND (1.1) | ND (1.1) | NA |
| Aviation Fuel (JP4) | ND (11) | ND (11) | ND (11) | ND (11) | | ND (11) | ND (11) | 200 |
| TPH Diesel | ND (11) | ND (11) | ND (11) | ND (11) | | ND (11) | ND (11) | 200 |
| Unknown HC (extractable)[h] | 260 J[i] | ND (11) | ND (11) | 61 J | | ND (11) | 12 J | NA |
| Lead (total) | 18.5 | 6.7 | 6 | 13.6 | | 13.2 | 11.1 | 190 |

# Table A-1. Petroleum, Oil, and Lubricant Outparcel
## Subsurface Soil Organics Summary
(Page 2 of 2)

| Sample Number / Location / Depth / Type | HB-4069 SB-POLA-103 6.5' Bedrock | HB-4061 SB-POLA-104 1.5' Fill | HB-4062 SB-POLA-104 6' Bedrock | HB-4063 SB-POLA-104 8.5' Bedrock | HB-4064 SB-POLA-104 10.5' Bedrock | HB-4039 SB-POLA-118 4.5' Bedrock | GSA Phase I Residential Cleanup Goals (RCGs) for Soil |
|---|---|---|---|---|---|---|---|
| ANALYTE | Results in milligrams per kilogram | | | | | | |
| 2-Methylnaphthalene | ND (0.037) | 0.043 | ND (0.035) | ND (0.039) | ND (0.035) | ND (0.035) | NA |
| Acenaphthene | ND (0.037) | ND (0.034) | ND (0.035) | ND (0.039) | ND (0.035) | ND (0.035) | NA |
| Anthracene | ND (0.037) | ND (0.034) | ND (0.035) | ND (0.039) | ND (0.035) | ND (0.035) | 9,376 |
| Benzo(a)anthracene | ND (0.037) | 0.047 | ND (0.035) | ND (0.039) | ND (0.035) | ND (0.035) | 0.11 |
| Benzo(a)pyrene | ND (0.037) | 0.051 | ND (0.035) | ND (0.039) | ND (0.035) | ND (0.035) | 0.186 |
| Benzo(b)fluoranthene | ND (0.037) | 0.071 | ND (0.035) | ND (0.039) | ND (0.035) | ND (0.035) | 0.11 |
| Benzo(k)fluoranthene | ND (0.037) | ND (0.034) | ND (0.035) | ND (0.039) | ND (0.035) | ND (0.035) | 0.11 |
| Chrysene | ND (0.037) | 0.070 | ND (0.035) | ND (0.039) | ND (0.035) | ND (0.035) | 1.1 |
| Dibenz(a,h)anthracene | ND (0.037) | 0.041 | ND (0.035) | ND (0.039) | ND (0.035) | ND (0.035) | 0.037 |
| Fluoranthene | ND (0.037) | 0.054 | ND (0.035) | ND (0.039) | ND (0.035) | ND (0.035) | 1,250 |
| Fluorene | ND (0.037) | ND (0.034) | ND (0.035) | ND (0.039) | ND (0.035) | ND (0.035) | 1,250 |
| Indeno(1,2,3-cd)pyrene | ND (0.037) | 0.036 | ND (0.035) | ND (0.039) | ND (0.035) | ND (0.035) | 0.11 |
| Naphthalene | ND (0.037) | ND (0.034) | ND (0.035) | ND (0.039) | ND (0.035) | ND (0.035) | 1,240 |
| Phenanthrene | ND (0.037) | 0.055 | ND (0.035) | ND (0.039) | ND (0.035) | ND (0.035) | NA |
| Pyrene | ND (0.037) | 0.059 | ND (0.035) | ND (0.039) | ND (0.035) | ND (0.035) | 938 |
| Benzene | ND (0.0011) | ND (0.001) | ND (0.0011) | ND (0.0012) | ND (0.001) | ND (0.0011) | 0.84 |
| Ethylbenzene | ND (0.0011) | ND (0.001) | ND (0.0011) | ND (0.0012) | ND (0.001) | ND (0.0011) | 3,400 |
| Toluene | ND (0.0011) | ND (0.001) | ND (0.0011) | ND (0.0012) | ND (0.001) | ND (0.0011) | 2,700 |
| Xylenes | ND (0.0011) | ND (0.001) | ND (0.0011) | ND (0.0012) | ND (0.001) | ND (0.0011) | 980 |
| TPH Gasoline | ND (1.1) | ND (1.0) | ND (1.1) | ND (1.2) | ND (1.0) | ND (1.1) | 100 |
| Unknown HC (purgeable) | ND (1.1) | ND (1.0) | ND (1.1) | ND (1.2) | ND (1.0) | ND (1.1) | NA |
| Aviation Fuel (JP4) | ND (11) | ND (10) | ND (11) | ND (12) | ND (10) | ND (11) | 200 |
| TPH Diesel | ND (11) | ND (10) | ND (11) | ND (12) | ND (10) | ND (11) | 200 |
| Unknown HC (extractable) | ND (11) | 16 J | ND (11) | ND (12) | ND (10) | ND (11) | NA |
| Lead (total) | 9.2 | 16.6 | 6.6 | 9.8 | 7.7 | 5.4 | 190 |

Shaded value (or detection limit) exceeds the GSA Phase I Residential Cleanup Goal WCFS, 1995b);

[a] Field Duplicate [b] General Services Administration [c] Not detected [d] Not available

[e] Total petroleum hydrocarbon(s) [f] Hydrocarbons [g] unknown HC (purgeable) compared to TPH Gasoline Residential Cleanup Goal

[h] Unknown HC (extractable) compared to TPH Diesel Residential Cleanup Goal [i] Estimated Value

