Hazardous, Toxic, and Radioactive Waste (HTRW) Site Inspection Report DERP-FUDS Site IO2PR006800

Former Lower Camp Debris Site Culebra Island, Puerto Rico

Revision No. 00

Contract No. W912DY-09-D-0060
Task Order No. 0002

Submitted to:

U.S. Army Engineering and Support, Huntsville

Prepared by:

1000 Abernathy Road
Suite 1600
Atlanta, GA 30328

December 2011

Hazardous, Toxic, and Radioactive Waste (HTRW) Site Inspection Report at DERP-FUDS Site IO2PR006800

Former Lower Camp Debris Site
Culebra Island, Puerto Rico

Revision No. 00

Contract No. W912DY-09-D-0060
Task Order No. 0002

Submitted to:

U.S. Army Engineering and Support, Huntsville

Prepared by:

CH2MHILL.

December 2011

Prepared/Approved By:

Tom Beisel, P.G., Project Manager — December 16, 2011 Date

Approved By:

Ben Redmond, Program Manager — December 16, 2011 Date

Client Acceptance:

USACE, Responsible Authority — Date

Contents

1.0 Introduction 1-1
1.1 Site Description and History 1-2
1.2 Previous Site Investigation 1-6
1.3 Technical Project Planning Meeting 1-9
1.4 Project Objectives 1-9

2.0 Environmental Setting 2-1
2.1 Physiography and Topography 2-1
2.2 Climate 2-1
2.3 Surface Water 2-3
2.4 Regional Geology and Hydrogeology 2-3

3.0 Site Inspection Procedures 3-1
3.1 Site Walk and Visual Inspection 3-1
3.2 Site Geophysical Screening 3-1

4.0 Site Inspection Results 4-1
4.1 Site Walk and Visual Inspection 4-1
4.2 Site Geophysical Screening 4-1
4.3 Risk-based Screening of 1996 Site Investigation Analytical Data 4-2
4.3.1 Soil 4-2
4.3.2 Groundwater 4-3
4.3.3 Cumulative Soil and Groundwater 4-4
4.3.4 Protection of Groundwater 4-4

5.0 Conclusions and Recomendations 5-1
5.1 Conclusions 5-1
5.2 Recomendations 5-2

6.0 References 6-1

Tables

1-1 Summary Analytical Results – Sediment/Soil and Groundwater Samples
4-1 Screening Levels Used in the Risk Screening
4-2 Human Health Risk Assessment Contaminants of Potential Concern - Residential
4-3 Human Health Risk Assessment Contaminants of Potential Concern - Industrial
4-4 Soil Protection of Groundwater Screening

Figures

1-1 Puerto Rico Site Location Map
1-2 Culebra Site Location Map
1-3 Former Lower Camp Debris Site Location
1-4 Site Map from 1996 Site Investigation by Ecology and Environment, Inc.

Contents

Figures, Continued

2-1 Site Inspection Location Topography
3-1 Site Inspection Location Map
3-2 GPS Debris Locations – Map Area 1
3-3 GPS Debris Locations – Map Area 2
3-4 GPS Debris Locations – Map Area 3
3-5 Geophysical Screening Map

Appendices

A Site Investigation Report Prepared by Ecology and Environment, Inc.
B Technical Project Planning Meeting Minutes
C Photodocumentation Log: Photographs of Debris Located at the Former Lower Camp Debris Site
D Geophysical Screening Report by OneVision Utility Services

Acronyms and Abbreviations

˚F	Fahrenheit
AMSL	above mean sea level
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CH2M HILL	CH2M HILL Constructors, Inc.
DAF	dilution attenuation factor
DoD	U.S. Department of Defense
DQO	data quality objective
E&E	Ecology and Environment, Inc.
EDB	ethylene dibromide
ELCR	excess lifetime cancer risk
EPA	U.S. Environmental Protection Agency
ERIS	Environmental Restoration Information System
ft^2	square feet
GPR	ground penetrating radar
GPS	global positioning system
HQ	hazard quotient
HTRW	hazardous, toxic, and radioactive waste
IEUBK	Integrated Exposure Uptake Biokinetic
µg/L	micrograms per liter
mg/kg	micrograms per kilogram
MCL	maximum contaminant level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
PAH	polynuclear aromatic hydrocarbon
PREQB	Puerto Rico Environmental Quality Board

Acronyms and Abbreviations, Continued

RSL	Regional Screening Level
SI	Site Inspection
SSL	soil screening level
TRPH	total recoverable petroleum hydrocarbon
USACE	U.S. Army Corps of Engineers
USACEHNC	U.S. Army Corps of Engineers, Engineering and Support Center, Huntsville
USFWS	U.S. Fish and Wildlife Service

1.0 Introduction

CH2M HILL Constructors, Inc. (CH2M HILL) has been contracted by the U.S. Army Corps of Engineers (USACE), U.S. Army Corps of Engineers, Engineering and Support Center, Huntsville (USACEHNC), to prepare this Site Inspection (SI) Report for the Former Lower Camp Debris Site located on Culebra Island, Puerto Rico. The work was performed in accordance with Contract Number W912DY-09-D-0060, Task Order Number 0002. The SI presents the findings obtained following CH2M HILL's evaluation of historical and recently collected site data. The SI was performed to determine if the contaminants detected in the soil and groundwater and surface debris present a risk to human health and the environment. The SI also includes recommendations for additional work based on our evaluation of data.

During the completion of the work, CH2M HILL abided by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), as appropriate. Additionally, CH2M HILL performed the work in accordance with the *Guidance for Performing Site Inspections Under CERCLA*, September 1992 (U.S. Environmental Protection Agency [EPA] 540-R-92-021, Directive 9345.1-05); the *Relative Risk Site Evaluations Primer*, Summer 1997 (Revised Edition), DoD; and the USACE *Safety and Health Requirements Manual* (effective 12 January 2009).

This report is organized as follows:

- **Section 1.0 Introduction** includes the site description (history and summary of previous work) along with a summary of the Technical Project Planning meeting and project objectives.
- **Section 2.0 Environmental Setting** provides a description of the physiography and topography, climate, surface water, and regional geology and hydrogeology.
- **Section 3.0 Site Inspection Procedures** provides a summary of the field activities followed during execution of the work scope and includes details pertaining to a site walk and visual survey and geophysical screening.
- **Section 4.0 Site Inspection Results** presents the findings obtained from the site walk and visual inspection and geophysical screening activities.
- **Section 5.0 Conclusions and Recommendations** summarizes the major conclusions obtained from completion of the work and provides recommendations.
- **Section 6.0 References** contains a list of the works cited in this report.
- **Appendix A** contains the 1996 Site Investigation Report prepared by Ecology and Environment, Inc. (E&E).
- **Appendix B** contains the Technical Project Planning meeting minutes.
- **Appendix C** contains the Photodocumentation Log for Former Lower Camp Debris Site.

- **Appendix D** contains the geophysical screening report by OneVision Utility Services.

1.1 Site Description and History

Culebra Island is located approximately 17 miles east of the Puerto Rican mainland and 9 miles north of Vieques (see **Figure 1-1**) and encompasses an area of about 10 square miles. The interior of Culebra is primarily used for pasture, and the remainder of the island is covered by brush and secondary growth forest. The town of Culebra and surrounding areas are residential and commercial with individual homes and small resorts scattered throughout the island. The Península Flamenco on the northwest corner of Culebra was once used as a gunnery impact area by the U.S. Navy, but is now designated as a wildlife refuge (U.S. Geological Survey [USGS], 1996).

After Spain ceded all of Puerto Rico to the United States in 1898 at the end of the Spanish-American War, President Roosevelt placed all of Culebra's public lands under Navy control in 1901. These areas included all of Culebra Island, nearby keys, and all surrounding water for a total area of approximately 92,500 acres (7,300 acres of land and 85,000 acres of water) (see **Figure 1-2**). After acquisition in 1901, the Navy built permanent camps and the Caribbean Fleet used the area for naval exercises. In addition, the Marines used Culebra for training from 1903 until 1941, and the Navy used Culebra as a bombing and gunnery range from 1935 until 1975. In September 1980, the Navy transferred the property to the U.S. Department of Interior.

The Former Lower Camp Debris Site encompasses a 40,000-square foot (ft^2) section (100 feet by 400 feet) of marine wetland located along the eastern shoreline of Ensenada del Cementerio. The area is located adjacent to the Department of Conservation automotive shop, and is currently under the jurisdiction of the Commonwealth of Puerto Rico and the Authority for Conservation and Development of Culebra (see **Figure 1-3**). Historically, the area east of the wetland was used by the Navy as a housing facility from the early 1940s until 1980. A concrete foundation, currently occupied by the Department of Conservation automotive shop, previously supported a Navy restroom facility. Between the early 1940s and 1980, various materials were discarded into the wetland area west of the bathroom facility. These previously identified areas are located within the Estimated Site Walk and Visual Inspection Area shown on **Figure 1-3** and are within the area of interest for this investigation.

N

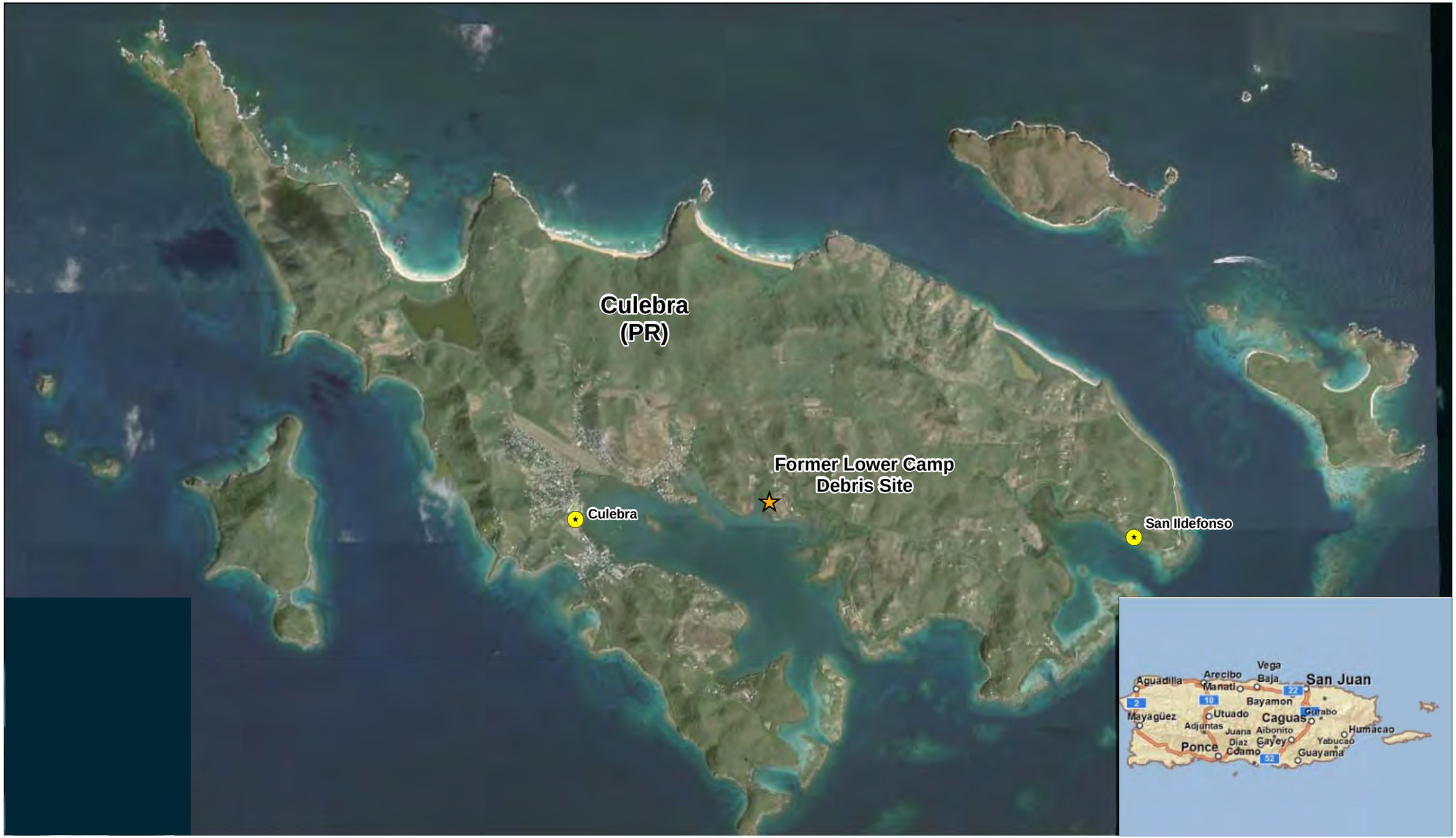
0 4 8 16
Miles

1 in = 10 miles

FIGURE 1-1
Puerto Rico Site Location Map
Former Lower Camp Debris Site
Culebra, Puerto Rico

CH2MHILL

\\GALILEO\PROJ\USNAVY\PUERTORICO_CULEBRA\MAPFILES\CAMPOREILLY\LOCATIONMAP.MXD LSUBER1 7/16/2010 09:23:59



City

Site Location

N

0 0.5 1 2
Miles

1 in = 1 miles

Imagery Source: World Imagery, ESRI Online v92, 2007

FIGURE 1-2
Culebra Site Location Map
Former Lower Camp Debris Site
Culebra, Puerto Rico

CH2MHILL

\\GALILEO\PROJ\USNAVY\PUERTORICO_CULEBRA\MAPFILES\CULEBRA\LOCATIONMAP.MXD LSUBER1 7/16/2010 10:34:47

Estimated Site Walk and Visual Inspection Area

N

0 75 150 300
Feet

1 in = 150 feet

Imagery Source: World Imagery, ESRI Online v92, 2007

FIGURE 1-3
Site Location
Former Lower Camp Debris Site
Culebra, Puerto Rico

CH2MHILL

ATL \\GALILEO\PROJ\USNAVY\PUERTORICO_CULEBRA_378718\MAPFILES\CULEBRA\SITEMAP.MXD JKELLY3 12/12/2011 9:45:51 AM

1.2 Previous Site Investigation

On July 19, 1996, E&E performed a site investigation and prepared a Site Investigation Report (E&E, 1996) that was submitted to the USACE on October 4, 1996 (**Appendix A**). A summary of the work performed as part of the 1996 site investigation is provided below. The site map from the previous site investigation is shown on **Figure 1-4**.

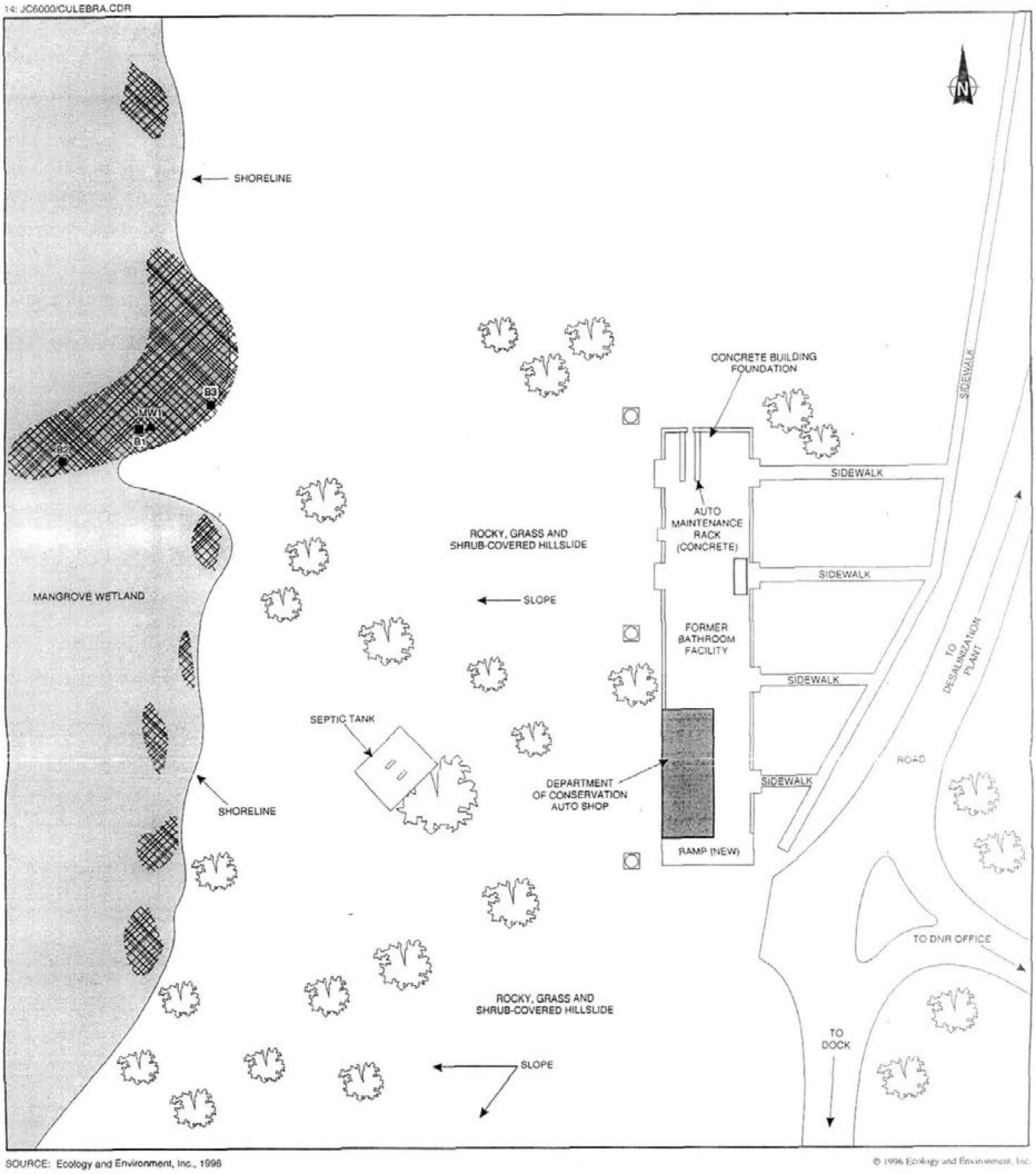
General Information

- Debris was scattered along approximately 400 feet of the shoreline and extended from 20 feet to 100 feet into the wetland.
- The highest concentration of debris encompassed an area of approximately 4,800 ft^2 (40 feet by 120 feet). The debris consists primarily of rusted metal building materials such as steel beams and reinforcing rods, corrugated steel sheeting, and bolts.
- Other material observed in the wetland area included broken glass and automobile parts.
- The eastern edge of the wetland area is approximately 180 feet west (downslope) of a 35-foot by 160-foot concrete pad. The pad was part of a Navy restroom facility, but is now used by the Department of Conservation as an automotive maintenance facility.
- The hillside between the automotive maintenance facility and the wetland area is scattered with auto body parts and corrugated steel sheeting that appears relatively new (i.e., within 10 to 15 years as of 1996).
- No freshwater bodies, streams, or water supply wells are located in the immediate vicinity of the site.
- A water intake for the Culebra Island Desalinization Plant is located in Ensenada Honda Bay, about 700 feet south of the debris area (50 to 100 feet offshore). However, the desalinization plant is currently not in use, and drinking water to Culebra Island is pumped through pipes from the main island of Puerto Rico to Vieques Island, and from Vieques Island to Culebra Island.

Soil and Groundwater Investigation

- Three soil borings (B-1, B-2, and B-3) were advanced within the wetland in an area of concentrated debris (see **Figure 1-4**). Boring B-1 was advanced to 4 feet below ground surface (bgs), and borings B-2 and B-3 were advanced to 2 feet bgs. Soil samples from the 0- to 2-foot intervals of soil borings B-l and B-2 were collected for lithologic description, headspace screening, and chemical analysis. Composite soil samples were collected at 2-foot intervals from the ground surface to the boring completion depth. Soil samples were analyzed for the following: purgeable aromatic hydrocarbons, purgeable aromatic halocarbons, ethylene dibromide (EDB), polynuclear aromatic hydrocarbons (PAHs), total recoverable petroleum hydrocarbons (TRPHs), and eight metals (lead, arsenic, cadmium, chromium, barium, selenium, silver, and mercury).

14: JC6000/CULEBRA.CDR



SOURCE: Ecology and Environment, Inc., 1996

© 1996 Ecology and Environment, Inc.

SCALE
0 40 80 FEET

KEY:
- Tree
- Building
- Septic System Manway
- Sediment Sampling Location
- Visible Areas of Metal Debris
- Monitoring Well

FIGURE 1-4
Site Map from 1996 Site Investigation by Ecology and Environment, Inc.
Former Lower Camp Debris Site
Culebra, Puerto Rico

A 2-inch diameter, temporary monitoring well, screened from 0.5 to 5 feet bgs, was installed in the wetland area immediately adjacent to soil boring B-1 (see **Figure 1-4**). The well was purged and groundwater samples were analyzed for the same parameters as soil.

Soil and Groundwater Results

- Lithology from ground surface to the completion depth of the borings was characterized as black organic silt and peat.
- Groundwater was encountered at 0.3 foot bgs.
- No odor, visible evidence of contamination (staining and/or sheens) or elevated headspace readings were observed in the soil and groundwater.
- Soil/sediments have been impacted by metals and benzo(k)fluoranthene (see **Table 1-1**).
- Elevated levels of metals (above background and regulatory levels) were detected in the unfiltered groundwater sample (**Table 1-1**).
- Elevated concentrations of lead and barium were detected in the filtered groundwater sample (**Table 1-1**).

