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October 29, 2004

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Dear BCT members:

Enclosure (1) is the Final Parcel E Nonstandard Data Gaps Investigation Landfill Lateral Extent Evaluation. This report is provided for your information.

Should you have any concerns with this matter, please contact the undersigned at (619) 532-0913.

Sincerely,

A handwritten signature in blue ink that reads "Marie A. Avery".

MARIE A. AVERY
Base Closure Manager
By direction of the Director

Enclosure: 1. Final Parcel E Nonstandard Data Gaps Investigation Landfill Lateral Extent Evaluation, Hunters Point Shipyard, October 29, 2004

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This public summary represents information presented in the document listed below. Neither the document nor the public summary has been reviewed by the regulatory agencies.

**Public Summary: Final Parcel E Nonstandard Data Gaps Investigation
Landfill Lateral Extent Evaluation
Hunters Point Shipyard, San Francisco, California
October 29, 2004**

This document discusses data collected for, and results of, an investigation to assess the extent of solid waste at the Industrial Landfill in Installation Restoration Site 01/21 of Parcel E (hereinafter referred to as the Landfill) at Hunters Point Shipyard (HPS) in San Francisco, California. This work was conducted as part of the Parcel E nonstandard data gaps investigation under the protocols set forth in the "Draft Final Field Sampling Plan and Quality Assurance Project Plan [FSP/QAPP] for Parcel E Nonstandard Data Gaps Investigation (Industrial Landfill and Wetlands Delineation), HPS, San Francisco, California," dated January 8, 2002. This report is part of the revised remedial investigation and feasibility study for the Landfill at HPS. The results from this evaluation will be used to assist in development of the final remedy for the Landfill.

To determine the extent of solid waste, the Navy conducted the following activities: (1) visually observed excavated test pits and soil boring cuttings collected around the Landfill to identify the type of fill material and determine whether it consisted of solid waste; (2) reviewed boring logs and data, such as cone penetrometer tests, from other investigations; and (3) reviewed historical aerial photographs and landfill design maps.

Results of the evaluation indicate that four types of fill are present at Parcel E: native soil; soil and rock; construction debris; and solid waste from domestic, commercial, and industrial activities at HPS. The Landfill consists of solid waste and solid waste mixed with construction debris. The extent of solid waste at the Landfill covers approximately 22 acres and varies in thickness from 10 to 25 feet.

Information Repositories: A complete copy of the "Final Parcel E Nonstandard Data Gaps Investigation, Final Landfill Liquefaction Potential, Hunters Point Shipyard, California," dated October 29, 2004, is available to community members at:

San Francisco Main Library	Anna E. Waden Library
100 Larkin Street	5075 Third Street
Government Information Center, 5th Floor	San Francisco, CA 94124
San Francisco, CA 94102	Phone: (415) 715-4100
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The report is also available to community members upon request to the Navy. For more information about environmental investigation and cleanup at HPS, contact Mr. Keith Forman of the Navy at (619) 532-0913 (phone), (619) 532-0995 (fax), or keith.forman@navy.mil (e-mail).

A-E CERCLA/RCRA/UST STUDIES AND REMEDIAL DESIGN

CONTRACT NUMBER N68711-00-D-0005



Parcel E Nonstandard Data Gaps Investigation Landfill Lateral Extent Evaluation

Hunters Point Shipyard
San Francisco, California

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FINAL

October 29, 2004



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A-E CERCLA/RCRA/UST Contract Number N68711-00-D-0005
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Final
Parcel E Nonstandard Data Gaps Investigation
LANDFILL LATERAL EXTENT
EVALUATION
Hunters Point Shipyard, San Francisco, California

October 29, 2004

Prepared for



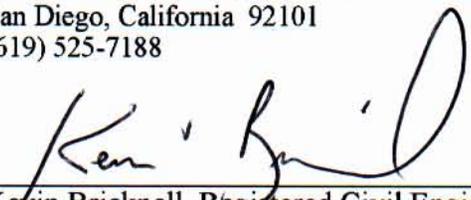
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ACRONYMS AND ABBREVIATIONS

Bay	San Francisco Bay
bgs	Below ground surface
FSP/QAPP	Field sampling plan and quality assurance project plan
HPS	Hunters Point Shipyard
IR	Installation Restoration
LEL	Lower explosive limit
Navy	U.S. Department of the Navy
Tetra Tech	Tetra Tech EM Inc.
Triple A	Triple A Machine Shop, Inc.
UCSF	University of California, San Francisco
VOC	Volatile organic compound

1.0 INTRODUCTION

Tetra Tech EM Inc. (Tetra Tech) received Delivery Order 003 from the U.S. Department of the Navy (Navy) under Indefinite Quantity Contract for Architectural–Engineering Services to Provide CERCLA/RCRA/UST Studies No. N68711-00-D-0005. Tetra Tech provides technical support under this contract at Parcel E of Hunters Point Shipyard (HPS) in San Francisco, California. Under Delivery Order 003, Tetra Tech evaluated the lateral extent of solid waste at the Industrial Landfill at Parcel E (hereinafter referred to as the “Landfill”) to support a revised remedial investigation and feasibility study. Subsequent to the draft report being prepared under Delivery Order 003, the Landfill and surrounding areas have been designated as Parcel E-2. The remainder of Parcel E is still referred to as Parcel E. The landfill lateral extent report is being finalized under Delivery Order 057. This report presents the findings of the lateral extent evaluation.

The report scope, report organization, and background of Parcel E, Parcel E-2, and the Landfill are discussed below.

1.1 REPORT SCOPE

In October 1997, the Navy submitted the draft final remedial investigation report for Parcel E (Tetra Tech, Levine-Fricke-Recon, and Uribe & Associates 1997), and in January 1998, the Navy submitted the draft Parcel E feasibility study report (Tetra Tech 1998). During preparation of those reports, the Navy, the regulatory agencies, and the project team identified additional tasks required to support the remedial design for Parcel E. One task is to refine the lateral extent of solid waste in the Parcel E Landfill, subsequently renamed as Parcel E-2. The extent of solid waste at the Landfill was investigated in March 2002 and September 2002 as part of the Parcel E nonstandard data gaps investigation (Tetra Tech 2002a). During this investigation, data were collected to further define the following:

1. Lateral extent of solid waste within the Landfill Area
2. Thickness of the solid waste near the observed limit of waste

1.2 REPORT ORGANIZATION

This report contains the following sections:

- [Section 1.0](#) – Introduction, discusses the report scope, report organization, and the background of Parcel E, Parcel E-2, and the Landfill
- [Section 2.0](#) – Investigation Methods, discusses the investigation methods used to delineate the lateral extent of solid waste, which consisted of excavating test pits and drilling soil borings.

- [Section 3.0](#) – Investigation Results and Findings, presents the findings of the lateral extent investigation, including definitions for the compositions of waste and fill, and delineation of the extent of solid waste.
- [Section 4.0](#) – Conclusions, summarizes the results of the report and presents recommendations to address remaining issues.
- [Section 5.0](#) – References, lists the references used to prepare this report.

Figures and tables are presented after [Section 5.0](#). The appendices to this report consist of the test pit logs ([Appendix A](#)), photographs taken during the landfill lateral extent investigation ([Appendix B](#)), the soil boring logs ([Appendix C](#)), and the responses to regulatory agency comments on the draft landfill lateral extent evaluation report ([Appendix D](#)).

1.3 PARCEL E AND LANDFILL BACKGROUND

HPS is located in southeast San Francisco on a peninsula that extends east into San Francisco Bay (Bay) and is divided into seven parcels (A through F and E-2). Parcel E was established in 1992 and currently occupies 125.6 acres of shoreline and lowland coast along the southwestern portion of HPS ([Figure 1](#)). Parcel E is bounded by Parcel A to the north, Parcel D to the north and east, the Bay (Parcel F) to the east and south, and Parcel E-2 to the west. Former land use at Parcel E included office and laboratory space used by the Naval Radiological Defense Laboratory; and storage areas for waste, construction, and industrial materials. The City and County of San Francisco’s current reuse plan for Parcel E designates the following reuse categories: industrial, maritime, research and development, mixed use, and open space ([San Francisco Redevelopment Agency 1997](#)).

Parcel E-2 was established in September 2004 and occupies approximately 48 acres of shoreline and lowland coast along the southwestern portion of HPS. Parcel E-2, as shown on [Figure 1](#), comprises Installation Restoration (IR) Site 01/21, the entire Panhandle Area, the area of IR-02 Northwest proposed for the sedimentation basin, and the area east of IR-01/21 that does not have an IR site designation. No buildings are known to have existed on Parcel E-2. Filling of the Bay in this area began in the 1940s during construction of HPS. By 1946, the area immediately north of the Landfill, the current University of California, San Francisco (UCSF) compound, had been filled using primarily soil and serpentinite rock. The west side of the area was filled with dredge spoil, soil, rock, and inert construction debris during the early 1950s. The central portion of IR-01/21 served as a landfill for shipyard waste from the mid-1950s to 1974.

The Landfill Area is unpaved and consists of bare soil, seasonal vegetation, and a 15-acre multilayer cap that covers part of the Landfill. The cap was constructed in August 2000 in response to a fire on the surface and subsurface of the Landfill. The fire was extinguished, and the multilayer cover was installed to ensure that smoldering fires were extinguished through oxygen depletion.

All area determinations discussed in this section were completed using large-scale aerial photographs and the ArcMap module of Environmental Systems Research Institute, Inc., ArcGIS 8.2 (a graphic information system software) to calculate areas.

During 1974 and 1975, the following measures were implemented in an effort to close the Landfill:

- Installing a storm water interceptor line to divert storm water runoff from the hill area north of the Landfill to a storm water outfall
- Placing 2 feet of compacted, imported fill on the Landfill
- Grading the entire site to facilitate storm water drainage

In 1977, an attempt was made to construct a 1,000-foot-long clay dike along the Bay front of the Landfill to impede the flow of groundwater into the Bay. When this construction proved infeasible because of the presence of large concrete construction debris in the fill, a sheet pile cut-off wall was installed instead in the southeast area of the Landfill along the Bay front.

Parcel E-2 was affected by the operations of Triple A Machine Shop, Inc. (Triple A), which leased property at HPS from May 1976 to June 1986. Triple A operated a commercial ship repair facility and subleased portions of HPS to warehouse, industrial, and commercial firms. The San Francisco District Attorney's Office charged Triple A with illegally disposing of hazardous wastes at 19 locations throughout HPS, including Parcel E-2. Triple A allegedly disposed of industrial debris, sandblast waste, oily industrial sand, and asphalt over 5 acres along the shoreline and stored unlabeled, deteriorated, uncovered drums in the southeastern corner of Parcel E-2 ([Tetra Tech, Levine-Fricke-Recon, and Uribe & Associates 1997](#)).

In 1996, the Navy installed an 800-foot-long sheet pile barrier consisting of 410 sheet piles 12 to 55 feet long between the Landfill Area and the Bay shoreline and installed a groundwater extraction system upgradient of the barrier ([IT Corporation 1999](#)). The upgradient extraction system, combined with the sheet pile barrier, was designed to intercept and collect shallow groundwater, thereby limiting the potential for contaminants to migrate to the Bay.

2.0 INVESTIGATION METHODS

With some exceptions that are noted in the text, the investigation of the lateral extent of solid waste was performed in accordance with the methodology described in the nonstandard data gaps field sampling plan and quality assurance project plan (FSP/QAPP) ([Tetra Tech 2002a](#)). The investigation was conducted through visual observation and sampling of excavated test pits and soil borings and cuttings to supplement the subsequent standard data gaps investigation that was intended to determine any impacts to adjacent soil from the Landfill. Soil samples and analytical results will be reported along with the standard data gaps results and are not included in this report.

A total of 51 samples were collected from the test pits. Four additional samples were collected from the soil borings, for a total of 55 samples. The following subsections describe the methods used to excavate and sample the test pits and soil borings during the investigation.

2.1 TEST PITS

As described in the FSP/QAPP, test pits were excavated at the known boundaries of the Landfill near the multilayer cap and in suspected areas of solid buried waste. If waste was found in the test pit between the ground surface and 10 feet below ground surface (bgs), the FSP/QAPP called for a “step-out” method whereby an additional test pit was excavated 10 feet from the previous test pit until the limit of waste was determined ([Tetra Tech 2002a](#)).

During the test pit investigation, there were two deviations to the methods described in the FSP/QAPP. First, step-out test pits were sometimes offset up to 50 feet (rather than 10 feet) from the previous test pit based on site conditions during the field activities. Second, several test pits were excavated to below 10 feet bgs (up to 18 feet bgs) based on site conditions and observations.

A total of 37 test pits (including step-out locations) were completed in areas outside the landfill cap using a CAT 320B hydraulic excavator. [Figure 2](#) shows the location of each test pit. The maximum test pit depth was 18 feet bgs at test pit location WE17B. The average test pit depth was 10 feet bgs, although some test pits were shallower because of the shallow depth to groundwater or because methane gas was detected at or above the lower explosive limit (LEL). The depth of test pit WE18D was only 3 feet bgs because the pit became filled with groundwater at that depth. Test pits were not excavated at locations WE13 and WE14 because the soil was too soft to allow excavator access so near the Bay shore; however, boring TPBWE14 was drilled there because the soil was stable enough for a drill rig.

The widths of the test pits were the size of the excavator bucket (4 feet). The average length of each test pit was about 10 feet, although test pit lengths varied from 4 to 20 feet. The individual test pit locations were spaced, on average, about 100 feet apart.

Each test pit was logged based on visual observations to record the presence or absence of solid waste. The log included an itemized list of the type of waste observed and any odors detected. The test pit logs are included in [Appendix A](#) and summarized in [Table 1](#). [Appendix B](#) presents photographs taken during test pit excavation.

The presence of solid waste was defined as a six-inch (minimum) thickness of solid waste material in the test pit. Step-out test pits were continued until solid waste material was not encountered. The first test pit where no waste was encountered was considered to be the limit of the solid waste. Soil borings were drilled at some locations to verify that waste was not present at a greater depth than the test pit depth. At locations WE03, WE07, WE18, WE19, and WE20, information from borings drilled during the soil gas or soil liquefaction investigations was used

to verify the absence of waste at depth rather than drilling an additional new boring. Soil samples were collected from most test pits as discussed in [Section 2.3](#).

After sampling, the test pit excavations were backfilled using the excavated materials and compacted using the excavator bucket. At locations with identified waste, the waste was returned to the excavation and then covered with topsoil to the ground surface.

During excavation activities, safety personnel monitored the field team's breathing zone using a GasTech 302 meter and an OVM 580B photoionization detector calibrated to detect the presence of chlorine gas, methane and oxygen levels, the percentage of explosive gases, and volatile organic compound (VOC) levels. When methane levels exceeded 5 percent by volume in air, which is the LEL, in test pits WE02A, WE02B, WE03B, WE04B, WE05A, WE07A, WE12, WE21A, work was temporarily suspended to assess safety conditions and evaluate whether soil samples could be collected.

2.2 SOIL BORINGS

Soil borings were drilled to confirm that solid waste was not present below the test pits and to obtain waste depth and thickness data. Except as noted in [Section 2.1](#) above, a boring was advanced at each final step-out test pit location accessible to the drill rig to confirm that waste was not present beneath the bottom of the test pit. The borings were advanced until native soils were encountered. The borehole depths ranged from 5 to 27.5 feet bgs. The borings drilled during March and April 2002 were advanced by Gregg In Situ, Inc., using a Mobil B61 HDZ drill rig equipped with hollow stem augers. The borings drilled during September 2002 (TPBWE23B, TPBWE24, TPBWE25, and TPBWE26) were advanced by Vironex, using a direct-push method.

The 25 borings shown on [Figure 2](#) were drilled using hollow-stem auger drilling methods and continuously sampled using either a 5-foot-long Central Mining Equipment sampler or a 1.5-foot-long split-spoon sampler. Soil borings were drilled at additional locations if landfill waste was encountered or if the drill auger encountered refusal. Multiple borings were drilled at some of the test pit locations along the northern boundary of the Landfill instead of excavating test pits because a concrete foundation covered this area and precluded excavation. The soil borings were logged in accordance with procedures described in the FSP/QAPP ([Tetra Tech 2002a](#)) and ASTM International (formerly American Society for Testing and Materials) Method 2488-00 ([ASTM International 2000](#)). [Appendix C](#) provides the soil boring logs, and [Table 2](#) summarizes the soil boring data.

Upon completion of each borehole, the auger was removed and the borehole was backfilled with a cement slurry or hydrated bentonite chips.

During soil boring activities, the worker breathing zone was monitored using a GasTech 302 meter and an OVM 580B photoionization detector to protect the health and safety of the field team. When gas levels at the Landfill exceeded the LEL in boreholes TPBWE01, TPBWE04B, TPBWE05, TPBWE06, TPBWE08, TPBWE09D, and TPBWE10E, dry ice (CO₂) chips were placed in the hole to reduce methane levels to below the LEL ([Appendix C](#)). If methane levels were reduced to below the LEL, the borehole was continued.

2.3 SOIL SAMPLING

Soil sampling of the test pits and soil boring locations are discussed below. [Figure 3](#) shows the soil sampling locations, and [Tables 1 and 2](#) summarize the test pits and soil borings sampled.

2.3.1 Test Pit Soil Sampling

Although the objective of the lateral extent investigation was to define the extent of the solid waste, data regarding the nature of chemical contamination in soils surrounding the Landfill were collected to supplement the data being collected as part of the standard data gaps investigation. Sampling methodologies and results of chemical analyses are presented in the standard data gaps investigation FSP/QAPP ([Tetra Tech 2002b](#)) and the Parcel E data summary report ([Tetra Tech pending](#)), respectively. The FSP was changed in the field to ensure a soil sample was collected from every pit except for pits where excavation was limited because the LEL for methane was exceeded, groundwater filled the pit, or concrete blocks prevented or limited pit excavation so that soil could not be exposed to collect the sample.

A total of 51 test pit soil samples were collected from the excavator bucket both above and below (when possible) the known waste level. The deepest sample collected was from 18 feet bgs, although most samples were collected from 4 or 8 feet bgs. Four duplicate soil samples were also collected. All soil samples were collected in 8-ounce glass jars except for samples for VOC analysis, which were collected using 5-gram EnCore® samplers.

Samples were field screened using a photoionization detector for VOCs. The FSP stated that all samples would be submitted for VOC analyses; however, the VOC analytical frequency was adjusted to be consistent with the standard data gaps FSP because these VOC data were intended to supplement the standard data gaps investigation ([Tetra Tech 2002b](#)).

2.3.2 Soil Boring Soil Sampling

Although not required by the FSP/QAPP, a total of four soil samples were collected from the boreholes to provide supplemental information on the lithology of soil near the solid waste. Soil samples were collected at 1.5-foot intervals using either a 5-foot-long Central Mining Equipment sampler or a 1.5-foot-long split-spoon sampler. The four samples were collected either from locations where test pits were not excavated or from depths below test pit excavations. Specifically, samples were collected from test pit borings TPBWE08B (sample W32W001 from 5.5 to 7.0 feet bgs and sample W32W002 from 19.0 to 20.5 feet bgs),

TPBWE14 (sample W33W001 from 15.5 to 17.0 feet bgs), and TPBWE20B (sample W31W001 from 16.0 to 17.5 feet bgs).

3.0 INVESTIGATION RESULTS AND FINDINGS

The data collected from the test pits and soil borings were evaluated to determine the composition of the solid waste, the lateral extent of the Landfill, and the vertical extent of solid waste along the northern perimeter of the Landfill. The extent determination was made based on field observations of the test pits and soil borings (Tables 1 and 2), test pit and soil boring logs (Appendices A and C), historic soil and monitoring well boring logs, soil-gas boring logs, cone penetrometer logs from a simultaneous liquefaction study, historic aerial photographs, and landfill design maps. Table 2 provides references for data presented in other documents.

The following four solid media types are located at Parcel E:

- **Native soil**, including the subsurface geological units
- **Soil and rock** used to fill the Bay and create new land, generally from leveling the eastern portion of the ridge at HPS, and spoil dredged to deepen channels in the Bay for shipbuilding/repair operations
- **Construction debris** used as fill to further expand the landmass at HPS, frequently in areas where the dredge spoil was spread
- **Solid waste** from domestic, commercial, and industrial activities at HPS that was disposed of in a landfill constructed to state-of-the-art standards at the time of construction and operation

The soil and rock fill, along with construction debris, were placed specifically to build and expand the HPS peninsula. The history of the Bay includes many instances where inlets and other portions of the Bay were filled to create usable land for industrial and domestic purposes. Many areas of the City and County of San Francisco consist of similar fill areas created using debris from earthquakes events; these fill actions were conducted both to dispose of the earthquake-derived waste material and create new real estate. Although such fill practices are out of favor today, they were routine in the past and led to creation of significant properties in the Bay area.

For purposes of delineating the extent of the solid waste at HPS, the native soil, soil and rock fill, and construction debris fill are considered to be the primary land mass in which the Landfill was constructed. The composition of solid waste, lateral extent of solid waste, and vertical extent of solid waste are discussed below.

3.1 COMPOSITION OF SOLID WASTE

Delineation of the extent of solid waste at the HPS Landfill is based on the physical presence of municipal, commercial, and industrial wastes. Based on deep soil borings drilled in the center of the Landfill from 1988 to 1992, landfill waste consists of wood, paper, plastic, metal, glass, nails, Styrofoam, copper wire, cloth, rubber, plywood, ceramics, asphalt, concrete, bricks, sand, and clay and gravel fill. The waste is usually brown to black. In many areas within the Landfill, the waste is mixed with construction debris. [Figure 4](#) shows the extent of solid waste.

In some areas in and near the Landfill, solid waste and soil fill or construction debris materials appear to have a sheen that may be from petroleum products. The presence of a sheen was not used as a criterion for defining solid waste but was considered for designating areas possibly impacted by petroleum products or leachate.

Soils located adjacent to the extent of solid waste contain inert material and construction debris similar to debris from the 1906 earthquake used to fill marshland in the marina area of San Francisco ([The Exploratorium 2003](#)). The construction debris includes concrete, brick, wood, gravel, sand, asphalt, and limited amounts of ceramic, glass, and metal (primarily as rebar in the concrete). Construction debris is typically inert. Inert waste does not contain hazardous waste or soluble pollutants at concentrations exceeding applicable water quality objectives, nor does it contain significant quantities of decomposable waste (as defined in Title 27 of the *California Code of Regulations*, Section 20230). Inert fill material has little capacity to generate leachate that may create potential risks to human health or the environment. The construction debris was used as fill material to create and expand the landmass at HPS; therefore, it is not included in the definition of solid waste.

The solid waste is saturated at depth and lies up to 10 to 15 feet below the water table.

3.2 LATERAL EXTENT OF SOLID WASTE

Data from the test pits and related borings were evaluated along with historic data (soil and well boring logs) to determine the extent of solid waste in Parcel E-2. [Figures 4 and 5](#) show the extent of solid waste based on this evaluation. [Figure 4](#) shows the extent of solid waste superimposed on an aerial photograph along with well, boring, and test pit locations. [Figure 5](#) shows the same data as [Figure 4](#) without the aerial photograph. The area immediately west of the Landfill was used to handle and treat oily waste materials. Upon closure, ponded liquid in this area was removed and the top 6 inches of soil was scarified before soil cover was placed. Based on borings and exploratory trenches, this area also was partially filled with solid waste during closure; therefore, this area is included in the delineated limits of the Landfill on [Figures 4 and 5](#).

Several areas of isolated solid waste beyond the limits of the Landfill are shown on [Figures 4 and 5](#). These isolated solid waste areas are not contiguous with the delineated solid waste extent and will be addressed during the Parcel E-2 remedial investigation and feasibility study.

The lateral extent of the solid waste along the northern, eastern, southern, and western perimeters is discussed below. [Figures 4 and 5](#) show the locations of the pits, borings, and wells discussed below.

3.2.1 Northern Perimeter

The northern perimeter of the solid waste consists of the area adjacent to the UCSF compound and railroad museum. Test pit locations WE01 through WE11 and related soil borings TPBWE01 through TPBWE11 were advanced in this area outside of the existing multi-layer cap. Solid waste was encountered in test pits WE01, WE02A, WE04A, WE05, WE06B, and WE07A. Step-out test pits were continued in most of these areas until no solid waste was encountered. The step-out test pit locations show that solid waste stops a few feet south of the fence separating the UCSF property and the Landfill.

Both test pits WE02B and WE04B contained a small layer of solid waste. Test pit WE05B contained a small debris zone consisting mainly of wood, which stopped about 14 feet from the fence. Test pit WE06A contained only gravel backfill. WE07B contained some wood and metal debris just below the ground surface, and these materials stopped just before the fence. Soil-gas boring SG05A was drilled during the landfill gas characterization investigation directly on the north side of the fence and contained no solid waste, indicating that the solid waste did not extend to the fence line. Test pit WE03B contained solid waste on its sidewall. This waste continued to about 4 feet from the fence. WE03A was not excavated because the northern limit of solid waste was observed in the sidewall of WE03B. Test pit WE01 in the northwest corner of the property, contained waste in the 1- to 2-foot interval. Test pit WE09 contained bricks but no solid waste. Minimal fill (a 2-foot-thick interval with 10 percent paper and wood) was encountered in test pit WE11.

Boring TPBWE01 is located about 10 feet southeast of test pit WE01 and contained trace amounts of wood debris. Test pit WE01 is considered the northern extent of the solid waste because minimal solid waste existed at a shallow depth. Test pits WE02B and WE03B are considered the northern extent of the solid waste because the test pits contained minimal solid waste that stopped a few feet from the fence. Test pit borings TPBWE04B, TPBWE05, and TPBWE06 all contained minimal amounts of solid waste; however, these boring are located just south of test pits WE04B, WE05B, and WE06A, respectively, which all contained minimal waste that stopped a few feet from the fence. These data demonstrate that test pits WE04B, WE05B, and WE06A are the northernmost extent of the solid waste.

Along the eastern extent of the northern perimeter, solid waste was found in borings TPBWE08, TPBWE08B, TPBWE09, TPBWE09B, TPBWE09C, and TPBWE09D. At test pit location WE09, the northern extent of the solid waste is considered to be soil-gas boring SG06, because the soil-gas boring contained no solid waste. Further east, the extent of the solid waste is defined by test pit boring TPBWE10C and soil-gas boring SG07 because no solid waste was observed in either boring. From boring TPBWE10C, the edge of the solid waste turns south and passes directly adjacent to boring TPBWE11, which contained only trace amounts of wood. Only a minor amount of paper and wood was encountered in test pit WE11.

Information from the test pits and borings from WE01 through WE11 was used to design the landfill gas barrier wall installed between the Landfill and the UCSF property. Observations were made regarding the presence of waste during installation of the gas barrier. The location of the gas barrier is shown on [Figures 4 and 5](#). During the gas barrier construction, solid waste was not observed more than a few feet north of the barrier trench. Solid waste that was encountered in the construction trench was excavated and removed prior to installation of the high-density polyethylene gas barrier. When solid waste was encountered in the northwest and northeast corners of the Landfill (the areas of the barrier with 90° turns on [Figures 4 and 5](#)), the fencing was removed and all waste was removed from north of these areas, and the fence was reconstructed after barrier installation. Because all visible waste was removed from north of the gas barrier during the barrier's construction, the gas barrier marks the northern limit of solid waste.

3.2.2 Eastern Perimeter

The eastern perimeter of the Landfill is beneath the existing multilayer cap. Based on a review of historic material, including boring logs, aerial photographs, and maps, the limit of waste is within approximately 10 feet of the eastern edge of the cap ([Figures 4 and 5](#)). No solid waste was observed in the boring logs for IR01MW366A, IR01B023, IRMW42A, and IR01MW47B, which are located in the area of the cap but east of the extent of waste. Solid waste was documented during the remedial investigation in the boring logs for IR01B041 and IR01B046.

3.2.3 Southern Perimeter

The southern perimeter of the Landfill lies along the shore of the Bay. Test pit locations WE12, WE15, WE16, and WE22 are located in this area. Test pits were not excavated at locations WE13 and WE14 because the soil was too soft to allow excavator access; however, boring TPBWE14 was drilled at this location because soil was stable enough for a drill rig.

At the extreme southern end of the Landfill, solid waste was observed at depths below 15 feet bgs in boring IR01MW43A ([Figure 4](#)). No solid waste was observed in boring IR01MW47B; therefore, IR01MW43A marks the southern extent of the solid waste. Also, no solid waste was encountered in test pit WE22, which is located between debris placed by Triple A along the shorefront and the edge of water in the Bay. Further west along the southern perimeter, solid waste was encountered in the upper 5 feet of boring IR01MWI-3. Solid waste was also observed in test pit WE12. About 65 feet west of IR01MWI-3, the solid waste extent turns north for about 75 feet and then continues northwest. Solid waste was observed in test pit boring TPBWE14 at 9.5 to 15.5 feet bgs and in soil boring IR01B039 at 8 to 20 feet bgs. Solid waste was not observed in test pits WE15 or WE16. Similarly, solid waste was not recorded in the historical boring logs for IR01B028 and IR01B035.

3.2.4 Western Perimeter

The western perimeter consists of land adjacent to the warehouse/industrial area west of the Landfill. Test pit locations WE17 through WE21 are located in this area. At test pit locations WE17 through WE19, several step-out test pits were excavated to further determine the extent of solid waste. Solid waste was observed in test pits WE21A, WE20A, WE19A, WE19B, WE18A, WE18B, WE18C, WE17A, WE17B, WE17C, WE17D, and WE17E (Figure 4). Solid waste was not observed in test pits WE21B, WE20B, WE19C, and WE18D. Metal was observed in test pit WE17F; however, this test pit contained no waste similar to that observed in test pits WE17D and WE17E. Solid waste is not recorded in the boring logs for IR01B032, located west of WE17F, and IR01B033, located south of WE17F; therefore, test pit WE17F is considered to be the southwesternmost extent of the solid waste. Further north along this perimeter, waste was not observed in borings TPBWE20B, SG21, or SG20, or in historic boring logs for IR01B015; therefore, the extent of the solid waste is considered to be east of these borings.

Solid waste was encountered in boring TPBWE21A, which was located a few feet west of test pit WE21A, which also contained solid waste. Test pit WE21B contained concrete rubble at 2 feet bgs. The landfill gas barrier marks the northwestern extent of solid waste because no solid waste was encountered in test pit WE21B.

3.3 VERTICAL EXTENT OF SOLID WASTE

Data from the test pits and related historical borings along the perimeter of the Landfill were evaluated along with historic soil and well boring data to determine the depth and thickness of solid waste.

Borings completed along the perimeter of the Landfill confirm that the bottom of the solid waste is usually deeper than the bottoms of the test pit. One or more borings were drilled at most test pit locations to locate the bottom of the waste. Borings were terminated when native material was encountered, when field monitoring meters measured vapors exceeding the LEL for methane, or in a few cases, when auger refusal resulted from the presence of concrete blocks.

The water table was encountered before the bottom of the solid waste in most test pit borings drilled deeper than 15 feet bgs. For example, the bottom of solid waste in boring TPBWE05 was located at about 20 feet bgs, and the water table was encountered at 14 feet bgs. At boring TPBWE10, the bottom of solid waste was located at 18.5 feet bgs, with fill material to 23 feet bgs; the water table was encountered at 15.5 feet bgs. At boring TPBWE08B, the bottom of solid waste was below 22 feet bgs (at the total boring depth), and the water table was encountered at 13 feet bgs. Historic soil and well borings were reviewed at locations where the test pit borings were completed above the bottom of solid waste. At historic soil boring locations IR01B001, IR01B004, IR01B006, IR01MW02B, IR01MW03A, and IR01MW05A, the bottom of solid waste was located below the water table.

The northwest corner of the Landfill is the only area where the bottom of solid waste was located above the water table. At boring TPBWE02, the bottom of solid waste was located at 11 feet

bgs, and the water table was encountered at 14 feet bgs. At boring TPBWE21A, the bottom of solid waste and the water table both were located at 13 feet bgs.

The data from the test pit borings and the historic borings were used to construct a series of cross sections to show the depth and extent of solid waste at the Landfill. The locations of these sections are shown on [Figure 6](#). Cross sections are provided on Figures 7 through 12. [Figures 7, 8, 10, 11, and 12](#) show sections through the waste in the Landfill, while [Figure 9](#) shows the geology along Crisp Avenue rather than through the Landfill. [Figure 9](#) is presented in this report to be consistent with the series of cross sections presented in the final landfill gas characterization report ([Tetra Tech 2003](#)).

Solid waste is generally located between 21 above and 14 feet below mean sea level. Waste thickness generally varies from 10 to 25 feet. The solid waste lies directly on the Bay Mud clays in the southern and eastern portions of the Landfill and the sands of the B-aquifer in the northwestern portion of the Landfill. In other areas, the solid waste lies on fill sands and gravels. The solid waste is bounded in most areas by construction debris, sand, and gravel.

Data indicate that the bottom of solid waste along the northern perimeter of the Landfill is located at 12 to 30 feet bgs (8 feet above to 10 feet below mean sea level). The type of solid waste is variable. The solid waste debris interval along the northern perimeter varies from 5 feet thick in test pit boring TPBWE21A to 22.5 feet thick in historical boring IR01B001. Other historical borings on the northern perimeter containing specific solid waste intervals include IR01B006 (17.5 feet thick), IR01MW02B (14.5 feet thick), IR01MW03A (18.5 feet thick), IR01MW05A (20 feet thick), TPBWE08B (greater than 18 feet thick), and TPBWE10 (10.5 feet thick). Borings containing solid waste mixed with soil include TPBWE05 (estimated at 15 feet thick) and IR01B004 (estimated at 25 feet thick). The results of the test pit investigation along the northern perimeter of the Landfill were verified during construction of the gas barrier wall.

4.0 CONCLUSIONS

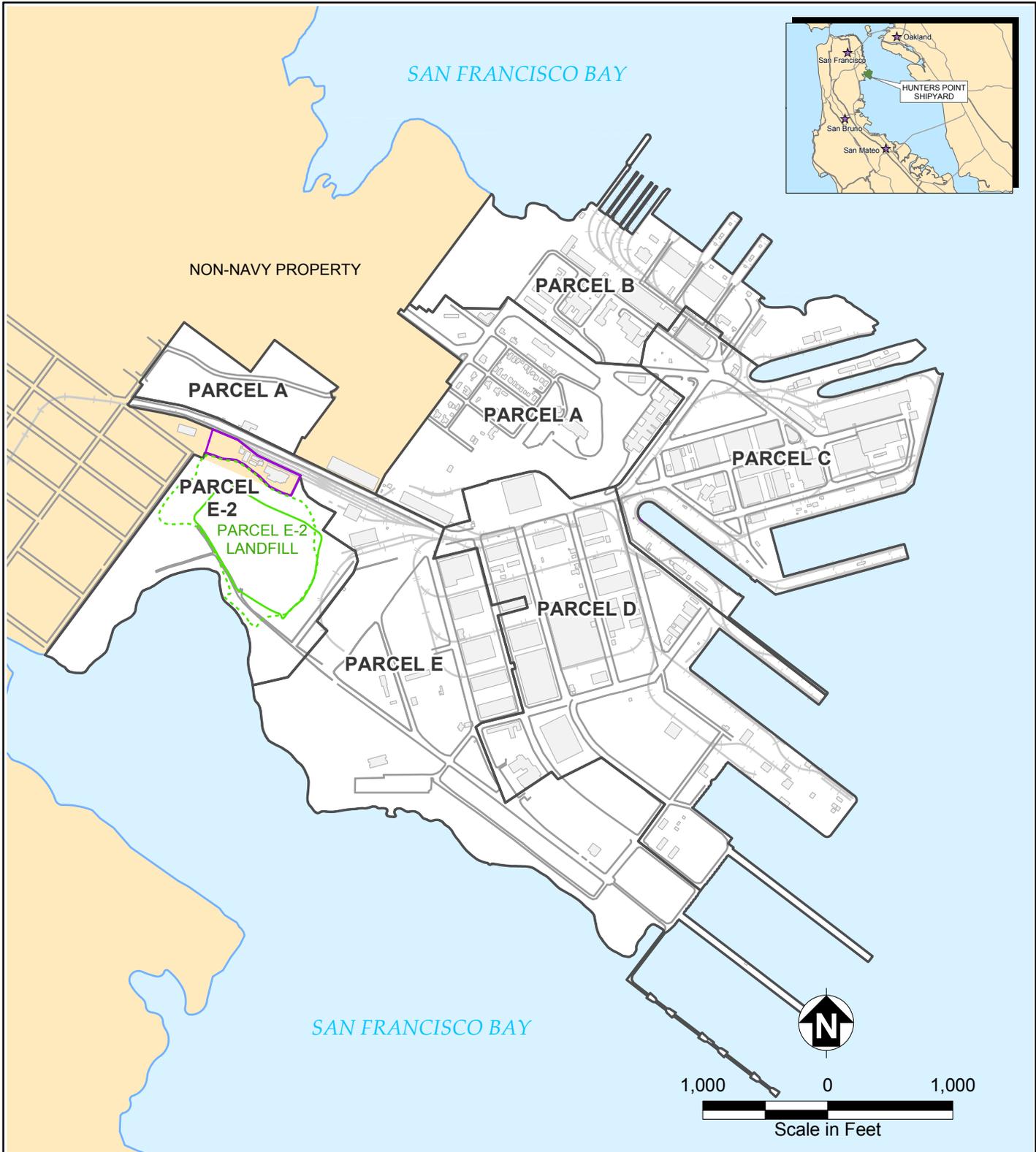
The purpose of this investigation was to better define the lateral and vertical extent of solid waste at the Parcel E-2 Landfill. Historical data were evaluated and combined with visual observations of test pits and soil borings, along with physical data collected during this investigation to achieve these purposes. To assist with the extent delineation along the eastern perimeter of the Landfill, historic aerial photographs and maps were also reviewed. [Figures 4 and 5](#) show the refined solid waste lateral extent boundary. The revised area of the solid waste is about 22 acres.

The solid waste varies from exclusively solid waste material to solid waste intermixed with soil fill and construction debris. Solid waste is generally located between 21 feet above and 14 feet below mean sea level, and the waste thickness generally varies from 10 to 25 feet. The solid waste lies directly on the Bay Mud clay in the southern and eastern portions of the Landfill and directly on the B-aquifer in the northwestern portion of the Landfill. In other areas, solid waste lies on fill sand and gravel. The solid waste is bounded in most areas by construction debris and sand and gravel. The bottom of the solid waste is below the water table throughout most of the Landfill area, except in the northwest corner. The water table along the northern perimeter is generally located at 12.5 to 15 feet bgs.

