

## Section 1. Introduction

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This report presents a combined Remedial Investigation (RI)/Feasibility Study (FS) for the contiguous area consisting of the closed industrial landfill (hereafter identified as the “Parcel E-2 Landfill”) and the surrounding adjacent areas that contain isolated or non-contiguous pockets of buried solid waste at Parcel E-2, Hunters Point Shipyard (HPS) in San Francisco, California (Figure 1-1). HPS was identified as a National Priorities List (NPL) site by the U.S. Environmental Protection Agency (EPA) in 1989. As a result, the U.S. Department of the Navy (Navy) is conducting investigations in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Title 42 *United States Code* [USC] Sections [§§] 9601-9675) at a number of sites at HPS where a release of a CERCLA hazardous substance has occurred. As a management tool to accelerate site investigation, cleanup, and reuse, HPS was divided into parcels and sites within each parcel are evaluated concurrently.

HPS is currently divided into six parcels, Parcels B through F and E-2 (Figure 1-1). In 1992, the Navy divided HPS into five contiguous parcels (A through E). In 1996, the Navy added a sixth parcel (Parcel F), also known as the offshore area. In September 2004, the Navy divided Parcel E into two parcels (Parcels E and E-2) to facilitate the closure of the Parcel E-2 Landfill and its adjacent areas (Figure 1-2). In December 2004, the Navy transferred Parcel A to the San Francisco Redevelopment Agency (SFRA).

This RI/FS is part of ongoing efforts by the Navy to address contamination at HPS Parcel E-2 in accordance with CERCLA. The RI/FS is a mechanism for characterizing the nature and extent of site risks and evaluating potential remedial options. As the lead agency, the Navy has authority over evaluation of risk, selection of the remedial alternative, and overall public participation at HPS. The Navy is coordinating with the EPA Region IX, the California Department of Toxic Substances Control (DTSC), and the San Francisco Bay Regional Water Quality Control Board (RWQCB) in accordance with a federal facilities agreement (FFA) that provides a procedural framework and schedule for the CERCLA cleanup process at HPS (Navy, EPA, DTSC, and RWQCB, 1991). The Navy, EPA, DTSC, and RWQCB representatives are collectively referred to as the Base Realignment and Closure (BRAC) Cleanup Team (BCT) for HPS.

Engineering/Remediation Resources Group, Inc. (ERRG), and Shaw Environmental, Inc. (Shaw) jointly produced this combined RI/FS for Parcel E-2, with support from Tetra Tech EM, Inc. (TtEMI). Shaw was retained by the Navy to develop remedial alternative 3. TtEMI was subcontracted by ERRG to provide FS support and to perform the baseline human health risk assessment (HHRA).

## 1.1. PARCEL E-2 CERCLA PROGRESS

EPA guidance describes the CERCLA remedial process as a series of several, progressive steps for achieving cleanup and release of the environmental issues at a site for future reuse (EPA, 1988a). The typical sequence includes a preliminary assessment and site inspection, RI, FS, proposed plan, public comment period, record of decision (ROD), remedial design, remedial action, and post-construction reporting. Removal actions are also used at times to expedite the cleanup process.

### 1.1.1. Previous Investigations

The Navy previously completed parcel-wide RI and FS reports (TtEMI, Levine-Fricke-Recon [LFR], and Uribe & Associates [Uribe], 1997; TtEMI, 1998) for Parcel E, which encompassed the area later subdivided as Parcel E-2. During preparation of the Parcel E RI and FS reports, the Navy and regulatory agencies identified additional tasks to support the remedial design for Parcel E, the majority of which were specific to the Parcel E-2 Landfill. These tasks included defining the nature and extent of landfill gas, refining the lateral extent of solid waste, evaluating liquefaction potential, and delineating wetlands areas adjacent to the landfill. In addition, the Navy and regulatory agencies decided that additional data for Parcel E were needed, including data from the area now referred to as Parcel E-2, to better define the nature and extent of chemicals in soil and groundwater.

Groundwater data gap investigations (GDGIs) were conducted in three phases from July 2000 through October 2002, to better define the extent of groundwater contamination at Parcels C, D, and E (TtEMI, 2001; TtEMI, 2002c; TtEMI, 2004c). In addition, a soil and sediment data gap investigation was conducted in 2002 to further delineate the nature and extent of soil and sediment contamination in all of Parcel E (TtEMI, 2002a; TtEMI, 2005c), including areas within Parcel E-2. This soil and sediment data gap investigation was referred to as the “Standard Data Gap Investigation” (SDGI), to differentiate it from a series of data gap investigations conducted in 2002 to evaluate various landfill and wetland characteristics at Parcel E-2. These landfill and wetland data gap investigations were referred to as “Nonstandard Data Gap Investigations” (NDGI), and included:

- A characterization of the nature and extent of landfill gas (TtEMI, 2003e) (Appendix A to this report)
- An evaluation of the lateral extent of the solid waste within the Parcel E-2 Landfill (TtEMI, 2004f) (Appendix B to this report)
- An evaluation of landfill liquefaction potential (TtEMI and Innovative Technical Solutions, Inc. [ITSI], 2004b) (Appendix C to this report)
- A delineation and functions and values assessment of the wetland areas within and adjacent to the Parcel E-2 Landfill (TtEMI, 2003d) (Appendix D to this report)

Parcel E-2 was evaluated in the previous RI and FS reports, and subsequent data gaps investigations, primarily referred to as Installation Restoration (IR) Site 1/21; however, small portions of IR Sites 2 and

76 are located within Parcel E-2. In addition, numerous sampling locations from adjoining IR Sites 4, 12, 56, and 72 are located within Parcel E-2.

### 1.1.2. Ongoing Monitoring Programs

The Navy has implemented several environmental monitoring programs to satisfy regulatory requirements for Parcel E-2<sup>1</sup> until a final remedy is selected. In accordance with the monitoring requirements for waste disposal facilities (Title 27 California Code of Regulations [27 CCR], Chapter 2), the following monitoring programs have been established and are currently being conducted at Parcel E-2:

- Landfill gas control and monitoring program (TtEMI and ITSI, 2004c): Program includes operation and maintenance of the gas control system and monthly perimeter gas monitoring to document compliance with 27 CCR requirements for control of off-site gas migration.
- Basewide groundwater monitoring program (BGMP) (TtEMI, 2004e): Program involves quarterly monitoring of groundwater wells throughout Parcel E-2 for a variety of chemicals specified in 27 CCR, including volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), metals and other inorganic compounds, petroleum hydrocarbons, polychlorinated biphenyls (PCBs), and pesticides.
- Landfill cover-integrity monitoring and maintenance program (TtEMI, 2003b): Program includes irrigation of the vegetative cover, periodic inspections of the interim cap, and necessary maintenance actions based on inspection results.
- Stormwater management and monitoring program (TtEMI, 2003c; TtEMI, 2005a): Program involves inspecting and maintaining best management practices (BMPs) currently in place to control erosion and monitoring surface water runoff at all discharge points.

These monitoring programs are discussed in more detail in [Subsection 3.9](#). The landfill gas and groundwater data produced from the aforementioned monitoring programs helped define the nature and extent of contamination at Parcel E-2, and are presented in [Sections 4 and 5](#), along with data from previous investigations.

### 1.1.3. Removal Actions in Parcel E-2

The Navy also conducted several interim removal actions in Parcel E-2 after completion of the Parcel E RI and FS reports. The interim actions consisted of:

- Installation of a groundwater containment and extraction system to reduce the potential for release of landfill constituents into the San Francisco Bay (the Bay) ([International Technology Corporation \[IT\], 1999](#))

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<sup>1</sup> In September 2004, the Navy divided Parcel E into two parcels (E and E-2). Discussions within this document that reference reports published prior to September 2004 refer to the portion of Parcel E that became Parcel E-2.

- Installation of a multilayer interim cap on a portion of the Parcel E-2 Landfill to prevent oxygen intrusion and extinguish smoldering subsurface areas following a brush fire (TtEMI, 2005b) (Appendix E to this report)
- Installation of a landfill gas control and monitoring system along the northern Parcel E-2 boundary to control gas migration from the landfill (TtEMI, 2004a) (Appendix F to this report)
- Collection, characterization, and disposal of various debris along the shoreline of Parcels E and E-2 (Tetra Tech FW, Inc. [TtFW], 2004c)

In 2006, the Navy completed removal actions to excavate and dispose of a PCB-contaminated soil hot spot and a metal slag area at Parcel E-2. The location of the removal actions are shown on Figure 1-3.

#### 1.1.4. Parcel E-2 RI/FS

This RI/FS was prepared to summarize and evaluate the current site conditions following the data gaps investigations and interim removal actions. The data gaps investigations and ongoing monitoring programs significantly expanded the set of environmental data at Parcel E-2, with more than 460 additional soil and groundwater samples being collected to date. In addition, the interim removal actions have removed potential contamination sources in Parcel E-2. To address these changes, this RI/FS includes: 1) an update to the site characterization; 2) a revised HHRA and an evaluation of potential environmental impacts on the San Francisco Bay; 3) updated remedial action objectives (RAOs); and 4) development and evaluation of revised remedial alternatives based on these updates.

This document addresses CERCLA hazardous substances with the exception of radionuclides. Potential radiological contamination will be addressed in a radiological addendum to the RI/FS. Both chemical and radiological contaminants will then be addressed together in the proposed plan and the ROD.

## 1.2. STUDY AREAS IN PARCEL E-2

Figure 1-2 shows the location of the four distinct but contiguous areas contained within Parcel E-2:

1. The “Landfill Area,” which comprises the entire Parcel E-2 Landfill and its immediate perimeter
2. The “East Adjacent Area,” located to the east of the Landfill Area
3. The “Panhandle Area,” located west/southwest of the Landfill Area
4. The “Shoreline Area the Bay

These four areas were designated for the RI/FS to facilitate the referencing to each throughout the narrative, tables and figures. Each study area is further described in Subsection 1.6.4.

Although part of Parcel E-2, the Shoreline Area is located in a narrow intertidal zone that is being evaluated in conjunction with Parcel F, the off-shore property at HPS. This report briefly summarizes studies conducted in the Shoreline Area and discusses the tidal wetlands located in the Shoreline Area. The intertidal sediments were evaluated in a Shoreline Characterization Technical Memorandum that included a Screening-Level Ecological Risk Assessment (SLERA) for the Parcel E and E-2 shoreline

(Sullivan Consulting Group and TtEMI [SulTech], 2005) (Appendix G to this report). The results of this Shoreline SLERA were incorporated into the FS portion of this report. The remedial alternatives evaluated in this report are intended to control unacceptable exposures to human and ecological receptors from the soil, sediment, and groundwater, throughout Parcel E-2, including the Shoreline Area.

### 1.3. REPORT FRAMEWORK

In 2004, the Navy decided to conduct the RI/FS process for the Parcel E-2 area separately from the other Parcel E sites to increase the efficiency of the CERCLA process. Creation of Parcel E-2 to separate the landfill and its adjacent areas from the rest of Parcel E allows for a streamlined evaluation and a more focused remedy evaluation process that will help accelerate the remedy for Parcel E-2. This approach is consistent with EPA RI/FS guidance for landfills (EPA, 1991a; EPA, 1993a; EPA, 1993b; EPA, 1996) and is based on the rationale that the unique characteristics of landfills (such as the presence of extensive heterogeneous waste intervals) limit the selection of practicable remedial alternatives.

This report was prepared in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Title 40 of the *Code of Federal Regulations* [40 CFR], Part 300) and utilized the following guidance documents:

- *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA, 1988a)
- *Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites* (EPA, 1991a)
- *A Guide to Principal Threat and Low Level Threat Wastes* (EPA, 1991b)
- *Presumptive Remedy for CERCLA Municipal Landfill Sites* (EPA, 1993a) (Appendix H to this report)
- *Presumptive Remedy: Policy and Procedures* (EPA, 1993b) (Appendix H to this report)
- *Feasibility Study Analysis for CERCLA Municipal Landfill Sites* (EPA, 1994) (Appendix H to this report)
- *Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills* (EPA, 1996) (Appendix H to this report)
- *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* (EPA, 2000)

The report purpose and goals, organization, site description, site history, and planned site reuse are discussed in this section.

### 1.4. REPORT PURPOSE AND GOALS

As discussed in the NCP, the comprehensive goal of the RI/FS process is to evaluate remedies that: 1) are protective of human health and the environment; 2) maintain this protection over time; and 3) minimize the mobility, toxicity, and volume of hazardous substances.

The EPA has also developed a specialized RI/FS process for municipal landfill sites (EPA, 1991a; EPA, 1993a; EPA, 1993b; EPA, 1994) that allows these goals to be achieved in a streamlined manner, provided certain conditions are met, so that a “presumptive remedy” may be implemented. Use of the streamlined process is intended to improve and accelerate the remedy evaluation process and ensure consistent evaluation of remedial actions at similar sites.

Many military landfills that contain wastes similar to those found in municipal landfills have been evaluated using the presumptive remedy guidance consistent with supplemental EPA guidance (EPA, 1996). The streamlined approach has allowed the process to focus on containment technologies for use in remedial alternative evaluations, and has allowed for qualitative risk evaluations in lieu of more detailed quantitative evaluations, provided there was a clear need for remedial action based on exceedance of Applicable or Relevant and Appropriate Requirement (ARAR) criterion.

The containment presumptive remedy typically involves:

- a landfill cap
- source area groundwater control and leachate control, if groundwater contamination is a problem
- landfill gas control, if landfill gas is migrating beyond the site boundary above action levels
- land use controls to prevent any direct contact with contamination in waste material, groundwater, and landfill gas, if any of these are present

The presumptive remedy has typically been used for wastes that pose a relatively low long-term threat and where treatment is impracticable. An example is a large landfill (approximately 100,000 cubic yards or larger) with heterogeneous wastes impracticable for treatment.

The Parcel E-2 Landfill could be considered for application of the presumptive remedy because it is large (estimated volume of 473,000 cubic yards) and its contents are more similar to municipal landfills than to hazardous waste landfills. However, the areas adjacent to the Parcel E-2 Landfill (the Panhandle Area and East Adjacent Area) are not as easily categorized for application of the presumptive remedy.

Waste deposits exist within the adjacent areas (the Panhandle Area, East Adjacent Area, and Shoreline Area); these deposits are similar in content to the Landfill Area, although they are intermittent and separated by other fill soils. This is largely due to the manner in which the adjacent areas were reclaimed from the Bay by using a combination of fill soils and waste materials. If waste deposits in the adjacent areas were contiguous throughout Parcel E-2, the presumptive remedy could be considered for the entire parcel, and the RI/FS process streamlined considerably. While the Landfill Area still may be considered under such a scenario, the adjacent areas require consideration more typical of a standard RI/FS (i.e., quantitative risk assessments and evaluation of remedial alternatives other than containment).

Thus, the goal of this document is to strike a balance between a presumptive remedy RI/FS and a standard RI/FS. The RI will evaluate all characterization data collected to date, and will present quantitative risk evaluations for soil and groundwater to provide a strong basis for the RAOs. The FS will focus on

containment technologies (consistent with EPA RI/FS guidance for landfills), and will include excavation and disposal technologies as a point of comparison.

Based on this approach, the goals of the RI/FS are:

- Characterize the nature and extent of contamination in Parcel E-2 by compiling and evaluating data from previous investigations.
- Develop a conceptual site model that describes contaminant sources, transport routes, exposure pathways, and potential receptors.
- Conduct a quantitative risk assessment that uses the conceptual site model and data from previous investigations to identify areas that require remedial action to protect human health and the environment.
- Develop RAOs that specify the contaminants and media of interest, exposure pathways, and remediation goals.
- Develop general response actions (GRA) for each medium that will satisfy the RAOs
- Identify and screen remedial technologies and process options for each GRA to retain those that can be technically and cost-effectively implemented at Parcel E-2, with a focus on containment and excavation/disposal technologies.
- Develop focused remedial alternatives (which include containment and excavation/disposal) from the retained remedial technologies and process options, screen the alternatives against EPA criteria, and perform a comparative analysis of retained alternatives to identify those that most effectively meet the RAOs.