TABLE 1-1
Summary Analytical Results – Sediment/Soil and Groundwater Samples
Former Lower Camp Debris Site, Culebra, Puerto Rico

Parameter	**Soil Samples (mg/kg)**		**Groundwater Sample (µg/L)**	
	B-1 (0-2 feet bgs)	**B-2 (0-2 feet bgs)**	**MW1**	
TRPHs	660	ND	ND	
Benzo(k)fluoranthene	16	0.24	ND	
Metals			**Total[a]**	**Dissolved[b]**
Arsenic	17	8.6	220	ND
Barium	540	120	2,300	54
Chromium	38	7.6	750	ND
Lead	460	52	4,700	9.8
Selenium	ND	0.94	29	ND
Mercury	0.17	0.049	0.82	ND

Notes:
[a] total (unfiltered) metals concentration
[b] filtered (0.45 micron) metals concentration
bgs = below ground surface
mg/kg = milligrams per kilogram
µg/L = micrograms per liter
ND = not detected
TRPHs = total recoverable petroleum hydrocarbons
Source: Ecology and Environment, 1996

1.3 Technical Project Planning Meeting

On July 8, 2010, CH2M HILL personnel attended a Technical Project Planning meeting in San Juan, Puerto Rico. Attendees included USACE personnel and representatives from the EPA, Puerto Rico Environmental Quality Board (PREQB), and USFWS (see *July 8, 2010 Meeting Minutes* in **Appendix B**). The meeting was held to present the inspection approach developed to complete the SI and gain regulatory acceptance of the approach prior to the execution of field activities.

At the conclusion of the meeting, all parties agreed that additional work would include:

- Completion of a site visit to corroborate the locations of debris identified by E&E in 1996
- Completion of a geophysical survey to locate and estimate the extent of buried debris
- Locating the outlet of the existing septic tank through visual observations and/or geophysical screening equipment

The EPA and USFWS also requested that vegetation not be cleared during completion of the geophysical work to prevent damage to the mangroves.

1.4 Project Objectives

The objective of this project was to complete an SI and perform a relative site risk evaluation of the Former Lower Camp Debris Site on Culebra Island, Puerto Rico. The data quality objectives (DQOs) included the collection of additional data to determine the presence or absence of contamination, and the determination if additional investigation is warranted. In order to complete these objectives, CH2M HILL conducted the following activities:

- Performed a site visit to obtain additional site information regarding the type, location, and distribution of debris
- Completed a geophysical survey to locate and delineate, to the extent possible, buried metal debris
- Completed visual observations and a geophysical survey to locate, to the extent possible, the outlet of the existing septic tank, and
- Photographed the debris field

2.0 Environmental Setting

This section provides an overview of Culebra Island and the Former Lower Camp Debris Site describing the physiography and topography, climate, surface water, and regional geology and hydrogeology.

2.1 Physiography and Topography

Culebra Island contains an east-west trending ridge with an average elevation of about 300 feet above mean sea level (AMSL) in the northern part of the island. To the north of the ridge, the land slopes steeply from the crest to the coast. However, the slope to the south of the ridge is steep near the ridges and becomes more moderate below an elevation of 200 feet AMSL. Below this elevation, the topography is characterized by southward trending valleys separated by low ridges to the coast. The larger of these valleys contain alluvium in small embayments where they reach the coast. Intermittent stream channels drain the valleys on the south side of the ridge. An interior valley located in east central Culebra contains a relatively extensive area of alluvium in its upper reaches. A northwest to southeast trending ridge, ranging from 300 to 440 feet AMSL, forms the western part of Culebra. The ridge is separated from the remainder of the island by a low saddle between Ensenada Honda and Bahía Flamenco (USGS, 1996).

The Former Lower Camp Debris Site is primarily located within a mangrove bordering Ensenada del Cementerio. The land surface adjacent to the mangrove is characterized by gentle to moderate slopes covered in dense vegetation and 1- to 3-foot wide boulders; a small percentage of area has grassy vegetation. Land surface elevations at the site range from sea level to 10 feet AMSL. The topography of the Former Lower Camp Debris Site is shown on **Figure 2-1**.

2.2 Climate

The Former Lower Camp Debris Site is located in a tropical climate that is characterized by year around moderate temperatures (averaging 86 degrees Fahrenheit [˚F]). Average high temperatures range from 85˚F in January and February to 90˚F in July, August, and September; average low temperatures range from 72˚F in January to 78˚F in June, July, August, and September (The Weather Channel, 2011).

Annual rainfall on Culebra averaged approximately 32 inches from 1961 to 1970 (Jordan and Gilbert, 1976).

Surface Water Flow Direction

Estimated Extent of Surface Debris

Data Source: USGS 7.5 Minute Topographic Map
Culebra and Adjacent Islands, P. R. 1948
Contour Interval 5 feet

N

0 100 200 400
Feet

1 in = 200 feet

FIGURE 2-1
Site Inspection Location Topography
Former Lower Camp Debris Site
Culebra, Puerto Rico

CH2MHILL

ATL \\GALILEO\PROJ\USNAVY\PUERTORICO_CULEBRA_378718\MAPFILES\CULEBRA\GPS_LOCATIONS\TOPO.MXD JKELLY3 12/7/2011 7:52:01 PM

2.3 Surface Water

The Former Lower Camp Debris Site is located mostly within a mangrove bordering Ensenada del Cementerio and is directly influenced by tidal flux. No named streams or freshwater bodies are within the vicinity of the site (see **Figure 1-3**).

2.4 Regional Geology and Hydrogeology

Culebra is underlain primarily by volcanic and plutonic rocks of Late Cretaceous age. Andesite lava, lava breccia, and tuffs are the dominant volcanic rocks with intrusions by diorite and diorite porphyry; these rocks are characterized by fractures formed in a joint pattern. Some faulting is also present, with major faults aligned in a northwest-southeast direction. Alluvium, predominately composed of silt and clay with minor quantities of sand and gravel, is deposited in the few existing river valleys near the coast. On the coast, alluvium interfingers with coral, beach, and mangrove deposits (USGS, 1996).

The soil cover associated with Culebra is homogeneous and has only one soil association, the Descalabrado-Guayama. This association is described by Boccheciamp (1977) as composed of shallow, well drained, strongly sloping to very steeply sloping soils derived from the underlying volcanic rocks. The associated permeability is moderate and ranges from 0.6 to 2.0 inches per hour (USGS, 1996).

Although scarce, groundwater associated with Culebra occurs in alluvial deposits and in volcanic and plutonic rocks. Fractures and joints within the volcanic and plutonic rock formations store water in small quantities. Most of these fractures and joints diminish in number and size with depth and pinch out at about 300 feet bgs. Water table conditions prevail in the bedrock aquifer. By comparing changes in water levels with records of pumpage and estimates of recharge, the specific yield for the bedrock aquifer was estimated as less than 1 percent (Jordan and Gilbert, 1976; USGS, 1996).

Direct rainfall is the only source of recharge for the Culebra aquifer system. However, recharge from rainfall only occurs during storms that last 2 to 4 days. Such storms take place only two to three times a year. About 1 percent of the rainfall infiltrates to the aquifer during these events. Annual recharge ranges from 0 to 6.8 percent of annual rainfall (Jordan and Gilbert, 1976; USGS, 1996).

The depth to the water table beneath the ridges may be 100 feet or more, but in the lower part of the valleys may be less than 10 feet. The water flows toward the sea, but little water is discharged to the sea because it mostly evaporates from the water table. In coastal embayments, such as the Former Lower Camp Debris Site, the water table usually is 1 to 2 feet AMSL. Because of the low heads and the proximity to the sea, salt water encroachment is common (USGS, 1996).

Groundwater associated with Culebra is characterized by naturally high mineral concentrations that in most cases exceed EPA standards for drinking water. Dissolved-solids concentrations range from 500 to 1,000 milligrams per liter (mg/L). This condition is a result of airborne particulates that fall on the land surface and infiltrate the aquifer during periods of recharge and evapotranspiration in the soil zone. The most serious potential threat to groundwater on Culebra are effluents from septic tanks; these effluents can quickly infiltrate

through the thin soil and saprolite zone, and enter the fractured bedrock aquifer in a nearly unfiltered, unaltered state. The greater the concentration of septic tanks in an area, the greater the potential threat to the aquifer (USGS, 1996).

No water supply wells are located in the immediate vicinity of the Former Lower Camp Debris Site. A water intake for the Culebra Island Desalinization Plant is located in Ensenada Honda Bay, about 700 feet south of the debris area (50 to 100 feet offshore). However, the desalinization plant currently is not in use, and drinking water to Culebra Island is pumped through pipes from the main island of Puerto Rico to Vieques Island, and from Vieques Island to Culebra Island.

3.0 Site Inspection Procedures

This section of the report summarizes the field procedures by CH2M HILL personnel during site inspection activities on August 14, 2011 and August 15, 2011.

3.1 Site Walk and Visual Inspection

A site walk and visual survey was performed to record detailed information regarding the type, location, and estimated extent of debris currently at the site. Site activities occurred during low tide to expose and identify debris that may be covered by water. The extent of metal debris based on the 1996 SI is shown on **Figure 1-4** and the site walk area is shown on **Figure 1-3**. Once located, the debris areas were photographed, and the latitude and longitude determined using a handheld global positioning system (GPS) unit. The GPS unit was calibrated, maintained, and inspected in accordance with the procedures presented in the owner's manual. **Figures 3-1** through **3-4** present the site walk and GPS debris location maps.

3.2 Site Geophysical Screening

Geophysical screening was performed following the site walk to determine the extent of buried debris and locate the outfall piping for the septic tank (see **Figure 3-5**). The following instruments were available for use:

- Radiodetection RD8000 – This is a direct and indirect connection instrument that allows the tracing of all conductive utility systems through direct access to the system (i.e., valve/electrical panel/terminal). A signal is placed on a selected frequency appropriate to the target utility with the transmitter and then detected with a handheld receiver providing horizontal location of the target utility. In addition, this instrument has the capacity to operate on passive frequencies to detect underground power and communications lines that may not have an access point in the project area. Because this is a handheld instrument, most vegetation can be navigated so long as it is passable by walking. Equipment is calibrated for accuracy according to manufacturer standards.
- Pipehorn Model 800 – This is an indirect connection instrument that operates by emitting a signal directly into the ground with the transmitter at a static high frequency, which is then detected by the receiver. Also a handheld instrument, this unit is specifically geared to tracing systems that have no direct access point as well as performing a final site clearance for errant lines. Grid sweeps are performed at each location at transects of 5 feet north/south and east/west to capture all available field data. Because this is a handheld instrument, most vegetation can be navigated so long as it is passable by walking. Equipment is calibrated for accuracy according to manufacturer standards.
- Sensors & Software Noggin 250 GPR – This is ground penetrating radar (GPR) technology which has the capacity to detect buried utilities in addition to other anomalies such as storage tanks, drums, etc. This instrument allows for the location of

non-conductive material types as it operates on the radiographic response from the utility/pipe rather than the conductivity of the utility/pipe. Additionally, this technology allows for depth penetrations up to 30 feet in favorable soil conditions such as sandy soils where radio-frequency technologies are limited to a depth of 12 to 15 feet in ideal settings. This instrument is cart-mounted and requires a clear passage of terrain to collect accurate data either in singular lines or on a grid. Grid spacing, when applicable, is defaulted to 2-foot transects north-south and east-west. Post-processing software is also available for analyzing field data collected with this technology.

The geophysical inspection began in areas where the debris was visually observed at land surface and continued away from these areas until the 100-foot by 400-foot area of the site had been traversed.

A handheld GPS unit was available to determine the location of encountered subsurface debris, and notes were taken based on interpretation of the GPR signature regarding the probable type of debris encountered. In accordance with the EPA and U.S. Fish and Wildlife Service (USFWS) request made during the TPP, no vegetation was removed during the completion of the geophysical survey work (CH2M HILL, 2010). Due to the density of the mangroves, a GPR survey was not performed in areas of heavy vegetation. In these areas, only ferromagnetic and/or electromagnetic instruments were used to fill data gaps.

Edge of Mangrove

Estimated Extent of Surface Debris

Septic Tank

N

0 25 50 100

Feet

1 in = 50 feet

FIGURE 3-1
Site Inspection Location Map
Former Lower Camp Debris Site
Culebra, Puerto Rico

ATL \\GALILEO\PROJ\USNAVY\PUERTORICO_CULEBRA_378718\MAPFILES\CULEBRA\GPS_LOCATIONS\SITEMAP.MXD JKELLY3 12/6/2011 10:33:11 AM

CH2MHILL

GPS Point Locations

- Debris
- Edge of Mangrove
- Estimated Extent of Surface Debris

HDOM = Highly Deteriorated Oxidized Metal

Center of map area as displayed

N

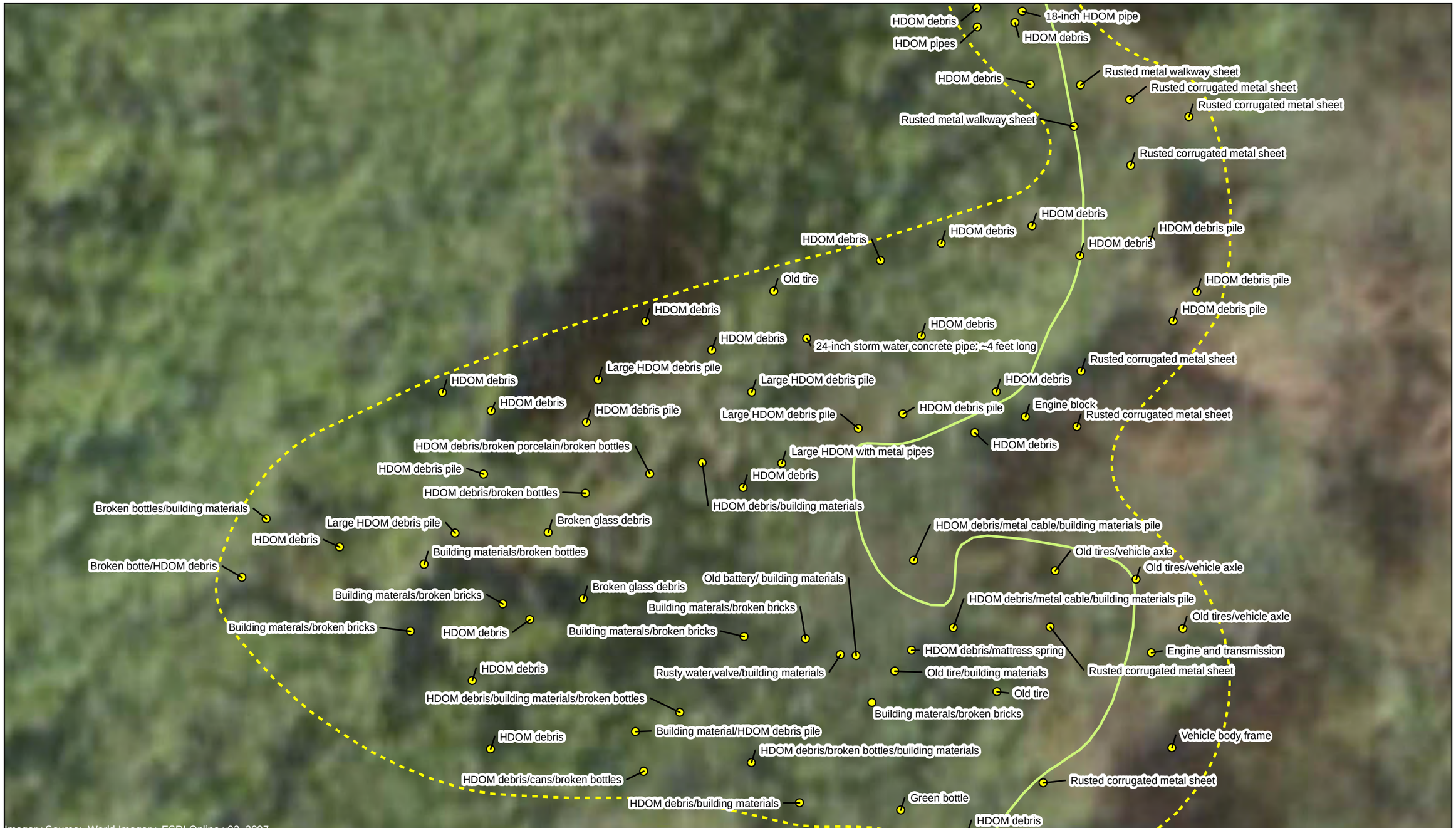
0 7.5 15 30
Feet

1 in = 15 feet

FIGURE 3-2
GPS Debris Locations - Map Area 1
Former Lower Camp Debris Site
Culebra, Puerto Rico

CH2MHILL

ATL \\GALILEO\PROJ\USNAVY\PUERTORICO_CULEBRA_378718\MAPFILES\CULEBRA\GPS_LOCATIONS\CULEBRA_1.MXD JKELLY3 12/7/2011 4:31:01 PM



GPS Point Locations

- Debris
- Edge of Mangrove
- Estimated Extent of Surface Debris

HDOM = Highly Deteriorated Oxidized Metal

Center of map area as displayed

N

0 7.5 15 30
Feet

1 in = 15 feet

FIGURE 3-3
GPS Debris Locations - Map Area 2
Former Lower Camp Debris Site
Culebra, Puerto Rico

CH2MHILL

ATL \\GALILEO\PROJ\USNAVY\PUERTORICO_CULEBRA_378718\MAPFILES\CULEBRA\GPS_LOCATIONS\CULEBRA_2.MXD JKELLY3 12/7/2011 7:13:43 PM

GPS Point Locations

- Debris
- Edge of Mangrove
- Estimated Extent of Surface Debris

HDOM = Highly Deteriorated Oxidized Metal

Center of map area as displayed

N

0 7.5 15 30
Feet

1 in = 15 feet

FIGURE 3-4
GPS Debris Locations - Map Area 3
Former Lower Camp Debris Site
Culebra, Puerto Rico

CH2MHILL

ATL \\GALILEO\PROJ\USNAVY\PUERTORICO_CULEBRA_378718\MAPFILES\CULEBRA\GPS_LOCATIONS\CULEBRA_3.MXD JKELLY3 12/7/2011 7:16:55 PM

Edge of Mangrove

Ground Penetrating Radar (GPR) Lines

Estimated Extent of Surface Debris

Septic Tank

N

0 25 50 100

Feet

1 in = 50 feet

FIGURE 3-5
Geophysical Screening Map
Former Lower Camp Debris Site
Culebra, Puerto Rico

ATL \\GALILEO\PROJ\USNAVY\PUERTORICO_CULEBRA_378718\MAPFILES\CULEBRA\GPS_LOCATIONS\GEOPHYSICALSCREENING.MXD JKELLY3 12/1/2011 10:09:22 AM

CH2MHILL

4.0 Site Inspection Results

The results of the site walk, visual inspection, and geophysical screening are discussed below.

4.1 Site Walk and Visual Inspection

Visual inspection of the debris areas along the shoreline of the mangrove was performed within the designated site boundary. Information regarding the type, location, and extent of debris currently at the site indicates the debris piles identified in the 1996 SI (E&E, 1996) are still present along with an additional debris pile approximately 50 feet north of the northern most debris pile shown on **Figure 1-4**. The estimated extent of surface debris is shown on **Figure 3-1**. The location and type of debris are shown on **Figures 3-2**, **3-3**, and **3-4**.

The estimated extent of debris encompasses a total area of 15,070 ft^2 (0.35 acre) and extends a distance of 350 feet from the southernmost to the northern most tip of the debris field. The widest point of the debris field is approximately 165 feet. The debris consisted of broken bottles, building materials (i.e., bricks both broken and whole, and mortar), highly deteriorated oxidized metal (i.e., pipes, beams, rods/rebar, bolts, mattress springs, cables, water valves, and cans), rusted metal walkway sheets, rusted refrigerator type appliance, rusted corrugated metal sheets, concrete stormwater pipes, old vehicle engines, a battery, tires, axles, transmissions, body frames, and broken porcelain. A photo documentation log of the debris is presented in **Appendix C**.

Based on visual observations, the debris appears to be the result of dumping from a vehicle starting at the edge of the mangrove and proceeding into the mangrove as a "road" was created. The main debris area is characterized by individual piles positioned radially around an entry point with the larger individual debris piles located nearest to the edge of the mangrove.

The septic tank is concrete with a flat top 18.5 feet wide by 28 feet long and located approximately 75 feet west of the concrete pad used for the former Navy restroom facility. No outfall could be visually observed. A photograph of the septic tank is included in **Appendix C**.

4.2 Site Geophysical Screening

Electromagnetic scans were performed inductively to search for buried debris and utilities exiting the former Navy restroom facility in accessible areas between the visible debris piles and the former restroom facility. GPR scans were also performed to determine soil conditions, and to locate a tailout line leaving the septic tank area (**Figure 3-5**).

Electromagnetic scans of the area behind the former Navy restroom facility did not detect any utilities. Additionally the GPR scans did not find a tailout line leaving the septic tank area. However, the effectiveness of the GPR unit was compromised by uneven terrain and heavy vegetation. GPR scans performed along the former road bed and along the edge of the

mangroves did not reveal any anomalies inconsistent with site soil conditions. The geophysical screening report by OneVision Utility Services is provided in **Appendix D**.

4.3 Risk-based Screening of 1996 Site Investigation Analytical Data

Historical analytical data collected in 1996 from the two soil borings and one groundwater sample were screened against human health and ecological protective criteria and soil-to-groundwater protective criteria for soil/sediment. The risk-based screening was performed in accordance with the EPA SI guidance (EPA, 1992), as well as PREQB-accepted risk-based evaluation methodology.

As a conservative approach, risk estimates were prepared for future residential and industrial scenarios at the Former Lower Camp Debris Site. The site consists of an approximate 100-foot by 400-foot section of marine wetland along the eastern shoreline of Ensenada del Cementerio adjacent to the current Department of Conservation automotive shop facility or former Navy restroom facility.

Two soil samples and one groundwater sample were available from the site (**Appendix A**). The results of these analyses and the applicable screening levels are presented in **Tables 1-1** and **4-1**, respectively. Surface soil data were compared to EPA Regional Screening Levels (RSLs) for chemical contaminants at Superfund Sites (EPA, 2011) for residential soil, industrial soil, and protection of groundwater and results are provided in **Tables 4-2**, **4-3**, and **4-4**. Groundwater data were compared to the RSLs for tap water. The RSLs that are based on non-carcinogenic health endpoints were reduced by a factor of 10 (that is, adjusted to a hazard quotient [HQ] of 0.1) to account for the potential presence of multiple chemicals affecting the same target organ, with the exception of lead. No adjustment was made for the RSLs based on carcinogenic health endpoints (that is, the RSLs are based on a target excess lifetime cancer risk [ELCR] of 1×10^{-6}). For chromium (total), the RSLs for hexavalent chromium were used as a conservative approach; however, the protection of groundwater screening level selected was based on the maximum contaminant level (MCL) for total chromium. The RSLs for mercury (inorganic salts) were used for mercury because elemental mercury is not expected to be present at the site. The results of the protection of groundwater screening sample analyses are presented in **Table 4-4**.