Checked by: MMd 12-23-99
Approved By: AWS 12-23-99

## Table A-2. Petroleum, Oil, and Lubricant Outparcel Composite Surface Rock Organics Summary

| Sample Number Location | HB-4103 SR-POLA-001 | General Services Administration Phase I Residential Cleanup Goals for Soil |
|---|---|---|
| ANALYTE | Results in milligrams per kilogram | |
| 2-Methylnaphthalene | ND[a] (0.5) | NA[b] |
| Acenaphthene | ND (0.5) | NA |
| Anthracene | ND (0.5) | 9,376 |
| Benzo(a)anthracene | ND (0.5) | 0.11 |
| Benzo(a)pyrene | ND (0.5) | 0.186 |
| Benzo(b)fluoranthene | ND (0.5) | 0.11 |
| Benzo(k)fluoranthene | ND (0.5) | 0.11 |
| Chrysene | 0.96 J[c] | 1.1 |
| Dibenz(a,h)anthracene | ND (0.5) | 0.037 |
| Fluoranthene | ND (0.5) | 1,250 |
| Fluorene | ND (0.5) | 1,250 |
| Indeno(1,2,3-cd)pyrene | ND (0.5) | 0.11 |
| Naphthalene | ND (0.5) | 1,240 |
| Phenanthrene | ND (0.5) | NA |
| Pyrene | ND (0.5) | 938 |
| Aviation Fuel (JP4) | ND (1,000) | 200 |
| TPH[d] Diesel | ND (1,000) | 200 |
| Unknown HC[e] (extractable) | 1,800 J[f] | NA |
| Aroclor-1016 | ND (0.02) | 0.16 (Total PCBs)[g] |
| Aroclor-1221 | ND (0.02) | |
| Aroclor-1232 | ND (0.02) | |
| Aroclor-1242 | ND (0.02) | |
| Aroclor-1248 | ND (0.02) | |
| Aroclor-1254 | ND (0.02) | |
| Aroclor-1260 | ND (0.02) | |

Shaded value (or detection limit) exceeds the Residential Cleanup Goal (WCFS, 1995b

[a] Not Detected (detection limit in parentheses)

[b] Not Available

[c] Estimated Value

[d] Total petroleum hydrocarbon(s)

[e] hydrocarbon(s) unknown HC (extractable) compared to TPH Diesel Residential Clean

[f] Estimated

[g] Polychlorinated biphenyls

Checked By: NMF 12-23-99



Approved By: AWS 12-23-99

# Table A-3. Petroleum, Oil, and Lubricant Outparcel Groundwater Organics Summary

(Page 1 of 7)

| Location | MW-POLA-117A | | MW-POLA-117B | | MW-POLA-118 | | | GSA[b] Phase I Residential |
|---|---|---|---|---|---|---|---|---|
| Sample Number | HB-4311 | HB-4344 | HB-4304 | HB-4336 | HB-4316 | HB-4317 (FD)[a] | HB-4341 | Cleanup |
| Date | 02/27/1997 | 03/26/1997 | 02/27/1997 | 03/26/1997 | 02/27/1997 | 02/27/1997 | 03/26/1997 | Goals |
| ANALYTE | Results in micrograms per liter | | | | | | | |
| 2-Methylnaphthalene | ND[c] (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA[d] |
| Acenaphthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 526,495,000 |
| Benzo(a)anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 200,000 |
| Benzo(a)pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 19,000 |
| Benzo(b)fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 56,000 |
| Benzo(k)fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Chrysene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 2,128,000 |
| Dibenz(a,h)anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 29,000 |
| Fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 284,842,000 |
| Fluorene | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | 36,988,000 |
| Indeno(1,2,3-cd)pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 301,000 |
| Naphthalene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 1,710,000 |
| Phenanthrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 249,882,000 |
| Benzene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 350 |
| Ethylbenzene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 1,924,000 |
| Toluene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 835,000 |
| Xylenes | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 20,299,000 |
| TPH[e] Gasoline | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 600 |
| Unknown HC[f] (purgeable) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | NA |
| Aviation Fuel (JP4) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 1,200 |
| TPH Diesel | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 1,200 |
| Unknown HC (extractable) | 53 J[g] | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | NA |

## Table A-3. Petroleum, Oil, and Lubricant Outparcel Groundwater Organics Summary

(Page 2 of 7)

| Location | MW-POLA-119 | | MW-POLA-120 | | MW-POLA-121 | | PL-MW-101 | GSA Phase I Residential |
|---|---|---|---|---|---|---|---|---|
| Sample Number | HB-4303 | HB-4350 | HB-4306 | HB-4351 | HB-4320 | HB-4345 | HB-4321 | Cleanup |
| Date | 02/27/1997 | 03/27/1997 | 02/27/1997 | 03/27/1997 | 02/28/1997 | 03/26/1997 | 02/28/1997 | Goals (RCGs) |
| ANALYTE | Results in micrograms per liter | | | | | | | |
| 2-Methylnaphthalene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (40) | 62 J | NA |
| Acenaphthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (40) | ND (20) | NA |
| Anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (40) | ND (20) | 526,495,000 |
| Benzo(a)anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (40) | ND (20) | 200,000 |
| Benzo(a)pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (40) | ND (20) | 19,000 |
| Benzo(b)fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (40) | ND (20) | 56,000 |
| Benzo(k)fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (40) | ND (20) | NA |
| Chrysene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (40) | ND (20) | 2,128,000 |
| Dibenz(a,h)anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (40) | ND (20) | 29,000 |
| Fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (40) | ND (20) | 284,842,000 |
| Fluorene | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | ND (30) | ND (15) | 36,988,000 |
| Indeno(1,2,3-cd)pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (40) | ND (20) | 301,000 |
| Naphthalene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (40) | 47 | 1,710,000 |
| Phenanthrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (40) | ND (20) | NA |
| Pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (40) | ND (20) | 249,882,000 |
| Benzene | ND (1) | ND (1) | ND (1) | ND (1) | 2.7 | 4.6 | ND (5) | 350 |
| Ethylbenzene | ND (1) | ND (1) | ND (1) | ND (1) | 7.3 | 10 J | 78 | 1,924,000 |
| Toluene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (5) | 835,000 |
| Xylenes | ND (1) | ND (1) | ND (1) | ND (1) | 7.7 | 13 J | 140 | 20,299,000 |
| TPH Gasoline | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 630 J | ND (50) | 600 |
| Unknown HC (purgeable) | ND (50) | ND (50) | ND (50) | ND (50) | 480 J | ND (50) | 4800 J | NA |
| Aviation Fuel (JP4) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 1,200 |
| TPH Diesel | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 1,200 |
| Unknown HC (extractable) | ND (50) | ND (50) | ND (50) | ND (50) | 580 J | 730 J | 6600 J | NA |

