N60201.AR.002427
NS MAYPORT
5090.3a

SEDIMENT AND GROUNDWATER QUALITY INVESTIGATION IN SUPPORT OF EA AND PERMITTING FOR HARBOR OPS/SMALL CRAFT BERTHING AND ADJACENT FACILITIES

NS MAYPORT FL

4/1/2000

ECOLOGY AND ENVIRONMENT, INC

Sediment and Groundwater Quality Investigation in Support of EA and Permitting for Harbor Ops/Small Craft Berthing and Adjacent Facilities at Naval Station Mayport Jacksonville, Florida

Prepared for:

Southern Division (SOUTHDIV), Naval Facilities Engineering Command (NAVFACENGCOM)
2155 Eagle Drive
North Charleston, South Carolina 29406

April, 2000

Evan M. Skornick, MS
REM # 9984/ REPA #5839
Project Scientist

Jim Bolleter, P.E.
FL # 40051
Project Director

A. Marie Ecton
Project Manager

ecology and environment, inc.
International Specialists in the Environment

Parkside Corporate Center I, 15280 N.W. 79th Court, Suite #100, Miami Lakes, Florida 33016
Tel: (305) 822-9959, Fax: (305) 822-5958

Table of Contents

Table of Contents (continued)

List of Tables

List of Figures

Acronym/Abbreviation List

ABB-ES	ABB Environmental Services, Inc.
A/E	Archtectural/Engineering
AMI	Atlantic Marine, Inc.
ASC	Analytical Services Center
ASTM	American Society for Testing and Materials
Bechtel	Bechtel Environmental, Inc.
CompQAP	Comprehensive Quality Assurance Plan
E & E	Ecology and Environment, Inc.
EA	Environmental Assessment
EPA	United States Environmental Protection Agency
FDEP	Florida Department of Environmental Protection
FID	Flame Ionization Detector
Greiner	URS Greiner
GWCTL	Groundwater Cleanup Target Level
HCl	Hydrochloric Acid
HNO_3	Nitric Acid
IM	Interim Measure
JSI	Jacksonville Shipyards, Inc.
L	Liter
LAWGIBB	Law Engineering and Environmental Services, Inc.
LUC	Land Use Control
µg/L	Micrograms per Liter
MCL	Maximum Concentration Level
MDL	Method Detection Limit
mg/kg	Milligrams per Kilogram
MHW	Mean High Water
mL	Milliliter
MOA	Memorandum of Agreement
NAVFACENGCOM	Naval Facilities Engineering Command
NAVSTA	Naval Station
Navy	United States Navy
NFS	North Florida Shipyards, Inc.

Acronym/Abbreviation List (Continued)

OVA	Organic Vapor Analyzer
oz.	Ounce
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PP	Priority Pollutant
PQL	Practical Quantitative Limit
PVC	Polyvinyl Chloride
QC	Quality Control
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SCTL	Soil Cleanup Target Level
SouthDiv	Southern Division
SSP	Subsurface Sampling Plan
SPT	Standard Penetration Test
STL	STL Savannah Laboratories
SVOC	Semi Volatile Organic Compound
SWMU	Solid Waste Management Unit
TOV	Total Organic Vapor
UCL	Upper Confidence Level
USACE	United States Army Corps of Engineers
VOC	Volatile Organic Compound

1 Introduction and Background

1.1 Investigation Location/Background

Ecology & Environment, Inc., (E & E) was commissioned under Contract Number N62467-97-D-0860 by Mr. Will Sloger of the Department of the Navy, Southern Division (SouthDiv) of the Naval Facilities Engineering Command (NAVFACENGCOM), to conduct an Environmental Assessment (EA) and permitting activities (Delivery Order Number 0026) for the Harbor Operations/Small Craft Berthing and Adjacent Facilities Project (Harbor Ops Project) proposed for Naval Station (NAVSTA) Mayport, Jacksonville, Florida. In support of these activities, E & E personnel designed and implemented a subsurface sampling plan (SSP) in order to meet the objectives of investigating the sediment and groundwater quality within the Harbor Ops Project area. This SSP was handled in conjunction with geotechnical subsurface borings scheduled for architectural and engineering design work, undertaken by URS Greiner, Inc., (Greiner) and their subcontractor, Law Engineering and Environmental Services, Inc., (LAWGIBB). This report is a synopsis of the SSP, and presents the results and findings of the investigation. The primary objective of this investigation is to establish the physical and chemical nature of the material to be removed to create the Harbor Ops basin, and to establish potential water quality impacts. The quality of the material is of further interest since its nature will determine how the material can be disposed. A nearby solid waste management unit (SWMU) or other previous activities in the area may have impacted the soil and/or groundwater within the proposed limits of soil removal, thus, further necessitating the need to assess soil and groundwater conditions.