4.3.1 Soil

Total chromium was detected above its RSL for hexavalent chromium at concentrations exceeding 100 times the screening level (see **Table 4-2**). However, chromium is not expected to be present in its hexavalent form; therefore, no hot spots were identified and all soil data were merged in the residential and industrial evaluations.

Three metals (arsenic, chromium, and lead) and one PAH (benzo(k)fluoranthene) were detected in surface soil (0 to 2 feet) above RSLs in the residential evaluation. Two metals (arsenic and chromium) exceeded RSLs in the industrial evaluation. Results are as follows:

- Benzo(k)fluoranthene was detected in one of two surface soil samples above its RSL (1.5 milligrams per kilogram [mg/kg]). Based on the maximum detected concentration (16

mg/kg), the ELCR is 1 x 10^{-5}, which is within EPA's acceptable risk range, and benzo(k)fluoranthene would not be identified as a risk driver.

- Arsenic was detected in both of the two surface soil samples above its RSL (0.39 mg/kg) in the residential evaluation. Based on the maximum detected concentration (17 mg/kg), the ELCR is 4 x 10^{-5} and the non-cancer HQ is 0.8, which are within EPA's acceptable levels, and arsenic would not be identified as a risk driver. Both arsenic results exceeded the industrial RSL (1.6 mg/kg). The industrial ELCR is 1 x 10^{-5} and the non-cancer HQ is 0.07, which are within EPA's acceptable levels, and arsenic would not be identified as a risk driver.

- Chromium was detected in both of the two surface soil samples above its conservative hexavalent chromium screening RSL (0.29 mg/kg) in the residential evaluation. Based on the maximum detected concentration (38 mg/kg), and a comparison to the trivalent chromium (the form of chromium expected to be present at the site) adjusted RSL, the non-cancer HQ is 0.0003, which is within EPA's acceptable levels, and chromium would not be identified as a risk driver. Both chromium results exceeded the conservative hexavalent chromium industrial screening RSL (5.6 mg/kg). Based on the industrial trivalent chromium adjusted RSL, the non-cancer HQ is 0.00003, which is less than EPA's target level, and chromium would not be identified as a risk driver.

- Lead was detected in one of two surface soil samples above its RSL (400 mg/kg). The soil RSL for lead of 400 mg/kg was established using probabilistic exposure models, namely the Integrated Exposure Uptake Biokinetic (IEUBK). It is the recommendation of the technical review workgroup for lead that the average detected concentration of lead be used for evaluation purposes. The average detected concentration of lead was less than the RSL and therefore lead would not be identified as a risk driver.

Based on the maximum detected concentrations of benzo(k)fluoranthene and the three metals (arsenic, chromium, and lead), the cumulative residential ELCR is 5 x 10^{-5} and the maximum target organ-specific HI is 0.8 (see **Table 4-2**); the cumulative ELCR and HI are within EPA's acceptable levels. Based on the maximum detected concentrations of arsenic and chromium, the cumulative industrial ELCR is 1 x 10^{-5} and the maximum target organ-specific hazard index (HI) is 0.07 (see **Table 4-3**); the cumulative ELCR and HI are within EPA's acceptable levels. Consequently, there is not a concern for potential cumulative effects from PAHs and metals in soil at Former Lower Camp Debris Site.

4.3.2 Groundwater

Three metals (arsenic, chromium, and lead) in groundwater were detected above adjusted RSLs at concentrations exceeding 100 times the screening level (see **Table 4-2**). However, only one groundwater sample was available for evaluation. Results are as follows:

- Arsenic was detected above its RSL (0.045 micrograms per liter [µg/L]; see **Table 4-2**). Based on the single detected concentration (220 µg/L), the ELCR is 5 x 10^{-3} and the non-cancer HQ is 47, which exceeds EPA's acceptable levels, and **arsenic would be identified as a risk driver**.

- Barium was detected above its adjusted RSL (290 µg/L). Based on the single detected concentration (2,300 µg/L), the non-cancer HQ is 0.8, which is less than EPA's target level, and barium would not be identified as a risk driver.
- Chromium was detected above its conservative hexavalent chromium screening RSL (0.031 µg/L). Based on the single detected concentration (750 µg/L) and a comparison to the trivalent chromium (the form of chromium expected to be present at the site) adjusted RSL, the non-cancer HQ is 0.05, which is less than EPA's target level, and chromium would not be identified as a risk driver.
- Lead was detected above its action level (15 µg/L). Based on the single detected concentration (4,700 µg/L) of lead, **lead would be identified as a risk driver**.
- Selenium was detected above its adjusted RSL (7.8 µg/L). Based on the single detected concentration (29 µg/L), the non-cancer HQ is 0.4, which is less than EPA's target level, and selenium would not be identified as a risk driver.
- Mercury was detected above its adjusted RSL (0.43 µg/L). Based on the single detected concentration (0.82 µg/L), the non-cancer HQ is 0.2, which is less than EPA's target level, and mercury would not be identified as a risk driver.

4.3.3 Cumulative Soil and Groundwater

Potential cumulative risks from residential and industrial exposure to soil and potable use of groundwater were evaluated. As indicated on **Table 4-2**, the residential cumulative ELCR is 5×10^{-3} and the maximum target organ-specific HI is 48 due to arsenic in groundwater under a hypothetical potable use scenario. As indicated on **Table 4-3**, the industrial cumulative ELCR is 5×10^{-3} and the maximum target organ-specific HI is 47 due to arsenic in groundwater under a hypothetical potable use scenario. Potential risks associated with residential and industrial exposures to soil are within EPA's acceptable levels. **Risks associated with lead exposure in groundwater under a hypothetical use scenario are unacceptable based on the detected concentration in exceedance of the EPA Action Level**.

4.3.4 Protection of Groundwater

When evaluating the potential for contaminant migration from soils to groundwater, EPA generic soil screening levels (SSLs) based on a dilution attenuation factor (DAF) of 1 were used as a conservative approach. However, as a general rule, DAF values from 1 to 20 can be applied, dependent upon site-specific data (e.g., size of site and depth to groundwater.).

Benzo(k)fluoranthene, which exceeded its SSL at location B-1, was not detected in the groundwater samples collected from MW-1. No SSL is available for TRPH; however, TRPH was not detected at location MW-1. This suggests that the SSLs based on a DAF of 1 are overly-conservative predictors of organics leaching to groundwater at the site. **Arsenic, barium, lead, and selenium were detected in surface soil above their SSLs. Although all four inorganic compounds were detected in groundwater at MW-1, they may be present in groundwater due to turbidity issues, or present at background levels; however, background data were not available**.

TABLE 4-1
Screening Levels Used in the Risk Screening
Former Lower Camp Debris Site, Culebra, Puerto Rico

Parameter	Soil						Groundwater	
	Adj. Res. Soil RSL (mg/kg) (1)	qual	Adj. Ind. Soil RSL (mg/kg) (2)	qual	Groundwater Protection RSL (mg/kg)(3)	qual	Adj. Tapwater RSL (ug/L)(4)	qual
TRPH	NA		NA		NA		--	
Benzo(k)fluoranthene	1.5	ca	21	ca	0.35	R	--	
Arsenic	0.39	ca	1.6	ca	0.29	MCL	0.045	ca
Barium	1500	nc	19000	nc	82	MCL	290	nc
Chromium	0.29	ca	5.6	ca	180000	MCL	3.10E-02	ca
Lead	400	IEUBK	800	ALM	14	MCL	15	AL
Selenium	39	nc	510	nc	0.26	MCL	7.8	nc
Mercury	2.3	nc	31	nc	NA		0.43	nc

Note:
(1) Adjusted residential soil RSL (November, 2011) based on an ELCR = $1x10^{-6}$ or HQ = 0.1.
(2) Adjusted industrial soil RSL (November, 2011) based on an ELCR = $1x10^{-6}$ or HQ = 0.1.
(3) Protection of groundwater soil screening level (November 2011). When available, MCL based SSLs are used preferentially.
(4) Adjusted tap water (November 2011) based on an ELCR = $1x10^{-6}$ or HQ = 0.1.

The SL for Cr(VI) was used as the SL for Chromium.
The SL for 'Mercuric Chloride (and other Mercury salts)' was used as the SL for Mercury.

Key:
-- - Chemical was not detected. No SL necessary.
AL = Action Level
ALM = Adult Lead Methodology
ca = cancer
IEUBK = Integrated Exposure Uptake Biokinetic Model
MCL = MCL based soil screening level
NA = Not screening level available
nc = non-cancer
qual = qualifier
R = risk based soil screening level
RSL = Regional Screening Level
TRPHs = Total recoverable petroleum hydrocarbons

TABLE 4-2
HHRA COPC Summary Table - Residential
Former Lower Camp Debris Site, Culebra, Puerto Rico

Site: Former Lower Camp Debris Site
Media: Surface Soil, Groundwater

Data Summary									Screening Level (SL) Comparison						Exposure Point Concentrations (EPC)				Risk Estimates		
Exposure Point	CAS Number	Chemical (1)	Minimum Concentration Qualifier	Maximum Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Carcinogenic RSL ELCR=1.0E-6 (2)	Noncarcinogenic RSL HQ=1 (2)	Final Adjusted RSL (3)	Basis	Frequency of SL Exceedance (4)	Max Exceeds 100x SL (4)	EPC (5)	Statistic	Basis	Note	Target Organ	ELCR (6)	HQ (6)
Surface Soil	207-08-9	Benzo(k)fluoranthene	0.24	16	mg/kg	B-1	2 / 2	--	1.5	--	1.5	ca	1 / 2	No	16	--	Max	--	--	1.1E-05	--
	7440-38-2	Arsenic	8.6	17	mg/kg	B-1	2 / 2	--	0.39	22	0.39	ca	2 / 2	No	17	--	Max	--	skin, cardiovascular	4.4E-05	0.8
	18540-29-9	Chromium	7.6	38	mg/kg	B-1	2 / 2	--	--	120000	0.29	ca	2 / 2	Yes	38	--	Max	--	NOE	--	0.0003
	7439-92-1	Lead	52	460	mg/kg	B-1	2 / 2	--	--	--	400	IEUBK	1 / 2	No	460	--	Max	--	--	--	--
Groundwater	7440-38-2	Arsenic	220	220	ug/L	MW1	1 / 1	--	0.045	5	0.045	ca	1 / 1	Yes	220	--	Max	--	skin, cardiovascular	4.9E-03	47
	7440-39-3	Barium	2300	2300	ug/L	MW1	1 / 1	--	--	2900	290	nc	1 / 1	No	2300	--	Max	--	kidney	--	0.8
	18540-29-9	Chromium	750	750	ug/L	MW1	1 / 1	--	--	16000	0.031	ca	1 / 1	Yes	750	--	Max	--	NOE	--	0.05
	7439-92-1	Lead	4700	4700	ug/L	MW1	1 / 1	--	--	--	15	AL	1 / 1	Yes	4700	--	Max	--	--	--	--
	7782-49-2	Selenium	29	29	ug/L	MW1	1 / 1	--	--	78	8	nc	1 / 1	No	29	--	Max	--	selenosis (liver, hair, nail)	--	0.4
	7487-94-7	Mercury	0.82	0.82	ug/L	MW1	1 / 1	--	--	4.3	0.43	nc	1 / 1	No	0.82	--	Max	--	immune system	--	0.2

Note:

(1) Chemical whose maximum detected concentration (MaxDet) exceeds adjusted RSL in the exposure medium are presented on the table.

(2) Regional Screening Levels (RSL) (November 2011) based on an ELCR of $1x10^{6}$ and an HQ=1.0.
- RSLs for residential soil are used for surface soil.
- RSLs for tapwater are used for groundwater.

(3) The final RSL: the lower of carcinogenic RSLs based on ELCR of $1x10^{6}$ and noncarcinogenic RSLs adjusted using HQ=0.1.

(4) The final RSL is used as the Screening Level (SL).

(5) The MaxDet was used as exposure point concentration (EPC).

(6) Noncarcinogenic hazard quotient and ELCR are estimated using the ratio of RSL and EPC.
- HQ = EPC / Noncarcinogenic RSL (based on HQ=1.0)
- ELCR = EPC x $1x10^{-6}$ / Carcinogenic RSL (based on ELCR=$1x10^{-6}$)

The SL for 'Chromium (VI)' was used as the adjusted SL for Chromium. The expected form of chromium is Chromium (III). Therefore, the SL for 'Chromium (III)' was used as the Cancer and Noncancer Toxicity screening value.
The SL for 'Mercuric Chloride (and other Mercury salts)' was used as the SL for mercury.

RSL Basis: ca = Carcinogenic; nc = Noncarcinogenic; IEUBK = Integrated Exposure Uptake Biokinetic Model, AL = Action Level
Target Organ: NOE = no observed effect

NWR Cumulative Risk	ELCR	Max HI *
Soil	5E-05	0.8
HI is based on effect on skin/cardiovascular.		
Groundwater	5E-03	47
HI is based on skin/cardiovascular.		
Total Risk	5E-03	48

* Max HI is the highest HI associated with any target organ

TABLE 4-3
HHRA COPC Summary Table - Industrial
Former Lower Camp Debris Site, Culebra, Puerto Rico

Site: Former Lower Camp Debris Site
Media: Surface Soil, Groundwater

Data Summary										Screening Level (SL) Comparison						Exposure Point Concentrations (EPC)				Risk Estimates		
Exposure Point	CAS Number	Chemical (1)	Minimum Concentration Qualifier	Maximum Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Carcinogenic RSL ELCR=1.0E-6 (2)	Noncarcinogenic RSL HQ=1 (2)	Final Adjusted RSL (3)	Basis	Frequency of SL Exceedance (4)	Max Exceeds 100x SL (4)	EPC (5)	Statistic	Basis	Note	Target Organ	ELCR (6)	HQ (6)
Surface Soil	7440-38-2	Arsenic	8.6	17	mg/kg	B-1	2 / 2	--	1.6	260	1.6	ca	2 / 2	No	17	--	Max	--	skin, cardiovascular	1.1E-05	0.07
	18540-29-9	Chromium	7.6	38	mg/kg	B-1	2 / 2	--	--	1500000	5.6	ca	2 / 2	No	38	--	Max	--	NOE	--	0.00003
Groundwater	7440-38-2	Arsenic	220	220	ug/L	MW1	1 / 1	--	0.045	5	0.045	ca	1 / 1	Yes	220	--	Max	--	skin, cardiovascular	4.9E-03	47
	7440-39-3	Barium	2300	2300	ug/L	MW1	1 / 1	--	--	2900	290	nc	1 / 1	No	2300	--	Max	--	kidney	--	0.8
	18540-29-9	Chromium	750	750	ug/L	MW1	1 / 1	--	--	16000	0.031	ca	1 / 1	Yes	750	--	Max	--	NOE	--	0.05
	7439-92-1	Lead	4700	4700	ug/L	MW1	1 / 1	--	--	--	15	AL	1 / 1	Yes	4700	--	Max	--	--	--	--
	7782-49-2	Selenium	29	29	ug/L	MW1	1 / 1	--	--	78	8	nc	1 / 1	No	29	--	Max	--	selenosis (liver, hair, nail)	--	0.4
	7487-94-7	Mercury	0.82	0.82	ug/L	MW1	1 / 1	--	--	4.3	0.43	nc	1 / 1	No	0.82	--	Max	--	immune system	--	0.2

Note:

(1) Chemical whose maximum detected concentration (MaxDet) exceeds adjusted RSL in the exposure medium are presented on the table.

(2) Regional Screening Levels (RSL) (November 2011) based on an ELCR of $1x10^{-6}$ and an HQ=1.0.
- RSLs for industrial soil are used for surface soil.
- RSLs for tapwater are used for groundwater.

(3) The final RSL: the lower of carcinogenic RSLs based on ELCR of $1x10^{-6}$ and noncarcinogenic RSLs adjusted using HQ=0.1.

(4) The final RSL is used as the Screening Level (SL).

(5) The MaxDet was initially used as exposure point concentration (EPC).

(6) Noncarcinogenic hazard quotient and ELCR are estimated using the ratio of RSL and EPC.
- HQ = EPC / Noncarcinogenic RSL (based on HQ=1.0)
- ELCR = EPC x $1x10^{-6}$ / Carcinogenic RSL (based on ELCR=$1x10^{-6}$)

The SL for 'Chromium (VI)' was used as the adjusted SL for Chromium. The expected form of chromium is Chromium (III). Therefore, the SL for 'Chromium (III)' was used as the Cancer and Noncancer Toxicity screening value.

The SL for 'Mercuric Chloride (and other Mercury salts)' was used as the SL for mercury.

RSL Basis: ca = Carcinogenic; nc = Noncarcinogenic; AL = Action Level
Target Organ: NOE = no observed effect

NWR Cumulative Risk	ELCR	Max HI *
Soil	1E-05	0.07
HI is based on effect on skin, vascular		
Groundwater	5E-03	47
HI is based on body weight		
Total Risk	5E-03	47

* Max HI is the highest HI associated with any target organ.

TABLE 4-4
Soil Protection of Groundwater Screening
Former Lower Camp Debris Site, Culebra, Puerto Rico

Parameter	Groundwater Protection SL (mg/kg)(1)	Soil Samples (mg/kg)	
		B-1 (0-2)	B-2 (0-2)
TRPH	NA	660	ND
Benzo(k)fluoranthene	0.35	**16**	0.24
Arsenic	0.29	**17**	**8.6**
Barium	82	**540**	**120**
Chromium	180000	38	7.6
Lead	14	**460**	**52**
Selenium	0.26	ND	**0.94**
Mercury	NA	0.17	0.049

Bold indicates concentration exceeds protection of groundwater SL.
(1) Protection of groundwater soil screening level (November 2011). When available, MCL based SSLs are used preferentially.

Key:
ND = Not Detected
TRPHs = Total recoverable petroleum hydrocarbons
mg/kg = milligrams per kilogram

5.0 Conclusions and Recommendations

5.1 Conclusions

The Former Lower Camp Debris Site encompasses an area of approximately 40,000 ft^2 and is positioned within and adjacent to a marine wetland (mangrove) located along the eastern shoreline of Ensenada del Cementerio. The area east of the site historically was used by the Navy as a housing facility from the early 1940s until 1980, but is currently used as an automotive shop facility under the jurisdiction of the Commonwealth of Puerto Rico and the Authority for Conservation and Development of Culebra.

Associated with the former Navy housing facility is a concrete septic tank (18.5 feet wide by 28 feet long) characterized by a flat top. No outfall could be observed visually or detected using geophysical screening techniques.

Information regarding the type, location, and extent of debris currently at the site indicates the debris piles identified in the 1996 SI are still present, as well as an additional debris pile approximately 50 feet north of the northern most debris pile shown on **Figure 1-4**.

The estimated extent of debris is located in a total area of 15,070 ft^2 (0.35 acre), and extends a distance of 350 feet from the southernmost to the northernmost tip of the debris field (**Figure 3-1**). The widest point of the debris field is approximately 165 feet. The debris consisted of broken bottles, building materials (i.e., bricks both broken and whole and mortar), highly deteriorated oxidized metal (i.e., pipes, beams, rods/rebar, bolts, mattress springs, cables, water valves, and cans), rusted metal walkway sheets, rusted refrigerator type appliance, rusted corrugated metal sheets, concrete stormwater pipes, old vehicle engines, a battery, tires, axles, transmissions, body frames, and broken porcelain..

Based on visual observations, the debris appears to be the result of dumping from a vehicle starting at the edge of the mangrove and proceeding into the mangrove as a "road" was created. The main debris area is characterized by individual piles positioned radially around an entry point with the larger individual debris piles located nearest to the edge of the mangrove.

E&E performed a site investigation and prepared a Site Investigation Report (E&E, 1996) that was submitted to the USACE on October 4, 1996. During the investigation, three soil borings were advanced and one temporary monitoring well was installed; soil samples from two borings along with groundwater samples from the temporary well were collected for chemical analysis (see Section 1.2). These historical analytical data were screened against human health and ecological protective criteria and soil-to-groundwater protective criteria for soil/sediment for both future residential and industrial scenarios at the Former Lower Camp Debris Site (see Section 4.3). Results of the risk screening are summarized as follows:

- Surface soil data were compared to EPA RSLs for chemical contaminants at Superfund Sites (EPA, 2011) for residential soil, industrial soil, and protection of groundwater. No

metals or PAHs detected in soil samples are identified as risk drivers and there is not a concern for potential cumulative effects.

- Groundwater data were compared to RSLs for tap water. Arsenic and lead are identified as risk drivers for groundwater at the Former Lower Camp Debris Site.
- Potential cumulative risks from residential and industrial exposure to soil and potable use of groundwater were also evaluated. Results indicate risks associated with lead exposure in groundwater under a hypothetical use scenario are unacceptable based on the detected concentration in exceedance of the EPA Action Level.
- The potential for contaminant migration from soils to groundwater were evaluated using EPA generic SSLs based on a DAF of 1. Results indicate arsenic, barium, lead and selenium were detected in surface soil above their SSLs. Although all four inorganic compounds were detected in groundwater at MW-1, they may be present in groundwater due to turbidity issues, or present at background levels; however, background data were not available.

Based on visual observations and historical data, the effects of the debris to the environment at the Former Lower Camp Debris Site are not completely understood. Therefore, the entire Former Lower Camp Debris Site should be considered an area of concern.

5.2 Recommendations

Recommendations for the next phase of investigation are as follows:

- Complete a wetland delineation study at the Former Lower Camp Debris Site since a majority of the debris is located within a mangrove.
- Complete a Remedial Investigation at the Former Lower Camp Debris Site.
- Include an investigation of the septic tank in the Remedial Investigation at the Former Lower Camp Debris site.