5.0 REFERENCES

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- IT Corporation. 1999. "Post Construction Report, Site IR-01/21 Industrial Landfill Removal Action, Hunters Point Shipyard, San Francisco, California." July.
- San Francisco Redevelopment Agency. 1997. "Hunters Point Shipyard Redevelopment Plan." June 14.
- Tetra Tech EM Inc. (Tetra Tech). 1998. "Draft Parcel E Feasibility Study, Hunters Point Shipyard, San Francisco, California." January 15.
- Tetra Tech. 2002a. "Draft Final Field Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) for Parcel E Nonstandard Data Gaps Investigation, Hunters Point Shipyard, San Francisco, California." January 8.
- Tetra Tech. 2002b. "Revised Draft Final Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) for Parcel E Standard Data Gaps Investigation, Hunters Point Shipyard, San Francisco, California." August 22.
- Tetra Tech. 2003. "Final Parcel E Nonstandard Data Gaps Investigation, Landfill Gas Characterization, Hunters Point Shipyard, San Francisco, California." December 23.
- Tetra Tech. 2004. "Final Parcel E Nonstandard Data Gaps Investigation, Landfill Liquefaction Potential, Hunters Point Shipyard, San Francisco, California." August 13.
- Tetra Tech. Pending. "Parcel E Standard Data Gaps Investigation, Data Summary Report, Hunters Point Shipyard, San Francisco, California."
- Tetra Tech, Levine-Frick-Recon, and Uribe & Associates. 1997. "Draft Final Parcel E Remedial Investigation Report, Hunters Point Shipyard, San Francisco, California." October 27.
- The Exploratorium. 2003. "Filling the Marina." An Interview with Robert MacKimmie of the California Historical Society. Accessed in March 2001. Available Online at: <http://www.exploratorium.edu/marina/index.html>

FIGURES



2004-10-14 V:\Hunters Point\Projects\Parcel E Non-Standard Data Gaps\lateral extent report fig 1.mxd TTEM-SF Kevin Ernst

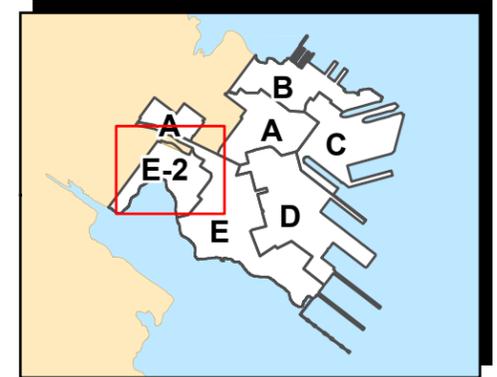
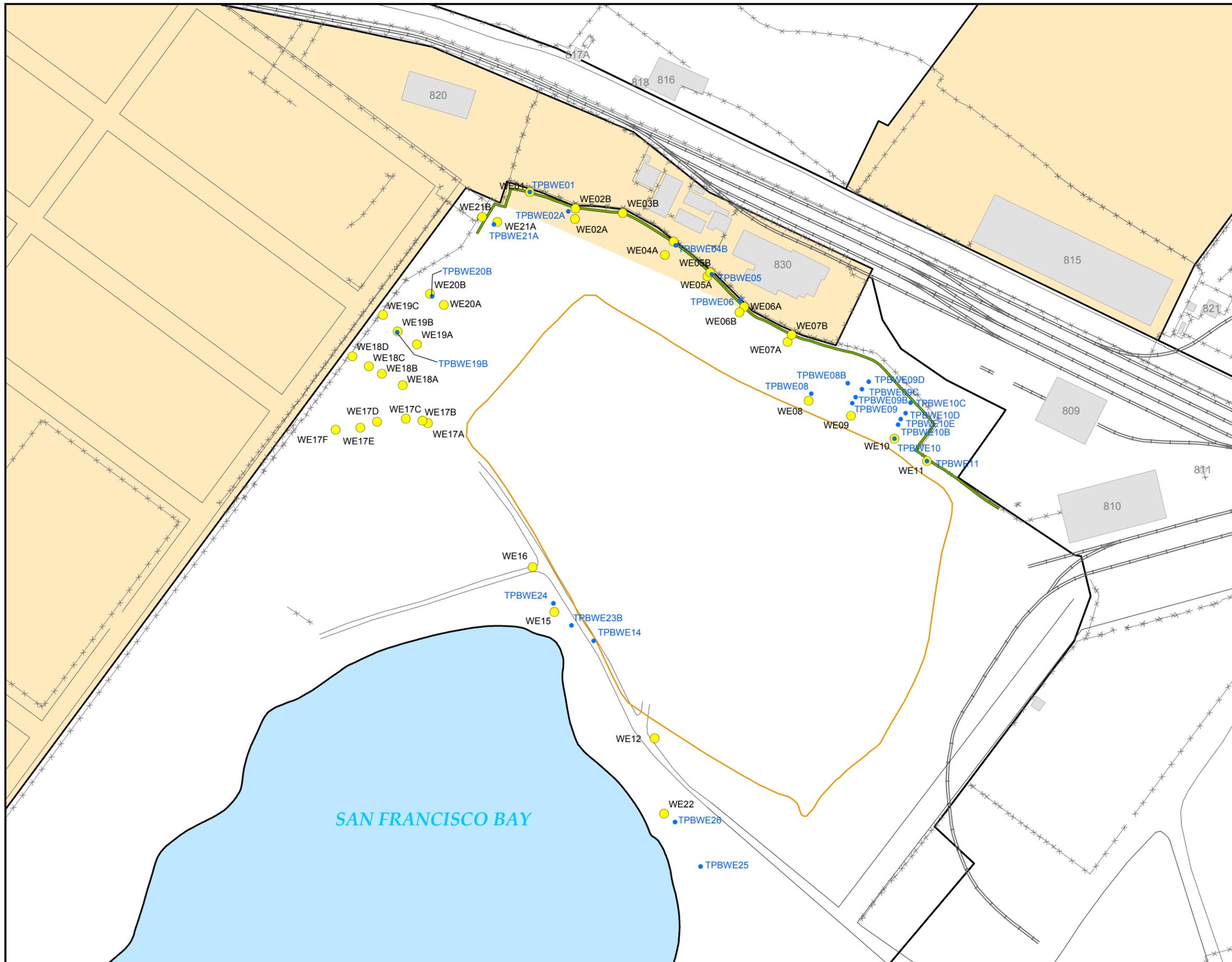
- - - Extent of Landfill
- Limit of Landfill Cap
- University of California, San Francisco Compound
- Parcel Boundary
- Non-Navy Property
- San Francisco Bay
- Building
- Road
- Rail Line



Hunters Point Shipyard, San Francisco, California
 U.S. Department of the Navy, BRAC PMO West, San Diego, California

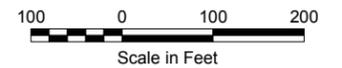
**FIGURE 1
 FACILITY LOCATION MAP**

Final Parcel E Nonstandard Data Gaps Investigation
 Landfill Lateral Extent Evaluation



Location Map

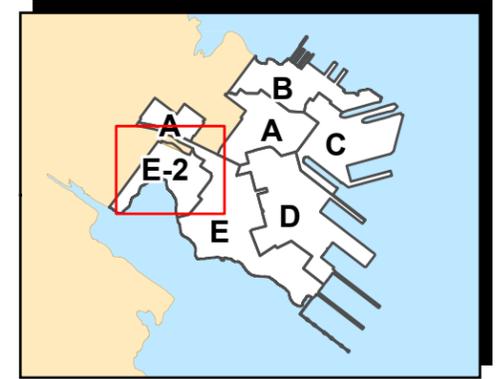
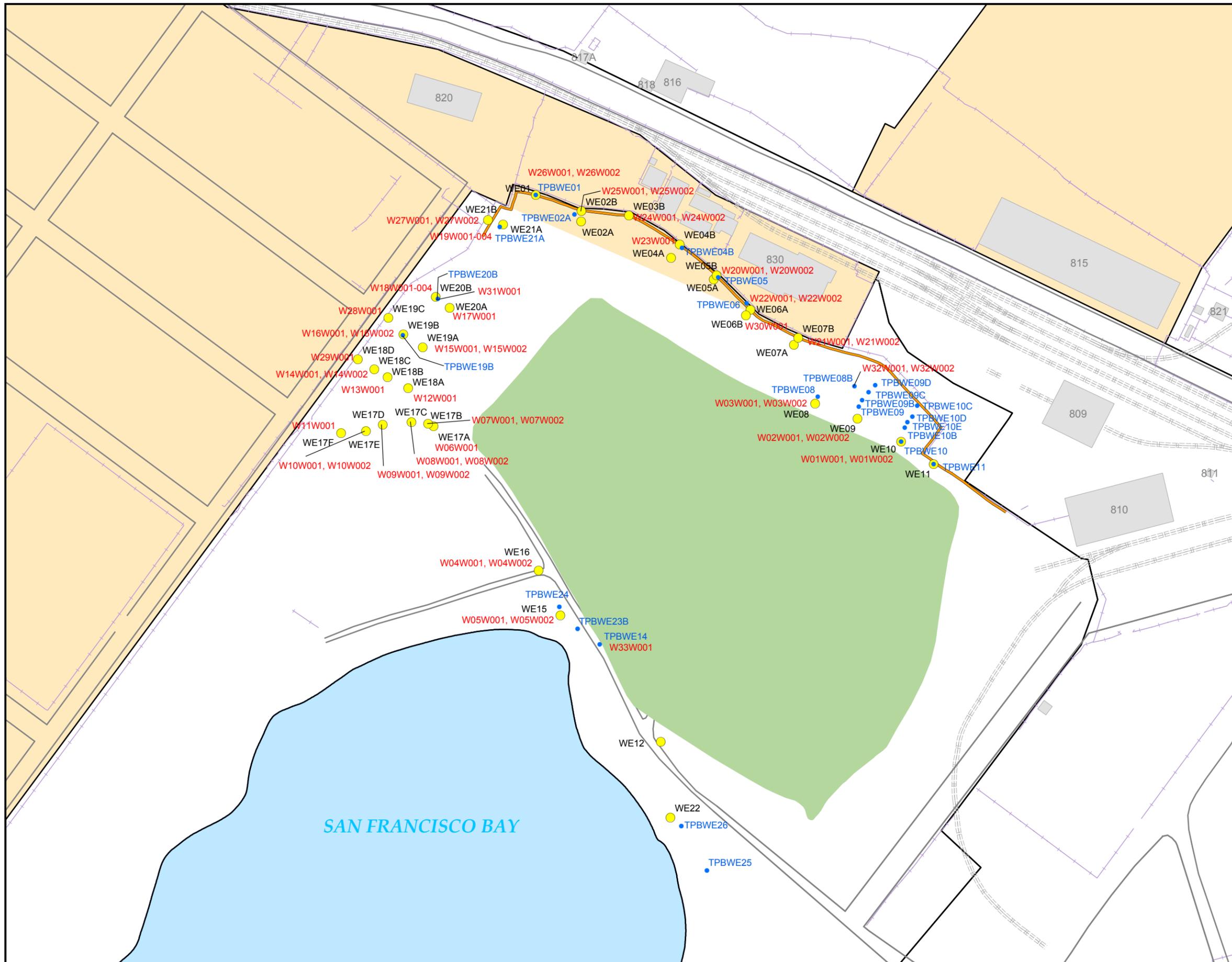
- Test Pit Boring
- Test Pit Location
- Approximate Limit of Landfill Cap
- Landfill Gas Barrier Wall
- Rail Lines
- Road
- *-* Fence
- Parcel Boundary
- Non-U.S. Navy Property
- Building



Hunters Point Shipyard, San Francisco, California
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**FIGURE 2
 TEST PIT AND SOIL BORING
 LOCATIONS**

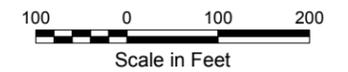
Final Parcel E Nonstandard Data Gaps Investigation
 Landfill Lateral Extent Evaluation



Location Map

- Test Pit Boring
- Test Pit Location
- Approximate Limit of Landfill Cap
- Parcel Boundary
- Non-U.S. Navy Property
- Building
- Landfill Gas Barrier Wall
- Rail Line
- Road
- Fence

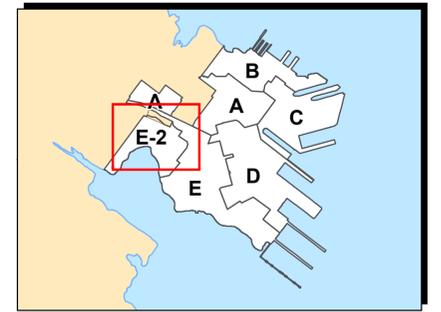
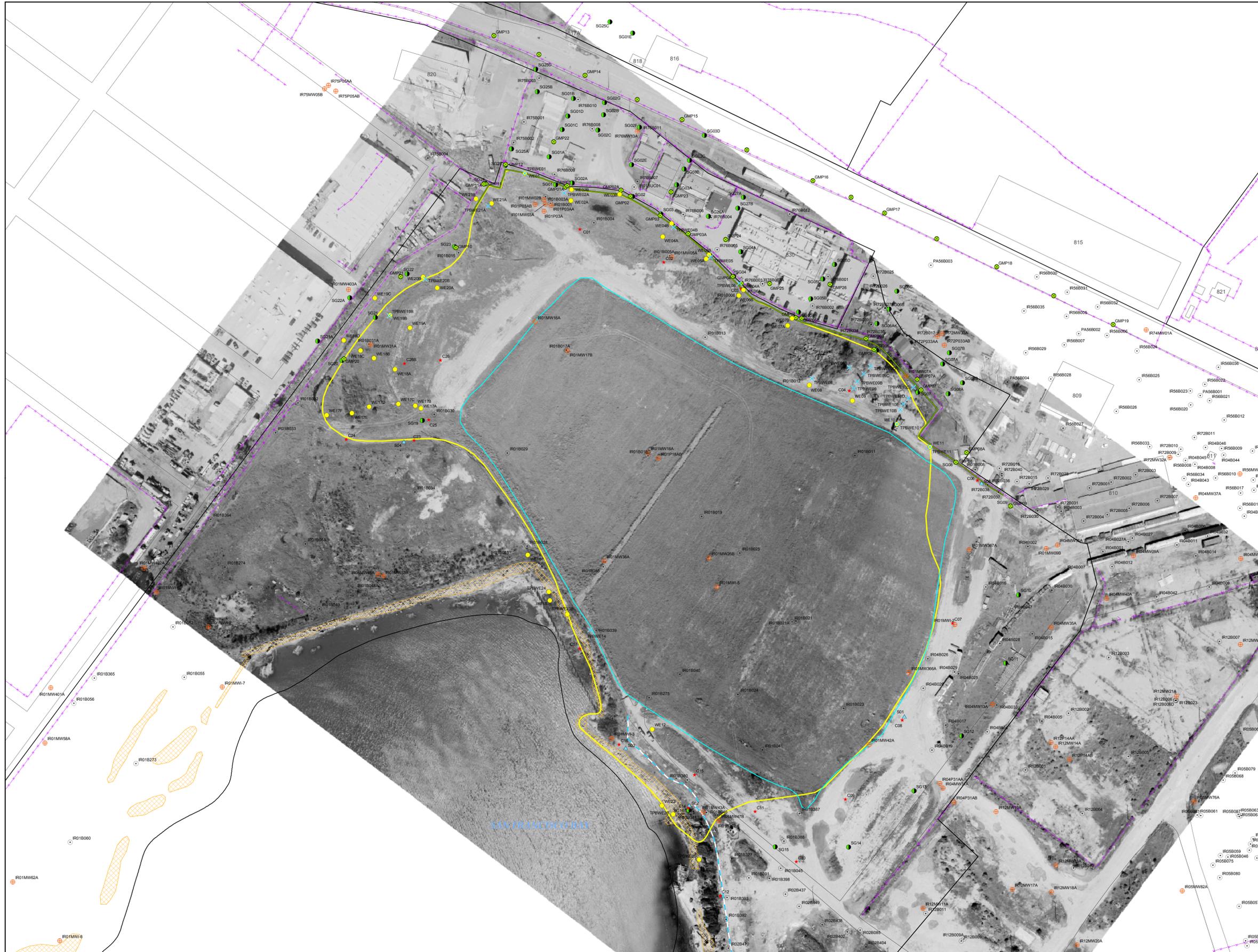
Soil sample identification numbers shown in red text



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 U.S. Department of the Navy, BRAC PMO West, San Diego, California

**FIGURE 3
 SOIL SAMPLING LOCATIONS**

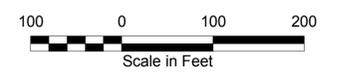
Final Parcel E Nonstandard Data Gaps Investigation
 Landfill Lateral Extent Evaluation



Location Map

- x Test Pit Boring
- Test Pit Location
- ★ Cone Penetrometer Test Location
- ▲ Standard Penetrometer Test Location
- Soil Gas Location
- Gas Monitoring Probe
- ⊕ Monitoring Well and Piezometer
- Soil Boring
- Landfill Gas Barrier Wall
- Revised Landfill Extent
- Approximate Limit of Landfill Cap
- - - Fence
- - - IR-01/21 Sheet Pile Wall
- ▨ Riprap
- Parcel Boundary

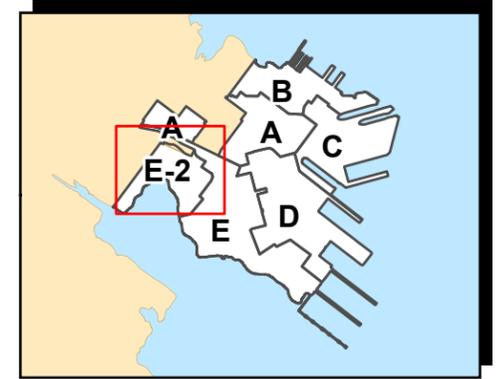
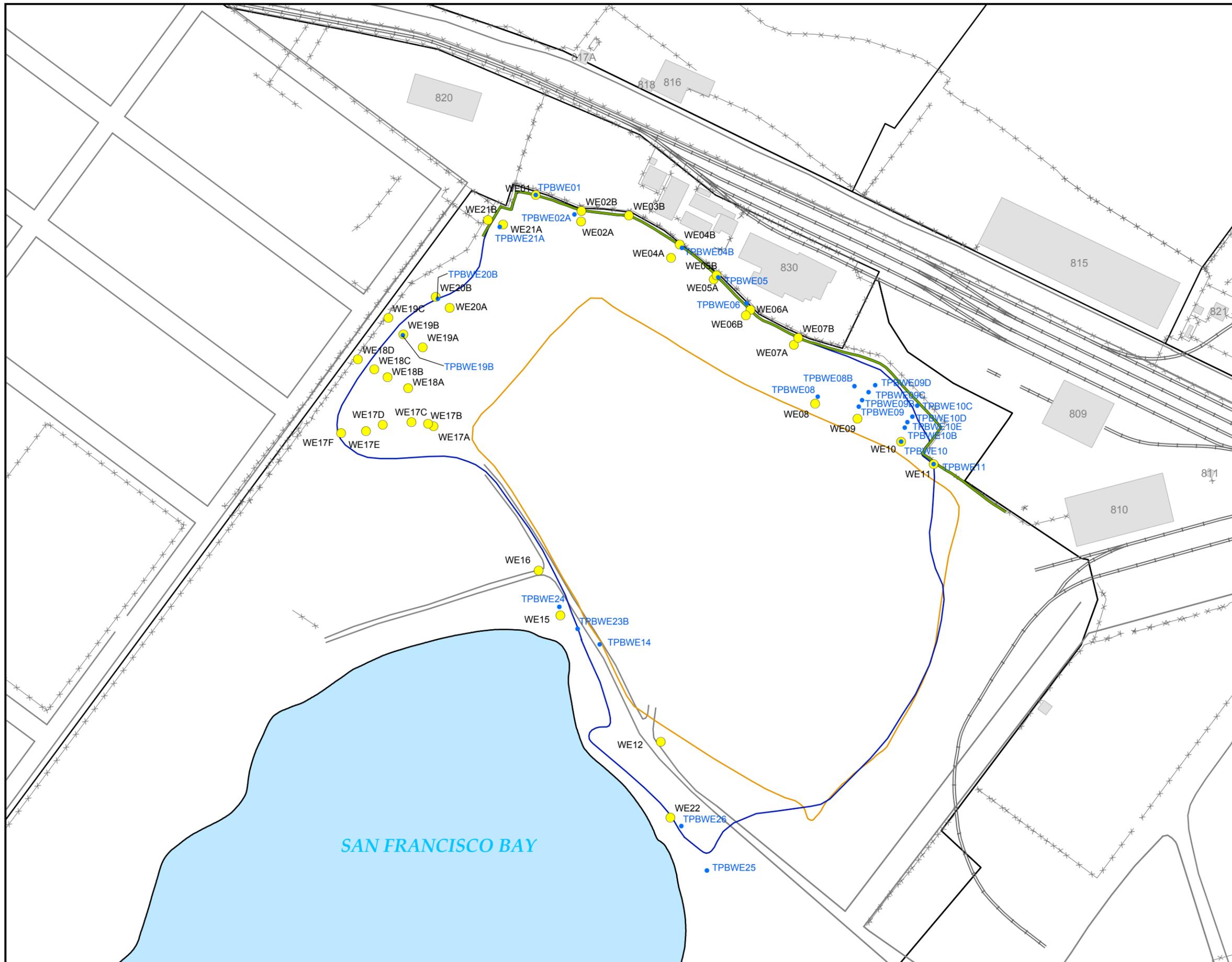
Aerial photo from May 2002



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 U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 4
REVISED LATERAL DELINEATION
WITH AERIAL PHOTOGRAPH

Final Parcel E Nonstandard Data Gaps Investigation
 Landfill Lateral Extent Evaluation



Location Map

- Test Pit Boring
- Test Pit Location
- Landfill Gas Barrier Wall
- Approximate Limit of Landfill Cap
- Revised Landfill Extent
- Rail Line
- Road
- Fence
- Building
- Parcel Boundary



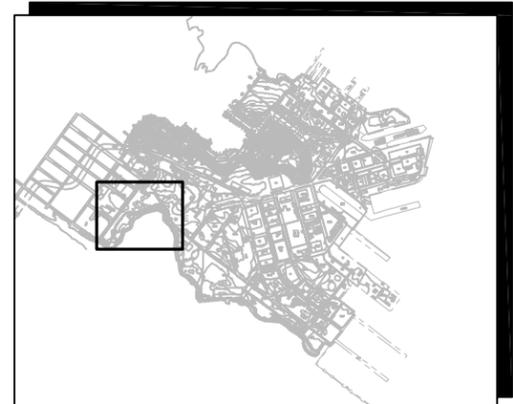
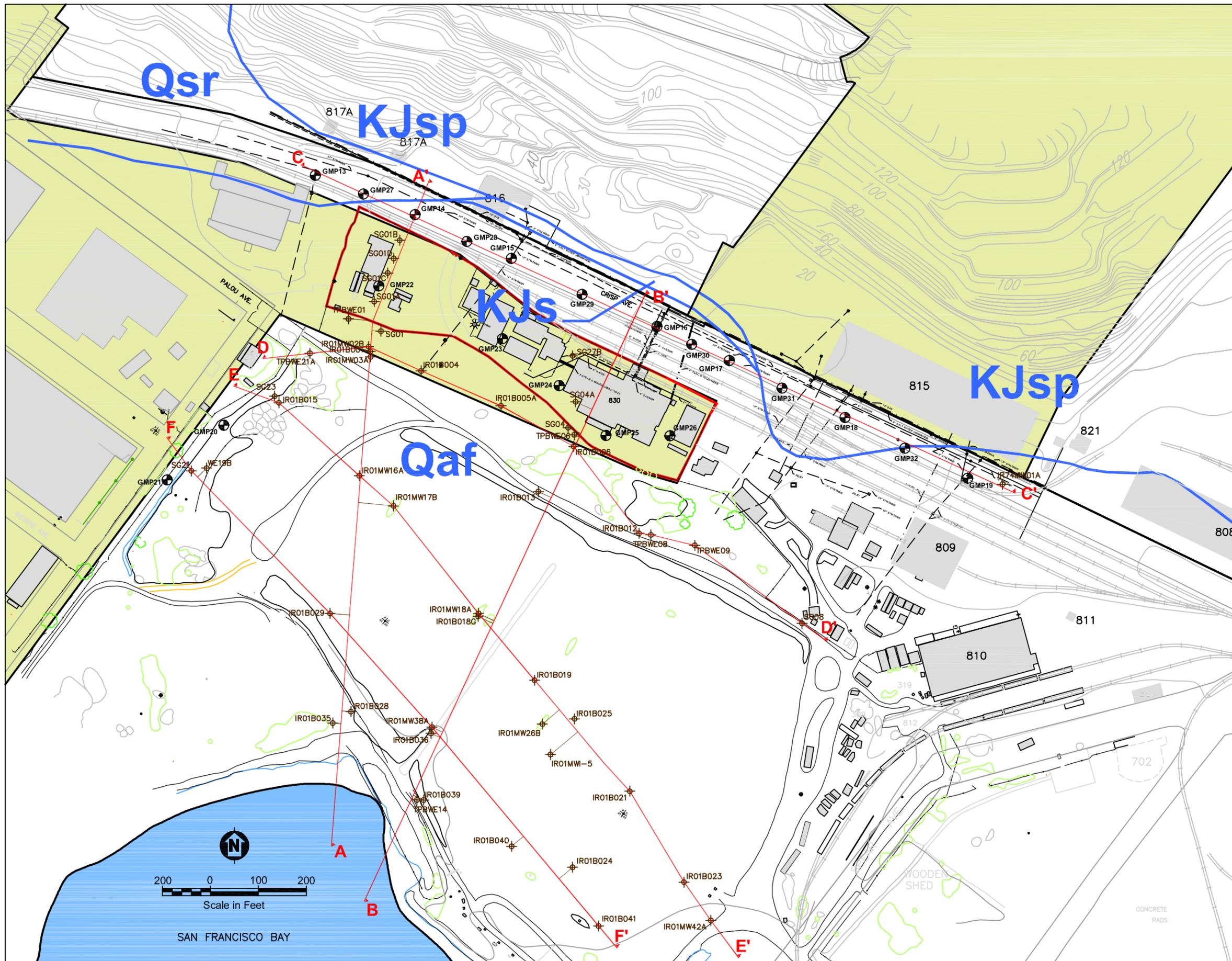
200 0 200
Scale in Feet



Hunters Point Shipyard, San Francisco, California
U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 5
REVISED LATERAL EXTENT DELINEATION

Final Parcel E Nonstandard Data Gaps Investigation
Landfill Lateral Extent Evaluation



- Existing Gas Monitoring Probe
- Landfill Extent Test Pit/Test Boring
- Existing Monitoring Well
- Boring Location
- Soil-Gas Test Location
- Geologic Contact
- Cross-Section Location
- Gas
- Sanitary Sewer
- Storm Drain
- Rail Road Track
- 255 Building or Structure
- University of California, San Francisco Compound
- Parcel Boundary
- Non-Navy Property

Contours shown are from aerial survey conducted during April 2002.

- KJs Sandstone and Shale Bedrock
- KJsp Serpentine Bedrock
- Qaf Artificial Fill
- Qsr Colluvium

Source for geology: Tetra Tech EM Inc. 1998. "Parcel E Feasibility Study, Draft Report, Hunters Point Shipyard, San Francisco, California." January 15.

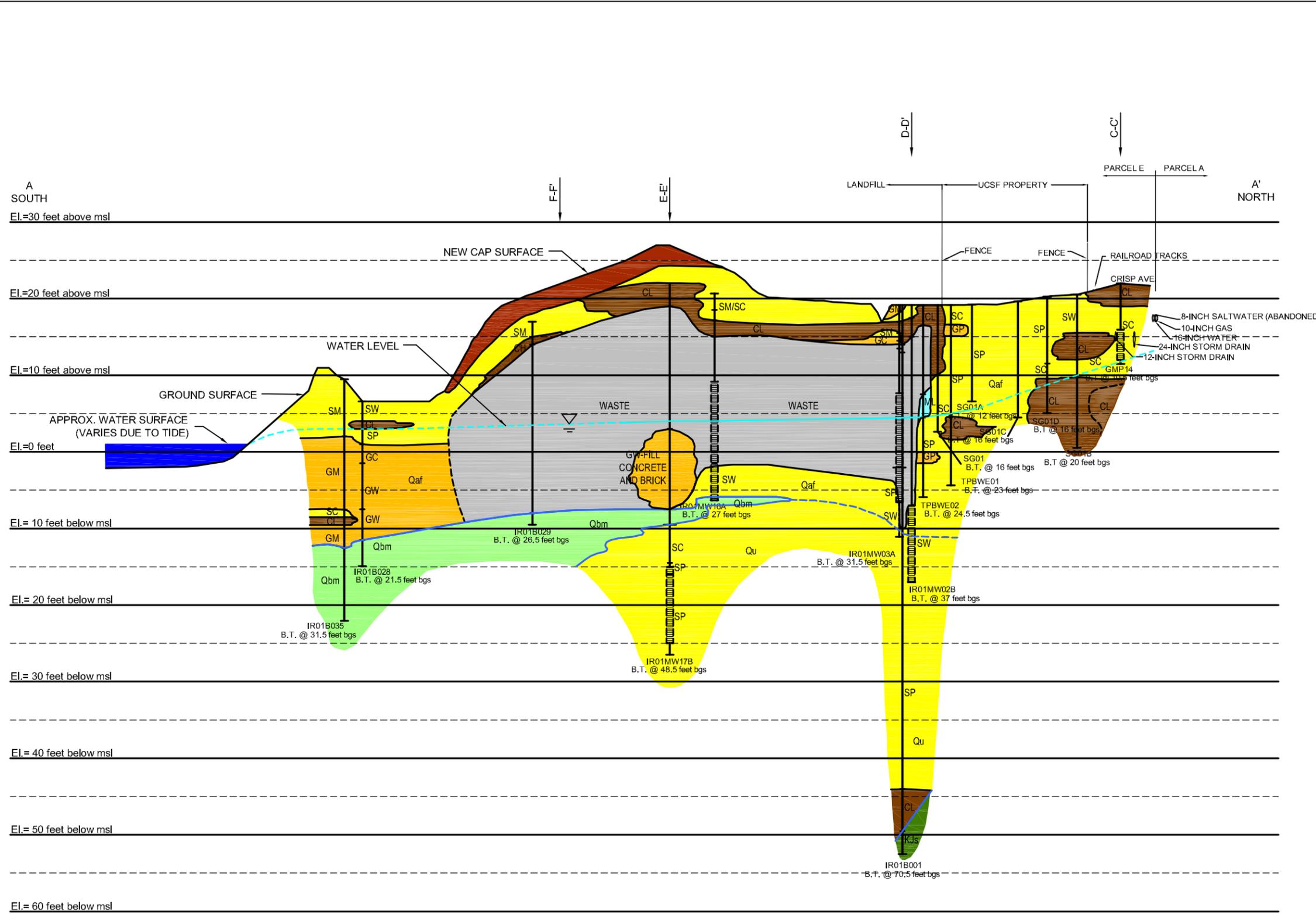


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FIGURE 6
LOCATION OF LANDFILL LITHOLOGY
CROSS SECTIONS

Final Parcel E Nonstandard Data Gaps Investigation
 Landfill Lateral Extent Evaluation

Oct 11, 2004/troy.fegter S:\Projects\Directory\Federal Government\Navy Projects\Hunters Point Naval Shipyard-Landfill\Cross-Sections\050503\Final LLEE\Figure 7-LLEE-AA.dwg Sheet 11x17



- Water Table Measurement on February 20, 2002; Water Level Shown is A-aquifer
- Lithologic or Waste Boundary (dashed where inferred)
- Formation Boundary (dashed where inferred)
- Boring Location (tic marks represent change in lithology)

- IR01B006
- IR01MW02B Screened Area
- C-C' Intersection Location of Cross Sections
- Cap
- Sand
- Clay
- Silt
- Gravel
- Bay Mud (clay)
- Waste
- Bedrock
- Tidal Reference

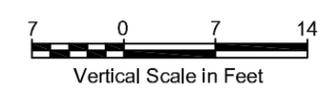
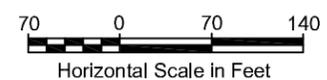
- Notes:
- bgs Below ground surface
 - B.T. Borehole termination
 - CH High plasticity clay
 - CL Clay
 - EI. Elevation
 - GC Clayey gravel
 - GM Silty gravel
 - GMP Gas monitoring probe
 - GP Poorly graded gravel
 - GW Well graded gravel
 - KJs Sandstone and Bedrock
 - ML Silt
 - msl Mean sea level
 - SC Clayey sand
 - SM Silty sand
 - SP Poorly graded sand
 - SW Well graded sand
 - Qaf Artificial Fill
 - Qbm Bay Mud (clay)
 - Qu Undifferentiated Sediment
 - UCSF University of California, San Francisco



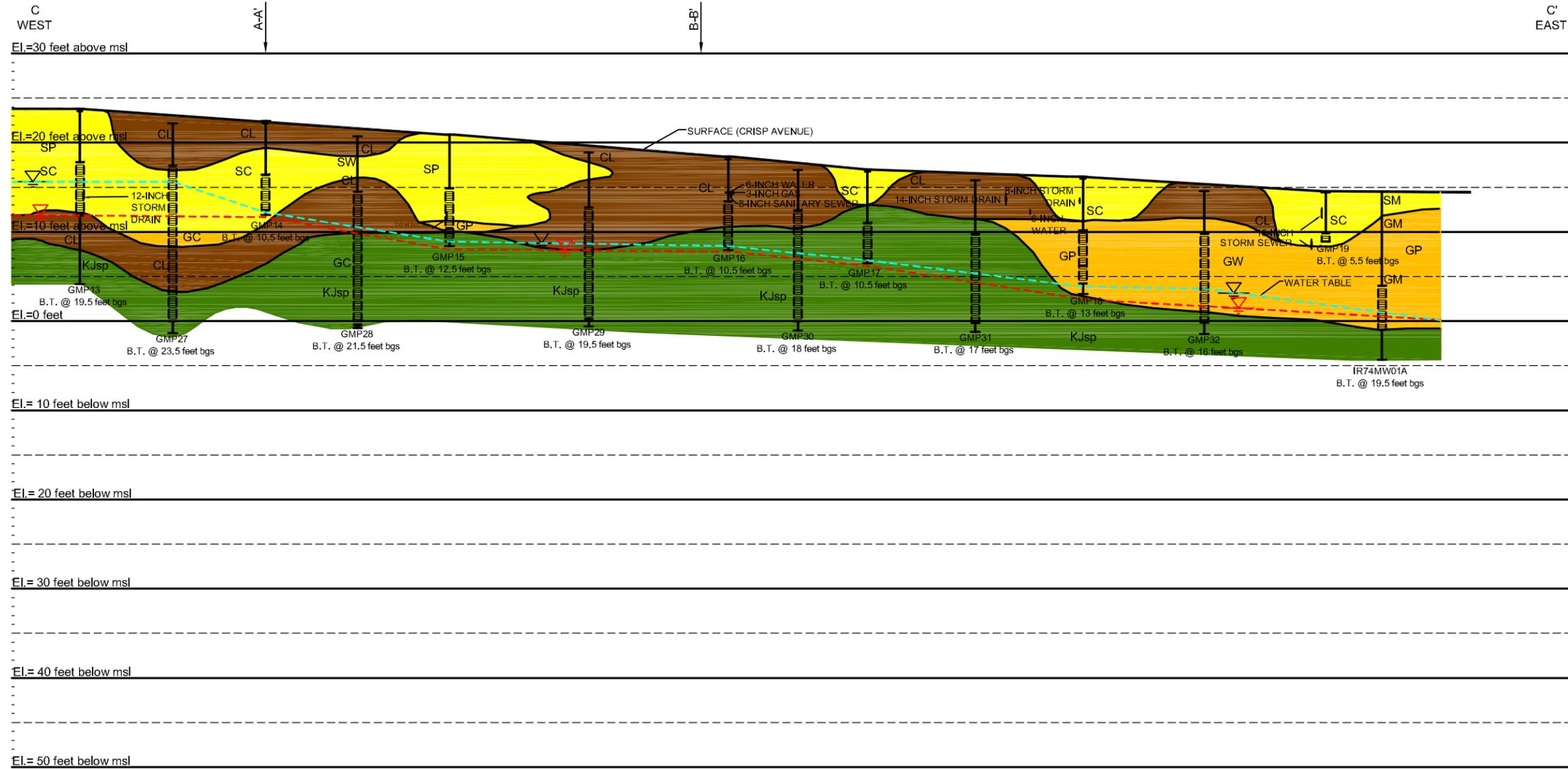
Hunters Point Shipyard, San Francisco, California
 U.S. Department of the Navy, BRAC PMO West, San Diego, California

**FIGURE 7
 CROSS SECTION A-A'**

Final Parcel E Nonstandard Data Gaps Investigation
 Landfill Lateral Extent Evaluation



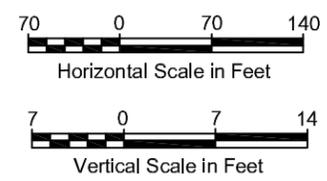
Oct 11, 2004/troy.fegter S:\Projects Directory\Federal Government\Naval Shipyard-Landfill\Cross-Sections050503\Final LLEE\Figure 9-LLEE-CC.dwg Sheet 11x17



- Water Table Measurements at GMPs on February 20, 2002; Water Level Shown is A-aquifer
- Water Table Represents the Estimated Low Groundwater Level Based on the Measurements at GMPs on May 31, 2002, that were adjusted approximately 2 feet downward to account for the maximum historic-level fluctuation.
- Storm Water Sewer Utility Line
- Lithologic or Waste Boundary (dashed where inferred)
- Boring Location (tic marks represent change in lithology)

- IR01B006
- IR74MW01A Screened Area
- A-A' Intersection Location of Cross Sections
- Sand
- Clay
- Gravel
- Bedrock

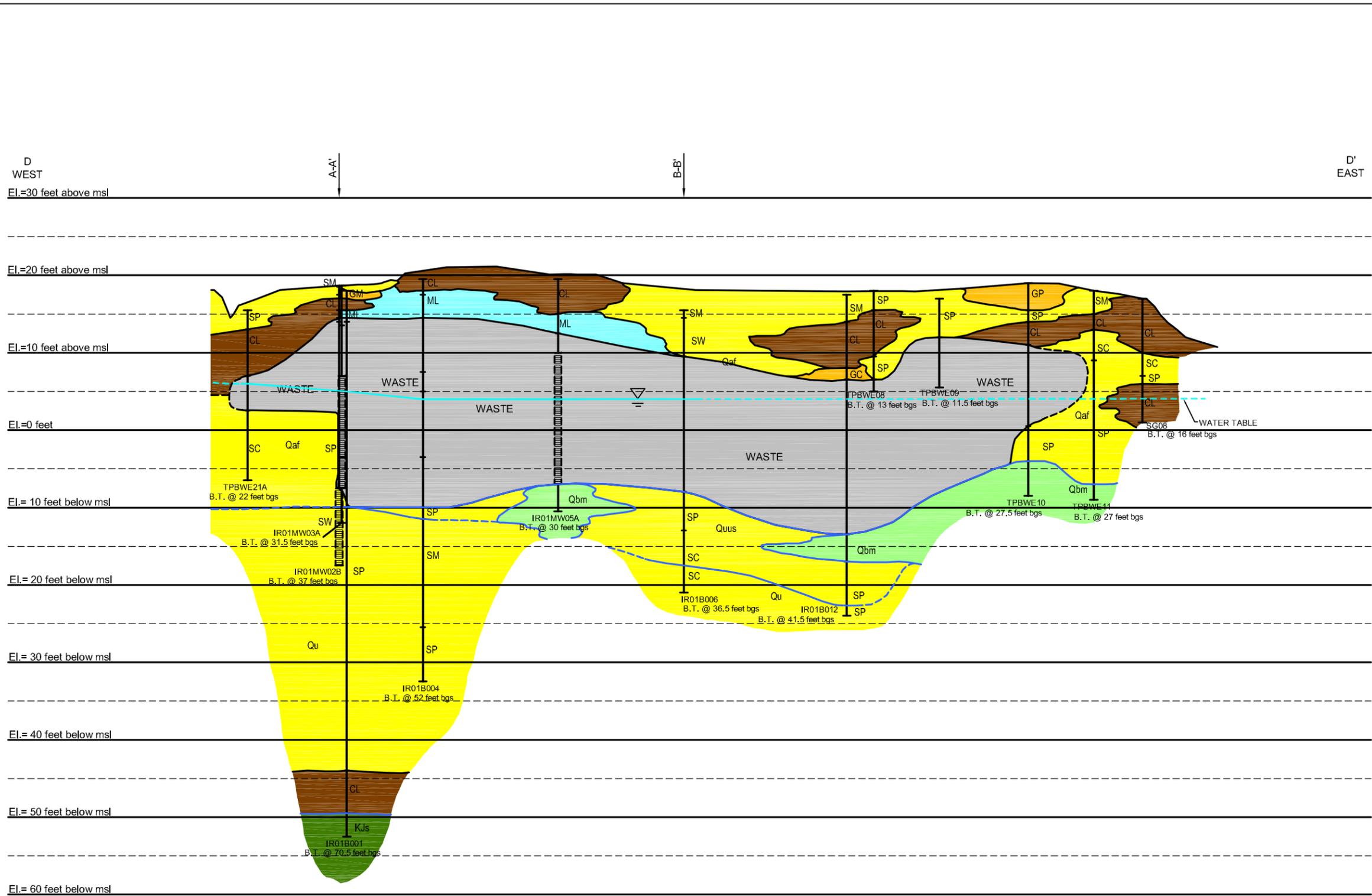
- Notes:**
- bgs Below ground surface
 - B.T. Borehole termination
 - CL Clay
 - EI. Elevation
 - GC Clayey gravel
 - GM Silty gravel
 - GMP Gas monitoring probe
 - GP Poorly graded gravel
 - GW Well graded gravel
 - KJsp Serpentine Bedrock
 - msl Mean sea level
 - SC Clayey sand
 - SM Silty sand
 - SP Poorly graded sand
 - SW Well graded sand



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**FIGURE 9
 CROSS SECTION C-C'**

Final Parcel E Nonstandard Data Gaps Investigation
 Landfill Lateral Extent Evaluation



- Water Table Measurement on February 20, 2002; Water Level Shown is A-aquifer
- Lithologic or Waste Boundary (dashed where inferred)
- Formation Boundary (dashed where inferred)
- Boring Location (tic marks represent change in lithology)

IR01B006
 IR01MW02B
 Screened Area

A-A' → Intersection Location of Cross Sections

- Sand
- Clay
- Silt
- Gravel
- Bay Mud (clay)
- Waste
- Bedrock

Notes:

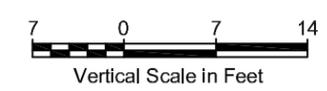
- bgs Below ground surface
- B.T. Borehole termination
- CL Clay
- EI. Elevation
- GC Clayey gravel
- GM Silty gravel
- GP Poorly graded gravel
- KJs Sandstone and Shale Bedrock
- ML Silt
- msl Mean sea level
- SC Clayey sand
- SM Silty sand
- SP Poorly graded sand
- SW Well graded sand
- Qaf Artificial Fill
- Qbm Bay Mud (clay)
- Qu Undifferentiated Sediment
- Quus Undifferentiated Upper Sand Deposit

