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FINAL RECORD OF DECISION SITE 2 NAS PENSACOLA FL
9/1/2005
ENSAFE/ALLEN AND HOSHALL

FINAL RECORD OF DECISION
OPERABLE UNIT 3, SITE 2 — WATERFRONT SEDIMENTS
NAS PENSACOLA
PENSACOLA, FLORIDA

Contract Number: N62467-89-D-0318
CTO-083

Prepared for:

Naval Facilities Engineering Command
SOUTHERN DIVISION

Comprehensive Long-Term
Environmental Action Navy (CLEAN)
Naval Air Station Pensacola
Pensacola, Florida

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September 2005

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List of Abbreviations

The following list contains many of the acronyms, initials, abbreviations, and units of measure used in this report. A glossary of commonly used terms is provided in Appendix A.

ARAR	Applicable or Relevant and Appropriate Requirement
AVS	acid volatile sulfide
bls	below land surface
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COC	Chemical of Concern
COPC	Chemical of Potential Concern
DOT	Department of Transportation
DU	Decision Unit
E&E	Ecology & Environment, Inc.
E\A&H	EnSafe\Allen & Hoshall
EIS	Environmental Impact Statement
EP	Extraction Procedure
ERL	Effects Range Low
ERM	Effects Range Medium
FDEP	Florida Department of Environmental Protection
FFA	Federal Facilities Agreement
FFSA	Focused Feasibility Study Addendum
FS	Feasibility Study
G&M	Geraghty & Miller, Inc.
HHRA	Human Health Risk Assessment
HI	Hazard Index
LDR	Land Disposal Restriction
LTSM	Long-Term Sediment Monitoring
mg/mysid	milligrams per mysid
mg/amphipod	milligrams per amphipod
Msl	mean sea level
NADEP	Naval Aviation Depot
NARF	Naval Air Rework Facility
NAS	Naval Air Station
NCP	National Contingency Plan
ND	Not determined
NEESA	Naval Environmental and Engineering Support Activity

NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PAH	Polynuclear Aromatic Hydrocarbon
PBS	Pensacola Bay System
PCB	Polychlorinated Biphenyl
PEL	Probable Effects Level
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RG	Remedial Goal
RGO	Remedial Goal Option
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SEM	Simultaneously extracted metals
SQG	Sediment Quality Guideline
SQT	Sediment Quality Triad
SWMU	Solid Waste Management Unit
SVOC	Semivolatile Organic Compound
TBC	To-be-considered
TEL	Threshold Effects Level
TRC	Technical Review Committee
µg/kg	Micrograms per kilogram
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

DECLARATION OF THE RECORD OF DECISION

Site Name and Location

Operable Unit 3
Site 2 — Waterfront Sediments
Naval Air Station Pensacola
Pensacola, Florida

Statement of Basis and Purpose

This decision document (Record of Decision) presents the selected remedial action for Operable Unit 3 (OU 3) also called Site 2, an area of waterfront sediments at Naval Air Station Pensacola, Pensacola, Florida. The selected remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. § 9601 et seq., and to the extent practicable, in a manner consistent with the National Contingency Plan (NCP), 40 Code of Federal Regulations, Part 300. This decision is based on the administrative record for Site 2 at the Naval Air Station Pensacola.

The U.S. Environmental Protection Agency and the Florida Department of Environmental Protection concur with the selected remedy.

Assessment of the Site

The response action selected in this record of decision is necessary to protect public human health or welfare or the environment.

Description of Selected Remedy

This action is the first remedial action for the site. No CERCLA action is necessary for the protection of human health and the environment at the site.

Statutory Determinations

The selected remedy is No Action. None of the CERCLA Section 121 statutory determinations are necessary in this section since no remedial action is selected. No CERCLA action is necessary for the protection of human health and the environment at the site. This remedy results in hazardous substances remaining onsite; therefore, a 5-year review will be required as recommended by the NCP.

Peter S. Frano
Captain, U.S. Navy
Commanding Officer

28 SEP 05
Date

Alan Farmer
Acting Director, Waste Management Division
USEPA, Region 4

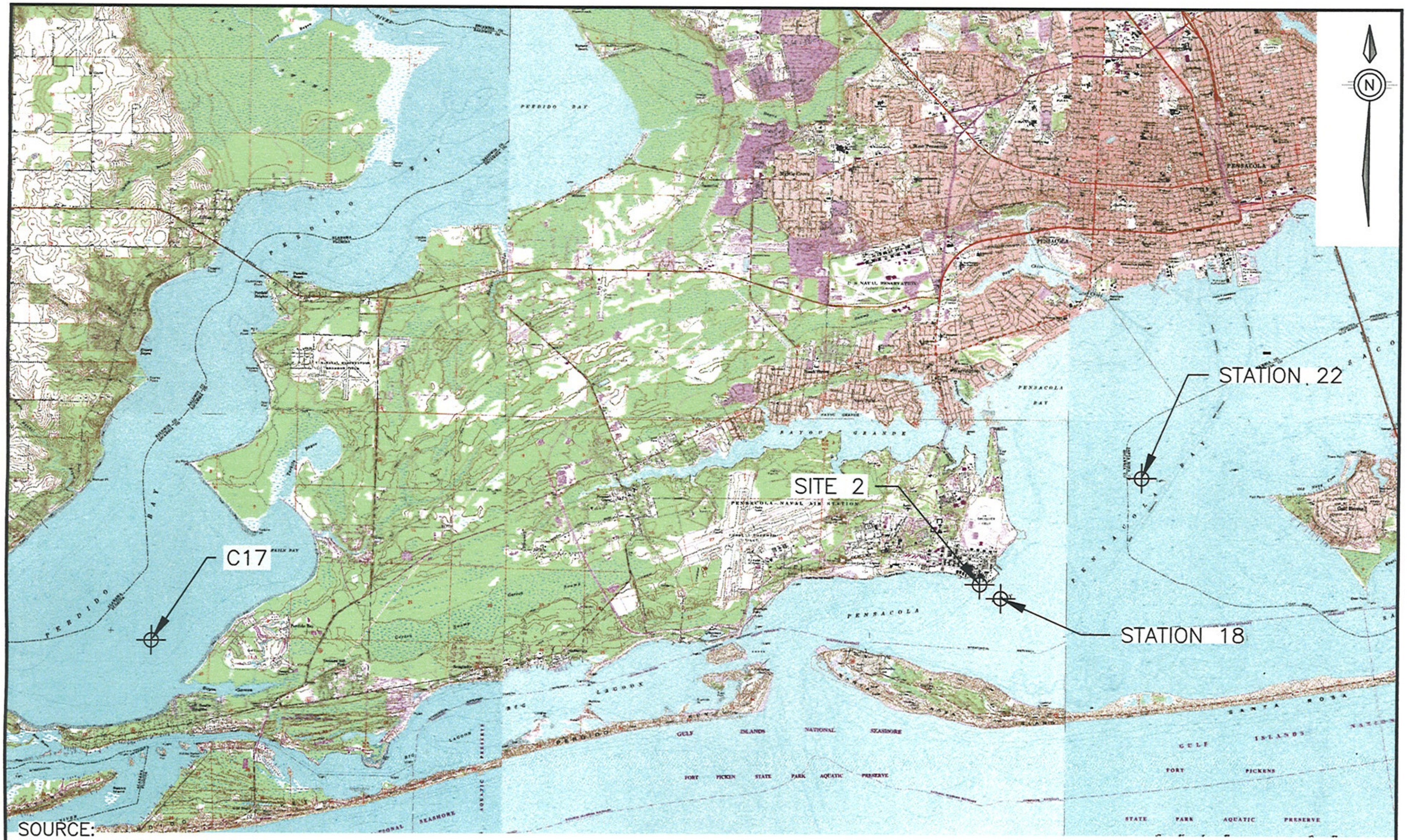
9/30/05
Date

1.0 SITE NAME, LOCATION, AND DESCRIPTION

Operable Unit 3 (Site 2) is on the southeastern shoreline of NAS Pensacola, along the Pensacola Bay waterfront. Pensacola Bay is an estuarine water body adjacent to the eastern and southern borders of Naval Air Station (NAS) Pensacola in Escambia County, Florida. It includes the Intercoastal Waterway from Trout Point, east to NAS Pensacola's Pier 303, and terminates at the mouth of Bayou Grande. Pensacola Bay occupies approximately 52 square miles of surface area. Approximately 10 miles of Pensacola Bay coastline border NAS Pensacola property (Figure 1-1). The Florida Department of Environmental Protection (FDEP) has classified Pensacola Bay as Class III waters, indicating its use for recreation and maintaining a well-balanced fish and wildlife population.

NAS Pensacola was placed on the U.S. Environmental Protection Agency's (USEPA) National Priorities List (NPL) in December 1989 (Figure 1-2). The Federal Facilities Agreement (FFA), signed in October 1990 by USEPA, FDEP and the Navy, outlined the regulatory requirements to be followed at NAS Pensacola. NAS Pensacola must satisfy not only the regulatory obligations associated with its NPL listing, but also the ongoing requirements of a Resource Conservation and Recovery Act (RCRA) permit issued to the facility in 1988. That permit addresses the treatment, storage, and disposal of hazardous materials and waste as well as investigation and remediation of any releases of hazardous waste and/or constituents from solid waste management units (SWMUs). RCRA governs ongoing use of hazardous materials and the rules of the operating permit. RCRA and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) investigations and actions are integrated through the FFA, thereby streamlining the cleanup process.

Site 2 is an area of waterfront sediments along the southeast waterfront, where numerous active storm water and inactive industrial waste sewer outfalls exist. The southeast waterfront is dominated by a protective concrete seawall with several seaplane ramps, and is adjacent to a large paved parking apron. The approximately 3- to 4-foot high seawall rests on a concrete platform. Fifty-six outfalls, ranging in diameter from 1 to 42 inches, were previously identified along the seawall (Ecology & Environment, Inc. [E&E], 1991). The seawall also accommodates numerous scuppers to drain surface water runoff from the adjacent parking areas. In the past, many of the outfalls discharged untreated industrial wastes into Pensacola Bay. This occurred from 1939 to 1973, after which NAS Pensacola's industrial waste-stream was diverted to the Industrial Wastewater Treatment Plant.



SOURCE:
FORT BARRANCAS, GULF BREEZE, PERDIDO BAY,
PENSACOLA, WEST PENSACOLA, AND LILLIAN QUADRANGLES
FLORIDA–ESCAMBIA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

10000 0 10000
SCALE FEET

REFERENCE STATIONS:
STATION 18
STATION 22
C17

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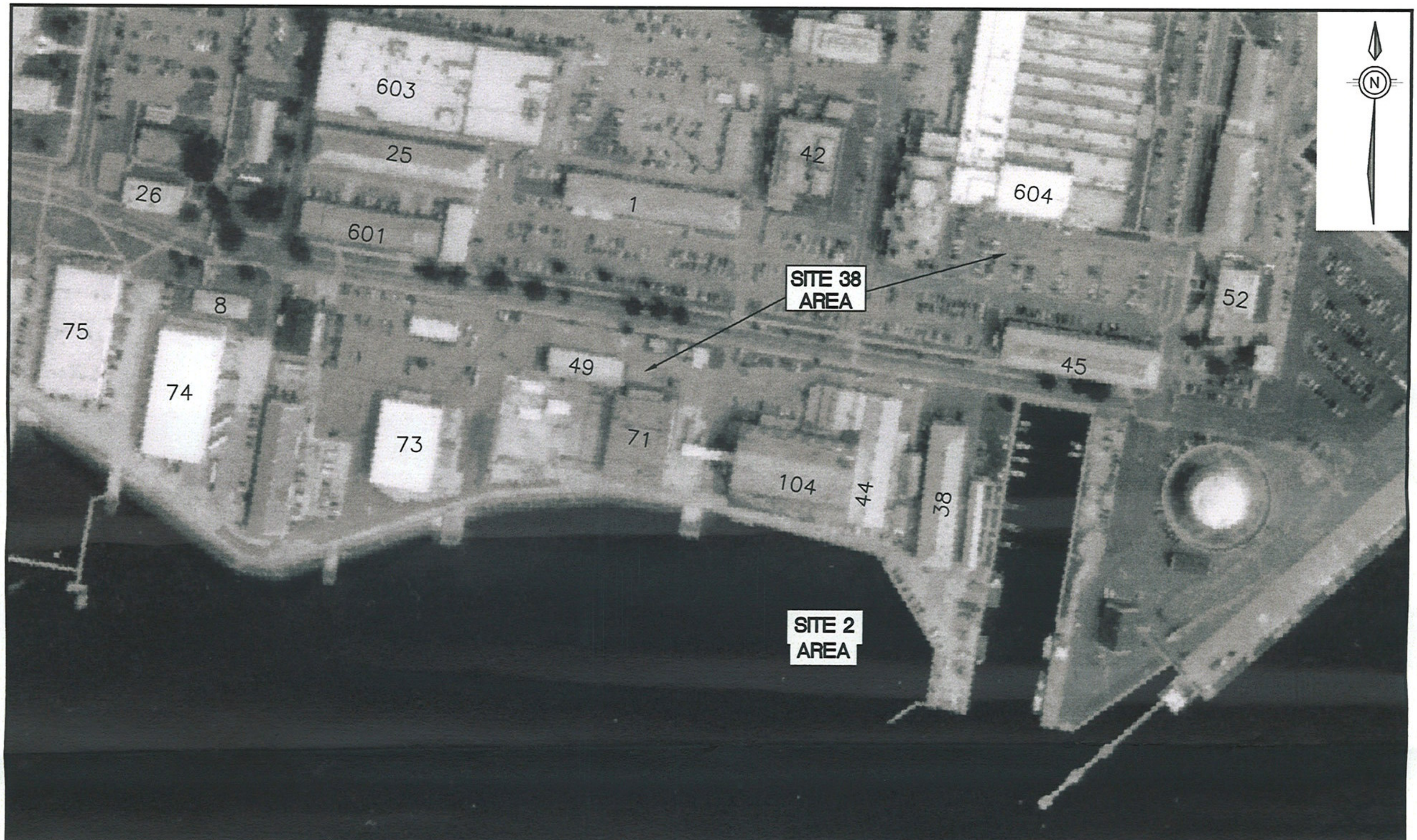
FIGURE 1–1
SITE LOCATION
AND REFERENCE STATIONS
OPERABLE UNIT 3, SITE 2

DWG DATE: 04/22/05
NAME: 0059001W016



LEGEND

PHOTO DATE: 08/25/93

71 — BUILDING NUMBER

250 0 250

SCALE FEET

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NAS PENSACOLA
PENSACOLA, FLORIDA

FIGURE 1–2
SITE 2 AND VICINITY

DWG DATE: 04/22/05 | NAME: 0059001W093

NAS Pensacola land surface elevations range from 0 to approximately 40 feet above mean sea level (msl). The most prominent topographic feature at NAS Pensacola is a bluff paralleling the southern and eastern shorelines. Between the bluff and the shoreline, a nearly level marine terrace is at approximately 5 feet above msl. Gently rolling uplands reach elevations of up to 40 feet above msl landward of the bluff.