This RI/FS will provide the necessary information to support an informed risk management decision regarding which remedy appears to be most appropriate for Parcel E-2. Following the RI/FS, a preferred alternative will be presented in the proposed plan and a final remedy will be selected in the ROD.

## 1.5. REPORT ORGANIZATION

The primary report sections and appendices are summarized in [Table 1-1](#). The RI sections of the report, which include an evaluation of the nature and extent of the contamination, development of a conceptual site model, and evaluations of human health and ecological risks, are provided in Sections 1 through 8. Sections 9 through 14 constitute the FS portion of the document and include development of RAOs, identification of ARARs, specification of GRAs, identification and screening of technologies and process options, and development and evaluation of remedial alternatives.

[Appendices A](#) through [D](#) include summary reports for previous phases of the NDGI. [Appendices E](#) and [F](#) present the closure reports for the interim landfill cap and the landfill gas control system, respectively. [Appendix G](#) presents the characterization information (including a SLERA) for the shoreline area at Parcels E and E-2. [Appendix H](#) includes EPA presumptive remedy guidance documents for incorporation into the CERCLA administrative record for Parcel E-2. [Appendix I](#) presents an evaluation of groundwater beneficial uses for the A- and B-aquifers at Parcel E-2. [Appendix J](#) is a summary of analytical data and boring logs from previous Parcel E-2 investigations. [Appendix K](#) presents the HHRA.

[Appendix L](#) presents the SLERA for the onshore area at Parcel E-2. [Appendix M](#) presents an evaluation of groundwater chemical migration to the aquatic environment offshore of Parcel E-2. [Appendix N](#) includes an ARARs analysis for the remedial alternatives. [Appendix O](#) summarizes the condition of existing wetlands at Parcel E-2 and evaluates mitigation options. [Appendices P and Q](#) evaluate landfill cap infiltration and slope stability, respectively, associated with the containment alternative. [Appendix R](#) details the cost estimates for each remedial alternative.

## 1.6. SITE DESCRIPTION

This subsection presents a general description of the location, topography, site features, and climate of HPS. A brief description of the Landfill Area and other adjacent areas at Parcel E-2 is included in the subsections below. A more specific description of the site features and a summary of the physical characteristics (i.e., geology, hydrology, and ecology) of Parcel E-2 is provided in [Section 2](#).

### 1.6.1. Location

HPS is located in southeast San Francisco on a peninsula that extends east into the Bay. Parcel E-2 consists of 47.4 acres of shoreline and lowland coast along the southwestern portion of HPS ([Figure 1-1](#)). Parcel E-2 is bounded by:

- Property owned by the University of California, San Francisco (UCSF) and a portion of Parcel E to the north
- The Bay to the south
- Portions of Parcel E to the east
- Non-Navy off-base property to the west

The Landfill Area is located in Parcel E-2, with a small portion extending north onto the UCSF property, which is a formerly used defense site (FUDS) investigated during the Parcel E RI as IR Site 76 ([TtEMI, LFR, and Uribe, 1997](#)). Although the Parcel E-2 Landfill extends slightly north beyond the property line, this small portion of land is not being used by UCSF. The Navy is in the process of negotiating an easement with UCSF in order to perform the necessary environmental restoration activities within this small portion of land. [Figure 1-2](#) shows the small portion of the Landfill Area that extends onto UCSF property.

### 1.6.2. Topography and Site Features

The ground surface elevation at Parcel E-2 varies from approximately 30 feet above mean sea level (msl) in the northern portion of the site to a few feet above msl along the southwestern portion of the site. The Parcel E-2 Landfill is covered with either several feet of soil or a multilayer interim landfill cap composed of geosynthetic materials with a soil vegetative cover. Surface runoff from most of Parcel E-2 flows into the Bay, but runoff in the northern portion of Parcel E-2 (including portions of the UCSF property) flows into catch basins which ultimately discharge into the HPS storm sewer system. Surface water runoff at all

discharge locations is monitored in accordance with the Stormwater Discharge Management Plan (SWDMP) (TtEMI, 2003c; TtEMI, 2005a).

Limited underground utilities are located in the northeastern portion of Parcel E-2, and include water and storm sewer lines. Historical records show that these utility lines may extend into the landfill waste; however, no subsurface utilities were encountered during construction of the gas control system, which extended through an area where a water line was shown to exist on historic records. Figure 1-4 shows the surface topography, surface water discharge locations (including the underdrain channel that bisects the landfill cap), and underground utility lines present at Parcel E-2.

Seasonal vegetation is present in the Panhandle Area and East Adjacent Area, and portions of the shoreline are covered with concrete riprap (TtEMI, LFR, and Uribe, 1997). Saline emergent wetlands (approximately 2.38 acres) are located along the Parcel E-2 shoreline and extend into the Panhandle Area, Landfill Area, and East Adjacent Area. In addition, a 1.3-acre seasonally ponded area is located in the Panhandle Area of Parcel E-2 (TtEMI, 2003d). Wetland areas in Parcel E-2 are shown in Figure 1-4, and are discussed in Subsection 2.4.2.

No buildings are present in Parcel E-2. Table 1-2 lists buildings located within 1,000 feet of the Parcel E-2 Landfill, which, in accordance with the requirements of 27 CCR, have been shown through previous and ongoing gas monitoring to not be threatened by landfill gas migration (TtEMI, 2003e; TtEMI, 2004a; ITSI, 2004a through 2004g; ITSI, 2005a through 2005p).

### 1.6.3. Climate

The climate in the HPS area is characterized by partly cloudy, cool summers with little precipitation and mostly clear, mild winters with moderate precipitation. Average temperatures typically vary between 50 and 60 degrees Fahrenheit, with an average humidity range of 70 to 75 percent.

The prevailing winds at HPS are out of the west, west-northwest, and west-southwest. Figure 1-5 shows a wind rose plot generated from wind data collected at the meteorological station at HPS over a period of nearly 2 years. Seasonal variations occur in wind strength and direction. Generally, wind at HPS is strongest in the mid to late afternoon hours, when higher velocity wind tends to blow in from the Pacific Ocean. The average wind speed is approximately 8 miles per hour, although gusts may exceed 25 miles per hour (TtEMI, LFR, and Uribe, 1997).

### 1.6.4. Study Areas

For the purposes of this report, Parcel E-2 is composed of four distinct but contiguous areas, as described in Subsection 1.2. These areas are shown in Figure 1-2 and are described in the following subsections.

Parcel E-2 was created by filling in the Bay margin with a variety of material, including native soil, rock, and sediments, as well as construction and industrial debris. Figures 1-6 through 1-11 are aerial photographs of Parcel E-2 that document the expansion of Parcel E-2 into the Bay at various stages of the

filling history. Specific observations from these aerial photographs are discussed below; however, the overall filling history is discussed in [Subsection 1.7.2](#).

#### **1.6.4.1. The Landfill Area**

Between 1958 and 1974, the Navy created the Parcel E-2 Landfill by placing a variety of shipyard wastes, including construction debris, municipal-type solid waste, and industrial waste (including sandblast waste, paint sludge, solvents, and waste oils) ([Naval Energy and Environmental Support Activity \[NEESA\], 1984](#)). As a result, the landfill has a heterogeneous composition ranging from solid waste material to solid waste intermixed with soil fill. Intervals containing the solid waste are usually brown to black. In some areas, the waste can be sludge-like with an oily sheen. Historic records indicate that an oily waste area was located along the western perimeter of the Landfill Area ([Naval Facilities Engineering Command \[NAVFAC\] Western Division, 1974](#)) ([Figure 1-8](#)). The physical extent of solid waste covers approximately 22 acres ([TtEMI, 2004f](#)). [Figure 1-10](#) shows the approximate extent of solid waste within the Landfill Area superimposed over an aerial photograph from 1975.

#### **1.6.4.2. The East Adjacent Area**

The East Adjacent Area extends from the Landfill Area to the eastern Parcel E-2 boundary, which abuts portions of Parcel E (IR Sites 2, 4, 12, 56, and 72). During previous investigations, the East Adjacent Area was determined to contain isolated solid waste locations and soil contamination. The East Adjacent Area includes an area with PCB contamination that was addressed under an interim removal action ([TtFW, 2005a](#)). The Parcel E-2 boundary encompasses a small portion of IR Site 2 (known as the “Bay Fill Area”); the boundary was created in this manner so that the initial removal area would be contained entirely within the Parcel E-2 boundary.

Aerial photographs from 1946 through 1969 ([Figures 1-6 through 1-9](#)) show that the East Adjacent Area was historically used by the Navy for equipment and material storage. During the RI, these uses were distinguished from the industrial uses of the adjacent Parcel E IR sites ([Figure 1-9](#)). Navy operations at these sites included a former scrap yard (IR Site 4); a former salvage yard (IR Site 12); a railroad yard and former lumber storage yard (IR Site 56); and a former paint and oil store house (IR Site 72). From 1976 to 1986, the adjacent Parcel E IR Sites were also used by a private ship repair company, Triple A Machine Shop, Inc. (Triple A), for operations that reportedly included the disposal of hazardous substances and wastes ([California Department of Health Services \[DHS\], 1988](#)). Triple A disposal sites within Parcel E-2 and the adjoining Parcel E IR Sites are identified on [Figure 1-11](#). The adjacent Parcel E IR Sites are being evaluated under a separate RI report.

#### **1.6.4.3. The Panhandle Area**

The Panhandle Area is located west and southwest of the Landfill Area and has a relatively flat topography. A drainage channel is located along the western perimeter of Parcel E-2, and runs south into the low-lying inland seasonal wetlands southwest of the Landfill Area. During previous investigations,

the Panhandle Area was determined to contain isolated solid waste locations and soil contamination. The Panhandle Area also contains areas of potential low-level radioactivity, including an experimental ship-shielding area (Figure 1-8) and a metal slag area (Figure 1-3). A removal action was conducted to remove the metal slag area and prevent potential contaminant migration to the Bay (TiFW, 2005). The radiological history at Parcel E-2 is discussed briefly in Subsection 1.7.3, and is presented in detail in Volume II of the Historical Radiological Assessment (HRA) (Naval Sea Systems Command [NAVSEA], 2004).

#### 1.6.4.4. The Shoreline Area

The Shoreline Area is the intertidal zone that contains areas covered with concrete rip-rap and other exposed shoreline containing intertidal sediments and emergent saline wetlands. The inland boundary of the Shoreline Area is defined by the break in slope (in areas covered with concrete rip-rap) or presence of drift material (in beach and wetland areas). The outboard boundary of the Shoreline Area shown on Figure 1-3 was defined in the aerial photograph used to generate the HPS base map. The intertidal sediments present in the Shoreline Area were characterized during the RI and SDGI, and the results are summarized in a Shoreline Characterization Technical Memorandum (SulTech, 2005). The metal slag area, discussed in the subsection above, also extends into the Shoreline Area.

### 1.7. SITE HISTORY

The site history described in this subsection is presented as a graphical timeline in Figure 1-12. The following subsections summarize the history of the activities that led to the contaminant releases at HPS and the subsequent clean-up efforts that have been conducted to mitigate those releases.

#### 1.7.1. General Site History

HPS was owned and operated as a commercial dry dock facility until 1939, when the Navy purchased the property from Bethlehem Steel. Upon the entry of the U.S. into World War II in 1941, the Navy immediately began to expand HPS into a naval shipyard. The Navy began excavation of the hills surrounding the shipyard, using the resulting spoils to expand the shoreline into the Bay. Quays, docks, and support buildings were built on an expedited wartime schedule to support the shipyard's mission of fleet repair and maintenance (NAVSEA, 2004).

As shipyard operations expanded, the need for skilled workers grew. HPS, known then as San Francisco Naval Shipyard, established apprenticeship programs for most of the shipyard trades and recruited personnel from all over the U.S. to fill jobs created by the shipyard expansion. This influx of personnel greatly impacted growth of the surrounding area (NAVSEA, 2004).

Immediately after the end of World War II, the Navy used the expansive berthing facilities at HPS for reserve fleet ships returning from the Pacific. By 1951, HPS shifted from operating as a general repair facility to specializing in submarine maintenance and repair. However, the Navy continued to operate Pacific Fleet carrier overhaul and ship maintenance repair facilities at HPS through the 1960s. Use of the

shipyard began to decline steadily in the late 1960s and early 1970s, and the shipyard was disestablished as an active naval facility in 1974 (NAVSEA, 2004).

From 1976 to 1986, the Navy leased 98 percent of HPS to Triple A. During this period, Triple A used dry docks, berths, machine shops, power plants, offices, and warehouses to repair commercial and naval vessels. During its occupancy, Triple A allegedly generated and disposed of hazardous substances and wastes at various locations throughout HPS, including Parcel E-2 (DHS, 1988).

The Navy resumed operation of the shipyard in 1986, when HPS was assigned as an annex to Naval Station Treasure Island. Shipyard operations were permanently terminated in 1989 (NAVSEA, 2004). In 1991, HPS was slated for closure under the Defense Base Closure and Realignment Act of 1990. Oversight of the base closure activities was overseen by the NAVFAC, Engineering Field Activity West (EFA West), in San Bruno, California until 2000, when oversight of HPS was transferred to NAVFAC Southwest, in San Diego, California. Ongoing base closure work at HPS is overseen by the Navy's BRAC Program Management Office (PMO) West, in San Diego, California.

The first environmental investigation at HPS was the 1984 Initial Assessment Study (IAS), conducted under the Navy Assessment and Control of Installation Pollutants (NACIP) program. The IAS consisted primarily of a records review and a visual inspection of the site. The IAS recommended confirmation studies at numerous HPS sites, including the Parcel E-2 Landfill (NEESA, 1984). Following completion of the confirmation studies, a RI/FS process was developed for a number of HPS sites (including the Parcel E-2 Landfill) and RI field activities were initiated in 1988 (TtEMI, LFR, and Uribe, 1997).

In 1989, HPS was included on the NPL as a Superfund site pursuant to CERCLA as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. HPS was designated as a "B" site by the Agency for Toxic Substances and Disease Registry (ATSDR) in 1991; this designation is for sites that pose no imminent threats to human health but have the potential to pose long-term threats to human health (ATSDR, 1991). In 1992, HPS was divided into five parcels (Parcels A through E) to aid in environmental investigation and cleanup activities. In 2004, Parcel E was divided into two parcels (Parcels E and E-2) to facilitate the closure of the Parcel E-2 Landfill and its adjacent areas.

### 1.7.2. Parcel E-2 History

Parcel E-2 is part of an area created in the 1940s, 1950s, and 1960s by filling in the Bay margin with a variety of material, including soil, crushed bedrock, dredged sediments, and debris. The overall composition of the fill material, on which the Parcel E-2 Landfill was created, is primarily sand and clay with intermixed construction debris (TtEMI, 2004f). The majority of land at HPS was created in the early 1940s; however, these filling activities only extended into the eastern edge of Parcel E-2, as evidenced in the 1946 aerial photograph (Figure 1-6). In 1955 (Figure 1-7), additional filling had occurred at the western boundary of Parcel E-2. By 1965 (Figure 1-8), the majority of Parcel E-2 had been filled and industrial activities throughout the parcel were evident. By 1969 (Figure 1-9), filling activities at Parcel E-2 were largely complete with the exception of a channel that extended from near the Bay to the

northwestern corner of Parcel E-2. This channel was filled in by 1975, at which time the landfill was closed by placing and compacting a soil cover (Figure 1-10). Triple A's industrial operations at Parcel E-2 are evidenced in the 1985 aerial photograph (Figure 1-11).