6.0 References

Boccheciamp, R.A. 1977. *Soil survey of the Humacao area of eastern Puerto Rico*. U.S. Department of Agriculture, Soil Conservation Service, 103 p.

Ecology and Environment, Inc. (E&E). 1996. *Site Investigation Report for the Culebra Island National Wildlife Refuge Site, Culebra Island, Puerto Rico (DERP-FUDS Site No. I02PR006800; Contract No. DACW17-95-D-0010; Delivery Order No. 2)*. October.U.S. Army Corps of Engineers (USACE). 2009. *Safety and Health Requirements Manual*. Effective January 12, 2009.

Jordan, D.G., and Gilbert, B.K. 1976. *Water supply and waste disposal, Culebra, Puerto Rico*. U.S. Geological Survey Water-Resources Investigations Report 76-3.

The Weather Channel. 2011. http://www.weather.com/weather/wxclimatology/monthly/graph/USPR0031. Accessed on December 9, 2011.

U.S. Army Corps of Engineers (USACE). 2009. *Safety and Health Requirements Manual*. EM385-1-1. Effective January 12.

U.S. Department of Defense (DoD). 1997. *Relative Risk Site Evaluations Primer*. Revised Edition (Summer).

U.S. Environmental Protection Agency (EPA). 1992. *Guidance for Performing Site Inspections Under CERCLA: Interim Final*. EPA 540-R-92-021 Directive 9345.1-05. September.

U.S. Environmental Protection Agency (EPA). 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm. Regions 3, 6, and 9. Last updated on Tuesday, December 06, 2011.

U.S. Geological Survey (USGS). 1996. *Atlas of Ground-Water Resources in Puerto Rico and the U.S. Virgin Islands*. Water-Resources Investigations Report 94-4198.

Appendix A
Site Investigation Report Prepared by Ecology and Environment, Inc.

200.1e
I02PR006800_01.09_0001

ecology and environment, inc.
International Specialists in the Environment

1950 Commonwealth Lane
Tallahassee, Florida 32303
Tel (904) 574-1400, Fax: (904) 574-1179

October 4, 1996

Department of the Army
Jacksonville Army Corps of Engineers
CESAJ-PD-EE
Attn: Ivan Acosta, Planning Division
400 West Bay Street
Jacksonville, Florida 32232-0019

Re: Site Investigation Report for the Culebra Island National Wildlife Refuge Site, Culebra Island, Puerto Rico (DERP-FUDS Site No. IO2PR006800; Contract No. DACW17-95-D-0010; Delivery Order No. 2)

Dear Mr. Acosta:

On July 19, 1996, Ecology and Environment, Inc., (E & E) conducted investigation activities at the above-referenced site to determine whether soil and/or groundwater contamination is present in the vicinity of a wetland area apparently used for disposal of debris between 1940 and 1975. This report provides a brief summary of the facility history, the hydrogeologic setting, and a discussion of the results of the investigation.

Site Description

The Culebra Island National Wildlife Refuge site consists of an approximately 100 by 400 foot section of marine wetland along the eastern shoreline of Ensenada del Cementerio adjacent to the Department of Conservation auto shop facility. The property is currently under the jurisdiction of Puerto Rico Department of Natural Resources and is part of the Culebra Island National Wildlife Refuge (see Figure 2).

Debris is scattered along approximately 400 feet of the shoreline and extends from 20 to 100 feet into the wetland. The largest concentration of debris occupies an area approximately 120 by 40 feet (see Figure 2). The debris consists primarily of highly-rusted metal building materials such as steel beams and rods, corrugated steel sheeting and bolts. Other material observed in the wetland area includes broken glass and automobile parts. The eastern edge of the wetland area is approximately 180 feet west (downslope) of a 35 by 160-foot concrete foundation. The foundation was formerly a bathroom facility and is currently used as the Department of Conservation Automotive Maintenance facility. The hillside between the automotive maintenance facility and the wetland area is scattered with auto body parts and corrugated steel sheeting that appears relatively new (within 10 to 15 years). Figure 2 shows the site layout; photographs of the site are included as Attachment A.

There are no fresh-water bodies, streams, or supply wells in the immediate vicinity of the site. However, the intake for the desalinization plant, the only source of municipal supply

water for the island, is located in the Ensenada Honda Bay, 50 to 100 feet offshore and approximately 700 feet south of the debris area.

Site History

From the early 1940s until 1980, the area to the east of the wetland was used as a housing facility by the U.S. Navy. The concrete foundation, currently occupied by the Department of Conservation auto shop, was previously a bathroom facility. Between the early 1940s and 1980, various materials were apparently discarded into the wetland area west of the bathroom facility. In September 1980, the Navy transferred the property to the U.S. Department of Interior, Fish and Wildlife Service, and it is now the Culebra Island National Wildlife Refuge under the control of the Puerto Rico Department of Natural Resources.

Hydrogeology

The island of Culebra is located approximately 17 miles east of Puerto Rico and 9 miles north of the Island of Vieques. Culebra Island has an area of approximately 10 square miles. The dominant features of the island are two ridges: one trending northwest-southeast and the other trending east-west. The highest elevation on the island is 650 feet above mean sea level.

Culebra Island is composed of volcanic and intrusive rocks, primarily andesite lava and tuff, of the late Cretaceous Age. The lava and tuff have been intruded by diorite in the north-central portion of the island. Alluvial deposits of silt, clay, sand, and gravel are located primarily in the larger stream valleys near the coast and interfinger with coral beach sand and organic silt and clay deposited in mangrove areas.

The principal aquifer on Culebra Island is the fractured andesite and tuff. The estimated storage capacity is less than 1 percent by volume. Roof top catchments and desalinization are the primary sources of fresh water supply. Before the construction of the desalinization plant in 1971, the principal source of municipal water supply for Culebra was a municipal well field located in the central portion of the island. The well field consists of five wells, 55 to 70 feet deep, constructed during the mid-1960s. The wells yield approximately 20 gallons per minute each; however, the water is very high in mineral concentrations and no longer used for potable supply.

The site is a mangrove area with organic silts and clays underlain by andesite lava. The andesite lava outcrops in several areas along the hillside immediately east of the mangrove wetland. The water desalinization plant is located approximately 1,000 feet northeast of the site.

Sediment/Soil Samples

A total of three borings were completed within the wetland in the area of most concentrated debris (see Figure 2). The depth to water was approximately 0.3 foot below ground surface (BGS). Boring B-1 was completed to 4 feet BGS and borings B-2 and B-3 were completed to 2 feet BGS. The lithology at each boring location from ground surface to the completion depth was characterized as black organic silt and peat. Composite samples were collected at 2 foot intervals from the surface to the completion depth of each boring (see Table 1).

An organic vapor analyzer (OVA) was used to measure the headspace vapors for each 2-foot composite sample. Headspace readings ranged between 30 and 68 ppm with some methane contribution to the total readings (see Table 1). No petroleum odor or visible evidence of petroleum contamination was detected in any of the samples.

Soil samples from the 0 to 2 foot intervals of soil borings B-1 and B-2 were collected and analyzed for purgeable aromatic hydrocarbons (EPA Method 8020), purgeable aromatic halocarbons (EPA Method 8011), ethylene dibromide (EDB; EPA Method 8010 modified), polynuclear aromatic hydrocarbons (PAHs; EPA Method 8310), total recoverable petroleum hydrocarbons (TRPHs; EPA Method 418.1), and eight metals (EPA Methods 6010 and 7471). The results are summarized on Table 3; the complete analytical report is presented as Attachment B.

As shown on Table 2, elevated concentrations of various metals and benzo(k)fluoranthene were present in samples from both soil borings. The highest concentrations were detected in boring B1. The sample from B1 also contained an elevated TRPH concentration.

Groundwater Sample

A single 2-inch diameter, temporary monitoring well, screened from 0.5 foot to 5 feet BGS was installed in the wetland area immediately adjacent to the location of soil boring B-1. A groundwater sample was collected from the well using a teflon bailer and analyzed for purgeable aromatic hydrocarbons (EPA Method 8020), purgeable aromatic halocarbons (EPA Method 8020), EDB (EPA Method 8011), PAHs (EPA Method 8310), TRPHs (EPA Method 418.1), total and dissolved lead, arsenic, cadmium, chromium, barium, selenium, silver, and mercury (EPA Methods 7421, 7470, and 6010). As shown on Table 2, the water sample contained elevated concentrations of several total metals; however, only low concentrations of dissolved barium and lead were detected. No organics were detected in the water sample.

Conclusions

The results of this limited investigation revealed that the soil/sediments have been impacted by metals and to a lesser extent by benzo(k)fluoranthene in the vicinity of B1 and B2. Although these sample locations were selected based on their proximity to abundant metal debris and were intended to represent "worst case" conditions, it is not known to what extent that soils/sediments have been impacted in other areas of the site. With regard to the single groundwater sample, elevated levels of several metals were present in the total-unfiltered sample; however, only lead and barium were detected at much lower concentrations in the dissolved samples. This indicates that the metals are primarily associated with sediments in the groundwater. No organics were detected in the groundwater sample.

If you have any questions or comments regarding these results, please call me or Jim Milne at (904) 574-1400.

Sincerely,

ECOLOGY AND ENVIRONMENT, INC.

James G Milne for

Perry Kelso, P.G.
Project Geologist

PK/ddb

Attachments

cc: J. Milne; E & E—Tallahassee
D. Bowman; E & E—Tallahassee

Table 1

OVA HEADSPACE DATA
CULEBRA ISLAND NWR SITE
(July 19, 1996)

Soil Boring Number	Sampling Interval (feet BGS)	OVA Headspace Reading (ppm)		
		Total	Methane Filtered	Corrected for Methane
B-1	(0-2)	30	16	14
B-1	(2-4)	39	33	6
B-2	(0-2)	68	45	23
B-3	(0-2)	0	0	0

Key:

OVA = Organic vapor analyzer.
ppm = Parts per million.

Table 2

SUMMARY ANALYTICAL RESULTS—SEDIMENT/SOIL AND GROUNDWATER SAMPLES CULEBRA ISLAND NWR SITE (July 19, 1996)

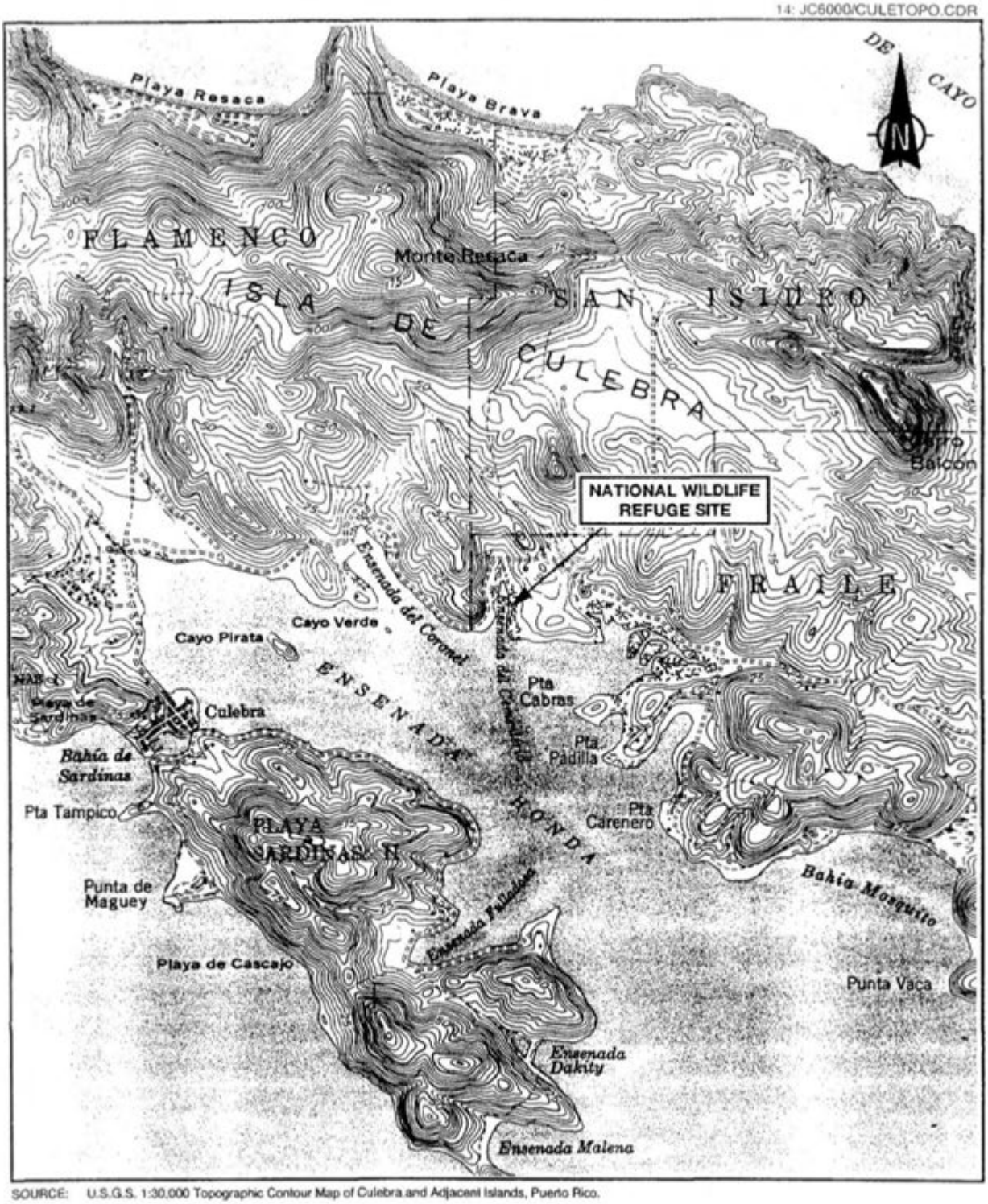
Parameter	Soil Samples (mg/kg)		Groundwater Sample (μg/L)	
	B-1 (0-2)	B-2 (0-2)	MW1	
TRPHs	660	ND	ND	
Benzo(k)fluoranthene	16	0.24	ND	
Metals			**Total[a]**	**Dissolved[b]**
Arsenic	17	8.6	220	(ND)
Barium	540	120	2,300	(54)
Chromium	38	7.6	750	(ND)
Lead	460	52	4,700	(9.8)
Selenium	ND	0.94	29	(ND)
Mercury	0.17	0.049	0.82	(ND)

[a] Total (unfiltered) metals concentration.
[b] Filtered (0.45 micron) metals concentration.

Key:

μg/kg = Micrograms per kilogram.
μg/L = Micrograms per liter.
NA = Not applicable.
ND = Not detected.
TRPHs = Total recoverable petroleum hydrocarbons.

14: JC5000/CULETOPO.CDR



SOURCE: U.S.G.S. 1:30,000 Topographic Contour Map of Culebra and Adjacent Islands, Puerto Rico.

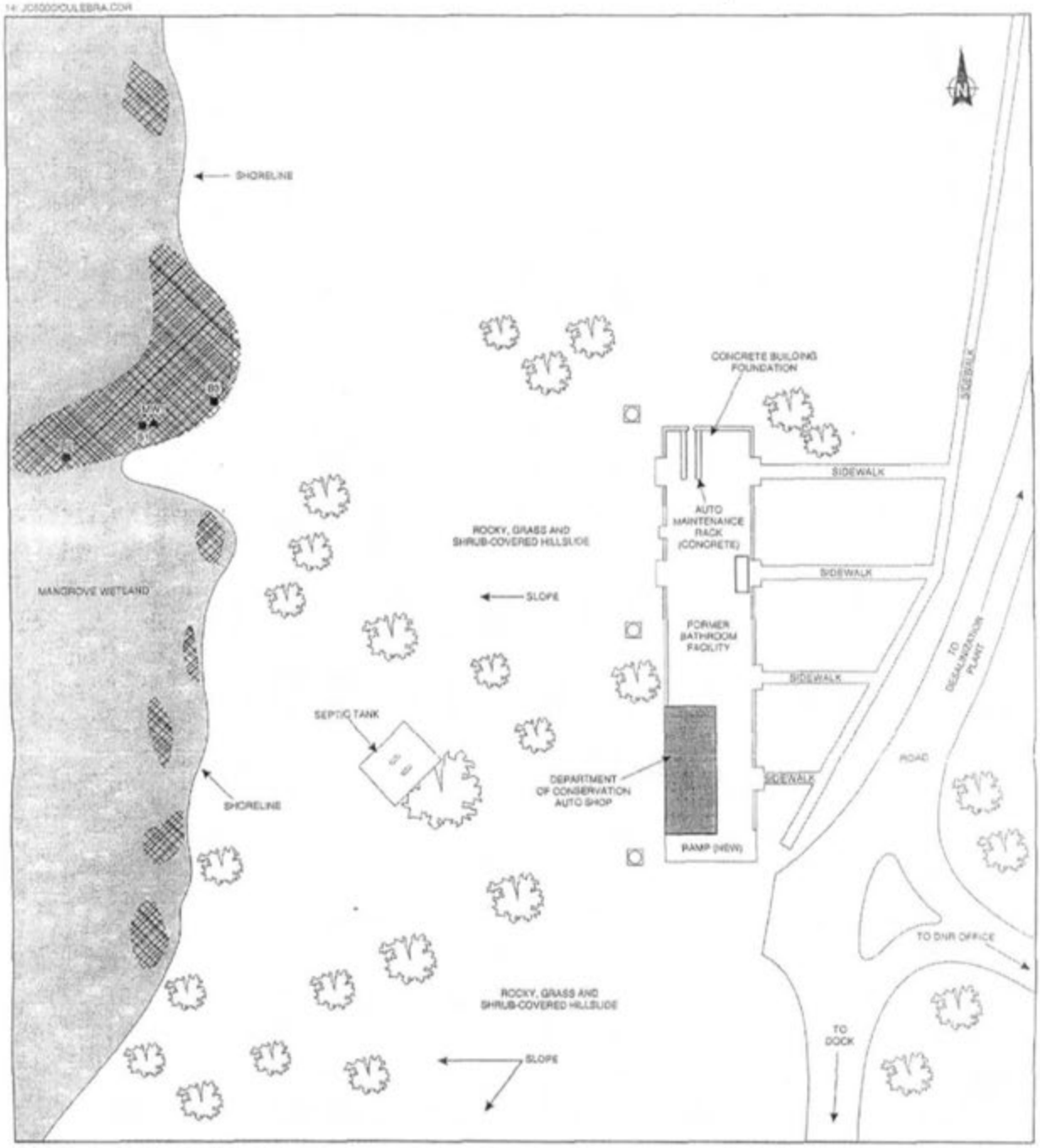
SCALE

0 .5 1 MILE

0 1000 2000 3000 4000 5000 FEET

Figure 1 LOCATION MAP -- CULEBRA ISLAND NATIONAL WILDLIFE REFUGE SITE, CULEBRA ISLAND, PUERTO RICO

14: JOB00/CULEBRA.CDR



SOURCE: Ecology and Environment, Inc., 1996

© 1996 Ecology and Environment, Inc.