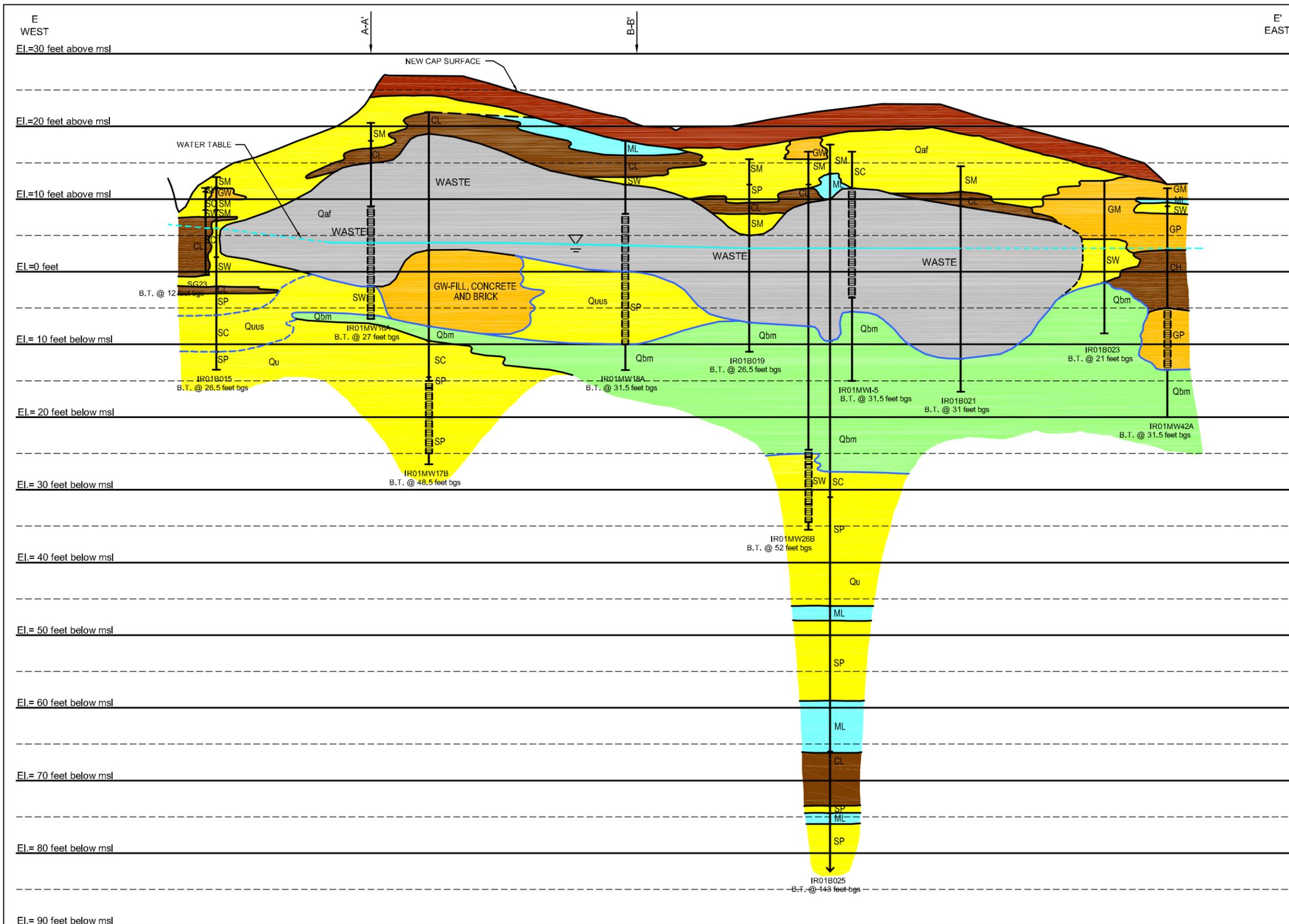


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FIGURE 10
 CROSS SECTION D-D'

Final Parcel E Nonstandard Data Gaps Investigation
 Landfill Lateral Extent Evaluation





Water Table Measurement on February 20, 2002; Water Level Shown is A-aquifer (dashed where inferred)
 Lithologic or Waste Boundary (dashed where inferred)
 Formation Boundary (dashed where inferred)
 Boring Location (tic marks represent change in lithology)

IR01B006
 IR01MW17B Screened Area
 A-A' Intersection Location of Cross Sections

- Cap
- Sand
- Clay
- Silt
- Gravel
- Bay Mud (clay)
- Waste
- Bedrock

Notes:
 bgs Below ground surface
 B.T. Borehole termination
 CH High plasticity clay
 CL Clay
 El. Elevation
 GM Silty gravel
 GP Poorly graded gravel
 GW Well graded gravel
 ML Silt
 msl Mean sea level
 SC Clayey sand
 SM Silty sand
 SP Poorly graded sand
 SW Well graded sand
 Qaf Artificial Fill
 Qbm Bay Mud (clay)
 Qu Undifferentiated Sediment
 Quus Undifferentiated Upper Sand Deposit

Tetra Tech EM Inc.
Hunters Point Shipyard, San Francisco, California
 U.S. Department of the Navy, BRAC PMO West, San Diego, California

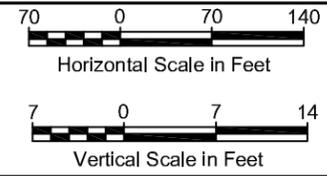
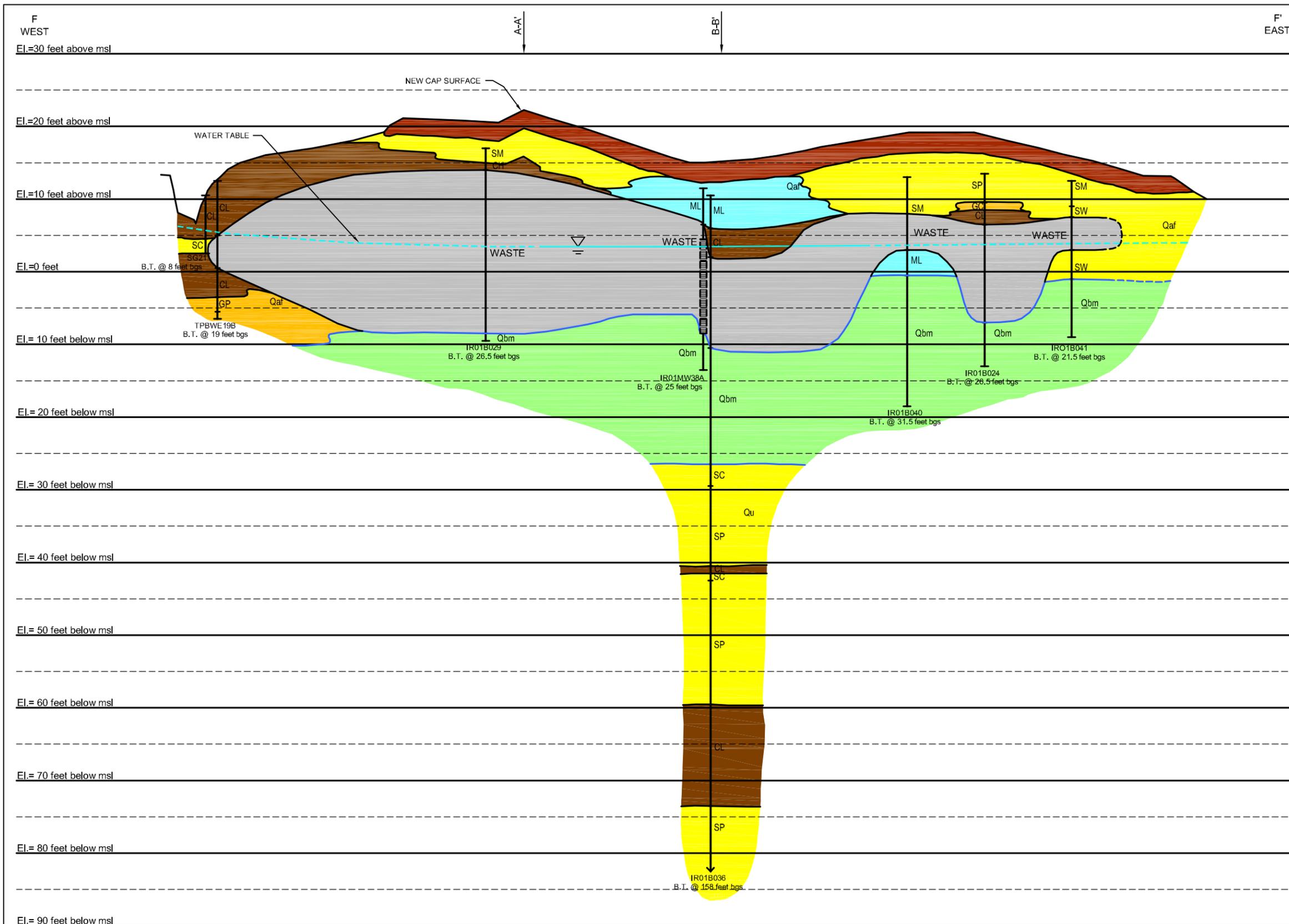


FIGURE 11
CROSS SECTION E-E'
 Final Parcel E Nonstandard Data Gaps Investigation
 Landfill Lateral Extent Evaluation



Water Table Measurement on February 20, 2002; Water Level Shown is A-aquifer
 Lithologic or Waste Boundary (dashed where inferred)
 Formation Boundary (dashed where inferred)
 Boring Location (tic marks represent change in lithology)

IR01B006
 IR01MW38A Screened Area
 A-A' Intersection Location of Cross Sections

- Cap
- Sand
- Clay
- Silt
- Gravel
- Bay Mud (clay)
- Waste
- Bedrock

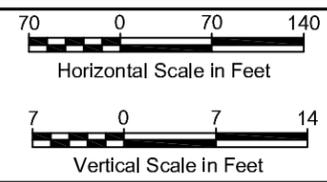
- Notes:
- bgs Below ground surface
 - B.T. Borehole termination
 - CH High plasticity clay
 - CL Sandy or silty clay
 - EI. Elevation
 - GC Clayey gravel
 - GP Poorly graded gravel
 - ML Silt
 - msl Mean sea level
 - SC Clayey sand
 - SM Silty sand
 - SP Poorly graded sand
 - SW Well graded sand
 - Qaf Artificial Fill
 - Qbm Bay Mud (clay)
 - Qu Undifferentiated Sediment



Hunters Point Shipyard, San Francisco, California
 U.S. Department of the Navy, BRAC PMO West, San Diego, California

FIGURE 12
 CROSS SECTION F-F'

Final Parcel E Nonstandard Data Gaps Investigation
 Landfill Lateral Extent Evaluation



TABLES

TABLE 1: TEST PIT DATA SUMMARY

Final Landfill Lateral Extent Evaluation, Hunters Point Shipyard, San Francisco, California

Test Pit	Date of Excavation	Findings	Depth (feet bgs)	Soil Sample(s) Collected
WE01	3/21/2002	Bluish gray soil with some landfill refuse at 2 feet bgs; water table at 6 feet bgs	6	W26W001 (4 feet bgs) W26W002 (4 feet bgs) DUP
WE02A	3/21/2002	50 percent landfill refuse at 3 feet bgs	5.5	--
WE02B	3/21/2002	Landfill refuse, including gravel fill at 1 foot bgs; purple chemical stain at 3 feet bgs; bluish gray color at 6 to 8 feet bgs; and concrete rubble at 8 feet bgs	12	W25W001B (4 feet bgs) W25W002B (12 feet bgs)
WE03B ^a	3/21/2002	Landfill refuse, including gravel fill, at 2 feet bgs; wood debris, asphalt, and concrete at 4 feet bgs; and bluish gray-stained soil from 3 to 8 feet bgs	12	W24W001 (4 feet bgs) W24W002 (12 feet bgs)
WE04A	3/20/2002	Landfill refuse, including stained soil, glass, and cans, at 3 feet bgs, and wood waste, paper, and concrete fill at 5 feet bgs	8	--
WE04B	3/20/2002	Landfill refuse, including gravel, wood, paper, and metal, at 2 feet bgs and 4 feet from fence	6	W23W001 (4 feet bgs)
WE05A	3/20/2002	Landfill refuse, including wood debris, metal, paper, and trash, from 3 to 9 feet bgs	10	--
WE05B	3/20/2002	Landfill refuse and black staining at 3 feet bgs, and mainly wood debris, gravel, and concrete present	13	W20W001 (4 feet bgs) W20W002 (13 feet bgs)
WE06A	3/20/2002	Landfill refuse, including wood and gravel, at 3 feet bgs	8	W22W001 (4 feet bgs) W22W002 (8 feet bgs)
WE06B	3/21/2002	Landfill refuse at 2 feet bgs	4	W30W001 (4 feet bgs)
WE07A	3/20/2002	Landfill refuse, including concrete and wood, at 2 feet bgs, and trash at 6 feet bgs	5	--
WE07B	3/20/2002	Wood and metal landfill refuse encountered just below ground surface and bluish-stained soil at 8 feet bgs	8	W21W001 (8 feet bgs) W21W002 (4 feet bgs)
WE08	3/13/2002	Brick, paper, and concrete landfill refuse from 2 to 4 feet bgs with stained soil and petroleum odors but no debris below 4 feet bgs	10	W03W001 (4 feet bgs) W03W002 (10 feet bgs)
WE09	3/13/2002	40-foot-long trench; bricks on north end and concrete rubble in the middle and southern sections	9	W02W001 (4 feet bgs) W02W002 (9 feet bgs)

TABLE 1: TEST PIT DATA SUMMARY (Continued)

Final Landfill Lateral Extent Evaluation, Hunters Point Shipyard, San Francisco, California

Test Pit	Date of Excavation	Findings	Depth (feet bgs)	Soil Sample(s) Collected
WE10	3/13/2002	Flat concrete slab at 1 foot bgs; some petroleum odor	10	W01W001 (4 feet bgs) W01W002 (10 feet bgs)
WE11	3/13/2002	Concrete rubble at 5 feet bgs, and wood and paper debris at 9 feet bgs	11	--
WE12	3/22/2002	Wood debris and gravel landfill refuse at 1 foot bgs	3	--
WE15	3/14/2002	Dark decaying organic matter; hydrogen sulfide odor; heavily saturated soil	10	W05W001 (4 feet bgs) W05W002 (10 feet bgs)
WE16	3/14/2002	Clean soil with few large concrete blocks	8	W04W001 (4 feet bgs) W04W002 (8 feet bgs)
WE17A	3/19/2002	Organic odor below 12 feet bgs; no debris	15.5	W06W001 (15.5 feet bgs)
WE17B	3/19/2002	Landfill refuse below 4 feet bgs of brick, gravel, metal, and wood; staining and odor at 16 feet bgs	18	W07W001 (4 feet bgs) W07W002 (18 feet bgs)
WE17C	3/19/2002	Landfill refuse, including concrete, gravel, metal, and wood, below 3 feet bgs	16	W08W001 (4 feet bgs) W08W002 (16 feet bgs)
WE17D	3/19/2002	Gravel fill increasing with depth; metal debris and PVC pipe at 4 feet bgs, and concrete block at 13.5 feet bgs	13	W09W001 (5 feet bgs) W09W002 (13 feet bgs)
WE17E	3/19/2002	Landfill refuse, including gravel, wood, asphalt, metal, and large concrete block, below 4 feet bgs	11	W10W001 (5 feet bgs) W10W002 (11 feet bgs)
WE17F	3/19/2002	Landfill refuse, including large gravel, metal, brick, and wood, below 4 feet bgs	6	W11W001 (4 feet bgs)
WE18A	3/19/2002	Brick debris from 0 to 4 feet bgs, black-stained soil at 11 feet bgs, and wood and metal debris at 12 feet bgs	12	W12W001 (12 feet bgs)
WE18B	3/19/2002	Landfill refuse, including metal, plastic, bricks, and tires, throughout test pit; strong methane odor	13	W13W001 (13 feet bgs)
WE18C	3/19/2002	Landfill refuse, including wood, paper, brick, plastic, and glass	12	W14W001 (4 feet bgs) W14W002 (12 feet bgs)

TABLE 1: TEST PIT DATA SUMMARY (Continued)

Final Landfill Lateral Extent Evaluation, Hunters Point Shipyard, San Francisco, California

Test Pit	Date of Excavation	Findings	Depth (feet bgs)	Soil Sample(s) Collected
WE18D	3/21/2002	Gravel fill from 0 to 2 feet bgs, and water at 3 feet bgs	3	W29W001 (3 feet bgs)
WE19A	3/19/2002	Landfill refuse, including gravel, brick, wood, and plastic, below 4 feet bgs	16	W15W001 (4 feet bgs) W15W002 (16 feet bgs)
WE19B	3/19/2002	Large concrete boulders near top of test pit, plastic pipe at 7.5 feet bgs, and wood debris increasing with depth to almost total wood debris at 11 feet bgs	11	W16W001 (4 feet bgs) W16W002 (11 feet bgs)
WE19C	3/21/2002	Gravel fill below 2 feet bgs and pieces of wood at 5 feet bgs	5.5	W28W001 (4 feet bgs)
WE20A	3/19/2002	Gravel fill at 2 feet bgs, and wood, plastic, brick, and stained soils below 6 feet bgs	11	W17W001 (11 feet bgs)
WE20B	3/19/2002	Stained soil below 4 feet bgs; water table at 10 feet bgs	10	W18W001 (4 feet bgs) W18W004 (4 feet bgs) DUP W18W002 (10 feet bgs) MS/MSD W18W003 (10 feet bgs) DUP
WE21A	3/19/2002	Landfill refuse, including PVC pipe, gravel, and concrete	11	W19W001 (4 feet bgs) MS/MSD W19W002 (4 feet bgs) DUP W19W003 (11 feet bgs) MS/MSD W19W004 (11 feet bgs) DUP
WE21B	3/21/2002	Large concrete rubble at 2 feet bgs; little debris and about 40 percent gravel	10	W27W001 (4.5 feet bgs) W27W002 (10 feet bgs)
WE22	3/22/2002	Sand, saturated clay for few inches, then Bay Mud	8	--

Notes:

- a Test pit WE03A was not excavated because of the presence of refuse in WE03B
- Sample not collected
- bgs Below ground surface
- DUP Duplicate sample
- MS Matrix spike (created with sample)
- MSD Matrix spike duplicate (created with sample)
- PVC Polyvinyl chloride

TABLE 2: SOIL BORING DATA SUMMARY

Final Parcel E Nonstandard Data Gaps Investigation, Landfill Lateral Extent Evaluation
 Hunters Point Shipyard, San Francisco, California

Boring	Date of Drilling	Findings	Depth (feet bgs)	Depth to Water (feet bgs)	Soil Sample(s) Collected
TPBWE01	3/29/2002	Fill material and petroleum-saturated coarse sand beginning at 17 feet bgs	23	14	--
TPBWE02A	3/29/2002	Landfill refuse from 3.5 to 12.5 feet bgs, and petroleum odor and black staining in soil below 15.5 feet bgs	24.5	14	--
TPBWE04B	3/28/2002	Landfill refuse at 3 feet bgs	9.5	NA	--
TPBWE05	3/28/2002	Fill material and petroleum staining and odor below 15.5 feet bgs	21.5	14	--
TPBWE06	3/28/2002	Fill material and petroleum staining from 2.0 to 5.0 feet bgs and below 11.0 feet bgs	18.5	15.5	--
TPBWE08	3/28/2002	Landfill refuse beginning at 8.5 feet bgs	13	NA	--
TPBWE08B	4/2/2002	Landfill refuse from 5.5 to 17.5 feet bgs	22	13	W32W001 (5.5 to 7.0 feet bgs) W32W002 (19.0 to 20.5 feet bgs)
TPBWE09	3/26/2002	Landfill refuse beginning at 5 feet bgs, and petroleum staining from 1.0 to 5.0 feet bgs	13	NA	--
TPBWE09B	3/26/2002	Landfill refuse beginning at 9.5 feet bgs, and petroleum staining from 2.0 to 3.5 feet bgs	11	NA	--
TPBWE09C	3/27/2002	Landfill refuse beginning at 8.0 feet bgs, and petroleum staining and odor between 8.0 to 9.5 feet bgs	12.5	NA	--
TPBWE09D	3/27/2002	Landfill refuse beginning at 9.5 feet bgs, and petroleum staining in soil below 2.0 feet bgs	12.5	NA	--
TPBWE10	3/25/2002	Landfill refuse from 8.0 to 15.5 feet bgs, and petroleum odor and staining in soil below 9.5 feet bgs	27.5	15.5	--
TPBWE10B	3/26/2002	Landfill refuse from 6.5 to 17.5 feet bgs	27	NA	--
TPBWE10C	3/27/2002	Fill material	18	15	--
TPBWE10D	3/27/2002	Fill material	17	12.5	--
TPBWE10E	3/27/2002	Fill material	17	12.5	--
TPBWE11	3/25/2002	Fill material and petroleum staining beginning at 10.5 feet bgs	27	10	--
TPBWE14	4/2/2002	Landfill refuse from 3.5 to 15.5 feet bgs, and petroleum staining beginning at 15.5 feet bgs	20	6.5	W33W001 (15.5 to 17.0 feet bgs)
TPBWE19B	4/1/2002	Fill material and petroleum staining below 16.0 feet bgs	19	8.5	--
TPBWE20B	4/1/2002	Fill material and petroleum staining below 11.5 feet bgs	19	10	W31W001 (16.0 to 17.5 feet bgs)
TPBWE21A	4/1/2002	Landfill refuse from 7.0 to 13.0 feet bgs, and petroleum staining below 5.5 feet bgs	22	13	--
TPBWE23B	9/3/2002	Silty sand and gravel; Bay Mud and no refuse	12	NA	--
TPBWE24	9/3/2002	Poorly graded sand with gravel and shell fragments; Bay Mud and no refuse	12	NA	--
TPBWE25	9/3/2002	Silty sand with minor iron and petroleum staining; Bay Mud and no refuse	12	NA	--
TPBWE26	9/3/2002	Sand and gravel; Bay Mud and no refuse	12	NA	--

TABLE 2: SOIL BORING DATA SUMMARY (Continued)

Final Parcel E Nonstandard Data Gaps Investigation, Landfill Lateral Extent Evaluation
Hunters Point Shipyard, San Francisco, California

Notes: To determine the extent of solid waste at the Landfill, data from numerous investigations were evaluated. Only data collected during the Parcel E nonstandard data gaps investigation evaluation of the landfill lateral extent are included in this report. The Parcel E draft final remedial investigation report contains historic soil and monitoring well boring logs (Tetra Tech, Levine-Fricke-Recon, and Uribe & Associates 1997). The draft Parcel E nonstandard data gaps investigation landfill gas characterization report contains soil-gas boring logs (Tetra Tech EM Inc. 2003). The Parcel E nonstandard data gaps investigation landfill liquefaction potential report contains cone penetrometer tests (Tetra Tech EM Inc. 2004). The revised draft final sampling and analysis plan for the Parcel E standard data gaps investigation contains aerial photographs (Tetra Tech EM Inc. 2002b). [Appendix D](#) of this report includes historic landfill design maps.

-- Soil sample not collected

bgs Below ground surface

NA Not available

Sources:

Tetra Tech EM Inc. 2002b. "Revised Draft Final Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) for Parcel E Standard Data Gaps Investigation, Hunters Point Shipyard, San Francisco, California." August 22.

Tetra Tech EM Inc. 2003. "Final Parcel E Nonstandard Data Gaps Investigation, Landfill Gas Characterization, Hunters Point Shipyard, San Francisco, California." December 23.

Tetra Tech EM Inc. 2004. "Final Parcel E Nonstandard Data Gaps Investigation, Landfill Liquefaction Potential, Hunters Point Shipyard, San Francisco, California." August 13.

Tetra Tech EM Inc, Levine-Frick-Recon, and Uribe & Associates. 1997. "Draft Final Parcel E Remedial Investigation Report, Hunters Point Shipyard, San Francisco, California." October 27.

APPENDIX A
TEST PIT LOGS

LIST OF TEST PIT LOGS

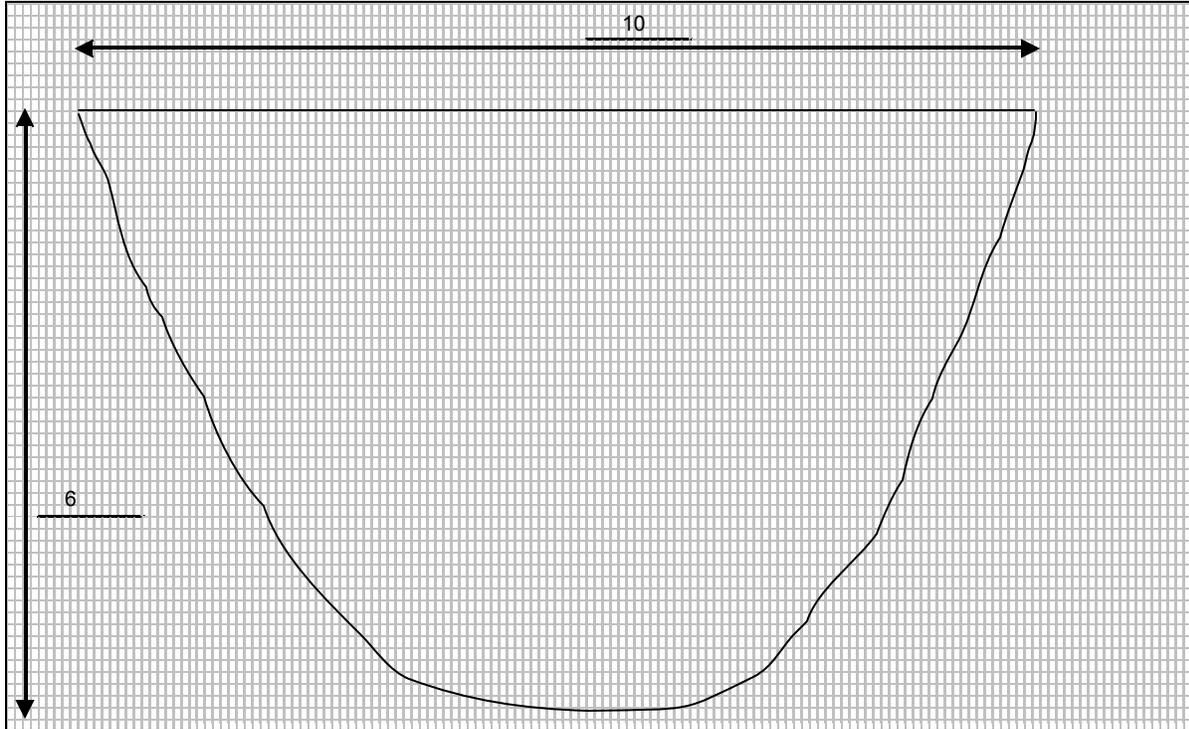
WE01	WE17A
WE02A	WE17B
WE02B	WE17C
WE03B	WE17D
WE04A	WE17E
WE04B	WE17F
WE05A	WE18A
WE05B	WE18B
WE06A	WE18C
WE06B	WE18D
WE07A	WE19A
WE07B	WE19B
WE08	WE19C
WE09	WE20A
WE10	WE20B
WE11	WE21A
WE12	WE21B
WE15	WE22
WE16	

ACRONYMS AND ABBREVIATIONS

bgs	Below ground surface
ERRG	Engineering Remediation Resources Group
GT	Gas Tech
HSP	Hunters Point Shipyard
IR	Installation Restoration
LEL	Lower explosive limit
MS/MSD	Matrix spike/matrix spike duplicate
OVA	Organic vapor analyzer
ppm	Parts per million
PVC	Polyvinyl chloride
TPH-e	Total petroleum hydrocarbons as extractables
UCSF	University of California, San Francisco
VOC	Volatile organic compound

TEST PIT LOG WE01

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/21/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/21/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 10
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 6
Type of Equipment:	CAT 320B	Depth to Water (feet): 6



Soil Description:

- 0-1 feet Clay, brownish; 1.1 VOCs, 60 ppm methane
- 1-2 feet Bluish gray soil; trash; 140 ppm at soil pile; 6.9 VOCs
- 3-4 feet Bluish gray, some greenish color, hit water at 6 feet; 880 ppm

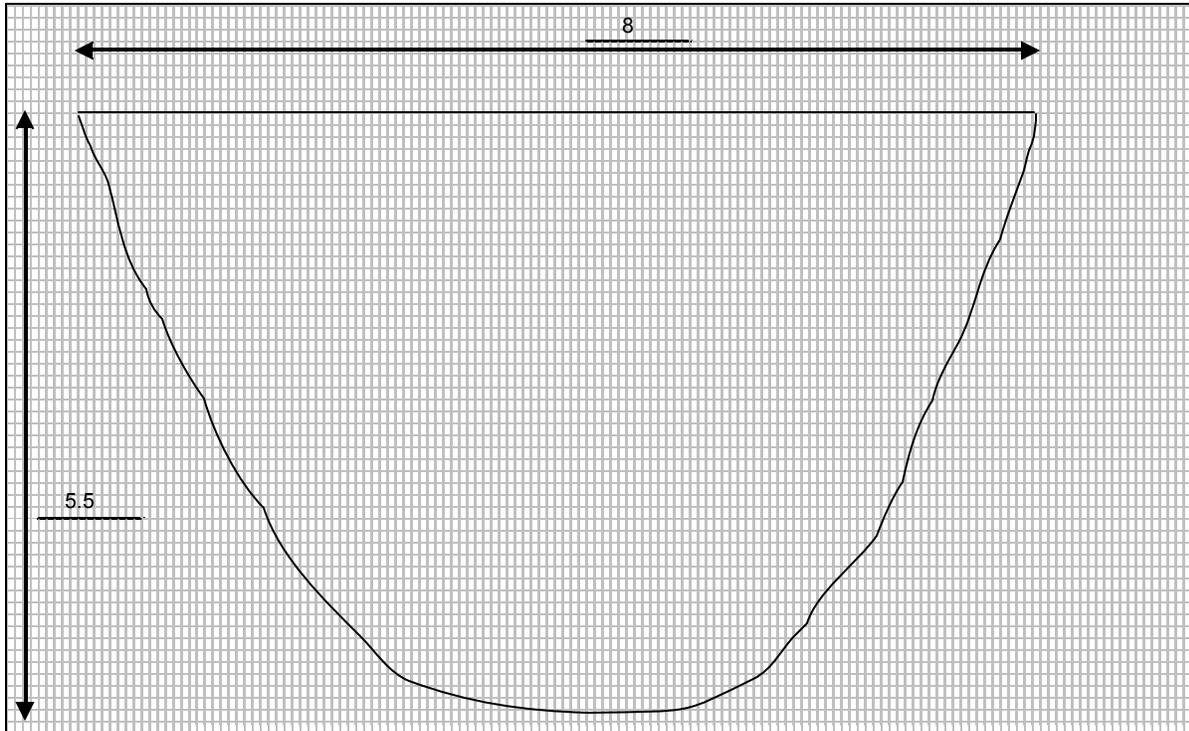
Notes:

Photograph: looking north at 4 feet.

Samples: W26W001 (4 feet), additional jar for TPH-e, and W26W002, MS/MSD.

TEST PIT LOG WE02A

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/21/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/21/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 8
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 5.5
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

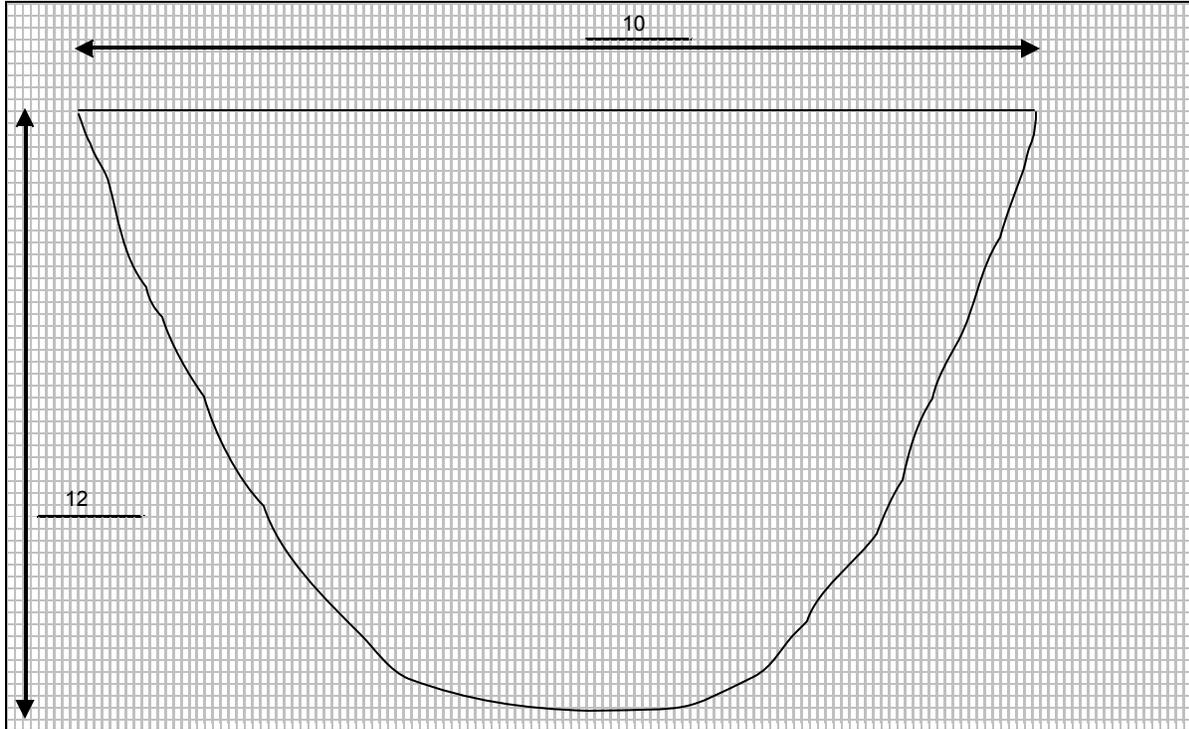
- 0-1 feet Brown silty clay; clear earthy odor
- 2-3 feet Grayish color; 3 feet - 50 percent debris, black staining, gravel, rubber, wood; 4,300 ppm, 7 percent LEL, 60 ppm methane ambient

Notes:

Photographs: two photographs taken looking south at waste.

TEST PIT LOG WE02B

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/21/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/21/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 10
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 12
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

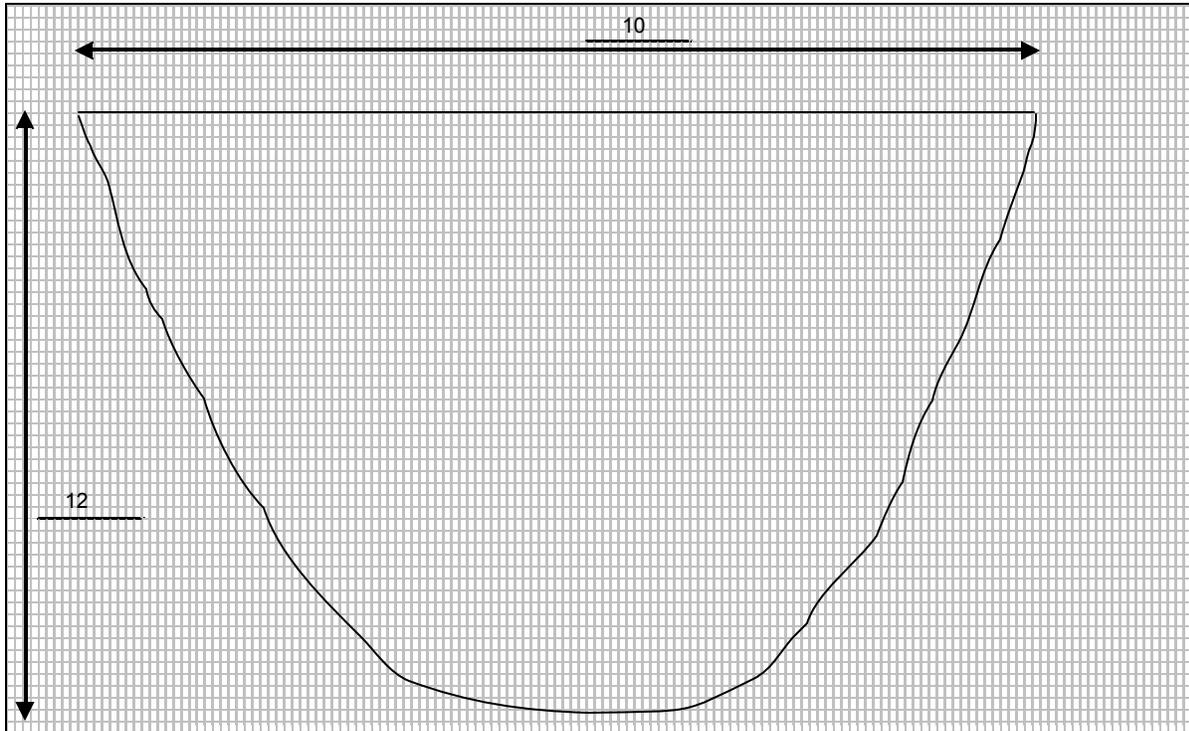
- 0-1 feet Silty clay backfill topsoil; reddish brown
- 1-2 feet Gravel backfill; 10 percent trash; 160 ppm
- 2-3 feet Light gray sand; 40 percent gravel backfill; 400 ppm; 3 feet - purplish stain, stain looks like chemical dye; visible methane escaping; 360 ppm; large rock against fence at about 3 to 4 feet
- 4 feet 2,800 ppm; more visible off-gassing or dust from concrete; 8 percent LEL at north side pit opening
- 6-8 feet Bluish gray greenish color; 2.3 VOCs; 4 percent LEL ambient soil
- 10-12 feet Bluish gray color, 40 to 50 percent gravel, sweet odor, not petroleum, not methane; 5 percent LEL

Notes:

Photograph: one photograph looking north.
 Samples: W25W001B (4 feet) collected at 0855, additional jar for TPH-e, and W25W002B (12 feet) collected at 0910, additional jar for TPH-e.
 Test pit located right along fence. Liquid seeping off western side of trench at 2 to 3 feet. No odor, no VOCs found at point of seepage.

TEST PIT LOG WE03B

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/21/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/21/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 10
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 12
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

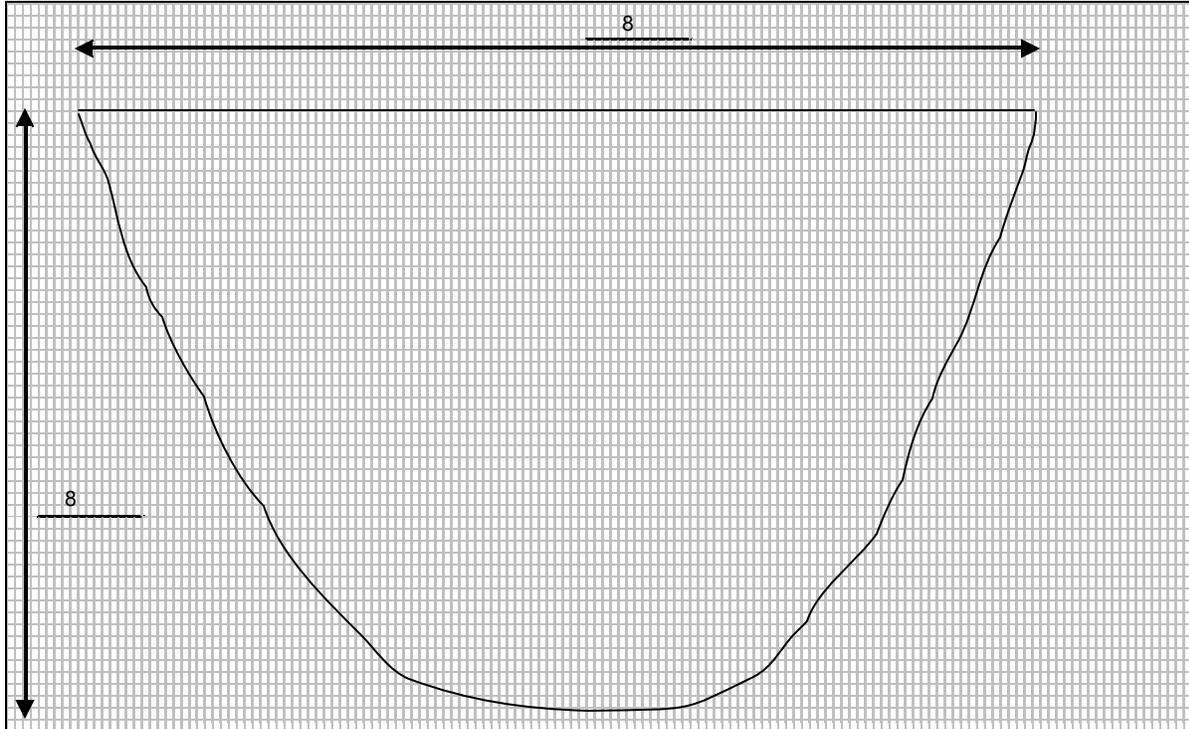
- 0-2 feet Silty clay backfill topsoil; organic roots, brownish gray color; 2 feet - gravel backfill, hard gravel, 10 percent debris, bluish gray tint
- 3 feet 1,500 ppm, 1 percent LEL
- 4 feet Wood debris; large asphalt concrete; 600 ppm, 1 percent LEL
- 4-6 feet Blue tinted sand with 40 percent gravel; 1 percent LEL
- 8 feet 3 percent LEL at soil; 2.2 VOCs on pile; 700 ppm methane
- 10 feet 40 percent gravel, 5 percent debris, light bluish gray color
- 10-12 feet 10 percent debris, 40 percent gravel; 3 percent LEL

Notes:

Photographs: North at 4 feet, north at 10 to 12 feet, and two photographs south at 10 to 12 feet.
 Samples: W24W001 (4 feet) at 0800, and W24W002 (12 feet) at 0810, additional jar for TPH-e. Debris stops 4 feet from the fence.