NAVSTA Mayport is located northeast of the City of Jacksonville, along the southern bank of the St. Johns River (See Figure 1-1). NAVSTA Mayport encompasses 3,400 acres, almost half of which is classified as wetland, brackish marshland or beach, and can accommodate up to 34 ships. Currently, NAVSTA Mayport is the homeport for over 14,000 sailors and civilians, and supports

three battle group staffs, 20 vessels and five helicopter squadrons.

The proposed Harbor Ops Project is to consist of upland excavation and a limited amount of soil removal below the mean high water (MHW) level, and construction of a small craft berthing facility (utilizing floating docks and bulkheads), a boat ramp, a turning basin and adjacent support facilities. The proposed Harbor Ops Project area is to the east of the Foxtrot Wharf (located in the northeast quadrant of NAVSTA Mayport, see Figure 1-2), and encompasses approximately 7.5 acres of the existing underwater, nearshore, and upland areas. The Foxtrot Wharf is currently used as a docking point and maintenance area for cruiser type vessels. Due east of the Foxtrot Wharf is a cove-like area that is currently unutilized and bounded by rubble rip-rap. To the southeast of the Foxtrot Wharf is an equipment staging area (for vessel maintenance activities), followed by a parking lot. Beyond that is a currently vacant, industrial area. This industrial area consists of open, moderately vegetated land with some abandoned structures, including a large building, concrete pads and an old oil tank. This industrial area is part of a SWMU which will be discussed in detail later in this section. Farther to the east and southeast of the pier are currently utilized facilities, such as a wastewater treatment plant and buildings that house the base's Public Works Department.

1.2 Investigation Scope

The scope of this investigation was to collect data in support of the EA and permitting activities for the Harbor Ops Project. In order to minimize cost and effort, the investigation was scheduled to coincide with previously scheduled borings planned by the Architectural/Engineering (A/E) subcontractor, LAWGIBB. The previously designed boring plan consisted of 12 borings, 10 on land and two from a floating barge, all to a final depth of 40 feet below surface. E & E originally planned to provide LAWGIBB with a sampling protocol to be followed by LAWGIBB personnel in the field, but was then tasked with collecting all necessary samples. To this end, an SSP was designed that included collection of samples of the soil, sediment, groundwater and surface water throughout the Harbor Ops Project area, and shipping of these samples to analytical laboratories for analysis. Soil, sediment and groundwater samples were analyzed for priority pollutant (PP) metals, volatile organic compounds (VOCs), and/or semivolatile organic compounds (SVOCs)/polynuclear aromatic hydrocarbons (PAHs). In addition, soils and sediments from selected borings were composited and shipped, along with surface water samples, for processing by the elutriate extraction method, and analysis for PP metals and PAHs. Contact reports pertinent for this investigation can be found in Appendix A.

1.3 Discussion of Previous SWMU Assessments

NAVSTA Mayport, as with any other military installation, includes in its current and prior operations, a number of industrial activities including shipbuilding, metal fabrication, painting, paint removal, and engine maintenance and repairs. Various assessments have been conducted at NAVSTA Mayport in order to characterize and delineate areas of environmental contamination. In particular, the areas including, and immediately adjacent to, this investigation are designated as SWMUs, and have undergone Resource Conservation and Recovery Act (RCRA) Facility Investigations (RFIs).

The Harbor Ops Project area sits to the north and northwest of, and within the northern section of, the understood boundaries of designated SWMU 23 (Note: anecdotal information from Naval personnel indicated that the boundaries of the SWMUs as drawn on maps may not be the definitive delineation point, and that SWMU contamination may exist outside of said boundaries). SWMU 23 was the former location of Jacksonville Shipyards, Inc., (JSI) from 1961 until 1992 (ABB Environmental Services, Inc., [ABB-ES] 1996). This facility consisted of a number of buildings and underground and aboveground storage tanks, and operated as a ship building and maintenance contractor to the NAVSTA.