SCALE
0 40 80 FEET

KEY:

- Tree
- Building
- Septic System Manway
- Sediment Sampling Location
- Visible Areas of Metal Debris
- Monitoring Well

Figure 2 SITE MAP – CULEBRA ISLAND NATIONAL WILDLIFE REFUGE, CULEBRA ISLAND, PUERTO RICO

ATTACHMENT A

SITE PHOTOGRAPHS

PHOTOGRAPH DOCUMENTATION LOG

Site Culebra Island National Wildlife Refuge

Camera/Lens Minolta X-370 SLR/50mm **Serial No.** NA

Photo Number	Date	Subject	Direction	Photographer
1	7-19-96	View from airplane.	Northeast	P. Kelso
2	7-19-96	Former bathroom facility concrete foundation and Department of Conservation auto shop.	South	P. Kelso
3	7-19-96	Metal debris in wetland area.	West	P. Kelso
4	7-19-96	Metal debris in wetland area.	North	P. Kelso

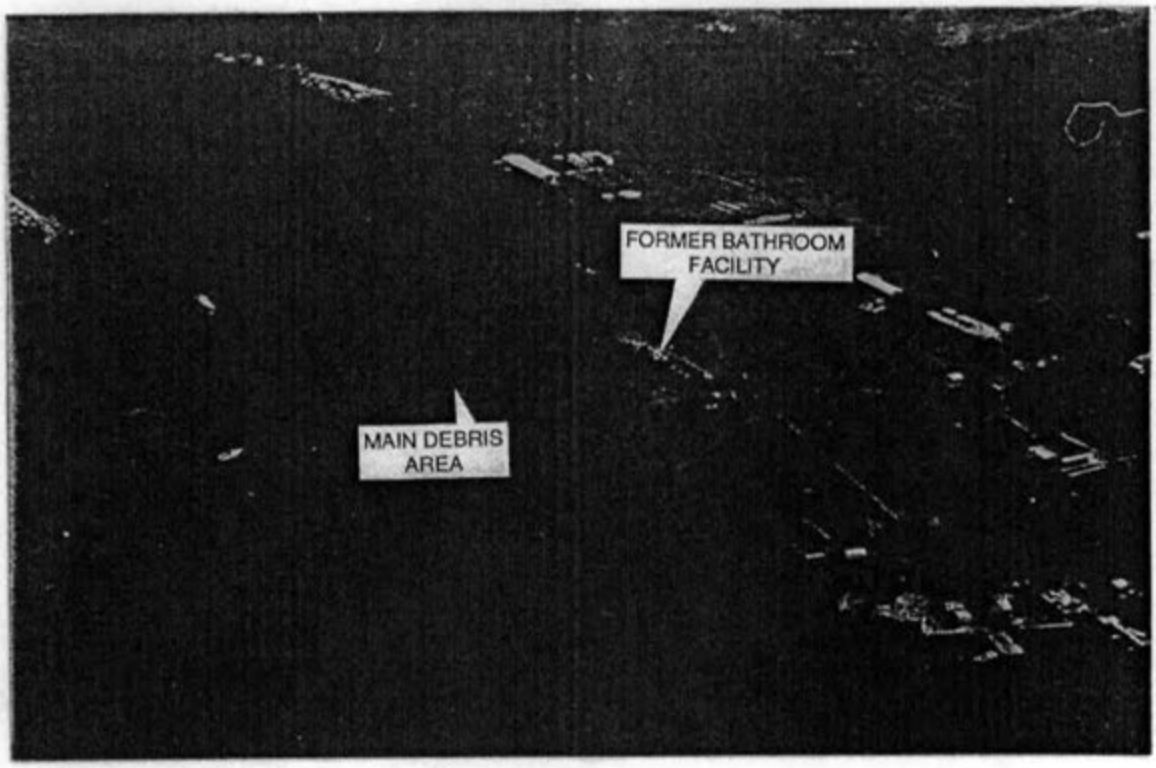
PHOTOS

3. Culebra Island NWR (metal debris in wetland area)

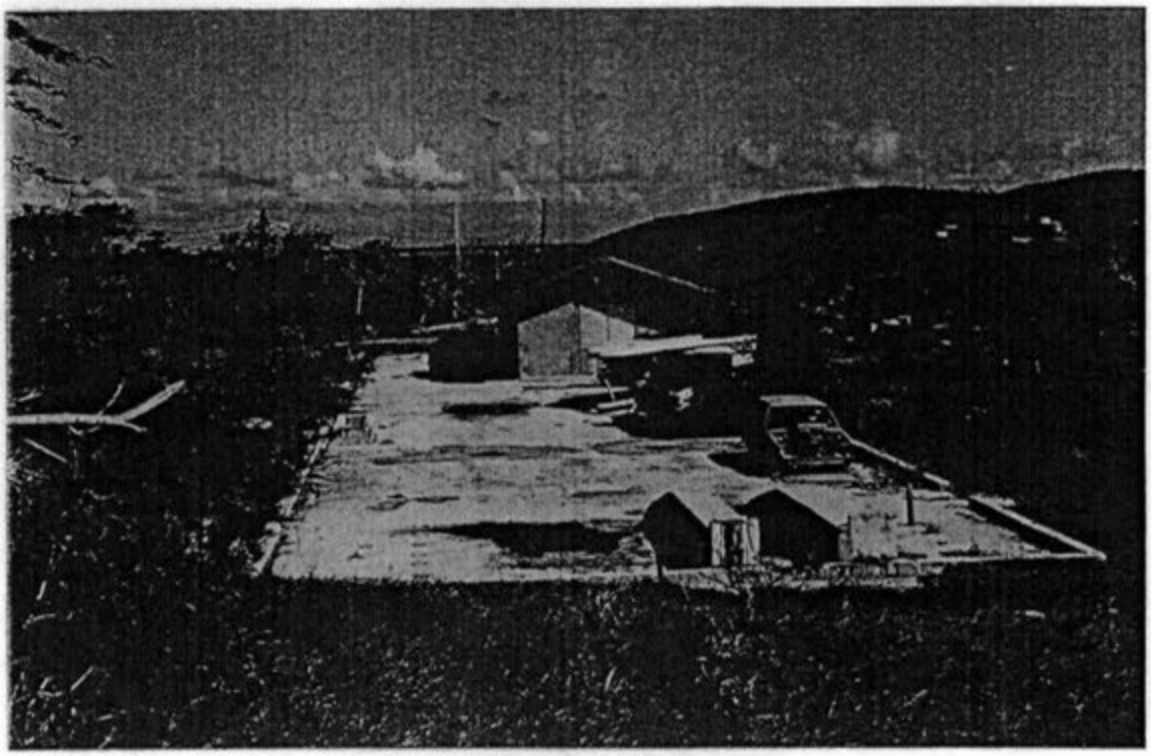
4. Culebra Island NWR (metal debris in wetland area)

Source: Ecology and Environment, Inc., 1996.

PHOTOS



1. Culebra Island NWR (view from airplane)



2. Culebra Island NWR (former bathroom foundation and auto shop)

Source: Ecology and Environment, Inc., 1996.

ATTACHMENT B

ANALYTICAL REPORT
July 19, 1996

MEMORANDUM

TO: Debra Bowman

FROM: Gary Hahn Gary Hahn/kr

DATE: August 7, 1996

SUBJECT: JC-6000 INPRS and Site Investigations
Culebra NWR
U.S.A.C.E. Jacksonville Report

RE: 9601.532

CC: Lab File

Attached is the laboratory report of the analysis conducted on four samples received at the Analytical Services Center on July 23, 1996. Analysis was performed according to the procedures set forth in "Methods for the Chemical Analysis of Water and Wastes", USEPA-600/4-79-020, March 1983 and "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, USEPA, 1986.

The chain of custody form provided herein is integral to this report and must be included with the analytical results forms upon transferral to another data user.

All samples on which this report is based will be retained by E & E for a period of 30 days from the date of this report, unless otherwise instructed by the client. If additional storage of samples is requested by the client, a storage fee of $1.00 per sample container per month will be charged for each sample, with such charges accruing until destruction of the samples is authorized by the client.

GH/kr
Enclosure

ecology and environment, inc.
Analytical Services Center
4493 Walden Avenue, Lancaster, New York, 14086, Tel. 716/685-8080, Fax 716/685-0852
International Specialists in the Environment

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

Project No.: JC7000
Project Name: Culebra NWR
Project Manager: Bowman
Samplers: (Signature) P Kelso
Field Team Leader: Kelso

STATION NUMBER	DATE	TIME	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE TYPE AIR	SAMPLE INFORMATION / EXPECTED COMPOUNDS (Concentration)*	STATION LOCATION	NUMBER OF CONTAINERS	8020 (pres. w HCl)	8010	8010 Mod	9073 (pres w H_2SO_4)	8 RCRA metals (total)	8 metals (dissolved & filtered & pres w HNO_3)	8010 8020 EDB	8310, 9073 8 RCRA metals	REMARKS
B1 0-2	7/19	1411	X			Low	B1 (0-2)	2							1	1	
B2 0-2	7/19	1430	X				B2 (0-2)	2							1	1	
MW1	7/19	1500		X			MW1	10	2	2	2	1	1	1	1		

Relinquished By: (Signature)	Date/Time:	Received By: (Signature)	Relinquished By: (Signature)	Date/Time:	Received By: (Signature)	Ship Via:
P Kelso	7-22-96	Fedex				Fed Ex
Relinquished By: (Signature)	Date/Time:	Received By: (Signature)	Relinquished By: (Signature)	Date/Time:	Received By: (Signature)	BL/Airbill Number: 7014776451
Fed Ex	7-23-96 0910	Received For Laboratory By: (Signature)	Relinquished By: (Signature)	Date/Time:	Received For Laboratory By: (Signature)	Date: 7-22-96

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files
*See CONCENTRATION RANGE on back of form.

0571194

Ecology and Environment, Inc.
Analytical Services Center
Cooler Receipt Form

PACKAGE RECEIPT #: 1318 NUMBER OF COOLERS: 1 DATE RECEIVED: 7-23-96

E&E Project #: JC-7000 Project or Site Name: Culebra

A: Preliminary Examination Phase

(CIRCLE ONE)

1 Did coolers come with airbill or packing slip? YES NO

if YES, enter carrier here and print airbill # below: FedEx

2 Did cooler(s) have custody seals? YES NO

if YES, how many and where: 2 @ seam

3 Were custody seals unbroken and intact on receipt? YES NO

4 Where custody seals dated and signed? YES NO

if YES, enter Date: 7.22.96 Name: —

5 Initial here to acknowledge receipt of cooler(s): [illegible]

B Unpacking Phase:

Date Cooler(s) Opened: 7.23.96 C-O-C Numbers: —

Coolers Opened By(print): J. Hendricks (sign): [illegible]

6 Where C-O-C forms received and sealed in plastic bag? YES NO

7 Was the project identifiable from the C-O-C form? YES NO

if YES, enter the project number and name in the heading above.

8 Was enough packing material used in cooler(s)? YES NO

Circle type of material: Vermiculite Bubble Wrap Other

9 If required, was enough ice used?: YES NO

if YES, circle type of ice: WET DRY BLUE Other

10 Was a temperature blank included inside cooler(s)? YES NO

if Yes, indicate temperature in table below.

If No, indicate Cooler temperature in table below.

11 Were all containers sealed in separate plastic bags?: YES NO

12 Did all containers arrive unbroken and in good condition? YES NO

C Login Phase:

Date Samples Logged in: 7.23.96

Samples logged in By(print): J. Hendricks (sign): [illegible]

13 Were all container labels complete(eg.date,time,preserv.)? YES NO

14 Were all C-O-C forms filled out properly in ink and signed? YES NO

15 Did the C-O-C form agree with containers received? YES NO

16 Were the correct containers used for the tests requested? YES NO

17 Were the correct preservatives listed on the sample labels? YES NO

18 Was a sufficient sample volume sent for the tests requested? YES NO

19 Were all volatile samples received without head space? YES NO

Please record Temp. Blank or Cooler Temp. for each cooler, range (2 - 5 C°)*

AIRBILL #	TEMP.C°	AIRBILL #	TEMP.C°	AIRBILL #	TEMP.C°
7014776451	3.5				

* If NO or Temp. outside of acceptable range a Discrepancy form must be filed.

ANALYTICAL REFERENCE SUMMARY 9601.532

PARAMETER	METHOD
Total Recoverable Petroleum Hydrocarbons	Method 418.1 "Methods for the Chemical Analysis of Water and Wastes", USEPA-600/4-79-020, March 1983.
Arsenic Barium Cadmium Chromium Total Lead Selenium Silver	Method 6010 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, USEPA, 1986.
Mercury (Water)	Method 7470 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, USEPA, 1986.
Mercury (Soil)	Method 7471 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, USEPA, 1986.
Ethylene Dibromide (Microextractables)	Method 8011 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, USEPA, 1986.
8310 PAH/LC	Method 8310 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, USEPA, 1986.
8010 VOA Single Column	Method 8010 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, USEPA, 1986.
8020 VOA Single Column	Method 8020 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, Third Edition, USEPA, 1986.

JOB NUMBER : 9601.532

Ecology and Environment, Inc.
SAMPLE TRACKING REPORT

SAMPLE NUMBER	CLIENT SAMPLE ID	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED
TRPH	-S			
48214.02	B1 (0-2)	07/19/96		08/02/96
48215.02	B2 (0-2)	07/19/96		08/02/96
TRPH	-W			
48212.08	MW 1	07/19/96		07/27/96
ARSENIC	(ICP)-S			
48214.02	B1 (0-2)	07/19/96	07/24/96	07/26/96
48215.02	B2 (0-2)	07/19/96	07/24/96	07/26/96
ARSENIC	(ICP)-W			
48212.09	MW 1	07/19/96	07/24/96	07/26/96
48213.01	MW 1- DISS	07/19/96	07/24/96	07/26/96
BARIUM	(ICP)-S			
48214.02	B1 (0-2)	07/19/96	07/24/96	07/26/96
48215.02	B2 (0-2)	07/19/96	07/24/96	07/26/96
BARIUM	(ICP)-W			
48212.09	MW 1	07/19/96	07/24/96	07/26/96
48213.01	MW 1- DISS	07/19/96	07/24/96	07/26/96
CADMIUM	(ICP)-S			
48214.02	B1 (0-2)	07/19/96	07/24/96	07/26/96
48215.02	B2 (0-2)	07/19/96	07/24/96	07/26/96
CADMIUM	(ICP)-W			
48212.09	MW 1	07/19/96	07/24/96	07/26/96
48213.01	MW 1- DISS	07/19/96	07/24/96	07/26/96
CHROMIUM TOTAL	(ICP)-S			
48214.02	B1 (0-2)	07/19/96	07/24/96	07/26/96
48215.02	B2 (0-2)	07/19/96	07/24/96	07/26/96
CHROMIUM TOTAL	(ICP)-W			
48212.09	MW 1	07/19/96	07/24/96	07/26/96
48213.01	MW 1- DISS	07/19/96	07/24/96	07/26/96
LEAD	(ICP)-S			
48214.02	B1 (0-2)	07/19/96	07/24/96	07/26/96
48215.02	B2 (0-2)	07/19/96	07/24/96	07/26/96
LEAD	(ICP)-W			
48212.09	MW 1	07/19/96	07/24/96	07/26/96
48213.01	MW 1- DISS	07/19/96	07/24/96	07/26/96
MERCURY	(CVAP)-S			
48214.02	B1 (0-2)	07/19/96		07/24/96
48215.02	B2 (0-2)	07/19/96		07/24/96
MERCURY	(CVAP)-W			
48212.09	MW 1	07/19/96		07/24/96
48213.01	MW 1- DISS	07/19/96		07/24/96
SELENIUM	(ICP)-S			
48214.02	B1 (0-2)	07/19/96	07/24/96	07/26/96
48215.02	B2 (0-2)	07/19/96	07/24/96	07/26/96
SELENIUM	(ICP)-W			
48212.09	MW 1	07/19/96	07/24/96	07/26/96
48213.01	MW 1- DISS	07/19/96	07/24/96	07/26/96

JOB NUMBER : 9601.532

Ecology and Environment, Inc.
SAMPLE TRACKING REPORT

SAMPLE NUMBER	CLIENT SAMPLE ID	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED
SILVER (ICP)-S				
48214.02	B1 (0-2)	07/19/96	07/24/96	07/26/96
48215.02	B2 (0-2)	07/19/96	07/24/96	07/26/96
SILVER (ICP)-W				
48212.09	MW 1	07/19/96	07/24/96	07/26/96
48213.01	MW 1- DISS	07/19/96	07/24/96	07/26/96
8010 VOA -S				
48214.01	B1 (0-2)	07/19/96		07/29/96
48215.01	B2 (0-2)	07/19/96		07/29/96
8010 VOA -W				
48212.03	MW 1	07/19/96		07/26/96
8020 VOA -S				
48214.01	B1 (0-2)	07/19/96		07/29/96
48215.01	B2 (0-2)	07/19/96		07/29/96
8020 VOA -W				
48212.01	MW 1	07/19/96		07/26/96
ETHYLENE DIBROMIDE -W				
48212.05	MW 1	07/19/96		07/25/96
ETHYLENE DIBROMIDE-SOLID				
48214.01	B1 (0-2)	07/19/96		07/26/96
48215.01	B2 (0-2)	07/19/96		07/26/96
8310 PAH/LC -S				
48214.02	B1 (0-2)	07/19/96	07/24/96	07/26/96
48215.02	B2 (0-2)	07/19/96	07/24/96	07/26/96
8310 PAH/LC -W				
48212.07	MW 1	07/19/96	07/25/96	07/26/96
CLP SOLIDS-TOTAL -S				
48214.02	B1 (0-2)	07/19/96		07/24/96
48215.02	B2 (0-2)	07/19/96		07/24/96

TEST CODE :STSCLP1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
TEST NAME : CLP SOLIDS-TOTAL UNITS : %
PARAMETER : SOLIDS - TOTAL

SAMPLE ID	RESULTS	Q
EE-96-48214		
B1 (0-2)	29	
EE-96-48215		
B2 (0-2)	61	

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE

QUALITY CONTROL FOR PRECISION
RESULTS OF ANALYSIS OF DUPLICATE
ANALYSES OF SOLID SAMPLES

9601.532

(%)

Parameter	E & E Laboratory No. 96-	Sample Result	Duplicate Result	Relative Percent Difference (RPD)
Solids-Total	48215	60.9	57.8	5.2

THIS RPD IS WITHIN E & E, INC. QC TARGETS.

TEST CODE :WPETHY1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
TEST NAME : TRPH UNITS : MG/L
PARAMETER : Petroleum Hydrocarbons

SAMPLE ID	RESULTS	Q	QNT. LIMIT
EE-96-48212 MW 1	ND		1.0
METHOD BLANK (07/27)	ND		1.0

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE
NA = NOT APPLICABLE

LABORATORY CONTROL SAMPLE (07/27)

9601.532

(mg/L)

ANALYTE	FOUND VALUE	TRUE VALUE	PERCENT RECOVERY
Total Recoverable Petroleum Hydrocarbons	15.0	16.6	90.6

THIS RECOVERY IS WITHIN E & E, INC. QC TARGETS.

TEST CODE :SPETHY1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
RESULTS IN DRY WEIGHT

TEST NAME : TRPH UNITS : MG/KG
PARAMETER : Petroleum Hydrocarbons

SAMPLE ID	RESULTS	Q	QNT. LIMIT
EE-96-48214			
B1 (0-2)	660		69
EE-96-48215			
B2 (0-2)	ND		33

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE
NA = NOT APPLICABLE

QUALITY CONTROL FOR PRECISION
RESULTS OF ANALYSIS OF DUPLICATE
ANALYSES OF SOLID SAMPLES

9601.532

(mg/kg as received)

Parameter	E & E Laboratory No. 96-	Sample Result	Duplicate Result	Relative Percent Difference (RPD)
Total Recoverable Petroleum Hydrocarbons				
	Batch QC	ND	ND	NC

ND = NOT DETECTED

NC = NOT CALCULABLE

QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY
FOR SPIKED SOLID SAMPLES

9601.532

(mg/kg as received)

Parameter	E & E Laboratory No. 96-	Sample Result	Spiked Sample Result	Spike Amount	Percent Recovery
Total Recoverable Petroleum Hydrocarbons					
	Batch QC	ND	162	178	90.5

THIS RECOVERY IS WITHIN E & E, INC. QC TARGETS.

ND = NOT DETECTED

LABORATORY CONTROL SAMPLE (08/02)

9601.532

(mg/kg)

ANALYTE	FOUND VALUE	TRUE VALUE	PERCENT RECOVERY
Total Recoverable Petroleum Hydrocarbons	168	166	101

THIS RECOVERY IS WITHIN E & E, INC. QC TARGETS.

TEST CODE :SPETHY1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
TEST NAME : TRPH UNITS : MG/KG
PARAMETER : Petroleum Hydrocarbons

SAMPLE ID	RESULTS	Q	QNT. LIMIT
METHOD BLANK (08/02)	ND		20

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE
NA = NOT APPLICABLE

JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
SAMPLE ID LAB :EE-96-48212 MATRIX: WATER
SAMPLE ID CLIENT: MW 1

PARAMETER	RESULTS	Q	QNT. LIMIT	UNITS
Silver	ND		50	UG/L
Arsenic	220		5.0	UG/L
Barium	2300		20	UG/L
Cadmium	ND		50	UG/L
Chromium Total	750		10	UG/L
Lead	4700		5.0	UG/L
Selenium	29		5.0	UG/L
Mercury	0.82		0.10	UG/L

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE

JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
SAMPLE ID LAB :EE-96-48213 MATRIX: WATER
SAMPLE ID CLIENT: MW 1- DISS

PARAMETER	RESULTS	Q	QNT. LIMIT	UNITS
Silver	ND		10	UG/L
Arsenic	ND		5.0	UG/L
Barium	54		20	UG/L
Cadmium	ND		5.0	UG/L
Chromium Total	ND		10	UG/L
Lead	9.8		5.0	UG/L
Selenium	ND		5.0	UG/L
Mercury	ND		0.10	UG/L

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE

LABORATORY CONTROL SAMPLE (773)

9601.532

(ug/L)

ANALYTE	FOUND VALUE	TRUE VALUE	PERCENT RECOVERY
Arsenic	1050	1000	105
Barium	1070	1000	107
Cadmium	1050	1000	105
Chromium Total	1010	1000	101
Lead	1050	1000	105
Selenium	1010	1000	101
Silver	98.5	100	98.5

THESE RECOVERIES ARE WITHIN E & E, INC. QC TARGETS.

INITIAL CALIBRATION VERIFICATION (07/24)

9601.532

(ug/L)

ANALYTE	FOUND VALUE	TRUE VALUE	PERCENT RECOVERY
Mercury	4.89	5.0	97.8

THIS RECOVERY IS WITHIN E & E, INC. QC TARGETS.

JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
SAMPLE ID LAB : METHOD BLANK (773) MATRIX: WATER

PARAMETER	RESULTS	Q	QNT. LIMIT	UNITS
Silver	ND		10	UG/L
Arsenic	ND		5.0	UG/L
Barium	ND		20	UG/L
Cadmium	ND		5.0	UG/L
Chromium Total	ND		10	UG/L
Lead	ND		5.0	UG/L
Selenium	ND		5.0	UG/L

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE

JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
SAMPLE ID LAB : METHOD BLANK (07/24) MATRIX: WATER

PARAMETER	RESULTS	Q	QNT. LIMIT	UNITS
Mercury	ND		0.10	UG/L

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE

METALS SECTION

JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
RESULTS IN DRY WEIGHT %SOLIDS : 29 %
SAMPLE ID LAB : EE-96-48214 MATRIX: SOLID
SAMPLE ID CLIENT: B1 (0-2)

PARAMETER	RESULTS	Q	QNT. LIMIT	UNITS
Silver	ND		3.4	MG/KG
Arsenic	17		1.7	MG/KG
Barium	540		6.9	MG/KG
Cadmium	ND		1.7	MG/KG
Chromium Total	38		3.4	MG/KG
Lead	460		1.7	MG/KG
Selenium	ND		1.7	MG/KG
Mercury	0.17		0.069	MG/KG

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE

METALS SECTION

JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
RESULTS IN DRY WEIGHT %SOLIDS : 61 %
SAMPLE ID LAB : EE-96-48215 MATRIX: SOLID
SAMPLE ID CLIENT: B2 (0-2)

PARAMETER	RESULTS	Q	QNT. LIMIT	UNITS
Silver	ND		1.6	MG/KG
Arsenic	8.6		0.82	MG/KG
Barium	120		3.3	MG/KG
Cadmium	ND		0.82	MG/KG
Chromium Total	7.6		1.6	MG/KG
Lead	52		0.82	MG/KG
Selenium	0.94		0.82	MG/KG
Mercury	0.049		0.033	MG/KG

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE

LABORATORY CONTROL SAMPLE (774)

9601.532

(ug/L)

ANALYTE	FOUND VALUE	TRUE VALUE	PERCENT RECOVERY
Arsenic	1040	1000	104
Barium	1070	1000	107
Cadmium	1050	1000	105
Chromium Total	1010	1000	101
Lead	1050	1000	105
Selenium	1000	1000	100
Silver	99.5	100	99.5

THESE RECOVERIES ARE WITHIN E & E, INC. QC TARGETS.