TEST PIT LOG WE04A

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/20/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/20/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 8
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 8
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

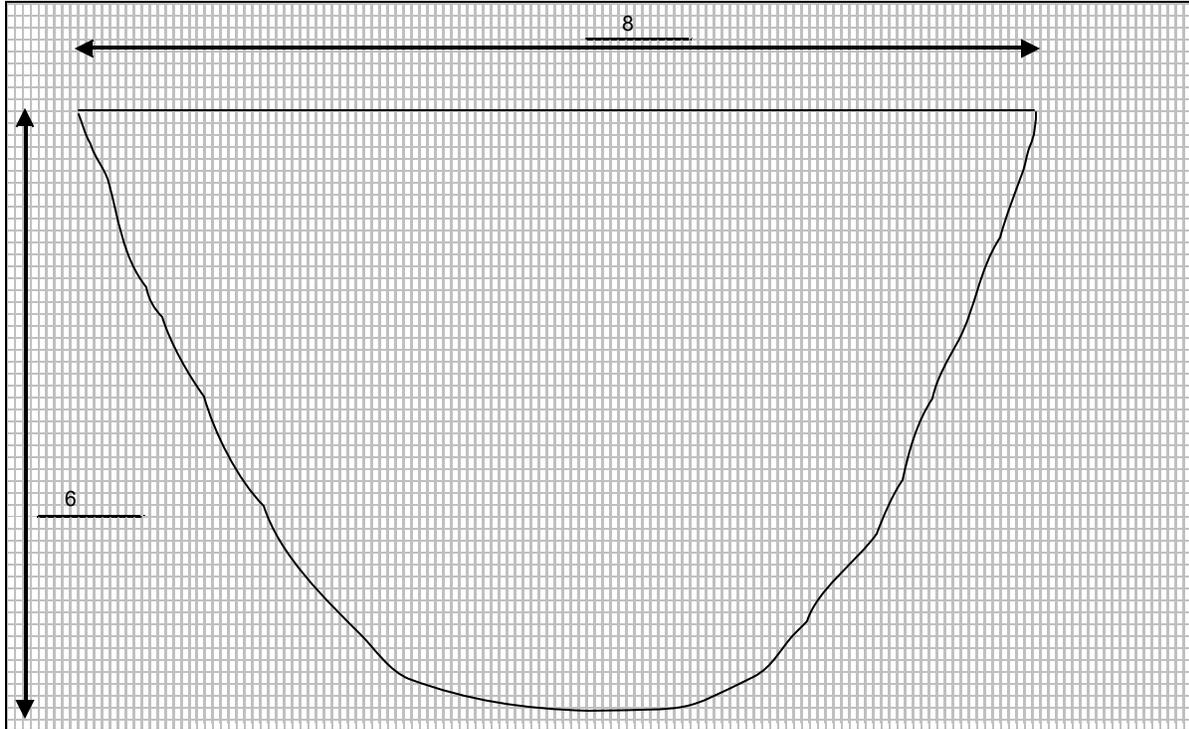
- 0-2 feet Clay backfill
- 3-4 feet Stained soil backfill, some glass, about 30 percent gravel, methane odor, 80 ppm
- 4 feet Debris backfill; 100 ppm methane, 0 ppm VOCs
- 5 feet Wood waste, paper, concrete, rubble
- 6-8 feet Trash - cans, bottles, paper, wood, sandpaper

Notes:

No samples collected.

TEST PIT LOG WE04B

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/20/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/20/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 8
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 6
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

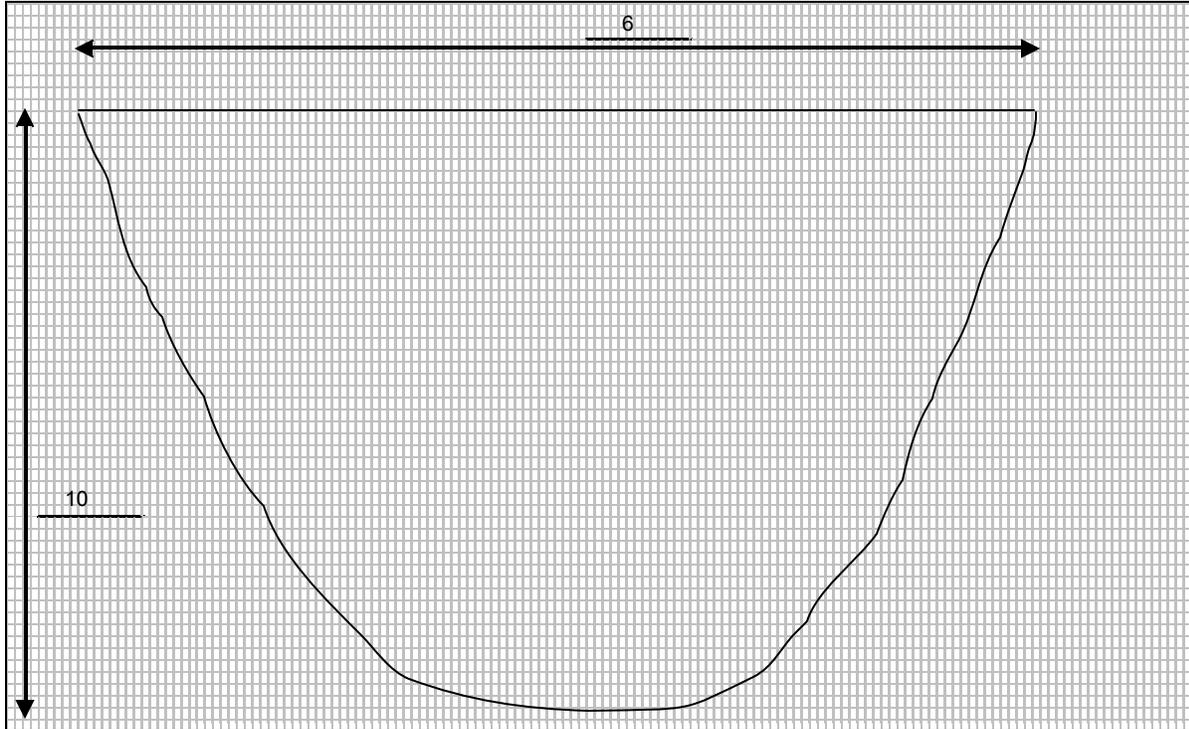
- 0-2 feet Clay backfill; below 2 feet - gravel, wood, paper, and metal debris; about 80 percent in front half of test pit; most debris stops about 4 feet from fence; 180 ppm methane, 0 ppm VOCs
- 4 feet Bluish gray color, about 80 to 90 percent debris; 2 feet from fence line debris is about 3 feet deep

Notes:

Sample: W23W001 (4 feet).

TEST PIT LOG WE05A

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/20/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/20/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 6
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 10
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

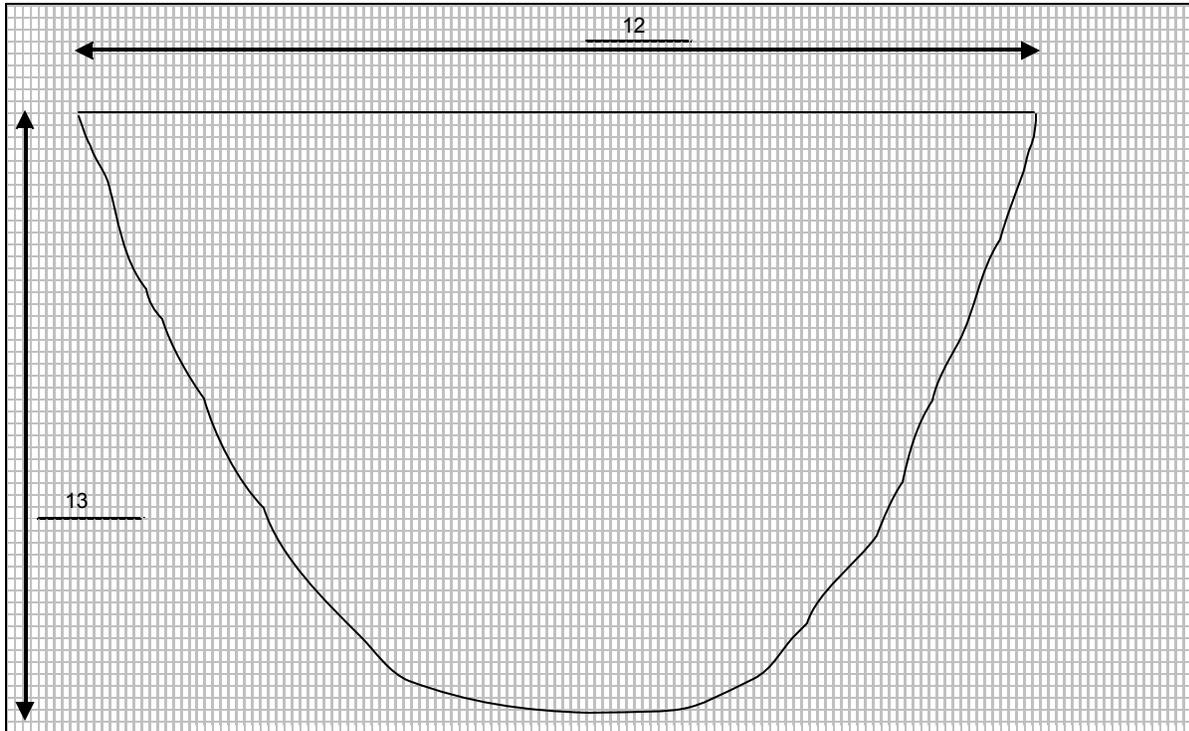
- 2 feet Wood debris; silty clay
- 3 feet 200 ppm, methane odor; below 4 feet debris, metal; 300 ppm methane - stained soils
- 5 feet 70 percent debris, gravel, weed, metal; 340 ppm methane, 4.3 ppm VOCs
- 6 feet Dark staining; paper and wood debris
- 8 feet 100 percent trash, strong odor, paper, metal, wood, gravel; 700 ppm methane, 4.4 ppm VOCs in pile; 6 to 9 percent LEL at mouth of pit; large concrete slab encountered at 9 feet

Notes:

UCSF compound present beyond fence.

TEST PIT LOG WE05B

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/20/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/20/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 12
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 13
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

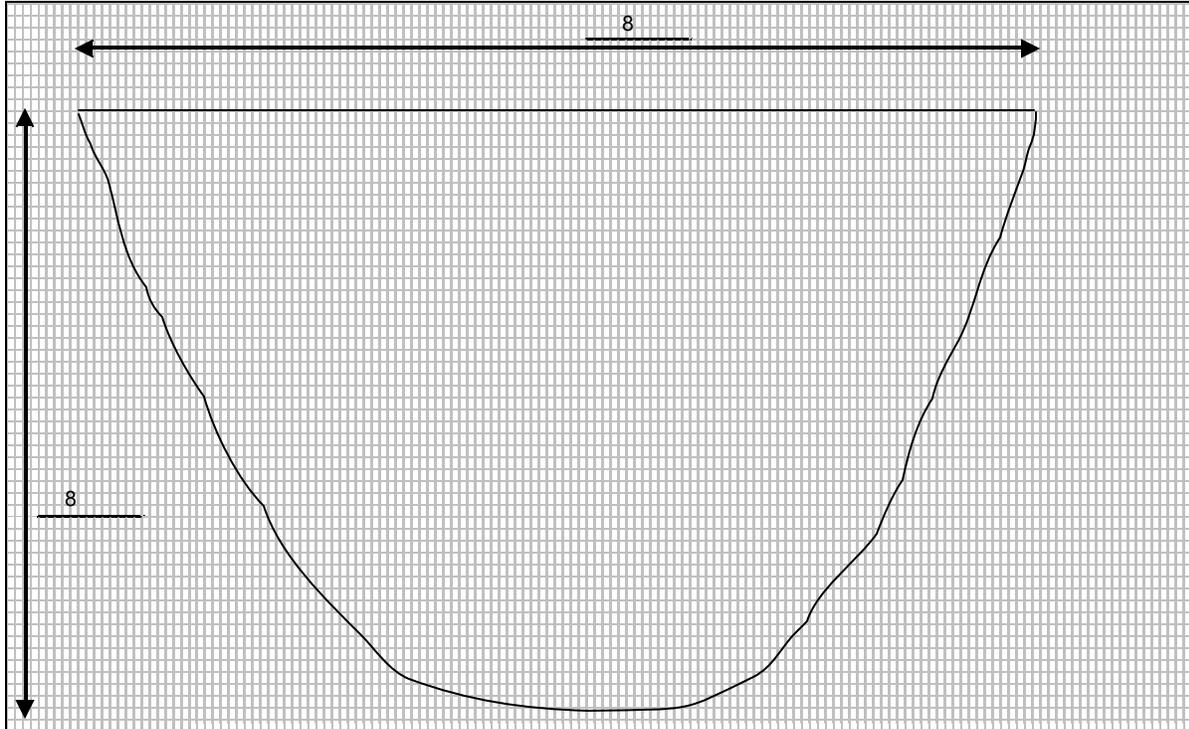
2 feet	Wood debris
2-3 feet	Silty clay with black staining; wood debris encountered between 2 to 3 feet
3-4 feet	60 ppm, 0.07 ppm VOCs
4-6 feet	500 ppm methane, 1.1 ppm VOCs
6 feet	1 percent LEL, 900 ppm methane
8-10 feet	160 ppm methane
13 feet	Sandy soil, 50 percent gravel, 10 percent debris; 100 ppm methane, 2.2 ppm VOCs, opening of pit, debris zone stops about 14 feet from fence except for minor concrete debris

Notes:

Samples: W20W001 (4 feet) and W20W002 (13 feet).

TEST PIT LOG WE06A

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/20/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/20/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 8
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 8
Type of Equipment:	CAT 320B	Depth to Water (feet): 5



Soil Description:

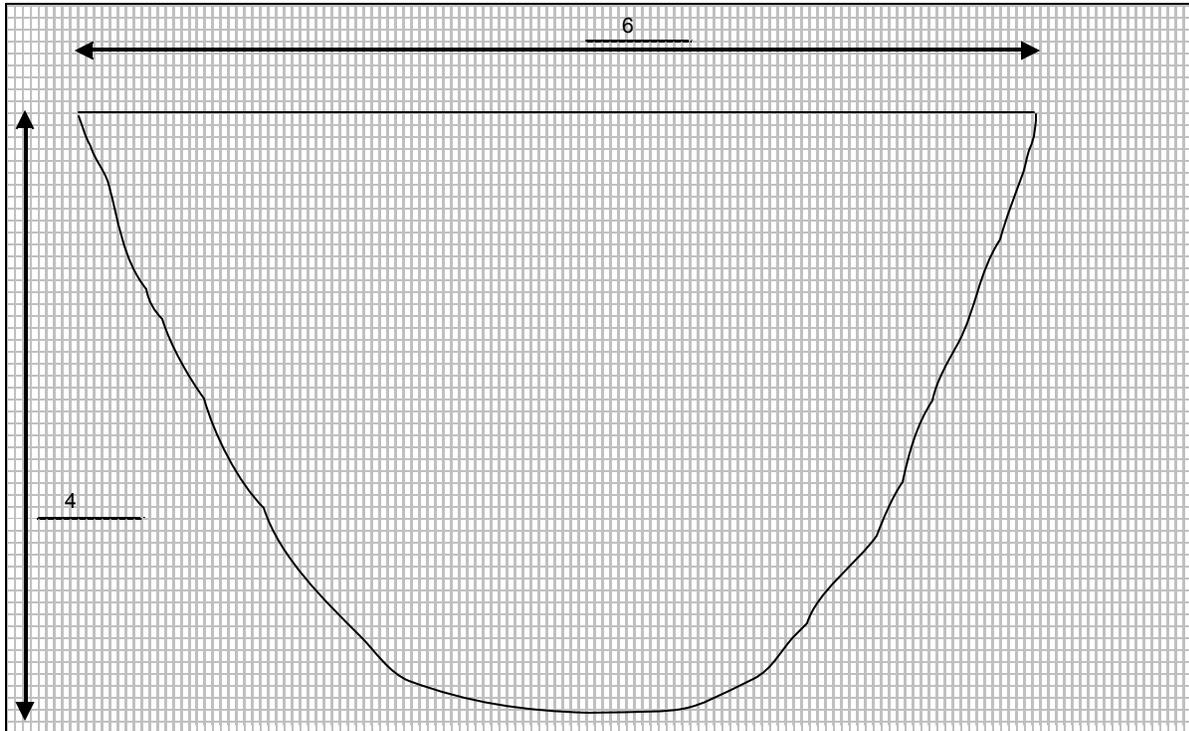
- 2-3 feet Silty clay; strong methane odor; 40 ppm; 300 ppm at 3 feet
- 4 feet Wood, gravel debris, 30 percent gravel fill; 1,200 ppm methane, 2 percent LEL
- 6 feet Staining of clay; 460 ppm methane
- 8 feet Clay, gravel fill

Notes:

Samples: W22W001 (4 feet) and W22W002 (8 feet).

TEST PIT LOG WE06B

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/21/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/21/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 6
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 4
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

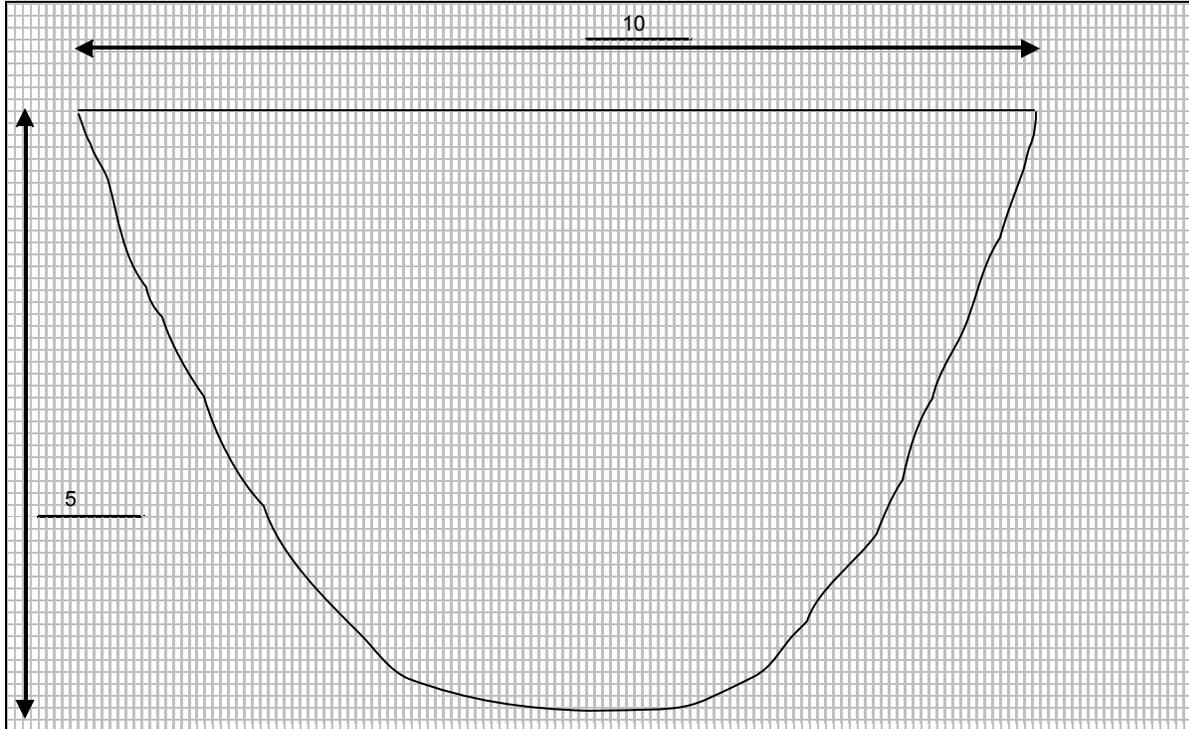
- 0-1 feet Reddish brown gravel backfill, about 30 percent trash
- 2-3 feet Reddish brown; 30 percent trash, at 3 feet water seepage, 100 ppm; 0 ppm VOCs, 0 ppm VOCs ambient
- 4 feet Refusal

Notes:

Sample: W30W001 (4 feet) at 1510.

TEST PIT LOG WE07A

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/20/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/20/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 10
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 5
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

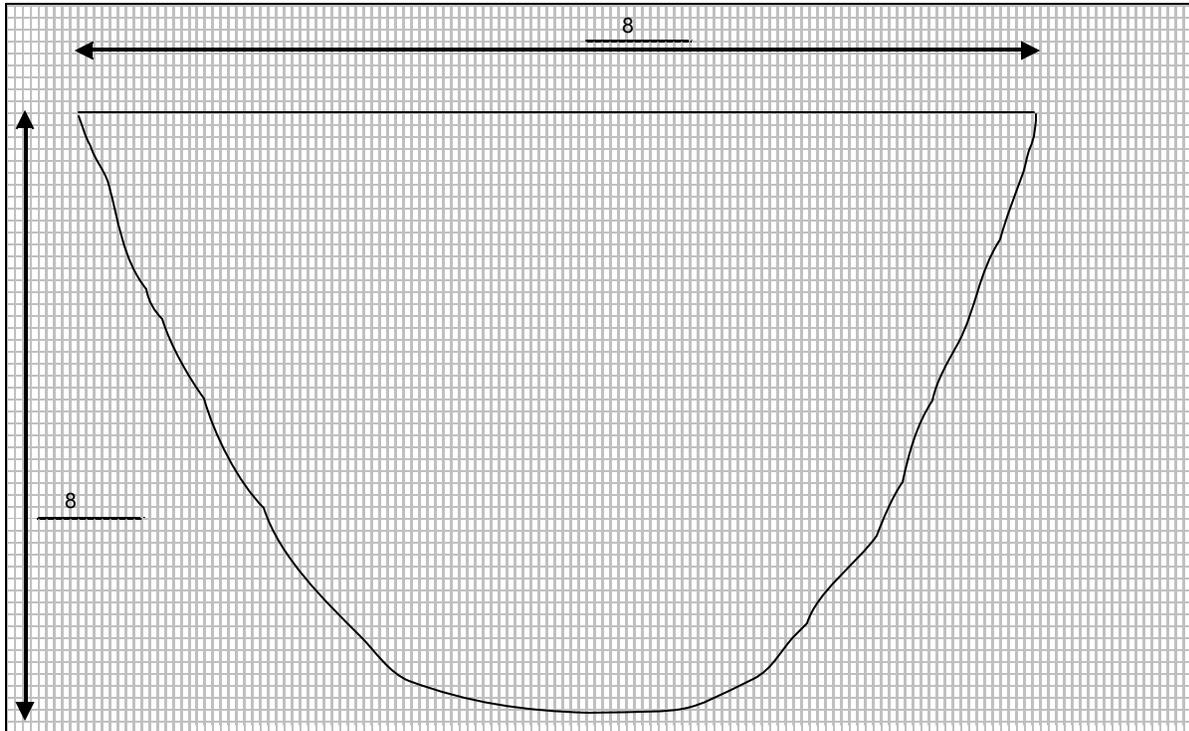
- 0-2 feet 40 ppm methane, 0 ppm VOCs
- 4 feet Brown silty clay turns into concrete, rubble, and black-stained soil; 1.2 ppm VOCs, 60 ppm methane
- 4-6 feet 50 percent wood debris, concrete rubble; 220 ppm, 4.0 to 6.5 ppm VOCs; hit trash at 6 feet - 12 to 20 percent LEL at mouth of test pit; 0 ppm, 0 percent LEL in ambient; 1.1 ppm VOCs; strong methane odor

Notes:

No sample, no recovery.

TEST PIT LOG WE07B

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/20/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/20/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 8
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 8
Type of Equipment:	CAT 320B	Depth to Water (feet): 4



Soil Description:

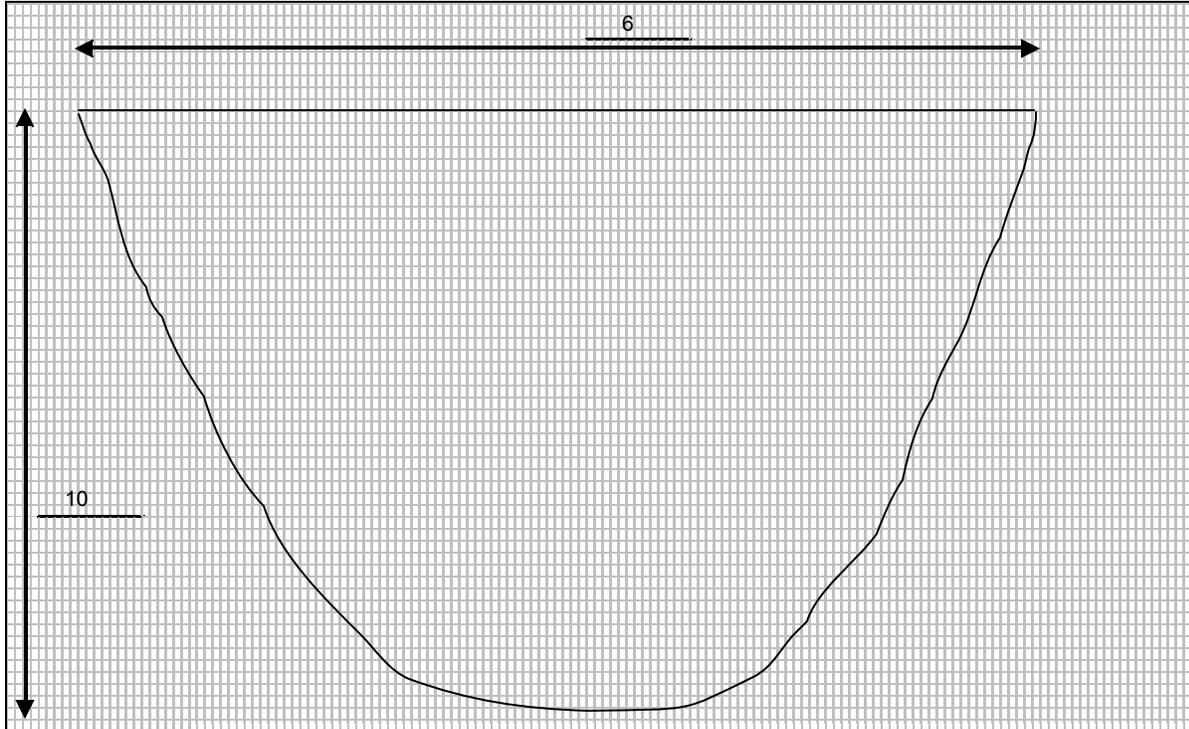
- 0-3 feet Silty clay, 30 percent wood and metal debris; 100 ppm at 3 feet
- 5 feet More wood debris; 400 ppm
- 8 feet Bluish-stained soils

Notes:

Samples: W21W001 (8 feet) collected at 1325, and W21W002 (4 feet) collected at 1330. Debris ends before the north end of the pit.

TEST PIT LOG WE08

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/13/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/13/2002
Geologist/Engineer:	ANTHONY TALMANTEZ	Length (feet): 6
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 10
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

4 feet Gas readings 0 ppm, 0 percent LEL in ambient, soil pile, and at mouth of pit; northern end has 20 percent concrete rubble in soil; southern end has brick, paper, concrete rubble (2 to 4 feet); below 4 feet, soil was stained with petroleum odor but had no debris

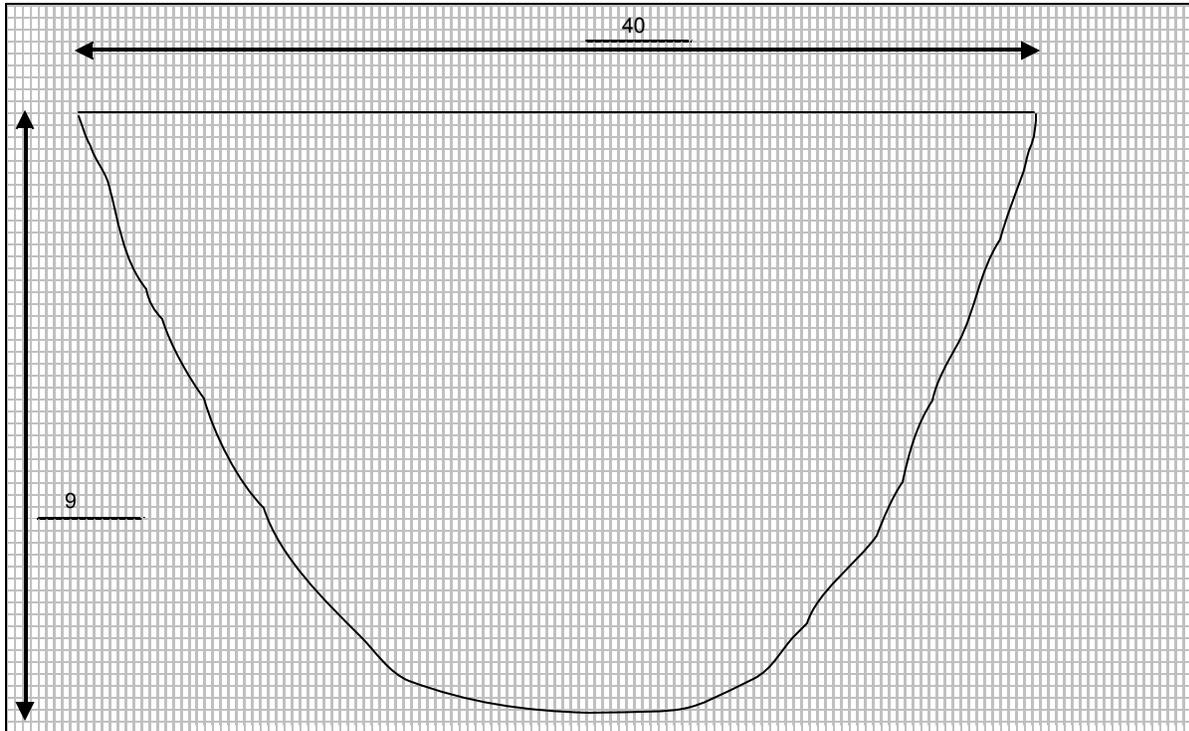
Notes:

Photographs: pit, soil pile, and backfill.

Sample: W03W001 (4 feet).

TEST PIT LOG WE09

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/13/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/13/2002
Geologist/Engineer:	ANTHONY TALAMANTEZ	Length (feet): 40
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 9
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

0-9 feet Trench 40 feet long; north end has bricks; middle section and southern has 50 percent concrete rubble; silty sand fill material; slight petroleum odor; 0 ppm, 0 percent LEL in hole and soils pile

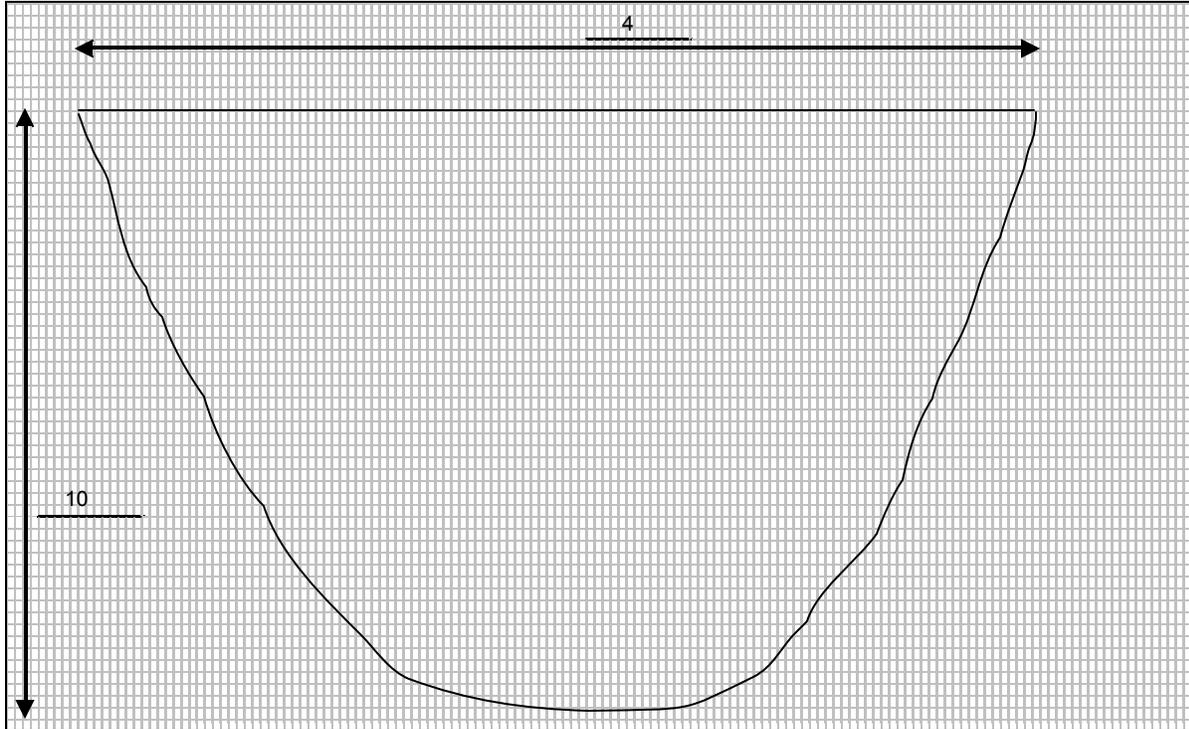
Notes:

Photographs: soil pile and backfill.

Samples: W02W001 (4 feet), and W02W002 (9 feet), collected next to landfill, southern end of trench.

TEST PIT LOG WE10

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/13/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/13/2002
Geologist/Engineer:	ANTHONY TALAMANTEZ	Length (feet): 4
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 10
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

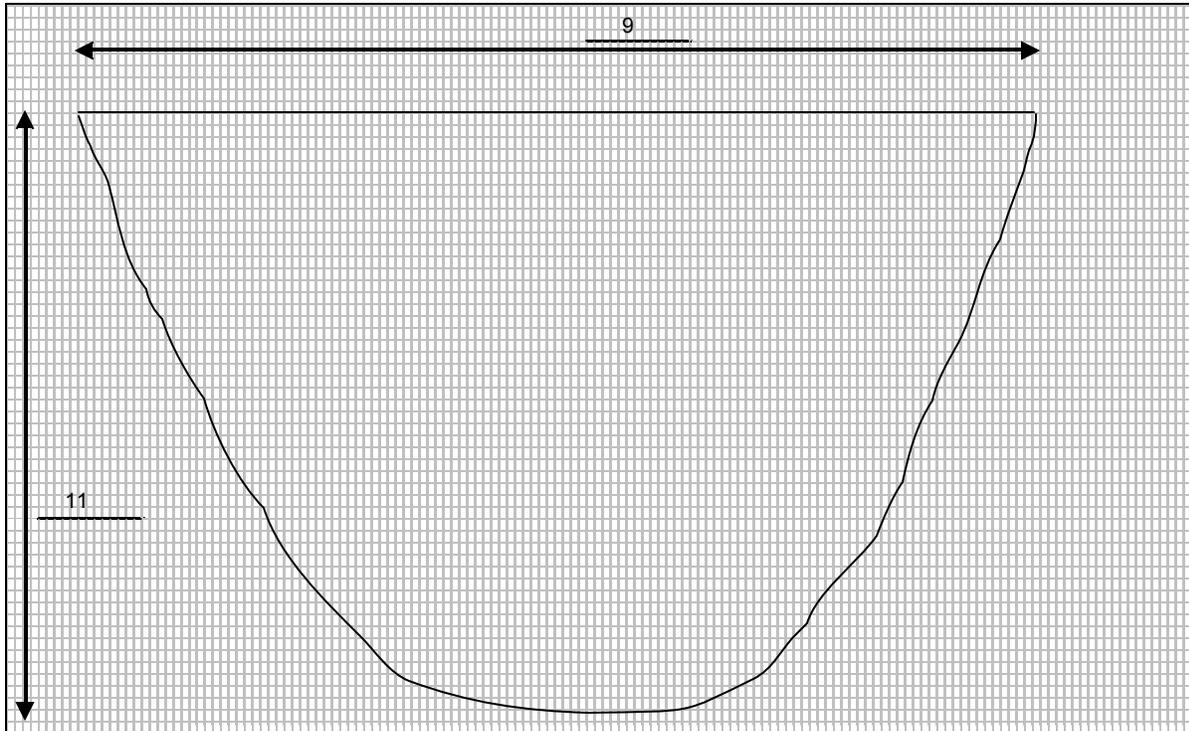
0-1 foot	Flat concrete slab
1-10 feet	Silty sand; some petroleum odor

Notes:

Photographs: concrete slab and sign of test pit.
Samples: W01W001 (4 feet) and W01W002 (10 feet).

TEST PIT LOG WE11

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/13/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/13/2002
Geologist/Engineer:	ANTHONY TALMANTEZ	Length (feet): 9
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 11
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

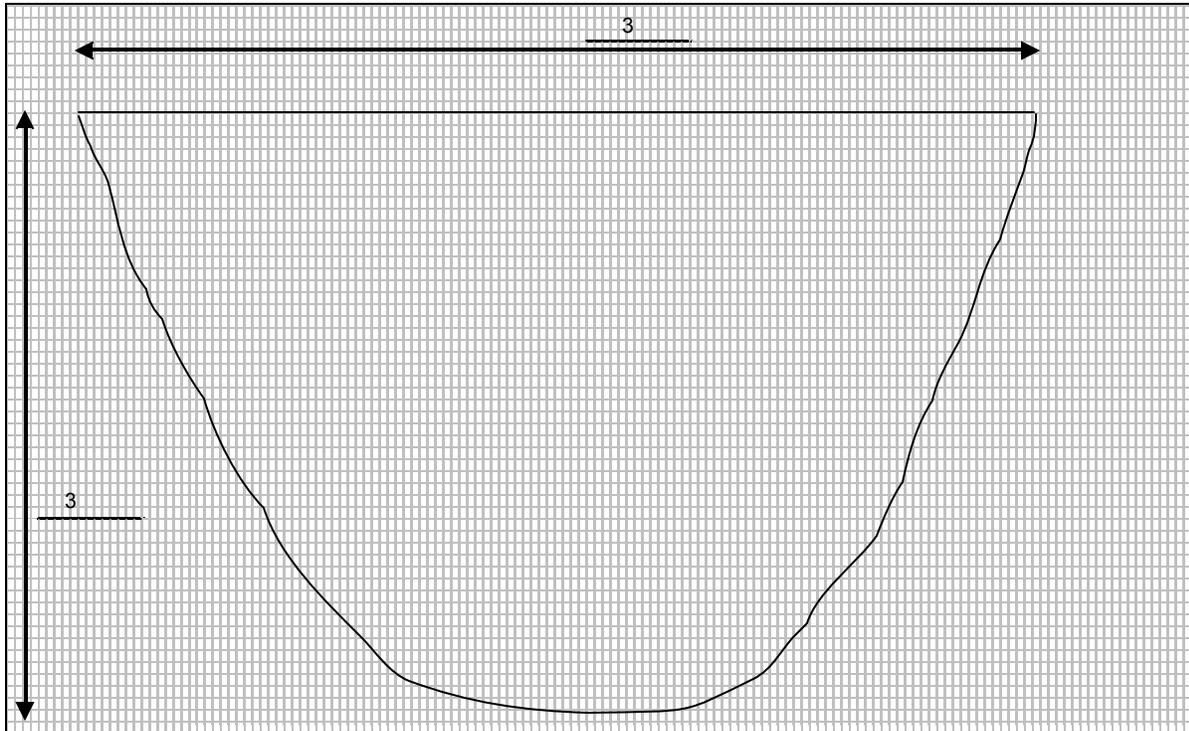
- 1 foot Fill material
- 1-3 feet Sandy silt (brown); clean fill
- 3-5 feet Dirt with concrete rubble (average 2 feet in diameter)
- 9 feet Wood and paper debris (about 10 percent of fill); 11 feet bgs final depth; OVA and GT readings: 0 ppm in ambient air, soil pile, and at mouth of hole

Notes:

Photographs: soil, pile, and backfill.

TEST PIT LOG WE12

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/22/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/22/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 3
Excavation Company:	ERRG	Width (feet): 6
Method:		Depth (feet): 3
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

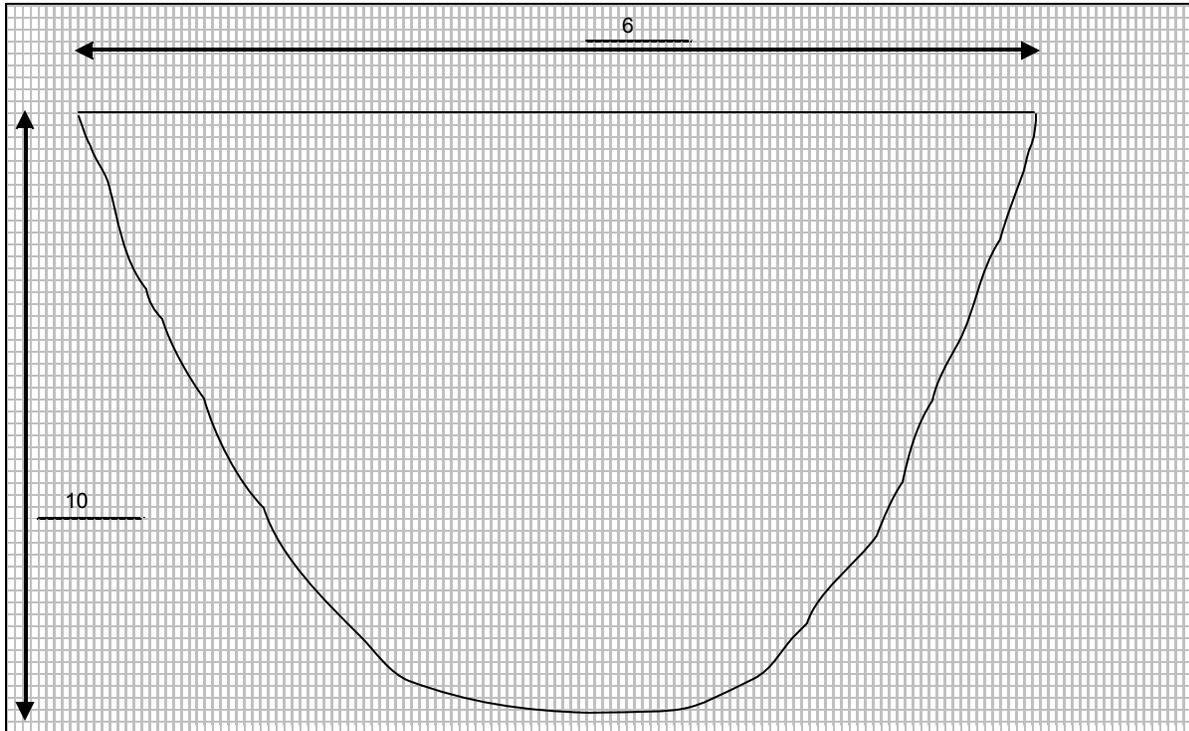
- 0-1 feet Light brown sand, backfill; 10 percent wood debris, 40 percent gravel; 160 ppm
- 1-2 feet More sand, wood debris; 60 percent debris at 2 feet
- 2-3 feet 3,800 ppm, 7 percent LEL, 1.6 ppm VOCs; at mouth of pit: 10 percent LEL, 1.8 ppm VOCs

Notes:

Photographs: pit 2.5 to 3 feet looking east.