Surface soil at NAS Pensacola is primarily highly permeable sands, which limit stream formation. Several naturally occurring intermittent streams and numerous man-made drainage ditches flow south into Pensacola Bay, which has a mean depth of 10 feet in the NAS Pensacola area.

The depth to groundwater at NAS Pensacola ranges from less than 1 foot to approximately 20 feet below land surface (bls), depending upon land surface elevation and proximity to surface water bodies. Groundwater is not currently used as a potable water source at NAS Pensacola, which receives its potable water from Corry Station, approximately 4 miles north.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 General Site History

NAS Pensacola was placed on the USEPA's NPL in December 1989. The FFA, signed in October 1990, outlined the regulatory path to be followed at NAS Pensacola. NAS Pensacola must complete not only the regulatory obligations associated with its NPL listing, but also satisfy the ongoing requirements of a RCRA permit issued to the facility in 1988. RCRA and CERCLA investigations and actions are integrated through the FFA, thereby streamlining the cleanup process.

2.2 Site-Specific History

Since the early 1950s, numerous investigations have been conducted in and around the Pensacola Bay System (PBS) to monitor the ecological health of the bay and determine the impact of commercial, industrial, and municipal activities. Previous investigations have documented industrial activities, including Navy activities, discharging to Pensacola Bay. Other studies have been associated with industrial activities of the entire PBS.

Collard (1991) summarized the environmental-biological history of the PBS, documenting published as well as previously unpublished data from numerous studies conducted from the 1950s to the present. These studies, which were conducted to identify biological trends and help understand the current status of the PBS, have been performed with varying sampling methods, locations, and analytical procedures. Collard's biological trends analysis concluded: (1) the data did not support distinct, discernible trends and (2) future investigations should not attempt to evaluate existing data for these trends because of significant database deficiencies.

Early environmental studies of Site 2 were conducted under the direction of the Navy Assessment and Control of Installation Pollutants Department (Naval Environmental and Engineering Support Activity [NEESA], 1983). Sediment samples collected and analyzed using Extraction Procedure (EP) toxicity methods showed elevated concentrations of lead and chromium.

In 1984, a study by Thompson Engineering and Testing, Inc. on sediments in the area of the turning basin near Site 2 showed grain-size variation from sandy silt/clayey silt with sand on the northeastern side of the turning basin, to fine sands/fine sands with silts on the southwestern side. Samples were also collected for laboratory analysis; no elevated concentrations for metals or polychlorinated biphenyls (PCBs) were detected. However, the analytical methods were not approved for marine sediment analysis.

In 1984, Geraghty and Miller, Inc. (G&M) conducted a verification and characterization study at Site 2. Six samples were collected approximately 300 feet offshore from the storm-sewer outfalls, in about 30 feet of water. Because EP toxicity methods were used for analysis, it is suspected that the arsenic values reported were from elutriate tests rather than derived through metal extraction methods.

The Navy conducted a study in support of an environmental impact statement (EIS) in 1986, regarding the feasibility of expanding NAS Pensacola facilities (E&E, 1992). As part of the study, water and sediment samples were collected in the turning basin and analyzed for heavy metals. Although the Florida Department of Environmental Regulation (now FDEP) recommended methods were used, results for both media are suspect because incorrect analytical methods were applied, and detection limits and laboratory quality assurance/quality control data were not provided. A general observation of the results suggests the presence of elevated concentrations of chromium and zinc in sediments.

To determine if sediments were enriched from anthropogenic sources of nitrogen, ratios of total Kjeldahl nitrogen to total organic carbon were examined during the Navy EIS study (E&E, 1992). Only one station had ratios indicative of elevated nitrogen concentrations; its location could not be determined from the referenced figure.

FDEP routinely collects sediment data from various areas across Pensacola Bay. Generally, mercury concentrations are elevated west and east of Site 2, along with higher lead concentrations east of the turning basin. Enriched sediment nitrogen concentrations were also observed in the bay near NAS Pensacola.

In addition to these studies, EnSafe Inc. conducted a thorough remedial investigation of Site 2; results were reported in December 1996 and in a 2004 RI Report Addendum. Results are summarized in Section 5, Site Characteristics.

3.0 COMMUNITY PARTICIPATION

Throughout the site's history, the community has been kept abreast of activities in accordance with CERCLA Sections 113(k)(2)(B)(i-v) and 117. In January 1989, a technical review committee (TRC) was formed to review recommendations for and monitor progress of the investigation and remediation efforts at NAS Pensacola. The TRC included representatives of the Navy, USEPA, FDEP, and the local community. In addition, a mailing list of interested community members and organizations was established and maintained by the NAS Pensacola Public Affairs Office. In July 1995, a Restoration Advisory Board (RAB) was established as a forum for communication between the community and decision-makers. The RAB absorbed the TRC and added members from the community and local organizations. Its members work together to monitor progress of the investigation and to review remediation activities and recommendations at NAS Pensacola. Regularly held RAB meetings are advertised and open to the public.

After finalizing the 1996 Remedial Investigation (RI) report, the preferred alternative for Site 2 was presented in the Proposed Remedial Action Plan, also called the Proposed Plan. A copy was sent to everyone on the NAS Pensacola mailing list. The notice of availability of the Proposed Plan, RI and feasibility study (FS) documents was published in the *Pensacola News Journal* on December 4, 1997, followed by a public comment period from December 8, 1997, to January 22, 1998, to encourage public participation in the remedy-selection process. The opportunity for a public meeting was provided during the comment period. Only one comment was submitted by a community member. That comment suggested the Navy do a remedial action or nothing at the site, instead of monitoring. After deliberation of this comment, the USEPA, FDEP, and the Navy agreed to assess the current condition of Site 2 because Hurricane Georges had affected the area in the years following the original sampling event.

Additional assessment was performed and a 2004 RI Report Addendum and 2004 FS Report Addendum were completed. The preferred alternative for Site 2 was presented in a second Proposed Plan. A copy was sent to everyone on the NAS Pensacola mailing list. The notice of availability of the Proposed Plan, RI and FS reports and addendums was published in the *Pensacola News Journal* on July 3, 2005, followed by a public comment period from July 1, 2005, to August 14, 2005, to encourage public participation in the remedy-selection process. The opportunity for a public meeting was provided during the comment period. No comments from the public were received.

4.0 SCOPE AND ROLE OF THE OPERABLE UNIT

The proposed remedial action identified in this document is no action. No human health COCs were identified for Site 2. The selected remedy will address conditions that pose a threat to the environment including sediment contamination that may be affecting ecological receptors.

- Contaminants are expected to continue diminishing through natural processes, since the contaminant source ended more than 35 years ago when the sewer no longer discharged to the bay.

- Ecological risk was assessed using a triad approach of sediment chemistry, toxicity and benthic community analysis. Only two of the 11 decision units had survival rates of less than 80% in the 2000 sampling event. The survival rates were 78% and 73% at the two 150-foot by 150-foot units.

- This alternative poses no excess risk to current workers or site trespassers. No COCs were identified from the crab tissue data used to assess excess human health risk for the tissue ingestion pathway.

The initial monitoring event would also include:

- Initial engineering and design study.

This is the only Record of Decision (ROD) contemplated for Site 2. Operable Unit 3, which consists of Site 2, is one of 13 operable units within NAS Pensacola. The purpose of each operable unit is defined in the *FY 2005 Site Management Plan* (SOUTHNAVFACENGCOM, 2004) for NAS Pensacola, which is in the Administrative Record. Separate investigations and assessments are being conducted for the other operable units at NAS Pensacola in accordance with CERCLA. Therefore, this ROD applies only to Site 2.

5.0 SITE CHARACTERISTICS

Operable Unit 3 (Site 2) consists of Pensacola Bay waterfront sediments along the southeast seawall at NAS Pensacola. The area extends approximately 1,400 feet off the seawall. The purpose of the RI was to identify the nature and extent of contaminants in surface waters and sediments, and groundwater influence, as a result of past disposal practices from shore-based facilities. Detailed information is available in the RI report with errata dated December 22, 1996 and the RI report addendum March 29, 2004.

5.1 Conceptual Site Model

Untreated Naval Aviation Depot (NADEP) and Naval Air Rework Facilities (NARF) industrial wastes were discharged into the Pensacola Bay System from 1939 to 1973 at Site 2. During that 34-year span, an estimated 83 million gallons of the following materials were disposed into the bay: waste-containing paint, paint solvents, thinners, ketones, trichloroethylene, Alodine, mercury, and concentrated plating wastes (primarily chromium, cadmium, lead, nickel, and cyanide [G&M, 1984]). All industrial waste outfalls have been inactive since 1973. In addition, contaminated groundwater from adjacent Site 38 has discharged into the Bay in the Site 2 area.

5.2 Site Overview

Operable Unit 3 (Site 2) is situated on the southeastern shoreline of NAS Pensacola, along the Pensacola Bay waterfront. This site is an approximately 1,800 foot by 1,400 foot area of nearshore sediments along the southeast waterfront area, where numerous active storm water and inactive industrial waste sewer outfalls exist. The southeast waterfront is dominated by a protective concrete seawall with several seaplane ramps, and is adjacent to a large paved parking apron. The approximately 3- to 4-foot high seawall rests on a concrete platform. Fifty-six outfalls, ranging in diameter from 1 to 42 inches, were previously identified along the seawall (E&E, 1991). The seawall also contains numerous scuppers to drain surface water runoff from the adjacent parking areas.

Fifty-six outfalls were previously identified along the seawall, as well as numerous scuppers to drain surface water from adjacent areas. All industrial waste outfalls have been inactive since 1973.

In the past, many of the outfalls discharged untreated industrial wastes into Pensacola Bay. This occurred from 1939 to 1973, after which NAS Pensacola's industrial waste-stream was diverted to the Industrial Wastewater Treatment Plant. Contaminants sorbed to sediments, potentially posing excess risk to the benthic community and the predatory animals feeding upon it.

Previous studies have described the bay sediments as fine sands to a water depth of 30 feet, with silty sands and muds in deeper parts of the ship channel (E&E, 1992).

NAS Pensacola land surface elevations range from 0 to approximately 40 feet above msl. The most prominent topographic feature at NAS Pensacola is a bluff paralleling the southern and eastern shorelines. Between the bluff and the shoreline is a nearly level marine terrace approximately 5 feet above msl. Gently rolling uplands reach elevations up to 40 feet above msl landward of the bluff.

Surface soil at NAS Pensacola consists primarily of highly permeable sands, which limit stream formation. Several naturally occurring intermittent streams and numerous man-made drainage ditches flow south into Pensacola Bay, which has a mean depth of 10 feet in the NAS Pensacola area.
The depth to groundwater at NAS Pensacola ranges from less than 1 foot to approximately 20 feet bls, depending on land surface elevation and proximity to surface water bodies, including Pensacola Bay. Groundwater is not currently used as a potable water source at NAS Pensacola, which receives its potable water from Corry Station, approximately 4 miles north.

5.3 Site Features

Pensacola Bay is an estuarine water body adjacent to the eastern and southern borders of NAS Pensacola. It includes the Intercoastal Waterway from Trout Point, east to NAS Pensacola's Pier 303, and terminates at the mouth of Bayou Grande. Pensacola Bay occupies approximately 52 square miles of surface area. Approximately 10 miles of Pensacola Bay coastline border NAS Pensacola property. The most prominent topographic feature at NAS Pensacola is a bluff paralleling the southern and eastern shorelines. Site 2 is the area of nearshore sediments along the southeast waterfront area.

5.4 Previous Sampling Investigations

The Site 2 investigation, which began in 1993 and extended through 1996, included a Phase I sampling event to determine total organic carbon and grain-size distributions in sediments and a Phase II sampling event to assess contamination. During Phase II, sediment and surface water samples were collected for chemical analyses. There were two Phase II sampling events, termed A and B.

During Phase IIA, contaminants and locations were identified for additional investigation in Phase IIB. The areas identified during Phase IIA were resampled for chemical analyses during Phase IIB (E/A&H, 1996). Based on analytical results from these sampling events, the "hot spots" (samples A2, F3, H1, H3, and I0, defined as having a hazard index greater than 10) were identified, and the extent of contamination was delineated (Figure 5-1).

An FS was completed in 1997 that evaluated four remedial alternatives (no action, monitoring, capping, and dredging with offsite disposal) for the site. Concurrence on the FS report was received on December 22, 1997, from FDEP. The proposed plan for the site stated that monitoring was the preferred alternative and a public comment period was held from December 8, 1997, to January 22, 1998. Only one comment was submitted by a community member. That comment suggested the Navy do a remedial action or nothing at the site, instead of monitoring. After deliberation of this comment, the USEPA, FDEP, the National Oceanographic and Atmospheric Administration (NOAA) and the Navy agreed to assess the current condition of Site 2 because Hurricane Georges had affected the area in the years following the original sampling event.