INITIAL CALIBRATION VERIFICATION (07/24)

9601.532

(ug/L)

ANALYTE	FOUND VALUE	TRUE VALUE	PERCENT RECOVERY
Mercury	4.89	5.0	97.8

THIS RECOVERY IS WITHIN E & E, INC. QC TARGETS.

METALS SECTION

JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
SAMPLE ID LAB : METHOD BLANK (774) MATRIX: SOLID

PARAMETER	RESULTS	Q	QNT. LIMIT	UNITS
Silver	ND		1.0	MG/KG
Arsenic	ND		0.50	MG/KG
Barium	ND		2.0	MG/KG
Cadmium	ND		0.50	MG/KG
Chromium Total	ND		1.0	MG/KG
Lead	ND		0.50	MG/KG
Selenium	ND		0.50	MG/KG

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE

METALS SECTION

JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
SAMPLE ID LAB : METHOD BLANK (07/24) MATRIX: SOLID

PARAMETER	RESULTS	Q	QNT. LIMIT	UNITS
Mercury	ND		0.050	MG/KG

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE

TEST CODE :WEDB 1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
TEST NAME : ETHYLENE DIBROMIDE UNITS : UG/L
SAMPLE ID LAB : EE-96-48212 MATRIX: WATER
SAMPLE ID CLIENT: MW 1

PARAMETER	RESULTS	Q	QNT. LIMIT
1,2-Dibromoethane	ND		0.020

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

1,2-DIBROMOETHANE (EDB) IN WATER
BY MICROEXTRACTION AND GAS CHROMATOGRAPHY
MDL CHECK SAMPLE

9601.532

(ug/L)

Compound	Original Value	Amount Added	Amount Determined	Percent Recovery
Ethylene dibromide	ND	0.020	0.0146	73.0

THIS RECOVERY IS WITHIN E & E, INC. QC TARGETS.

ND = NOT DETECTED

1,2-DIBROMOETHANE (EDB) IN WATER
BY MICROEXTRACTION AND GAS CHROMATOGRAPHY
REFERENCE SAMPLE CHECK

9601.532

(ug/L)

Compound	Original Value	Amount Added	Amount Determined	Percent Recovery
Ethylene dibromide	ND	0.10	0.0888	88.8

THIS RECOVERY IS WITHIN E & E, INC. QC TARGETS.

ND = NOT DETECTED

1,2-DIBROMOETHANE (EDB) IN WATER
BY MICROEXTRACTION AND GAS CHROMATOGRAPHY
LFB CHECK SAMPLE

9601.532

(ug/L)

Compound	Original Value	Amount Added	Amount Determined	Percent Recovery
Ethylene dibromide	ND	0.25	0.225	90.0

THIS RECOVERY IS WITHIN E & E, INC. QC TARGETS.

ND = NOT DETECTED

TEST CODE :WEDB 1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
TEST NAME : ETHYLENE DIBROMIDE UNITS : UG/L
SAMPLE ID LAB : METHOD BLANK MATRIX: WATER

PARAMETER	RESULTS	Q	QNT. LIMIT
1,2-Dibromoethane	ND		0.020

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

TEST CODE :SEDB 1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
RESULTS IN DRY WEIGHT %SOLIDS : 29 %
TEST NAME : ETHYLENE DIBROMIDE UNITS : UG/G
SAMPLE ID LAB : EE-96-48214 MATRIX : SOLID
SAMPLE ID CLIENT: B1 (0-2)

PARAMETER	RESULTS	Q	QNT. LIMIT
1,2-Dibromoethane	ND		0.003

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
X = EXCEEDS CALIBRATION LIMIT
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

TEST CODE :SEDB 1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
RESULTS IN DRY WEIGHT %SOLIDS : 61 %
TEST NAME : ETHYLENE DIBROMIDE UNITS : UG/G
SAMPLE ID LAB : EE-96-48215 MATRIX : SOLID
SAMPLE ID CLIENT: B2 (0-2)

PARAMETER	RESULTS	Q	QNT. LIMIT
1,2-Dibromoethane	ND		0.001

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
X = EXCEEDS CALIBRATION LIMIT
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

1,2-DIBROMOETHANE (EDB) IN WATER
BY MICROEXTRACTION AND GAS CHROMATOGRAPHY
MDL CHECK SAMPLE

9601.532

(ug/g)

Compound	Original Value	Amount Added	Amount Determined	Percent Recovery
Ethylene dibromide	ND	0.000673	0.000435	64.6

THIS RECOVERY IS WITHIN E & E, INC. QC TARGETS.

ND = NOT DETECTED

1,2-DIBROMOETHANE (EDB) IN WATER
BY MICROEXTRACTION AND GAS CHROMATOGRAPHY
REFERENCE SAMPLE CHECK

9601.532

(ug/g)

Compound	Original Value	Amount Added	Amount Determined	Percent Recovery
Ethylene dibromide	ND	0.00321	0.00279	86.9

THIS RECOVERY IS WITHIN E & E, INC. QC TARGETS.

ND = NOT DETECTED

1,2-DIBROMOETHANE (EDB) IN WATER
BY MICROEXTRACTION AND GAS CHROMATOGRAPHY
LFB CHECK SAMPLE

9601.532

(ug/g)

Compound	Original Value	Amount Added	Amount Determined	Percent Recovery
Ethylene dibromide	ND	0.00833	0.00704	84.5

THIS RECOVERY IS WITHIN E & E, INC. QC TARGETS.

ND = NOT DETECTED

TEST CODE :SEDB 1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
TEST NAME : ETHYLENE DIBROMIDE UNITS : UG/G
SAMPLE ID LAB : METHOD BLANK MATRIX : SOLID

PARAMETER	RESULTS	Q	QNT. LIMIT
1,2-Dibromoethane	ND		0.001

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
X = EXCEEDS CALIBRATION LIMIT
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

TEST CODE :WPAH0A1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
TEST NAME : 8310 PAH/LC UNITS : UG/L
SAMPLE ID LAB : EE-96-48212 MATRIX: WATER
SAMPLE ID CLIENT: MW 1

PARAMETER	RESULTS	Q	QNT. LIMIT
Naphthalene	ND		5.0
Acenaphthylene	ND		5.0
1-methylnaphthalene	ND		5.0
2-Methylnaphthalene	ND		5.0
Acenaphthene	ND		5.0
Fluorene	ND		1.0
Phenanthrene	ND		1.0
Anthracene	ND		1.0
Fluoranthene	ND		2.5
Pyrene	ND		2.5
Benzo(a)anthracene	ND		1.0
Chrysene	ND		1.0
Benzo(b)fluoranthene	ND		1.0
Benzo(k)fluoranthene	ND		1.0
Benzo(a)pyrene	ND		1.0
Dibenzo(a,h)anthracene	ND		2.5
Benzo(ghi)perylene	ND		2.5
Indeno(1,2,3-cd)pyrene	ND		1.0

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

QUALITY CONTROL FOR ACCURACY AND PRECISION:
PERCENT RECOVERY AND RELATIVE PERCENT DIFFERENCE (RPD)
OF WATER MATRIX SPIKE (MS) AND MATRIX SPIKE DUPLICATE (MSD)
(Sample # 48212)

9601.532

(ug/L)

Parameter	Original Value	Amount Added	Amount Determined MS	Amount Determined MSD	Percent Recovery MS	Percent Recovery MSD	RPD
Naphthalene	ND	20	11.5	12.0	57.6	60.2	4.4
Acenaphthylene	ND	20	16.3	19.2	82.0	96.0	16.1
Acenaphthene	ND	20	14.9	14.7	75.0	73.0	1.6
Fluorene	ND	20	13.4	13.6	66.8	67.8	1.5
Phenanthrene	ND	20	14.2	14.0	70.9	70.2	1.0
Anthracene	ND	20	14.4	14.3	72.1	71.4	1.0
Fluoranthene	ND	20	14.4	13.6	72.0	68.0	5.6
Pyrene	ND	20	15.2	15.4	76.0	77.0	1.3
Benzo(a)anthracene	ND	20	13.7	13.6	68.4	68.3	0.2
Chrysene	ND	20	12.8	11.9	64.0	59.7	7.0
Benzo(b)fluoranthene	ND	20	19.5	20.4	97.7	102	4.4
Benzo(k)fluoranthene	ND	20	11.7	13.9	58.5	69.3	17.0
Benzo(a)pyrene	ND	20	9.66	8.98	48.3	44.9	7.3
Dibenzo(a,h)anthracene	ND	20	11.8	12.2	59.2	61.1	3.2
Benzo(ghi)perylene	ND	20	9.48	8.79	47.4	44.0	7.6
Indeno(1,2,3-cd)pyrene	ND	20	8.95	8.41	44.8	42.1	6.2

THESE RECOVERIES AND RPDs ARE WITHIN E & E, INC. QC TARGETS.

ND = NOT DETECTED

QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY
FOR SPIKED WATER SAMPLES
Laboratory Control Sample (8604)

9601.532

(ug/L)

Parameter	Amount Added	Amount Determined	Percent Recovery
Naphthalene	10	7.19	71.9
Acenaphthylene	10	7.22	72.2
Acenaphthene	10	7.42	74.2
Fluorene	10	7.44	74.4
Phenanthrene	10	7.97	79.7
Anthracene	10	7.68	76.8
Fluoranthene	10	8.56	85.6
Pyrene	10	8.47	84.7
Benzo(a)anthracene	10	8.62	86.2
Chrysene	10	8.42	84.2
Benzo(b)fluoranthene	10	8.18	81.8
Benzo(k)fluoranthene	10	8.14	81.4
Benzo(a)pyrene	10	7.58	75.8
Dibenzo(a,h)anthracene	10	7.94	79.4
Benzo(ghi)perylene	10	7.23	72.3
Indeno(1,2,3-cd)pyrene	10	7.26	72.6

THESE RECOVERIES ARE WITHIN E & E, INC. QC TARGETS.

QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY
OF SURROGATE SPIKES

9601.532

(ug)

Parameter	E & E Laboratory No. 96-	Amount Added	Amount Determined	Percent Recovery
Terphenyl-d14	48212	27.3	20.0	73.3
	48212 MS	54.6	41.3	75.6
	48212 MSD	54.6	37.5	68.9
	Method Blank (8602)	27.3	17.0	62.3
	LCS (8604)	27.3	27.7	101

THESE RECOVERIES ARE WITHIN E & E, INC. QC TARGETS.

MS = MATRIX SPIKE
MSD = MATRIX SPIKE DUPLICATE
LCS = LABORATORY CONTROL SAMPLE

TEST CODE :WPAH0A1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
TEST NAME : 8310 PAH/LC UNITS : UG/L
SAMPLE ID LAB : METHOD BLANK (8602) MATRIX: WATER

PARAMETER	RESULTS	Q	QNT. LIMIT
Naphthalene	ND		5.0
Acenaphthylene	ND		5.0
1-methylnaphthalene	ND		5.0
2-Methylnaphthalene	ND		5.0
Acenaphthene	ND		5.0
Fluorene	ND		1.0
Phenanthrene	ND		1.0
Anthracene	ND		1.0
Fluoranthene	ND		2.5
Pyrene	ND		2.5
Benzo(a)anthracene	ND		1.0
Chrysene	ND		1.0
Benzo(b)fluoranthene	ND		1.0
Benzo(k)fluoranthene	ND		1.0
Benzo(a)pyrene	ND		1.0
Dibenzo(a,h)anthracene	ND		2.5
Benzo(ghi)perylene	ND		2.5
Indeno(1,2,3-cd)pyrene	ND		1.0

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

TEST CODE :SPAH0A1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
RESULTS IN DRY WEIGHT %SOLIDS : 29 %
TEST NAME : 8310 PAH/LC UNITS : UG/KG
SAMPLE ID LAB : EE-96-48214 MATRIX : SOLID
SAMPLE ID CLIENT: B1 (0-2)

PARAMETER	RESULTS	Q	QNT. LIMIT
Naphthalene	ND		6900
Acenaphthylene	ND		6900
1-methylnaphthalene	ND		6900
2-Methylnaphthalene	ND		6900
Acenaphthene	ND		6900
Fluorene	ND		690
Phenanthrene	ND		690
Anthracene	ND		690
Fluoranthene	ND		1700
Pyrene	ND		1700
Benzo(a)anthracene	ND		690
Chrysene	ND		690
Benzo(b)fluoranthene	ND		690
Benzo(k)fluoranthene	16000		690
Benzo(a)pyrene	ND		690
Dibenzo(a,h)anthracene	ND		1700
Benzo(ghi)perylene	ND		1700
Indeno(1,2,3-cd)pyrene	ND		690

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
X = EXCEEDS CALIBRATION LIMIT
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

TEST CODE :SPAH0A1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
RESULTS IN DRY WEIGHT %SOLIDS : 61 %
TEST NAME : 8310 PAH/LC UNITS : UG/KG
SAMPLE ID LAB : EE-96-48215 MATRIX : SOLID
SAMPLE ID CLIENT: B2 (0-2)

PARAMETER	RESULTS	Q	QNT. LIMIT
Naphthalene	ND		330
Acenaphthylene	ND		330
1-methylnaphthalene	ND		330
2-Methylnaphthalene	ND		330
Acenaphthene	ND		330
Fluorene	ND		33
Phenanthrene	ND		33
Anthracene	ND		33
Fluoranthene	ND		82
Pyrene	ND		82
Benzo(a)anthracene	ND		33
Chrysene	ND		33
Benzo(b)fluoranthene	ND		33
Benzo(k)fluoranthene	240		33
Benzo(a)pyrene	ND		33
Dibenzo(a,h)anthracene	ND		82
Benzo(ghi)perylene	ND		82
Indeno(1,2,3-cd)pyrene	ND		33

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
X = EXCEEDS CALIBRATION LIMIT
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

QUALITY CONTROL FOR ACCURACY AND PRECISION:
PERCENT RECOVERY AND RELATIVE PERCENT DIFFERENCE (RPD)
OF SOIL MATRIX SPIKE (MS) AND MATRIX SPIKE DUPLICATE (MSD)
(Sample # 48215)

9601.532

(ug/kg as received)

Parameter	Original Value	Amount Added	Amount Determined MS	Amount Determined MSD	Percent Recovery MS	Percent Recovery MSD	RPD
Naphthalene	ND	330	350	360	106	109	2.8
Acenaphthylene	ND	330	410	400	124	121	2.5
Acenaphthene	ND	330	370	370	112	112	0.0
Fluorene	ND	330	340	350	103	106	2.9
Phenanthrene	ND	330	300	340	90.9	103	12.5
Anthracene	ND	330	280	310	84.8	93.9	10.2
Fluoranthene	ND	330	320	370	97.0	112	14.5
Pyrene	ND	330	310	360	93.9	109	14.9
Benzo(a)anthracene	ND	330	310	350	93.9	106	12.1
Chrysene	ND	330	310	350	93.9	106	12.1
Benzo(b)fluoranthene	ND	330	420	390	127	118	7.4
Benzo(k)fluoranthene	150	330	420	430	81.8	84.8	3.6
Benzo(a)pyrene	ND	330	310	350	93.9	106	12.1
Dibenzo(a,h)anthracene	ND	330	350	390	106	118	10.8
Benzo(ghi)perylene	ND	330	300	330	90.9	100	9.5
Indeno(1,2,3-cd)pyrene	ND	330	300	330	90.9	100	9.5

THESE RECOVERIES AND RPDs ARE WITHIN E & E, INC. QC TARGETS.

ND = NOT DETECTED

QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY
FOR SPIKED SOIL SAMPLES
Laboratory Control Sample (8547)

9601.532

(ug/kg)

Parameter	Amount Added	Amount Determined	Percent Recovery
Naphthalene	330	330	100
Acenaphthylene	330	300	90.9
Acenaphthene	330	300	90.9
Fluorene	330	280	84.1
Phenanthrene	330	290	87.1
Anthracene	330	260	78.1
Fluoranthene	330	310	93.1
Pyrene	330	300	90.9
Benzo(a)anthracene	330	300	90.9
Chrysene	330	290	87.1
Benzo(b)fluoranthene	330	280	84.1
Benzo(k)fluoranthene	330	280	84.1
Benzo(a)pyrene	330	250	75.1
Dibenzo(a,h)anthracene	330	280	84.1
Benzo(ghi)perylene	330	230	69.1
Indeno(1,2,3-cd)pyrene	330	240	72.1

THESE RECOVERIES ARE WITHIN E & E, INC. QC TARGETS.

QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY
OF SURROGATE SPIKES

9601.532

(ug)

Parameter	E & E Laboratory No. 96-	Amount Added	Amount Determined	Percent Recovery
Terphenyl-d14	48214	910	1060	116
	48215	910	1240	135
	48215 MS	910	990	109
	48215 MSD	910	1090	120
	Method Blank (8548)	910	988	109
	LCS (8547)	910	918	101

THESE RECOVERIES ARE WITHIN E & E, INC. QC TARGETS.

MS = MATRIX SPIKE
MSD = MATRIX SPIKE DUPLICATE
LCS = LABORATORY CONTROL SAMPLE

TEST CODE :SPAH0A1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
TEST NAME : 8310 PAH/LC UNITS : UG/KG
SAMPLE ID LAB : METHOD BLANK (8548) MATRIX : SOLID

PARAMETER	RESULTS	Q	QNT. LIMIT
Naphthalene	ND		200
Acenaphthylene	ND		200
1-methylnaphthalene	ND		200
2-Methylnaphthalene	ND		200
Acenaphthene	ND		200
Fluorene	ND		20
Phenanthrene	ND		20
Anthracene	ND		20
Fluoranthene	ND		50
Pyrene	ND		50
Benzo(a)anthracene	ND		20
Chrysene	ND		20
Benzo(b)fluoranthene	ND		20
Benzo(k)fluoranthene	ND		20
Benzo(a)pyrene	ND		20
Dibenzo(a,h)anthracene	ND		50
Benzo(ghi)perylene	ND		50
Indeno(1,2,3-cd)pyrene	ND		20

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
X = EXCEEDS CALIBRATION LIMIT
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

TEST CODE :WPH_0A1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
TEST NAME : 8010 VOA UNITS : UG/L
SAMPLE ID LAB : EE-96-48212 MATRIX: WATER
SAMPLE ID CLIENT: MW 1

PARAMETER	RESULTS	Q	QNT. LIMIT
Dichlorodifluoromethane	ND		5.0
Chloromethane	ND		5.0
Vinyl chloride	ND		1.0
Bromomethane	ND		0.50
Chloroethane	ND		0.80
Trichlorofluoromethane	ND		0.60
1,1-Dichloroethene	ND		0.50
Methylene chloride	ND		2.5
trans-1,2-Dichloroethene	ND		0.50
1,1-Dichloroethane	ND		0.50
cis-1,2-Dichloroethene	ND		0.50
Chloroform	ND		0.50
1,1,1-Trichloroethane	ND		0.50
Carbon tetrachloride	ND		0.50
1,2-Dichloroethane	ND		0.50
Trichloroethene	ND		1.0
1,2-Dichloropropane	ND		3.0
Bromodichloromethane	ND		2.0
2-Chloroethylvinylether	ND		2.0
cis-1,3-Dichloropropene	ND		0.70
trans-1,3-Dichloropropene	ND		1.5
1,1,2-Trichloroethane	ND		0.50
Tetrachloroethene	ND		0.50
Dibromochloromethane	ND		0.50
Chlorobenzene	ND		0.80
Bromoform	ND		0.50
1,1,2,2-Tetrachloroethane	ND		0.50
1,3-Dichlorobenzene	ND		0.80
1,4-Dichlorobenzene	ND		0.80
1,2-Dichlorobenzene	ND		0.80

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

QUALITY CONTROL FOR ACCURACY AND PRECISION:
PERCENT RECOVERY AND RELATIVE PERCENT DIFFERENCE (RPD)
OF WATER MATRIX SPIKE (MS) AND MATRIX SPIKE DUPLICATE (MSD)
(Sample # 48212)

9601.532

(ug/L)

Compound	Original Value	Amount Added	Amount Determined MS	Amount Determined MSD	Percent Recovery MS	Percent Recovery MSD	RPD
Dichlorodifluoromethane	ND	20	19.9	20.6	99.5	103	3.3
Chloromethane	ND	20	20.2	24.3	101	122	18.5
Vinyl chloride	ND	20	20.8	20.4	104	102	2.0
Bromomethane	ND	20	17.7	16.7	88.5	83.6	5.7
Chloroethane	ND	20	26.0	26.3	130	131	1.2
Fluorotrichloromethane	ND	20	21.4	21.5	107	108	0.5
1,1-Dichloroethene	ND	20	22.5	22.6	112	113	0.5
Methylene chloride	ND	20	20.8	23.0	104	115	10.2
trans-1,2-Dichloroethene	ND	20	21.5	20.1	107	100	6.8
1,1-Dichloroethane	ND	20	20.0	20.4	99.9	102	2.0
cis-1,2-Dichloroethene	ND	20	20.6	19.8	103	99.2	3.6
Chloroform	ND	20	21.5	21.3	108	106	1.3
1,1,1-Trichloroethane	ND	20	19.4	19.7	96.8	98.3	1.6
Carbon tetrachloride	ND	20	18.6	20.2	93.2	101	8.3
1,2-Dichloroethane	ND	20	21.6	20.9	108	104	3.6
Trichloroethene	ND	20	19.6	19.3	98.2	96.4	1.8
1,2-Dichloropropane	ND	20	19.0	18.5	95.0	92.7	2.5
Bromodichloromethane	ND	20	18.3	18.8	91.6	94.2	2.8
cis-1,3-Dichloropropene	ND	20	18.7	18.5	93.3	92.3	1.0
trans-1,3-Dichloropropene	ND	20	14.9	17.7	74.5	88.7	17.4
1,1,2-Trichloroethane	ND	20	19.6	24.5	98.0	123	22.2
Tetrachloroethene	ND	20	18.7	20.9	93.7	105	11.0
Chlorodibromomethane	ND	20	21.9	23.6	110	118	7.1
Chlorobenzene	ND	20	20.8	20.9	104	105	0.7
Bromoform	ND	20	23.8	23.0	119	115	3.2
1,1,2,2-Tetrachloroethane	ND	20	28.8	27.4	144	137	4.8
1,3-Dichlorobenzene	ND	20	21.5	20.5	108	102	5.0
1,4-Dichlorobenzene	ND	20	21.8	21.1	109	106	3.0
1,2-Dichlorobenzene	ND	20	23.7	20.7	118	104	13.3

THESE RECOVERIES AND RPDs ARE WITHIN E & E, INC. QC TARGETS.