In addition to this SWMU, the following SWMUs are in the general vicinity of the Harbor Ops Project location (refer to Appendix B):

- SWMU 25 – Due south of the Harbor Ops Project area, south of SWMU 23. Includes facilities of Atlantic Marine, Inc.,(AMI), a ship building, repair and maintenance contractor;
- SWMU 44 – East of the Harbor Ops Project area, east of SWMU 23, on the grounds of the Wastewater Treatment Plant;
- SWMU 45 – East and northeast of the proposed Harbor Ops Project area, east and northeast of SWMU 23, on the grounds of the Wastewater Treatment Plant;
- SWMU 1 – East and Southeast of the Harbor Ops Project area, to the east of SWMU 23. Known location of the former Landfill A, currently includes the NAVSTA Public Works Department building; and
- SWMU 24 – Southeast of the Harbor Ops Project area, southeast of SWMU 23. Includes facilities of North Florida Shipyards, Inc., (NFS), a ship building, repair and maintenance contractor.

The assessments for these SWMUs were grouped together as an RFI due to a number of factors including, but not limited to, similar lithology, proximity to one another, and similarity of previous operations (these areas were collectively referred to as the Shipyard; ABB-ES 1996). Furthermore, the former "Landfill A" (SWMU 1) was thought to possibly encompass portions of SWMUs 1, 23, 25, 44, and 45, as well. Landfill A consisted of a series of trenches in which various sanitary and industrial wastes were placed, and was operated from 1942 to 1960 (ABB-ES 1996). An RFI report for these SWMUs indicated that some buried materials were discovered during excavation for the Wastewater Treatment Plant.

To summarize some of the past assessment and remediation efforts within these SWMU areas, surface/subsurface soil samples and groundwater samples were collected and analyzed for VOCs, SVOCs, inorganics, pesticides and polychlorinated biphenyls (PCBs) in 1995 by ABB-ES in support of their Group III RFI. Soil results of these samplings and analyses were compared to risk-based concentrations (RBCs) from the United States Environmental Protection Agency (EPA), Region 3, and the Florida Department of Environmental Protection's (FDEP) Soil Cleanup Goals for Florida. Groundwater results were compared to FDEP Groundwater Guidance Concentration, EPA maximum concentration levels (MCLs) and EPA Region 3 RBCs. Utilizing these criteria, ABB-ES' RFI (1996) reported the following:

- Surface soils: Seventy-four samples (and 10 duplicates) were collected throughout all the SWMU areas. In these samples, eight VOCs, 24 SVOCs, 14 pesticides, two PCBs, and 18 inorganics were detected. None of the VOCs exceeded the EPA/FDEP criteria utilized; however, five SVOCs, two pesticides, two PCBs and nine inorganics exceeded either or both of the residential criteria for EPA and FDEP. Three of the organics (two SVOCs and one pesticide) exceeded FDEP industrial values, as well;

- Subsurface soils: Twenty-one samples (and one duplicate) were collected throughout all the SWMU areas. In these samples, three VOCs, one SVOC, two pesticides, and 16 inorganics were detected. None of the detected contaminants exceeded the FDEP or EPA criteria; and

- Groundwater: Sixty-three terraprobe samples were collected for field screening to determine monitoring well locations. Twenty-four monitoring wells were installed and 24 samples (and four duplicates) were collected from the study area. Water quality indicator parameters indicated that the surficial aquifer in the area would meet the FDEP classification of Group III. In these samples, four VOCs, two SVOCs and 18 inorganics were detected. Pesticides and PCBs were not detected in the groundwater samples. Of these, one VOC, one SVOC and nine inorganics exceeded one or more of the criteria discussed above. Furthermore, it was concluded that some of the inorganics occurred downgradient from their soil exceedences, and that, therefore, a release to the environment had occurred.

Since the proposed Harbor Ops Project is located within the potential influence zone for SWMU 23, and since a component of this investigation is to determine potential impacts of this SWMU on the Harbor Ops Project area (primarily as it relates to the dredge/excavation area), the remainder of this section will focus on SWMU 23 and any further work performed there as a result of the above referenced RFI. Contaminants of concern that were detected within SWMU 23 during the RFI activities are as follows:

- Surface Soils: Toluene, total xylenes, naphthalene, phenanthrene, di-n-butylphthalate, fluoranthene, acetophenone, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, bis(2-ethylhexyl)phthalate, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene, carbon disulfide, 4,4'-DDE, methoxychlor, 4,4'-DDT, endrin ketone, benzo(a)pyrene, dibenz(a,h)anthracene, aroclor 1254, aroclor 1260, endosulfan II, chlordane, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium, tin, vanadium, zinc and cyanide. Of these, only benzo(a)pyrene, dibenz(a,h)anthracene, aroclor 1254, aroclor 1260, antimony, arsenic, beryllium, copper, lead and zinc exceeded one or both of the stated comparative criteria. The areas where these analytes exceeded industrial goals were typically grouped in areas near buildings where industrial activities took place, and were considered contamination "hot spots;"