The March 2000 RI investigation, which is reported in the final RI Report Addendum (EnSafe, 2004), was conducted to determine whether chemical constituents at Site 2 create adverse conditions for benthic communities. Because Hurricane Georges affected the area after the 1996 sampling event, additional data were needed to assess the current site conditions. Sediment contamination near samples F3, H1, H3, and I0 appears to be localized as a result of a rotational flow pattern, as evidenced by the siltation and flow patterns described in the RI report (EnSafe/Allen & Hoshall, 1996). Sediment was not evaluated near sample A2. In the data quality objectives, sediment contamination near sample A2 was stated to be attributed to Port Operation activities and therefore is not associated with Site 2.

A sampling grid was established to assess sediment contamination near the Site 2 "hot spot" contamination (i.e., samples F3, H1, H3, and I0) identified in 1996. Eight decision units (DUs) — DU01 to DU08 — were established, covering the central area beginning at the seawall adjacent to the location of former Building 71 and extending offshore to the southeast. Three additional DUs (DU09 to DU11) were established to delineate potential contamination to the west, south, and east (Figure 5-2). These DUs were defined using the transect system originally established for the site. The original sampling grid consists of parallel north-south, lettered transects spaced 100 feet apart and transects parallel to the shoreline, also at 100-foot intervals. The sampled grid cells are named based on this grid but are established as 150-foot square DUs. The nomenclature for the sample grid cells are based on the grid location (e.g., GH-34 intersects transects G, H, 300 feet, and 400 feet) and are referred to as station numbers (e.g., USEPA Station 4) or decision units (e.g., DU04).

In the Final RI Report Addendum (EnSafe, 2004), sediment contamination was identified in the southeast portion of Site 2. This distribution moderately correlated with fine-grain sediments and

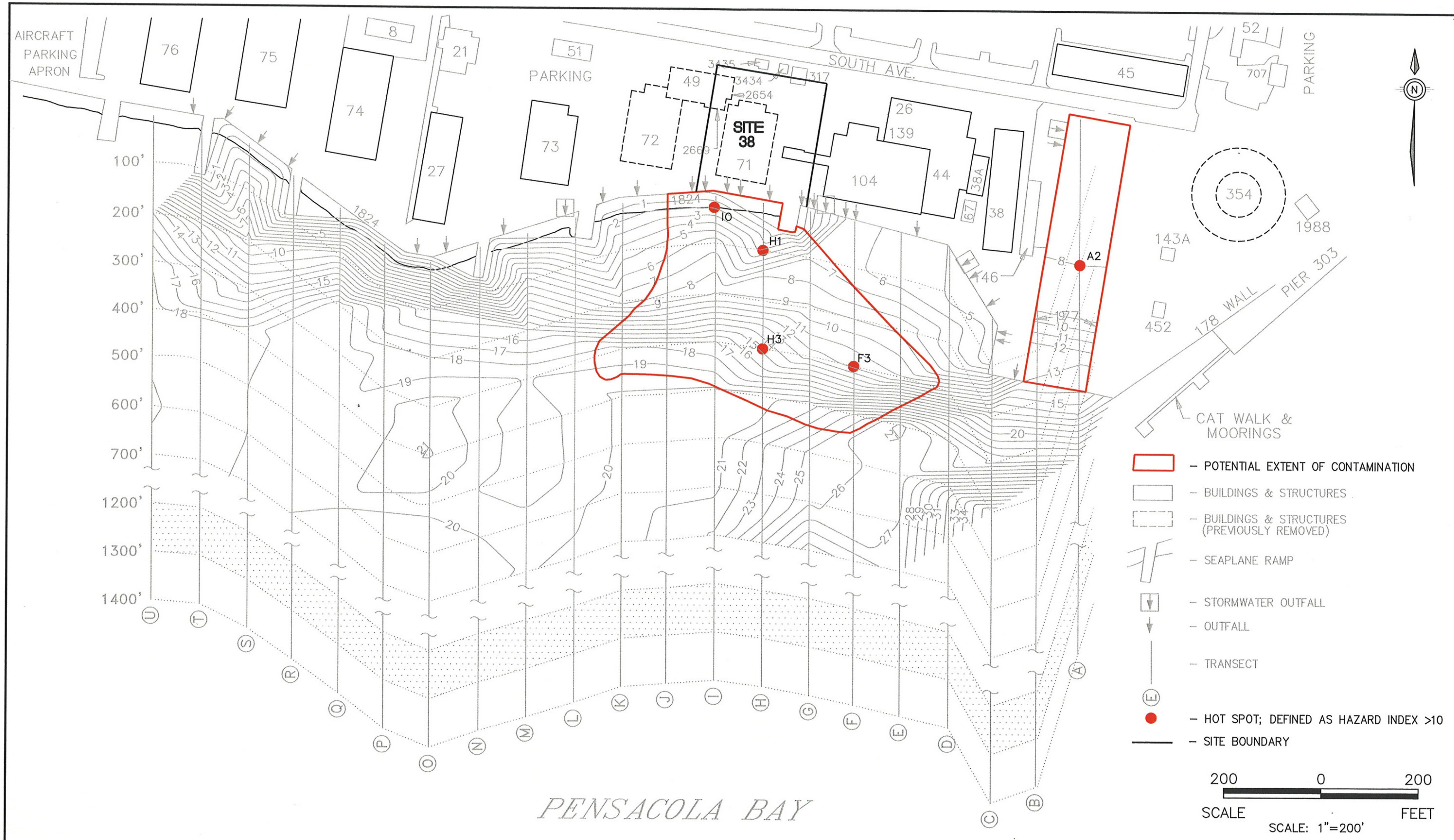

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FIGURE 5–1
EXTENT OF CONTAMINATION BASED ON 1996 SAMPLING DATA
OPERABLE UNIT 3, SITE 2

DWG DATE: 04/22/05 | DWG NAME: 0059001B016

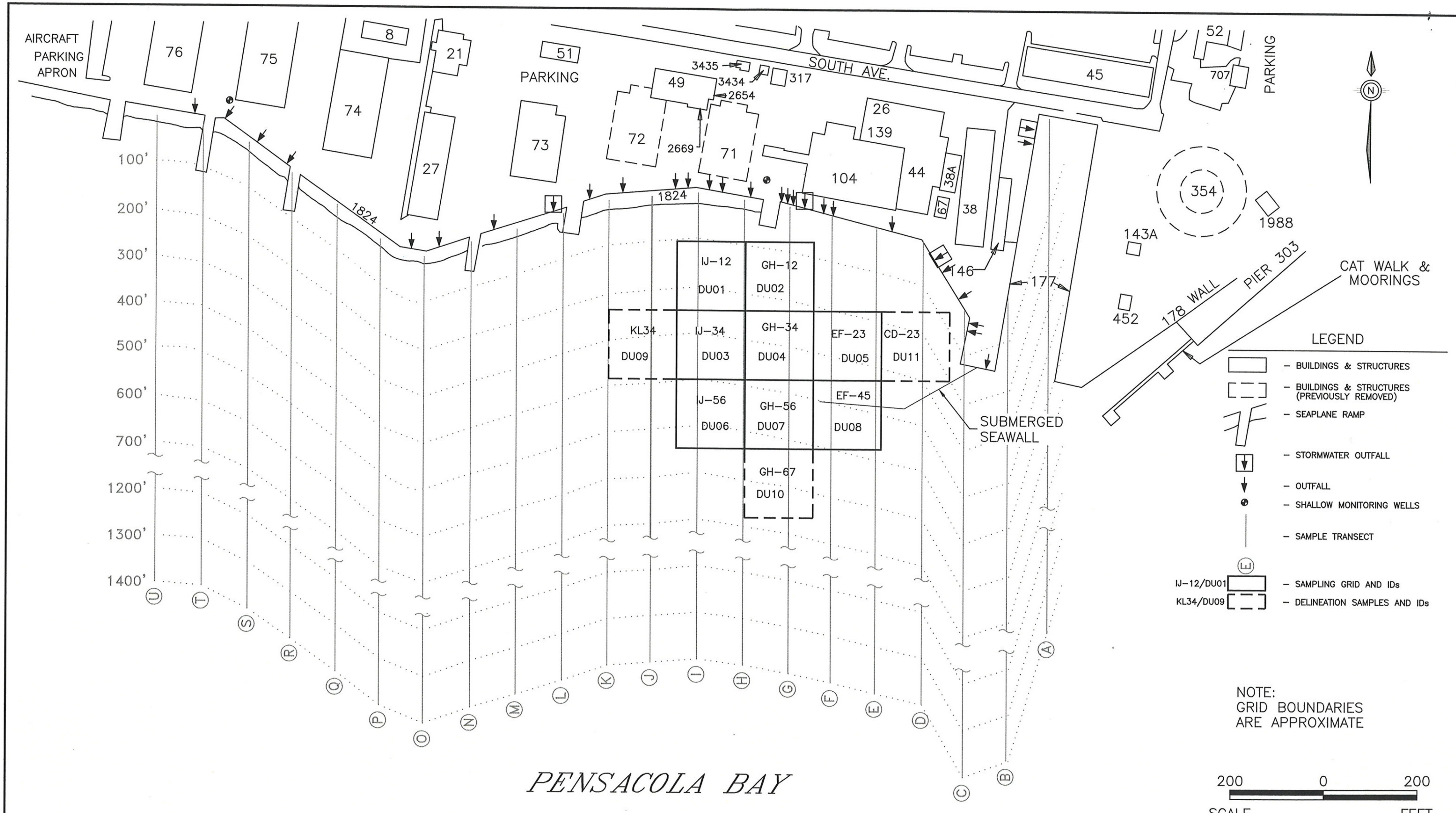

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FIGURE 5-2
2000 SAMPLING LOCATIONS
OPERABLE UNIT 3, SITE 2

DWG DATE: 03/18/05 | NAME: 0059001T023

shallow waters in that portion of the site. Based on the 2000 sampling event, DU08 and DU11 sediments were identified as containing toxic chemicals that are probably stressing the ecological system. The estimated volume of contamination, assuming a 1 foot depth, is 1,600 cubic yards (Figure 5-3).

The groundwater pathway between Site 38 (OU 11), which is north of Site 2, and Site 2 sediments was evaluated as an exposure pathway. From the investigation at Site 38, it was concluded that groundwater and soil had been affected. According to data in the Site 38 RI, the greatest potential impact to Site 2 is from a volatile organic compound (VOC) plume underneath former Building 71. However, the natural attenuation model presented in the Site 38 FFS report predicts that the plume has completely attenuated. Sampling was directed near the shoreline of Site 38 and within the estimated outfall width for offshore groundwater discharge. The VOCs identified in the groundwater at Site 38 were not detected in the sediment and surface water samples collected at Site 2.

It was recommended in the Final RI Report Addendum that a feasibility study be conducted to determine the most appropriate method for addressing the sediment at DU08 and DU11.

A focused feasibility study addendum (FFSA) that evaluated four remedial alternatives (no action, monitoring, capping, and dredging with offsite disposal) for the site was completed in October 2004. This report addresses sediment within the two 150-foot by 150-foot areas identified as having adverse effects in the 2004 RI Addendum. The proposed plan for the site stated that no action was the preferred alternative, and a public comment period was held from July 1, 2005 to August 14, 2005. No comments were received from the public on the proposed plan.

5.5 Sources of Contamination

From 1939 to 1973, untreated industrial wastes from NADEP and NARF operations were routinely discharged into Pensacola Bay, near Site 2. Over 34 years, an estimated 83 million gallons of the following materials were disposed into the bay: waste-containing paint, paint solvents, thinners, ketones, trichloroethylene, Alodine, mercury, and concentrated plating wastes (primarily chromium, cadmium, lead, nickel, and cyanide) (G&M, 1984). In 1973, NAS Pensacola's industrial waste stream was diverted to an industrial wastewater treatment plant (E&E, 1991 and 1992) and the discharges to Site 2 ended.

Other potential effects may have occurred from vessel operations at the pier and docking facilities in the immediate area. Additionally, because of transport mechanisms characteristic of open bay systems such as Pensacola Bay, offsite sources also may have affected the site.