## Table A-3. Petroleum, Oil, and Lubricant Outparcel Groundwater Organics Summary

(Page 3 of 7)

| Location | PL-MW-101 | PL-MW-103 | | | PL-MW-104 | | PL-MW-105 | GSA Phase I Residential |
|---|---|---|---|---|---|---|---|---|
| Sample Number | HB-4348 | HB-4308 | HB-4352 | HB-4353 (FD) | HB-4314 | HB-4337 | HB-4293 | Cleanup |
| Date | 03/27/1997 | 02/27/1997 | 03/27/1997 | 03/27/1997 | 02/28/1997 | 03/26/1997 | 02/26/1997 | Goals (RCGs) |
| ANALYTE | Results in micrograms per liter | | | | | | | |
| 2-Methylnaphthalene | ND (40) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Acenaphthene | ND (40) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Anthracene | ND (40) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 526,495,000 |
| Benzo(a)anthracene | ND (40) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 200,000 |
| Benzo(a)pyrene | ND (40) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 19,000 |
| Benzo(b)fluoranthene | ND (40) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 56,000 |
| Benzo(k)fluoranthene | ND (40) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Chrysene | ND (40) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 2,128,000 |
| Dibenz(a,h)anthracene | ND (40) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 29,000 |
| Fluoranthene | ND (40) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 284,842,000 |
| Fluorene | ND (30) | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | 36,988,000 |
| Indeno(1,2,3-cd)pyrene | ND (40) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 301,000 |
| Naphthalene | ND (40) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 1,710,000 |
| Phenanthrene | ND (40) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Pyrene | ND (40) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 249,882,000 |
| Benzene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 350 |
| Ethylbenzene | 77 J | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 1,924,000 |
| Toluene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 835,000 |
| Xylenes | 120 J | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 20,299,000 |
| TPH Gasoline | 4,600 J | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 600 |
| Unknown HC (purgeable) | ND (50) | ND (50) | ND (50) | ND (50) | 130 J | 180 J | ND (50) | NA |
| Aviation Fuel (JP4) | ND (500) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 1,200 |
| TPH Diesel | ND (500) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 1,200 |
| Unknown HC (extractable) | 3,900 J | 110 J | ND (50) | ND (50) | 270 J | 230 J | ND (50) | NA |

## Table A-3. Petroleum, Oil, and Lubricant Outparcel Groundwater Organics Summary

(Page 4 of 7)

| Location | PL-MW-105 | PL-MW-106 | | | PL-MW-107 | | PL-MW-108 | GSA Phase I Residential |
|---|---|---|---|---|---|---|---|---|
| Sample Number | HB-4325 | HB-4294 | HB-4295 (FD) | HB-4326 | HB-4299 | HB-4329 | HB-4296 | Cleanup |
| Date | 03/25/1997 | 02/26/1997 | 02/26/1997 | 03/25/1997 | 02/26/1997 | 03/25/1997 | 02/26/1997 | Goals (RCGs) |
| ANALYTE | Results in micrograms per liter | | | | | | | |
| 2-Methylnaphthalene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Acenaphthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 526,495,000 |
| Benzo(a)anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 200,000 |
| Benzo(a)pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 19,000 |
| Benzo(b)fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 56,000 |
| Benzo(k)fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Chrysene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 2,128,000 |
| Dibenz(a,h)anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 29,000 |
| Fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 284,842,000 |
| Fluorene | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | 36,988,000 |
| Indeno(1,2,3-cd)pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 301,000 |
| Naphthalene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 1,710,000 |
| Phenanthrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 249,882,000 |
| Benzene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 350 |
| Ethylbenzene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 1,924,000 |
| Toluene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 835,000 |
| Xylenes | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 20,299,000 |
| TPH Gasoline | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 600 |
| Unknown HC (purgeable) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | NA |
| Aviation Fuel (JP4) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 1,200 |
| TPH Diesel | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 1,200 |
| Unknown HC (extractable) | ND (50) | ND (50) | ND (50) | ND (50) | 56 J | ND (50) | ND (50) | NA |

## Table A-3. Petroleum, Oil, and Lubricant Outparcel Groundwater Organics Summary

(Page 5 of 7)

| Location | PL-MW-108 | PL-MW-109 | | PL-MW-111A | | PL-MW-111B | | GSA Phase I Residential |
|---|---|---|---|---|---|---|---|---|
| Sample Number | HB-4327 | HB-4310 | HB-4328 | HB-4297 | HB-4339 | HB-4298 | HB-4346 | Cleanup |
| Date | 03/25/1997 | 02/27/1997 | 03/25/1997 | 02/26/1997 | 03/26/1997 | 02/26/1997 | 03/26/1997 | Goals (RCGs) |
| ANALYTE | Results in micrograms per liter | | | | | | | |
| 2-Methylnaphthalene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Acenaphthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 526,495,000 |
| Benzo(a)anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 200,000 |
| Benzo(a)pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 19,000 |
| Benzo(b)fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 56,000 |
| Benzo(k)fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Chrysene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 2,128,000 |
| Dibenz(a,h)anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 29,000 |
| Fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 284,842,000 |
| Fluorene | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | 36,988,000 |
| Indeno(1,2,3-cd)pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 301,000 |
| Naphthalene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 1,710,000 |
| Phenanthrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 249,882,000 |
| Benzene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 350 |
| Ethylbenzene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 1,924,000 |
| Toluene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 835,000 |
| Xylenes | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 20,299,000 |
| TPH Gasoline | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 600 |
| Unknown HC (purgeable) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | NA |
| Aviation Fuel (JP4) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 1,200 |
| TPH Diesel | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 1,200 |
| Unknown HC (extractable) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | NA |

## Table A-3. Petroleum, Oil, and Lubricant Outparcel Groundwater Organics Summary

(Page 6 of 7)

| Location | PL-MW-112A | | PL-MW-112B | | PL-MW-113A | | PL-MW-113C | GSA Phase I Residential |
|---|---|---|---|---|---|---|---|---|
| Sample Number | HB-4307 | HB-4330 | HB-4300 | HB-4349 | HB-4309 | HB-4343 | HB-4302 | Cleanup |
| Date | 02/27/1997 | 03/25/1997 | 02/26/1997 | 03/27/1997 | 02/27/1997 | 03/26/1997 | 02/27/1997 | Goals (RCGs) |
| ANALYTE | Results in micrograms per liter | | | | | | | |
| 2-Methylnaphthalene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Acenaphthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 526,495,000 |
| Benzo(a)anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 200,000 |
| Benzo(a)pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 19,000 |
| Benzo(b)fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 56,000 |
| Benzo(k)fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Chrysene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 2,128,000 |
| Dibenz(a,h)anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 29,000 |
| Fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 284,842,000 |
| Fluorene | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | 36,988,000 |
| Indeno(1,2,3-cd)pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 301,000 |
| Naphthalene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 1,710,000 |
| Phenanthrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 249,882,000 |
| Benzene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 350 |
| Ethylbenzene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 1,924,000 |
| Toluene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 835,000 |
| Xylenes | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 20,299,000 |
| TPH Gasoline | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 600 |
| Unknown HC (purgeable) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | NA |
| Aviation Fuel (JP4) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 1,200 |
| TPH Diesel | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 1,200 |
| Unknown HC (extractable) | 100 J | ND (50) | ND (50) | 110 J | 59 J | ND (50) | 51 J | NA |