TEST PIT LOG WE15

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/14/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/14/2002
Geologist/Engineer:	ANTHONY TALAMANTEZ	Length (feet): 6
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 10
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

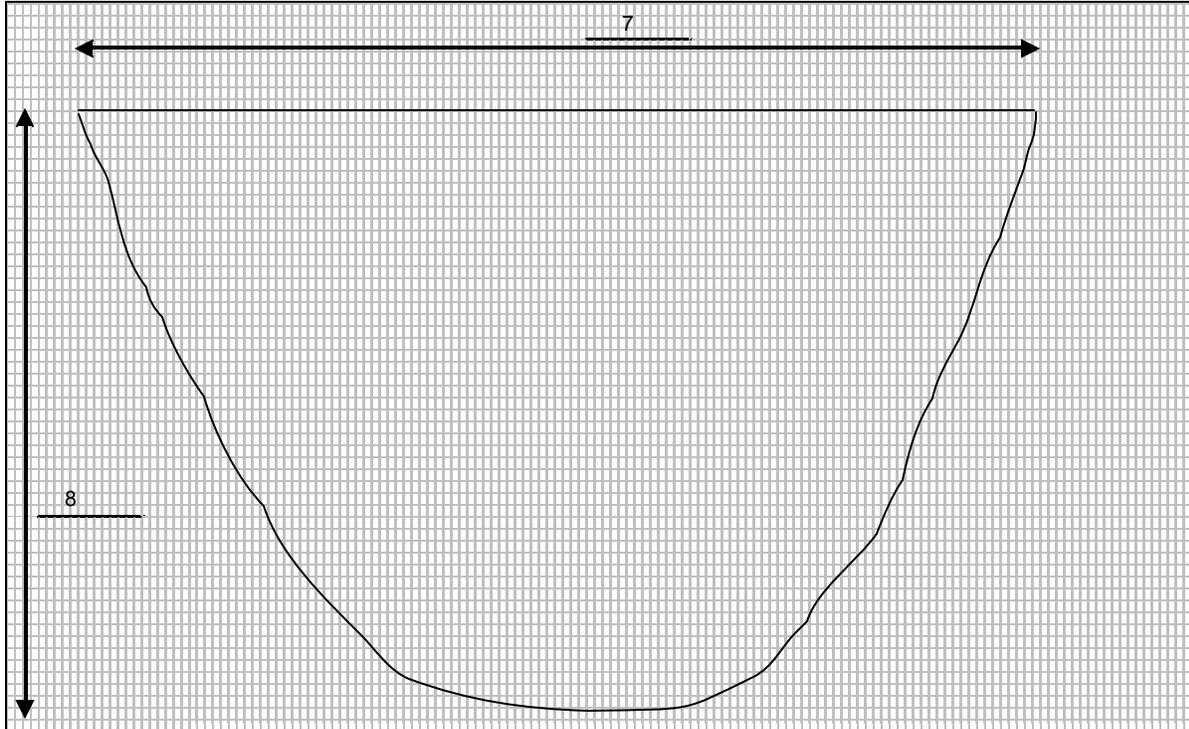
0-10 feet Dark decaying organic matter, saturated clayey sands; no debris; no detections:
hydrogen sulfide, chlorine; heavy saturated soil

Notes:

Samples: W05W001 (4 feet) and W05W002 (10 feet).

TEST PIT LOG WE16

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/14/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/14/2002
Geologist/Engineer:	ANTHONY TALAMANTEZ	Length (feet): 7
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 8
Type of Equipment:	CAT 320B	Depth to Water (feet): 7



Soil Description:

0-8 feet Soil with some concrete blocks; no gas detected (organics or chlorine); no petroleum staining or odor

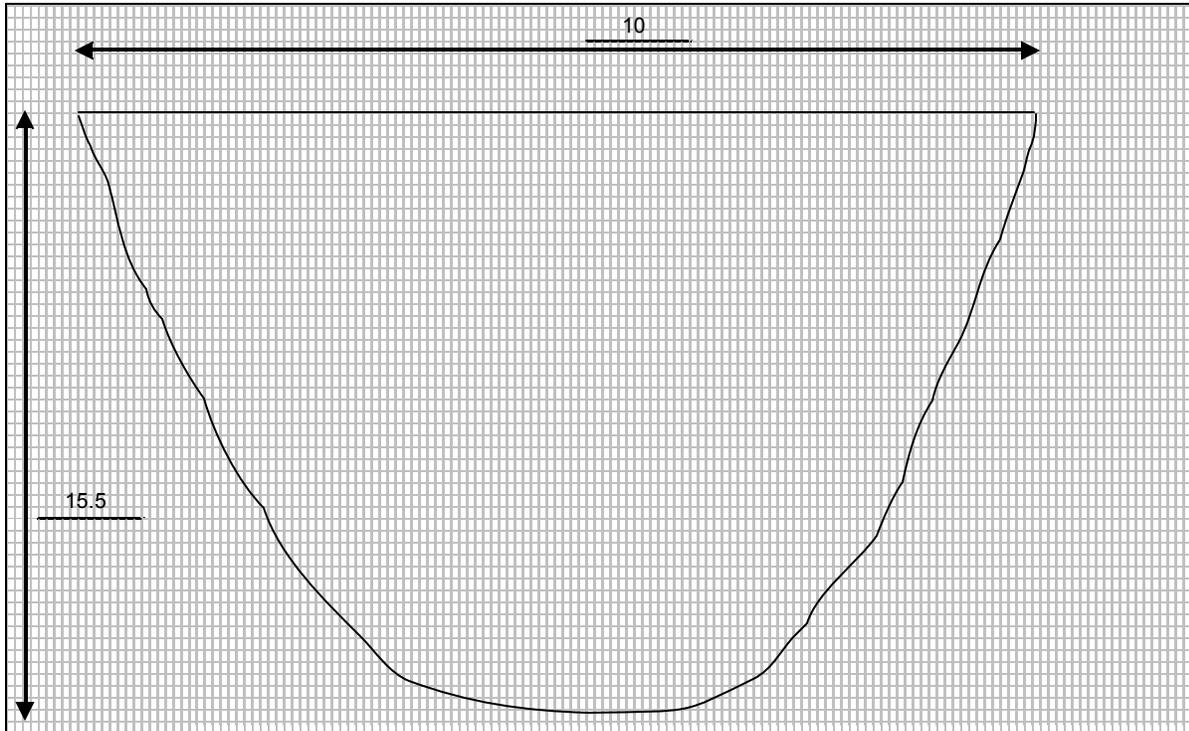
Notes:

Photographs: test pit, profile.

Samples: W04W001 (4 feet) and W04W002 (8 feet).

TEST PIT LOG WE17A

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/19/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/19/2002
Geologist/Engineer:	ANTHONY TALAMANTEZ	Length (feet): 10
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 15.5
Type of Equipment:	CAT 320B	Depth to Water (feet): 15.5



Soil Description:

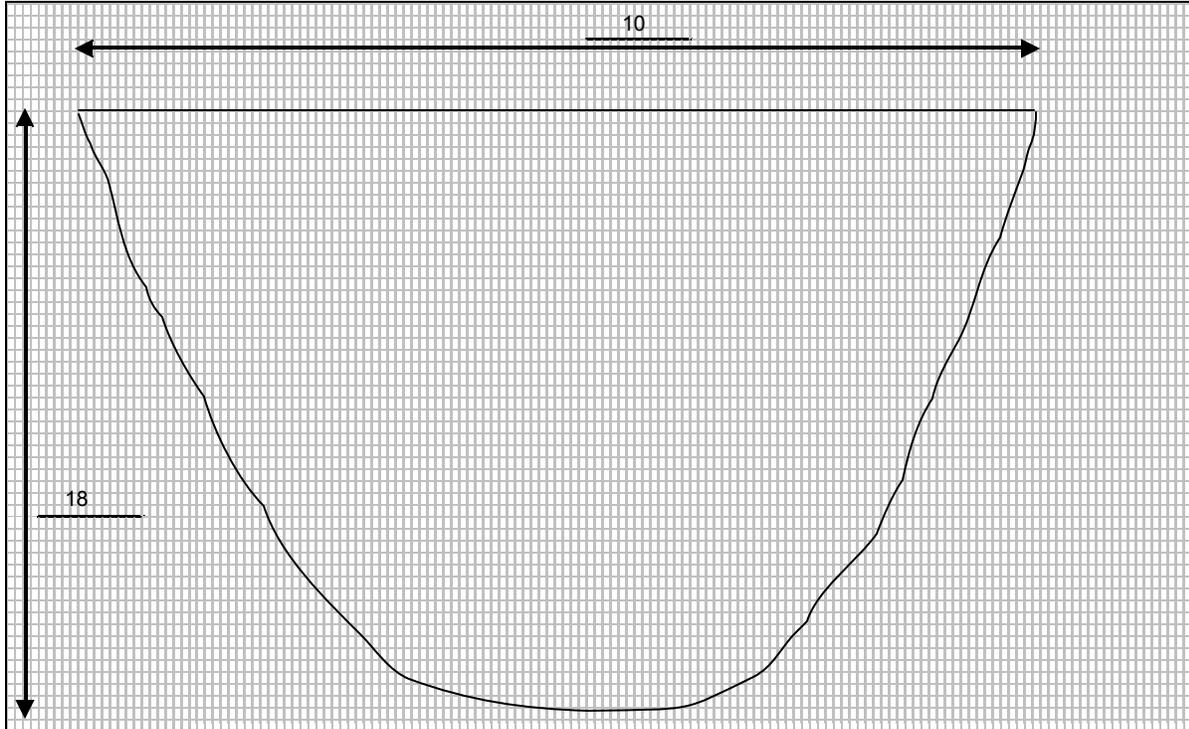
- 12 feet Reddish brown silty clay; organic odor below 12 feet
- 15 feet Encountered water table at 15.5 feet; hit what seems to be concrete and/or asphalt; refusal at 17 feet

Notes:

Sample: W06W001 (15.5 feet).

TEST PIT LOG WE17B

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/19/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/19/2002
Geologist/Engineer:	ANTHONY TALAMANTEZ	Length (feet): 10
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 18
Type of Equipment:	CAT 320B	Depth to Water (feet): 18



Soil Description:

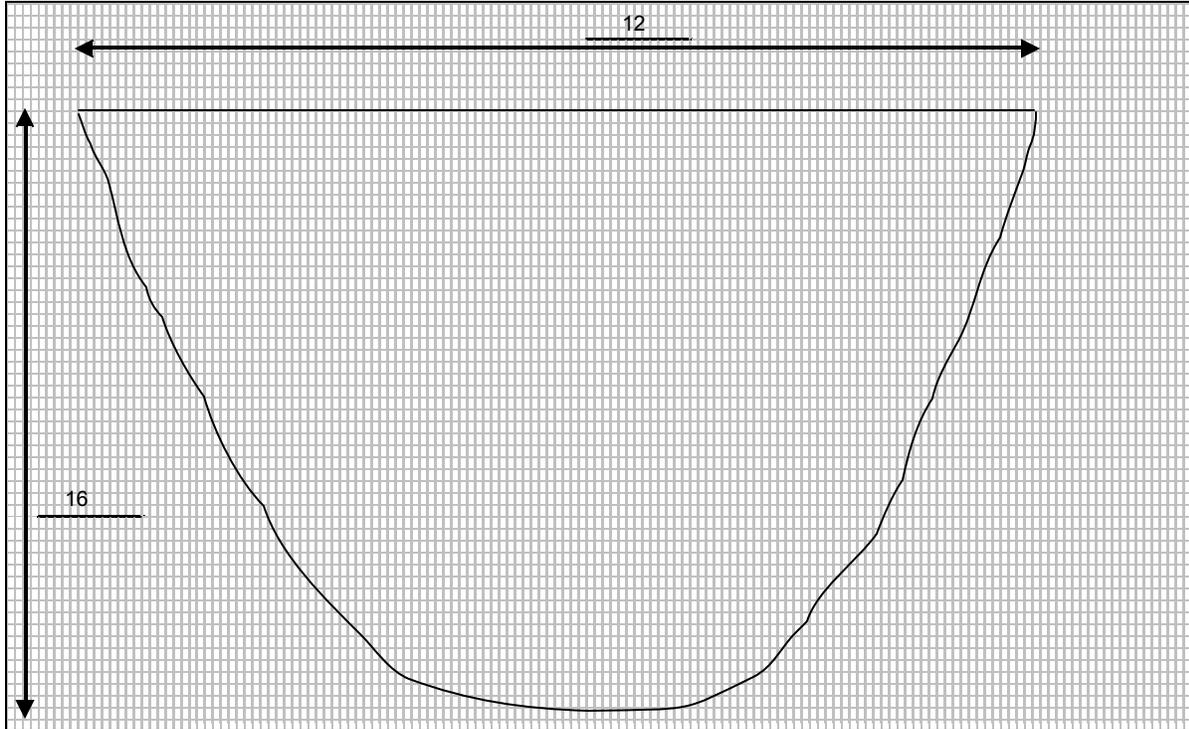
- 16 feet Petroleum staining and odor but no detections on meters; at 18 feet, 5 to 10 percent wood debris
- 4 feet Brick, gravel, and silty clay; large debris in clean fill
- 6-8 feet Small metal debris; wood debris at 8 feet

Notes:

Sample: W07W001 (4 feet) and W07W002 (18 feet).

TEST PIT LOG WE17C

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/19/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/19/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 12
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 16
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

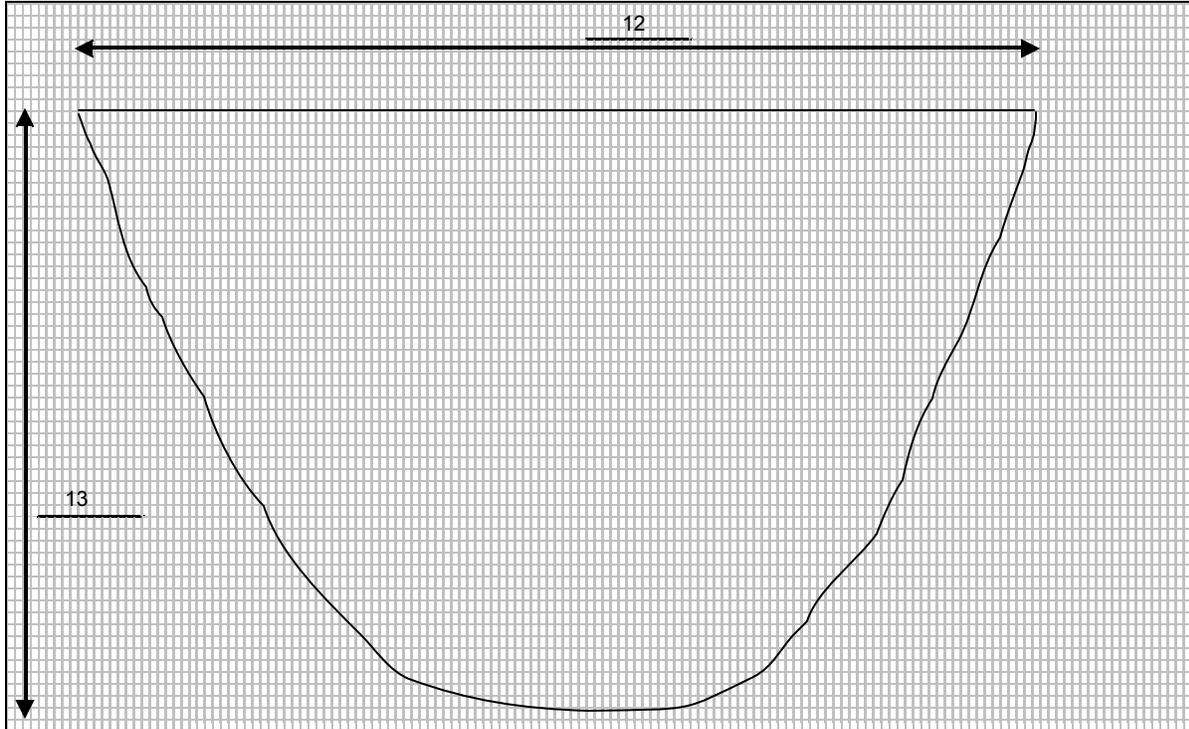
- 0-3 feet Large concrete debris in clean fill; 10 percent light gravel
- 14 feet Small pieces of metal scraps; slight petroleum odor
- 16 feet Stronger odor and stained soil; concrete boulders (about 1 foot in diameter) and wood debris at 14 to 16 feet

Notes:

Sample: W08W001 (4 feet).

TEST PIT LOG WE17D

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/19/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/19/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 12
Excavation Company:	ERRG	Width (feet): 3
Method:		Depth (feet): 13
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

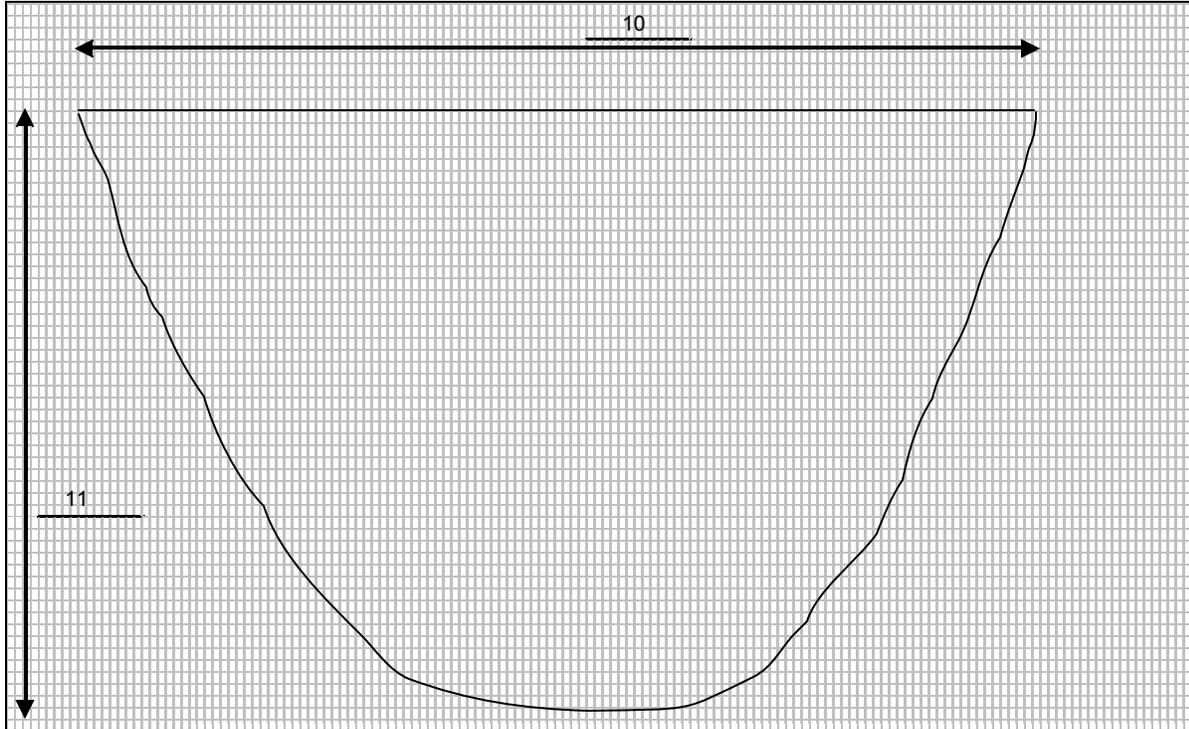
- 0-4 feet 30 percent gravel, increasing with depth; metal pipe 6 inches in diameter, 5 feet long; other miscellaneous metal debris; 3 feet PVC pipe
- 12 feet Staining
- 12.5 feet Concrete block
- 13 feet Refusal

Notes:

Sample: W09W001 (5 feet) and W09W002 (13 feet).

TEST PIT LOG WE17E

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/19/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/19/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 10
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 11
Type of Equipment:	CAT 320B	Depth to Water (feet): 10



Soil Description:

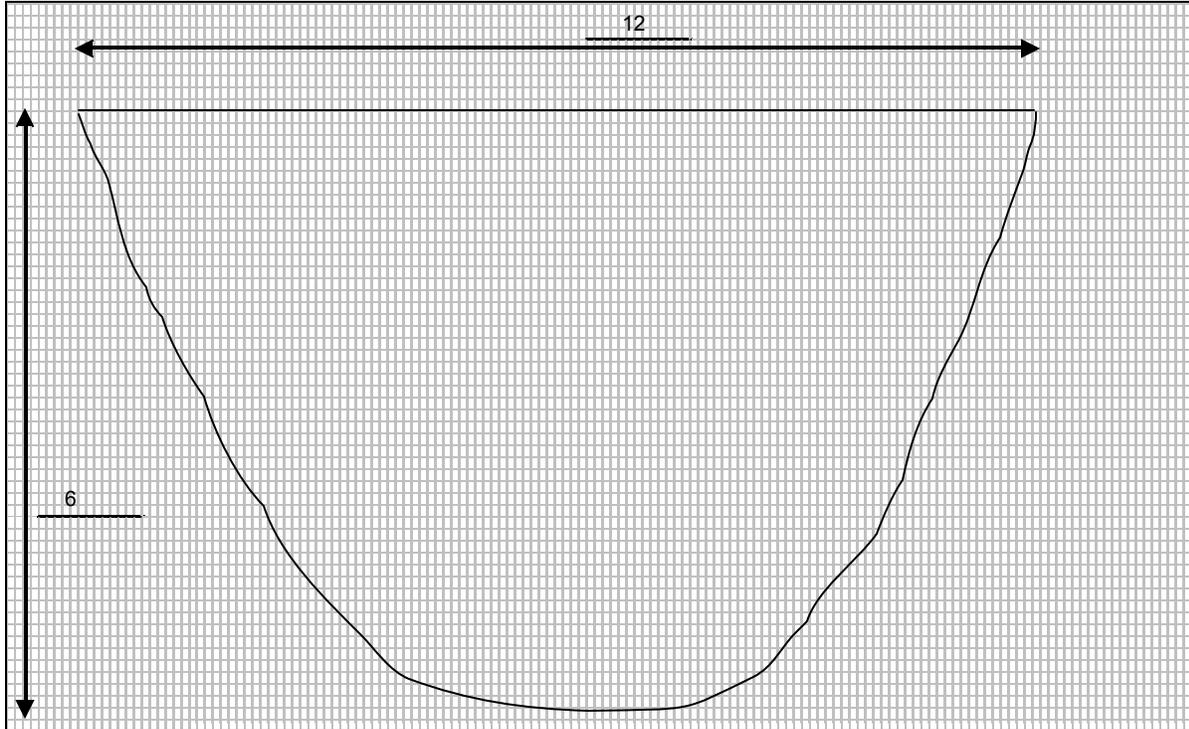
- 4-5 feet Large gravel fill; 10 percent small wood debris and asphalt (4 to 5 feet)
- 9 feet Large concrete blocks and saturated soils (no detections on meters); 30 percent metal debris
- 10 feet 50 percent wood debris and concrete blocks

Notes:

Samples: W10W001 (5 feet) and W10W002 (11 feet).

TEST PIT LOG WE17F

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/19/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/19/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 12
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 6
Type of Equipment:	CAT 320B	Depth to Water (feet): 6



Soil Description:

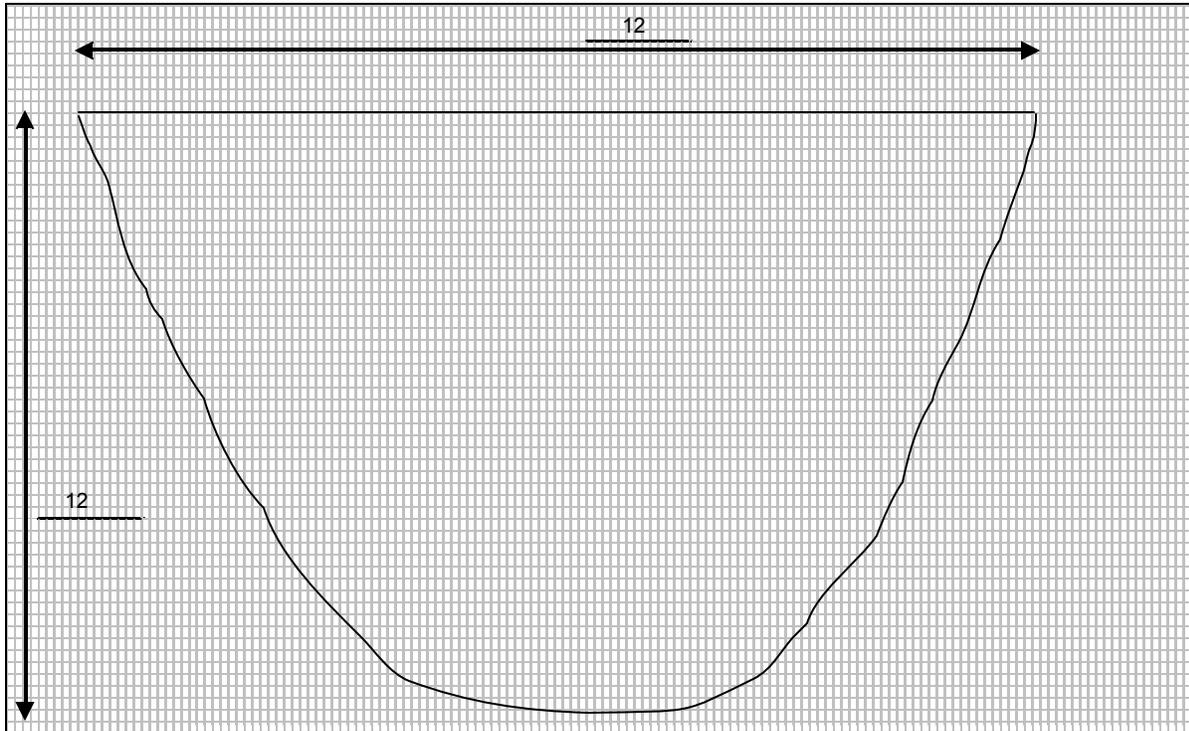
- 4 feet Large gravel fill; dark stained wet soils but no detections on meter, 60 to 70 percent gravel, large pieces of metal
- 6 feet Little brick and wood (less than 10 percent)

Notes:

Samples: W11W001 (4 feet).

TEST PIT LOG WE18A

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/19/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/19/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 12
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 12
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

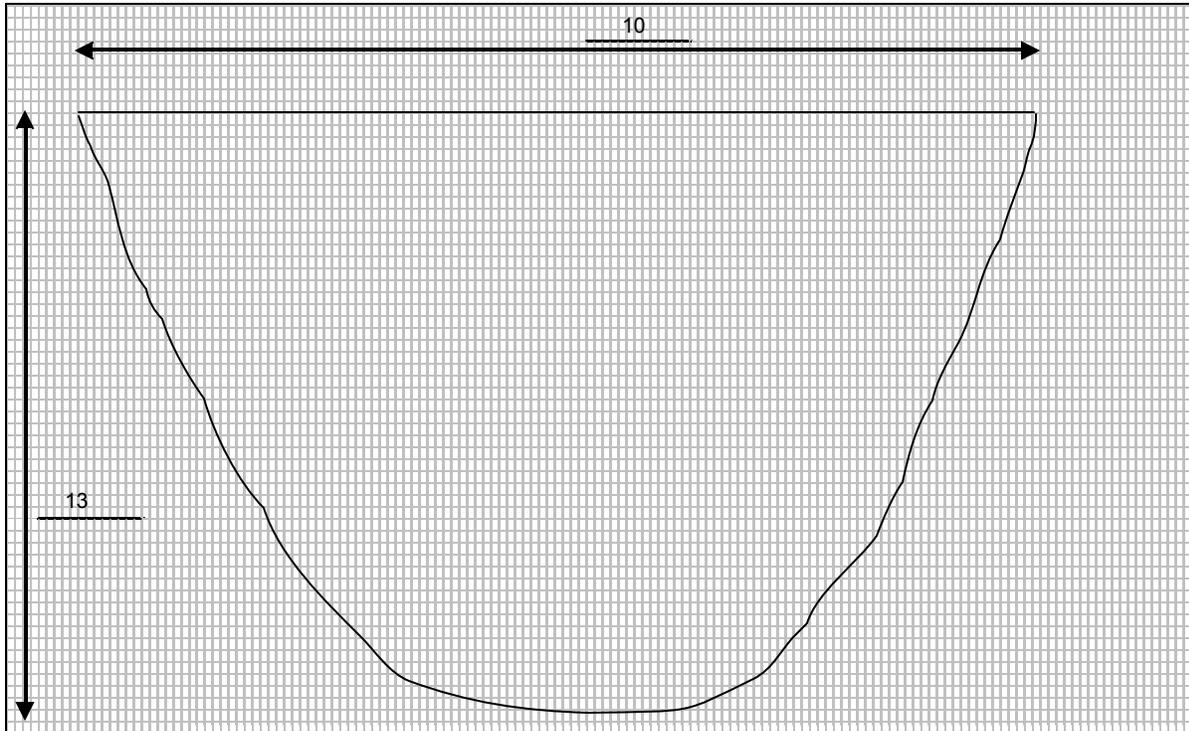
- 0-4 feet 5 percent brick debris, 40 ppm in soil pile; below 4 feet no brick debris; clayey sand
- 11 feet Black-stained soil; strong odor (not petroleum, more of a chemical smell)
- 12 feet 5 percent wood and metal debris (also plastic and rags), 20 percent gravel, remaining is black stained soil

Notes:

Sample: W12W001 (12 feet).

TEST PIT LOG WE18B

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/19/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/19/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 10
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 13
Type of Equipment:	CAT 320B	Depth to Water (feet): 13



Soil Description:

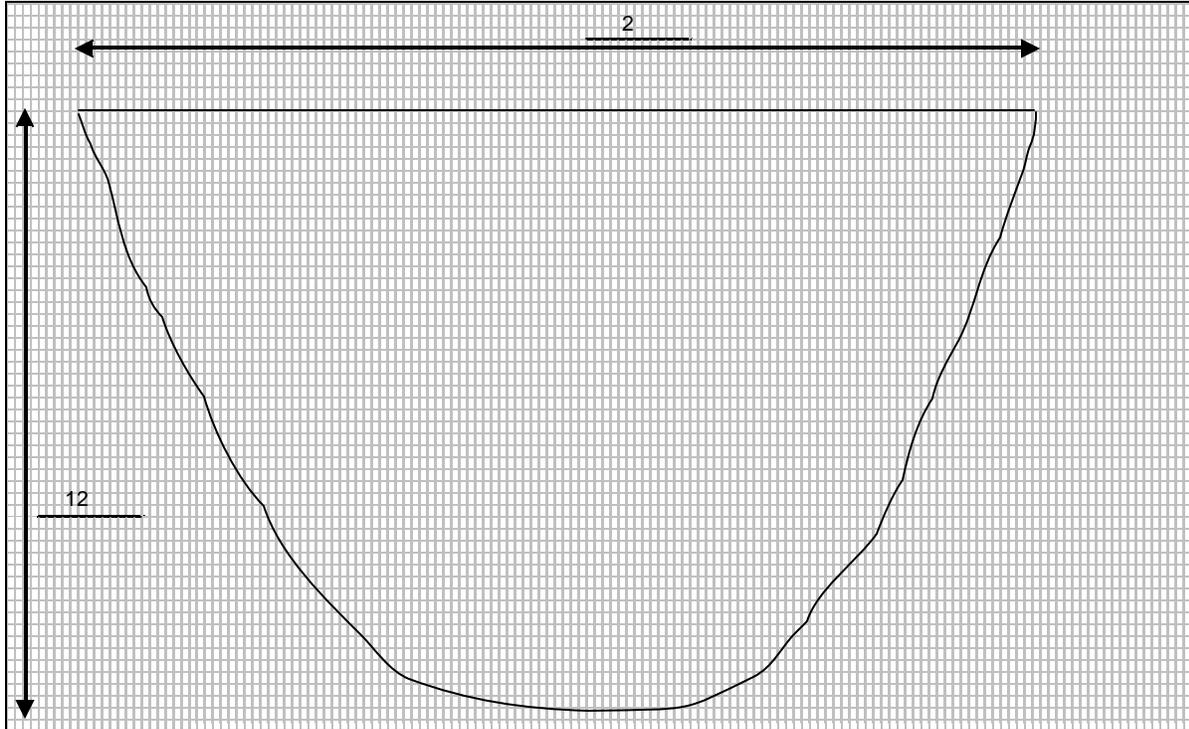
- 0-6 feet Metal, 10 percent plastic bricks; silty clay with 30 percent gravel; 20 ppm in ambient air at edge of trench, no readings at soil pile
- 8-13 feet 70 percent debris (wood, tire, metal, plastic) and strong methane odor; 80 ppm at 8 feet

Notes:

Sample: W13W001 (13 feet).

TEST PIT LOG WE18C

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/19/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/19/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 2
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 12
Type of Equipment:	CAT 320B	Depth to Water (feet): 10



Soil Description:

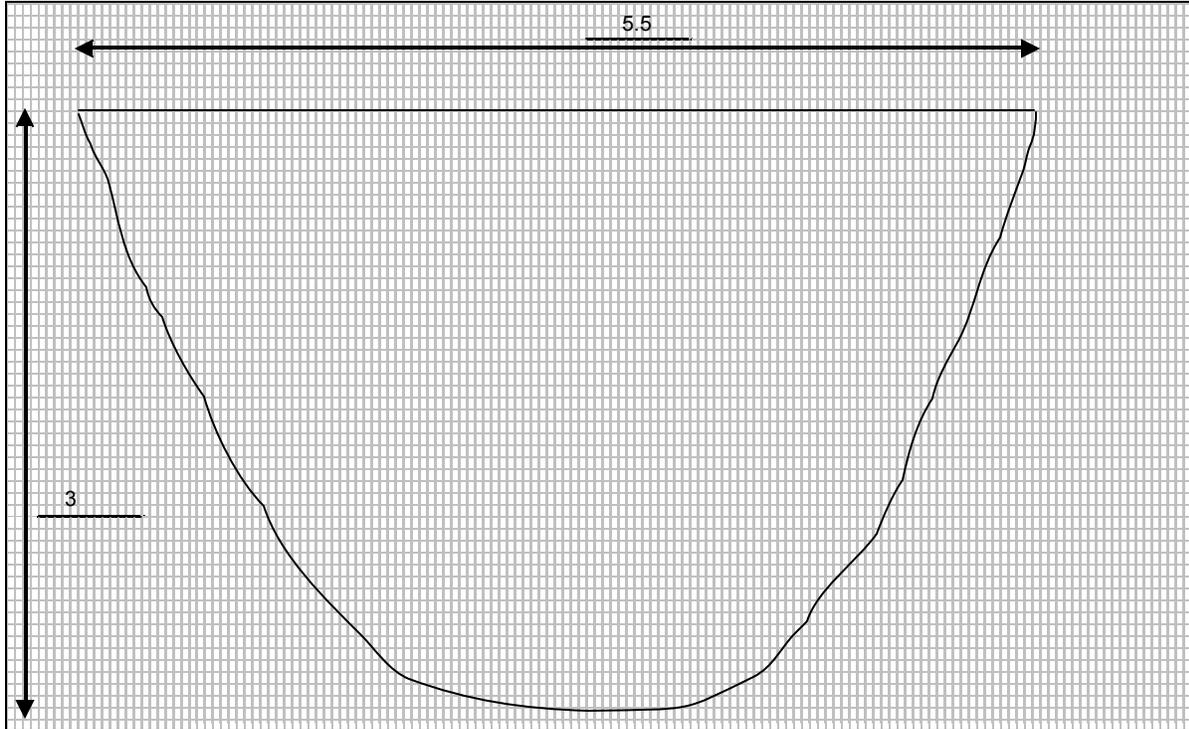
0-4 feet	45 percent debris (wood, plastic, brick), 30 percent gravel; sweet smell on west end of pit; silty clay
6 feet	Debris (wood, paper, glass)
8-10 feet	120 ppm at soil pile
12 feet	140 ppm, 0 percent LEL

Notes:

Need to take VOC sample on boring.
Samples: W14W001 (4 feet) and W14W002 (12 feet).

TEST PIT LOG WE18D

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/21/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/21/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 5.5
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 3
Type of Equipment:	CAT 320B	Depth to Water (feet): 3



Soil Description:

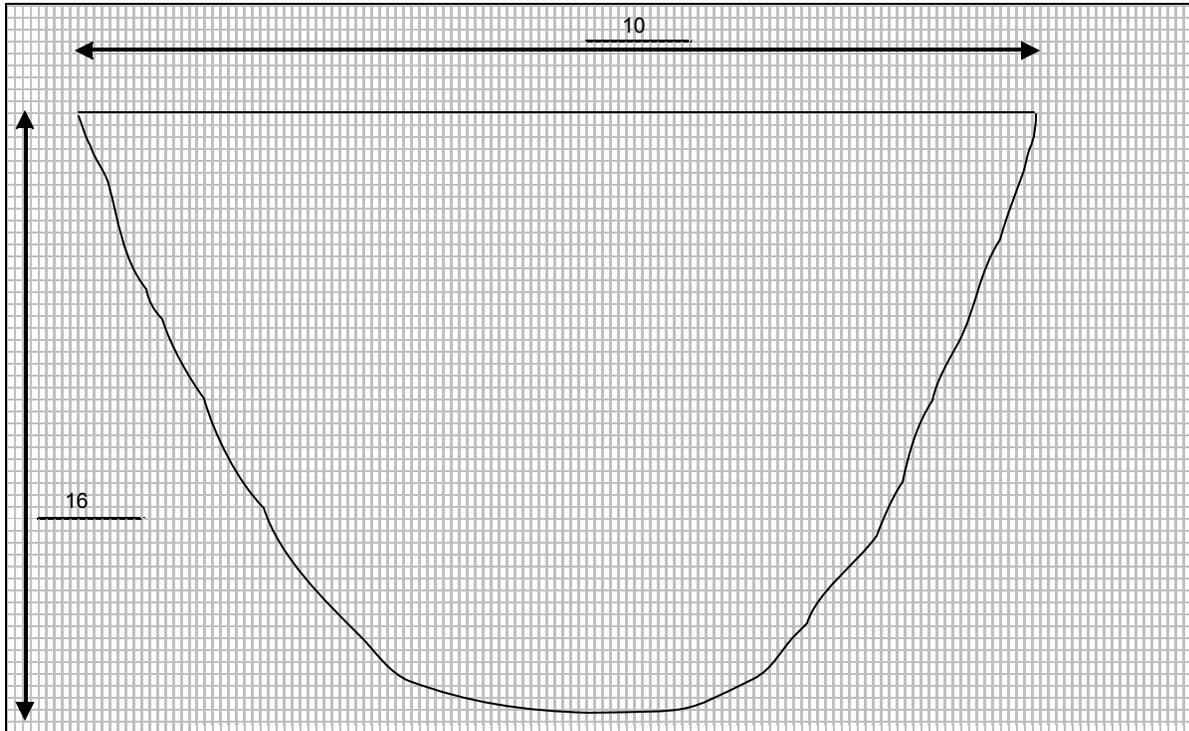
0-2 feet 60 percent gravel; 10 to 20 percent rubble, some sand; 80 ppm methane
3 feet No trash; pit overflowing with water after backfill

Notes:

Photograph: Pit full of water, looking west.
Sample: W29W001 (3 feet) at 1445.