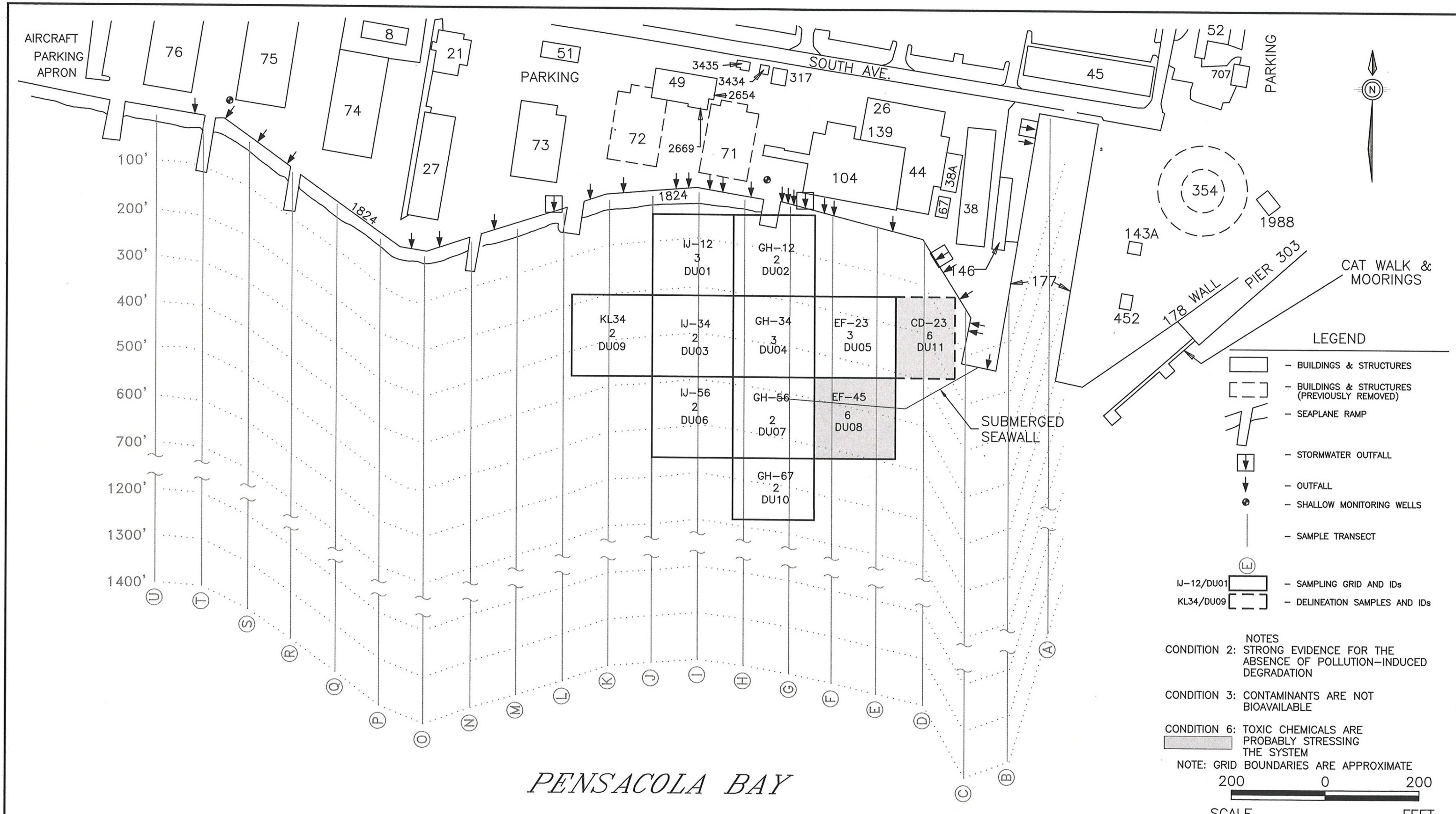

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FIGURE 5–3
EXTENT OF CONTAMINATION BASED ON 2000 SAMPLING DATA
OPERABLE UNIT 3, SITE 2

DWG DATE:04/22/05 | NAME: 0059001T015

5.6 Types of Contamination and Affected Media

Surface Water: To assess potential environmental effects in the Site 2 area, observed contaminant concentrations in surface water were compared to federal and state water-quality criteria. Analytical data collected during the RI indicate surface water is not contaminated at or near Site 2. According to the Final RI Report (E/A&H, 1996), few constituents in surface water exceeded established criteria. The only significant occurrence across the site was for silver; however, the reported silver concentrations are suspected to be a result of laboratory matrix interference from the high-salinity water (per telephone conversation with laboratory personnel). Surface water analytical data from the 1996 RI sampling event show that Site 2 activities are not affecting this medium; therefore, additional surface water sampling was not performed in the 2000 event.

Sediment: The suspected source of chemicals found in sediment at Site 2 in Pensacola Bay is a combination of wastewaters discharged into the bay, vessel operations at the pier and docking facilities in the area, numerous outfalls, including storm water outfalls, and vessel traffic in the area. To assess both the nature and extent of contamination and the potential for excess ecological risk, surface sediment was evaluated using the sediment quality triad (SQT) (Chapman et al., 1997). The SQT is used for the integrated assessment of sediment quality based on three parameters: sediment chemistry, toxicity, and benthic community assessment. To apply the outcome of the two different toxicity tests (acute and chronic), species diversity and chemical data, assumptions and decision rules were agreed upon and the resultant input into the triad (i.e., + or —) established before sampling was conducted. Typically, a "+" was assigned when there was a measured difference between test and control or reference conditions. Alternatively, a "—" was input into the triad when there was no measurable difference between test and control or reference conditions.

Sediment chemistry data were compared with sediment quality guidelines (SQGs), including the FDEP probable effects level (PEL) and threshold effects level (TEL) and the effects range low (ERL) and the effects range medium (ERM) from a biological effects database (Long et al., 1995). The mean ERM quotient method for multiple chemicals of potential concern (COPCs) was applied to the DUs (National Oceanic and Atmospheric Administration [NOAA], 1999). Based on the mean ERM quotient, categories were assigned as outlined below.

- Category 1 — Mean ERM quotient <0.1
- Category 2 — Mean ERM quotient 0.11 – 0.5
- Category 3 — Mean ERM quotient 0.5 – 1.5
- Category 4 — Mean ERM quotient > 1.5

Category 1 is considered to be nontoxic while Category 4 has the greatest probability of toxicity. Categories 2 and 3 have the greatest uncertainty as to the relationship with toxicity; however, for the

Site 2 investigation, sediments were considered to have adverse sediment chemistry when the mean ERM quotient exceeded 0.1. Using these criteria, DU01, DU04, DU05, DU08, and DU11 were conservatively considered affected for the chemical parameter and were scored "+". The surface sediment chemistry data and mean ERM quotients are summarized in Table 5-1. Sediments were also analyzed for acid volatile sulfides/simultaneously extracted metals (AVS/SEM) to assess the bioavailability of metals. The AVS/SEM data indicated probable bioavailability at DU11. Bioavailabilty of metals was also possible at DU02 and DU10, although there was not concordance between the two trace methods (EnSafe, 2004).

Toxicity was evaluated by performing 10-day *Leptocheirus plumulosus* and 7-day *Mysidopsis bahia* sediment bioassays, which each provided measures of survival and growth, and the latter provided a measure of reproduction. Results are presented in Table 5-2. When a DU had an unacceptable survival (defined as less than 80%) or two statistically significant differences for sublethal effects, it was considered affected. Using these criteria, DU08 and DU11 had survivals less than 80% and were scored "+".

The benthos was evaluated by measuring the benthic diversity in the sediments. Based on indices of benthic diversity, evenness, and richness, the Site 2 sediments outperformed control Stations 18 and 22. This may have been attributable to the deeper depths and lower salinity of the reference stations. Nevertheless, none of the DUs were determined to be adversely affected for the benthos parameter and were scored "—" as shown in Table 5-3.

The analyses, criteria, and evaluations are detailed in the *Final Remedial Investigation Addendum, Site 2 Waterfront Sediments* (EnSafe, 2004). The results of the sediment chemistry, toxicity tests, and benthic assessment were used to determine the condition of the sediment in each DU. The matrix for assessing the results is defined and described in Table 5-4. Table 5-5 summarizes the results of the sediment chemistry, toxicity, and benthic assessment results and assigns a corresponding sediment condition. Based on the decision-making process established in the *Final Remedial Investigation Addendum, Site 2 Waterfront Sediments* (EnSafe, 2004), sediment conditions 2 and 3 require no further action. Thus, only decision units DU08 and DU11 required a feasibility study assessment.

Subsurface sediment samples were also assessed using the mean ERM quotient methods for comparison to surface sediments. Subsurface sediment chemistry, mean ERM quotients and categories are summarized in Table 5-6. Five of the eight subsurface stations revealed mean ERM quotients of greater than 0.1 resulting in a classification of Category 2. Four of these samples have greater values than the surface station counterparts as shown in Table 5-7.

Table 5-1
Surface Sediment ERM Quotients and Mean ERM Quotients
Operable Unit 3, Site 2
NAS Pensacola

		IJ-12		GH-12		IJ-34		GH-34		EF-23		IJ-56		GH-56		EF-45		KL-34		GH-67		CD-23		Reference			
Parameters	**ERMs**	**SD00101**	**HQ**	**SD00201**	**HQ**	**SD00301**	**HQ**	**SD00401**	**HQ**	**SD00501**	**HQ**	**SD00601**	**HQ**	**SD00701**	**HQ**	**SD00801**	**HQ**	**SD00901**	**HQ**	**SD01001**	**HQ**	**SD01101**	**HQ**	**SD01801**	**HQ**	**SD02201**	**HQ**
Metals (mg/kg)																											
Arsenic	70	4.9	0.07	1.5	0.02	12	0.17	11	0.16	16	0.23	2.6	0.04	3.4	0.05	6.9	0.1	14	0.2	0.52	0.01	9.1	0.13	5	0.07	18	0.26
Cadmium	9.6	2.3	0.24	0.17	0.02	1.7	0.18	5.2	0.54	4.3	0.45	0.07	0.01	0.1	0.01	0.17	0.02	0.39	0.04	0.0205	0	1.3	0.14	0.075	0.01	0.22	0.02
Chromium	370	100	0.27	8.9	0.02	39	0.11	38	0.1	75	0.2	6.8	0.02	13	0.04	19	0.05	39	0.11	1.2	0	41	0.11	13	0.04	50	0.14
Copper	270	25	0.09	11	0.04	14	0.05	27	0.1	66	0.24	3.4	0.01	4.4	0.02	8.8	0.03	23	0.09	0.56	0	48	0.18	3.7	0.01	13	0.05
Lead	218	190	0.87	16	0.07	47	0.22	51	0.23	**640**	**2.94**	15	0.07	12	0.06	17	0.08	27	0.12	1.1	0.01	150	0.69	5.7	0.03	24	0.11
Nickel	51.6	3.3	0.06	1.1	0.02	8.7	0.17	10	0.19	7.8	0.15	2.1	0.04	2.4	0.05	6.1	0.12	9.8	0.19	0.34	0.01	5.2	0.1	3.7	0.07	14	0.27
Silver	3.7	0.077	0.02	0.0275	0.01	0.06	0.02	0.11	0.03	0.21	0.06	0.03	0.01	0.033	0.01	0.0475	0.01	0.075	0.02	0.027	0.01	0.2	0.05	0.036	0.01	0.075	0.02
Total Mercury	0.71	0.086	0.12	0.036	0.05	0.085	0.12	0.082	0.12	0.21	0.3	0.018	0.03	0.026	0.04	0.044	0.06	0.075	0.11	0.00375	0.01	0.16	0.23	0.019	0.03	0.11	0.15
Zinc	410	75	0.18	14	0.03	55	0.13	59	0.14	**670**	**1.63**	17	0.04	19	0.05	34	0.08	52	0.13	2.5	0.01	79	0.19	13	0.03	70	0.17
Pesticides (µg/kg)																											
4,4'-DDE (P,P'-DDE)	27	0.52	0.02	0.46	0.02	1.1	0.04	0.92	0.03	0.75	0.03	0.48	0.02	0.52	0.02	0.77	0.03	1.2	0.04	0.4	0.01	0.65	0.02	0.57	0.02	1.1	0.04
4,4'-DDT (P,P'-DDT)	46.1	0.52	0.01	0.46	0.01	1.1	0.02	0.92	0.02	0.75	0.02	0.48	0.01	0.52	0.01	1.8	0.04	1.2	0.03	0.4	0.01	0.65	0.01	0.57	0.01	1.1	0.02
Total PCBs (µg/kg)	180	**287.8**	**1.6**	36.9	0.21	88	0.49	98	0.54	157	0.87	38.5	0.21	41.2	0.23	62.2	0.35	96	0.53	32.2	0.18	52	0.29	46.2	0.26	89	0.49
PAHs (µg/kg)																											
2-Methylnaphthalene	670	28	0.04	22	0.03	4.65	0.01	43	0.06	41.5	0.06	8.6	0.01	2.65	0	38	0.06	6	0.01	2.15	0	31	0.05	2.9	0	6	0.01
Acenaphthene	500	85	0.17	65	0.13	14	0.03	22.5	0.05	125	0.25	7.5	0.02	8	0.02	115	0.23	19	0.04	6.5	0.01	95	0.19	9	0.02	18	0.04
Acenaphthylene	640	140	0.22	110	0.17	23	0.04	210	0.33	205	0.32	12	0.02	13	0.02	185	0.29	30.5	0.05	10.5	0.02	150	0.23	14	0.02	29	0.05
Anthracene	1100	28	0.03	18	0.02	9.8	0.01	45	0.04	59	0.05	2	0	11	0.01	42	0.04	22	0.02	0.375	0	43	0.04	0.495	0	29	0.03
Benzo(a)anthracene	1600	100	0.06	95	0.06	49	0.03	160	0.1	310	0.19	8.4	0.01	41	0.03	210	0.13	85	0.05	0.69	0	240	0.15	2.7	0	95	0.06
Benzo-a-pyrene	1600	160	0.1	86	0.05	62	0.04	180	0.11	440	0.28	9.7	0.01	45	0.03	240	0.15	110	0.07	1.1	0	410	0.26	3.8	0	120	0.08
Chrysene	2800	280	0.1	240	0.09	93	0.03	350	0.13	1000	0.36	20	0.01	92	0.03	380	0.14	170	0.06	1.6	0	630	0.23	6.1	0	210	0.08
Dibenzo(a,h)anthracene	260	35	0.13	9	0.03	15	0.06	44	0.17	110	0.42	2.9	0.01	11	0.04	56	0.22	26	0.1	0.9	0	100	0.38	1.2	0	31	0.12
Fluoranthene	5100	210	0.04	61	0.01	91	0.02	300	0.06	710	0.14	16	0	66	0.01	570	0.11	180	0.04	0.65	0	470	0.09	6.8	0	250	0.05
Fluorene	540	10.5	0.02	8.5	0.02	1.75	0	16	0.03	15.5	0.03	0.9	0	1	0	14.5	0.03	2.35	0	0.8	0	11.5	0.02	1.1	0	13	0.02
Naphthalene	2100	180	0.09	45.5	0.02	71	0.03	90	0.04	85	0.04	18	0.01	62	0.03	160	0.08	110	0.05	4.5	0	130	0.06	17	0.01	12.5	0.01
Phenanthrene	1500	97	0.06	52	0.03	39	0.03	130	0.09	230	0.15	7.8	0.01	35	0.02	140	0.09	62	0.04	0.5	0	160	0.11	3.2	0	130	0.09
Pyrene	2600	240	0.09	99	0.04	91	0.04	270	0.1	720	0.28	21	0.01	71	0.03	560	0.22	160	0.06	1.8	0	440	0.17	6.7	0	200	0.08
Total ERM Quotients			4.72		1.23		2.07		3.52		9.69		0.61		0.84		2.74		2.19		0.29		4.12		0.66		2.44
Mean ERM Quotient			0.19		0.05		0.08		0.14		0.39		0.02		0.03		0.11		0.09		0.01		0.16		0.03		0.1
Number of ERM Exceedances			1		0		0		0		2		0		0		0		0		0		0		0		0
Category			2		1		1		2		2		1		1		2		1		1		2		1		2
Input into Triad			+		-		-		+		+		-		-		+		-		-		+		-		+