During Triple A's occupancy of the site from 1976 to 1986, the company allegedly disposed of industrial debris, sandblast waste, oily industrial sand, and asphalt over an area of approximately 5 acres along the shoreline in Parcel E-2, Triple A Site 16 (Figure 1-11) (San Francisco District Attorney [SFDA], 1986). A portion of the Landfill Area was also included as part of Triple A Site 16 (TtEMI, LFR, and Uribe, 1997). In addition, Triple A allegedly stored unlabeled, deteriorating, uncovered drums with their contents exposed to the elements in the southeast portion of Parcel E-2 known as Triple A Site 1 (Figure 1-11) (SFDA, 1986).

Since landfill operations ceased, the Navy implemented several preliminary landfill closure measures (NAVFAC Western Division, 1974), including:

- Installing a stormwater interceptor line to divert runoff from the hill area north of the Parcel E-2 Landfill to an outfall
- Attempting to construct a clay dike to minimize groundwater flow into the Bay; the construction was terminated due to the extensive large debris present within the landfill
- Placing a minimum of 2 feet of compacted, imported fill on top of the landfill
- Grading the entire site to facilitate stormwater drainage

The Parcel E-2 Landfill was initially identified as an area of potential concern during the IAS, which concluded that it was highly probable that chemicals from waste disposed of in the landfill had reached the groundwater and were migrating toward San Francisco Bay. This conclusion revealed a potential threat to the Bay environment and a confirmation study was recommended for the site (NEESA, 1984). As a result, the landfill was included in several subsequent investigations, eventually progressing to the RI stage as IR Site 1/21. The IR Site 1/21 boundary encompasses most of Parcel E-2; however, a small portion of IR Site 2 (Bay Fill Area) is included within Parcel E-2. Figure 1-14 shows the air, soil, soil gas, and groundwater locations sampled during previous investigations at Parcel E-2. Figure 1-14 also shows the boundaries of IR Site 1/21 and various Triple A sites identified in Parcel E-2.

As discussed at the beginning of this section, the Navy has performed several interim removal actions at Parcel E-2 to control potential releases of hazardous substances. These actions include construction of an interim landfill cap in response to an August 2000 brush fire at the Parcel E-2 Landfill. The landfill cap was constructed to inhibit oxygen migration into the waste to prevent any further fires from occurring under the capped area (TtEMI, 2005b) (Appendix E). The interim cap consists of a multilayer system of sub-base soil, high-density polyethylene (HDPE) membrane, synthetic drainage layer, and topsoil. The interim cap encompasses approximately 14.5 acres (Figure 1-10).

Table 1-3 summarizes environmental investigations and interim actions conducted at Parcel E-2 from 1984 to date. These activities are discussed in more detail in Section 3.

### 1.7.3. Parcel E-2 Radiological History

A comprehensive history of Navy radiological operations at HPS is provided in Volume II of the HRA (NAVSEA, 2004). The HRA concluded that low levels of radioactive contamination exist within the confines of HPS. The review of previous radiological activities, cleanup actions, and release surveys identified no imminent threat or substantial risk to tenants or the environment of HPS or the local community (NAVSEA, 2004).

Historical radiological operations at Parcel E-2 included:

- Disposal of radioluminescent commodity items (dials, gauges, and deck markers)
- Potential disposal of wastes from decontamination of ships used in atomic weapons testing (i.e., sandblast waste)
- Potential disposal of building debris from demolition of radiologically impacted buildings used by the Naval Radiological Defense Laboratory (NRDL)
- Potential disposal of materials used in radiological experiments by NRDL
- Use of an Experimental Shielding Range – located in the Panhandle Area, the range was used for ship shielding experiments and included a fan-shaped, post-exposure reflection/refraction field, and two other support areas bordered on the west side by a soil berm (Figure 1-8)

Numerous investigations of potential radiological contamination have been performed throughout HPS, including Parcel E-2. The results of the radiological investigations at Parcel E-2 are discussed briefly in Subsection 3.6, and are presented in more detail in Volume II of the HRA. The HRA identified the majority of land area within Parcel E-2 as “radiologically impacted.” These radiologically impacted sites are shown on Figure 1-13.

The results of radiological characterization performed to date will be summarized in a forthcoming addendum to this RI/FS report. Given the potential radiological impacts at Parcel E-2, the remedial alternatives evaluated in this report will include provisions for the proper screening, handling, and disposal of radiological materials.

## 1.8. FUTURE SITE REUSE

Based on the City and County of San Francisco's Hunters Point Naval Shipyard Redevelopment Plan, Parcel E-2 is designated for open space reuse except for a small area in the eastern portion, which is designated for industrial and research and development (R&D) reuse (San Francisco Redevelopment Agency [SFRA], 1997). At time of transfer, restrictive covenants will be established to prohibit certain construction activities within a specified distance from the Parcel E-2 boundary. These restrictions will impact this small area of industrial and R&D uses, but will be consistent with the intentions of the Redevelopment Plan. This conclusion is based on the following rationale:

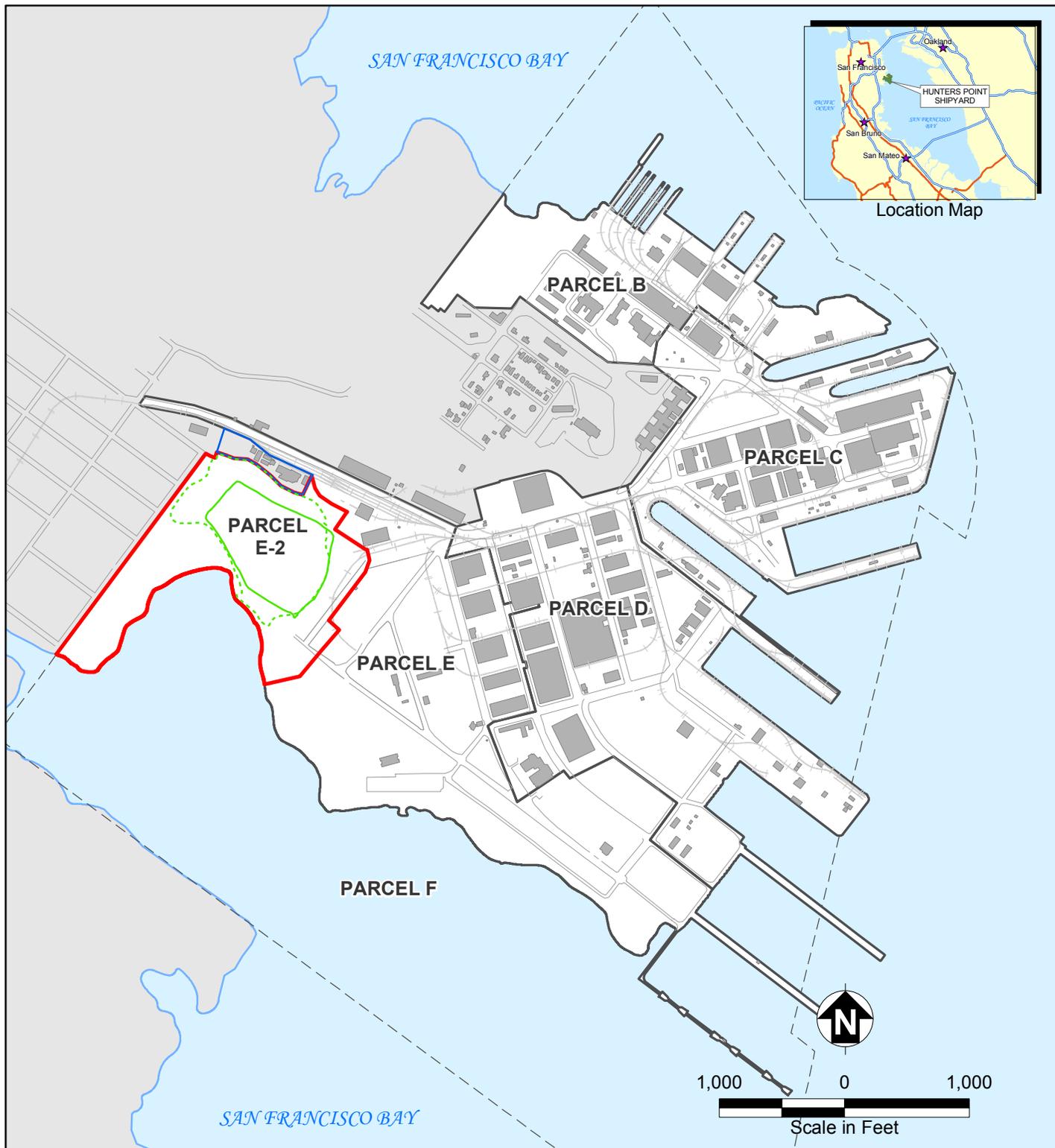
- The drafters of the 1997 Redevelopment Plan developed the Parcel E-2 reuse areas based on all available information. If the full lateral extent of landfill waste had been defined in 1997, the open space reuse boundaries would have included the entire landfill area.

- Due to this lack of information in 1997, the reuse boundaries were drawn such that the waste material extends onto a portion of the area slated for R&D and is in close proximity to the other areas slated for industrial and R&D uses. These types of uses, which include residential, are incompatible with the landfill area.
- In order to address this incompatibility, restrictive covenants that limit land use to open space development will be incorporated in the transfer process.

Figure 1-15 shows the designated reuse of Parcel E-2 according to the SFRA Redevelopment Plan (SFRA, 1997).

# Figures

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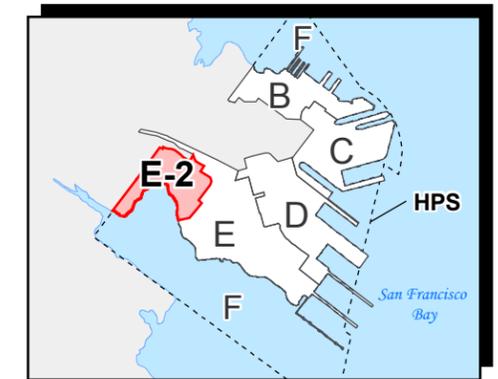
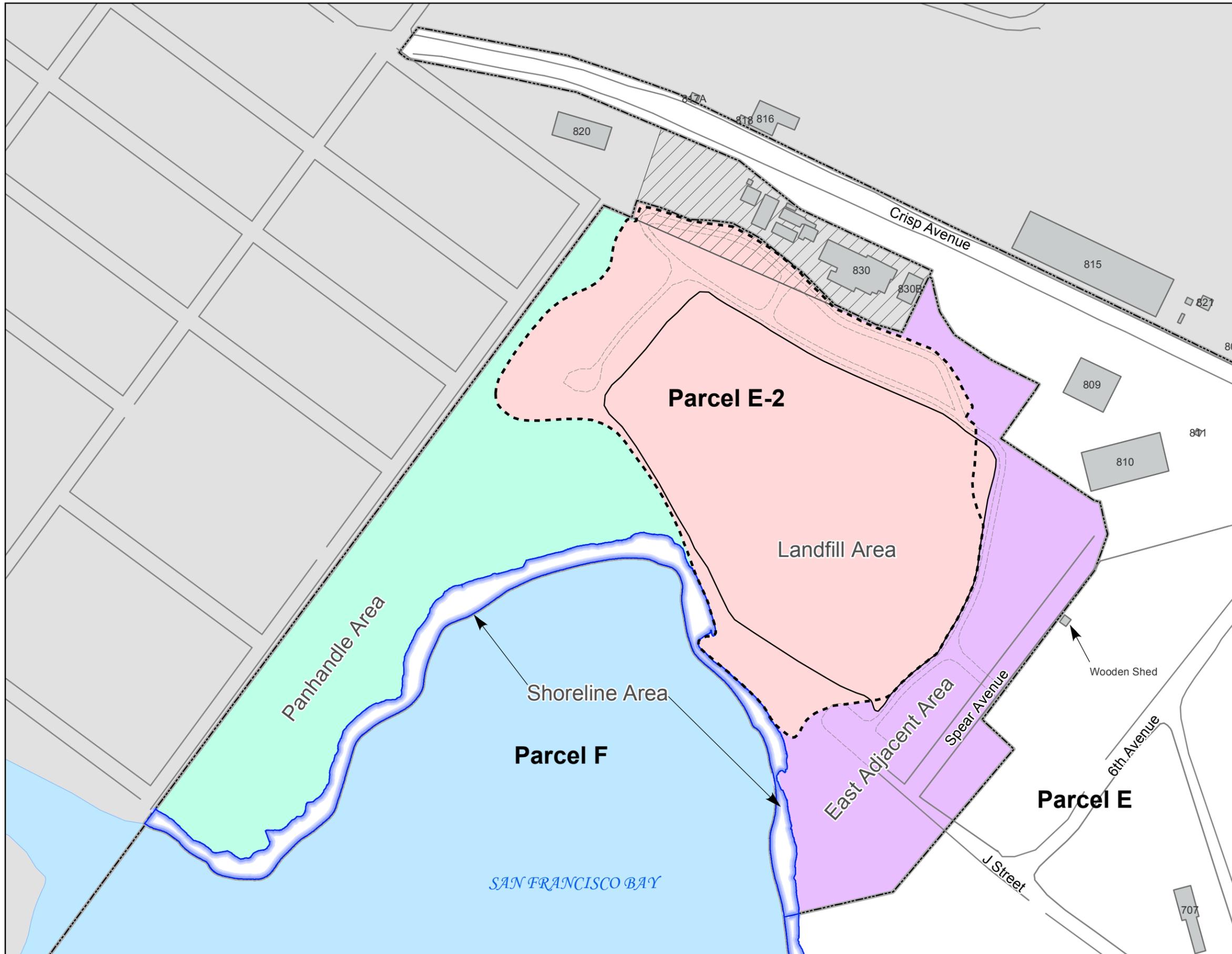
-  Parcel Boundary
-  University of California, San Francisco (UCSF) Compound
-  Non-Navy Property
-  Parcel E-2 Boundary
-  Road
-  Rail Line
-  Building
-  Parcel F Boundary
-  Estimate of Solid Waste Extent
-  Interim Landfill Cap Extent

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**FIGURE 1-1**  
**SITE VICINITY MAP**

Remedial Investigation/Feasibility Study for Parcel E-2

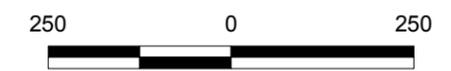


Location Map

**Legend**

-  Parcel Boundary
-  Landfill Area
-  East Adjacent Area
-  Panhandle Area
-  Shoreline Area
-  Estimate of Solid Waste Extent
-  Interim Landfill Cap Extent
-  Non-Navy Property
-  UCSF Compound
-  Non-Navy Property within Landfill Area\*
-  Building
-  Road
-  Gravel Road
-  San Francisco Bay

\*Remediation work in area to be performed under easment (to be granted by UCSF.)