- Subsurface Soils: Bis(2-ethylhexyl)phthalate, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, selenium, vanadium, and zinc. None of these were detected at levels that exceeded either of the comparative criteria; and

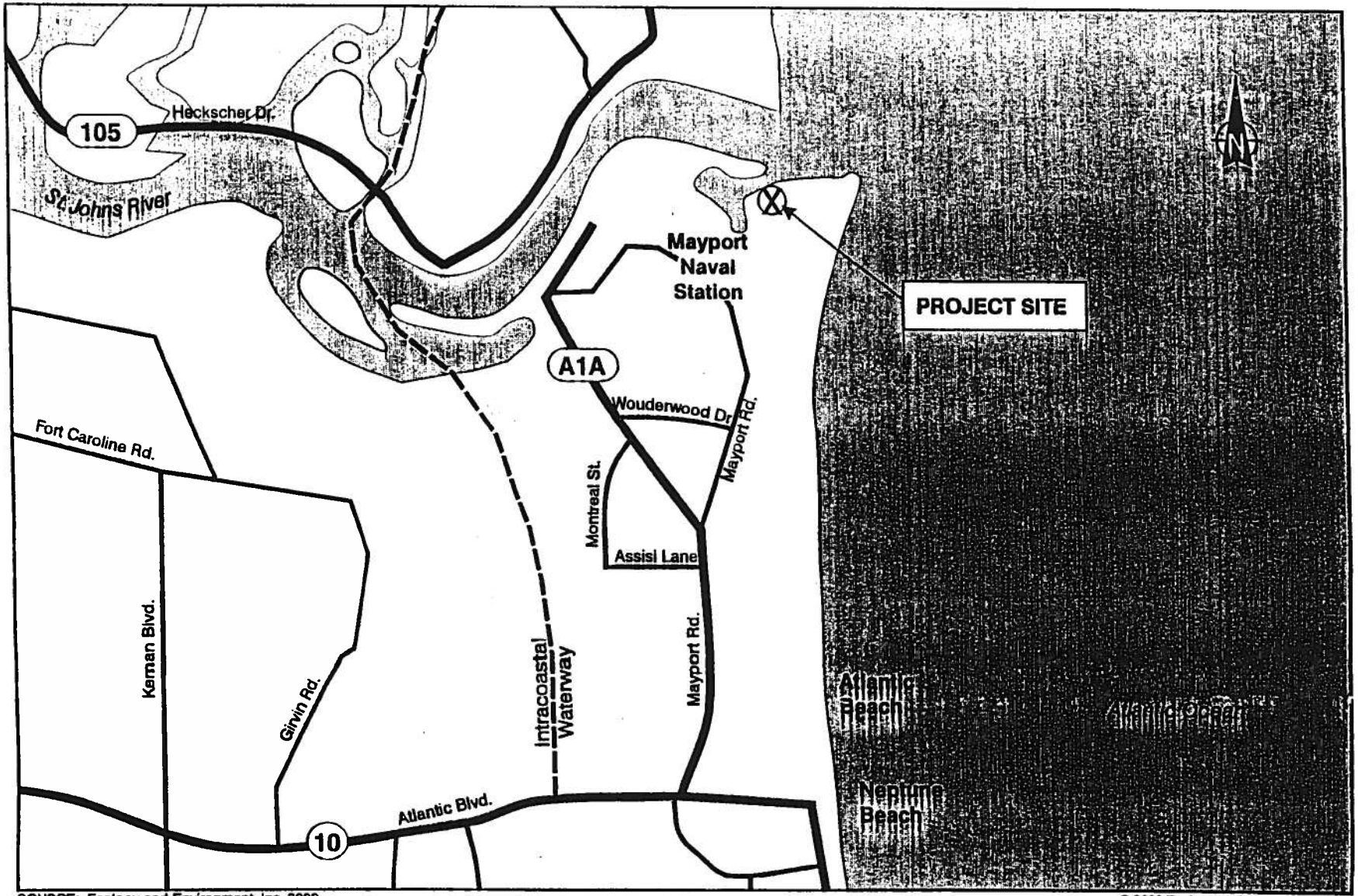
- Groundwater: Tetrachloroethene, toluene, 1,1 dichloroethane, 1,1 dichloroethene, 1,2 dichloroethene, trichlorofluoromethane, bis(2-ethylhexyl)phthalate, di-n-butylphthalate, arsenic, barium, calcium, iron, magnesium, manganese, selenium, sodium, vanadium, and cyanide. Of these, 1,1 dichloroethene, bis(2-ethylhexyl)phthalate, antimony, arsenic, iron, magnesium, manganese, sodium and vanadium exceeded one or more of the stated comparative criteria. ABB-ES concluded, however, that the concentrations of arsenic, sodium, iron and magnesium were naturally occurring in the assessment area.