Notes:
One-half the detection limit has been used for parameters that were not detected, except for total PCBs and pesticides, which used one-tenth the detection limit (See EPA report in Appendix B).
Concentrations exceeding the ERM are shown in **bold**.
mg/kg = milligrams per kilogram or parts per million
µg/kg = micrograms per kilogram or parts per billion
HQ = Concentration/ERM
ERM = Effects Range Medium

Table 5-2
Toxicity Test Results Input Into Matrix
Operable Unit 3, Site 2
NAS Pensacola

	Stations											Reference Stations	
EnSafe Station	**IJ-12**	**GH-12**	**IJ-34**	**GH-34**	**EF-23**	**IJ-56**	**GH-56**	**EF-45**	**KL-34**	**GH-67**	**CD-23**		
USEPA Station	**DU01**	**DU02**	**DU03**	**DU04**	**DU05**	**DU06**	**DU07**	**DU08**	**DU09**	**DU10**	**DU11**	**18**	**22**
Mysid													
Survival (%)	100	100	97	97	97	97	97	97	95	84	100	90	92
Growth (mg/mysid)	0.36	0.34	0.39	0.35	0.34	0.53	0.4	0.37	0.34	0.3	0.47	0.28	0.32
Reproduction (%)	85	92	94	100	67	94	88	75	88	69	95	93	22
Mysid Scoring	—	—	—	—	—	—	—	—	—	—	—	—	—
Leptocheirus													
Survival (%)	89	88	95	95	95	81*[a]	82	73*	97	99	78*	98	96
Growth (mg/amphipod)	0.13*	0.14*	0.25	0.21	0.16	0.21	0.28	0.24	0.27	0.13*	0.27	0.12*	0.14*
Leptocheirus Scoring	+	+	—	—	—	—	—	++	—	+	++	—	—
Score for Triad Input	—	—	—	—	—	—	—	+	—	—	+	—	—

Notes:
mg/mysid = milligrams per mysid
mg/amphipod = milligrams per amphipod
a = Although station IJ-56 (DU06) was identified as being significantly different, the station met the 80% survival criteria, therefore, a "—" was used for scoring, since the sublethal endpoint did not show a significant difference from control
Survival > 80% is considered acceptable
* = statistically significant difference from control
Reproduction = 50% or more of the females were gravid, indicating a valid test
— = Acceptable
+ = Not Acceptable

Table 5-3
Benthic Assessment and Input into the Sediment Quality Triad
Operable Unit 3, Site 2
NAS Pensacola

USEPA Stations	EnSafe Stations	Diversity	Evenness	Richness	Benthic Community to Triad
DU01	IJ-12	3.04	0.77	9.87	—
DU02	GH-12	2.90	0.77	8.83	—
DU03	IJ-34	3.25	0.85	8.83	—
DU04	GH-34	3.17	0.82	8.30	—
DU05	EF-23	2.87	0.76	8.28	—
DU06	IJ-56	3.25	0.84	8.53	—
DU07	GH-56	3.16	0.83	8.47	—
DU08	EF-45	3.05	0.75	10.22	—
DU09	KL-34	3.11	0.80	8.88	—
DU10	GH-67	3.06	0.90	6.74	—
DU11	CD-23	3.04	0.82	8.26	—
18	18	2.81	0.76	6.84	—
22	22	2.57	0.87	4.53	—

Notes:
— = Acceptable
+ = Not Acceptable

Table 5-4
Project Decision-Making Triad Matrix
Operable Unit 3, Site 2
NAS Pensacola

Condition	Sediment Chemistry	Toxicity Tests	Benthic Assessment	Interpretation
1	+	+	+	Strong evidence for pollution-induced degradation.
2	—	—	—	Strong evidence for absence of pollution-induced degradation.
3	+	—	—	Contaminants are not bioavailable.
4	—	+	—	Unmeasured contaminants or conditions exist that have the potential to cause degradation.
5	—	—	+	Alteration of benthic community is probably not due to toxic chemical contamination.
6	+	+	—	Toxic chemicals are probably stressing the system.
7	—	+	+	Unmeasured toxic chemicals are causing degradation.
8	+	—	+	Benthic community degraded by toxic chemicals but toxicity tests not sensitive to toxic chemicals present or chemicals are not bioavailable, or alteration is not due to toxic chemicals.

Notes:
— = No measurable difference between test and control or reference conditions
+ = Measured difference between test and control or reference conditions

Table 5-5
Surface Sediment Summary as Applied to the Triad
Operable Unit 3, Site 2
NAS Pensacola

USEPA Station	EnSafe Station	Sediment Chemistry	Toxicity Tests	Benthic Assessment	Condition	Interpretation
DU01	IJ-12	+	—	—	3	Contaminants are not bioavailable.
DU02	GH-12	—	—	—	2	Strong evidence for absence of pollution-induced degradation.
DU03	IJ-34	—	—	—	2	Strong evidence for absence of pollution-induced degradation.
DU04	GH-34	+	—	—	3	Contaminants are not bioavailable.
DU05	EF-23	+	—	—	3	Contaminants are not bioavailable.
DU06	IJ-56	—	—	—	2	Strong evidence for absence of pollution-induced degradation.
DU07	GH-56	—	—	—	2	Strong evidence for absence of pollution-induced degradation.
DU08	EF-45	+	+	—	6	Toxic chemicals are probably stressing the system.
DU09	KL-34	—	—	—	2	Strong evidence for absence of pollution-induced degradation.
DU10	GH-67	—	—	—	2	Strong evidence for absence of pollution-induced degradation.
DU11	CD-23	+	+	—	6	Toxic chemicals are probably stressing the system.
18		—	—	—	2	Strong evidence for absence of pollution-induced degradation.
22		+	—	—	2	Strong evidence for absence of pollution-induced degradation.

Notes:
Acceptable = —
Unacceptable = +

Table 5-6
Subsurface Sediment ERM Quotients and Mean ERM Quotients
Operable Unit 3, Site 2
NAS Pensacola

														Reference Stations			
		IJ-12		**IJ-34**		**GH-34**		**EF-23**		**KL-34**		**CD-23**		**18**		**22**	
Parameters	**ERMs**	**SD00102**	**HQ**	**SD00302**	**HQ**	**SD00402**	**HQ**	**SD00502**	**HQ**	**SD00902**	**HQ**	**SD01102**	**HQ**	**SD01802**	**HQ**	**SD02202**	**HQ**
Metals (mg/kg)																	
Arsenic	70	14	0.2	16	0.23	12	0.17	12	0.17	16	0.23	18	0.26	5.1	0.07	17	0.24
Cadmium	9.6	0.1	0.01	2.9	0.3	0.46	0.05	0.49	0.05	0.36	0.04	0.77	0.08	0.087	0.01	0.25	0.03
Chromium	370	39	0.11	99	0.27	14	0.04	36	0.1	48	0.13	49	0.13	12	0.03	49	0.13
Copper	270	50	0.19	29	0.11	14	0.05	52	0.19	19	0.07	75	0.28	3.4	0.01	13	0.05
Lead	218	52	0.24	140	0.64	**230**	**1.06**	63	0.29	36	0.17	200	0.92	5.6	0.03	24	0.11
Nickel	51.6	12	0.23	13	0.25	5.4	0.1	11	0.21	13	0.25	15	0.29	3.7	0.07	13	0.25
Silver	3.7	0.07	0.02	2.2	0.59	0.0335	0.01	0.055	0.01	0.065	0.02	0.065	0.02	0.0325	0.01	0.06	0.02
Total Mercury	0.71	0.21	0.3	0.24	0.34	0.25	0.35	0.46	0.65	**0.74**	**1.04**	**0.81**	**1.14**	0.021	0.03	0.1	0.14
Zinc	410	51	0.12	130	0.32	41	0.1	50	0.12	77	0.19	95	0.23	12	0.03	62	0.15
Pesticides (μg/kg)																	
4,4'-DDE (P,P'-DDE)	27	NS	NC	5	0.19	2.4	0.09	4.85	0.18	5	0.19	4.85	0.18	2.4	0.09	4.45	0.16
4,4'-DDT (P,P'-DDT)	46.1	NS	NC	5	0.11	2.4	0.05	4.85	0.11	5	0.11	1.8	0.04	2.4	0.05	1.2	0.03
Total PCBs (μg/kg)	180	NS	NC	119	0.66	33.7	0.19	68.5	0.38	71	0.39	68.5	0.38	33.7	0.19	62.5	0.35
PAHs (μg/kg)																	
2-Methylnaphthalene	670	5	0.01	50	0.07	27	0.04	46	0.07	5.5	0.01	50	0.07	2.6	0	4.65	0.01
Acenaphthene	500	15.5	0.03	155	0.31	80	0.16	140	0.28	16.5	0.03	160	0.32	8	0.02	14.5	0.03
Acenaphthylene	640	24.5	0.04	250	0.39	130	0.2	225	0.35	26.5	0.04	255	0.4	13	0.02	23	0.04
Anthracene	1100	17	0.02	64	0.06	42	0.04	35	0.03	25	0.02	91	0.08	3	0	22	0.02
Benzo(a)anthracene	1600	90	0.06	360	0.23	120	0.08	130	0.08	110	0.07	390	0.24	14	0.01	99	0.06
Benzo(a)pyrene	1600	100	0.06	460	0.29	160	0.1	160	0.1	140	0.09	460	0.29	22	0.01	120	0.08
Chrysene	2800	160	0.06	850	0.3	260	0.09	250	0.09	250	0.09	790	0.28	32	0.01	200	0.07
Dibenzo(a,h)anthracene	260	2.1	0.01	110	0.42	41	0.16	41	0.16	36	0.14	120	0.46	6.6	0.03	36	0.14
Fluoranthene	5100	180	0.04	530	0.1	260	0.05	260	0.05	230	0.05	800	0.16	30	0.01	210	0.04
Fluorene	540	9.6	0.02	19	0.04	26	0.05	17.5	0.03	11	0.02	48	0.09	1	0	11	0.02
Naphthalene	2100	32	0.02	105	0.05	55	0.03	95	0.05	47	0.02	105	0.05	5.5	0	32	0.02
Phenanthrene	1500	65	0.04	210	0.14	160	0.11	130	0.09	100	0.07	390	0.26	17	0.01	94	0.06
Pyrene	2600	190	0.07	890	0.34	270	0.1	290	0.11	250	0.1	1000	0.38	30	0.01	210	0.08
Total ERM Quotients			NC		6.75		3.46		3.95		3.56		7.04		0.76		2.32
Mean ERM Quotients			NC		0.27		0.14		0.16		0.14		0.28		0.03		0.09
Number of ERM Exceedances			0		0		1		0		1		1		0		0
Category			NC		2		2		2		2		2		1		1
Input into Triad			NC		+		+		–		+		+		–		–

Notes:
One-half the detection limit has been used for parameters that were not detected, except for total PCBs and pesticides, which used one-tenth the detection limit.
Concentrations exceeding the ERM are shown in **bold**.
NS = not sampled
NC = not calculated because of missing analytes
μg/kg = micrograms per kilogram or parts per billion (ppb)
mg/kg = milligrams per kilogram or parts per million (ppm)
HQ = Detected concentration/ERM
ERM = Effects Range Medium

Table 5-7
Comparison of Mean ERM Quotients Surface and Subsurface Sediments
Operable Unit 3, Site 2
NAS Pensacola

USEPA Station	EnSafe Station	Category, (Mean ERM Quotient) and ERM Exceeded for Surface Sediment	Category, (Mean ERM Quotient), and ERM Exceeded for Subsurface Sediment
DU01	IJ-12	2 (0.19) Total PCBs	NC
DU02	GH-12	1 (0.05)	NC
DU03	IJ-34	1 (0.08)	2 (0.27)
DU04	GH-34	2 (0.14)	2 (0.14) Pb
DU05	EF-23	2 (0.42) Pb, Zn, Total PCBs	2 (0.16)
DU06	IJ-56	1 (0.02)	NC
DU07	GH-56	1 (0.03)	NC
DU08	EF-45	2 (0.12)	NC
DU09	KL-34	1 (0.09)	2 (0.14) Hg
DU10	GH-67	1 (0.01)	NC
DU11	CD-23	2 (0.16)	2 (0.28) Hg
DU18	18	1 (0.03)	1 (0.03)
DU22	22	2 (0.1)	1 (0.09)

Notes:
Mean ERM Quotients are shown in parentheses
NC = Not Collected
At Station IJ-56 (DU06), semivolatile organic compounds (SVOCs) and pesticides/polychlorinated biphenyls (PCBs) were not analyzed

5.7 Location of Contamination and Known or Potential Routes of Migration

Site 2 is a complex system with many factors affecting the fate and transport of contaminants introduced to the site. The physical state of the system (saline surface waters, presence of humic substances and clay minerals, and nearby current and past sources for metals) provides a way for contaminants to be introduced into Site 2 media and accumulate. The bay-gulf channel and Intercoastal Waterway strongly influence the hydraulic movement of sediment into and away from the site.

Marine biotas have been or are currently being affected by sediment contamination in DU08 and DU11 at Site 2. Bioassays completed during the 2000 sampling event indicate toxic chemicals are probably stressing the ecological system at only DU08 and DU11.