TEST PIT LOG WE19A

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps	Date Started: 3/19/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/19/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 10
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 16
Type of Equipment:	CAT 320B	Depth to Water (feet): 16



Soil Description:

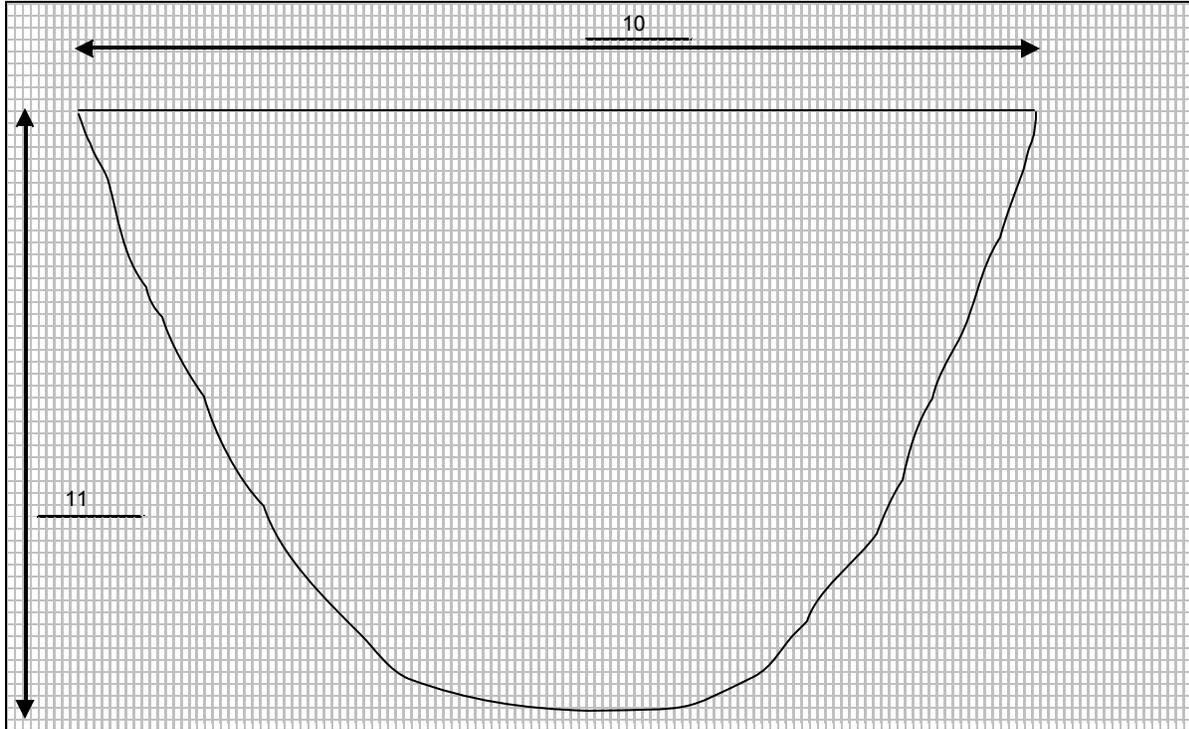
- 4 feet 20 percent gravel, 20 percent brick; 20 ppm at soil pile
- 10 feet Stained soil; larger gravel; boulders increasing in percentage; 20 ppm in soil pile
- 12 feet 5 percent wood debris
- 13-16 feet 60 percent debris (wood, brick, gravel, plastic); black-stained soil, clay; 0 ppm and 0 percent LEL at soil pile

Notes:

Need to take VOC samples from boring at 4 feet bgs.
Samples: W15W001 (4 feet), W15W002 (16 feet).

TEST PIT LOG WE19B

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps	Date Started: 3/19/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/19/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 10
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 11
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

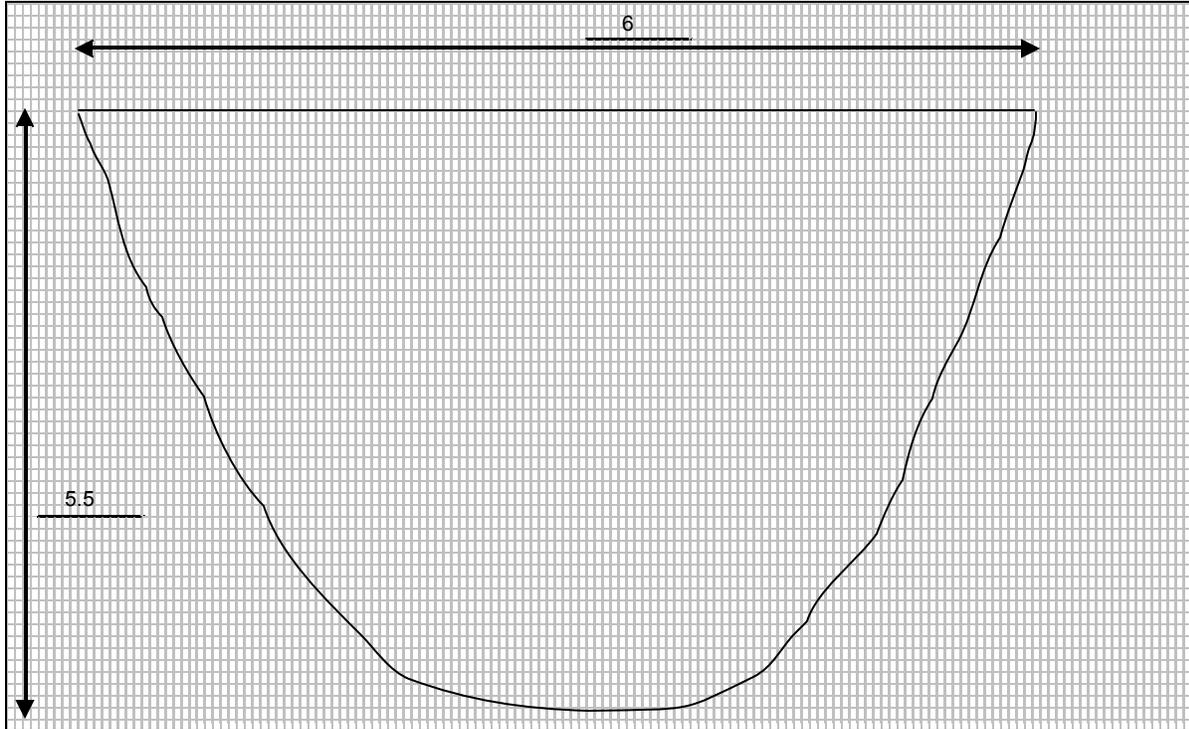
- 4 feet Increasing percentage of large concrete boulders; 0 ppm at soil pile, 4 feet bgs; 10 percent gravel in clay
- 6 feet Large concrete rubble
- 7.5 feet Plastic pipe
- 8 feet Strong methane smell, 30 percent wood debris, 560 ppm, 0 percent LEL; below 8 feet, 50 percent wood debris, strong odor
- 10 feet 95 percent wood debris; 460 ppm at soil pile
- 11 feet Refusal

Notes:

Samples: W16W001 (4 feet) and W16W002 (11 feet) with EnCores.

TEST PIT LOG WE19C

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/21/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/21/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 6
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 5.5
Type of Equipment:	CAT 320B	Depth to Water (feet): 5.5



Soil Description:

- 0-1 foot Dark brown silt; 0 ppm ambient
- 2-3 feet Lighter brown silty clay; gravel fill, 5 percent debris
- 3-4 feet Minor black staining in soil
- 5 feet Soils very wet; 10 percent debris, 40 percent gravel, pieces of wood; 5 to 6 feet hit water

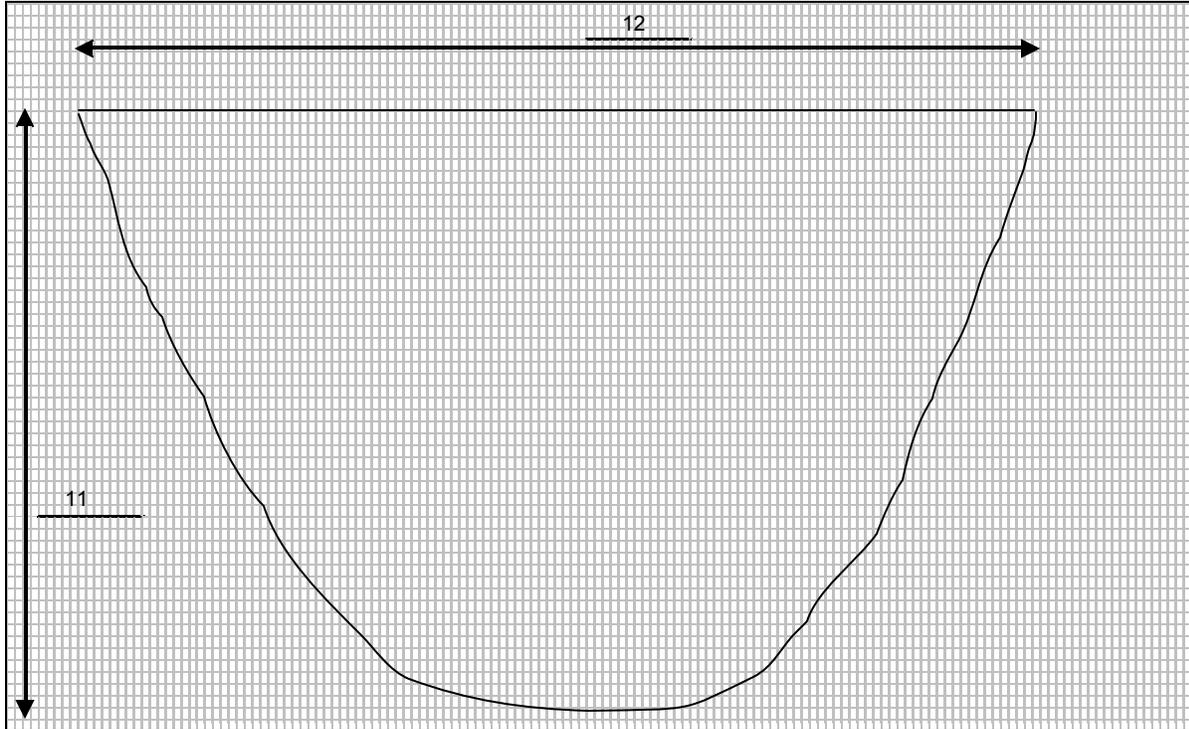
Notes:

Photographs: two photographs taken through fence at drums and tires; one photograph looking west at 3 to 4 feet; one photograph of pit looking east at 5.5 feet in depth.

Sample: W28W001 (4 feet) at 1415.

TEST PIT LOG WE20A

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/19/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/19/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 12
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 11
Type of Equipment:	CAT 320B	Depth to Water (feet): 10



Soil Description:

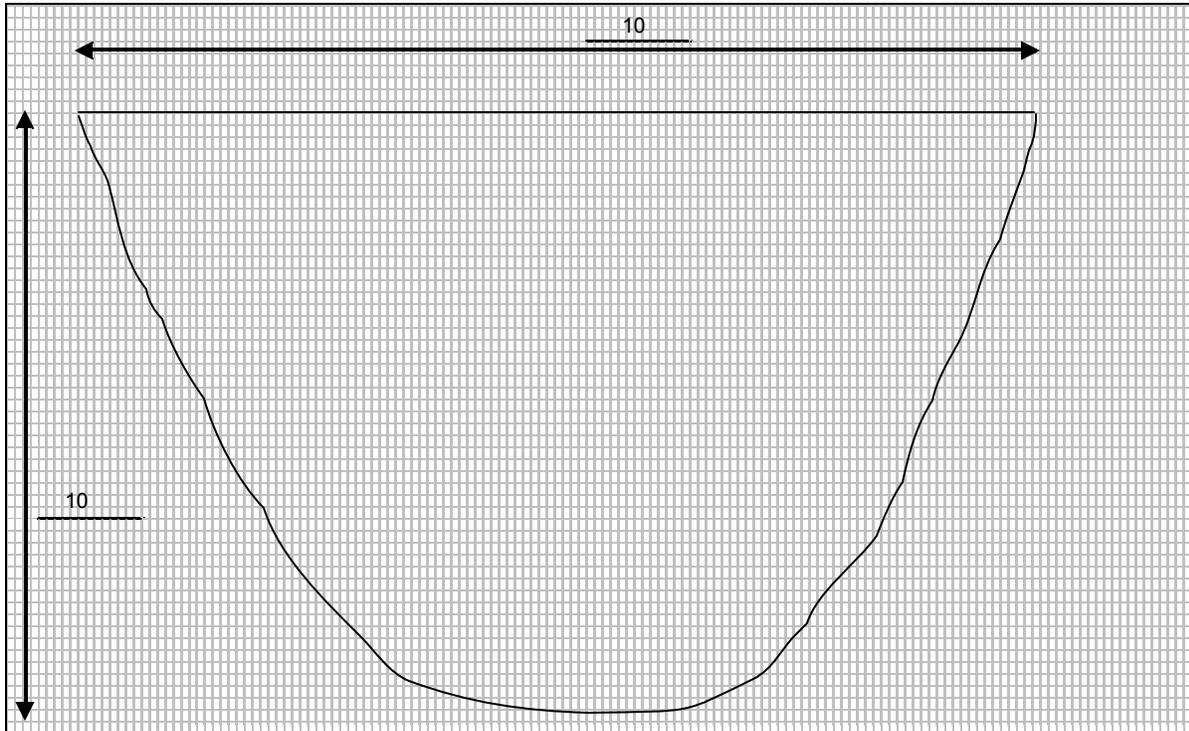
0-2 feet	Soil with gravel fill; 80 ppm, 0 percent LEL
4 feet	100 percent gravel, 40 ppm, 0 percent recovery; no samples collected at 4 feet
6 feet	Below 6 feet - clayey soils, 90 percent debris (wood, plastic, brick, stained soils)
7 feet	240 ppm
8 feet	140 ppm
10 feet	1,700 ppm, 2 percent LEL, water at 10 feet
11 feet	Below 10 feet, 240 ppm

Notes:

Sample: W17W001 (11 feet) with EnCores.

TEST PIT LOG WE20B

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/19/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/19/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 10
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 10
Type of Equipment:	CAT 320B	Depth to Water (feet): 10



Soil Description:

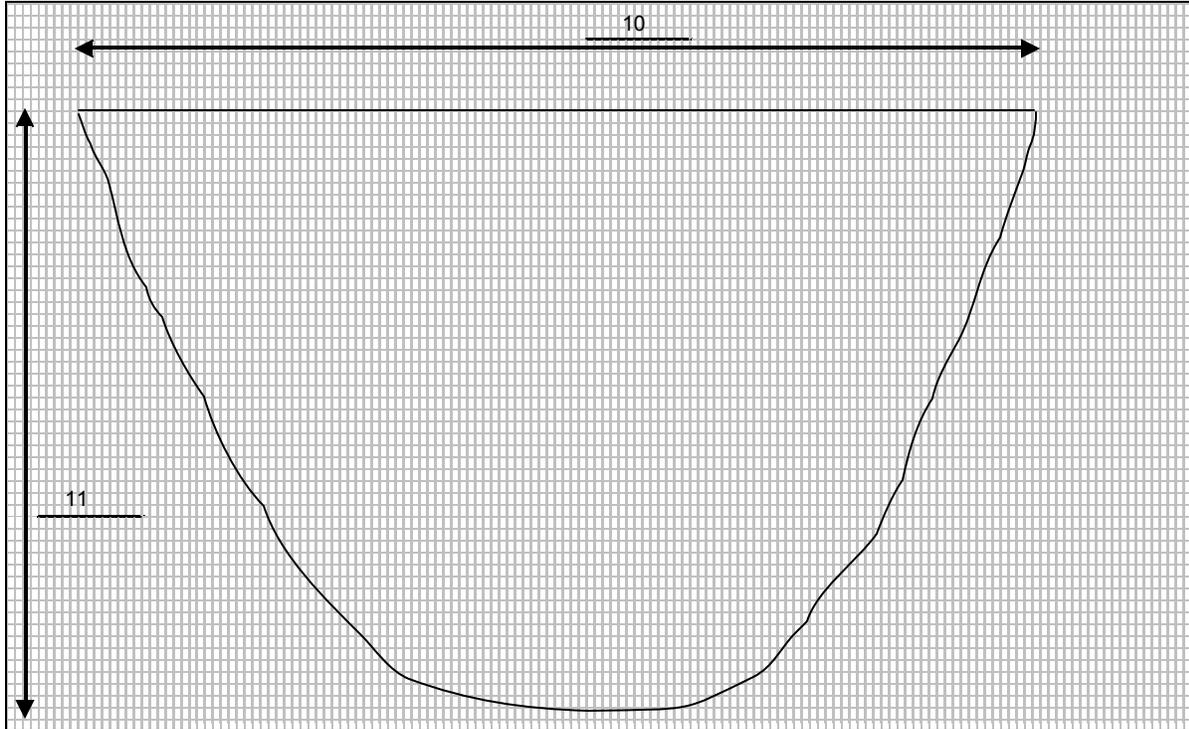
4 feet	Below 4 feet - stained soils
10 feet	80 ppm, water table

Notes:

Samples: W18W001 (4 feet), duplicate W18W004 (4 feet), W18W002 (10 feet), and duplicate W18W003 (10 feet) MS/MSD.

TEST PIT LOG WE21A

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/19/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/19/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 10
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 11
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

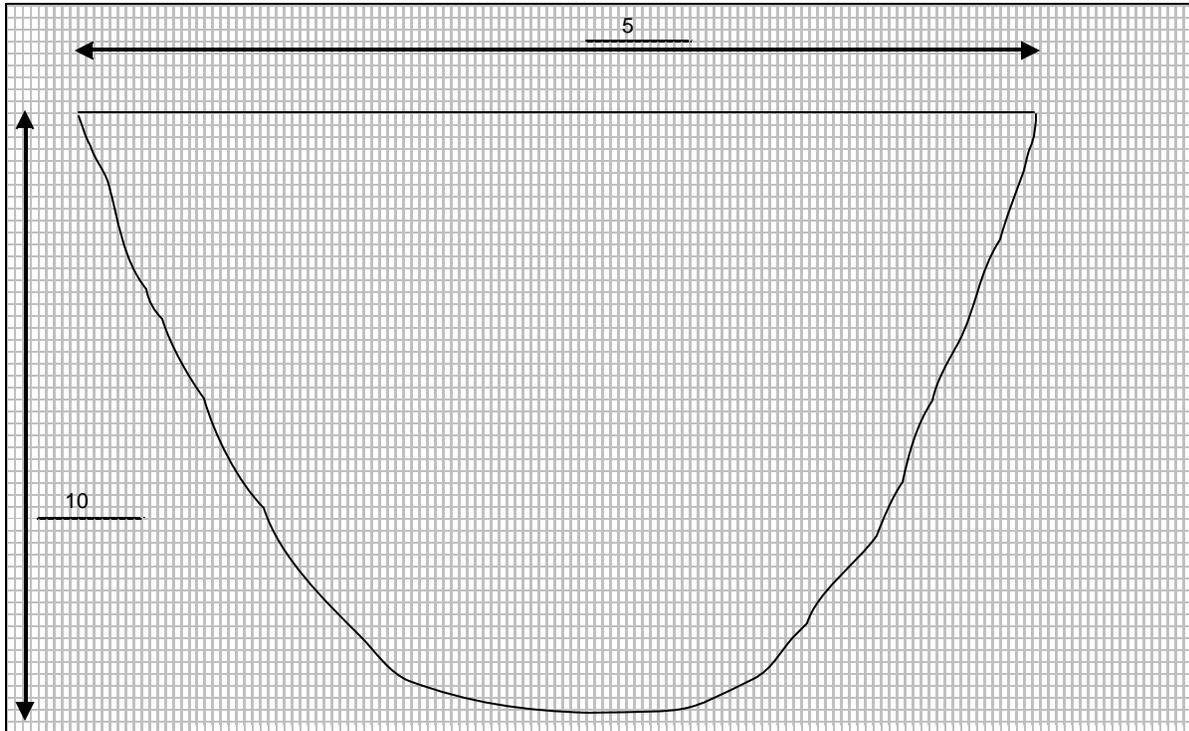
1 foot	40 percent debris (PVC pipes, large gravel and concrete); 40 ppm
5 feet	Below 5 feet - 50 percent gravel, concrete rubble
8 feet	Black staining, 2 percent LEL, 1,200 ppm
10 feet	1 percent LEL, 1,000 ppm
12 feet	10 percent LEL, 3,600 ppm

Notes:

Samples collected at northwest corner of landfill: W19W001 (4 feet) with MS/MSD, duplicate W19W002 (4 feet), W19W003 (11 feet) with MS/MSD, and duplicate W19W004 (11 feet).

TEST PIT LOG WE21B

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/21/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/21/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 5
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 10
Type of Equipment:	CAT 320B	Depth to Water (feet):



Soil Description:

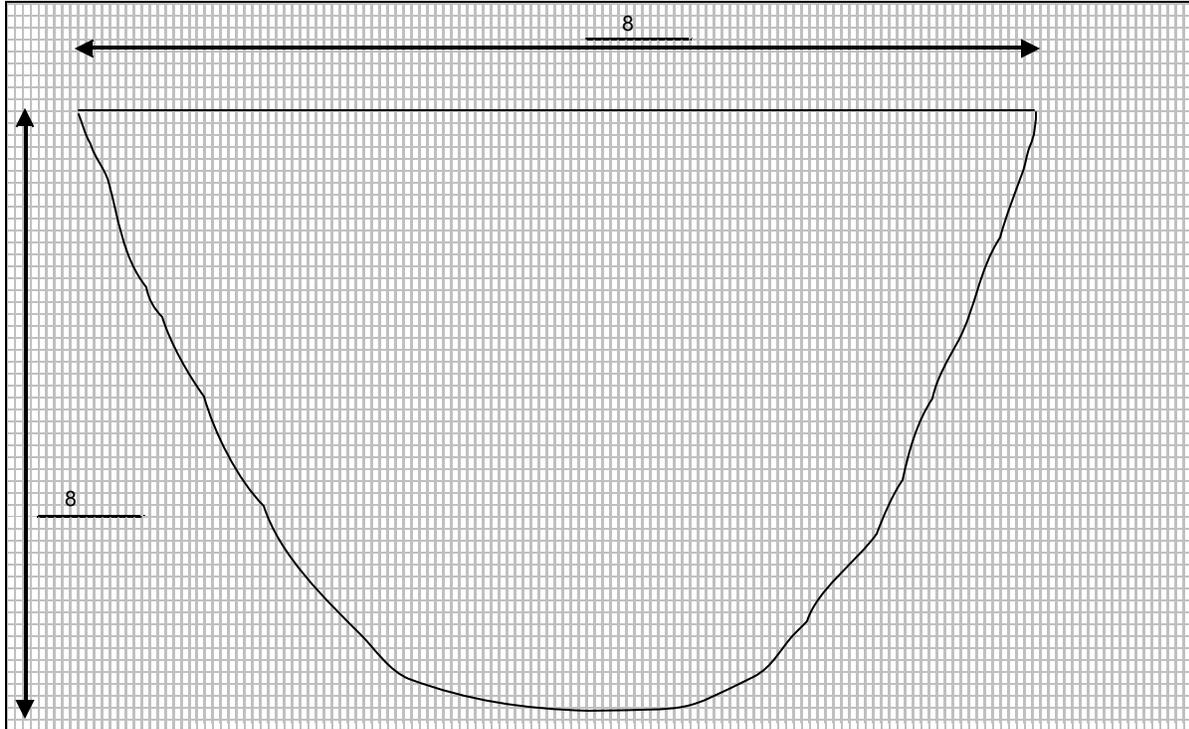
- 0-2 feet Silty sand backfill with large concrete rubble; 40 percent gravel; backfill; 60 ppm ambient
- 4-5 feet Less than 10 percent debris
- 8 feet Backfill; rich brown color; 40 percent color
- 10 feet Brown and gray silty clay

Notes:

Samples: W27W001 (4.5 feet) at 1345 and W27W002 (10 feet).

TEST PIT LOG WE22

Project No:	G90160030303020711	Page 1 of 1
Project Name:	HPS Parcel E Nonstandard Data Gaps Investigation	Date Started: 3/22/2002
Site Name:	Parcel E IR-01/21	Date Completed: 3/22/2002
Geologist/Engineer:	VICTORIA COKER	Length (feet): 8
Excavation Company:	ERRG	Width (feet): 4
Method:		Depth (feet): 8
Type of Equipment:	CAT 320B	Depth to Water (feet): 0



Soil Description:

1 inch Sand
2 inches-8 feet Light gray saturated clay (Bay Mud); 80 ppm at mouth, 20 to 40 ppm ambient

Notes:

Photographs: First scoop, two photographs at 8 feet.

APPENDIX B
TEST PIT EXCAVATION PHOTOGRAPHS



Photograph B-1: Bay Mud in test pit WE15. **Date Taken:** March 14, 2002. **Orientation:** Not Applicable (NA).



Photograph B-2: Excavator digging test pit WE15 through Bay Mud. **Date Taken:** March 14, 2002. **Orientation:** NA



Photograph B-3: Soil and fill in test pit WE19C. **Date Taken:** March 21, 2002.
Orientation: NA.



Photograph B-4: Water at bottom of test pit WE18D. **Date Taken:** March 21, 2002.
Orientation: NA.



Photograph B-5. Standing water in test pit WE18D along the western fence line.
Date Taken: March 21, 2002. **Orientation:** NA.



Photograph B-6: Stained soil and debris in test pit WE01.
Date Taken: March 21, 2002. **Orientation:** Looking north.



Photograph B-7: Landfill refuse, including rubber, wire, wood, and concrete, in test pit WE02B. **Date Taken:** March 21, 2002. **Orientation:** NA.



Photograph B-8: Purple chemical staining in test pit WE02A. **Date Taken:** March 21, 2002. **Orientation:** NA.



Photograph B-9: Excavator digging test pit WE22 on shoreline surrounded by wood, concrete, and metal debris. **Date Taken:** March 22, 2002. **Orientation:** NA.



Photograph B-10: Excavator dumping soil and debris onto pile on north side of landfill. **Date Taken:** March 20, 2002. **Orientation:** Looking east.



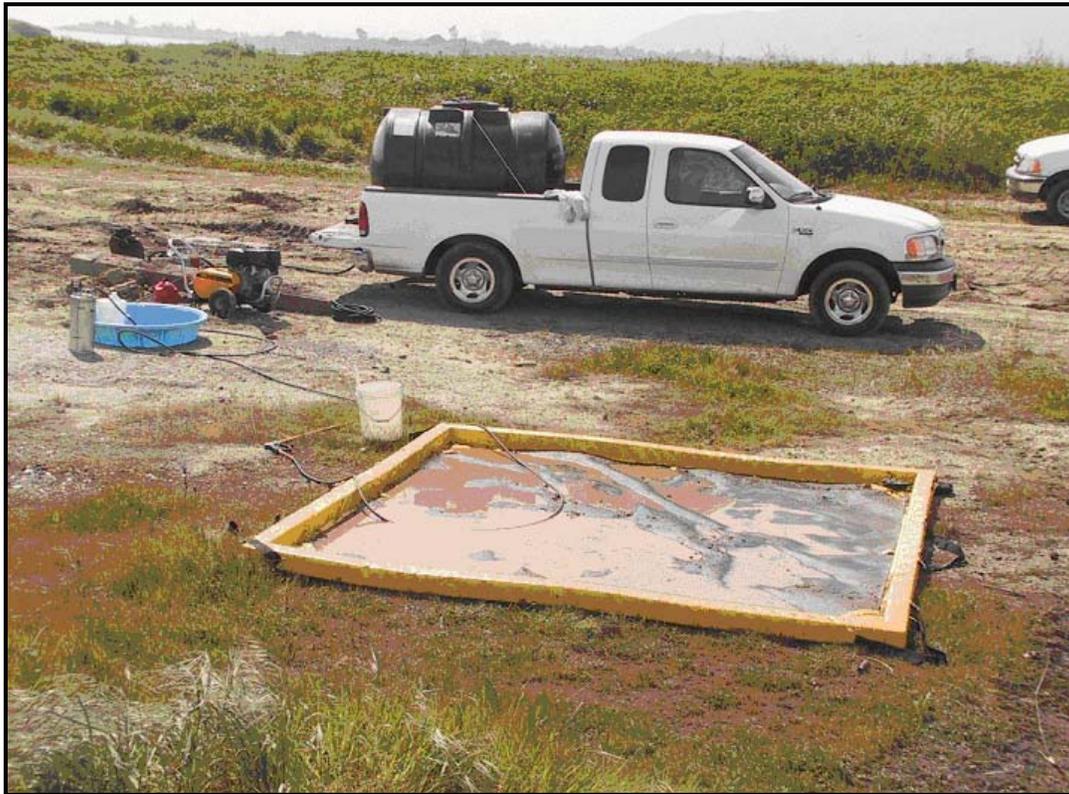
Photograph B-11: Excavator digging test pit WE09.
Date Taken: March 13, 2002. **Orientation:** Looking south.



Photograph B-12: Decontamination of excavator bucket after test pit excavation.
Date Taken: March 19, 2002. **Orientation:** NA.



Photograph B-13: Decontamination of excavator bucket using power washer. **Date Taken:** March 19, 2002. **Orientation:** NA.



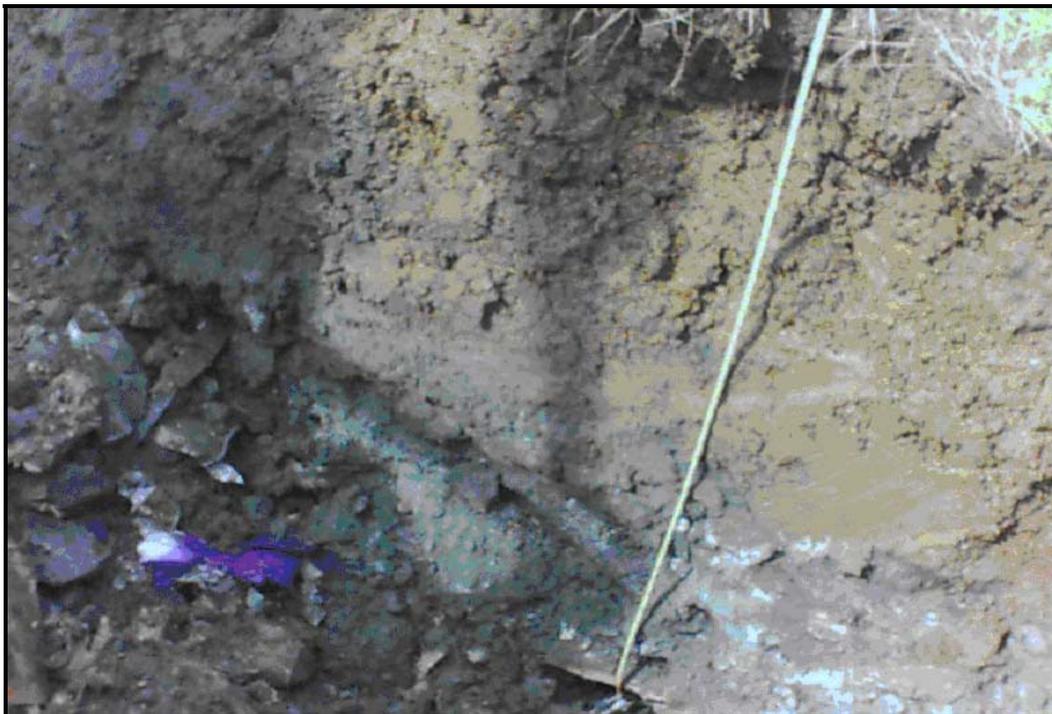
Photograph B-14: Decontamination pad used to decontaminate excavator bucket during landfill extent investigation. **Date Taken:** March 19, 2002. **Orientation:** NA.



Photograph B-15: Landfill debris and soil in test pit WE09.
Date Taken: March 13, 2002. **Orientation:** NA.



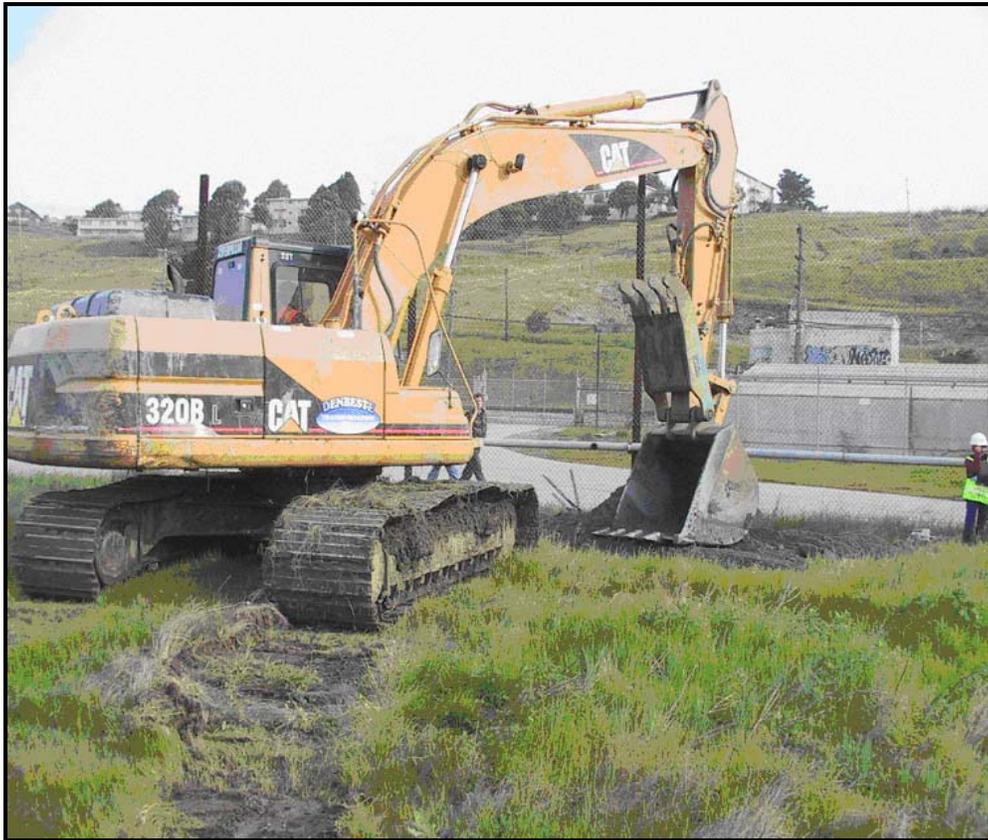
Photograph B-16: Various types of landfill refuse in test pit WE08.
Date Taken: March 13, 2002. **Orientation:** NA.



Photograph B-17: Measurement of depth from surface to landfill debris in test pit WE08. **Date Taken:** March 13, 2002. **Orientation:** NA.



Photograph B-18: Landfill refuse, including paper, wood, and rubber, in test pit WE11. **Date Taken:** March 13, 2002. **Orientation:** NA.



Photograph B-19: Excavator digging test pit WE03B along the University of California, San Francisco (UCSF) fence line. **Date Taken:** March 21, 2002. **Orientation:** Looking north.



Photograph B-20: Plastic sheeting placed on ground and used to pile soil excavated from test pit WE02B. **Date Taken:** March 21, 2002. **Orientation:** Looking north.



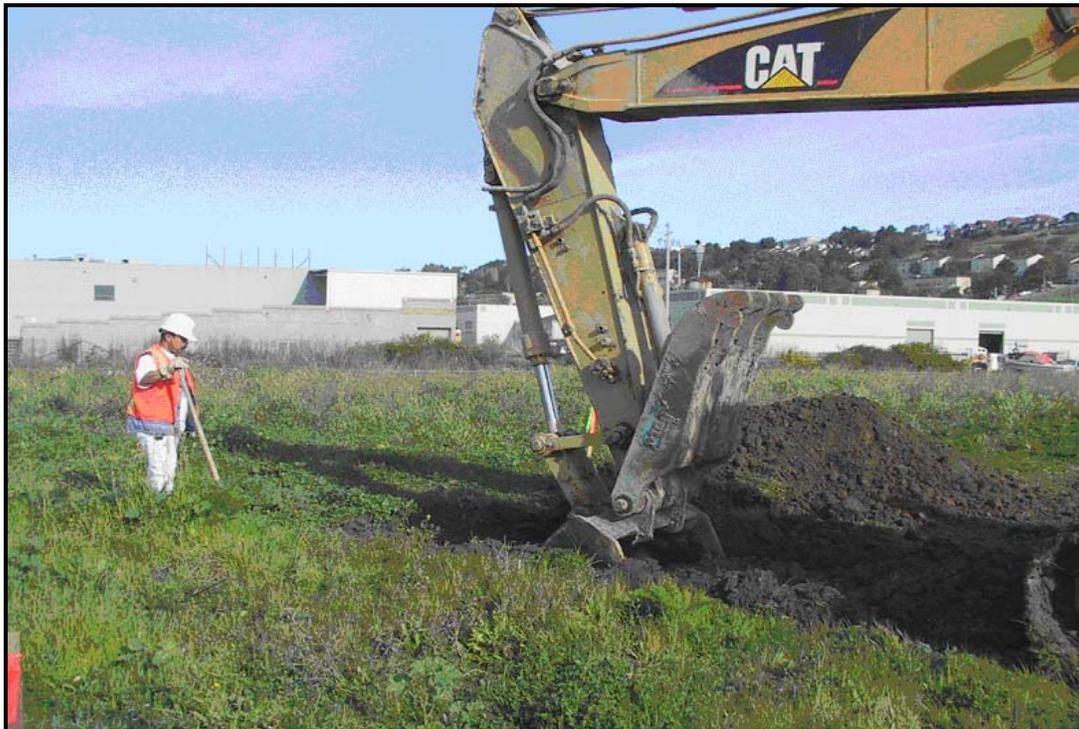
Photograph B-21: Field crew inspecting and documenting soil and debris removed from test pit WE02B along UCSF fence line. **Date Taken:** March 21, 2002.
Orientation: Looking west.



Photograph B-22: Hand-held field instrument used to measure methane levels inside of test pit WE04B (in lower right corner). **Date Taken:** March 20, 2002.
Orientation: NA.



Photograph B-23: Field crew member collecting soil sample from excavator bucket at test pit WE01. **Date Taken:** March 21, 2002. **Orientation:** Looking north.



Photograph B-24: Excavator commencing excavation at test pit WE17A. **Date Taken:** March 19, 2002. **Orientation:** Looking northwest.



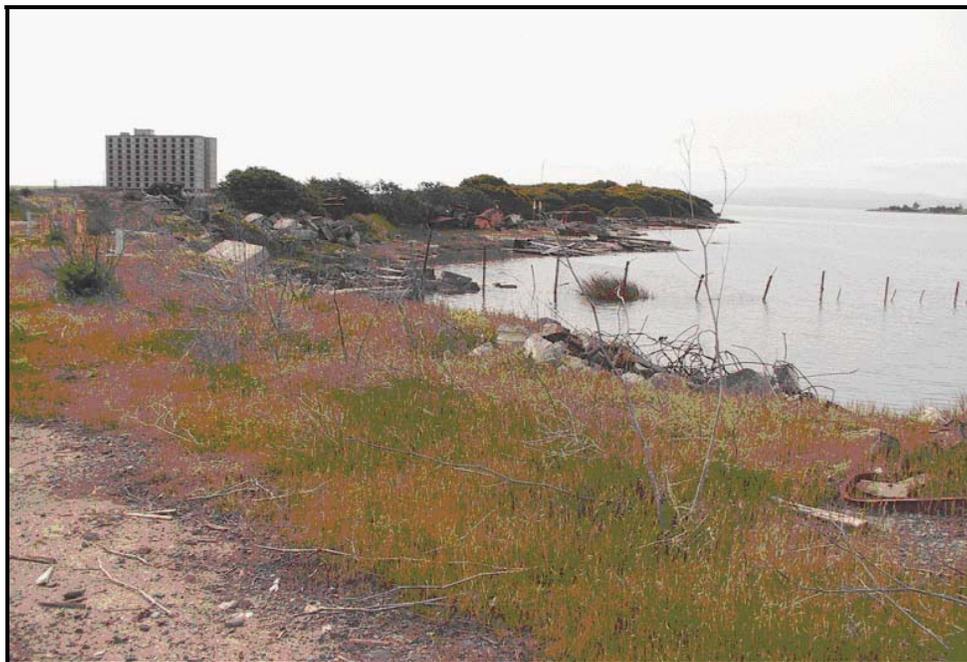
Photograph B-25: Field crew member monitoring methane level in ambient air at test pit WE17A. **Date Taken:** March 19, 2002. **Orientation:** Looking northwest.



Photograph B-26: Field crew inspecting contents of test pit WE03B and measuring depth to bottom of test pit. **Date Taken:** March 21, 2002. **Orientation:** Looking north.



Photograph B-27: Soil collected from test pit boring TPBWE11.
Date Taken: March 25, 2002. **Orientation:** NA.



Photograph B-28: Various types of debris along shoreline, including concrete, metal and wood debris. **Date Taken:** March 22, 2002.
Orientation: Looking southeast.



Photograph B-29: Road leading to north side of landfill.
Date Taken: March 19, 2002. **Orientation:** Looking west.



Photograph B-30: Drillers and drilling equipment at test pit boring TPBWE11.
Date Taken: March 25, 2002. **Orientation:** Looking west.



Photograph B-31: Drillers and drill rig at test pit boring TPBWE11.

Date Taken: March 25, 2002. **Orientation:** NA.



Photograph B-32: Drill rig at test pit boring TPBWE10C along fence line next to UCSF compound. **Date Taken:** March 27, 2002.

Orientation: Looking southwest.



Photograph B-33: Physical inspection of soil from test pit borings.
Date Taken: March 27, 2002. **Orientation:** NA.



Photograph 34: Ambient air monitoring of methane at mouth of test pit boring TPBWE10C located adjacent to UCSF fence line.
Date Taken: March 27, 2002.
Orientation: Looking south.



Photograph B-35: Test pit and test pit boring stake locations.
Date Taken: April 2, 2002. **Orientation:** Looking west.



Photograph B-36: Petroleum-stained soil from test pit boring TPBWE11.
Date Taken: March 25, 2002. **Orientation:** NA.



Photograph B-37: Landfill refuse from test pit boring TPBWE10 from 9.5 to 11 feet below ground surface. **Date Taken:** March 25, 2002. **Orientation:** NA.



Photograph B-38: Soil and landfill debris from test pit boring TPBWE11. **Date Taken:** March 25, 2002. **Orientation:** NA.

APPENDIX C
SOIL BORING LOGS

LIST OF SOIL BORING LOGS

TPBWE01	TPBWE10B
TPBWE02	TPBWE10C
TPBWE02A	TPBWE10D
TPBWE04B	TPBWE10E
TPBWE05	TPBWE11
TPBWE06	TPBWE14
TPBWE08	TPBWE19B
TPBWE08B	TPBWE20B
TPBWE09	TPBWE21A
TPBWE09B	TPBWE23B
TPBWE09C	TPBWE24
TPBWE09D	TPBWE25
TPBWE10	TPBWE26



Tetra Tech EM INC.