# Table A-3. Petroleum, Oil, and Lubricant Outparcel
# Groundwater Organics Summary
(Page 7 of 7)

| Location | PL-MW-113C | PL-MW-114 | | | PL-MW-115 | | PL-MW-116 | | GSA Phase I Residential |
|---|---|---|---|---|---|---|---|---|---|
| Sample Number | HB-4342 | HB-4319 | HB-4331 | HB-4332 (FD) | HB-4318 | HB-4340 | HB-4305 | HB-4335 | Cleanup |
| Date | 03/26/1997 | 02/28/1997 | 03/25/1997 | 03/25/1997 | 02/28/1997 | 03/26/1997 | 02/27/1997 | 03/26/1997 | Goals (RCGs) |
| ANALYTE | Results in micrograms per liter | | | | | | | | |
| 2-Methylnaphthalene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Acenaphthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 526,495,000 |
| Benzo(a)anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 200,000 |
| Benzo(a)pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 19,000 |
| Benzo(b)fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 56,000 |
| Benzo(k)fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Chrysene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 2,128,000 |
| Dibenz(a,h)anthracene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 29,000 |
| Fluoranthene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 284,842,000 |
| Fluorene | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | ND (15) | 36,988,000 |
| Indeno(1,2,3-cd)pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 301,000 |
| Naphthalene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 1,710,000 |
| Phenanthrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | NA |
| Pyrene | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | ND (20) | 249,882,000 |
| Benzene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 350 |
| Ethylbenzene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 1,924,000 |
| Toluene | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 835,000 |
| Xylenes | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | ND (1) | 20,299,000 |
| TPH Gasoline | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 600 |
| Unknown HC (purgeable) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | NA |
| Aviation Fuel (JP4) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 1,200 |
| TPH Diesel | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | ND (50) | 1,200 |
| Unknown HC (extractable) | ND (50) | ND (50) | ND (50) | ND (50) | 140 J | 97 J | ND (50) | ND (50) | NA |

Shaded value (or detection limit) exceeds the GSA Phase I Residential Cleanup Goal (WCFS, 1995b);

[a] Field Duplicate [b] General Services Administration [c] Not Detected [d] Not Available [e] Total petroleum hydrocarbon(s)

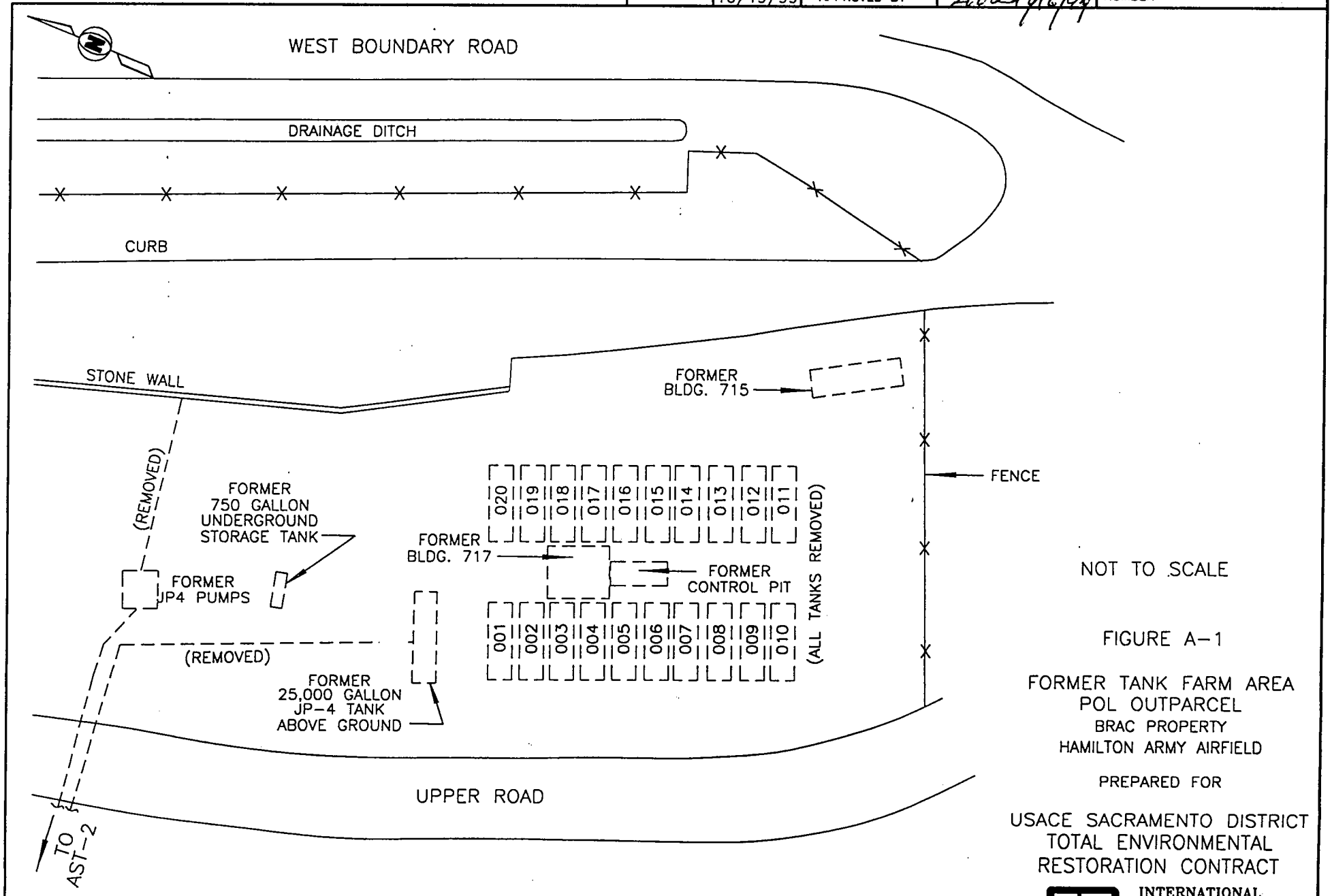
[f] Hydrocarbon(s) unknown HC (purgeable) compared to TPH Gasoline Residential Cleanup Goal, unknown HC (extractable) compared to TPH Diesel Residential Cleanup Goal