5.8 Groundwater Contamination

Hydrogeologic processes at Site 2 support both ground water and surface water being in equilibrium. Static hydrologic pressures coupled with natural processes mitigate contaminant transport mechanisms. By not disturbing the sediments at Site 2, the water column would continue to have minimal effects from infiltrating groundwater and vice versa. Contaminants infiltrating groundwater are prevented from entering into the surface water column due to heavily reducing sediments, which are typically capable of removing inorganic and organic compounds through binding and reductive processes.

5.9 Other Site-Specific Factors

Other site-specific factors that may affect response actions at the site include nearby vessel operations at the pier and docking facilities located in the immediate area (Figure 1-2). Additionally, transport mechanism characteristics of open bay systems such as Pensacola Bay may continue to impact the site.

6.0 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Boat maintenance, refueling services, surface water runoff, routine application of pesticides draining to the Site 2 area, and offsite bay activities (e.g., boat traffic, non-point source sediment drift) will continue to occur in the Pensacola Bay area near the NAS Pensacola shoreline.

Future land use at NAS Pensacola is expected to remain military oriented and under the control of the Navy.

Groundwater is not currently used as a potable water source at NAS Pensacola, which receives its potable water from Corry Station, approximately 4 miles north.

7.0 SUMMARY OF SITE RISKS

During the RI, the baseline risk assessment (BRA) was completed to identify site COPCs in contaminated media that potentially pose a risk or hazard in current or future-use scenarios. The BRA addressed surface water and sediment media. Both ecological and human health risk assessments were conducted to evaluate actual or potential risk at Site 2. The human health risk assessment (HHRA) represents an evaluation and identification of the risks of contamination at the site. The HHRA, based on RI data, considers environmental media and exposure pathways that could result in an unacceptable level of exposure now or in the foreseeable future. Potential receptors were identified and adverse effects associated with the site COPCs were qualitatively and quantitatively evaluated. The entire assessment can be found in the RI report (EnSafe/Allen and Hoshall, 1996).

The response action selected in this ROD is necessary to protect the public health and the environment from actual or threatened releases of hazardous substances into the environment.

7.1 Human Health Risk Assessment

The human health risk and hazard associated with exposure to Site 2 environmental media were assessed for the hypothetical current and future (combined) child and current and future (combined) adult recreationists crabbing exclusively at Site 2. The tissue ingestion exposure pathway was selected as an indicator of potential human health risk. Based on the Site 2 exposure scenarios, an incremental lifetime cancer risk (ILCR) of 3E-6, primarily due to heptachlor epoxide, was identified onsite. The risk estimate is below USEPAs' acceptable risk threshold of 1E-4 and is slightly above FDEP's acceptable risk level of 1E-6. The calculations are based on the maximum detected concentration in the edible tissue. If the arithmetic average concentration was used, the 1E-6 risk threshold would not be exceeded. HIs of 0.7 and 0.2 were calculated for child and adult exposure to Site 2 tissues. No COCs were identified.

Subsequent to the completion of the human health risk assessment, Homeland Security Restrictions were established for the surface water bodies surrounding NAS Pensacola. Unauthorized boat traffic is prohibited within 500 feet of the NAS Pensacola shoreline. Site 2 is within the restricted area.

7.2 Ecological Risk Assessment

Data from the Site 2 RI indicate that benthic communities in the nearshore environment have been affected. Site 2 sediments contained metals and SVOCs similar to those found in shoreline groundwater. No VOCs consistent with those found in Site 38 groundwater were detected in any surface water or sediment samples collected during the Site 2 investigation (E/A&H, 1996).

Bioassays completed during the 2000 sampling event indicate toxic chemicals are probably stressing the ecological system at only DU08 (approximately 160 from the seawall) and DU11 (adjacent to the seawall near Port Ops), and the feasibility study focused on these two locations (Figure 5-3).

Section 5 of this ROD summarizes the data evaluation for Site 2. Identification of chemicals of concern (COCs), exposure assessment, toxicity tests and ecological risk characterization for the site have also been discussed in Section 5.

8.0 REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) provide a general description of what the selected remediation alternative will accomplish. The remedial alternatives selection process begins during the planning of the RI, when preliminary remediation objectives, based on readily available information such as presence of chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs), are set. As the RI/FS proceeds, RAOs are modified as needed to reflect better understanding of the site and identified ARARs.

In developing remedial objectives, the following items were reviewed:

- The spatial distribution of sediment contamination, as presented in the Final RI Report Addendum (EnSafe, 2004).

- The BRA, including human health and ecological risk assessments (EnSafe\Allen & Hoshall, 1996).

- Action-, chemical-, and/or location-specific ARARs.

8.1 Chemical-Specific ARARs and To-Be-Considered (TBCs)

In accordance with the National Contingency Plan (NCP), remedial goals (RGs) must establish acceptable exposure levels that are protective of human health and the environment. They must be developed by considering the water quality criteria established under the Clean Water Act.

There are no chemical- or location-specific ARARs for sediment; however, there are several action-specific ARARs (Appendix B) associated with potential remedial actions. The lead agency (in this case, the U.S. Navy), in consultation with the support agencies (in this case, the USEPA and FDEP), decides which requirements are applicable or relevant and appropriate. Waivers must be obtained for selected alternatives that do not comply with established ARARs, in accordance with CERCLA 121(d)(4).

8.2 Remedial Goals

Final RGs must establish acceptable exposure levels protective of human health and the environment and must consider ARARs. Based on the analysis presented in the RI Report Addendum (EnSafe, 2004), the following remedial goal options (RGOs) for total polynuclear aromatic hydrocarbons (PAHs) were developed:

- 2,576 µg/kg based on Benthic Community Analysis
- 1,599.8 µg/kg to 2,576.5 µg/kg based on mysid fecundity
- 2,372 µg/kg based on *Leptocheirus* survival

The developed RGOs are similar to the USEPA sediment screening value and FDEP sediment quality assessment guideline of 1,684 µg/kg for total PAHs. Remedial goals were not developed for other contaminant groups (i.e., metals and pesticides) because a relationship between contaminant concentration and identified effect could not be clearly established.

Based on comparisons to the RGOs, locations EF-23 (DU05), CD-23 (DU11) and EF-45 (DU08) exceeded the identified goals. However, toxicity results from EF-23 (DU05) indicate a 97% survival rate for *Leptocheirus*, which is greater than the agreed upon acceptable 80% survival rate and would suggest that a remedial action is not needed for that area. The remaining two stations (DU11 and DU08) were identified as Condition 6, indicating that toxic chemicals are probably stressing the system.

8.3 Remedial Objectives and Remedial Volume

The remedial objective is to protect the ecological environment where it is determined that Condition 6 exists, i.e., toxic chemicals are probably stressing the system. Based on the 2000 sediment data, Condition 6 exists at DU08 and DU11, which are located in the southeast portion of Site 2. These 150-foot by 150-foot DUs contain 1,667 cubic yards of contaminated sediment, assuming a 1-foot depth for contaminant exposure. Remedial volumes are determined based on toxicity as well as the presence of COCs.

9.0 DESCRIPTION OF ALTERNATIVES

The following remedial options were considered for Site 2, given site sediment conditions and Pensacola Bay characteristics.

- No action
- Capping of sediment
- Dredging with site-specific confined disposal facilities
- Dredging with offsite disposal of sediment
- Solidification/stabilization of sediment
- Long-term sediment monitoring

9.1 Description of the Remedy Components

Because the remediation objectives for this site are clearly defined and sediment volumes are small, the FFSA format was used to address the medium of concern. Four of the six remedial alternatives were further evaluated:

- **Alternative 1 — No Action:** Consideration of this alternative is required under the NCP. Under the no-action alternative, sediment would be left in place. This alternative poses no risk to current workers and site trespassers, and no additional risk to the ecosystem.

- **Alternative 2 — Capping:** Subtidal capping would involve placement of a clean sand layer to isolate contaminants and limit their vertical migration and release into the water column. In addition to limiting migration, the cap would also limit the potential for marine organisms to reach the site sediment. However, capping would cause an immediate and acute adverse impact to the benthic organisms in that area but would ultimately eliminate exposure to contaminants that may be causing adverse effects.

- **Alternative 3 — Dredging with Offsite Disposal:** The two DUs identified in Figure 5-1, DU08 and DU11, would be dredged to remove the surface sediment from the site, eliminating future adverse effects to the ecological system. Because subsurface sediments are potentially contaminated with legacy contamination, the dredged areas would be covered with a sand replacement cover. The dredged sediment would be disposed offsite, presumably in an approved Subtitle D facility. Although this alternative would result in an immediate acute adverse impact to the benthic organisms, it would ultimately limit the long-term effects to the ecological system in these areas.

- **Alternative 4 — Long-Term Sediment Monitoring:** Under this alternative, site sediments would remain in place, controls would be implemented to limit access to the site, and the site would be monitored once every 5 years for changes that may affect risk. This alternative poses no risk to human health and is dependent upon no new point source discharges at this site and continued natural processes within the bay to mitigate risk to benthic organisms.

9.2 Common Elements and Distinguishing Features of Each Alternative

As outlined under the NCP (NCP §300.430(f)(5)(i)), each remedial alternative was evaluated with respect to the following nine criteria to define advantages and disadvantages:

Threshold Criteria

- Overall protection of human health and the environment
- Compliance with ARARs

Balancing Criteria

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost

Modifying Criteria

- State acceptance
- Community acceptance

9.2.1 Key ARARs and Remedial Goal Options

There are no chemical- or location-specific ARARs for sediment; however, there are several action-specific ARARs associated with potential remedial actions. The lead agency (in this case, the U.S. Navy), in consultation with the support agencies (USEPA and FDEP), decides which requirements are applicable or relevant and appropriate. The following ARARs were applicable or relevant and appropriate to the potential action selected for the site:

- FR 62-312 Dredge and Fill Activities

- FR 62-45 25-year Permits for Maintenance of Dredging in Deepwater Ports

- 33 CFR 320 U.S. Army Corps of Engineers (USACE) Authority to Regulate Actions in Navigable Waterways

- 33 CFR 322 USACE Permit for Work in or Affecting Navigable Waters

Based on the analysis presented in the RI Report Addendum (EnSafe, 2004), remedial goal options for PAHs were employed. The RGOs as presented in Section 8 are as follows:

- 2,576 µg/kg based on Benthic Community Analysis
- 1,599.8 µg/kg to 2,576.5 µg/kg based on mysid fecundity
- 2,372 µg/kg based on *Leptocheirus* survival

9.2.2 No Action

The No-Action alternative for Site 2 would involve no active remedial effort. No actions would be taken to contain, remove, or treat sediment contaminated above risk-based cleanup goals. Sediment would remain in place and would attenuate according to natural biotic or physical processes. Although there are insufficient data to estimate natural attenuation rates, the AVS/SEM analyses indicate that metals would not bioavailable at DU08 but are bioavailable in DU11.

The No-Action alternative would comply with all ARARs and would not trigger any action-specific ARARs. The No-Action alternative would not require offsite services, materials, specialists, or innovative technologies. This alternative includes a cost of $10,000 for initial engineering and design study and subsequent $10,000 for 5-year review costs. The estimated 30-year present value for the No-Action alternative is $45,000, assuming a 6% discount rate and including a 10% contingency.

9.2.3 Capping

Capping would involve constructing a physical barrier between site sediments and the biota in Pensacola Bay. There are two 150-foot by 150-foot areas that would be affected. Sediment would remain in place and be covered with a layer of coarse-grained sand and gravel. In areas where waves may cause excessive erosion, rip-rap or other suitable material would be placed to stabilize the sand and gravel layer.

Permits would have to be obtained before dredging or fill material may be discharged into navigable waters, and State of Florida and federal regulations, which outline dredging and filling requirements applicable to this action, must be followed.

Sufficient controls would be designed to prevent catastrophic erosion and the cap would be periodically inspected. In the event that sufficient erosion is detected, the emplacement of additional capping material might be required.

Capping would require a remedial design phase, remedial action, operation and maintenance (O&M), and site monitoring. Institutional controls would be necessary to restrict navigational dredging, and a warning system would be needed to identify the new shallow water depth.

The capping cost includes construction and monitoring costs of $765,200 and $208,200, respectively. The estimated refurbishing cost, based on 25% material loss and replacement every 10 years, is $249,000. The estimated 30-year present value for the capping alternative is $1,834,000, assuming a 6% discount rate and including a 30% contingency.

9.2.4 Dredging with Offsite Disposal

This action includes dredging, backfilling, dewatering, staging, sampling, classification, and offsite disposal of contaminated sediment. Exceedances of FDEP's residential soil cleanup target levels were identified in both DUs; therefore, use of dredge spoils as onsite fill material was not considered in this alternative.

All necessary permit(s) must be obtained before dredging or fill material is discharged into navigable waters and State of Florida and federal regulations which outline dredging and filling requirements applicable to this action must be followed. Water discharge from the filter press and staged soils may also require a National Pollutant Discharge Elimination System permit for discharge. Any water discharged to the Navy-owned waste water treatment works would be required to meet pretreatment standards. Department of Transportation (DOT) regulations would be followed for any offsite transportation, and depending on waste classification, disposed soils would be required to satisfy land disposal restrictions (LDRs) for hazardous soils and FDEP disposal requirements for non-hazardous soils. Dredging would eliminate long-term risk posed by the site sediments; however, future liability would be passed to the Navy through disposal at a landfill.

Dredging is a common remediation technique for sediments. Potential technical problems that could slow removal activities include sediment preconditioning to facilitate filter press operations, management of removed sediment and drained water, and materials handling and disposal. No long-term O&M activities would be associated with this alternative.

Based on a one-foot depth of removal and backfill, the estimated direct construction and disposal cost is $855,000. Dredged soils would be dewatered by filter press and presumably disposed as non hazardous waster at a RCRA Subtitle D landfill. Excluding transportation, compliance sampling, and exempted taxes, the estimated direct cost for disposal is $98,800. The estimated cost for the capping and offsite disposal alternative is $1,283,000, which includes a 30% contingency.