ND = NOT DETECTED

QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY OF SURROGATE SPIKES

9601.532

Compound	E & E Laboratory No. 96-	Percent Recovery
Bromochloromethane	48212	87.3
	48212 MS	90.9
	48212 MSD	89.0
	Method Blank	100
1-Chloro-2-bromopropane	48212	94.1
	48212 MS	12.7*
	48212 MSD	27.7*
	Method Blank	100
1,4-Dichlorobutane	48212	102
	48212 MS	118
	48212 MSD	116
	Method Blank	100

WITH THE EXCEPTION OF THOSE RECOVERIES FLAGGED "*" (DUE TO COELUTION), THESE RECOVERIES ARE WITHIN E & E, INC. QC TARGETS.

MS = MATRIX SPIKE
MSD = MATRIX SPIKE DUPLICATE

TEST CODE :WPH_0A1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
TEST NAME : 8010 VOA UNITS : UG/L
SAMPLE ID LAB : METHOD BLANK MATRIX: WATER

PARAMETER	RESULTS	Q	QNT. LIMIT
Dichlorodifluoromethane	ND		5.0
Chloromethane	ND		5.0
Vinyl chloride	ND		1.0
Bromomethane	ND		0.50
Chloroethane	ND		0.80
Trichlorofluoromethane	ND		0.60
1,1-Dichloroethene	ND		0.50
Methylene chloride	ND		2.5
trans-1,2-Dichloroethene	ND		0.50
1,1-Dichloroethane	ND		0.50
cis-1,2-Dichloroethene	ND		0.50
Chloroform	ND		0.50
1,1,1-Trichloroethane	ND		0.50
Carbon tetrachloride	ND		0.50
1,2-Dichloroethane	ND		0.50
Trichloroethene	ND		1.0
1,2-Dichloropropane	ND		3.0
Bromodichloromethane	ND		2.0
2-Chloroethylvinylether	ND		2.0
cis-1,3-Dichloropropene	ND		0.70
trans-1,3-Dichloropropene	ND		1.5
1,1,2-Trichloroethane	ND		0.50
Tetrachloroethene	ND		0.50
Dibromochloromethane	ND		0.50
Chlorobenzene	ND		0.80
Bromoform	ND		0.50
1,1,2,2-Tetrachloroethane	ND		0.50
1,3-Dichlorobenzene	ND		0.80
1,4-Dichlorobenzene	ND		0.80
1,2-Dichlorobenzene	ND		0.80

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

TEST CODE :WPA_0A1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
TEST NAME : 8020 VOA UNITS : UG/L
SAMPLE ID LAB : EE-96-48212 MATRIX: WATER
SAMPLE ID CLIENT: MW 1

PARAMETER	RESULTS	Q	QNT. LIMIT
Benzene	ND		0.60
Toluene	ND		0.90
Ethylbenzene	ND		0.70
Total Xylenes	ND		2.0
Chlorobenzene	ND		1.4
1,2-Dichlorobenzene	ND		1.2
1,3-Dichlorobenzene	ND		1.4
1,4-Dichlorobenzene	ND		1.2
MTBE	ND		1.5

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

QUALITY CONTROL FOR ACCURACY AND PRECISION:
PERCENT RECOVERY AND RELATIVE PERCENT DIFFERENCE (RPD)
OF WATER MATRIX SPIKE (MS) AND MATRIX SPIKE DUPLICATE (MSD)
(Sample # 48212)

9601.532

(ug/L)

Compound	Original Result	Amount Added	Amount Determined MS	Amount Determined MSD	Percent Recovery MS	Percent Recovery MSD	RPD
Benzene	ND	20	17.9	17.5	89.6	87.4	2.6
Toluene	ND	20	18.1	17.5	90.6	87.7	3.2
Ethylbenzene	ND	20	18.2	17.7	91.1	88.4	3.0
Total xylenes	ND	60	54.9	53.3	91.5	88.8	3.0
Chlorobenzene	ND	20	18.4	17.8	91.8	88.9	3.2
1,2-Dichlorobenzene	ND	20	19.1	18.5	95.4	92.6	3.0
1,3-Dichlorobenzene	ND	20	18.7	18.2	93.4	91.2	2.4
1,4-Dichlorobenzene	ND	20	18.6	18.1	92.9	90.7	2.4
MTBE	ND	40	44.5	42.1	111	105	5.6

THESE RECOVERIES AND RPDs ARE WITHIN E & E, INC. QC TARGETS.

ND = NOT DETECTED

QUALITY CONTROL FOR ACCURACY: PERCENT
RECOVERY OF SURROGATE SPIKES

9601.532

Compound	E & E Laboratory No. 96-	Percent Recovery
Trifluorotoluene	48212	83.9
	48212 MS	83.8
	48212 MSD	84.4
	Method Blank	100

THESE RECOVERIES ARE WITHIN E & E, INC. QC TARGETS.

MS = MATRIX SPIKE
MSD = MATRIX SPIKE DUPLICATE

TEST CODE :WPA_0A1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
TEST NAME : 8020 VOA UNITS : UG/L
SAMPLE ID LAB : METHOD BLANK MATRIX: WATER

PARAMETER	RESULTS	Q	QNT. LIMIT
Benzene	ND		0.60
Toluene	ND		0.90
Ethylbenzene	ND		0.70
Total Xylenes	ND		2.0
Chlorobenzene	ND		1.4
1,2-Dichlorobenzene	ND		1.2
1,3-Dichlorobenzene	ND		1.4
1,4-Dichlorobenzene	ND		1.2
MTBE	ND		1.5

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

TEST CODE :SPH_0A1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
RESULTS IN DRY WEIGHT %SOLIDS : 29 %
TEST NAME : 8010 VOA UNITS : UG/KG
SAMPLE ID LAB : EE-96-48214 MATRIX : SOLID
SAMPLE ID CLIENT: B1 (0-2)

PARAMETER	RESULTS	Q	QNT. LIMIT
Dichlorodifluoromethane	ND		17
Chloromethane	ND		17
Vinyl chloride	ND		3.4
Bromomethane	ND		1.7
Chloroethane	ND		2.8
Trichlorofluoromethane	ND		2.1
1,1-Dichloroethene	ND		1.7
Methylene chloride	ND		8.6
trans-1,2-Dichloroethene	ND		1.7
1,1-Dichloroehtane	ND		1.7
cis-1,2-Dichloroehtene	ND		1.7
Chloroform	ND		1.7
1,1,1-Trichloroethane	ND		1.7
Carbon tetrachloride	ND		1.7
1,2-Dichloroethane	ND		1.7
Trichloroethene	ND		3.4
1,2-Dichloropropane	ND		10
Bromodichloromethane	ND		6.9
2-Chloroethylvinylether	ND		6.9
cis-1,3-Dichloropropene	ND		2.4
trans-1,3-Dichloropropene	ND		5.2
1,1,2-Trichloroethane	ND		1.7
Tetrachloroethene	ND		1.7
Dibromochloromethane	ND		1.7
Chlorobenzene	ND		2.8
Bromoform	ND		1.7
1,1,2,2-Tetrachloroethane	ND		1.7
1,3-Dichlorobenzene	ND		2.8
1,4-Dichlorobenzene	ND		2.8
1,2-Dichlorobenzene	ND		2.8

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
X = EXCEEDS CALIBRATION LIMIT
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

TEST CODE :SPH_0A1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
RESULTS IN DRY WEIGHT %SOLIDS : 61 %
TEST NAME : 8010 VOA UNITS : UG/KG
SAMPLE ID LAB : EE-96-48215 MATRIX : SOLID
SAMPLE ID CLIENT: B2 (0-2)

PARAMETER	RESULTS	Q	QNT. LIMIT
Dichlorodifluoromethane	ND		8.2
Chloromethane	ND		8.2
Vinyl chloride	ND		1.6
Bromomethane	ND		0.82
Chloroethane	ND		1.3
Trichlorofluoromethane	ND		0.98
1,1-Dichloroethene	ND		0.82
Methylene chloride	ND		4.1
trans-1,2-Dichloroethene	ND		0.82
1,1-Dichloroehtane	ND		0.82
cis-1,2-Dichloroehtene	ND		0.82
Chloroform	ND		0.82
1,1,1-Trichloroethane	ND		0.82
Carbon tetrachloride	ND		0.82
1,2-Dichloroethane	ND		0.82
Trichloroethene	ND		1.6
1,2-Dichloropropane	ND		4.9
Bromodichloromethane	ND		3.3
2-Chloroethylvinylether	ND		3.3
cis-1,3-Dichloropropene	ND		1.1
trans-1,3-Dichloropropene	ND		2.4
1,1,2-Trichloroethane	ND		0.82
Tetrachloroethene	ND		0.82
Dibromochloromethane	ND		0.82
Chlorobenzene	ND		1.3
Bromoform	ND		0.82
1,1,2,2-Tetrachloroethane	ND		0.82
1,3-Dichlorobenzene	ND		1.3
1,4-Dichlorobenzene	ND		1.3
1,2-Dichlorobenzene	ND		1.3

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
X = EXCEEDS CALIBRATION LIMIT
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

QUALITY CONTROL FOR ACCURACY AND PRECISION:
PERCENT RECOVERY AND RELATIVE PERCENT DIFFERENCE (RPD)
OF SOIL MATRIX SPIKE (MS) AND MATRIX SPIKE DUPLICATE (MSD)
(Sample # 48215)

9601.532

(ug/kg as received)

Compound	Original Value	Amount Added	Amount Determined MS	Amount Determined MSD	Percent Recovery MS	Percent Recovery MSD	RPD
Dichlorodifluoromethane	ND	20	13.7	17.1	68.6	85.6	22.1
Chloromethane	ND	20	15.7	21.4	78.6	107	30.8
Vinyl chloride	ND	20	16.0	19.1	80.1	95.4	17.4
Bromomethane	ND	20	6.00	11.7	30.0	58.4	64.2
Chloroethane	ND	20	18.0	22.4	90.2	112	21.6
Fluorotrichloromethane	ND	20	17.2	19.5	85.9	97.3	12.5
1,1-Dichloroethene	ND	20	18.8	22.5	94.0	113	18.0
Methylene chloride	ND	20	24.9	30.7	124	153	20.8
trans-1,2-Dichloroethene	ND	20	16.0	20.0	80.0	100	22.2
1,1-Dichloroethane	ND	20	14.2	16.9	71.1	84.7	17.5
cis-1,2-Dichloroethene	ND	20	15.4	19.7	77.1	98.6	24.5
Chloroform	ND	20	15.5	18.7	77.4	93.5	18.9
1,1,1-Trichloroethane	ND	20	13.5	17.4	67.4	86.8	25.2
Carbon tetrachloride	ND	20	11.6	15.9	57.9	79.3	31.2
1,2-Dichloroethane	ND	20	14.7	19.7	73.7	98.5	28.9
Trichloroethene	ND	20	13.3	17.7	66.3	88.4	28.6
1,2-Dichloropropane	ND	20	12.8	18.8	63.8	94.1	38.5
Bromodichloromethane	ND	20	9.15	14.0	45.8	70.2	42.1
2-Chloroethylvinyl ether	ND	20	14.4	17.0	28.9	34.1	16.6
cis-1,3-Dichloropropene	ND	20	4.15	10.3	20.8	51.7	85.4
trans-1,3-Dichloropropene	ND	20	3.90	11.2	19.5	55.8	96.4
1,1,2-Trichloroethane	ND	20	13.1	17.2	65.3	86.0	27.3
Tetrachloroethene	ND	20	11.9	14.8	59.3	74.2	22.4
Chlorodibromomethane	ND	20	8.20	13.4	41.0	67.2	48.4
Chlorobenzene	ND	20	12.0	17.5	60.1	87.6	37.2
Bromoform	ND	20	6.50	12.7	32.5	63.4	64.4
1,1,2,2-Tetrachloroethane	ND	20	10.4	17.3	51.9	86.4	49.8
1,3-Dichlorobenzene	ND	20	8.49	13.6	42.5	67.8	46.0
1,4-Dichlorobenzene	ND	20	9.44	14.9	47.2	74.4	44.8
1,2-Dichlorobenzene	ND	20	7.03	11.8	35.1	59.2	51.0

THESE RECOVERIES AND RPDs ARE WITHIN E & E, INC. QC TARGETS.

ND = NOT DETECTED

QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY
FOR SPIKED SOIL SAMPLES
(Laboratory Control Sample)

9601.532

(ug/kg)

Compound	Amount Added	Amount Determined	Percent Recovery
Dichlorodifluoromethane	20	18.0	89.9
Chloromethane	20	26.2	131
Vinyl chloride	20	19.7	98.5
Bromomethane	20	18.1	90.4
Chloroethane	20	23.1	115
Fluorotrichloromethane	20	20.0	99.9
1,1-Dichloroethene	20	23.8	119
Methylene chloride	20	29.1	145
trans-1,2-Dichloroethene	20	22.5	113
1,1-Dichloroethane	20	17.9	89.7
cis-1,2-Dichloroethene	20	18.6	93.1
Chloroform	20	20.7	104
1,1,1-Trichloroethane	20	18.7	93.4
Carbon tetrachloride	20	19.8	98.8
1,2-Dichloroethane	20	20.3	101
Trichloroethene	20	19.6	97.9
1,2-Dichloropropane	20	18.5	92.6
Bromodichloromethane	20	16.7	83.4
2-Chloroethylvinyl ether	50	5.07	10.1
cis-1,3-Dichloropropene	20	17.5	87.7
trans-1,3-Dichloropropene	20	21.6	108
1,1,2-Trichloroethane	20	19.2	96.1
Tetrachloroethene	20	17.6	87.9
Chlorodibromomethane	20	18.2	91.1
Chlorobenzene	20	20.7	103
Bromoform	20	18.8	94.2
1,1,2,2-Tetrachloroethane	20	20.5	102
1,3-Dichlorobenzene	20	20.7	103
1,4-Dichlorobenzene	20	21.9	109
1,2-Dichlorobenzene	20	19.9	99.4
Ethylene dibromide	20	18.4	92.2

THESE RECOVERIES ARE WITHIN E & E, INC. QC TARGETS.

QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY OF SURROGATE SPIKES

9601.532

Compound	E & E Laboratory No. 96-	Percent Recovery
Bromochloromethane	48214	76.8
	48215	58.7
	48215 MS	72.0
	48215 MSD	92.9
	Method Blank	100
	LCS	91.8
1-Chloro-2-bromopropane	48214	72.1
	48215	46.8
	48215 MS	71.2
	48215 MSD	94.7
	Method Blank	100
	LCS	97.9
1,4-Dichlorobutane	48214	75.2
	48215	49.4
	48215 MS	59.4
	48215 MSD	76.2
	Method Blank	100
	LCS	101

THESE RECOVERIES ARE WITHIN E & E, INC. QC TARGETS.

MS = MATRIX SPIKE
MSD = MATRIX SPIKE DUPLICATE
LCS = LABORATORY CONTROL SAMPLE

TEST CODE :SPH_0A1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
TEST NAME : 8010 VOA UNITS : UG/KG
SAMPLE ID LAB : METHOD BLANK MATRIX : SOLID

PARAMETER	RESULTS	Q	QNT. LIMIT
Dichlorodifluoromethane	ND		5.0
Chloromethane	ND		5.0
Vinyl chloride	ND		1.0
Bromomethane	ND		0.50
Chloroethane	ND		0.80
Trichlorofluoromethane	ND		0.60
1,1-Dichloroethene	ND		0.50
Methylene chloride	ND		2.5
trans-1,2-Dichloroethene	ND		0.50
1,1-Dichloroehtane	ND		0.50
cis-1,2-Dichloroehtene	ND		0.50
Chloroform	ND		0.50
1,1,1-Trichloroethane	0.54		0.50
Carbon tetrachloride	ND		0.50
1,2-Dichloroethane	ND		0.50
Trichloroethene	ND		1.0
1,2-Dichloropropane	ND		3.0
Bromodichloromethane	ND		2.0
2-Chloroethylvinylether	ND		2.0
cis-1,3-Dichloropropene	ND		0.70
trans-1,3-Dichloropropene	ND		1.5
1,1,2-Trichloroethane	ND		0.50
Tetrachloroethene	ND		0.50
Dibromochloromethane	ND		0.50
Chlorobenzene	ND		0.80
Bromoform	ND		0.50
1,1,2,2-Tetrachloroethane	ND		0.50
1,3-Dichlorobenzene	ND		0.80
1,4-Dichlorobenzene	ND		0.80
1,2-Dichlorobenzene	ND		0.80

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
X = EXCEEDS CALIBRATION LIMIT
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

TEST CODE :SPA_0A1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
RESULTS IN DRY WEIGHT %SOLIDS : 29 %
TEST NAME : 8020 VOA UNITS : UG/KG
SAMPLE ID LAB : EE-96-48214 MATRIX : SOLID
SAMPLE ID CLIENT: B1 (0-2)

PARAMETER	RESULTS	Q	QNT. LIMIT
Benzene	ND		2.1
Toluene	ND		3.1
Ethylbenzene	ND		2.4
Total Xylenes	ND		6.9
Chlorobenzene	ND		4.8
1,2-Dichlorobenzene	ND		4.1
1,3-Dichlorobenzene	ND		4.8
1,4-Dichlorobenzene	ND		4.1
MTBE	ND		5.2

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
X = EXCEEDS CALIBRATION LIMIT
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

TEST CODE :SPA_0A1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
RESULTS IN DRY WEIGHT %SOLIDS : 61 %
TEST NAME : 8020 VOA UNITS : UG/KG
SAMPLE ID LAB : EE-96-48215 MATRIX : SOLID
SAMPLE ID CLIENT: B2 (0-2)

PARAMETER	RESULTS	Q	QNT. LIMIT
Benzene	ND		0.98
Toluene	ND		1.5
Ethylbenzene	ND		1.1
Total Xylenes	ND		3.3
Chlorobenzene	ND		2.3
1,2-Dichlorobenzene	ND		2.0
1,3-Dichlorobenzene	ND		2.3
1,4-Dichlorobenzene	ND		2.0
MTBE	ND		2.4

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
X = EXCEEDS CALIBRATION LIMIT
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

QUALITY CONTROL FOR ACCURACY AND PRECISION:
PERCENT RECOVERY AND RELATIVE PERCENT DIFFERENCE (RPD)
OF SOIL MATRIX SPIKE (MS) AND MATRIX SPIKE DUPLICATE (MSD)
(Sample # 48215)

9601.532

(ug/kg as received)

Compound	Original Result	Amount Added	Amount Determined MS	Amount Determined MSD	Percent Recovery MS	Percent Recovery MSD	RPD
Benzene	ND	20	13.0	17.3	65.2	86.3	27.8
Toluene	ND	20	11.6	16.4	58.0	82.2	34.6
Ethylbenzene	ND	20	10.4	15.6	51.9	77.9	40.1
Total xylenes	ND	60	30.4	45.7	50.7	76.2	40.2
Chlorobenzene	ND	20	10.1	15.2	50.4	76.2	40.8
1,2-Dichlorobenzene	ND	20	6.96	12.1	34.8	60.5	53.9
1,3-Dichlorobenzene	ND	20	7.21	12.3	36.1	61.6	52.3
1,4-Dichlorobenzene	ND	20	7.30	12.4	36.5	61.9	51.6
MTBE	ND	40	28.5	36.0	71.2	89.9	23.2

THESE RECOVERIES AND RPDs ARE WITHIN E & E, INC. QC TARGETS.

ND = NOT DETECTED

QUALITY CONTROL FOR ACCURACY: PERCENT RECOVERY
FOR SPIKED SOLID SAMPLES
(Laboratory Control Sample)

9601.532

(ug/kg)

Compound	Amount Added	Amount Determined	Percent Recovery
Benzene	20	18.7	93.5
Toluene	20	18.5	92.6
Ethylbenzene	20	18.8	94.2
Total xylenes	60	55.7	92.9
Chlorobenzene	20	18.5	92.7
1,2-Dichlorobenzene	20	19.3	96.7
1,3-Dichlorobenzene	20	19.2	95.9
1,4-Dichlorobenzene	20	19.4	96.8
MTBE	40	37.9	94.8

THESE RECOVERIES ARE WITHIN E & E, INC. QC TARGETS.

QUALITY CONTROL FOR ACCURACY: PERCENT
RECOVERY OF SURROGATE SPIKES

9601.532

Compound	E & E Laboratory No. 96-	Percent Recovery
Trifluorotoluene	48214	80.4
	48215	49.3
	48215 MS	64.1
	48215 MSD	86.4
	Method Blank	100
	LCS	96.0

THESE RECOVERIES ARE WITHIN E & E, INC. QC TARGETS.