Scale in Feet

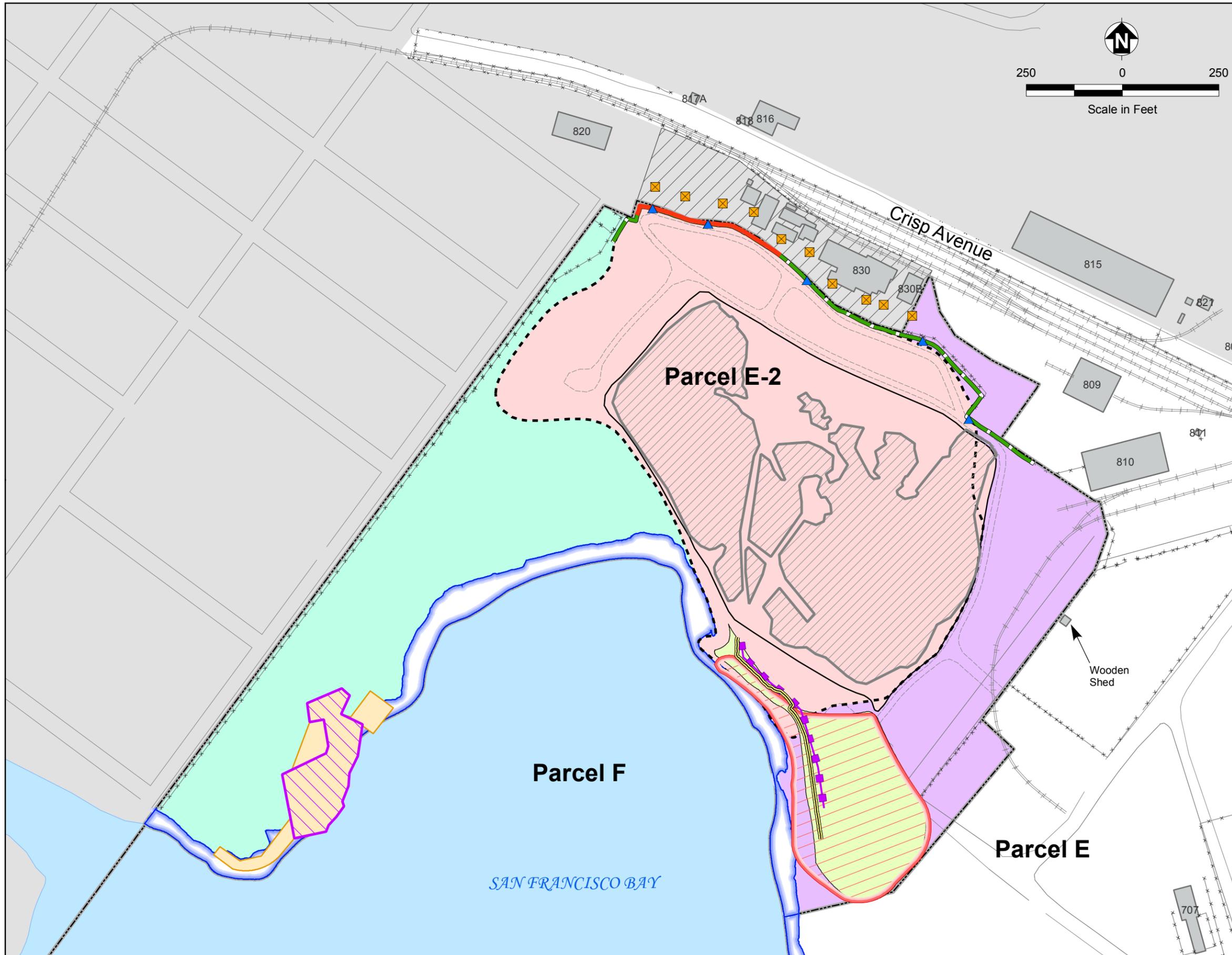
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**FIGURE 1-2**

**LANDFILL/PARCEL E-2 LOCATIONS**

Remedial Investigation/Feasibility Study for Parcel E-2



**Previous Removal Actions**

- Interim Landfill Cap
- Groundwater Extraction System**
- Sheet-Pile Wall
- Extraction Trench
- Interim Landfill Gas Control System**
- Extraction Wells
- Passive Vents
- HDPE Barrier Wall
- Grouted Section of HDPE Barrier Wall That Can Be Used For Extraction

**Recent Removal Actions**

- Proposed Metal Slag TCRA
- Actual Metal Slag TCRA\*
- Proposed PCB Hot Spot TCRA
- Actual PCB Hot Spot TCRA\*

- Burn Area
- Parcel Boundary
- Estimate of Solid Waste Extent
- Landfill Area
- Adjacent Area
- Panhandle Area
- Shoreline Area
- Non-Navy Property
- UCSF Compound
- Building
- San Francisco Bay
- Fence Line
- Road
- Gravel Road
- Railroad

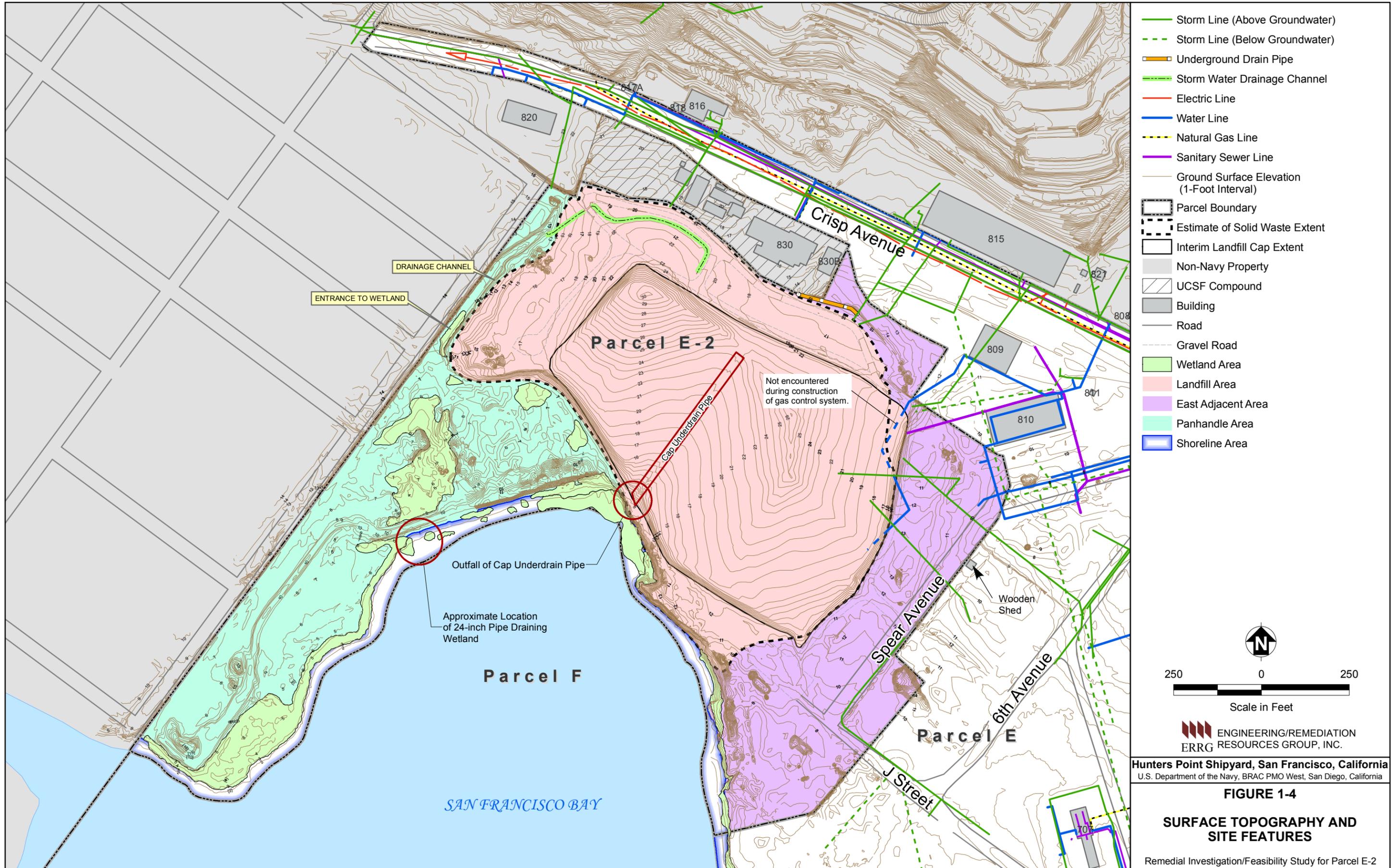
Notes:  
 HDPE High Density Polyethylene  
 PCB Polychlorinated Biphenyls  
 TCRA Time-Critical Removal Action  
 \* Actual boundaries of removal action excavation areas as of September 2006.



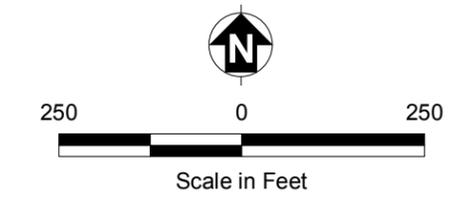
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**FIGURE 1-3**  
**REMOVAL ACTION AREAS**

Remedial Investigation/Feasibility Study for Parcel E-2



- Storm Line (Above Groundwater)
- - - Storm Line (Below Groundwater)
- Underground Drain Pipe
- Storm Water Drainage Channel
- Electric Line
- Water Line
- Natural Gas Line
- Sanitary Sewer Line
- Ground Surface Elevation (1-Foot Interval)
- Parcel Boundary
- Estimate of Solid Waste Extent
- Interim Landfill Cap Extent
- Non-Navy Property
- UCSF Compound
- Building
- Road
- Gravel Road
- Wetland Area
- Landfill Area
- East Adjacent Area
- Panhandle Area
- Shoreline Area



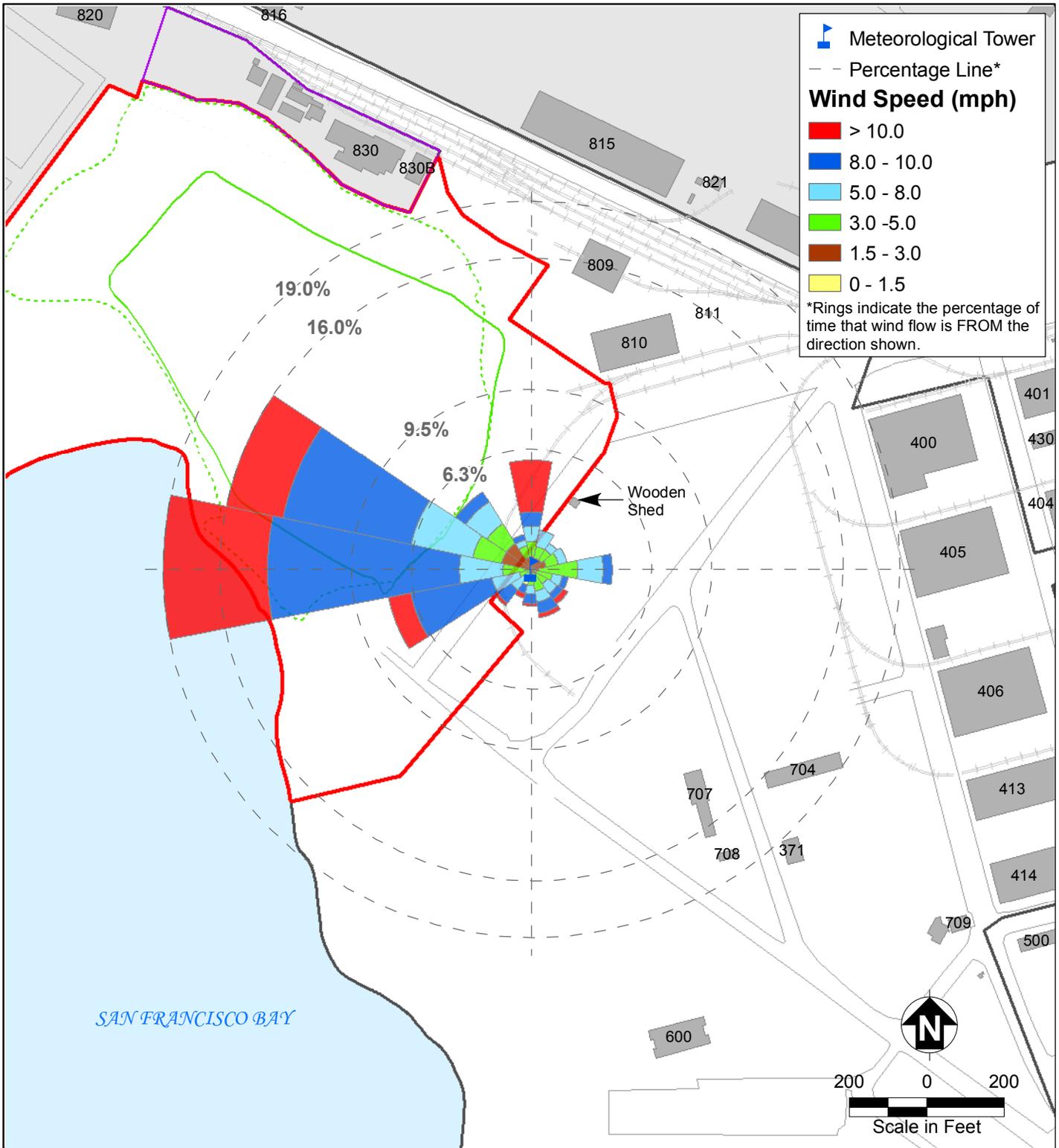
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**FIGURE 1-4**

**SURFACE TOPOGRAPHY AND  
SITE FEATURES**

Remedial Investigation/Feasibility Study for Parcel E-2



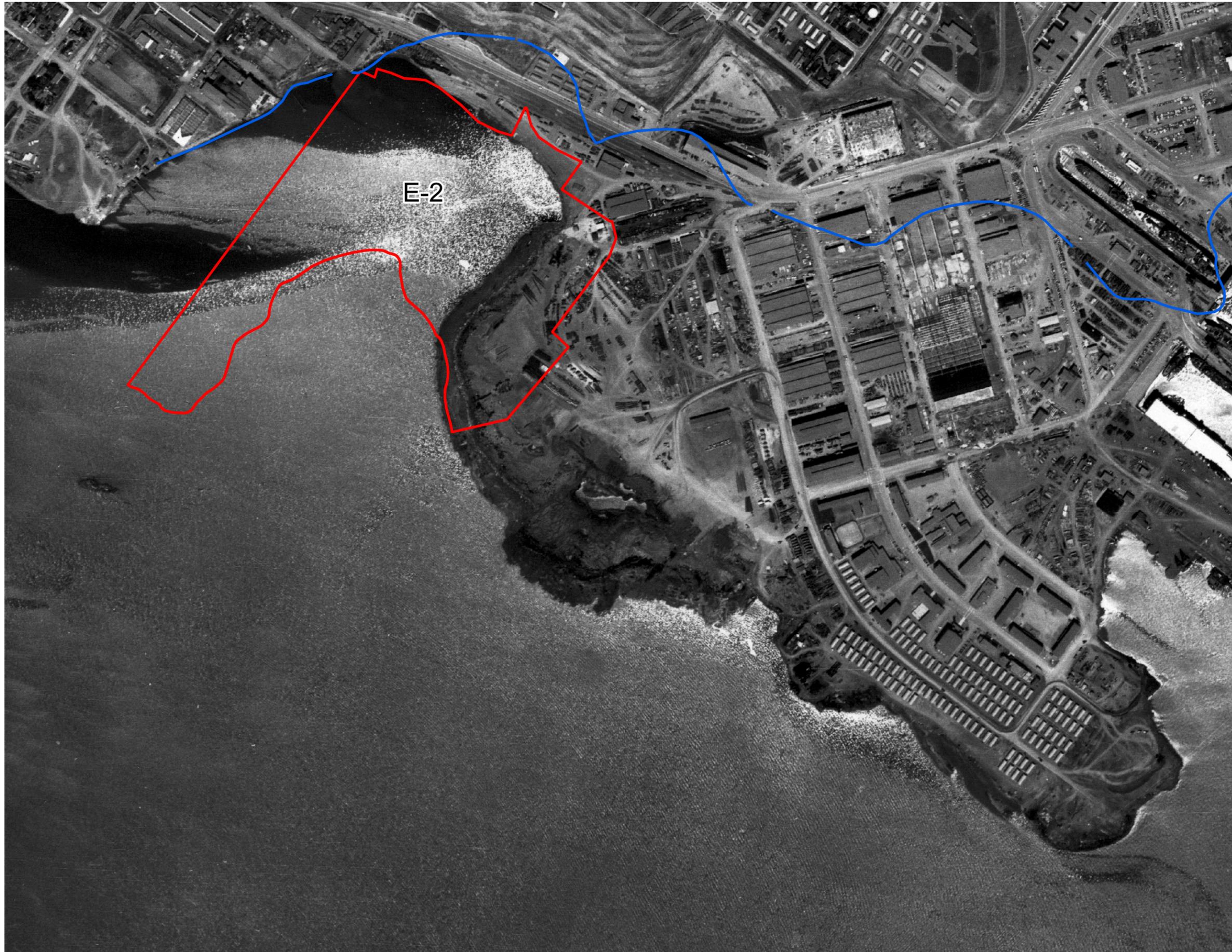
Meteorological Tower  
 Percentage Line\*  
**Wind Speed (mph)**  
 > 10.0  
 8.0 - 10.0  
 5.0 - 8.0  
 3.0 - 5.0  
 1.5 - 3.0  
 0 - 1.5  
 \*Rings indicate the percentage of time that wind flow is FROM the direction shown.