9.2.5 Long-Term Sediment Monitoring

Under the long-term sediment monitoring (LTSM) alternative, site sediments would be left in place, site access would be restricted, and the site would be monitored for a variety of parameters every five years for changes that may affect risk. The no-action alternative does not include sampling and analysis activities or the imposition of ICs.

LTSM would comply with all ARARs. Over time, sediments would be anticipated to reach remedial goals with time through natural processes. The long-term monitoring plan would set specific progress goals, and if goals were not met, a decision whether or not to abandon LTSM in favor of another alternative would be made.

Natural sedimentation may also be occurring in the area of concern and may eventually bury the contaminated material. Organisms at the site could transform or degrade organic COPCs to less toxic forms via bioprocesses.

The estimated direct initial and subsequent 5 year monitoring costs for LTSM are $64,000 and $32,000, respectively. LTSM would be conducted every five years. The estimated 30-year present value for the LTSM alternative is $227,000, assuming a 6% discount rate and including a 30% contingency.

9.2.6 Distinguishing Features

Table 9-1 lists the features of the Site 2 alternatives.

Table 9-1
Distinguishing Features Between Alternatives
Operable Unit 3, Site 2
NAS Pensacola

Alternative	Variables	Direct Costs	O&M Costs	Indirect Costs[a]	Total Present Value[b]
Alternative 1: No Action	Conduct 5-year reviews for 30 years	$10,000	$24,400	$10,200	$45,000
Alternative 2: Capping	25% material loss & refurbishment every 10 years	$765,200	$457,200	$611,100	$1,834,000

Table 9-1
Distinguishing Features Between Alternatives
Operable Unit 3, Site 2
NAS Pensacola

Alternative	Variables	Direct Costs	O&M Costs	Indirect Costs[a]	Total Present Value[b]
Alternative 3: Dredging with Offsite Disposal	1-foot excavation depth and replacement cover	$855,000	$0	$427,000	$1,283,000
Alternative 4: LTSM	Initial event + monitoring at 5-year intervals for 30 years	$64,000	$78,100	$85,300	$227,000

Notes:
a = Indirect costs include 30% contingency, contractor reporting requirements, and overhead and profit; except for the no-action alternative, which has a 10% contingency. The indirect costs are assumed to be a percentage of the total direct and O&M costs.
b = Present value is based on 30-years' operation and maintenance using a 6% discount rate.

9.3 Expected Outcome of Each Alternative

The Navy will continue to use the area for military purposes. Homeland security requirements restrict unauthorized boat traffic within 500 feet of the NAS Pensacola shoreline. Site 2 is within this restricted area. Groundwater is not currently used as a potable water source at NAS Pensacola, which receives its potable water from Corry Station, approximately 4 miles north. These conditions are expected to remain the same in the future.

No Action

The No-Action alternative does not provide any additional effectiveness over the current use scenario. This alternative does not reduce the toxicity, mobility, or volume of the contaminants; however, current site-access controls prohibit swimming, and homeland security restrictions prohibit boat traffic in the Site 2 area, reducing the potential for direct human contact with site sediments. Under the No-Action alternative, the only risks are to the resident marine organisms in two 150-foot by 150-foot areas.

Capping

Based on the USACE studies on capping of contaminated dredged material, this alternative would adequately protect the Site 2 ecology. Changing the bottom type from fine-grained sediment to coarse sand would change the benthic community structure. Although capping would temporarily eliminate any resident benthic organisms, they would be expected to recolonize the area over time. Several studies would be needed during remedial design to ensure cap effectiveness. Current and velocity mapping would be needed to evaluate sediment transport and potential erosion rates. Burrowing depths for bay biota should also be assessed to design an adequate cap thickness.

The main concern regarding the cap's effectiveness would be storm-induced erosion. Hurricanes and other strong storms occur annually in and around Pensacola. Forces induced by these storms are difficult to predict and could destroy a cap. However, the presence of unconsolidated, fine-grained sediments indicates a general lack of high water velocities and favors the durability of a coarse-grained cap.

Dredging with Offsite Disposal

Dredging is effective at limiting chronic effects to the ecology, but immediate protection would not be provided. In the short-term, benthic organisms would be severely stressed by hydraulic dredging. Benthic organisms would be expected to re-colonize the recovered, dredged areas after the construction activities are completed.

Long-Term Sediment Monitoring

This alternative has no short-term effectiveness, and only long-term monitoring results will indicate long-term effectiveness. There are many factors that support this option's potential for long-term effectiveness:

- Natural sedimentation could be occurring in the area of concern and could eventually bury the contaminated material.

- Organisms at Site 2 could transform or degrade organic COPCs to less toxic forms via bioprocesses. Intrinsic bioremediation, even of these persistent (organic) compounds, occurs naturally but slowly in sediments, and uses indigenous microorganisms and enzymatic pathways of both aerobic and anaerobic processes. As natural sedimentation and/or transformation of the chemicals occur, other less opportunistic species in the bay may begin to move into the area naturally (Bishop, 1996).

- Additional testing may refine risk-assessment capabilities and show a reduced level of risk, which does not require further remedial action.

Other advantages of LTSM include no disturbance of the sediments and continued protection of the water column from groundwater infiltration. Not disturbing the sediments eliminates the risk of releasing sediment-bound contaminants into the water column. The existing sediments could also be preventing groundwater contaminants from infiltrating the surface water column. Heavily reduced sediments are typically capable of removing inorganic and organic compounds through binding and reductive processes.

10.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

In accordance with the NCP, the alternatives were evaluated using the nine criteria that are discussed in the sections below. The objective of the evaluation is to evaluate the relative performance of the alternatives with respect to the nine criteria so that the advantages and disadvantages of each are clearly understood.

Table 10-1 shows the threshold, balancing, and modifying criteria used to evaluate the alternatives for Site 2. The table further compares each alternative with the nine criteria specified by the NCP.

For an alternative to be an acceptable remedy, it must pass the USEPA's two threshold criteria: (1) overall protection of human health and the environment, and (2) compliance with ARARs.

10.1 Overall Protection of Human Health and the Environment

This criterion evaluates the overall degree of protectiveness afforded to human health and the environment. It assesses the overall adequacy of each alternative.

Protection of Human Health

The BRA as detailed in the RI report (EnSafe/Allen and Hoshall, 1996) indicates that all alternatives are protective of human health and no associated risks are expected at Site 2 from sediment contamination. Access controls are currently enforced at the site and there is no direct contact between workers and/or residents and the site sediment.

Protection of the Environment

Each of the four alternatives would protect the environment to varying degrees. No action would allow the environment to continue to function undisturbed. Capping or dredging would afford long-term protection of the environment, but would exterminate benthic organisms in the application area (benthic organisms would gradually re-colonize the area). LTSM would monitor for changes in the sedimentary environment in anticipation of decreasing risk via natural processes.

10.2 Compliance with ARARs

Section 121(d) of both CERCLA and the NCP § 300.430(f)(1)(ii))B) require that any remedial action conducted under CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements , standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA section 121(d)(4).

Table 10-1
Comparative Analysis of Alternatives Summary
Operable Unit 3, Site 2
NAS Pensacola

Criteria	Alternative 1: No Action	Alternative 2: Capping	Alternative 3: Dredging and Offsite Disposal	Alternative 4: Monitoring
Overall Protection of Human Health and the Environment	No reduction in risk to humans or ecological receptors beyond natural processes. However, the site is practically inaccessible because of physical controls and Homeland Security restrictions. Natural processes will slowly lower contaminant levels.	Currently no risk to humans. Capping would likely exterminate benthic organisms in the area, although they would be expected to recolonize in time.	No risk to humans. Remediation workers would have adequate protection. Soil posing risk to be removed and replaced with 12 inches of sand. Benthic organisms would likely be exterminated with dredging but would recolonize.	Using this alternative poses no risk to human health or the environment. Existing sediments are practically inaccessible to people because of physical controls and Homeland Security restrictions. Natural processes will slowly lower contaminant levels.
Compliance with ARARs	No promulgated chemical-specific ARARs are identified for sediment. Does not trigger additional action or location-specific ARARs.	Would require permit, and would trigger Florida and federal requirements. This alternative is expected to comply with these ARARs.	Would require permits from several entities, including DOT for offsite transportation of waste. Compliance is attainable.	No promulgated chemical-specific ARARs are identified for sediment. Does not trigger additional action or location-specific ARARs.
Long-term Effectiveness and Permanence	Long term, contaminants are expected to diminish through natural processes and dilution since the contaminant source stopped over 35 years ago. Toxicity to benthic organisms will also decrease over time.	If the cap is maintained properly, risk to human health and the environment would not be expected. Maintenance of a sand cap in a tidal environment will require considerable attention.	Provides permanent exposure reduction by removing sediments. Navy would have long-term liability from landfilled wastes.	Long term, contaminants are expected to diminish through natural processes and dilution since the contaminant source stopped over 35 years ago. Toxicity to benthic organisms will also decrease over time.
Reduction of Toxicity, Mobility, or Volume through Treatment	No active reduction in toxicity, mobility, or volume. Also, natural processes reduce toxicity and volume over time.	Capping would not remove, treat, or reduce the amount of site sediments. However, capping would immobilize some metal contaminants.	Dredging does not meet statutory preference for reducing toxicity, mobility, or volume through treatment.	Toxicity, mobility, and volume are not treated under this alternative. Natural processes will break down and bury contaminants over time.

Table 10-1
Comparative Analysis of Alternatives Summary
Operable Unit 3, Site 2
NAS Pensacola

Criteria	Alternative 1: No Action	Alternative 2: Capping	Alternative 3: Dredging and Offsite Disposal	Alternative 4: Monitoring
Short-Term Effectiveness	No short-term risks.	Capping would likely exterminate benthic organisms in the area, although they would be expected to recolonize.	In the short term, dredging would exterminate benthic organisms, which would be expected to recolonize.	In the short term, this plan would not change current risks to ecology. Human access would remain unlikely as access controls are in place.
Implementability	Feasible and easily implemented. Requires reevaluation every 5 years.	Feasible and can be implemented.	Feasible and easily implemented. Dredging is a common remediation technique for sediments	Feasible and easily implemented. A monitoring program would have to be developed.
Cost	$45,000	$1,834,000	$1,283,000	$227,000
Support Agency Acceptance	FDEP and USEPA involved in process and have opportunity to comment.	FDEP and USEPA involved in process and have opportunity to comment.	FDEP and USEPA involved in process and have opportunity to comment.	FDEP and USEPA involved in process and have opportunity to comment.
Community Acceptance	No comments were received from the public.	No comments were received from the public.	No comments were received from the public.	No comments were received from the public.

Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those State standards that are identified by a state in a timely manner and that are more stringent that Federal requirements maybe applicable. Relevant and Appropriate requirements are those cleanup standards, standards of control, and other substantives, criteria, or limitations promulgated under Federal or State environmental siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited for a particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for a waiver.

As discussed in Section 10.1, no threats to human health are present at Site 2. If physical controls continue to be implemented at the site, no further action will be required at Site 2 to protect human health.

Alternatives 1 and 4 comply with ARARs. Compliance with action-specific ARARs for Alternatives 2 and 3 are attainable with regulatory concurrence.

10.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

Magnitude of Residual Risk

As stated in the BRA, no risk is posed to human health at Site 2. Alternative 1 (No-Action) has no long-term effectiveness. Alternative 2 (Capping) would reduce risk by preventing contact between benthic organisms and the site sediment. Risk to the environment is eliminated in Alternative 3 (Dredging) by removing sediments identified as probably causing an adverse effect. The long-term effectiveness of Alternative 4 (LTSM) is based on evaluation of natural processes with actions identified contingent upon site conditions. As a result, Alternatives 1 and 4 are estimated as less effective than Alternatives 2 and 3, which require more aggressive forms of remediation.

Adequacy and Reliability of Controls

Existing controls inherent to Site 2 include a concrete seawall, limited access, and restrictions on use. No further actions are required to protect human health at Site 2 under the current-use scenario for all four alternatives.

Alternative 2 (Capping) provides slightly more reliable controls than Alternative 1 (no-action) and Alternative 4 (LTSM). The completed cap would reduce the threat to future biota in that area of the bay; however, the cap could require annual maintenance to ensure contact with the site sediment is restricted. Alternative 3 (Dredging) provides the most reliability, because sediment is removed from the site; however, long-term liability would be incurred by the Navy through disposal at a landfill. Although potentially contaminated subsurface sediments would be exposed, they would be covered with a 12-inch sand replacement cover.

10.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of the remedy. Alternatives 1 (No Action), 3 (Dredging), and 4 (LTSM) would not reduce toxicity, mobility, or volume of contaminants through treatment. Alternative 2 (Capping) could reduce mobility by preventing sediment migration and immobilizing metals by promoting reducing conditions.

10.5 Short-Term Effectiveness

Short-term, effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved.

Because Alternatives 1 (No Action) and 4 (LTSM) do not involve construction, there are no short-term effectiveness issues associated with those alternatives. Alternatives 2 (Capping) and 3 (Dredging) would exterminate benthic organisms in the application area. In these alternatives, exposure to workers and the area around Site 2 can be controlled with engineering controls and use of proper personal protective equipment. Duration of field activities for both Alternatives 2 (Capping) and 3 (Dredging) would likely be less than 3 months.

10.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

All four alternatives are implementable, technically and administratively. Alternative 2 (Capping) would require a remedial design investigation before implementation. Velocities and directions of currents and the potential for possible erosion of the cap would need to be evaluated. Alternative 3 (Dredging) would require dewatering and transportation of sediment to an offsite facility; however, these alternatives would not require extraordinary services or materials. Permits would need to be obtained for both the dredging and capping alternatives before implementation could take place. Alternative 4 (LTSM) would require monitoring and a management plan for making decisions about how monitoring results would affect future actions at the site.