MS = MATRIX SPIKE
MSD = MATRIX SPIKE DUPLICATE
LCS = LABORATORY CONTROL SAMPLE

TEST CODE :SPA_0A1 JOB NUMBER :9601.532
ELAP ID : 10486

Ecology and Environment, Inc.
Analytical Services Center

CLIENT : JC-7000 RELATIVE RISK EVALUATION
TEST NAME : 8020 VOA UNITS : UG/KG
SAMPLE ID LAB : METHOD BLANK MATRIX : SOLID

PARAMETER	RESULTS	Q	QNT. LIMIT
Benzene	ND		0.60
Toluene	ND		0.90
Ethylbenzene	ND		0.70
Total Xylenes	ND		2.0
Chlorobenzene	ND		1.4
1,2-Dichlorobenzene	ND		1.2
1,3-Dichlorobenzene	ND		1.4
1,4-Dichlorobenzene	ND		1.2
MTBE	ND		1.5

QUALIFIERS: C = COMMENT ND = NOT DETECTED
J = ESTIMATED VALUE B = ALSO PRESENT IN BLANK
X = EXCEEDS CALIBRATION LIMIT
N = ANALYTE WAS NOT CONFIRMED BY ALTERNATE PROCEDURE
A = PHENOMENON OF METHODOLOGY WITH ACID PRESERVATION

Appendix B
Technical Project Planning Meeting Minutes

Technical Project Planning (TPP) Meeting Culebra SI

From: Tom Beisel - CH2M HILL
Date: July 9, 2010
Contract: W912DY-09-D-0060 CH2M HILL- Task Order 2

Attendees:

Name	Organization	Email Address	Telephone Number
Scott Bradley	USACE	Scott.G.Bradley@usace.army.mil	256-895-1637
Jose Mendez	USACE	Jose.M.Mendez@usace.army.mil	787-729-6877 x 3099
Wilmarie Rivera	PREQB	wilmarierivera@jca.gobierno.pr	787-767-8181 x 6141
Katarina Rutkowski	TRC Solutions	krutkowski@trcsolutions.com	860-298-6202
Ana M. Román	USFWS	ana_roman@fws.gov	787-742-0115
Susan Silander	NWR		787-851-7258 x 238
Daniel Rodriguez	USEPA	Rodriguez.daniel@epa.gov	787-741-5201
Bryan Burkingstock	CH2M HILL	bburking@ch2m.com	678-530-4060
Tom Beisel	CH2M HILL	tbeisel@ch2m.com	678-530-4033

The TPP meeting for site inspection services to be performed under contract W912DY-09-D-0060 Task Order 2 was held on July 8, 2010 in Puerto Rico. The TPP meeting started at 1:00 pm. The TPP meeting was lead by Jose Mendez and Tom Beisel. The TPP meeting was adjourned at 2:30 pm.

The meeting objectives were as follows:

- Introduce the team members and associated stakeholders for the Culebra SI site.
- Introduce and discuss the TPP process.
- Familiarize the stakeholders with the COE TPP process.
- Discuss the approach and objectives outlined in the 4 phases of the TPP process to be followed.
- Reach agreement on the site specific approach for data collection to complete the Site Inspections.
- Review and discuss the scope of work and objectives for the Culebra SI site as presented in the TPP Power Point presentation.

The Team discussed the scope of work overview to complete Site Inspections and Relative Risk Evaluations at the Culebra NWR Site.

In addition to the review of the TPP presentation, the following general topics and comments were discussed:

- Modify page 10 of the TPP presentation to include Richard Henry with the FWS and Daniel Rodriquez with the EPA.
- Locate and add stakeholders from PRDNER (Puerto Rico Department of Natural and Environmental Resources) and ACDEC (Authority for Conservation and Development of Culebra).
- The Culebra NWR site is on a property owned by Commonwealth of Puerto Rico.
- Rename the site, "Former Lower Camp Debris Site," to reduce confusion with other existing sites on Culebra.
- Culebra currently receives fresh water via a pipeline from the main island of Puerto Rico to Vieques to Culebra.
- The desalinization plant close to the site is currently not in operation or not frequently used.
- During field activities, the outlet of the existing septic tank will be located using visual observations and/or geophysical screening equipment.
- A UFP-SAP will not be created for this site.
- Field activities will be conducted during low tide to expose as much of the debris area as possible.
- During additional phases of work at this site, UXO specialist needs to be included in the field team while intrusive activities occur.
- Field activities will be as non-invasive as possible.

Work Plan Action Items:

	POC	Item
1	Tom	Page 10: add Daniel Rodriquez with the EPA to the stakeholder contact list.
2	Tom	Page 10: add Richard Henry with the FWS to the stakeholder contact list.
3	Jose	Locate stakeholders from PRDNER (Puerto Rico Department of Natural and Environmental Resources) and ACDEC (Authority for Conservation and Development of Culebra).
4	Tom	Page 18: revise to include the water supply from the main island of Puerto Rico.

Appendix C
Photodocumentation Log: Photographs of Debris Located at the Former Lower Camp Debris Site

Photodocumentation Log: Photographs of Debris Located at the Former Lower Camp Debris Site

The debris consisted of broken bottles, building materials (i.e., bricks both broken and whole, mortar), highly deteriorated oxidized metal (i.e., pipes, beams, rods/rebar, bolts, mattress springs, cables, water valves, cans), rusted metal walkway sheets, a rusted refrigerator type appliance, rusted corrugated metal sheets, concrete storm water pipes, old vehicle engines, an old vehicle battery, old vehicle tires, an old vehicle axle, an old vehicle transmission, old vehicle body frames, and broken porcelain associated with toilets.

The following pictures were taken on August 14th and 15th, 2011 while conducting the site walk and visual inspection. Locations of each photograph are shown on Figures 1, 2, 3, and 4.

Septic Tank:

Photograph #1

Battery:

Photograph #2

Old Tires:

Photograph #3

Vehicle Axle and Tires:

Photograph #4

Vehicle Engine, Transmission, and Frame:

Photograph #5

Refrigerator or Other Type Appliance:

Photograph #6

Old Tire, Mattress Spring, Building Material:

Photograph #7

Photograph #8

Photograph #9

Building Materials:

Photograph #10

Photograph #11

Photograph #12

Water Valve:

Photograph #13

Concrete Pipe:

Photograph #14

Metal Braided Cables:

Photograph #15

Metal Walkway:

Photograph #16

Photograph #17

Photograph #18

Highly Deteriorated Oxidized Metal:

Photograph #19

Photograph #20

Photograph #21

Photograph #22

Photograph #23

Photograph #24

Photograph #25

Highly Deteriorated Oxidized Metal Pile:

Photograph #26

Photograph #27

Photograph #28

Photograph #29

Photograph #30

Photograph #31

Highly Deteriorated Oxidized Metal and Building Material:

Photograph #32

Photograph #33

Photograph #34

Broken Porcelain and Highly Deteriorated Oxidized Metal:

Photograph #35

Broken Porcelain, Highly Deteriorated Oxidized Metal, Building Materials, and Broken Bottles:

Photograph #36

Photograph #37

Photograph #38

Photograph #39

Photograph #40

Metal Pipes:

Photograph #41

Photograph #42

Metal Chain Linked Fencing, Corrugated Sheets, Building Materials:

Photograph #43

Corrugated Sheet and Building Material:

Photograph #44

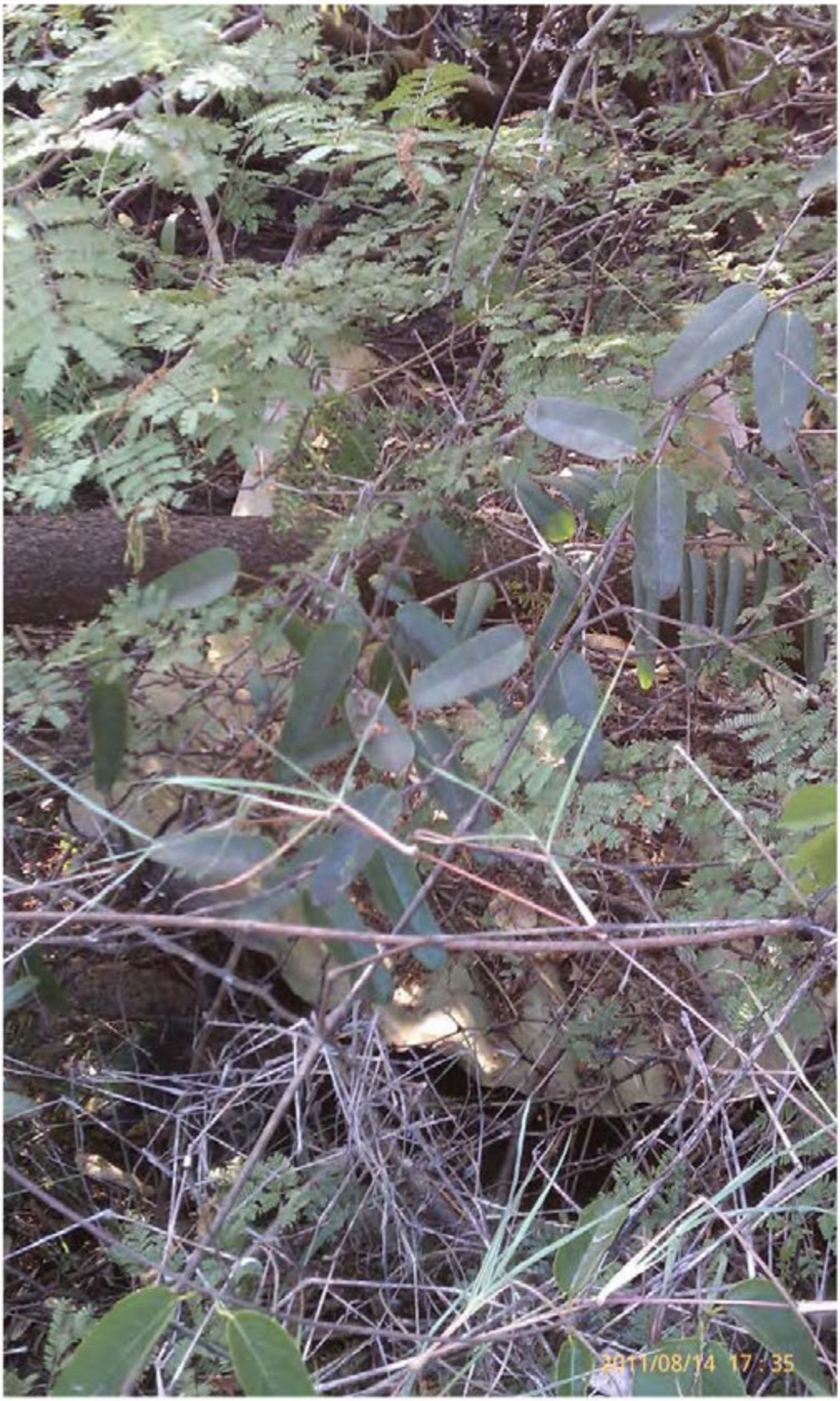
Photograph #45

Corrugated Sheet:

Photograph #46

Photograph #47

Photograph #48



Photograph #49

Photograph #50

Photograph #51

Photograph #52

Broken Glass:

Photograph #53

Photograph #54

Edge of Mangrove

Estimated Extent of Surface Debris

Septic Tank

N

0 25 50 100

Feet

1 in = 50 feet

FIGURE 1
Site Inspection Location Map
Former Lower Camp Debris Site
Culebra, Puerto Rico

ATL \\GALILEO\PROJ\USNAVY\PUERTORICO_CULEBRA_378718\MAPFILES\CULEBRA\GPS_LOCATIONS\SITEMAP.MXD JKELLY3 12/16/2011 11:59:33 AM

CH2MHILL

GPS Point Locations

- Debris
- Edge of Mangrove
- Estimated Extent of Surface Debris

HDOM = Highly Deteriorated Oxidized Metal

Center of map area as displayed

N

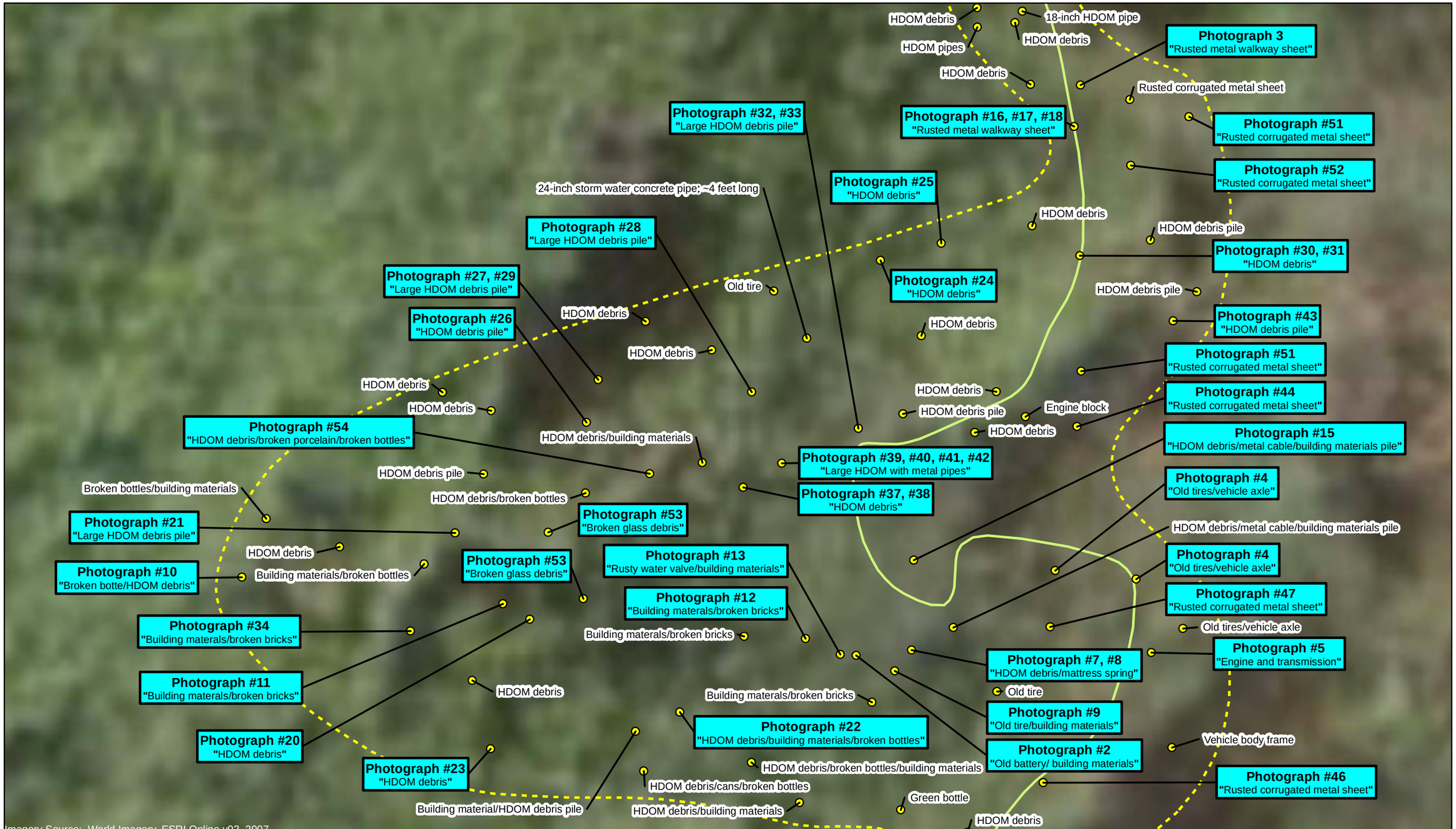
0 7.5 15 30
Feet

1 in = 15 feet

FIGURE 2
GPS Locations - Map Area 1
Former Lower Camp Debris Site
Culebra, Puerto Rico

CH2MHILL

ATL \\GALILEO\PROJ\USNAVY\PUERTORICO_CULEBRA_378718\MAPFILES\CULEBRA\GPS_LOCATIONS\CULEBRA_1.MXD JKELLY3 12/16/2011 9:07:49 AM



GPS Point Locations

- Debris
- Edge of Mangrove
- Estimated Extent of Surface Debris

HDOM = Highly Deteriorated Oxidized Metal

Center of map area as displayed

N

0 7.5 15 30
Feet

1 in = 15 feet

FIGURE 3
GPS Locations - Map Area 2
Former Lower Camp Debris Site
Culebra, Puerto Rico

CH2MHILL

ATL \\GALILEO\PROJ\USNAVY\PUERTORICO_CULEBRA_378718\MAPFILES\CULEBRA\GPS_LOCATIONS\CULEBRA_2.MXD JKELLY3 12/16/2011 9:59:27 AM

GPS Point Locations

- Debris
- Edge of Mangrove
- Estimated Extent of Surface Debris

HDOM = Highly Deteriorated Oxidized Metal

Center of map area as displayed

N

0 7.5 15 30
Feet

1 in = 15 feet

FIGURE 4
GPS Locations - Map Area 3
Former Lower Camp Debris Site
Culebra, Puerto Rico

CH2MHILL

ATL \\GALILEO\PROJ\USNAVY\PUERTORICO_CULEBRA_378718\MAPFILES\CULEBRA\GPS_LOCATIONS\CULEBRA_3.MXD JKELLY3 12/16/2011 10:32:33 AM

Appendix D
Geophysical Screening Report by OneVision Utility Services

Project : Culebra Island, PR
Site: Former Lower Camp Debris Site
Field Dates: 8/14-8/16/11
Field Crew: Sean Byers

Site Conditions:

Site is currently a mangrove at the bottom of the hill. At the top of the hill, a former fueling station sits. Heavy vegetation and tall grass exists between the former fueling station and the mangrove area.

Technical approach:

Visual inspection of the debris areas along the shoreline of the mangrove was performed within the designated site boundary. Electromagnetic scans were performed inductively to search for utilities leaving the former fueling station. GPR scans were performed to determine soil conditions as well as search for tailout line leaving septic tank area.

Summary:

Locations of existing debris – ie; tires, rusted metal framing, glass bottles, etc. were confirmed visually and locations logged in with GPS coordinates by Bryan Burkingstock on site defining the limits of each debris pile discovered. The largest pile discovered was in the mangroves even with the north end of the former fueling station.

Electromagnetic scans of the area behind the former fueling station were negative in detecting conflicting utilities. Ground Penetrating Radar scans in search of the tailout line leaving the septic tank area were negative as well. Confirmation of the location of this line was not definitive due to existing terrain and vegetation obstructions when attempting GPR scans. GPR scans along the former road bed as well as the edge of mangrove did not reveal any anomalies inconsistent with site soil conditions.

Approximate Location of Desalinization Pipeline

Estimated Site Walk and Visual Inspection Area

Imagery Source: World Imagery, ESRI Online v92, 2007

N

0 75 150 300 Feet

1 in = 150 feet

FIGURE 1-3
Former Lower Camp Debris Site Location
Former Lower Camp Debris Site
Culebra, Puerto Rico

CH2MHILL

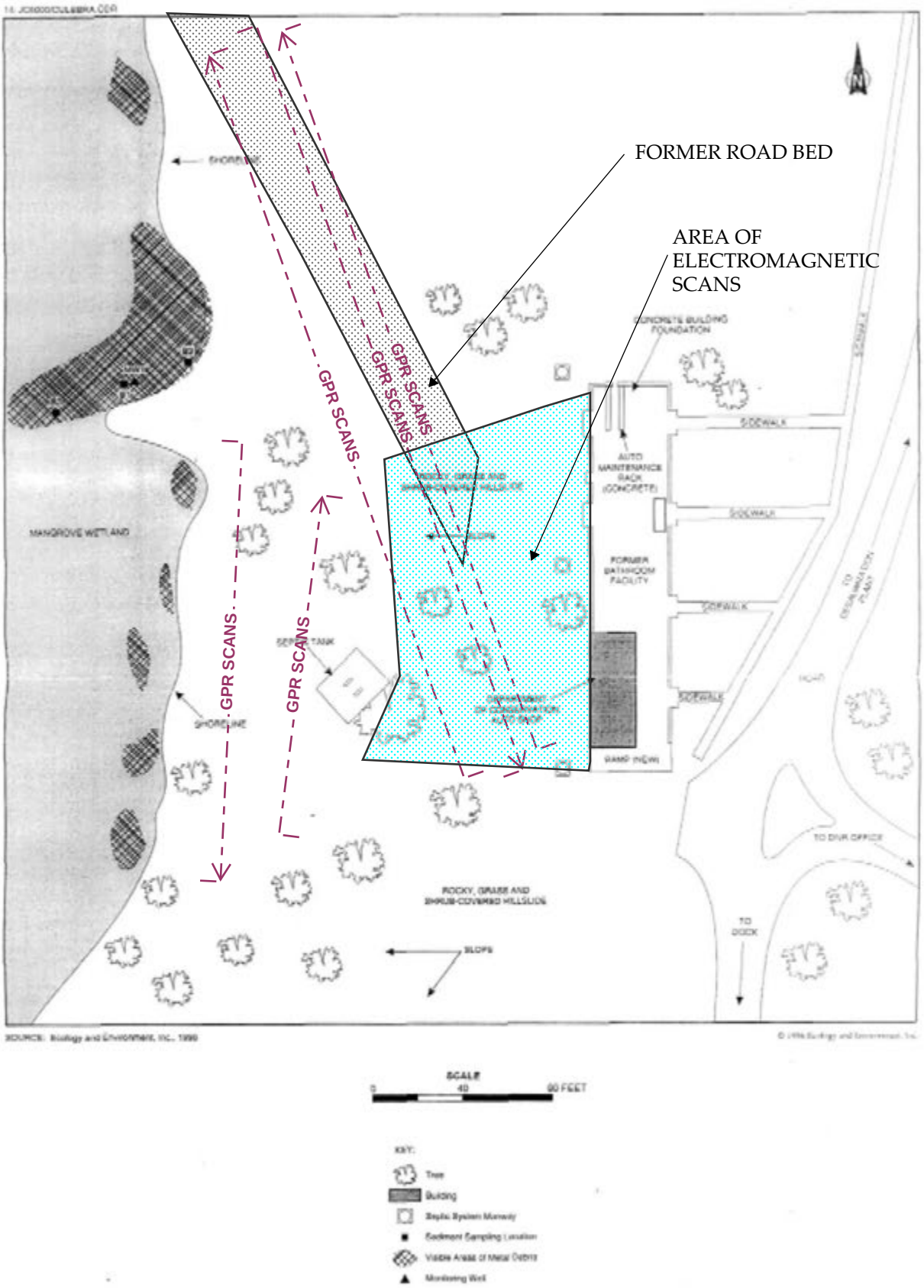


FIGURE 1-4
Site Map from 1996 Site Investigation by Ecology and Environment, Inc.
Former Lower Camp Debris Site
Culebra, Puerto Rico