Based upon these results, ABB-ES prepared Interim Measure (IM) Specifications (ABB-ES, 1998) to deal with the previously mentioned hot spots within SWMUs 23, 24 and 25. The IM report presented the findings of additional assessment activities undertaken in those areas that indicated elevated levels of soil contamination above the industrial target levels of the FDEP and/or EPA criteria. Activities within SWMU 23 concentrated around four buildings (Buildings 14, 54, 55 and 57) in the southern and eastern quadrants of the SWMU. As of the February-March, 2000 timeframe in support of the Harbor Ops Project, only two of these buildings were still intact

(Buildings 54 and 55) in the southern portion of the SWMU. These buildings, combined, make up Building 2031 seen in Figure 1-3. It is understood that while JSI operated at the property, various industrial activities took place at these buildings, and the soils around them may have been contaminated as a result of these activities. Based upon the IM assessment work, which consisted of the collection and laboratory analyses of surface and subsurface soil samples, areas around Buildings 54, 55 and 57 where contaminants exceeded industrial target levels, were recommended for IMs. Specifically, arsenic was detected in exceedence of FDEP industrial target levels at Buildings 54 and 55, while beryllium was in exceedence of FDEP industrial target levels at Building 57. The IMs recommended for these sites were to excavate the contaminated soils and properly dispose of them. These IMs were undertaken in 1998 by Bechtel Environmental, Inc., (Bechtel) and were detailed in an Interim Measures Completion report submitted by Bechtel in June, 1998.

As a final note to this discussion of the SWMU areas, it is important to mention the fact that NAVSTA Mayport is subject to a Memorandum of Agreement (MOA) with FDEP and EPA regarding potential contamination throughout the NAVSTA. This MOA (NAVY 1998) indicates it is understood that, due to previous and ongoing activities at the NAVSTA, areas of contamination have, or may be, discovered. Furthermore, this MOA calls for the use of Land Use Controls (LUCs) to ensure that cleanup criteria utilized meet the appropriate response level to fully protect human health and the environment. Therefore, as long as the Harbor Ops Project area is to remain an industrial categorized area, industrial cleanup criteria will be appropriate. A copy of the MOA can be found in Appendix C.

02:000822_SO09_00_01
Fig1 CDR-2/24/00-GRA



SOURCE: Ecology and Environment, Inc. 2000

APPROXIMATE SCALE

0 1 2 Miles

Figure 1-1 NAVAL STATION MAYPORT VICINITY MAP

THIS PAGE LEFT BLANK INTENTIONALLY

2 Investigation Rationale and Methodology

2.1 Investigative Rationale

Boring locations for this investigation were determined previous to the involvement of E & E. E & E did provide some input into the boring locations; however, boring locations did not change from the original Greiner plan since many of the borings were critical for geotechnical considerations. Upon receiving a finalized copy of the boring location map, E & E designed an SSP, which incorporated the LAWGIBB boring locations and depths and included environmental samples. The SSP was designed to help address potential impacts or environmental issues such as turbidity, resuspension of contaminants, and return water, associated with the soil excavation and disposal activities. Also, understanding whether the excavated material has been impacted by anthropologic inputs and the extent of these inputs, relative to naturally occurring levels and risk-based concentrations, are equally important. Given that a SWMU is nearby the project site, determining whether past releases have significantly impacted this site are of importance. Obtaining insight into these issues is critical to evaluating impacts in the environmental assessment and obtaining permits from state and federal agencies.