[g] Estimated Value

Checked By: MMJ 12-23-99
Approved By: AWS 12-23-99

BRAC POL

| DRAWN BY | RDB | CHECKED BY | MMS 12-16-99 | DRAWING NUMBER | 762538-A326 |
|---|---|---|---|---|---|
| | 10/19/99 | APPROVED BY | ACOS 12/16/99 | | |




NOT TO SCALE

FIGURE A-1

FORMER TANK FARM AREA
POL OUTPARCEL
BRAC PROPERTY
HAMILTON ARMY AIRFIELD

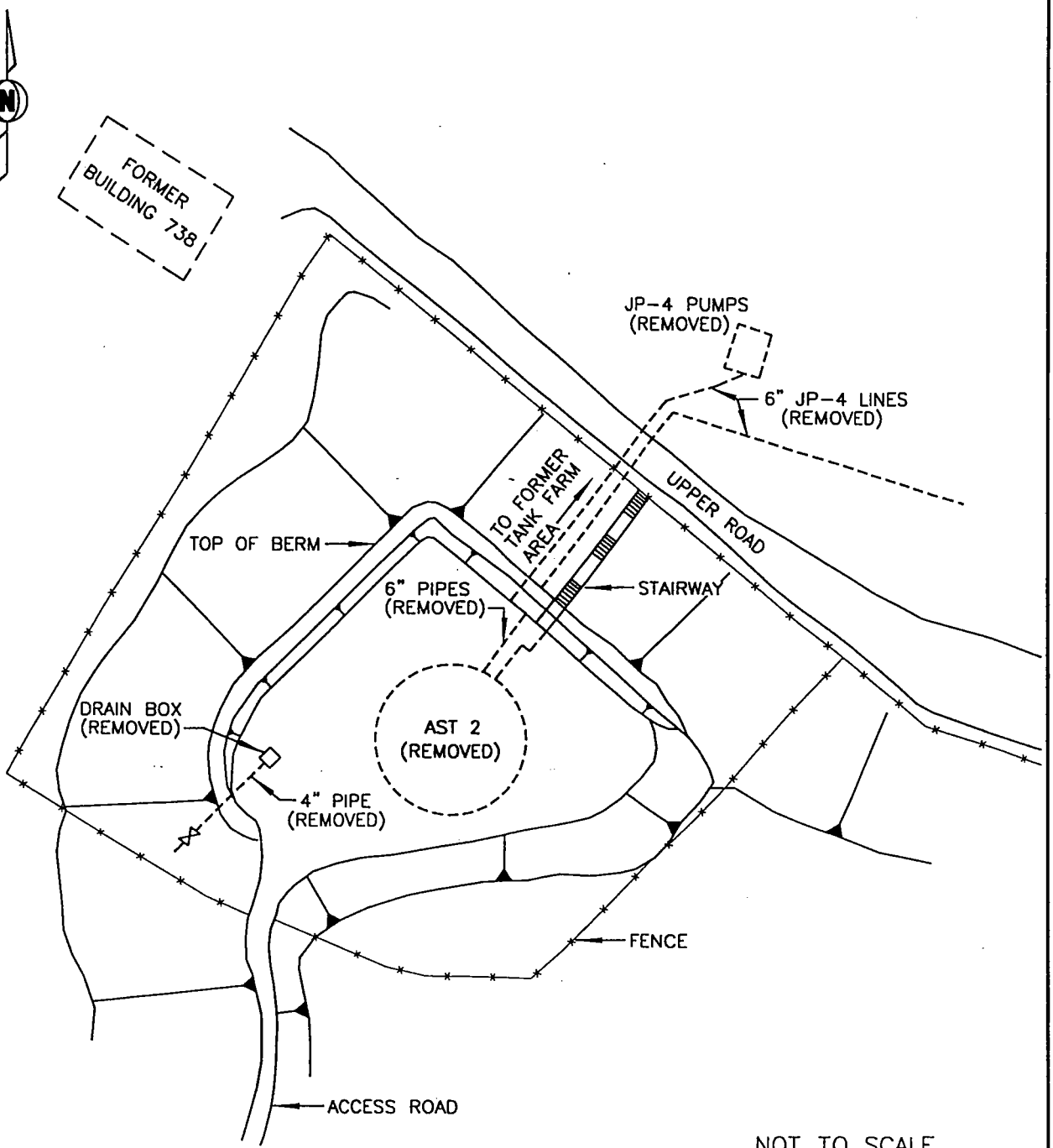
PREPARED FOR

USACE SACRAMENTO DISTRICT
TOTAL ENVIRONMENTAL
RESTORATION CONTRACT

IT INTERNATIONAL TECHNOLOGY CORPORATION

FTFAPOL

| DRAWN BY | RDB | CHECKED BY | mms | 8-26-99 | DRAWING NUMBER | 762538-B505 |
|---|---|---|---|---|---|---|
| | 8/24/99 | APPROVED BY | Ans | 8 Nov 99 | | |