- University of California, San Francisco (UCSF) Compound
- Non-Navy Property
- Parcel E-2 Boundary
- Road
- Rail Line
- Building
- Parcel F Boundary
- Estimate of Solid Waste Extent
- Interim Landfill Cap Extent

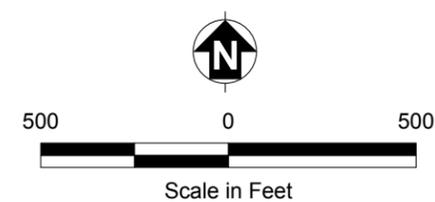
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**FIGURE 1-5**  
**WIND SPEED AND DIRECTION MAP**  
 Remedial Investigation/Feasibility Study for Parcel E-2



Parcel E-2 Boundary  
1935 Shoreline



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**FIGURE 1-6**  
**1946 AERIAL PHOTOGRAPH**

Remedial Investigation/Feasibility Study for Parcel E-2



 Parcel E-2 Boundary



500 0 500



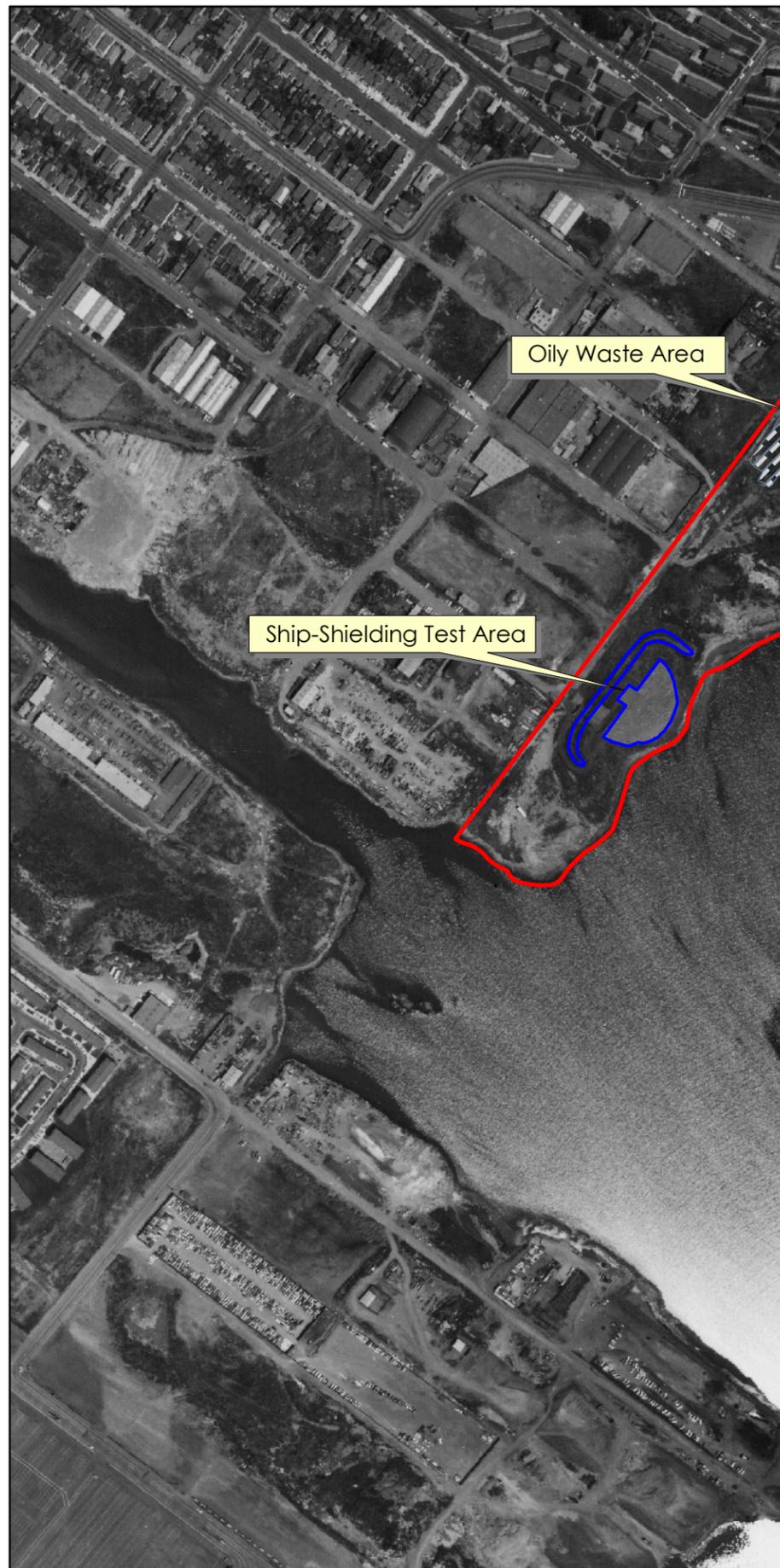
Scale in Feet

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**FIGURE 1-7**  
**1955 AERIAL PHOTOGRAPH**

Remedial Investigation/Feasibility Study for Parcel E-2



-  Parcel E-2 Boundary
-  Site Features
-  Oily Waste Area



500 0 500



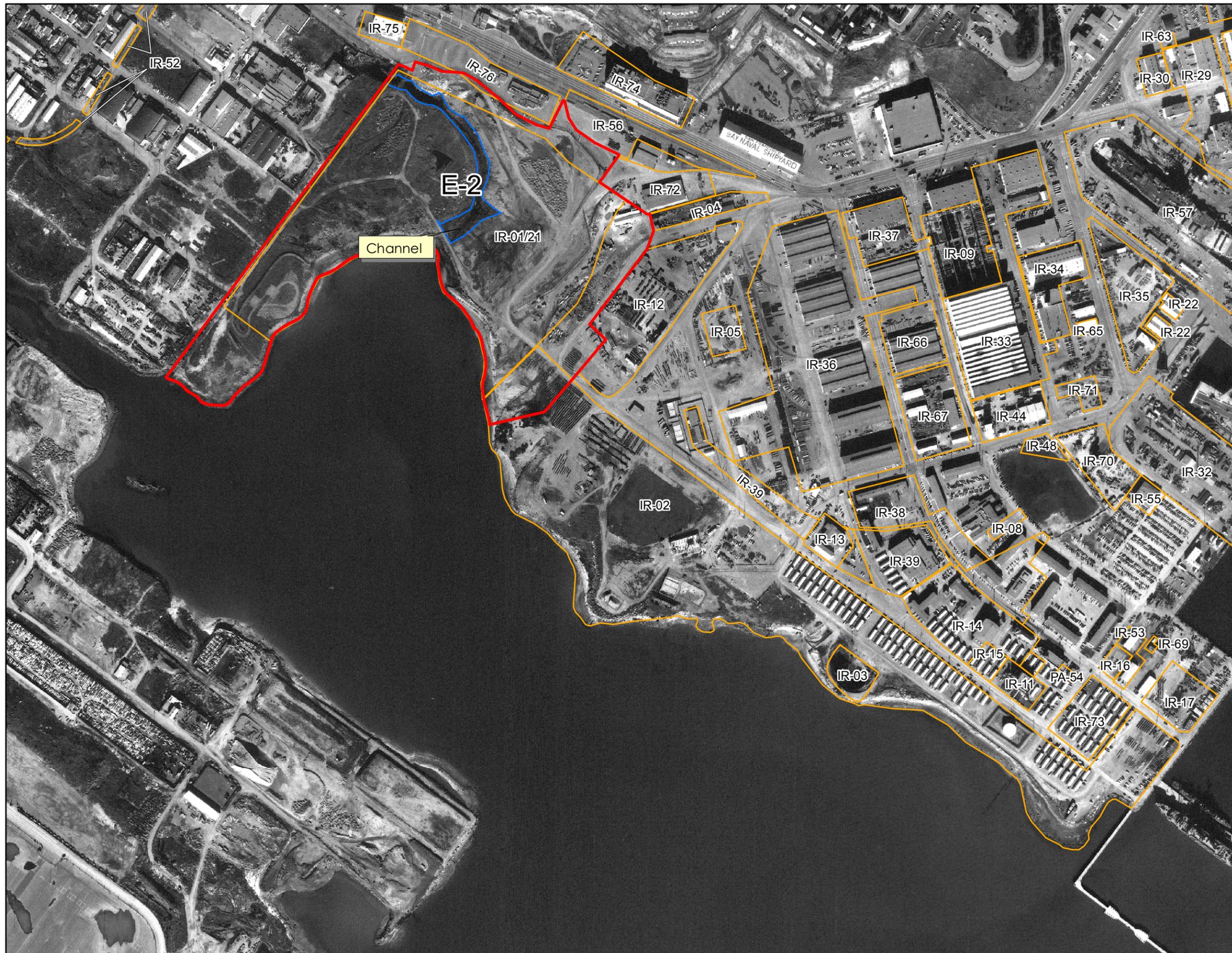
Scale in Feet

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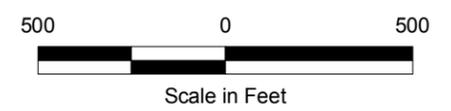
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**FIGURE 1-8**  
**1965 AERIAL PHOTOGRAPH**

Remedial Investigation/Feasibility Study for Parcel E-2



- Parcel E-2 Boundary
- Installation Restoration Site



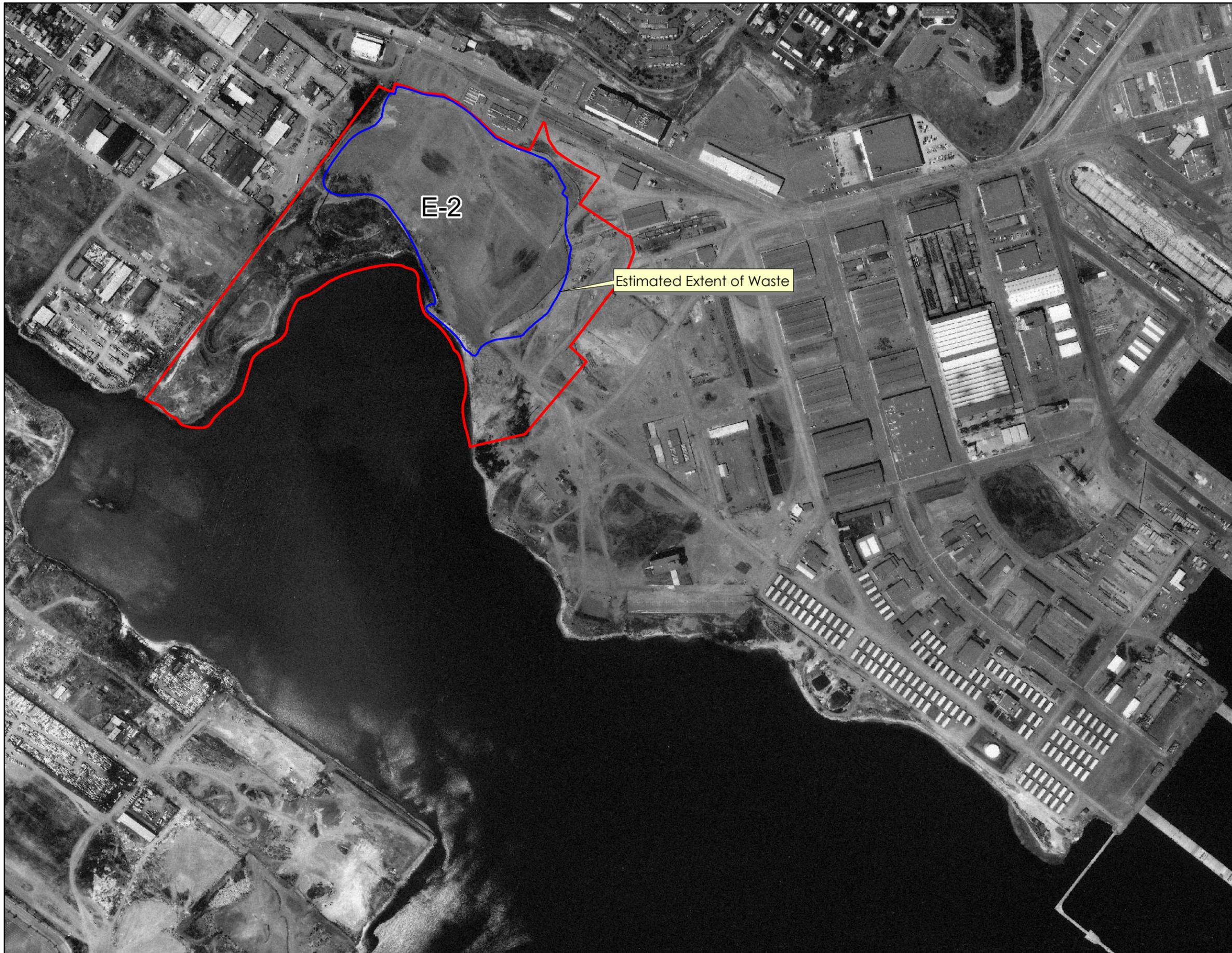
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**FIGURE 1-9**