In order to address these concerns, it was recognized that the SSP design would require samples to be collected from various depths throughout the potential soil removal zone. According to plans forwarded to E & E prior to design of the SSP, there were to be 12 boring locations (see Figure 1-3), 10 within the upland area and two within the underwater portion of the Harbor Ops Project area. Of these 12 borings, nine were to be located within or in close proximity to the proposed soil removal area (W1, W2, B1, B2, B3, B4, B6, B7 and B11), while the other three were to be located closer to SWMU 23 further south and outside of the proposed excavation limits (B8, B9, and B10). Each of these borings was planned to go to a final depth of 40 feet below the surface of the land/water; therefore, the assumption was made, at the time,that the 40-foot depth was to be the maximum lower limits of any soil removal activities for the Harbor Ops Project.

that the 40-foot depth was to be the maximum lower limits of any soil removal activities for the Harbor Ops Project.

The SSP called for soil/sediment samples to be collected at three depths from the borings that were planned within the proposed zone of dredging and excavation, one at surface, one at mid-depth and one at bottom. It should be noted that, prior to field activities, B5 was removed from the Harbor Ops Project and replaced by B11. In the other three borings, which were planned outside of the proposed excavation area, samples were collected at only two depths, one near the surface and one at just above the water table. Samples from six borings inside the proposed excavation area were analyzed for VOCs (EPA Method 8260B), PAHs (EPA Method 8310), or SVOCs (EPA Method 8270), and PP metals (EPA Methods 6010B and 7471A). Samples from the remaining three borings within the proposed soil removal area were analyzed for PP metals only (B2, B4 and B7). Those samples collected from the three borings outside the proposed excavation area were only analyzed for PP metals.

The SSP also called for the installation of temporary monitoring wells adjacent to two of the borings, B3 and B9. These wells were to bracket the water table and were to be sampled for VOCs (EPA Method 8260B), PAHs (EPA Method 8310) and PP metals (EPA Methods 6010B and 7470).

As a final part of the SSP, an elutriate extraction analysis was planned for soils/sediments collected from selected borings within the proposed excavation area. The field sampling for this analysis included collecting composite samples from two borings and surface water from the Harbor Ops Project area. This was performed for two separate analyses, thus, bringing the number of borings utilized to four. One of the elutriate composites was collected from the combination of borings B3 and B6, while the other was collected from borings W1 and W2.

2.2 Investigative Methodology

Beginning on February 23, 2000, and continuing until March 1, 2000, E & E personnel worked together with personnel from LAWGIBB to collect the necessary samples for this investigation (see field log notes, Appendix D). As previously stated, the number of borings and their locations were pre-determined by the A/E contractor. Staking of the borings and providing for underground clearances were the responsibility of LAWGIBB. The 12 borings (B1 through B4, B6 through B11, W1 and W2) were located and performed. The order in which these borings were performed was based upon LAWGIBB personnel's lease of access and completion of underground clearances. The two water based borings (W1 and W2) were performed last, due to the time necessary

to receive clearance from Harbor Ops to anchor a barge near the turning basin, and to mobilize the barge to the site.

The SSP specified the following procedures:

- Collect soil or sediment samples from near surface, near mid-depth and near bottom of boring in the nine borings to be conducted within the proposed soil removal area (W1, W2, B1, B2, B3, B4, B6, B7 and B11). These samples were to be analyzed for VOCs, PAHs or SVOCs and PP metals, except for B2, B4 and B7, from which only PP metals were collected;

- Collect soil samples from near surface and just above the water table in the three borings located outside (to the south) of the proposed soil removal area. These samples were to be analyzed for PP metals;

- Screen soils at collection depths for total organic vapors (TOVs) by using the jar-headspace method and a flame ionization detection (FID) organic vapor analyzer (OVA);

- Collect composite soil samples at selected depths from borings B3 and B6, and W1 and W2, and collect surface water samples from the Harbor Ops Project area, to be utilized in the elutriate extraction analysis. This analysis was to compare the surface water before and after the elutriate process for PAHs and PP metals;

- Install two temporary monitoring wells at B3 and B9 and collect water samples to be analyzed for VOCs, PAHs and PP metals; and

- Collect quality control (QC) samples including field duplicates, rinsates and trip blanks.