NOT TO SCALE

FIGURE A-2

FORMER AST-2
PLAN LOCATION MAP
POL OUTPARCEL
BRAC PROPERTY
HAMILTON ARMY AIRFIELD

PREPARED FOR

USACE SACRAMENTO DISTRICT
TOTAL ENVIRONMENTAL
RESTORATION CONTRACT

INTERNATIONAL TECHNOLOGY CORPORATION

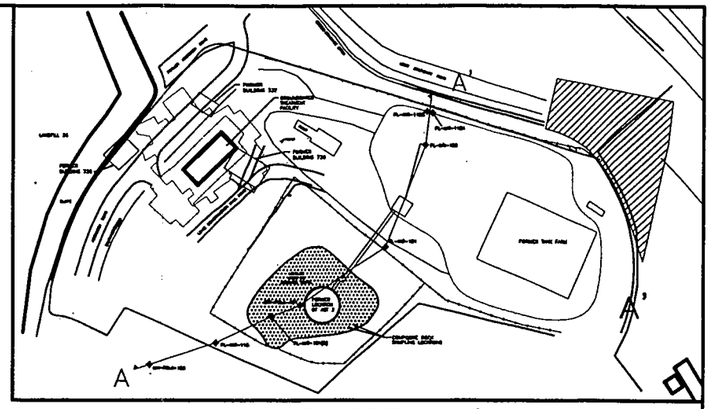
BRAC POL

fast2pol XREF: HBASE12S

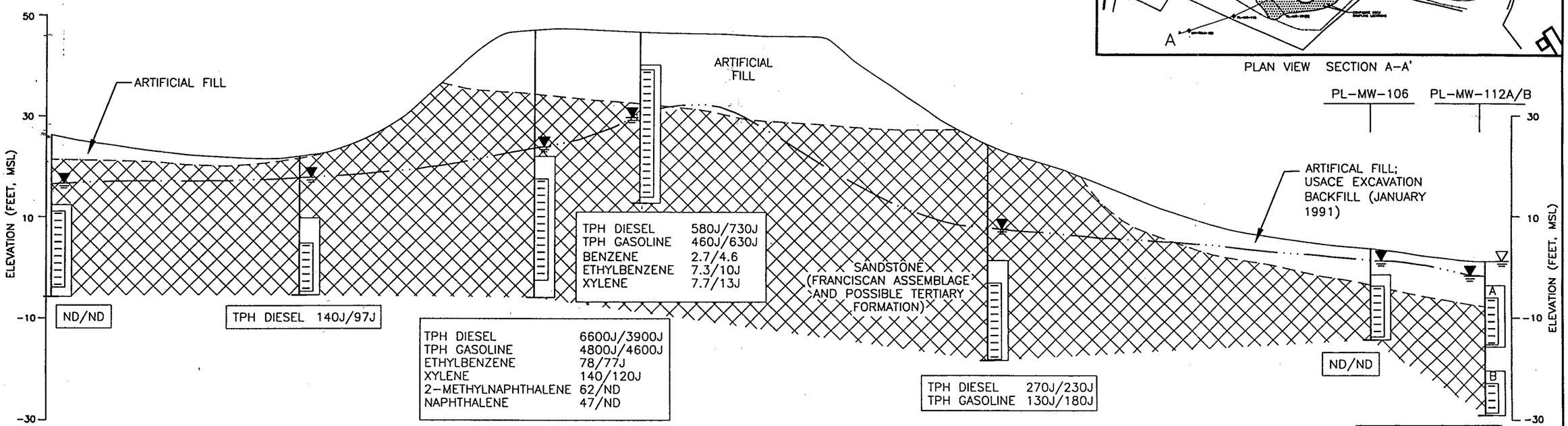
BY | DATE | APPROVED BY | DATE | CHECKED BY | DATE | NUMBER

BRAC POL

HAPOLXSA




PLAN VIEW SECTION A-A'




ARTIFICIAL FILL

SANDSTONE

WATER LEVEL ELEVATION (MARCH 1997)

DEEPER ZONE WATER LEVEL ELEVATION (MARCH 1997)

GEOLOGIC CONTACT, APPROXIMATELY LOCATED

MONITORING WELL, SHOWING
FILTER PACK
SCREEN INTERVAL

GROUNDWATER ANALYTICAL RESULTS (IN µg/L)

6600/3900 FEBRUARY 1997/MARCH 1997 RESULT

J ESTIMATED VALUE

ND NOT DETECTED

NOTE:

WHEN THE CHROMATOGRAM DOES NOT MATCH THAT OF THE FUEL STANDARD USED FOR CALIBRATION, THE CONTAMINANT IS REPORTED BY THE LABORATORY AS "UNKNOWN HYDROCARBON". WHEN THE UNKNOWN FALLS INTO THE GASOLINE RANGE, IT WAS QUANTITATED AGAINST THE GASOLINE STANDARD. WHEN THE UNKNOWN FALLS INTO THE DIESEL RANGE, IT WAS QUANTITATED AGAINST THE DIESEL STANDARD.

APPROXIMATE HORIZONTAL SCALE

0 50 100 FEET

APPROXIMATE VERTICAL SCALE

0 20 40 FEET

(VERTICAL EXAGGERATION = 2.5X)

FIGURE A-3

POL OUTPARCEL
HYDROGEOLOGIC CROSS SECTION A-A'
BRAC PROPERTY
HAMILTON ARMY AIRFIELD

PREPARED FOR

USACE SACRAMENTO DISTRICT
TOTAL ENVIRONMENTAL RESTORATION CONTRACT

INTERNATIONAL TECHNOLOGY CORPORATION

| | |
|---|---|
| DRAWING NUMBER | 762538-B503 |
| CHECKED BY | |
| APPROVED BY | |
| RDB | 8/24/99 |
| DRAWN BY | |

BRAC POL

| SB-POLA-101 | HB-4071(2') | HB-4073(6.5') | HB-4074(7.5') |
|---|---|---|---|
| TPH-DIESEL* | 260J | ND | ND |
| LEAD | 18.5 | 6.7 | 6.0 |

| SB-POLA-102 | HB-4065(2') |
|---|---|
| TPH-DIESEL* | 61J |
| LEAD | 13.6 |

| SB-POLA-118 | HB-4039(4.5') |
|---|---|
| TPH-DIESEL* | ND |
| LEAD | 5.4 |

| SB-POLA-103 | HB-4067(2.5') | HB-4068 (4'FIELD DUP.) | HB-4069(6.5') |
|---|---|---|---|
| TPH-DIESEL* | ND | 12J | ND |
| LEAD | 13.2 | 11.1 | 9.2 |
| PHENANTHRENE | ND | 0.071 | ND |

| SB-POLA-104 | HB-4061(1.5') | HB-4062(6') | HB-4063(8.5') | HB-4064(10.5') |
|---|---|---|---|---|
| TPH-DIESEL* | 16J | ND | ND | ND |
| LEAD | 16.6 | 6.6 | 9.8 | 7.7 |
| 2-METHYLNAPHTHALENE | 0.043 | ND | ND | ND |
| BENZO(A)ANTHRACENE | 0.047 | ND | ND | ND |
| BENZO(A)PYRENE | 0.051 | ND | ND | ND |
| BENZO(B)FLUORANTHENE | 0.071 | ND | ND | ND |
| CHYRSENE | 0.070 | ND | ND | ND |
| DIBENZ(A,H)ANTHRACENE | 0.041 | ND | ND | ND |
| FLUORANTHENE | 0.054 | ND | ND | ND |
| INDENO(1,2,3-CD)PYRENE | 0.036 | ND | ND | ND |
| PHENANTHRENE | 0.055 | ND | ND | ND |
| PYRENE | 0.059 | ND | ND | ND |

LIMIT OF 1993 USACE INVESTIGATION

LIMIT OF 1991 USACE INVESTIGATION

LANDFILL 26

LANDFILL 26 GROUNDWATER TREATMENT FACILITY

FORMER ABERDEEN ROAD

DRAINAGE DITCH

WEST BOUNDARY ROAD

FORMER BUILDING 737

FORMER BUILDING 738

FORMER BUILDING 736

RAMP

HYDRANT

SLOPE

ABERDEEN ROAD

DRAINAGE

LEVEE CONSTRUCTION HAUL ROAD

LEVELED AREA ON BENCHED SLOPE

FORMER AST 2

FORMER TANK FARM

LEGEND:

- FENCE
- SOIL BORING LOCATION
- FORMER STRUCTURE
- APPROXIMATE LIMITS OF USACE EXCAVATION
- ND NOT DETECTED
- J ESTIMATED VALUE

NOTES:

1. ANALYTICAL RESULTS IN mg/kg
2. * ANALYTICAL RESULTS ARE EVALUATED DIRECTLY AS SPECIATED BY MODIFIED EPA METHOD 8015 ANALYSIS, ASSUMING THAT PURGEABLE RESULTS ARE INDICATIVE OF GASOLINE-LIKE CONTAMINANTS AND EXTRACTABLE RESULTS ARE INDICATIVE OF DIESEL-LIKE CONTAMINANTS.