Log of Boring: TPBWE01

Drilling Method: HSA
Boring Started: 03/29/02
Completed: 03/29/02
Boring Depth (feet bgs): 23.00
Boring Diameter (inches): 6.00

Logged By: VICTORIA COKER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL): 18.57

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	16				1.1			SC	CLAYEY SAND: dark brown (10YR 3/3); 5 percent gravel
2	16	11						GP	POORLY GRADED GRAVEL: serpentinite gravel up to 2-inch diameter; roots
3									
4	14	14						SP	POORLY GRADED SAND: bluish gray; 40 percent serpentinite gravel up to 1-inch diameter; moist
5					1.1				100 percent lower explosive limit in borehole; dry ice added
6	18	13							4-inch-thick lens of wood debris
7	16	13			1.6				
8	16	10			0.5				
9									
10	7	12							
11									
12	11	N/A							
13	7	14							
14									
15	13	12						CL	SATURATED SILTY CLAY: dark greenish gray (GLEY1 3/5G); 50 percent gravel
16	14	N/A							
17	16	15							
18								SP	POORLY GRADED SAND: sand is coarse grained; stained black (petroleum)
19	18	N/A							
20	18	9							
21									
22	18	N/A							Same as above; finer grained, with shell fragments
23									Total Depth of Boring = 23 Feet
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									



Tetra Tech EM INC.

Log of Boring: TPBWE02

Drilling Method: HSA
Boring Started: 03/29/02
Completed: 03/29/02
Boring Depth (feet bgs): 24.50
Boring Diameter (inches): 6.00

Logged By: VICTORIA COKER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL):

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	18	18						CL	LEAN CLAY: dark brown (10YR 3/3); 5 percent gravel
2	13	65						WF	WASTE FILL: black stained coarse-grained sand, with wood debris 4-inch asphalt; black; paper; wood debris Color changes at 5 feet to dark greenish gray (GLEY1 3/5G) Broken glass; fiberglass; gravel; up to 1 1/2-inch diameter
3	0	50							
4	11	50							
5	4	50							
6	5	22							
7	4	27							
8	11	NR						ML	SANDY SILTY: dark greenish gray (Gley1 3/5G); with 10 percent gravel up to 2 inches in diameter. Gravel content increases to about 30 percent
9	9	NR							
10	7	36						SP	POORLY GRADED SAND: sand is coarse grained; blue tint; saturated; 40 percent gravel up to 2-inch diameter; minor petroleum staining
11	11	NR							
12	7	38							
13	9	15						GP	POORLY GRADED GRAVEL: same as above, with increase in gravel content to about 60 percent gravel
14	9	16							
15	18	7						SP	BAY MUD DEPOSIT POORLY GRADED SAND: sand is coarse grained; black staining; petroleum odor; shell fragments; saturated
16	18	NR							
17									Total Depth of Boring = 24.5 Feet
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									



Tetra Tech EM INC.

Log of Boring: TPBWE02A

Drilling Method: HSA
Boring Started: 03/29/02
Completed: 03/29/02
Boring Depth (feet bgs): 6.50
Boring Diameter (inches): 6.00

Logged By: VICTORIA COKER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL): 18.68

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	16	24						CL	SILTY CLAY: dark yellowish brown (10YR 3/6); less than 5 percent gravel
2	16	36							
3								WF	WASTE FILL: black loose sand with wire, paper, glass, and other debris
4	11	68							Refusal at 6.5 feet
5	11	61							
6									
7									Total Depth of Boring = 6.5 Feet
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
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35									



Tetra Tech EM INC.

Log of Boring: TPBWE04B

Drilling Method: HSA
Boring Started: 03/28/02
Completed: 03/28/02
Boring Depth (feet bgs): 9.50
Boring Diameter (inches): 6.00

Logged By: VICTORIA COKER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL): 18.37

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	16	31						GP/SP	POORLY GRADED SAND AND GRAVEL: very dark grayish brown (10YR 3/22); moist; 50 percent gravel up to 1.5-inch diameter
2	4	25			1.1			WF	GRAVEL: with 50 percent wood and paper
3									WOOD AND PAPER: bluish black (GLEY2 2.5/5PB); 50 percent black coarse-grained sand
4	14	20			1.4				
5	4	N/A			1.1			SP	POORLY GRADED SAND: bluish black (GLEY2 2.5/5PB); sand is coarse grained
6									
7	4	N/A			1.4			SM	SILTY SAND: dark greenish gray (GLEY1 3/5G); 20 percent gravel (0.25- to 0.5-inch diameter)
8									
9		N/A						WF	LANDFILL DEBRIS: same as above; 100 percent lower explosive limit in borehole
10									Total Depth of Boring = 9.5 Feet
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
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32									
33									
34									
35									



Tetra Tech EM INC.

Log of Boring: TPBWE05

Drilling Method: HSA

Boring Started: 03/28/02

Completed: 03/28/02

Boring Depth (feet bgs): 21.50

Boring Diameter (inches): 6.00

Logged By: VICTORIA COKER

Logging Consultant: TETRA TECH

Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS

Project No: G9016.003

Location: PARCEL E IR-01/21 LANDFILL

Ground Surface Elevation (feet MSL):

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	16	12						SM	SILTY SAND: dark brown (10YR 3/3); sand with organic matter; 20 percent angular gravel (0.5- to 1.5-inch diameter); rubber debris; some petroleum staining
2	18	59			1.4				
3									
4	7	22				.7			
5	11	17			10.7			SP	POORLY GRADED SAND WITH GRAVEL: sand is coarse grained; 30 percent gravel; increasing in moisture content; black staining; wood debris at 8.0 feet
6	11	12			4.4				
7									
8	13	11			3.3				
9									
10	16	11			2.5			SM	SILTY SAND: very dark brown (10YR 2/2); with stiff lean clay, greenish black (GLEY1 2.5/5G); 10 percent gravel; petroleum staining
11	2	27			3.3				
12	0	27						CL	SILTY LEAN CLAY WITH WOOD DEBRIS: greenish black (GLEY1 2.5/5G); 10 percent gravel, up to 1.5-inch diameter; 100 percent lower explosive limit in borehole; dry ice added
13	7	20							
14									
15	14	20							
16								SM	SILTY SAND: dark greenish gray (GLEY1 4/5G); petroleum staining and odor
17	16	14			10.1				
18	14	24							PAPER AND RUBBER DEBRIS
19									
20	18	8			5.1				
21									BAY MUD DEPOSITS: silty sand, with petroleum staining
22									Total Depth of Boring = 21.5 Feet
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									



Log of Boring: TPBWE06

Logged By: VICTORIA COKER
Logging Consultant: GREGG
Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL): 16.55

Drilling Method: HSA
Boring Started: 03/28/02
Completed: 03/28/02
Boring Depth (feet bgs): 18.50
Boring Diameter (inches): 6.00

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	18	22						SM	SILTY SAND: black (10YR 2/1), with petroleum staining; 30 percent subangular gravel (0.25- to 1.0-inch diameter) gravels are serpentinite in content
2	7	24			3.6				SILTY SAND: dark yellowish brown (10YR 3/6); 30 percent subangular gravel (0.25- to 1.0-inch diameter)
3									
4	9	18			2.2				
5	9	21			2.2				
6									
7	18	13			2.5				
8	11	19			2.5				
9									
10	7	16			2.5			SP	POORLY GRADED SAND: black (10YR 2/1); 60 percent rounded gravel (0.5- to 1.5-inch diameter); 10 percent wood debris; petroleum staining
11	5	18			3.3				
12									
13	2	12			5.1			WF	WASTE FILL: wood, with petroleum staining
14	13	13						SM	SILTY SAND: dark greenish gray (GLE Y1 4/5G); occasional gravel; 100 percent lower explosive limit in borehole; dry ice was added
15	11	12			.7				
16									
17	18	11			.3			CH	BAY MUD DEPOSITS
18									
19									Total Depth of Boring = 18.5 Feet
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									



Tetra Tech EM INC.

Log of Boring: TPBWE08

Drilling Method: HSA
Boring Started: 03/28/02
Completed: 03/28/02
Boring Depth (feet bgs): 13.00
Boring Diameter (inches): 6.00

Logged By: VICTORIA COKER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL): 17.70

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	16	18						SP	POORLY GRADED SAND: dark yellowish brown (10YR 3/4); sand is medium to fine grained; trace styrofoam
2									
3	17	21			3			CL	LEAN CLAY: dark greenish gray (GLE Y1 3/5G); with small wood debris
4	18	22			3.9				With occasional gravel (less than 0.5-inch diameter); petroleum staining
5	18	20			3.3				
6									
7	18	71			2.5				
8									
9	5	50			7			SP	POORLY GRADED SAND WITH GRAVEL: dark greenish gray (GLE Y1 2.5/5G); 30 percent subangular gravel; sand is dry; gravel is 1/4- to 3/4-inch diameter; metal, wood, and brick debris
10	9	70			3.6				
11									
12	4	50			8.4			SF	WASTE FILL: wood and paper debris; 100 percent lower explosive limit in borehole; boring terminated
13					12				Total Depth of Boring = 13 Feet
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
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29									
30									
31									
32									
33									
34									
35									



Tetra Tech EM INC.

Log of Boring: TPBWE08B

Drilling Method: HSA
Boring Started: 04/02/02
Completed: 04/02/02
Boring Depth (feet bgs): 22.00
Boring Diameter (inches): 6.00

Logged By: VICTORIA COKER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL): 17.09

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	7				0			GP	POORLY GRADED GRAVEL WITH SAND: 60 percent gravel; 40 percent brown sand; few brick fragments
2					0				
3	0				0				
4	18				0				
5	18			W32W001	0			WF	WASTE FILL: dark yellowish brown (10YR 4/6) silty sand; 40 percent gravel; waste fill made of rubber, brick, metal, paper, plastic, tile, and wood
6	18				0				Color changes to dark greenish gray with blue tints (sand)
7	14				0				Serpentinite gravels present.
8	4								
9	4								
10	5								
11	3								
12	7								
13	7								
14	0								
15	9								
16	13								
17	13								
18	16			W32W002					
19	16								
20	11								
21	11								
22									Total Depth of Boring = 22 Feet
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									



Log of Boring: TPBWE09

Logged By: VICTORIA COKER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL): 17.12

Drilling Method: HSA
Boring Started: 03/26/02
Completed: 03/26/02
Boring Depth (feet bgs): 11.50
Boring Diameter (inches): 6.00

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	10	N/A			.2			SP	POORLY GRADED SAND WITH GRAVEL: very dark grayish brown (10YR 3/2); sand is coarse grained; 20 percent subangular gravel, up to 0.5-inch diameter; petroleum staining Trace paper debris. Wood debris; some plastic and cloth
2									
3									
4									
5	30	N/A			6			WF	WASTE FILL: 10 percent brick debris; trace paper debris; strong odor Wood, plastic, and cloth 100 percent lower explosive limit in borehole; terminated boring
6									
7									
8									
9									
10	5	72			1.3				
11									
12									Total Depth of Boring = 11.5 Feet
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									



Tetra Tech EM INC.

Log of Boring: TPBWE09B

Logged By: VICTORIA COKER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL): 17.44

Drilling Method: HSA
Boring Started: 03/26/02
Completed: 03/26/02
Boring Depth (feet bgs): 11.00
Boring Diameter (inches): 6.00

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	9	70			1.9			SP	POORLY GRADED SAND WITH GRAVEL: reddish black (2.5YR 2.5/1); moist; sand is coarse grained; 40 percent gravel (0- to 0.5-inch diameter); petroleum staining; brick debris
2	7	36			2.7				
3									
4	16	28			1.9			SC	CLAYEY SAND WITH GRAVEL: brown (7.5 YR 4/3); 20 percent angular gravel (0.25- to 1.0-inch diameter); clay is stiff
5	16	18			1.6				
6									
7	18	17			1.1			GC	CLAYEY SAND WITH GRAVEL: greenish black (GLEYS 2.5/5G); gravel 0.25- to 1.0-inch diameter; with petroleum-stained sand; moist
8	14	59			1.1				
9	4	78						WF	WASTE FILL: 100 percent wood debris; 100 percent lower explosive limit in borehole; 10 percent ambient; boring terminated
10									
11									Total Depth of Boring = 11 Feet
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									



Log of Boring: TPBWE09C

Logged By: VICTORIA COKER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL): 17.00

Drilling Method: HSA
Boring Started: 03/27/02
Completed: 03/27/02
Boring Depth (feet bgs): 12.50
Boring Diameter (inches): 6.00

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	16	41			2.7			SM	SILTY SAND: sand is fine grained; moist; 5 percent gravel; some wood debris
2	0	46							
3									
4	0								
5	5	23			1.3			CL	LEAN CLAY: dark yellowish brown (10YR 3/6); moist; 5 percent gravel, up to 1/2-inch diameter
6									
7	18	34			.6				
8	16	28							
9	5	50			3.7			SM	SILTY SAND WITH GRAVEL: black (10YR 2/1); moist; 20% wood debris; petroleum staining
10									
11								WF	WASTE FILL: 100 percent wood, plastic, cable, glass, and copper wire debris; 100 percent lower explosive limit in borehole; boring terminated
12									
13									Total Depth of Boring = 12.5 Feet
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									



Tetra Tech EM INC.

Log of Boring: TPBWE09D

Drilling Method: HSA

Boring Started: 03/27/02

Completed: 03/27/02

Boring Depth (feet bgs): 12.50

Boring Diameter (inches): 6.00

Logged By: VICTORIA COKER

Logging Consultant: TETRA TECH

Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS

Project No: G9016.003

Location: PARCEL E IR-01/21 LANDFILL

Ground Surface Elevation (feet MSL): 17.08

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	7							SP	POORLY GRADED SAND WITH GRAVEL: sand is coarse grained; 30 percent gravel (0.5- to 1.0-inch diameter); petroleum staining BRICK AND NAIL DEBRIS.
2	13	50			3.4				
3									
4	16	22						SM	SILTY SAND: dark yellowish brown (10 YR 3/6); moist; petroleum staining; occasional gravel (0.5-inch diameter); lens of wood debris (10 percent) at 5 feet
5	11	16			.6				
6									
7	11	15							
8	7	48				1.7			
9									
10	5	27						WF	WASTE FILL: 100 percent wood with metal, paper, and glass debris; 100 percent lower explosive limit in borehole added dry ice; boring terminated
11									
12									
13									Total Depth of Boring = 12.5 Feet
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									



Tetra Tech EM INC.

Log of Boring: TPBWE10

Drilling Method: HSA

Boring Started: 03/25/02

Completed: 03/25/02

Boring Depth (feet bgs): 27.50

Boring Diameter (inches): 6.00

Logged By: VICTORIA COKER

Logging Consultant: TETRA TECH

Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS

Project No: G9016.003

Location: PARCEL E IR-01/21 LANDFILL

Ground Surface Elevation (feet MSL):

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	0	6						GP	POORLY GRADED GRAVEL: gravel 0.5- to 2.0-inch diameter; (Artificial Fill)
2	9	NR						SP	POORLY GRADED SAND WITH GRAVEL: very dark gray sand; 30 percent angular gravel
3	18	23						CL	LEAN CLAY: brown; stiff; with 10 percent gravel, up to 1.5-inch diameter
4	18	26						WF	WASTE FILL: 100 percent wood, metal, and paper debris; hydrocarbon staining; strong odor
5	18	55						SP	POORLY GRADED SAND: very dark gray; saturated; sand is coarse grained; 10 percent wood debris; 30 percent gravel (0.5- to 1-inch diameter); petroleum staining
6	2	53						CL	BAY MUD: very dark gray (5Y 3/1); lean clay with fine sand; petroleum staining; shell fragments
7	5	100							
8	1	50							
9	2	NR							
10	0	NR							
11	1	30							
12	1	NR							
13	13	27							
14	11	32							
15	14	25							
16	0	8							
17	18	14							
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									Total Depth of Boring = 27.5 Feet
29									
30									
31									
32									
33									
34									
35									



Log of Boring: TPBWE10B

Logged By: VICTORIA COKER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL): 17.03

Drilling Method: HSA
Boring Started: 03/26/02
Completed: 03/26/02
Boring Depth (feet bgs): 26.50
Boring Diameter (inches): 6.00

DEPTH (FEET)	DRIVE INTERVAL RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0								Ground Surface
1							SP	CONCRETE SLAB
2								
3	22							
4				3.3				POORLY GRADED SAND: black (10YR 2/1); 5 percent gravel; gravels are subangular, up to 1.5-inch diameter; some wood debris
5	0						CL GP	SANDY LEAN CLAY: dark yellowish brown (10YR 3/4); some wood debris
6								
7							CL	POORLY GRADED GRAVEL: wet; 1/2- to 2-inch diameter
8	18							LEAN CLAY: very dark grayish brown (10YR 3/2); moist; 10 percent subangular gravel, up to 1/2-inch diameter
9								
10	0							
11								
12								
13								
14								
15	0							
16								
17								
18	27						sp	POORLY GRADED SAND: course grained; (GLEYS 3/5G) dark greenish gray; petroleum staining; saturated.
19								
20	54							
21								
22								
23							ch	BAY MUD DEPOSITS: 15 percent shell fragments
24								
25								
26								
27								Total Depth of Boring = 26.5 Feet
28								
29								
30								
31								
32								
33								
34								
35								



Tetra Tech EM INC.

Log of Boring: TPBWE10C

Drilling Method: HSA
Boring Started: 03/27/02
Completed: 03/27/02
Boring Depth (feet bgs): 18.00
Boring Diameter (inches): 6.00

Logged By: VICTORIA COKER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL): 16.86

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1									ASPHALT AND CONCRETE: black staining beneath
2								SC	SANDY CLAY: reddish brown (5YR 4/4); slightly moist; 20 percent fine- to medium-grained sand; occasional fine-grained gravel
3									
4									
5									
6					1.3			CL	LEAN CLAY WITH GRAVEL: slightly moist; 10 percent fine-grained gravel; no staining
7									
8								GP	POORLY GRADED GRAVEL: gravel is serpentinite in content; slightly moist; fine- to medium-grained gravels; no odor
9									
10									
11					0				
12	18	9			3			SC	SANDY CLAY: very dark gray (2.5Y 3/1); slightly moist; 30 percent fine sand; 70 percent lean clay; no odor Color changes to very dark gray (GLEY1 3/N) very dark gray
13									
14	18	16			3				
15									
16	14	9			2.7			CH	BAY MUD DEPOSITS: 40 percent shell fragments
17									
18	18	20							
19									Total Depth of Boring = 18 Feet
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									



Tetra Tech EM INC.

Log of Boring: TPBWE10D

Drilling Method: HSA

Boring Started: 03/27/02

Completed: 03/27/02

Boring Depth (feet bgs): 15.50

Boring Diameter (inches): 6.00

Logged By: VICTORIA COKER

Logging Consultant: TETRA TECH

Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS

Project No: G9016.003

Location: PARCEL E IR-01/21 LANDFILL

Ground Surface Elevation (feet MSL): 16.84

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	13	19			3.4			SP	POORLY GRADED SAND WITH GRAVEL: black (5YR 2.5/1); moist; 40 percent subangular gravel (0.5- to 1-inch diameter); stiff clay
2	16	24			3			CL	LEAN CLAY WITH GRAVEL: dark reddish brown (5YR 3/3); with 20 percent subangular to angular gravel (0.5- to 1.5-inch diameter); gravel is serpentinite in content
3	16	31			3				
4	14	34			2				
5	16	10			2				
6	14	40			2				
7	11	18			3.7			SM	SILTY SAND: (GLE Y1 4/5G); with 40 percent gravel (0.5- to 2.0-inch diameter)
8	13	16			3.7				
9	14	16			3.7	11 IN		SC	CLAYEY SAND WITH GRAVEL: saturated; angular serpentinite gravel (0.5- to 1.5-inch diameter)
10	11	22			3				
11									Total Depth of Boring = 15.5 Feet
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									



Tetra Tech EM INC.

Log of Boring: TPBWE10E

Drilling Method: HSA

Boring Started: 03/27/02

Completed: 03/27/02

Boring Depth (feet bgs): 17.00

Boring Diameter (inches): 6.00

Logged By: VICTORIA COKER

Logging Consultant: TETRA TECH

Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS

Project No: G9016.003

Location: PARCEL E IR-01/21 LANDFILL

Ground Surface Elevation (feet MSL): 16.65

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1								CL	LEAN CLAY: dark yellowish brown (10 YR 3/4); stiff, less than 5 percent angular gravel
2	18	25							
3					2.3				
4	18	59							
5					2.3				
6	14	18						GP	POORLY GRADED GRAVEL: dark yellowish brown (10YR 3/4); 0.5- to 1.5-inch diameter; petroleum staining
7					2				
8	14	14						CL	LEAN CLAY WITH GRAVEL: dark yellowish brown (10 YR 3/4); 20 percent serpentinite gravel (0.5- to 1.5-inch diameter)
9					1.3				
10	18	23							
11					5.8				
12	14	14							
13					3.4				
14	14	6						SP	POORLY GRADED SAND WITH GRAVEL: gravel is subangular (0.5- to 7.5-inch diameter); about 20 percent serpentinite gravel.
15					3.4				
16	14	10							
17					3				
18	11	8							
19									
20	7	23							
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
									Total Depth of Boring = 17 Feet



Tetra Tech EM INC.

Log of Boring: TPBWE11

Logged By: VICTORIA COKER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL):

Drilling Method: HSA
Boring Started: 03/25/02
Completed: 03/25/02
Boring Depth (feet bgs): 27.00
Boring Diameter (inches): 6.00

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0	0								Ground Surface
1	18	10						SM	SILTY SAND WITH GRAVEL: dark brown; 10 percent gravel
2	18	4							
3	18	9							
4	18	10						CL	LEAN CLAY WITH GRAVEL: dark gray; 10 percent gravel; wood debris
5	18	10							
6	18	6						SC	CLAYEY SAND WITH GRAVEL: reddish brown; moist; stiff; 30 percent angular gravel (0.5- to 2.0-inch diameter)
7	18	7							
8	18	7							
9	2	58							
10	2	56						SP	POORLY GRADED SAND WITH GRAVEL: bluish green; 20 percent subangular gravel (0.5- to 2.5-inch diameter); increasing gravel with depth; trace wood fragments; petroleum staining
11	11	23							
12	11	15							
13	11	15							
14	11	15							
15	13	27							
16	13	27							
17	0	26							
18	18	27							
19	18	27							
20	5	28							
21	16	31							
22	16	31							
23	4	40							
24	18	7							
25	18	7						CH	BAY MUD: fat clay, with 5 percent shell fragments
26	18	6							
27									Total Depth of Boring = 27 Feet
28									
29									
30									
31									
32									
33									
34									
35									



Tetra Tech EM INC.

Log of Boring: TPBWE14

Drilling Method: HSA

Boring Started: 04/02/02

Completed: 04/02/02

Boring Depth (feet bgs): 20.00

Boring Diameter (inches): 6.00

Logged By: VICTORIA COKER

Logging Consultant: TETRA TECH

Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS

Project No: G9016.003

Location: PARCEL E IR-01/21 LANDFILL

Ground Surface Elevation (feet MSL): 8.10

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	14	68			0			CL	LEAN CLAY: brown (10YR 4/3); with brick and gravel up to 2.5-inch diameter
2	5	50			0			GP	POORLY GRADED GRAVEL WITH SAND: black; 80 percent gravel; occasional wood debris
3					0				
4	16	13			0				
5	0	NR			0				
6					0				
7	7	17			0				
8	7	23			0				
9	7	50			0				
10					0			WF	WASTE FILL: wood plastic, cloth, and metal debris; with coarse black sand
11	5	50			0				
12					0				
13	7	47			0				
14	9	83			0				
15					0				
16	14	NR		W33W001				SC	CLAYEY SAND: saturated with petroleum
17	18	NR						CH	BAY MUD: with wood debris and metal and shell fragments; petroleum staining
18									
19	18	NR							
20									Total Depth of Boring = 20 Feet
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									



Tetra Tech EM INC.

Log of Boring: TPBWE19B

Logged By: VICTORIA COKER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL):

Drilling Method: HSA
Boring Started: 04/01/02
Completed: 04/01/02
Boring Depth (feet bgs): 19.00
Boring Diameter (inches): 6.00

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION	
0									Ground Surface	
1	7	16			0			CL	LEAN CLAY: very dark grayish brown (10YR 3/2); wood; some gravel, up to 2-inch diameter	
2					0			CL		
3	4	4			0					
4					0					
5	13	10			0				Gravel content increases to 20 percent; moist	
6	7	4			0					
7	7	11			0					
8					0				SC	CLAYEY SAND WITH GRAVEL: dark greenish gray (GLE Y1 3/10GY); with 40 percent subangular gravel, up to 1.5-inch diameter
9	13	50			0					Color changes to brown (10YR 4/3)
10					0					
11	11	50			0					
12	7	50							CL	LEAN CLAY: occasional wood debris; with 10 percent angular to subangular gravel
13	7	50								
14										
15										
16								GP	POORLY GRADED GRAVEL: saturated	
17									Sampler broken	
18										
19									Total Depth of Boring = 19 Feet	
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										



Tetra Tech EM INC.

Log of Boring: TPBWE20B

Logged By: VICTORIA COKER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL): 13.59

Drilling Method: HSA
Boring Started: 04/01/02
Completed: 04/01/02
Boring Depth (feet bgs): 19.00
Boring Diameter (inches): 6.00

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	14	10			0			CL	LEAN CLAY WITH GRAVEL: dark brown (10YR 3/3); 20 percent gravel, up to 2-inch diameter
2					0				
3	18	20			0				
4	18	21			0				
5					0				
6	7	29			0			SC	CLAYEY SAND: black (10YR 2/1); 5 percent subangular gravel, up to 0.5-inch diameter; wood debris
7	13	50			0				
8					0				
9	14	50			0			GP	POORLY GRADED GRAVEL.
10	16	47			0				
11					0				
12	7	56			0			SP	POORLY GRADED SAND WITH GRAVEL: saturated; 30 percent gravel, up to 1.5-inch diameter; wood debris; petroleum staining
13					0				
14	11	50			0				
15	11	50			0				
16	18	50		W31W001	0				
17									
18	4	12						CH	BAY MUD: fat clay; with shell fragments
19									Total Depth of Boring = 19 Feet
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									



Tetra Tech EM INC.

Log of Boring: TPBWE21A

Logged By: VICTORIA COKER
Logging Consultant: TETRA TECH
Drilling Company: GREGG

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL): 15.43

Drilling Method: HSA
Boring Started: 04/01/02
Completed: 04/01/02
Boring Depth (feet bgs): 22.00
Boring Diameter (inches): 6.00

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0									Ground Surface
1	7	14						SP	POORLY GRADED SAND WITH GRAVEL: very dark grayish brown (10YR 3/2); 40 percent gravel, up to 2-inch diameter
2									
3	16	NR						CL	LEAN CLAY: dark yellowish brown (10YR 4/4); less than 5 percent gravel
4	14	23							
5	16	17							
6	16	17							SANDY CLAY: dark greenish gray (GLE Y1 3/5G); moist; some serpentinite sand; petroleum staining; wood debris
7	14	83							
8									
9	7							WF	WASTE FILL: dark greenish gray (GLE Y1 3/5G); serpentinite gravel with sand; wood and paper debris; black staining
10									
11	11								
12	16								
13	18					N		SC	CLAYEY SAND: dark greenish gray (GLE Y1 3/5G); petroleum staining; some gravel
14	14								
15	14								Color changes to brown
16	7								
17									
18	0								
19	18								
20									
21	18								
22									Total Depth of Boring = 22 Feet
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									



Tetra Tech EM INC.

Log of Boring: TPBWE23B

Drilling Method: DIRECT-PUSH
Boring Started: 09/03/02
Completed: 09/03/02
Boring Depth (feet bgs): 12.00
Boring Diameter (inches): 4.00

Logged By: VICTORIA COKER/JAMES MEDLEY
Logging Consultant: TETRA TECH
Drilling Company: VIRONEX

Project: PARCEL E NONSTANDARD DATA GAPS
Project No: G9016.003
Location: PARCEL E IR-01/21 LANDFILL
Ground Surface Elevation (feet MSL):

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0		19							Ground Surface
1					19.2			SM	SILTY SAND WITH GRAVEL: greenish black (GLEY1 2.5/5G); 20 percent fine gravel; wood, plant material, and roots
2									
3									
4		19	N/A		19.2			CH	BAY MUD: fat clay, with 20 percent gravel
5									BAY MUD DEPOSITS: saturated, with 5 percent shell fragments
6									
7									
8		29							
9									
10					28.8				
11									
12									Total Depth of Boring = 12 Feet
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
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30									
31									
32									
33									
34									
35									



Tetra Tech EM INC.

Log of Boring: TPBWE24

Drilling Method: DIRECT-PUSH

Boring Started: 09/03/02

Completed: 09/03/02

Boring Depth (feet bgs): 12.00

Boring Diameter (inches): 4.00

Logged By: VICTORIA COKER/JAMES MEDLEY

Logging Consultant: TETRA TECH

Drilling Company: VIRONEX

Project: PARCEL E NONSTANDARD DATA GAPS

Project No: G9016.003

Location: PARCEL E IR-01/21 LANDFILL

Ground Surface Elevation (feet MSL):

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0		24	N/A						Ground Surface
1					19.2			SP	POORLY GRADED SAND WITH GRAVEL: greenish black (GLEY1 2.5/5G); 30 percent gravel; 10 percent plant material and roots
2									Some shell fragments
3									
4		24	N/A		19.2				
5									
6									
7									
8		24	N/A		19.2			CH	BAY MUD: fat clay; 10 percent shell fragments
9									
10									
11									
12									Total Depth of Boring = 12 Feet
13									
14									
15									
16									
17									
18									
19									
20									
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35									



Tetra Tech EM INC.

Log of Boring: TPBWE25

Drilling Method: DIRECT-PUSH

Boring Started: 09/03/02

Completed: 09/03/02

Boring Depth (feet bgs): 12.00

Boring Diameter (inches): 4.00

Logged By: VICTORIA COKER/JAMES MEDLEY

Logging Consultant: TETRA TECH

Drilling Company: VIRONEX

Project: PARCEL E NONSTANDARD DATA GAPS

Project No: G9016.003

Location: PARCEL E IR-01/21 LANDFILL

Ground Surface Elevation (feet MSL):

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION	
0		24	N/A					SM	Ground Surface	
1					19.2			SM	SILTY SAND: dark reddish brown (5YR 3/3); 10 percent gravel; no debris	
2									SM	Minor iron oxide staining at 4 to 5 feet; black staining and petroleum odor at 7 to 8 feet
3										
4		24	N/A		19.2					
5										
6										
7										
8		24	N/A		19.2			CH	BAY MUD: fat clay; no staining; no debris	
9									CH	
10										
11										
12									Total Depth of Boring = 12 Feet	
13										
14										
15										
16										
17										
18										
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35										



Tetra Tech EM INC.

Log of Boring: TPBWE26

Drilling Method: DIRECT-PUSH

Boring Started: 09/03/02

Completed: 09/03/02

Boring Depth (feet bgs): 12.00

Boring Diameter (inches): 4.00

Logged By: VICTORIA COKER/JAMES MEDLEY

Logging Consultant: TETRA TECH

Drilling Company:

Project: PARCEL E NONSTANDARD DATA GAPS

Project No: G9016.003

Location: PARCEL E IR-01/21 LANDFILL

Ground Surface Elevation (feet MSL):

DEPTH (FEET)	DRIVE INTERVAL	RECOVERY (IN)	BLOW COUNTS	SAMPLE ID	OVM (PPM)	WATER LEVEL	GRAPHIC LOG	USCS SOIL TYPE	DESCRIPTION
0		29							Ground Surface
1					28.8			SM	SILTY SAND WITH GRAVEL: brown; 40 percent gravel
2									
3								SP	POORLY GRADED SAND: dark brown (10YR 3/3); 10 percent gravel
4	17				16.8				
5									
6									
7									
8	17				16.8			CH	BAY MUD: fat clay
9									
10									
11									
12									Total Depth of Boring = 12 Feet
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
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**APPENDIX D
RESPONSES TO REGULATORY AGENCY COMMENTS ON THE
DRAFT PARCEL E NONSTANDARD DATA GAPS INVESTIGATION,
LANDFILL LATERAL EXTENT EVALUATION**

RESPONSES TO REGULATORY AGENCY COMMENTS ON THE DRAFT NONSTANDARD DATA GAPS INVESTIGATION, LANDFILL LATERAL EXTENT EVALUATION, HUNTERS POINT SHIPYARD, SAN FRANCISCO, CALIFORNIA

This document presents the U.S. Department of the Navy's (Navy) responses to comments from the regulatory agencies on the "Draft Nonstandard Data Gaps Investigation, Landfill Lateral Extent Evaluation, Hunters Point Shipyard, San Francisco, California" (hereinafter referred to as the "landfill lateral extent evaluation report"), dated May 2003. The comments addressed below were received from (1) the U.S. Environmental Protection Agency (EPA) on June 20, 2003; (2) the California Department of Toxic Substances Control (DTSC) on June 26, 2003; and (3) the San Francisco Bay Regional Water Quality Control Board (Water Board) on June 30, 2003.

RESPONSES TO COMMENTS FROM EPA

Preliminary Comment

- 1. Comment:** EPA has concerns regarding the delineation boundary. For example, the delineation of the landfill boundary along the southwest side of the landfill seems to require a somewhat arbitrary delineation between the landfill waste and the fill used to create the land upon which the landfill was then constructed. The artificial fill contains large quantities of construction debris, which almost certainly includes lead paint and asbestos. The boring log for boring IR01B048 indicates that "abundant debris" was encountered at six feet below the ground surface and the boring reached refusal at 8 feet. This boring is located approximately 300 feet southwest of the proposed landfill boundary. The trench log for exploratory trench WE17F is as follows:

4 feet: Large gravel fill; dark stained wet soils but no detections on meter, 60 to 70 percent gravel, large pieces of metal

6 feet: Little brick and wood (less than 10 percent)

The Navy concluded that this trench marks the end of the landfill since the anthropogenic materials uncovered in the trench were different than the waste observed in the in-board trenches (WE17E and D).

As the final location of the landfill boundary along the southwest boundary of the landfill will have to be somewhat arbitrary because fill materials are also found southwest of the landfill boundary, the remedial project managers should discuss whether the landfill boundary is appropriate and to consider whether the materials used to fill the Bay prior to the use of the site as a landfill pose a threat to human health or the environment. A final determination of the acceptability of the Navy-proposed landfill limits will likely be delayed until the Navy releases the results of the chemical analyses on the soil samples collected during the landfill delineation study as this will

allow the remedial project managers to assess the threat posed by the anthropogenic materials in the fill around the landfill.

Response: The objective of the investigation of the extent of solid waste at the Landfill was to delineate the extent of solid waste. Soil contamination in the vicinity of the Landfill will be evaluated further in the forthcoming Parcel E-2 remedial investigation (RI) and feasibility study (FS). The extent of solid waste is delineated based on (1) the physical presence of observed industrial and municipal-type waste and (2) the extent of solid waste fill operations as shown on historical maps and aerial photographs. The Landfill lateral extent evaluation report differentiates between the solid waste refuse and construction debris and fill material. Visual observation of waste material and review of historical maps and photographs are standard methods recommended in regulatory guidance to delineate landfills. The use of trenches and borings to delineate the lateral extent of solid waste at the Landfill is consistent with regulatory guidance and the field sampling plan and quality assurance project plan (FSP/QAPP) for the nonstandard data gaps investigation (Tetra Tech EM Inc. [Tetra Tech] 2002a). The FSP/QAPP focused the investigation on areas of the Landfill where the solid waste material had not been adequately delineated, specifically in the Landfill's northwestern and northern perimeters and the southern perimeter adjacent to San Francisco Bay (Bay).

As part of the Parcel E-2 RI/FS, the Navy will evaluate surrounding soils, including artificial fill that EPA stated "almost certainly includes lead paint and asbestos," to assess whether removal or remedial action is warranted. The construction debris and soil fill consist principally of concrete (some pieces contain metal rebar), wood, asphalt, sand, brick, and soil fill. Borings drilled in the area of the landfill frequently encounter refusal because of the abundance of large pieces of concrete. Samples of concrete generally cannot be obtained without the use of a core bit, and field geologists overseeing sampling operations typically record the refusal as caused by encountering "abundant debris." The term "abundant debris" is not synonymous with solid waste refuse, however. Figure 5 of the report has been revised to include boring WE17F within the Landfill because a limited amount of metal was found at 4 feet below ground surface (bgs).

Previous investigations have confirmed isolated areas of solid waste outside of the Landfill, including areas to the southwest. The Navy will address these areas under the Parcel E-2 RI/FS.

Soil samples were collected during the investigation to supplement the standard data gaps investigation and assist in evaluating potential impacts to soils adjacent to the solid waste. No solid waste samples were collected during the landfill lateral extent investigation. Chemical impacts to soil will be presented and discussed in the Parcel E-2 RI/FS report. Analytical results for the soil samples are not included in this report. The final landfill lateral extent evaluation report will be included as an appendix to the Parcel E-2 RI/FS report.

General Comment

- Comment:** The Navy collected a large number of soil samples from the trenches and borings installed as part of the landfill delineation effort. The Navy indicates that the results of the chemical analyses performed on these soil samples will be reported later. For completeness, the results should also be reported in the landfill delineation effort, at least on the compact disk that accompanies the report. Please revise the report to include the results of the chemical analyses conducted on the soil samples collected during the delineation effort or show why this is impracticable.

Response: As stated in the response to preliminary comment number 1, chemical characterization of the adjacent soils and evaluation of impacts to soil from solid waste will be presented and discussed in the Parcel E-2 RI/FS report. The soil samples were collected to supplement analytical data collected as part of the standard data gaps investigation. Both sets of data, along with historical data, will be evaluated in the FS, to obtain a more complete picture of impacts adjacent to the solid waste. Analytical results for the soil samples collected during the landfill lateral extent investigation were not intended to assist in delineation of the solid waste extent and are therefore not included in this report. Analytical results for the soil samples collected during the landfill lateral extent investigation will be presented in the forthcoming Parcel E data summary report ([Tetra Tech pending](#)). The final landfill lateral extent evaluation report will be presented as an appendix to the Parcel E-2 RI/FS report.

Specific Comments

- Comment:** **Figures 4 and 5, Revised Landfill Extent:** It is unclear how the landfill boundary was determined along about 300 feet of the southwestern edge (between C25 and IR10B028), because there are no borings or test pits. Please explain why test pits or borings were not done in this area and how the extent of waste was determined. Similarly, it is unclear how the eastern extent of waste was determined; the description in Section 3.2.2 explains that this is based on aerial photographs and maps, but this information is not provided and there is only one boring (IR01B023) near the boundary along an 800 or 900 foot perimeter. Please explain why the eastern extent of waste should be considered accurately represented by the smooth curve drawn on these figures when the western edge of waste is fairly irregular and provide the maps and aerial photographs that were used to make this determination.

Response: The areas investigated included the Landfill's northwestern and northern perimeters and the Landfill's southern perimeter adjacent to the Bay. Neither the southwestern nor the eastern landfill perimeters were included for investigation in the FSP/QAPP.

The extent of solid waste in the eastern area of the Landfill was investigated during the original RI for Parcel E and was documented in the draft final Parcel E RI report (Tetra Tech, Levine-Fricke-Recon, and Uribe & Associates 1997). The eastern extent of solid waste was revised during this investigation to agree with historical maps and aerial photographs of the Landfill. The eastern extent was further revised after additional review of the historical data in preparing these responses to the agencies' comments. Copies of the most relevant maps are provided as an attachment to these responses to comments. Copies of the historical aerial photographs are provided in the FSP/QAPP for the standard data gaps investigation (Tetra Tech 2002b). The eastern area was not investigated further as part of the landfill lateral extent investigation because the eastern area had been delineated previously.

The western area is moderately irregular in shape because it includes the former oily waste treatment area. According to the 1997 RI report, the ponded liquid in the oily waste treatment area was removed at closure, and the top 6 inches of soil was scarified before the soil cover was placed (Tetra Tech, Levine-Fricke-Recon, and Uribe & Associates 1997). The Navy has included this area within the defined lateral extent of solid waste because the trenches and borings indicate that solid waste was placed in this area during closure.

2. Comment: **Figures 7 through 12: It is unclear why solid lines were used to delineate the extent of lithologic units in areas where there is no data. It is standard industry practice to use dashed lines. For example, on Figure 7 the southern extent of waste is an abrupt vertical line, but the nearest borings are about 105 and 110 feet away and there are no test pits in this vicinity. Please revise the cross sections to use dashed lines where there is no lithologic data.**

Response: The Navy has revised Figure 7 of the final report to show dashed lines to represent the southern extent of the waste. However, solid lines will continue to appear on cross sections based on lithologic, visual, or documented data used to establish the extent of the lithologic units.

3. Comment: **Figure 7, Cross Section A-A ': According to the boring log, the bottom 4 feet of the screened interval of IR01MW03A is poorly graded sand, but Figure 7 indicates that the poorly graded sand is below the screened interval. Please resolve this discrepancy.**

Response: The Navy has revised [Figure 7](#) of the final report as requested. The length of the screened interval for well IR01MW03A was increased to be consistent with the well log.

4. **Comment:** **Figure 7, Cross Section A-A ':** The log for boring SG01B indicates that the interval between 10.5 and 20 feet below ground surface (ft bgs) is clay with 10 per cent sand and occasional gravel, but the lithology on the cross-section is sand. Please resolve this discrepancy.