**1969 AERIAL PHOTOGRAPH WITH  
IR SITE BOUNDARIES**

Remedial Investigation/Feasibility Study for Parcel E-2



- Parcel E-2 Boundary
- Site Features



500 0 500



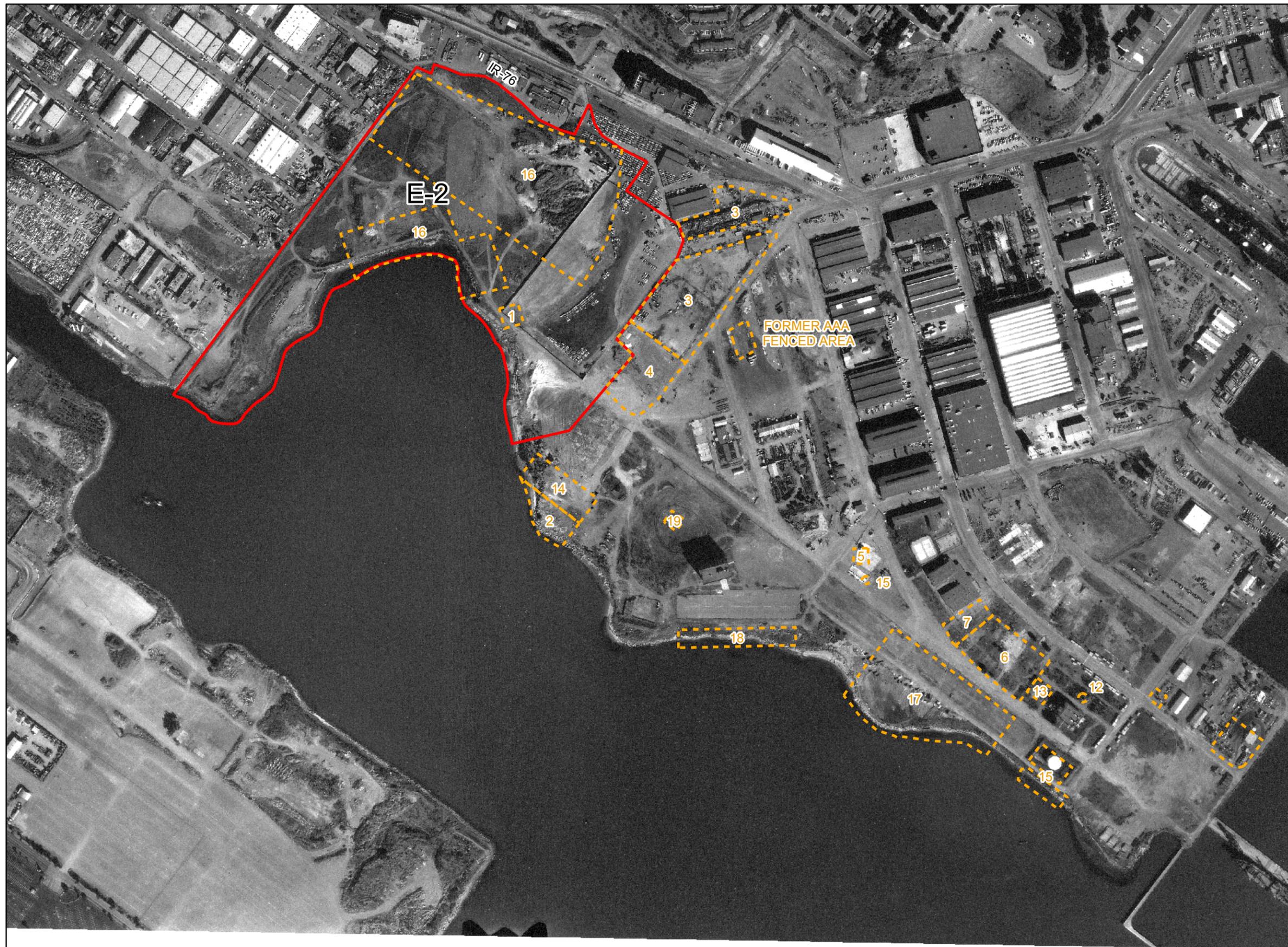
Scale in Feet

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**FIGURE 1-10**  
**1975 AERIAL PHOTOGRAPH**

Remedial Investigation/Feasibility Study for Parcel E-2



 AAA Sites  
 Parcel E-2 Boundary



500      0      500  
  
 Scale in Feet

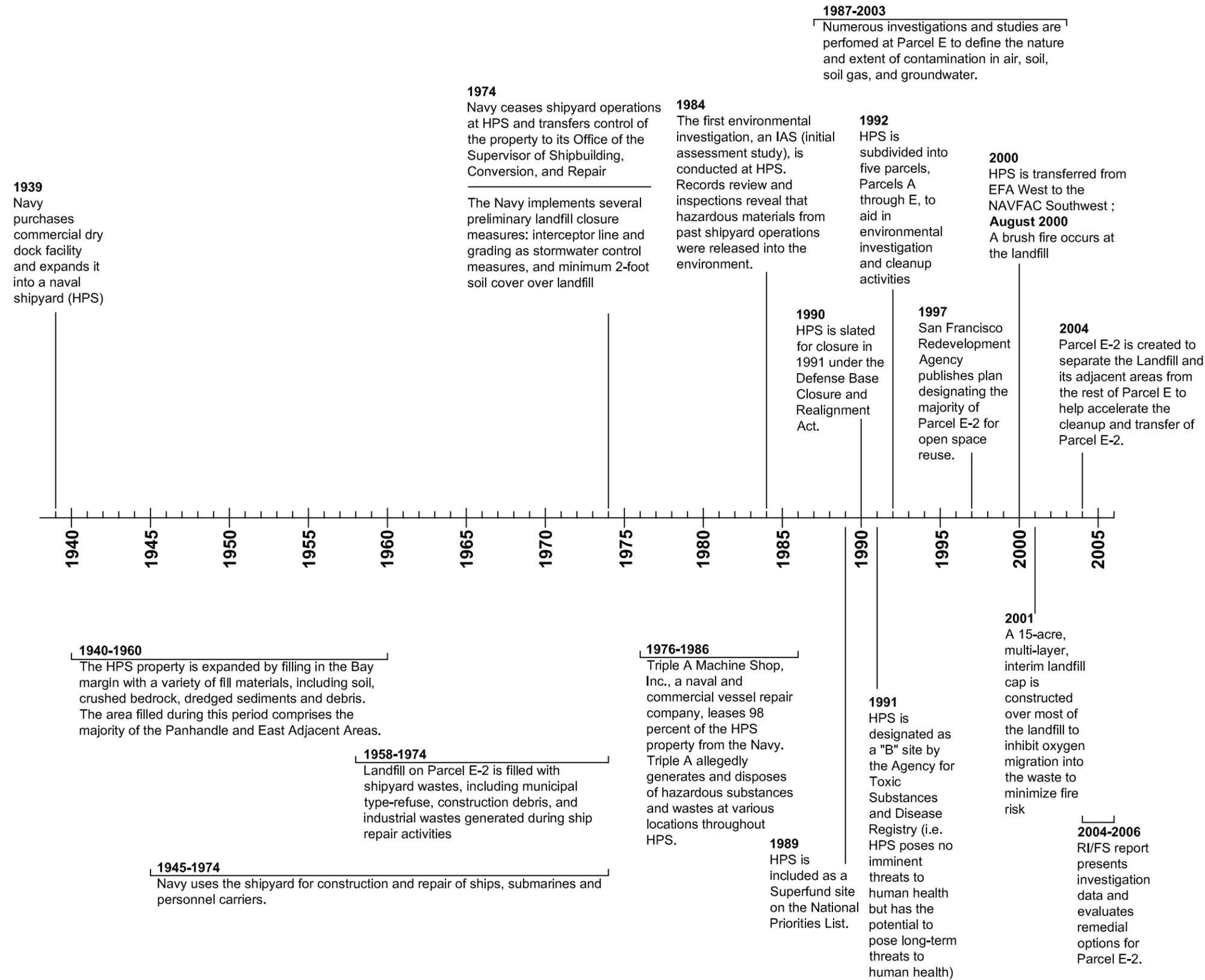
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**FIGURE 1-11**

**1985 AERIAL PHOTOGRAPH WITH  
 TRIPLE A SITE BOUNDARIES**  
 Remedial Investigation/Feasibility Study for Parcel E-2

P:\2005\_Projects\25-049\_Navy\_HPS\_E-2\_RI-FS\N\_Maps&Drawings\GIS\Projects\Landfill\_RI\Section 3\1\_1-HPS-timeline.dwg



Navy - U.S. Department of the Navy  
 BRAC - Base Realignment and Closure  
 HPS - Hunters Point Shipyard  
 IAS - Initial Assessment Study  
 NAVFAC - Naval Facilities Engineering Command  
 EFA - Engineering Field Activity  
 PMO - Project Management Office  
 RI/FS - Remedial Investigation/Feasibility Study

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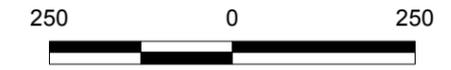
**FIGURE 1-12**  
**SITE HISTORY TIMELINE**

Remedial Investigation/Feasibility Study for Parcel E-2



- Area Radiological Status**
- Radiologically Impacted Sites
  - Landfill Area
  - Adjacent Area
  - Panhandle Area
  - Shoreline Area
  - Interim Landfill Cap Extent
  - Experimental Ship-Shielding Area
  - Parcel Boundary
  - Non-Navy Property
  - Building
  - Road
  - Rail Line

**Notes:**  
 Impacted sites are sites that have known radiological contamination or where site history indicates that radiological contamination may be present.  
 Impacted sites based on Historical Radiological Assessment (Naval Sea Systems Command, 2004).



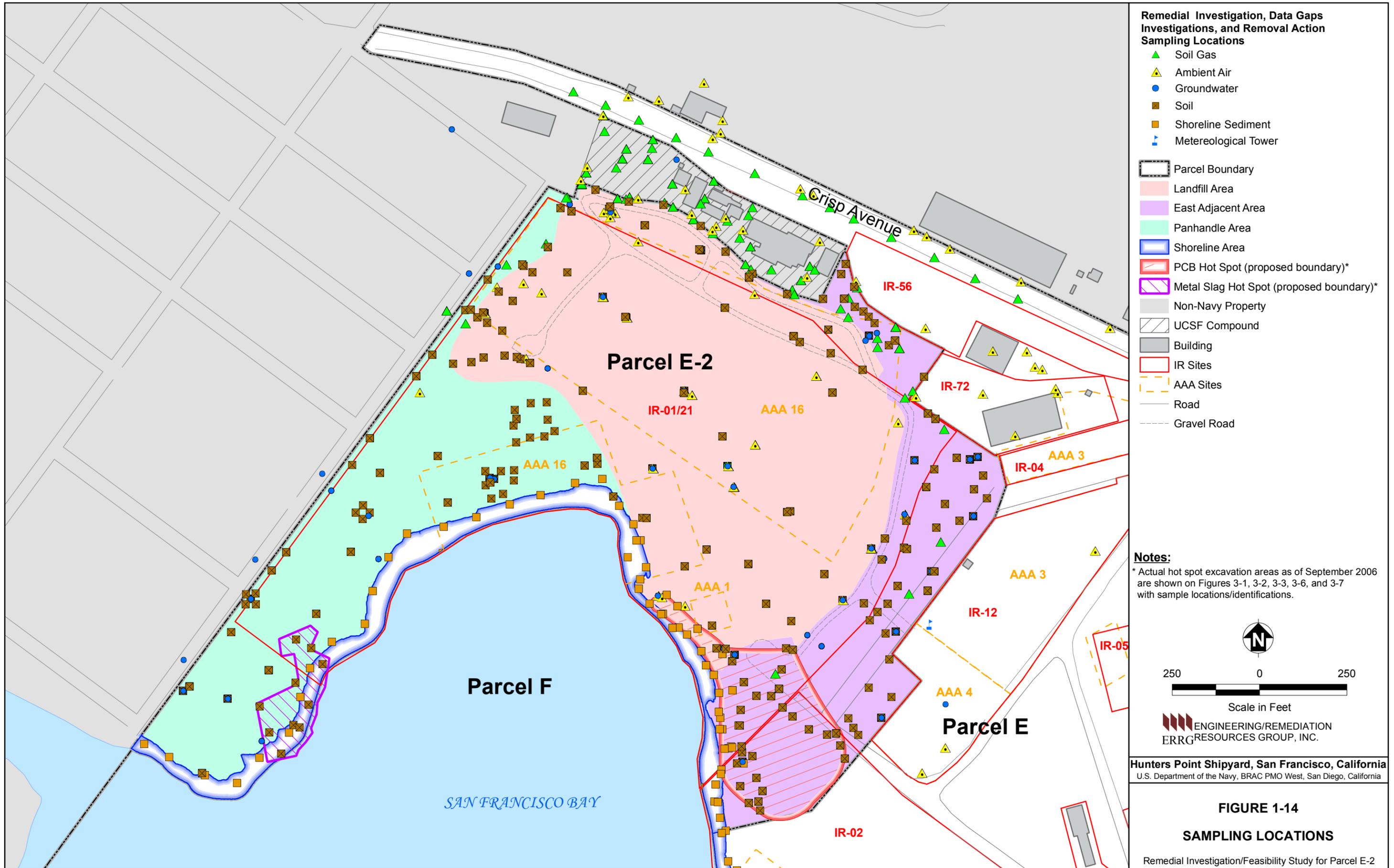
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 ENGINEERING/REMEDIAION  
 ERRG RESOURCES GROUP, INC.

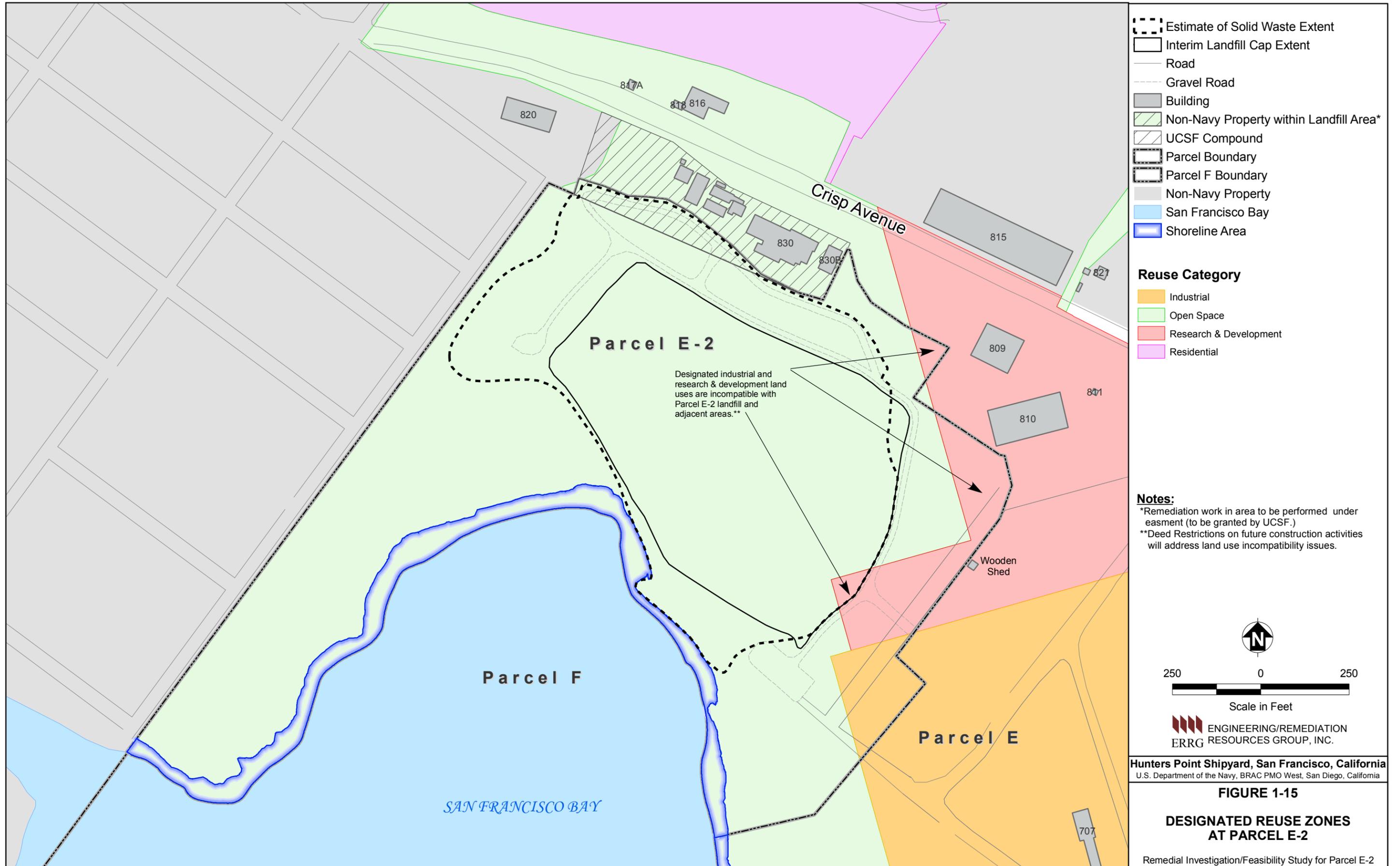
**Hunters Point Shipyard, San Francisco, California**  
 U.S. Department of the Navy, BRAC PMO West, San Diego, California