10.7 Cost

Direct, O&M, indirect, and present value costs for all four alternatives are presented in Table 9-1. Note that future costs for Alternative 2 (Capping) are significantly linked to erosional/depositional patterns. Further field investigation would be required to collect data to effectively evaluate costs associated with this alternative.

10.8 Support Agency Acceptance

Both the FDEP and USEPA have provided input and comment on the development of each of the alternatives detailed in the *Final Focused Feasibility Study for Site 2* (EnSafe, October 1, 2004).

10.9 Community Acceptance

The public comment period was held from July 1, 2005 to August 14, 2005. No comments were received from the public on the proposed plan.

11.0 PRINCIPAL THREAT WASTES

There are no source materials that would be considered principal threats at Site 2. Industrial discharges were eliminated in 1973.

12.0 SELECTED REMEDY

Alternative 1, No Action, has been selected as the preferred remedial action alternative for Site 2.

12.1 Summary of the Rationale for the Selected Remedy

Based on the information available at this time, the Navy, USEPA, and FDEP believe the selected remedy will be protective of human health and the environment, comply with ARARs, be cost-effective, and use permanent solutions and alternative treatment technologies to the maximum extent practicable.

The selected remedy leaves the site sediments in place.

12.2 Description of the Selected Remedy

The selected no-action alternative requires a statutory review be conducted within 5 years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

Homeland security restrictions are in place and prohibit unauthorized boat traffic within 500 feet of the shoreline, which includes the Site 2 area.

12.3 Summary of the Remedy Costs

Estimated costs for implementing the selected remedy are detailed in Table 12-1.

Table 12-1
Estimated Costs Associated with the No-Action Alternative
Operable Unit 3, Site 2
NAS Pensacola

Action	Total Cost
Initial Engineering and Design Costs	$10,000
Subsequent 5-Year Review Costs	$24,400
Subtotal Present Value Costs	*$34,400*
Contingency (30%)	$10,320
Total Cost (rounded to nearest $1,000)	**$45,000**[a]

Note:
[a] = Based on a 6% discount rate over 30 years

12.4 Expected Outcomes of the Selected Remedy

The expected outcomes of the selected remedy are as follows:

- The Navy will retain the use of the Site 2 area, which will be consistent with the current and expected military use of the area. Homeland security restrictions prohibit unauthorized boat traffic within 500 feet of the NAS Pensacola shoreline, which includes Site 2.

- Natural sedimentation should be occurring in the area of concern and eventually bury the contaminated sediment.

- Sediments are also expected to continue to be remediated through natural attenuation, which should reduce current contaminants to below remedial goals.

- Sediments would remain in place, eliminating the risk of releasing sediment-bound contaminants into the water column, and contaminants infiltrating from groundwater may be prevented from entering the surface water as heavily reduced sediments are typically capable of removing inorganic and organic compounds through binding and reductive processes.

13.0 STATUTORY DETERMINATIONS

Under CERCLA §121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practical. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the selected remedy meets these statutory requirements.

13.1 Protection of Human Health and the Environment

The selected remedy protects human health and the environment by eliminating, reducing, and controlling risk through access restrictions and natural processes.

13.2 Compliance with ARARs

The selected remedy complies with all ARARs.

13.3 Cost Effectiveness

The selected remedy is cost-effective and represents a reasonable value for the cost. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP §300.430(f)(l)(ii)(D)). This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., are both protective of human health and the environment, and ARAR compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs, and hence the selected remedy represents a reasonable value for the cost.

The estimated present worth cost of the selected remedy of No Action is $45,000. The selected remedy is a cost-effective means to meet Site 2 RAOs and protect human health and the environment.

13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The Navy has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. The selected remedy is protective of human health and the environment, complies with ARARs, and provides the best balance of trade-offs in terms of the five balancing criteria.

13.5 Preference for Treatment as a Principal Element

The selected remedy does not use treatment as a principal element of the remedial action. In this instance, the data generated during the RI/FS indicate natural processes are adequate to reduce contamination to acceptable risk-based concentrations in a timely manner. The statutory preference for remedies that employ treatment as a principal element does not require treatment under these circumstances.

13.6 Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unlimited use and unrestricted exposure, NCP §300.430(f)(4)(ii) requires that a statutory review be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

14.0 DOCUMENTATION OF SIGNIFICANT CHANGES FROM PROPOSED PLAN

The Proposed Plan for Site 2 released on July 1, 2005 identified the preferred alternative as No Action. The preferred alternative presented in the Proposed Plan is the same as described in this ROD.

15.0 RESPONSIVENESS SUMMARY

Overview

At the time of the public comment period, the U.S. Navy had selected a preferred remedy to address sediment at NAS Pensacola Site 2. This preferred remedy was selected in coordination with the USEPA and the FDEP. The NAS Pensacola Restoration Advisory Board, a group of community volunteers, reviewed the technical details of the selected remedy and raised no fundamental objections to its selection.

The sections below describe the background of community involvement in the project and comments received during the public-comment period.

Background of Community Involvement

Throughout the site's history, the community has been kept abreast of site activities through press releases to the local newspaper and television stations. Site-related documents were made available to the public in the Administrative Record stored at information repositories maintained at the NAS Pensacola Library and the John C. Pace Library of the University of West Florida.

An advertisement was placed in the *Pensacola News Journal* to announce the public-comment period from July 1, 2005 to August 14, 2005, in order to provide the opportunity for a public meeting and briefly summarize the Proposed Plan. In conjunction with the newspaper announcement, the proposed plan was sent to all addresses on the Site 2 mailing list.

Summary of Comments Received During the Public-Comment Period

No comments were received from the public on the proposed plan.

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Appendix B
Applicable or Relevant and Appropriate Requirements

Table B-1
Potential Action-Specific ARARs
Operable Unit 3, Site 2
NAS Pensacola

ARAR	Status	Description	Application
State Requirements			
FR 62-312 Dredge and Fill Activities	Applicable	Describes permitting and review process for dredge activities.	Applicable if Alternatives 2 or 3 are selected.
FR 62-45 25-year Permits for Maintenance of Dredging in Deepwater Ports	Relevant	Applies to dredging activities in deepwater ports.	Relevant if this area is deemed and continues to be part of a deepwater port.
Federal Requirements			
33 CFR 320	Applicable	Gives U.S. Army Corps of Engineers (USACE) authority to regulate actions in navigable waterways, including dredging.	Applicable if Alternatives 2 or 3 are selected.
33 CFR 322	Applicable	Contains USACE permitting structure for work in or affecting navigable waters of the United States.	Applicable if Alternatives 2 or 3 are selected.

Appendix A
Glossary

This glossary defines terms used in this ROD to describe CERCLA activities. The definitions apply specifically to this ROD and may have other meanings when used in different circumstances.

ADMINISTRATIVE RECORD: A file that contains all information used by the lead agency to make its decision in selecting a response action under CERCLA. This file is to be available for public review, and a copy is to be established at or near the site, usually at one of the information repositories. A duplicate is also filed in a central location, such as a regional or state office.

AQUIFER: An underground formation of materials such as sand, soil, or gravel that can store and supply groundwater to wells and springs. Most aquifers used in the United States are within 1,000 feet of the earth's surface.

BASELINE RISK ASSESSMENT: A study conducted to supplement an RI to determine the nature and extent of contamination at a Superfund site and the risks posed to public health and/or the environment.

CARCINOGEN: A substance that can cause cancer.

CLEANUP: Actions taken to deal with a release or threatened release of hazardous substances that could affect public health and/or the environment. The noun "cleanup" is often used broadly to describe various response actions or phases of remedial responses such as RI/FS.

COMMENT PERIOD: A time during which the public can review and comment on various documents and actions taken, either by the Department of Defense installation or the USEPA. For example, a comment period is provided when USEPA proposes to add sites to the National Priorities List.

COMMUNITY RELATIONS: USEPA's, and subsequently the Navy's/Naval Air Station Pensacola's, program to inform and involve the public in the Superfund process and respond to community concerns.

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA): A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA). The act created a special tax that goes into a trust fund, commonly known as "Superfund," to investigate and clean up abandoned or uncontrolled hazardous waste sites.

DRINKING WATER STANDARDS: Standards for quality of drinking water that are set by both the USEPA and the FDEP. National Primary Drinking Water Regulations are legally enforceable standards that apply to public water systems and include the Maximum Contaminant Levels, which are the highest levels of contaminants allowed in drinking water. National Secondary Drinking Water Regulations are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. The State of Florida uses Florida Primary/Secondary Drinking Water Standards to protect drinking water concurrent with the federal standards.

EXPLANATION OF SIGNIFICANT DIFFERENCES: After adoption of the final remedial action plan, if any remedial or enforcement action is taken, or if any settlement or consent decree is entered into, and if the settlement or decree differs significantly from the final plan, the lead agency is required to publish an explanation of any significant differences with rationale.

FEASIBILITY STUDY: See Remedial Investigation/Feasibility Study (RI/FS).

GROUNDWATER: Water beneath the earth's surface that fills pores between materials such as sand, soil, or gravel. In aquifers, groundwater occurs in quantities sufficient for drinking, irrigation, and other purposes.

HAZARDOUS SUBSTANCES: Any material that poses a threat to public health and/or the environment, typically those that are toxic, corrosive, ignitable, explosive, or chemically reactive.

INFORMATION REPOSITORY: A file containing information, technical reports, and reference documents regarding a Superfund site. Information repositories for Naval Air Station Pensacola are at the John C. Pace Library, University of West Florida; and the NAS Pensacola Library, Building 633, Naval Air Station, Pensacola, Florida.

MAXIMUM CONTAMINANT LEVEL: National standards for acceptable concentrations of contaminants in drinking water. These standards are legally enforceable standards set by the USEPA under the Safe Drinking Water Act.

MONITORING WELLS: Wells drilled at specific locations on or off a hazardous waste site where groundwater can be sampled at selected depths and studied to assess the groundwater flow direction, the types and amounts of contaminants present, etc.

NATIONAL PRIORITIES LIST (NPL): The USEPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial response using money from the trust fund. The list is based primarily ON a site’s Hazard Ranking System score. USEPA is required to update the NPL at least once a year.

PARTS PER BILLION (ppb)/PARTS PER MILLION (ppm): Units commonly used to express low concentrations of contaminants. For example, 1 ounce of trichloroethylene in a million ounces of water is 1 ppm; 1 ounce of trichloroethylene in a billion ounces of water is 1 ppb. If one drop of trichloroethylene is mixed in a competition-size swimming pool, the water will contain about 1 ppb of trichloroethylene.

PRELIMINARY REMEDIATION GOALS: Screening concentrations provided by the USEPA and the FDEP used to assess the site for comparison before remedial goals are set during the Baseline Risk Assessment.

PROPOSED PLAN: A public participation requirement of SARA in which the lead agency summarizes for the public the preferred cleanup strategy and rationale for the preference, reviews the alternatives presented in the detailed analysis of the RI/FS, and presents any waivers to cleanup standards of CERCLA §121(d)(4) that may be proposed. This may be prepared either as a fact sheet or as a separate document. In either case, it must actively solicit public review and comment on all alternatives under agency consideration.

RECORD OF DECISION (ROD): A public document that explains which cleanup alternative(s) will be used at NPL sites. The Record of Decision is based on information and technical analysis generated during the RI/FS and consideration of public comments and community concerns.

REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS): Investigation and analytical studies usually performed at the same time, and together referred to as the "RI/FS." They are intended to (1) gather the data necessary to determine the type and extent of contamination at a Superfund site; (2) establish criteria for cleaning up the site; (3) identify and screen cleanup alternatives for remedial action; and (4) analyze the technology and costs of the alternatives in detail.

REMEDIAL RESPONSE: A long-term action that stops or substantially reduces a release or threatened release of hazardous substances that is serious, but does not pose an immediate threat to public health and/or the environment.

REMOVAL ACTION: An immediate action performed to address a release or threatened release of hazardous substances.

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA): A federal law that established a regulatory system to track hazardous substances from the time of generation to disposal. The law requires safe and secure procedures to be used in treating, transporting, storing, and disposing of hazardous substances. RCRA is designed to prevent new, uncontrolled hazardous waste sites.

RESPONSE ACTION: As defined by CERCLA §101(25), a response action means a removal, remedy, or remedial action, including related enforcement activities.

RESPONSIVENESS SUMMARY: A summary of oral and written public comments received by the lead agency during a comment period on key documents, and the response to these comments prepared by the lead agency. The responsiveness summary is a key part of the ROD, highlighting community concerns for USEPA decision-makers.

SECONDARY DRINKING WATER STANDARDS: Secondary drinking water regulations are set by the USEPA and the FDEP. These guidelines are not designed to protect public health; instead they are intended to protect "public welfare" by providing guidelines for the taste, odor, color, and other aesthetic aspects of drinking water that do not present a health risk.

SUPERFUND: A trust fund established by CERCLA which can be drawn on to plan and clean up previous hazardous waste disposal sites, and current releases or threats of releases of non-petroleum products. Superfund is often divided into removal, remedial, and enforcement components.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA): The public law enacted on October 17, 1986, to reauthorize the funding provisions and amend the authorities and requirements of CERCLA and associated laws. Section 120 of SARA requires that all federal facilities "be subject to, and comply with, this act in the same manner and to the same extent as any non-governmental entity."

SURFACE WATER: Bodies of water that are above ground, such as bays, bayous, rivers, lakes, and streams.

VOLATILE ORGANIC COMPOUND: An organic (carbon-containing) compound that evaporates (volatilizes) readily at room temperature.

FINAL RECORD OF DECISION — OPERABLE UNIT 3
SITE 2 — NAS PENSACOLA — PENSACOLA, FLORIDA

FINAL RECORD OF DECISION — OPERABLE UNIT 3
SITE 2 — NAS PENSACOLA — PENSACOLA, FLORIDA

FINAL RECORD OF DECISION — OPERABLE UNIT 3
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