Soil borings were conducted via the American Society for Testing and Materials (ASTM) Standard Penetration Test (SPT) methodology (ASTM Standard D1586-99 – Standard Test Method for Penetration Test and Split Barrel Sampling of Soils), by which a 1.25-inch diameter, 2-foot long, stainless steel split spoon pipe was hammered into the ground. Once sunk to a depth of 2 feet, the pipe was removed from the ground and the spoon was split, where samples could be easily collected. Boring continued until the final planned depth was reached (in this case, 40 feet), with a spoon being removed for geotechnical sampling and lithologic characterization every 5 feet. Due to the final boring depths being well into the water table, LAWGIBB utilized a rotating core and drilling mud (bentonite based) to clear the bore hole, and hammered their split spoon at their required depth intervals (as stated, every 5 feet). LAWGIBB carried with them two spoons, in order to use one for their 5-foot intervals, and one to be decontaminated and used for the E & E samples. After each E & E

- Wednesday, February 23, 2000 – B7, B9, B10;
- Thursday, February 24, 2000 – B4, B6, B8;
- Friday, February 25, 2000 – B1, B2, B3;
- Monday, February 28, 2000 – B11. Also, MW1 (B3) and MW2 (B9) were installed; and
- Wednesday, March 1, 2000 – W1, W2.

Field sampling, decontamination procedures and sample management protocols were performed in accordance with E & E's FDEP approved Comprehensive Quality Assurance Plan (CompQAP #860165G, E & E 2000). Samples were collected at the planned intervals from each boring and placed inside pre-cleaned 4-ounce (oz.) glass jars supplied by E & E's Analytical Services Center (ASC), and/or 5-gram EnCore® samplers supplied by EnNovative Technologies of Green Bay, Wisconsin. The sample containers used depended upon the analysis to be performed on the sample. Samples to be analyzed for PAHs and PP metals were placed in the 4-oz. jars, while samples to be analyzed for VOCs were collected in the EnCore® samplers.

Soils to be OVA-screened at each sample depth were to be collected in two 16-oz. jars to approximately half capacity, and covered with aluminum foil. After an appropriate holding time, the unfiltered probe would be used to breach the aluminum foil of one of the jars, and a reading of the organic vapors trapped in the headspace was to be recorded. This was to be repeated with a probe with a charcoal filter (for methane correction) for the second jar. Subtracting the filtered reading (methane corrected) from the unfiltered reading would produce a net reading. However, the OVA provided for this investigation failed in the field after only one sample reading, and that data is to be considered suspect. Therefore, OVA screening was dropped from the field methodology scope of this investigation.

The temporary monitoring wells were installed based upon depth to groundwater. The plan for the wells was to have their screens bracket the water table. The method of well construction was by hollow-stem auger. Water table at both locations was approximately 6.5 feet deep. Therefore, the wells were installed to a depth of 12 feet deep. The wells were constructed of Schedule 40 polyvinyl chloride (PVC) with 0.010-inch slotted screen placed 5 feet into and 5 feet above the water table. The annular space between the well and the borehole was then filled with 20/30 silica sand and bentonite pellets, and covered with a layer of soil. Each well had its own locking cap. After sitting undisturbed for 24 hours, the wells were developed/purged of three to five volumes of water and sampled by

LAWGIBB personnel utilizing a peristaltic pump. Samples were collected for VOCs (two 40-milliliter [mL] septa vials for each well), PAHs (one 1-liter [L] amber glass bottle for each well) and PP metals (one 1-L polyethylene bottle for each well). Water samples for VOCs were preserved using hydrochloric acid (HCl) and samples for PP metals were preserved using nitric acid (HNO_3). PAH water samples were not preserved. Monitoring well construction diagrams and well sampling logs can be found in Appendix E.

Table 2-1 lists the field and QC samples collected for this investigation. At the end of each work day, beginning on February 24, 2000, the samples were packed in plastic ice chests on wet ice, and transported to LAWGIBB's offices, where representatives of LAWGIBB and E & E prepared them for shipping via Federal Express to the ASC.

2.3 Elutriate Extraction Methodology

The elutriate extraction samples were handled differently. The elutriate extraction is a United States Army Corps of Engineers (USACE) methodology used to determine the potential for contaminants in soils and sediments to be suspended in the water column during sediment removal projects. An additional soil/sediment sample was collected at each depth within the borings designated, and placed within two 1-quart glass jars. Therefore, there were two quart-sized jars for each of the two analyses, B3/B6 composite and W1/W2 composite. The surface water for the elutriate analysis was collected in a series of one 1-L glass bottles. A total of 10 bottles per each of the two sampling locations were filled with the surface water. No preservatives were used for the surface water samples. The sample jars and bottles for this analysis were supplied by E & E's contracted analytical laboratory, STL Savanah Laboratories (STL). The samples were packed in plastic ice chests on wet ice, and transported to LAWGIBB's offices, where representatives of LAWGIBB and E & E prepared them for shipping via Federal Express to STL.