**FIGURE 1-13**

**PARCEL E-2 RADIOLOGICALLY IMPACTED SITES**

Remedial Investigation/Feasibility Study for Parcel E-2





**FIGURE 1-15**

**DESIGNATED REUSE ZONES  
 AT PARCEL E-2**

# Tables

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**Table 1-1 RI/FS Organization Summary, Hunters Point Shipyard Parcel E-2, Remedial Investigation/Feasibility Study**

Section	Description
1. Introduction	Presents the report purpose and goals, organization, site description, site history and planned reuse
2. Site Description and Physical Characteristics	Describes the geology, hydrogeology, hydrology, and ecology of Parcel E-2. Characteristics of the four study areas at Parcel E-2 are also described.
3. Remedial Investigation Activities and Removal Actions	Discussion of investigations and evaluations conducted at Parcel E-2 (including removal actions and ongoing monitoring).
4. Nature and Extent of Solid Waste, Landfill Gas, and Chemicals in Soil	Evaluates data collected during previous investigations conducted at Parcel E-2 and discussed in Section 3 (and subsections) in order to define the nature and extent of solid waste, landfill gas, and chemicals in soil. Information presented in this section could affect the remedial alternatives evaluated in the FS portion of this report.
5. Nature and Extent of Chemicals in Groundwater	Evaluates data collected during previous investigations conducted at Parcel E-2 and discussed in Section 3 (and subsections) in order to define the nature and extent of chemicals in groundwater. Information presented in this section could affect the remedial alternatives evaluated in the FS portion of this report.
6. Conceptual Site Model	Description of Parcel E-2 contaminant sources, potentially affected media and migration pathways, and potential receptors.
7. Risk Assessment	Describes the baseline HHRA and SLERA conducted to quantify the potential risks to human health and the environment from the Landfill Area, East Adjacent Area and Panhandle Area.
8. Remedial Investigation Recommendations and Conclusions	Presents conclusions from the RI section of the report, and makes recommendations for the FS.
9. Remedial Action Objectives and Goals	Describes media, exposure routes, and receptors to be addressed in the remedial alternatives and defines contaminant levels that are protective of receptors in Parcel E-2.
10. Potential Applicable Or Relevant And Appropriate Requirements (ARARs)	Identifies potential chemical-, location-, and action-specific ARARs as required by CERCLA.
11. Identification And Screening of Technologies And Process Options	Describes the GRAs appropriate for Parcel E-2 and evaluates remedial technologies and processes that are applicable to Parcel E-2.
12. Development of Remedial Alternatives	Describes each alternative developed from the remedial technologies and process options retained after the evaluation in Section 10.
13. Detailed Analysis of Remedial Alternatives	Evaluates each remedial alternative against the nine criteria defined in EPA guidance ( <a href="#">EPA, 1988a</a> )
14. Comparative Analysis of Remedial Alternatives	Compares retained remedial alternatives to evaluate which alternative most effectively meets the RAOs
15. References	Presents the documents, publications and reports used to prepare this RI/FS report.

**Table 1-1 RI/FS Organization Summary, Hunters Point Shipyard Parcel E-2, Remedial Investigation/Feasibility Study (Continued)**

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**Appendices**

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A	Final Parcel E Nonstandard Data Gaps Investigation Landfill Gas Characterization (provided on compact disc only)
B	Final Parcel E Nonstandard Data Gaps Investigation Landfill Lateral Extent Evaluation (provided on compact disc only)
C	Final Parcel E Nonstandard Data Gaps Investigation Landfill Liquefaction Potential (provided on compact disc only)
D	Final Parcel E Nonstandard Data Gaps Investigation Wetlands Delineation and Function and Values Assessment Parcel B and E (provided on compact disc only)
E	Final Removal Action Landfill Cap Closeout Report (provided on compact disc only)
F	Removal Action Closeout Report, Landfill Gas Removal Action (provided on compact disc only)
G	Shoreline Characterization Technical Memorandum (provided on compact disc only)
H	EPA Presumptive Remedy Guidance (provided on compact disc only)
I	Groundwater Beneficial Use Evaluation
J	Analytical Results and Boring Logs (provided on compact disc only)
K	Human Health Risk Assessment
L	Screening Level Ecological Risk Assessment for Onshore Areas
M	Evaluation of Groundwater Chemical Migration to the Aquatic Environment
N	Applicable or Relevant and Appropriate Requirements
O	Wetlands Evaluation and Mitigation Options
P	Cap Infiltration Evaluation
Q	Qualitative Slope Stability Evaluation
R	Detailed Cost Estimates and Assumptions

---

**Notes:**

ARAR	Applicable or relevant and appropriate requirements
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
EPA	U.S. Environmental Protection Agency
FS	Feasibility study
GRA	General response action
HHRA	Human health risk assessment
RAO	Remedial action objective
RI	Remedial investigation
SLERA	Screening-level ecological risk assessment

**Table 1-2 Buildings Within 1,000 Feet of Parcel E-2 Landfill, Hunters Point Shipyard Parcel E-2, Remedial Investigation/Feasibility Study**

Building	IR Site	Parcel	Former Use	Current Use	Planned Reuse <sup>a</sup>	Approximate Distance from Landfill
400	IR-36 North	E	Storehouse	Vacant	Mixed Use	950 feet east
704	IR-36 West	E	Automotive repair shop	Vacant	Industrial	950 feet southeast
707	IR-39	E	NRDL animal colony	Vacant	Industrial	875 feet southeast
808	NA	Former A	Industrial Storehouse	Leased to Precision Transport	Mixed Use	700 feet northeast
809	IR-56	E	Lumber storehouse	Leased to Golden Gate Railroad Museum	R&D	250 feet northeast
810	IR-72	E	Paint and oil storehouse	Vacant	R&D	250 feet northeast
811	IR-72	E	Diesel fueling station	Vacant	R&D	575 feet northeast
815	IR-74	FUDS	NRDL main laboratory	Leased to Filesafe Company	NA <sup>b</sup>	325 feet northeast
816	NA	Former A	NRDL high-voltage accelerator laboratory	Vacant	Open Space	250 feet north
817A	NA	Former A	Sentry House	Vacant	Open Space	250 feet north
818	NA	Former A	Chlorination plant	Vacant	Open Space	250 feet north
820	IR-75	FUDS	NRDL cyclotron laboratory	Wood moulding shop	NA <sup>b</sup>	175 feet northwest
821	NA	Former A	X-ray shield facility	Vacant	Mixed	625 feet northeast
830	IR-76	FUDS	NRDL animal kennels	UCSF animal kennels	NA <sup>c</sup>	Less than 100 feet north
830B	IR-76	FUDS	UCSF animal kennels	UCSF animal kennels	NA <sup>c</sup>	Less than 100 feet north
831	IR-76	FUDS	NRDL animal kennels	UCSF animal kennels	NA <sup>c</sup>	Less than 100 feet north
Shed	IR-12	E	Storage shed (unnamed)	Vacant	R&D	250 feet east

Notes:

Current and former Navy buildings are identified in the table above; additional structures are located within 1,000 feet of the western boundary of the Parcel E-2 landfill.

- |   |  |      |                                       |      |   |
|---|--|------|---------------------------------------|------|---|
| a | Hunters Point Shipyard Redevelopment Plan (SFRA, 1997) | FUDS | Formerly utilized defense site        | R&D  | Research and development                |
| b | FUDS property owned by Ted Lowpensky                   | IR   | Installation Restoration              | SFRA | San Francisco Redevelopment Agency      |
| c | FUDS property owned by UCSF                            | NA   | Not applicable                        | UCSF | University of California, San Francisco |
|   |  | NRDL | Naval Radiological Defense Laboratory |      |   |

**Table 1-3 Summary of Previous Environmental Investigations and Remedial Activities in Parcel E-2, Hunters Point Shipyard, Remedial Investigation/Feasibility Study**

Date(s)	Activity	Summary of Activities
1984	Initial Assessment Survey (IAS)	The purpose of the IAS was to identify sites posing a potential threat to human health or the environment from contamination from past hazardous material operations. Records reviews and a visual inspection of the landfill (IAS Site 3, later renamed IR-01) were conducted. The IAS concluded that it was highly probable that chemicals from waste disposed of in the Parcel E-2 Landfill had reached the groundwater and were migrating toward San Francisco Bay. This migration constituted a potential threat to the Bay environment and a confirmation study was recommended for the site. (NEESA, 1984).
1987	Confirmation Study / Verification Step	The study was conducted in response to the IAS, to verify the presence of hazardous waste contamination. Activities conducted in the landfill area included a geophysical survey, subsurface exploration using exploratory borings, and soil and groundwater sampling. The study concluded that soil at the Parcel E-2 Landfill contained a variety of VOCs and SVOCs that appeared to be associated with petroleum products and some chlorinated organic solvents. The report recommended further environmental investigations due to the detection of contaminants beyond the reported landfill boundaries. (EMCON, 1987a).
1987	Area Study	The study was conducted throughout HPS to determine if a release of hazardous substances to soil had occurred at construction sites outside the boundaries of previously identified investigation sites. The area study primarily concluded that soils within Study Area A, including Parcels E and E-2, contained naturally-occurring asbestos derived from the serpentine bedrock. (EMCON, 1987b).
1988	Solid Waste Air Quality Assessment Test	The study included evaluation of meteorological conditions, ambient air quality, landfill gas compositions, surface gas emissions, and subsurface gas migration. The analysis of gases covered a wide range of organic compounds, including VOCs and methane. Surface gas emissions were not detected in this investigation. The only compounds detected were in the ambient air and detected upwind from possible sources off site in the surrounding industrial areas. Methane was detected in isolated pockets at IR-01 and at the northern edge of the IR-01 boundary (near the UCSF compound but within the solid waste footprint) (HLA, 1989).
1986 to 1988	Triple A Investigation, Remedial Action Order and Remedial Investigation/ Feasibility Study (RI/FS) Scoping Document	The Navy identified 19 sites that Triple A had allegedly used to store and dispose of hazardous and other wastes during its occupancy of the site. Two of these sites, Triple A Sites 1 and 16, are located within Parcel E-2 (SFDA, 1986). DHS issued a Remedial Action Order to the Navy and its tenant, Triple A (DHS, 1988). The Remedial Action Order listed numerous sites, including IR Site 01 and Triple A Sites 1 and 16. In response to the Remedial Action Order, the Navy completed a scoping document for the RI/FSs to be conducted at HPS. The scoping document grouped the sites into OUs and described the field investigations to be conducted under the RI (HLA, 1988).

**Table 1-3 Summary of Previous Environmental Investigations and Remedial Activities in Parcel E-2, Hunters Point Shipyard, Remedial Investigation/Feasibility Study (Continued)**

Date(s)	Activity	Summary of Activities
1988 – 1992	Operable Unit I Remedial Investigation (RI)	The Parcel E-2 Landfill progressed to the RI stage as IR Site 01 and was grouped (along with IR Sites 02 and 03 in Parcel E) into OU-I. The first phase of the OU-I RI (from 1988 to 1989) consisted of reconnaissance activities, including a geophysical survey and test pit excavation to delineate the extent of landfill waste, a soil gas survey to evaluate the presence of VOCs in soil and groundwater, and the installation of deep soil borings to define subsurface stratigraphy. Subsequent phases of the OU-I RI involved primary and contingency sampling of soil and groundwater performed from October 1990 to June 1992 (TiEMI, LFR, and Uribe, 1997).
1991 to 1992	Intertidal Sediment Study	As part of the intertidal sediment study, sediment samples were collected in the intertidal zone of HPS, including along the Parcel E-2 shoreline, to evaluate if contaminants had migrated from Parcels E and E-2 to the Bay (ATT, 1991). The ESAP whole sediment study measured concentrations of chemicals in sediments, stormwater, and Bay water near stormwater outfalls and other potential source areas within the boundaries of HPS.
1991 and 1993	Radiological Investigations (Phases I and II)	The Phase I investigation was initiated to determine and confirm the nature and surficial extent of radium-bearing devices in several disposal areas at HPS, including Parcel E-2. Nine radioactive point source anomalies associated with radium-containing devices were observed in the southwestern and northeastern areas. The Phase II investigation was conducted to delineate the subsurface distribution of radium-containing devices at several locations, including Parcel E-2. No elevated gamma count rates were measured in the test pits or trenches installed within IR-01/21; however, test pits and trenches installed at IR-02, in close proximity to Parcel E-2, contained gamma-emitting anomalies associated with radium-containing devices and firebrick (NAVSEA, 2004).
1991 to 1995	Sandblast Waste Fixation	A field treatment demonstration was performed to determine if sandblast waste could be stabilized and recycled into asphalt (Battelle, 1989). Between 1991 and 1995, 4,665 tons of sandblast waste from throughout HPS was collected and consolidated in Parcel E-2. The waste was sent to an asphalt plant, where it was successfully reused in the manufacture of asphalt (Battelle, 1996).
1992, 1994, and 1996	Facility-wide Ambient Air Monitoring (Phases I, II, and III)	Ambient air sampling was conducted at select locations, including the Parcel E-2 Landfill. Low levels of VOCs and asbestos were detected at IR-01 during Phase I. During Phase II, air samples near a sandblast waste pile at IR-01/21 contained elevated levels of asbestos, metals, and PCBs. During Phase III, detected concentrations of asbestos, metals, and VOCs were similar to regional background concentrations, and concentrations of PCBs were 2 orders of magnitude lower than concentrations detected in Phase II. The Phase III study concluded that the removal of the sandblast waste pile in 1994 most likely contributed to the elevated concentrations of asbestos, metals, and PCBs detected during Phase II (TiEMI, LFR, and Uribe, 1997).
1994 to 1996	Phase 1A and 1B Ecological Risk Assessment (ERA)	The Phase 1A ERA was a qualitative analysis that developed a preliminary characterization of HPS based on existing data, biotic surveys, and contaminant migration pathways and exposure routes. Both terrestrial and aquatic environments were considered in the Phase 1A ERA. Following the Phase 1A analysis, the quantitative Phase 1B ERA was performed to delineate potential gradients of contamination from on-shore sources to off-shore sediments, and to characterize the risk to aquatic receptors (PRC, 1994; PRC, 1996c, PRC, 1996d).