Response: The Navy has revised [Figure 7](#) of the final report as requested. The interval between 10.5 to 20 feet bgs for boring SG01B was revised to indicate that the lithology is clay.

5. **Comment:** **Figure 7, Cross Section A-A' and Figure 10, Cross Section D-D':** According to the boring log, the sand just above the screened interval of IR01MW02B is black sand with wood. This may be sand blast grit, which is a waste rather than the non-waste sand symbol used on the log. It appears that this would correspond more closely with the depth waste was observed in adjacent boring IR01B001. Please revise the cross-section to indicate that waste extends to the depth of the top of the screen in the vicinity of IR01MW02B.

Response: Because of the presence of trace wire from 19.5 to 27 feet bgs as indicated in the log for well boring IR01MW02B and trace cloth debris from 23 to 27 feet bgs shown in the log for well boring IR01MW03A, the designation for these intervals was revised to indicate waste on [Figures 7 and 10](#).

6. **Comment:** **Figure 8, Cross Section B-B' and Figure 12, Cross Section F-F':** The log for IR01MW38A indicates that the lithology in the bottom two feet of the well screen is a black fat clay with traces of aluminum. The presence of aluminum suggests that this is fill, not native materials. Please resolve this discrepancy.

Response: The Navy has revised [Figures 8 and 12](#) of the final report as requested. The 18- to 20-foot bgs depth interval on boring log IR01MW38A is now designated as waste.

7. **Comment:** **Figure 8, Cross Section B-B':** The thickness of poorly graded sand in IR01MW18A is only 10 feet on the boring log, but is shown as about 14 feet on [Figure 8](#). The thickness of this unit is correct on [Figure 11](#). Please resolve this discrepancy.

Response: The Navy has revised [Figure 8](#) of the final report to show the bottom of the waste at 18 feet bgs and the thickness of the sand to be 10 feet in the boring log for well IR01MW18A.

8. **Comment:** **Figure 8, Cross Section B-B': It is unclear how it was determined that waste ends just beyond TPBWE14 and does not extend beneath the bay. Please explain how the limit of waste was determined since the waste found in boring TPBWE14 extends from 9.5 to 15.5 feet below the ground surface.**

Response: The Navy identified the southern extent of solid waste on [Figure 8](#) by extrapolating the rapid decrease in waste thickness toward the Bay shown on boring log TPBWE14 compared with the thicker waste sequence shown on boring log IR01B039. Available data indicate that no solid waste has been found beneath the Bay. Results for samples collected from test pits along the Bay shore (WE15 and WE22) showed only undisturbed Bay Mud (please see [Appendices A and B](#) of the landfill lateral extent evaluation report).

9. **Comment:** **Figure 8, Cross Section B-B': The sand unit in SG04 (between 8 and 10 ft bgs) is only 2 feet thick according to the boring log, but this unit is shown as 5 feet thick on this cross section. Please resolve this discrepancy.**

Response: The Navy has revised [Figure 8](#) of the final report as requested. The interval from 10 to 16 feet bgs for boring SG04 was revised to indicate clay.

10. **Comment:** **Figure 9, Cross Section C-C': The log of boring GMP13 and the portrayal of this boring on the cross section may be inconsistent. The log indicates that the interval between 3 and 6 feet bgs is "CLAY and gravel," but this unit is classified with the lithologic label sc on the log and drawn as sand on the cross section. The classification on the log and the depiction as sand appear to be incorrect. Please resolve these discrepancies.**

Response: The Navy has revised boring log GMP13 in the landfill gas characterization report ([Tetra Tech 2003](#)) to be consistent with the lithology shown in the field log. [Figure 9](#) of the final landfill lateral extent evaluation report shows the correct lithology at boring GMP13. [Figure 9](#) therefore has not been revised in response to this comment.

11. **Comment:** Figure 9, Cross Section C-C': The log for boring GMP18 indicates that clayey sand extends from 0 to 5 ft bgs, but the thickness of this unit on the cross-section appears to be at least 8 feet. Please resolve this discrepancy.
- Response:** The Navy has revised Figure 9 of the final report to be consistent with boring log GMP18.
12. **Comment:** Figure 9, Cross Section C-C': There is little resemblance between the boring log for IR74MW01A and the depiction of the lithology in the vicinity of this boring on Cross Section C-C'. The cross section indicates that the lithology from 0 to 13 ft bgs is sand, then from 13-14.5 ft bgs, gravel, then below 14.5 feet, bedrock. The log for this boring indicates that sand only extends from the surface to 2.5 or 3 ft bgs, then gravel extends to 16 ft bgs, and bedrock is found below 16 ft bgs. Please revise the cross section to depict the correct lithology.
- Response:** The Navy has revised Figure 9 of the final report to be consistent with boring log IR74MW01A.
13. **Comment:** Figure 11, Cross Section E-E': The log for IR01MW17B indicates that the sample from the unit labeled "gw-fill, concrete and brick" had a sheen, so it is unclear why this unit is not considered waste. The log also indicates that the material was black. Please explain why this unit is not considered waste or change the symbol to waste on the cross-section.
- Response:** The purpose of the solid waste delineation is to identify the physical extent of solid waste. The composition of the material at 19 to 29.5 feet bgs shown on boring log IR01MW17B is consistent with construction debris fill. The sheen indicates there may also be a potential impact from petroleum hydrocarbons.
14. **Comment:** Figure 11, Cross Section E-E': There is no correspondence between the log for SG03 and the lithology shown on the cross section in the vicinity of this boring. The log for SG03 indicates that the lithology from 0 to 2 ft bgs is clay, and the unit below this is sand to 16 ft bgs, but the lithology on the cross section indicates that sand extends from 0 to 4 ft bgs and clay extends from 4 to about 14 ft bgs. As drawn, the lithology indicates an abrupt change between this boring and IR01B015, which is only located a few feet east of SG03, so it appears that the wrong boring log was used when the cross section was constructed. Please correct the lithology on the cross section.

Response: The boring log on Figure 11 was incorrectly labeled SG03 instead of SG23. The Navy has revised [Figure 11](#) of the final report to indicate that the log shown is SG23. However, the lithology for the log is correctly portrayed on the figure in the draft report, so the lithology has not been revised.

15. Comment: **Figure 12, Cross Section F-F': The boring log of SG21 and the lithologic label (sc) on the cross section indicate that the lithology between 6 and 8 feet bgs is clayey sand, but the cross section uses the color for clay in this depth interval. Please resolve this discrepancy.**

Response: The Navy has revised [Figure 12](#) of the final report to show the color of sand for the 6- to 8-foot bgs depth interval of boring SG21.

Minor Comment

1. Comment: **Figures 7 through 12: The deep borings have occasional horizontal tick marks, but it is unclear what these tick marks represent. For example, for IR01B025, there are tick marks at about 31 feet below mean sea level (msl) and -66 feet msl. In some areas, like the vicinity of IR01B001 and IR01MW03A, there are numerous tick marks within a few feet, but it is not clear that the tick marks have significance. Please define the tick marks in the legend or remove them.**

Response: The tick marks represent changes in facies on the boring logs (for example, a change from “SP,” poorly sorted sand, to “SW,” well-sorted sand, to “CL,” low plasticity clay). The Navy has revised the legends on [Figures 7 through 12](#) of the final report to include a definition for the tick marks.

RESPONSES TO COMMENTS FROM DTSC

General Response: The Navy has reviewed the comments from DTSC and has concluded that the comments primarily address the classification of waste and present inquiries about analytical results for samples collected during the landfill lateral extent investigation. Therefore, before the Navy responds to DTSC’s specific comments, a general discussion is presented below on fill types and waste characterization to serve as a frame of reference. The landfill lateral extent evaluation report has been revised to include some of the discussion below.

The following four solid media types are located at Parcel E:

- **Native soil**, including the subsurface geological units
- **Soil and rock** used to fill the Bay and create new land, generally from leveling the eastern portion of the ridge at Hunters Point Shipyard (HPS) and spoil dredged to deepen channels in the Bay for shipbuilding and repair operations
- **Construction debris** used as fill to further expand the land at HPS, frequently in areas where the dredge spoil was spread
- **Solid waste** from domestic, commercial, and industrial activities at HPS that was disposed of in a landfill

The soil and rock fill and construction debris were placed specifically to build and expand the HPS peninsula. During its history, many inlets and other portions of the Bay were filled to create usable land for industrial and domestic purposes. Many areas of the City and County of San Francisco consist of areas of similar fill created using construction debris generated after earthquakes; these areas were filled both to dispose of the earthquake-derived waste material and to create new real estate. Although these practices are out of favor today, they were used routinely in the past and created significant properties around the Bay.

Delineation of the extent of solid waste at the Landfill is based on the physical presence of municipal, commercial, and industrial wastes. Construction debris is typically inert, which means it will not chemically react. Inert waste does not contain hazardous waste or designated waste that contains soluble pollutants at concentrations that exceed applicable water quality objectives. Furthermore, it does not contain significant quantities of decomposable waste (as defined in Title 27 of the *California Code of Regulations*, Section 20230). Inert fill material has little capacity to generate leachate that may create risks to human health or the environment. For these reasons, the construction debris is not included in the definition of solid waste.

In delineating the extent of the Landfill at HPS, native soil, soil and rock fill, and construction debris are the primary landmass upon which the Landfill was constructed. The construction debris includes concrete, brick, wood, gravel, sand, asphalt, and limited amounts of ceramics, glass, and metal (primarily as rebar in the concrete). Based on boring and trench logs, solid waste placed in the Landfill consists primarily of wood, paper, plastic, metal, glass, nails, Styrofoam, wire, cloth, rubber, and ceramics. The solid waste is mixed with construction debris in many areas within the Landfill. The area immediately west of the Landfill was used to handle and treat oily waste materials. Based on borings and exploratory trenches in this area, the oily waste treatment area was partially filled with solid waste at closure. This oil waste treatment area is included within the solid waste extent. The Navy will evaluate soil surrounding the solid waste

against potential screening level risks in the Parcel E-2 RI/FS report to help assess whether removal or remedial action is warranted.

The Landfill ceased operations in the early 1970s, but subsequent activities created isolated areas of solid waste. During closure, 2 feet of compacted soil was placed on the Landfill, and the entire surface was graded to facilitate drainage. The Landfill Area was leased to Triple A Machine Shop, Inc. (Triple A) from 1976 to 1986. Triple A disposed of industrial debris, sandblast waste, oily industrial sand, and asphalt at isolated locations around the Landfill Area. These materials were generally dumped at the ground surface and created isolated areas of waste within Parcel E-2. The revised Parcel E-2 RI/FS report will present options for addressing the isolated waste areas.

The initial 10 to 15 feet of waste and fill placed on the native soil is saturated. In some areas, solid waste and fill materials exhibit a hydrocarbon sheen. However, the presence of a sheen was not used as a criterion for defining solid waste but is considered for designating areas potentially affected by petroleum hydrocarbons.

Soil samples were collected during the nonstandard data gaps investigation to supplement the standard data gaps investigation and assist in evaluating potential impacts from solid waste to adjacent soil. No solid waste samples were collected during the landfill lateral extent investigation. Historical data, data from this investigation and data from the standard data gaps investigation are required to evaluate impacts to adjacent soils. These data will be presented and evaluated in the Parcel E-2 RI/FS report. Analytical results for the soil samples are not included in the landfill lateral extent evaluation report. The final landfill lateral extent evaluation report will be presented as an appendix to the Parcel E-2 RI/FS report.

General Comments

- 1. Comment:** **Landfill versus filled land. Section 3. Composition of Landfill Waste.** There are intrinsic difficulties in distinguishing between landfill (which is designated as a yellow line on Figure 4 or as "waste" on cross sections) and filled land (which is designated on logs as "refuse" or as "fill" or as soil types with percentages of other constituents) based on visual observations only. This is especially true when the visible constituents of landfill and filled land are similar (e.g., wood, plastic, cloth, brick, paper, concrete, etc.). For the most part, it seems that the Navy has designated areas with higher percentages of visible constituents as landfill (i.e., "waste"). And, areas with lower percentages have been designated as not-landfill (i.e., as "refuse", or as "fill", or as soil types with percentages of other constituents). That is, the primary distinguishing characteristic seems to be the percentage of constituents. This fact is not clearly explicated in the text.

Response: The term “refuse” in the report is used only to refer to solid waste. The area of solid waste is differentiated from construction debris or other types of fill in the report. The report has been reviewed and corrected where necessary to better clarify the difference between solid waste and other types of soil fill or construction debris. Construction debris and soil fill exist alone in areas where new land mass was created. The Landfill comprises solid waste alone, as well as solid waste commingled with construction debris. The area designated as solid waste on [Figures 4 and 5](#) consists of the area where either solid waste alone or solid waste commingled with construction debris exists. Isolated pockets of solid waste have been identified outside the boundary shown on these figures; mitigation of these isolated solid waste areas will be addressed in the revised Parcel E-2 RI/FS report.

2. **Comment:** **Landfill extent. The extent of the landfill has not been fully determined, as detailed in *Specific Comments* below.**

Response: The extent of solid waste was defined with reasonable certainty. The FSP/QAPP focused the investigation on the areas of solid waste that had not been adequately delineated, specifically the Landfill’s northwestern and northern perimeters and the southern perimeter adjacent to the Bay.

3. **Comment:** **Title. The title of the document indicates that the lateral (horizontal) extent of the landfill is the subject of the evaluation. It is not clear why the title is limited to lateral extent only when an interpretation of the vertical extent is presented on cross sections in the document. The phrase "lateral" should be deleted from the title and the text revised as needed.**

Response: The term “lateral” in the title of the report is correct and appropriate because the principal issue of concern is the lateral extent of the Landfill as it applies to applicable or relevant and appropriate requirements, both for general regulatory standards and for the evaluation of potential screening level risks under current and future land uses. The cross sections were prepared based on recent and historical boring logs. Some of the historical borings were drilled to the base of waste. Therefore, the cross sections show the bottom of the waste as it was encountered in these historical borings. For this investigation, borings were drilled to verify the lateral extent of waste at depth, whereas the test pits were installed to identify the lateral extent near the ground surface. No new borings were drilled during the lateral extent investigation to measure the thickness or composition of waste in the middle of the Landfill.

4. **Comment:** **Criteria.** The criteria used to determine landfill extent are not sufficient. Chemical analytical results should be included as criteria for determining the extent of the landfill. A summary of results for 51 samples from test pits and 4 samples from soil borings (samples which were collected specifically for this investigation) should be included, along with QA/QC evaluation and laboratory reports. An evaluation of all chemical findings should be provided in the text. Figures showing chemical analytical results should be provided: all data above risk-based levels should be shown on figures. Please include and discuss all pertinent chemical analytical results, including RI results. Petroleum contaminated soil and stained soil should also be included as indicators of landfill extent. Contaminant odors and high field readings of volatile organic compounds (VOCs) and other landfill gases may also be relevant. Observations made during trenching for installation of the GundCurtain are also pertinent to the delineation of the landfill (along the northern perimeter and a portion of the western perimeter) and should be summarized here. This trench was essentially a very long test pit. Please indicate areas of refuse, petroleum contamination, and stained soil. Chemical analytical results for waste disposal are also pertinent.

Response: The Parcel E-2 RI/FS will include an evaluation of the extent of solid waste (the objective of this report) and an evaluation of chemical impacts to soil (data from the standard data gaps investigation and previous investigations). Soil samples were collected during the landfill lateral extent investigation to supplement the standard data gaps investigation and assist in evaluating potential impacts from solid waste to adjacent soils. No solid waste samples were collected during the landfill lateral extent investigation.

When the landfill gas barrier was installed, waste was observed extending no more than a few feet north of the trench. Waste that was encountered north of the construction trench was excavated and removed as part of construction before the barrier was installed. When waste was encountered in the northwestern and northeastern corners of the Landfill (the areas that show 90-degree angles on [Figures 4 and 5](#)), the fencing was dismantled and all waste was removed north of these areas. The fence was reconstructed after the barrier was installed. The Navy has revised the report to discuss observations made and waste removed during trenching for the gas barrier.

5. **Comment:** **Supporting data.** The extent of the landfill is not fully supported by the data presented in the document. Please include all supporting documentation. For example, include all logs (e.g., cone penetrometer test (CPT) results, standard penetration test (SPT) results, and remedial investigation (RI) logs) which were used to delineate the horizontal extent on Figure 4 and to develop cross sections. For these

comments, temporary soil gas probe (SG) and gas monitoring probe (GMP) logs were reviewed: these logs were presented in Parcel E Nonstandard Data Gaps Investigation, Landfill Gas Characterization, dated May 15, 2003. Due to time and resource constraints, RI data was not researched and reviewed.

Response: The requested data are presented in other reports that will be included as appendices to the Parcel E-2 RI/FS report. Specifically, results for cone penetrometer and standard penetration tests are presented in the landfill liquefaction report (Tetra Tech 2004a). The borings and well logs are presented in the original Parcel E RI report (Tetra Tech, Levine-Fricke-Recon, and Uribe & Associates 1997). References to the reports that contain the boring logs have been added to Table 2 of the final landfill lateral extent evaluation report. However, only boring logs for data collected during the landfill lateral extent investigation are included in this report.

6. **Comment:** Characterization of landfill "Waste". It is noted that "Waste" throughout most of the landfill has not been fully characterized.

Response: A physical description of the solid waste is included in boring and trench logs. Per EPA guidance, characterization of the landfill solid waste is not necessary to evaluate remedial alternatives.

Specific Comments

1. **Comment:** Landfill extent. These comments are preliminary, pending review of chemical analytical results and other supporting data. Comments generally refer to Figure 4.

1a. **Comment:** Northern Perimeter. The right angle (between temporary soil gas probes SG24 and SG25) is not supported. Wood debris and petroleum staining in TPBWE01 at depths greater than the nearby test pits and SGs suggest that the landfill may extend to the west beyond the limits shown. The text says that "no waste was found in test pit WE01" but the log notes "trash" and "greenish color" and photograph 6 notes "stained soil and debris in test pit WE01". The text says that boring TPBWE01 "is considered the northern extent of the landfill" but the log notes "wood debris" at 6.5 fbg and petroleum staining from 17 to 21.5 fbg. Landfill waste may be indicated at SG03A ("wood fragments") and SG03B poor recovery due to debris"). WE11 and TPBWE11 are shown as northern limits, with no stepouts to the north. But the logs show rubble, wood, and paper in WE11. And, petroleum staining from 9.5 to 24.5 fbg and trace wood fragments are noted in TPBWE11. The right angle to the west of WE11 is not

supported. Why isn't the line drawn from SG07 to SG08A? More data points may be needed to delineate between SG08A and SG08. The extent of "blackish soil" in SG08 is not determined and may warrant further investigation, since this was a sandblast grit disposal area.

Errors. The log is titled "TPBWE05" but Figure 2 shows the location as "TPBWE05-2". And, the log says "TPBWE06", but Figure 2 says "TPBWE06A ". Similarly, should "WE05" on Figure 2 be changed to "WE05-1"?

Response: During installation of the landfill gas barrier, waste was observed as extending no more than a few feet north of the trench. Waste that was encountered north of the gas barrier was excavated and removed as part of barrier construction. When waste was encountered in the northwestern and northeastern corners of the Landfill (the areas shown as 90-degree angles on [Figures 4 and 5](#)), the fencing was dismantled and all waste was removed from north of these areas. The fence was reconstructed after the barrier had been installed. Therefore, it was verified visually that solid waste does not extend beyond the gas barrier at any location.

The Navy has revised the landfill extent shown on [Figures 4 and 5](#) to include borings WE01 and TPBWE01 within the landfill extent, and the text has been revised to state that waste was found in boring WE01. Wood debris and fragments do not necessarily constitute waste because both can be construction debris fill. Similarly, petroleum staining indicates an impact, but is not a criterion for identifying solid waste.

Aerial photographs show that the area of boring SG03B was filled before 1946, which predates the Landfill. Wood fragments found in boring SG03A and debris found in boring SG03B are construction debris and not related to the Landfill. Furthermore, no evidence of solid waste or debris was found in boring SG03. Similarly, no solid waste or debris was found in borings SG07 or SG08A, nor was solid waste found around or east of SG07 when the landfill gas barrier was installed through the area. Whenever solid waste was encountered during construction of the gas barrier (for example, at the location of the 90-degree angle in the construction trench), solid waste north of the barrier was excavated and removed. The Navy has revised the report to discuss observations made and solid waste removed during construction trenching for the gas barrier, and the barrier location has been added to [Figures 4 and 5](#).

No sandblast waste was found in boring SG08. The blackish soil encountered in boring SG08 consists of 2 inches of soil within lean clay and is not sandblast waste.

On [Figure 4](#), borings TPBWE05A and TPBWE06A have been revised to borings TPBWE05 and TPBWE06. On [Figures 2, 3, and 5](#), borings TPBWE05-2 and TPBWE06A have been revised to borings TPBWE05 and TPBWE06. On [Figures 2 through 5](#), borings WE05 and WE05-2 have

been revised to borings WE05A and WE05B. The titles for test logs WE05-1 and WE05-2 have been revised to WE05A and WE05B in [Appendix A](#). In the text, test log WE05-2 has been revised to WE05B.

- 1b. Comment:** **Eastern Perimeter.** The eastern perimeter is not well defined and is controlled by one location (IR01B021) along 800 feet. At the southernmost reach of the eastern boundary as depicted, TPBWE25 is shown outside the landfill, but black staining and petroleum odor was noted on the log. Although VOCs were measured (e.g., 229.8 ppm in SG 11), no other contaminant indicators were noted on logs for SG09 to SG15. These may represent the outermost limit of the landfill based on information provided in this report (and not taking into account other supporting data).

Response: The extent of waste in the eastern area of the Landfill was investigated during the original RI and is documented in Section 4.2.3.1 of the Parcel E RI report ([Tetra Tech, Levine-Fricke-Recon, and Uribe & Associates 1997](#)). In addition, numerous historical maps and aerial photographs show the eastern extent of the Landfill. Copies of the most relevant maps are provided as an attachment to this appendix. Historical aerial photographs are provided in the FSP/QAPP for the standard data gaps investigation ([Tetra Tech 2002b](#)). The eastern area was not investigated further as part of this landfill lateral extent investigation because the eastern area had been previously delineated. After further review of the historical data in preparing this response, the eastern extent of the Landfill shown on [Figures 4 and 5](#) has been adjusted about 100 to 120 feet to the east due to shallow fill areas that appear on the historical aerial photographs.

The Navy will evaluate soil surrounding the Landfill based on analytical results from this investigation, the standard data gaps investigation, and other historical investigations to assess whether removal or remedial action is warranted in the Parcel E-2 RI/FS report. The Navy considers the lateral delineation of solid waste adequate to evaluate potential actions in the FS. Borings TPBWE25, SG09, SG10, SG11, SG12, SG13, SG14, and SG15 are outside the boundary of the Landfill and do not contain solid waste. Isolated locations of solid waste are present in the area east of and outside the delineated boundary of the Landfill. Remedial options for these isolated waste areas will be evaluated in the Parcel E-2 RI/FS report. Groundwater in the area southeast of the Landfill (generally near boring TPBWE25) is affected by hydrocarbons. These hydrocarbon impacts will be addressed as groundwater issues in the Parcel E-2 RI/FS report.

- 1c. Comment:** **Southern Perimeter.** It seems that the Navy has used the shoreline and topographic contours as criteria along the southern perimeter; however, this fact has not been clearly explicated in the text. Extent not determined from WE17F to TPBWE25 on the southern

perimeter: no stepouts to the south: Landfill extends at least to depths of 16 fbg at these locations. Stepouts should extend at least to these depths. Extent not determined from SG 19 to TPBWE24: no description was provided for WE 16 except at 1 fbg, no other data is provided between these two points, and there are no stepouts to the south. The log for WE 15 says no detections and no debris but also notes chlorine and hydrogen sulfide. How were these two gases detected? What were the concentrations? "sand saturated with petroleum" at 15.5 to 17 fbg and "wood debris with petroleum staining to 20 fbg was noted at TPBWE14. Stepouts to the south must extend at least to these depths. The "z" curve between TPBWE14 and WE22 is not supported. Also, there are no data points south of the line. Extent not determined at WE22: no description was provided except at 1 fbg, no stepouts to the south.

Response: The Landfill Area along the shore was designated for study during the lateral extent investigation. However, access was limited to the locations sampled during the field investigation by the presence of Bay water and soft sediments. Test pits were installed at locations WE15 and WE22, and only undisturbed Bay Mud was found at each location: no waste or debris was observed. Bay Mud along the shore is saturated to the ground surface much of the year, so these sediments are under reducing conditions (in other words, have low to negative reduction-oxidation potential) and therefore frequently emit a hydrogen sulfide odor (as reported during the excavation at test pit WE15). The field geologist also reported a chlorine odor similar to a swimming pool during the excavation at test pit WE15. However, no debris or disturbances that could be associated with the odor were observed.

Between test pits WE17F and TPBWE25, test pits also were installed at locations WE16, WE15, WE12, and WE22; and test pit borings were installed at locations TPBWE14, TPBWE23B, TPBWE24, and TPBWE26. Additional borings along this area include S-04, CPT-23, SG19, CPT-25, IR01B030, IR01B029, IR01B028, CPT-17, IR01MWI-3, CPT-16, S-03, IR01B380, CPT-14, S-02, SG16, IR01B038, IR01MW43A, IR01B046, IR01MW47B, and IR01B382. The area from boring IR01B028 to TPBWE25 was evaluated as part of the lateral extent investigation based on the information from the borings, visual observations, and historical maps. The historical maps for the Landfill indicate that the area to the north and within 150 feet of the shoreline in the southeast Landfill Area contain little or no solid waste. The boring log for IR01B046 supports this conclusion because no solid waste was encountered at depth in this boring, and only minimal solid waste was reported near the ground surface.

The descriptions in the test pit logs for WE15 and WE16 are for the total interval from the ground surface to 10 feet bgs ([Appendix A](#)). The test pit logs in the report have been revised to more clearly show that the descriptions apply to the complete excavation interval. Similar errors in the description for the depth interval occurred for test pits WE09, WE10, and WE22. These test pit logs have been revised to reflect that the descriptions apply to the complete excavation interval ([Appendix A](#)).

Test pit TPBWE14 contained brick, wood, plastic, cloth, metal, coarse black sand, and petroleum-stained soil and is within the area of the Landfill. The area south of test pit TPBWE14 is marshland and Bay. Site conditions prohibited access to most of this area. The s-curve in the line that shows the extent of the Landfill along the Bay follows the distribution of waste debris along the shore. Test pit WE22 was installed in the offshore Bay Mud beyond the waste debris scattered along the shoreline. No solid waste was found in test pit WE22.

The area from the WE17-series borings to WE16 was not designated for investigation in the final FSP/QAPP for the nonstandard data gaps investigation ([Tetra Tech 2002a](#)). DTSC provides no data to support the claim that waste extends to at least 16 feet bgs immediately south of this area. Therefore, the Navy considers the lateral extent delineation of the solid waste sufficiently complete to evaluate alternatives in the RI/FS report.

Debris is present at the ground surface along part of the shoreline. The delineation of the Landfill along the shoreline includes this debris within the solid waste extent when the surface debris is adjacent to areas where borings also encountered buried solid waste. Debris along the shoreline southeast of the Landfill is not included in the delineation because borings north of the area did not encounter buried solid waste. This shoreline waste southeast of the Landfill is considered an isolated area and will be addressed in the Parcel E-2 RI/FS report.

1d. Comment: Western Perimeter. The line should include "stained soils" at WE20B. Debris was noted at 6 fbgs in SG21A but nearest pit (WE 18D) was dug only to 3 fbgs and nearest SG (SG20) had a total depth of 4 fbgs. Extent at depth is not determined. The farthest southwestern extent has not been determined, but should include "dark stained" soils at SG19.

Response: Test pit WE20B is located near the former oily waste treatment area. Boring TPBWE20B was drilled in the immediate area of test pit WE20B. The boring encountered soil fill material to 17.5 feet bgs, with some wood debris and hydrocarbon-stained soil at the water table. However, solid waste was not encountered in boring TPBWE20B. The hydrocarbon

stains indicate impacts to groundwater and do not warrant designation of the fill material as solid waste.

Test pits WE19C and WE18D were drilled to shallow depths when water was encountered flowing into the pits. SG19 is included within the lateral extent of the landfill on [Figure 4](#).

2. **Comment:** **Cross Sections. DTSC agrees with USEPA's comments on cross sections. Additional comments may be provided by DTSC when supporting information is provided.**

Response: EPA's comments on [Figures 7 to 12](#) have been addressed. Revised cross sections have been included in the updated report.

3. **Comment:** **Test pit logs (Appendix A). The text refers to variations of the contents of the pits along the length of the pit. For example (page 8): "Both test pits WE02B and WE04B contained a small layer of landfill waste that stopped 3 to 4 feet from the fence". Similar statements, about waste stopping a few feet from the fence, are made for WE07B, WE03B. However, such information is not provided on the test pit logs. Where is such information documented? All pertinent information should be on the field logs. Descriptions are not provided for the full depths of the logs at some locations. For examples, see Southern Perimeter above.**

Response: The Navy has revised the text of [Appendix A](#) to agree with the descriptions in the test pit logs. Observations made during installation of the landfill gas barrier have been added to the report. The descriptions in the test pit logs for WE09, WE10, WE15, WE16, and WE22 are for the interval from the ground surface to the total depth of each pit. The test pit logs have been revised to show that the descriptions apply to the complete excavation intervals.

4. **Comment:** **Field measurements for VOCs and methane. Field measurements were not reported on all logs for all ground penetrations (e.g., GMPs) and test pits. Given the site history and site contaminants--especially the existence of potentially explosive gases (e.g., methane) and toxic gases (e.g., chlorine), it is imperative that health and safety requirements be complied with. Please include all field measurements on logs, including non-detects ("NDs"). Were ambient readings and soil PID readings taken via sensors suspended on booms? Or, were the readings taken from soil subsamples (sealed in plastic bags)? Note that the 5 ppm threshold cited is not necessarily conservative: that is, soils with significant levels of VOCs may not produce readings "consistently" above 5 ppm or at a "'sustained positive reading" above 5 ppm.**

Response: Field measurements were recorded on the logs for test pit excavations and test pit borings that were completed during the landfill lateral extent investigation. Data collected during other investigations supplement the landfill lateral extent investigation and may not include field measurements.

Organic vapors were measured in the field using a Thermo Environmental Instruments OVM-580B. Methane gas was measured using a GasTech Inc. GT-series model 201 methane gas meter; this meter reports methane as both parts per million (ppm) and as a percentage of gas volume. Measurements for the test pits were collected at the ground surface as the pits were excavated to each depth unless indicated otherwise on the logs. Organic vapor measurements reported for the test pit borings were collected by placing the probe next to a freshly exposed section of the soil core sampled. The air in the workspace was also monitored, and appropriate action was taken whenever concentrations of methane exceeded action levels (for example, work ceased and the excavation was allowed to vent for 10 to 30 minutes until the concentrations of methane returned to a safe level, dry ice was placed about the borehole to reduce concentrations of methane to a safe level, or digging ceased and the excavation was immediately filled). Measurements of methane and organic vapor recorded at the pit openings and from soil cores are recorded on the boring and test pit logs. Measurements that were made only for health and safety monitoring of the workspace are recorded in the field notebook.

Reporting values for nondetection vary because the concentrations in ambient air varied during the investigation; measurable organic vapors from the industrial/commercial area to the west would occasionally drift through the work area, causing relatively high background concentrations for organic vapors. Review of the recorded data presented in the logs shows that organic vapors are frequently reported at concentrations below 5 ppm; field organic vapor meters yield results only in the ppm range. No field organic vapor readings are therefore reported in parts per billion.

5. **Comment:** **Descriptions.** The phrases "no odor" and "no staining" are used appropriately on boring logs. The word "clean" is sometimes used to describe soil on test pit logs (e.g., "clean backfill"). How has it been determined that a material is "clean"? Since contamination is not always evident to the eye, the word "clean" should not be used without chemical analytical results demonstrating that contaminants have not been detected above risk-based levels. "Inert" is also sometimes used to describe waste. What does inert mean? Are not soil, bricks, concrete, glass, etc. all inert? How is it relevant? Is there a relationship between inertness and contamination?

Response: The report has been revised to remove the term “clean.” “Inert” is typically defined as exhibiting little or no ability to chemically react. Inert waste does not contain hazardous or designated waste that includes soluble pollutants at concentrations that exceed applicable water quality objectives and does not contain significant quantities of decomposable waste (as defined in Title 27 of the *California Code of Regulations*, Section 20230). Inert fill material has little capacity to generate leachate that may pose risks to human health or the environment.

6. **Comment:** **Figures. Figures in Appendix A should be drawn to scale and should represent the actual dimensions of the test pit. Presentation of identical figures for each pit is not very useful.**

Figures 1, 2, and 4. UCSF property extends to the Hunters Point property boundary. Please revise figures and text accordingly.

Figure 4. Please include GMPs.

Response: The test pit logs in [Appendix A](#) are reported on a standard form that was developed for this report. The depth and width of the test pits are shown on the figures.

[Figures 1, 2, and 4](#) correctly show the property boundary between HPS and the University of California at San Francisco property.

The locations of the gas monitoring probes have been added to [Figure 4](#).

7. **Comment:** **Appendix B. GMP construction logs. Amounts used (e.g., bentonite, annular seal, water) were not entered on all logs.**

Response: No gas monitoring probes were installed as part of this investigation. Therefore, no gas monitoring probe logs or construction diagrams are included with this report. [Appendix B](#) provides the photographs of the test pit excavations.

RESPONSE TO COMMENT FROM THE WATER BOARD

1. **Comment:** **San Francisco Bay Regional Water Quality Control Board (RWQCB) Staff has reviewed the subject report and concurs with all of the comments provided to the Navy by the U.S. Environmental Protection Agency (EPA) on June 20, 2003 and by the California Department of Toxic Substances Control (DTSC) on June 26, 2003. A landfill delineation taking into account both physical and chemical characteristics of the fill, as well as historic site filling information is critical to moving forward with many issues on and adjacent to Parcel E. The method by which the landfill boundary is defined should be determined jointly by the BCT. In addition, please make sure that geologic cross-sections and associated maps showing the location of the trace of the geologic cross-section are at the same scale.**

Response: The Navy agrees that delineation of the Landfill's boundary is important. The Navy developed data quality objectives that were used to define the edge of the Landfill in areas where it was not sufficiently delineated during previous nonintrusive investigations. The intent of the landfill lateral extent investigation was to locate the physical boundary of the solid waste. The investigation was conducted based on historical information from past filling supplemented by physical examination of the edge of the solid waste during the nonstandard data gaps investigation. Soil samples were collected for chemical characterization of potential impacts from leachate to soils adjacent to the solid waste. Results for soil samples from this investigation will be evaluated in the Parcel E-2 RI/FS report along with historical data and data from the standard data gaps investigation.

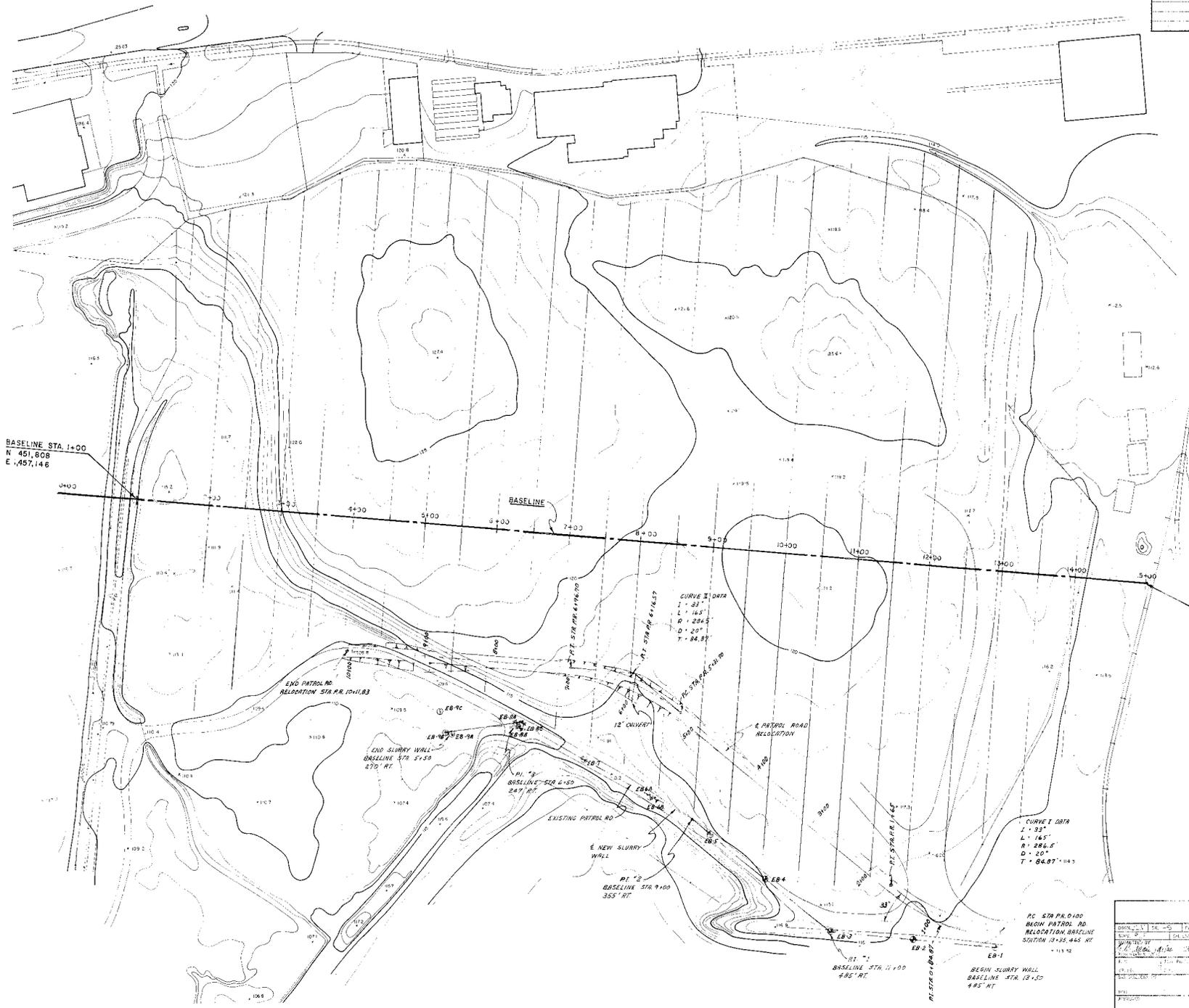
The Navy appreciates Water Board's review of the landfill lateral extent evaluation report. However, the map that shows the locations of the cross sections need not be at the same scale as the geologic cross sections. The purpose of the location map is to show the position of each transect relative to the others. The geologic cross sections are provided at a larger scale to allow presentation in greater detail.

REFERENCES

- Department of Toxic Substances Control (DTSC). 2003. "Protocols for Burn Dump Site Investigation and Characterization." June 30.
- Tetra Tech EM Inc. (Tetra Tech). 2002a. "Final Sampling Analysis (Field Sampling Plan and Quality Assurance Project Plan) for Parcel E Nonstandard Data Gaps Investigation, Hunters Point Shipyard, San Francisco, California." March 11.
- Tetra Tech. 2002b. "Revised Draft Final Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) for Parcel E Standard Data Gaps Investigation, Hunters Point Shipyard, San Francisco, California." August 22.
- Tetra Tech. 2003. "Final Parcel E Nonstandard Data Gaps Investigation Landfill Gas Characterization Report, Hunters Point Shipyard, San Francisco, California." December 23."
- Tetra Tech. 2004a. "Draft Parcel E Nonstandard Data Gaps Investigation, Landfill Liquefaction Potential, Hunters Point Shipyard, San Francisco, California." August 13.
- Tetra Tech. 2004b. "Parcel E Standard Data Gaps Investigation, Data Summary Report, Hunters Point Shipyard, San Francisco, California." October 22.
- Tetra Tech, Levine-Fricke-Recon, and Uribe & Associates. 1997. "Parcel E Remedial Investigation, Draft Final Report, Hunters Point Shipyard, San Francisco, California." October 27.

ATTACHMENT 1
HISTORICAL MAPS

NO.	DESCRIPTION	REV.	DATE	APPROV.



BASELINE STA. 1+00
N 451,808
E 1,457,146

BASELINE STA. 15+00
N 451,006
E 1,458,293

APPROXIMATE LOCATION OF
EXPLORATORY SOIL BORING

PREPARED BY: INSTRUMENTING SURVEYORS
SCALE 1 INCH = 50 FEET
CONTOUR INTERVAL 1 FT.
DATE: 10/20/2017
PROJECT: STORM SEWER INTERCEPTOR - PHASE II (P-26 IR)

WESTERN DIVISION
SURVEYS
IF SHEET IS LESS THAN
20" X 40"
IT IS A REDUCED PRINT -
SCALE REDUCED ACCORDINGLY

CURVE DATA
L = 33'
L = 165'
R = 286.5'
D = 20°
T = 84.87'

PC STA. PK. 0+00
BEGIN PATROL RD
RELOCATION, BASELINE
STATION 13+25.465 FT
+115.42

WESTERN DIVISION	
SURVEYS	
STORM SEWER INTERCEPTOR - PHASE II (P-26 IR)	
LANDFILL SEAL & COVER	
PLAN	
NO. 80091	PROJECT NO. 102072
DATE: 10/20/2017	SCALE: 1" = 50'
BY: [Signature]	CHECKED: [Signature]
DATE: 10/20/2017	DATE: 10/20/2017