APPROXIMATE SCALE

70 0 70 FEET

FIGURE A-4

POL OUTPARCEL CONTAMINANT CONCENTRATIONS IN SOIL
BRAC PROPERTY
HAMILTON ARMY AIRFIELD

PREPARED FOR

USACE SACRAMENTO DISTRICT
TOTAL ENVIRONMENTAL RESTORATION CONTRACT

INTERNATIONAL TECHNOLOGY CORPORATION

POL-3R XREF: HBASE12S

BRAC POL

| DRAWN BY | RDB | CHECKED BY | MMS 5-26-99 | DRAWING NUMBER | 762538-A316 |
|---|---|---|---|---|---|
| | 8/24/99 | APPROVED BY | AWS 5/26/99 | | |

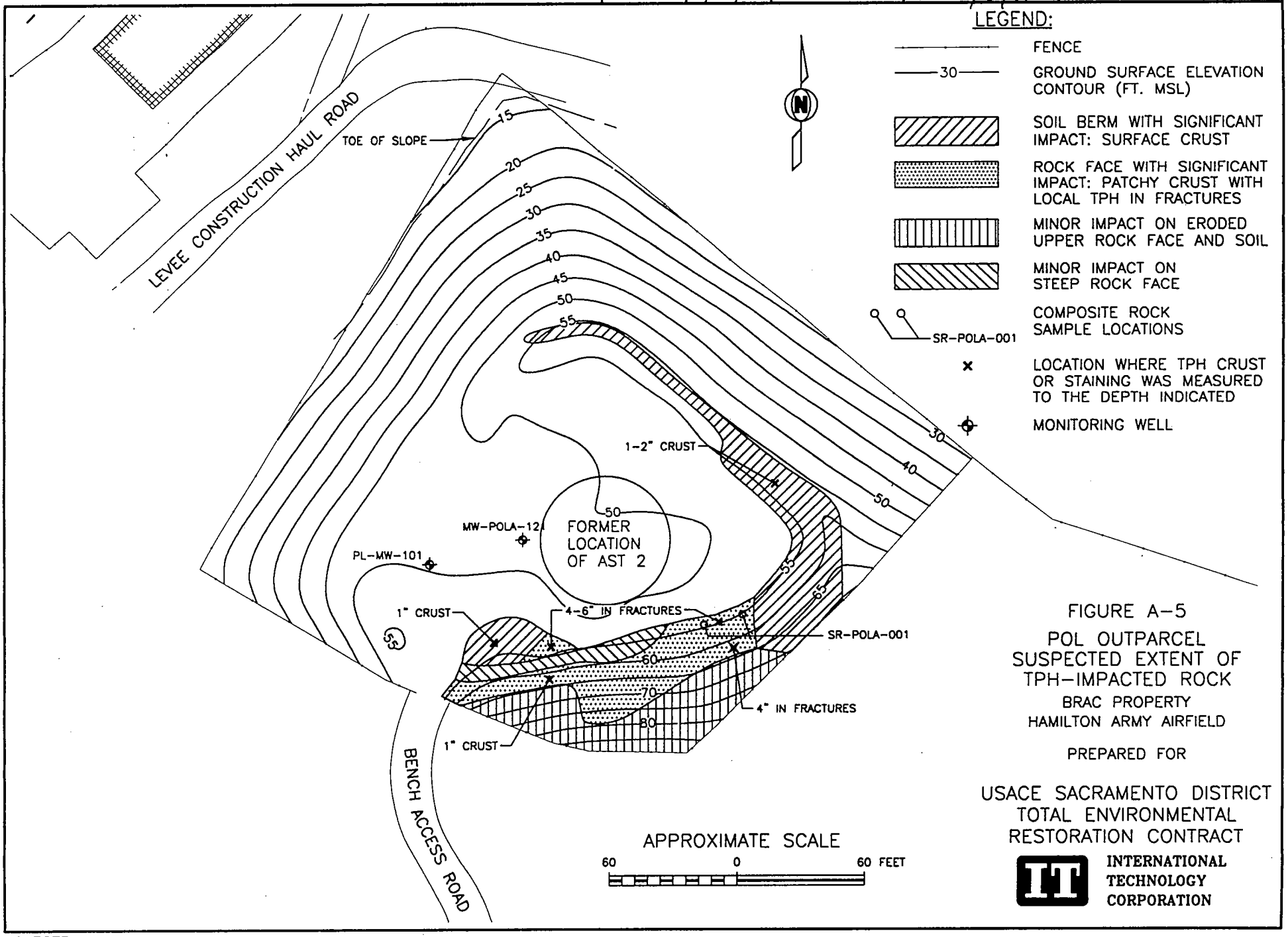



FIGURE A-5

POL OUTPARCEL
SUSPECTED EXTENT OF
TPH-IMPACTED ROCK
BRAC PROPERTY
HAMILTON army AIRFIELD

PREPARED FOR

USACE SACRAMENTO DISTRICT
TOTAL ENVIRONMENTAL
RESTORATION CONTRACT

INTERNATIONAL TECHNOLOGY CORPORATION

POLEOTPH

| | | |
|---|---|---|
| DRAWN BY | RDB | 10/15/99 |
| CHECKED BY | MMS | 12-16-99 |
| APPROVED BY | AJS | 12/16/99 |
| DRAWING NUMBER | 762538-B505 | |