**Table 1-3 Summary of Previous Environmental Investigations and Remedial Activities in Parcel E-2, Hunters Point Shipyard, Remedial Investigation/Feasibility Study (Continued)**

Date(s)	Activity	Summary of Activities
1995 to 1998	Parcel E Remedial Investigation (RI) and Feasibility Study (FS)	Following the 1992 decision to align the HPS IR sites into parcels, the RI at the landfill was completed in conjunction with other Parcel E IR sites, and involved additional field investigation performed from October 1995 to June 1996 (TiEMI, LFR, and Uribe, 1997). In 1993, IR Site 01 was combined with IR Site 21. IR Site 21 was initially identified as a separate site during the RI/FS scoping process, but was later determined to be part of the landfill and thus was combined with IR Site 01. The Parcel E RI also included a baseline ERA and HHRA. During preparation of the Parcel E RI and FS reports in 1997 and 1998, the Navy and regulatory agencies identified additional tasks to support the remedial design for Parcel E. These tasks were performed as part of data gaps investigations from 2000 through 2003.
1996 to 1997	Storm Drain Sediment Removal Action	The Navy removed accumulated sediments from the storm drain system at HPS to mitigate potential transport of contaminated sediments to the Bay. The storm drain system at HPS consists of approximately 107,000 linear feet of piping, less than 1,000 feet of which are present in Parcel E-2. Most storm drain lines within Parcel E-2 were inaccessible during the removal action, with the exception of a short section of storm drain (less than 200 feet) present southwest of Building 810 (IT, 1998).
1997 to 1998	Groundwater Extraction System and Containment Barrier	Previous investigations identified high PCB concentrations in groundwater in the southeast portion of Parcel E-2. To prevent the potential transport of PCBs to the Bay, the Navy (1) constructed an 800-foot-long, sheet-pile barrier between the landfill and the Bay and (2) installed a groundwater extraction system behind the barrier to prevent groundwater pressure behind the sheet-pile wall (IT, 1999). The barrier consists of 410 sheet piles 12 to 55 feet long. The groundwater extraction system consists of a groundwater extraction trench and seven groundwater extraction wells installed on the landward side of the sheet-pile wall as shown on Figure 1-3.
1999 to 2000	ERA Validation Study and Protective Soil Concentration (PSC) Technical Memorandum	The validation study addressed some of the uncertainties associated with dose calculations (from the baseline ERA) and developed site-specific soil concentrations that would be protective of terrestrial receptors (referred to as PSCs). Based on the results of the validation study, cadmium, copper, lead, nickel, selenium, and zinc were determined to be of potential risk to ecological receptors and PSCs were derived for these chemicals (TiEMI and LFR, 2000a and 2000b).
2000 to 2001	Interim Landfill Cap Construction	In August 2000, a brush fire burned about 37 percent of the landfill surface area. An interim cap was constructed to extinguish the fire and prevent the occurrence of future fires under the capped areas (TiEMI, 2005b) (Appendix E of this RI/FS report). In addition, the cap reduces the potential for hazardous substances to leach from landfill waste by preventing storm water from flowing through materials in the landfill. The cap encompasses about 14.5 acres (Figure 1-3). An extensive air monitoring program was performed during the cap construction to identify any conditions requiring corrective measures necessary to assure that public health and the environment of the nearby community were not compromised by air emissions from the subsurface smoldering and landfill capping activities.

**Table 1-3 Summary of Previous Environmental Investigations and Remedial Activities in Parcel E-2, Hunters Point Shipyard, Remedial Investigation/Feasibility Study (Continued)**

Date(s)	Activity	Summary of Activities
July 2000 to October 2002	Groundwater Data Gaps Investigation (GDGI)	The GDGI was conducted in three phases between 2000 and 2002 to update previous assessments of groundwater conditions at HPS, supplement information gathered during the Parcel E RI, and better define the extent of groundwater contamination at HPS (TiEMI, 2001a and 2004c). Water level measurements and a tidal study were used to refine the Parcel E-2 hydrogeological conceptual model, and three rounds of groundwater monitoring was used to develop a basewide groundwater monitoring program and to refine the nature and extent evaluation presented in this RI/FS.
2001 to 2005	Radiological Investigations, Phase V (and other interim investigations)	As part of an interim 2001 investigation, a characterization survey of the Parcels E and E-2 shoreline was performed. Several areas were noted during the survey that exceeded background gamma radiation levels, most significantly the area known as the "metal reef" within Parcel E. The Phase V investigation was performed from 2002 to 2003 at the radiologically impacted sites within Parcel E-2. Several areas with elevated levels of radioactivity were reported. The Historical Radiological Assessment recommended further characterization, followed by remediation, and a final status survey (NAVSEA, 2004).
October 2001 to November 2002	Non-Standard Data Gaps Investigation (NDGI)	An NDGI was conducted to collect the supplemental information required to support the remedial design for Parcel E. Four separate investigations were conducted and are described below.
	Wetlands Delineation and Functions and Values Assessment (October 2001 to April 2002)	The Navy conducted the wetland delineation and wetland functions and values assessment as part of the NDGI (TiEMI, 2003d) (Appendix D of this RI/FS report). Two wetland areas were identified at Parcel E: (1) about 3.2 acres of tidal wetlands along the shoreline and (2) about 1.3 acres of inland seasonal freshwater wetland that partially overlaps with the Parcel E-2 Landfill. The functions and values assessment found that the value of these wetlands is low, and the most significant function of these wetlands to be seasonal wildlife use for wintering and migrating birds.
	Landfill Lateral Extent Evaluation (March to April 2002)	The Navy evaluated the lateral extent of the solid waste as part of the NDGI of Parcel E (TiEMI, 2004f) (Appendix B of this RI/FS report). After a review of the existing information, test pits and soil borings were installed to determine the edge of physical waste. The lateral extent of landfill waste was found to encompass about 22 acres (Figure 1-2) and the vertical extent varies from 5 to 25 feet in thickness, with the bottom of waste being located between 12 and 30 feet bgs.
	Landfill Liquefaction Potential (April 2002)	The Navy evaluated the potential for soil liquefaction during an earthquake in areas surrounding the Parcel E-2 Landfill as part of the NDGI (TiEMI and ITSI, 2004b) (Appendix C of this RI/FS report). The evaluation indicated that the majority of the cohesionless soil layers (66 to 67 percent) would not liquefy during the MPE. The evaluation determined that, for the remaining soil layers that could liquefy during the MPE, lateral movement of soil below the waste would be less than 4 to 5 feet. The evaluation also concluded that, if containment were selected as the final remediation measure, further analysis would be required on response of the landfill cap, overall stability of the landfill site, slope stability, and other closure features.

**Table 1-3 Summary of Previous Environmental Investigations and Remedial Activities in Parcel E-2, Hunters Point Shipyard, Remedial Investigation/Feasibility Study (Continued)**

Date(s)	Activity	Summary of Activities
Landfill Gas Characterization  (April – November 2002)		As part of the NDGI, the Navy conducted an evaluation to characterize and delineate landfill gas as part of the NDGI (TtEMI, 2003e) (Appendix A of this RI/FS report). As part of the investigation, ambient air and soil gas surveys were conducted, and GMP01 through GMP21 were installed and monitored on a weekly basis. Results from GMP monitoring indicated that methane, the main component of landfill gas, was present at levels that exceeded the LEL (5 percent by volume in air) in subsurface areas in the northern part of the landfill and aboveground at four areas on the UCSF compound. Trace concentrations of NMOCs were also detected in this area; however, a screening evaluation concluded that the detected levels of NMOCs did not pose an unacceptable risk to human health.
August 2002 to May 2003	Landfill Gas Time-Critical Removal Action (TCRA)	<p>The Navy conducted a TCRA to remove combustible levels of methane on the UCSF compound. The landfill gas TCRA had the following goals: (1) to reduce methane levels on the UCSF compound to less than the LEL of 5 percent for methane and (2) to prevent future landfill gas migration onto the UCSF compound. The TCRA completed the following actions to achieve these goals:</p> <p>An active gas extraction system, consisting of two mobile extraction units, 10 extraction wells, and five GMPs on the UCSF compound was operated beginning in October 2002 to reduce methane levels. By January 20, 2003, the TCRA goals were met and gas extraction within the UCSF compound was discontinued.</p> <p>The Navy installed a landfill gas control system along the northern boundary of the landfill; the landfill gas control system consists of an HDPE barrier wall, gas collection trench, gas collection piping, and four gas vents</p> <p>Removed NMOCs from the vented and extracted gas streams using mobile treatment systems within the UCSF compound, and permanent treatment units attached to each of the four landfill gas control system vents; after goals within the UCSF compound were achieved, extraction within the UCSF compound was discontinued</p> <p>From January 29 to February 19, 2003, the gas extraction phase within the UCSF compound was followed by four rounds of weekly confirmation monitoring, and then from February through May 2003, four rounds of monthly confirmation monitoring were conducted. These monitoring events showed that methane concentrations across the UCSF property remained below the methane LEL.</p> <p>In February 2003 and May 2003, two rounds of sampling were conducted to verify NMOC concentrations. Gas samples were collected from all GMPs within the UCSF compound, and submitted for laboratory analyses. Sampling results confirmed that methane concentrations were less than 5 percent, and NMOCs were below the action level of 5 ppmv above background. Based on the confirmation field monitoring and laboratory sample data, the landfill gas TCRA goals were successfully met (TtEMI, 2004a) (Appendix F of this RI/FS report).</p>

**Table 1-3 Summary of Previous Environmental Investigations and Remedial Activities in Parcel E-2, Hunters Point Shipyard, Remedial Investigation/Feasibility Study (Continued)**

Date(s)	Activity	Summary of Activities
September 2002 to February 2003	Standard Data Gaps Investigation (SDGI)	The Navy conducted the onshore SDGI to further define the nature and extent of chemicals in soil within the non-landfill areas. The Navy reviewed aerial photographs and logs from test pits, soil borings, monitoring wells, and GMPs from various investigations at Parcel E-2 to identify known and potential contaminant sources that required additional delineation. The results from the SDGI (TtEMI, 2005c) were also used to delineate the PCB Hot Spot, which is being removed under an interim removal action. In addition to the onshore sampling, the SDGI characterized the nature and extent of chemicals in sediment within, or in close proximity to, the Shoreline Area. The intertidal sediments were evaluated in a Shoreline Characterization Technical Memorandum that included a SLERA for the Parcels E and E-2 shoreline (SuTech, 2005) (Appendix G to this report).
September 2003 to June 2004	Shoreline Cleanup	As part of a waste consolidation effort throughout HPS, hazardous and non-hazardous debris (consisting primarily of brick, metal scrap, concrete, and wood) along the Parcels E and E-2 shoreline (including portions of the Panhandle Area) was characterized and disposed off-site (TTFW, 2004c).
May 2003 to Present	Landfill Gas Monitoring and Control	Landfill gas is being monitored on a monthly basis under the Interim Landfill Gas MCP (Tetra Tech and ITSI, 2004c) to verify that hazardous levels of landfill gas are not migrating beyond the fence line of the landfill and onto the UCSF compound. Active extraction of the landfill gas control system is performed 40 hours per week. The remaining time, the system operates passively to control landfill gas migration. In monthly monitoring performed since January 2004, all concentrations of NMOCs were below action levels and regulatory requirements identified in the MCP. Methane concentrations have, in nearly all cases, remained below specified action levels; however, methane concentrations in excess of specified action levels have been detected in July 2004 and January 2006. In these instances, the Navy has notified the appropriate parties and implemented response measures to control landfill gas at the fence line of the landfill.
July 2003 to Present	Interim Cap Inspection and Maintenance	Inspection and maintenance of the interim landfill cap is performed in accordance with a site-specific operation and maintenance plan (TtEMI, 2003b). The irrigation system, along with other components of the interim cap, is inspected on a quarterly basis to ensure that it is functioning properly and providing adequate water to the vegetative cover. Inspection and mowing of the vegetative cover is performed twice per year.
July 2003 to Present	Storm Water Management and Monitoring	Storm water discharge in Parcel E-2 is managed in accordance with a SWDMP that was originally published in 2003 (TtEMI, 2003c). The Parcel E-2 storm water program involves quarterly non-storm water discharge visual observations, storm water sampling and analysis, monthly storm water discharge visual observations, and an annual comprehensive site compliance evaluation. Results to date indicate no incidents of non-compliance at Parcel E-2 except in isolated locations where BMPs require modification to better control erosion and sediment transport from neighboring properties. The SWDMP is revised on an annual basis to reflect current site conditions, clarify or change the discharge locations, and update the list of BMPs (TtEMI, 2005a; MACTEC Engineering and Consulting, 2005).

**Table 1-3 Summary of Previous Environmental Investigations and Remedial Activities in Parcel E-2, Hunters Point Shipyard, Remedial Investigation/Feasibility Study (Continued)**

Date(s)	Activity	Summary of Activities
June 2004 to Present	Basewide Groundwater Monitoring Program (BGMP)	The Navy monitors groundwater on a quarterly basis under the BGMP (TtEMI, 2004e). Analyses at wells in and around the landfill are performed based on Title 27 CCR requirements and additional wells are monitored, six A-aquifer wells in the Panhandle Area and one A-aquifer well in IR Site 12 (located adjacent to a former disposal trench associated with Triple A Site 4) were selected for groundwater sampling, to monitor chemicals previously detected at concentrations that may pose a potential risk to human health and the environment (TtEMI, 2004e).
June 2005 to Present	Metal Slag Area Removal Action	The TCRA at the Metal Slag Area was performed in conjunction with the removal of the Metal Debris Reef located in the southeast portion of Parcel E. The TCRA was designed to remove metal slag and debris containing low-level radiological material, as well as non-radiological chemical contamination incidental to the removal of both areas. The excavation at the Metal Slag Area was completed in May 2006. A detailed description of the scope of this removal action is included in the Draft Final Removal Action Design and Implementation Work Plan, Metal Debris Reef and Metal Slag Areas (TtFW, 2005b).
June 2005 to Present	PCB Hot Spot Removal Action	The TCRA at the PCB Hot Spot was designed to remove PCB and petroleum hydrocarbon-contaminated soil and debris, possibly containing low-level radiological material. The excavation involved the removal of soils that contain PCB at concentrations greater than 1 mg/kg (from the surface to 3 feet bgs) and 100 mg/kg (deeper than 3 feet bgs), TPH at concentrations greater than 3,500 mg/kg, or radioactive contaminants above the radiological removal action goals. The removal action goals also include removal of, to a practical extent, free-phase petroleum hydrocarbons. The removal action at the PCB Hot Spot was completed in September 2006, with the exception of a narrow portion along the shoreline (which could not be excavated because of its proximity to the Bay). A detailed description of the scope of this removal action is included in the Project Work Plan (TtFW, 2005a).

**Notes:**

- CCR California Code of Regulations
- ATT Aqua Terra Technologies, Inc.
- Bay The San Francisco Bay
- BGMP Basewide groundwater monitoring program
- BMP Best management practices
- bgs below ground surface
- DHS California Department of Health Services
- EMCON EMCON Associates, Inc.
- ERA Ecological risk assessment
- ESAP Environmental Sampling and Analysis Plan
- FS Feasibility study
- GDGI Groundwater data gaps investigation
- GMP Gas monitoring probe
- HDPE High density polyethylene

**Table 1-3 Summary of Previous Investigations and Activities in Parcel E-2, Hunters Point Shipyard Parcel E-2 Remedial Investigation/Feasibility Study (Continued)**

Notes (continued):

HHRA	Human health risk assessment
HLA	Harding Lawson Associates, Inc.
HPS	Hunters Point Shipyard
IAS	Initial Assessment Survey
IR	Installation Restoration
IT	International Technology Corporation
ITSI	Innovative Technical Solutions, Inc.
LEL	Lower explosive limit
LFR	Levine-Fricke-Recon
MCP	Monitoring and Control Plan
mg/kg	milligrams per kilogram
NAVSEA	Naval Sea Systems Command
Navy	U.S. Department of the Navy
NEESA	Naval Energy and Environmental Support Activity
NDGI	Non-standard data gaps investigation
NMOC	Non-methane organic compound
OU	Operable Unit
PCB	Polychlorinated biphenyl
ppmv	parts per million by volume
PSC	Protective soil concentration
RI	Remedial Investigation
SDGI	Standard data gaps investigation
SFDA	San Francisco District Attorney
SLERA	Screening level ecological risk assessment
SulTech	Sullivan Consulting Group and Tetra Tech EM, Inc.
SVOC	Semi-volatile organic compound
SWDMP	Storm water discharge management plan
TCRA	Time-critical removal action
TPH	Total petroleum hydrocarbons
Triple A	Triple A Machine Shop
TtEMI	Tetra Tech EM, Inc.
TtFW	Tetra Tech Foster-Wheeler, Inc.
UCSF	University of California, San Francisco
VOC	Volatile organic compound