BRAC POL

LIMIT OF 1993 USACE INVESTIGATION

LIMIT OF 1991 USACE INVESTIGATION

FORMER ABERDEEN ROAD

DRAINAGE DITCH

WEST BOUNDARY ROAD

FORMER BUILDING 737

LANDFILL 26 GROUNDWATER TREATMENT FACILITY

LANDFILL 26

FORMER BUILDING 736

FORMER BUILDING 738

HYDRANT

SLOPE

ABERDEEN ROAD

DRAINAGE

LEVEE CONSTRUCTION HAUL ROAD

FORMER TANK FARM

LEVELED AREA ON BENCHED SLOPE

FORMER AST 2

RESERVOIR HILL

PL-MW-111B(D)
PL-MW-111A(S)
MW-POLA-117A(S)
MW-POLA-117B(D)
PL-MW-112A(S)
PL-MW-112B(D)
PL-MW-113C(D)
PL-MW-113A(S)
PL-MW-105
PL-MW-106
PL-MW-107
PL-MW-108
PL-MW-109
PL-MW-116
MW-POLA-118
MW-POLA-121(S)
PL-MW-103
PL-MW-104
PL-MW-110 (ABANDONED)
MW-POLA-119
PL-MW-114
PL-MW-101(D)
PL-MW-115
MW-POLA-120

LEGEND:

- FENCE
- FORMER STRUCTURES
- APPROXIMATE LIMITS OF USACE EXCAVATION
- NHP LEVEE AND EASEMENT
- BRAC PROPERTY BOUNDARY
- GSA PHASE I TRANSFERRED PROPERTY BOUNDARY
- LANDFILL 26 BOUNDARY
- (S) WELL SCREENED ACROSS WATER TABLE
- (D) WELL SCREENED BELOW WATER TABLE
- COMPOSITE ROCK SAMPLING LOCATIONS

APPROXIMATE SCALE

70 0 70 FEET

FIGURE A-6

POL OUTPARCEL
GROUNDWATER WELL LOCATIONS
BRAC PROPERTY
HAMILTON ARMY AIRFIELD

PREPARED FOR

USACE SACRAMENTO DISTRICT
TOTAL ENVIRONMENTAL
RESTORATION CONTRACT

INTERNATIONAL TECHNOLOGY CORPORATION

| | | | |
|---|---|---|---|
| RDB | MM | 8-26-99 | 762538-B504 |
| 8/24/99 | AWS | 8-26-99 | |
| DRAWN BY | CHECKED BY | APPROVED BY | DRAWING NUMBER |

BRAC POL

POL-12A XREF: HBASE12S

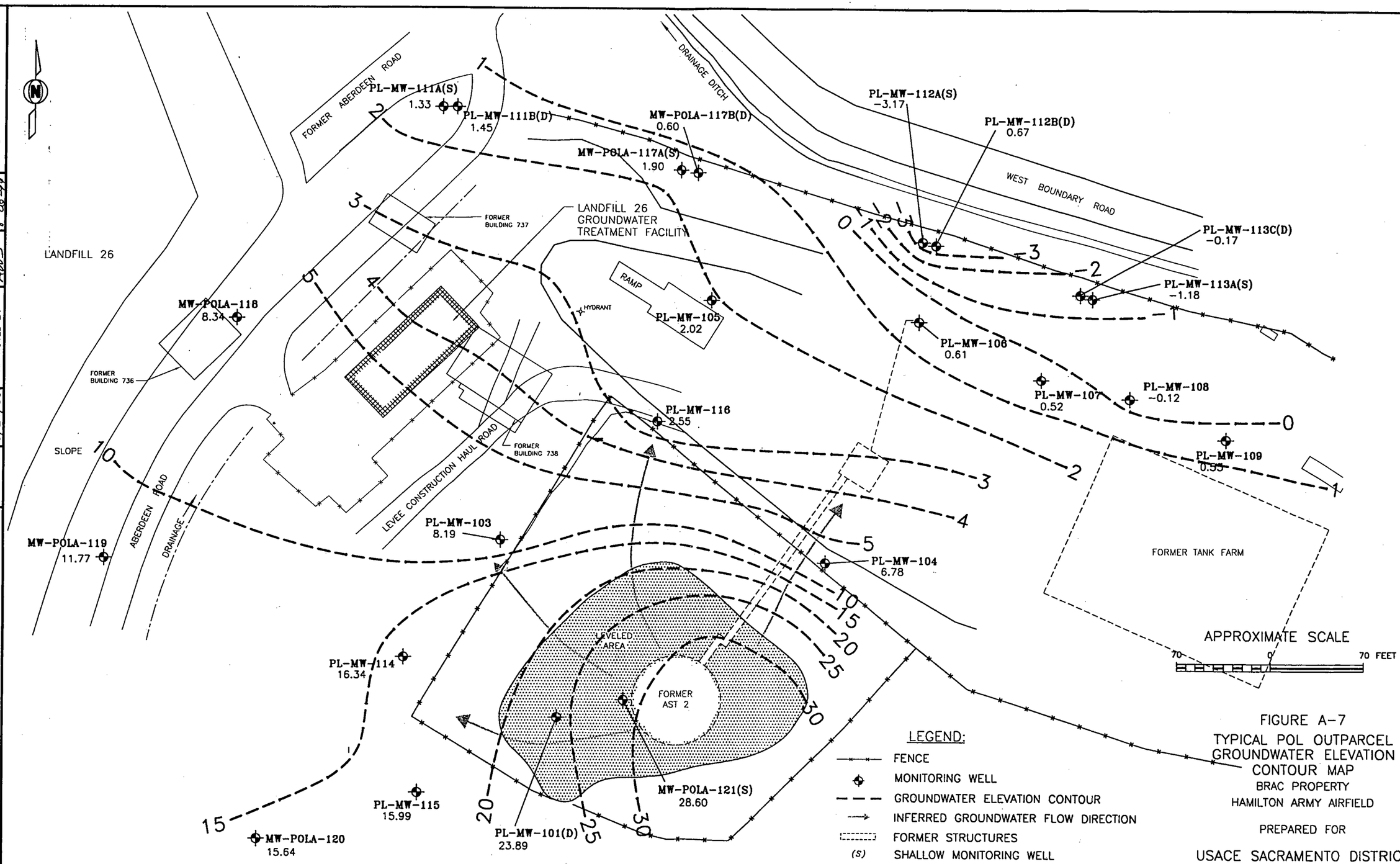



FIGURE A-7
TYPICAL POL OUTPARCEL GROUNDWATER ELEVATION CONTOUR MAP
BRAC PROPERTY
HAMILTON ARMY AIRFIELD

PREPARED FOR

USACE SACRAMENTO DISTRICT
TOTAL ENVIRONMENTAL RESTORATION CONTRACT

INTERNATIONAL TECHNOLOGY CORPORATION