The surface water was analyzed for PP metals and PAHs (EPA Method 8270), in order to have a baseline for comparison. Elutriate analysis for VOCs is typically not conducted. After analysis of the water, it was combined with composited soil/sediment samples from the project area and the mixture (called a slurry) was vigorously shaken and allowed to settle. The slurry was then filtered, and the remaining water (referred to as the elutriate) was analyzed for the contaminants of concern. Any increase in contamination from the baseline to the elutriate is considered evidence of potential contaminant release from soils/sediments during dredging.

concern. Any increase in contamination from the baseline to the elutriate is considered evidence of potential contaminant release from soils/sediments during dredging.

TABLE 2-1 - SOIL, SEDIMENT AND GROUNDWATER SAMPLES COLLECTED

Sediment and Groundwater Quality Investigation in Support of EA and Permitting for Harbor Ops/Small Craft Berthing and Adjacent Facilities at Naval Station Mayport Jacksonville, Florida (February/March, 2000)

(Key is shown on last page of table)

Boring ID	Sample ID	Depth (in Feet)	Sample Type	Sample Matrix	Sample Container(s)	Date Collected	Date Shipped	Analyses Conducted
B1	B1-A	2-4	SUB	SO	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	2/25/00	2/25/00	PP Metals; VOCs; SVOCs
B1	B1-B	20-22	SUB	SO	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	2/25/00	2/25/00	PP Metals; VOCs; PAHs
B1	B1-B(DUP)	NA	DUP	SO	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	2/25/00	2/25/00	PP Metals; VOCs; PAHs
B1	B1-C	38-40	SUB	SO	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	2/25/00	2/25/00	PP Metals; VOCs; PAHs
B1	B1-C(RINSATE)	NA	RINS	W	2 - 40ml Septa & 1 - 1L Poly Bottles	2/25/00	2/25/00	PP Metals; VOCs;
B2	B2-A	2-4	SUB	SO	1 - 4oz Glass Jar	2/25/00	2/25/00	PP Metals
B2	B2-B	20-22	SUB	SO	1 - 4oz Glass Jar	2/25/00	2/25/00	PP Metals
B2	B2-C	38-40	SUB	SO	1 - 4oz Glass Jar	2/25/00	2/25/00	PP Metals
B3	B3-A	2-4	SUB	SO	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	2/25/00	2/25/00	PP Metals; VOCs; PAHs
B3	B3-B	20-22	SUB	SO	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	2/25/00	2/25/00	PP Metals; VOCs; PAHs
B3	B3-B(DUP)	NA	DUP	SO	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	2/25/00	2/25/00	PP Metals; VOCs; PAHs
B3	B3-C	38-40	SUB	SO	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	2/25/00	2/25/00	PP Metals; VOCs; PAHs
B4	B4-A	2-4	SUB	SO	1 - 4oz Glass Jar	2/24/00	2/24/00	PP Metals
B4	B4-B	20-22	SUB	SO	1 - 4oz Glass Jar	2/24/00	2/24/00	PP Metals
B4	B4-C	38-40	SUB	SO	1 - 4oz Glass Jar	2/24/00	2/24/00	PP Metals
B4	B4-C(RINSATE)	NA	RINS	W	1 - 1L Poly Bottle	2/24/00	2/24/00	PP Metals
B6	B6-A	2-4	SUB	SO	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	2/24/00	2/24/00	PP Metals; VOCs; PAHs
B6	B6-B	20-22	SUB	SO	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	2/24/00	2/24/00	PP Metals; VOCs; PAHs
B6	B6-C	38-40	SUB	SO	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	2/24/00	2/24/00	PP Metals; VOCs; PAHs
B7	B7-A	2-4	SUB	SO	1 - 4oz Glass Jar	2/23/00	2/24/00	PP Metals
B7	B7-B	20-22	SUB	SO	1 - 4oz Glass Jar	2/23/00	2/24/00	PP Metals
B7	B7-C	38-40	SUB	SO	1 - 4oz Glass Jar	2/23/00	2/24/00	PP Metals
B8	B8-A	2-4	SUB	SO	1 - 4oz Glass Jar	2/24/00	2/24/00	PP Metals
B8	B8-B	6-8	SUB	SO	1 - 4oz Glass Jar	2/24/00	2/24/00	PP Metals
B9	B9-A	2-4	SUB	SO	1 - 4oz Glass Jar	2/23/00	2/24/00	PP Metals
B9	B9-B	6-8	SUB	SO	1 - 4oz Glass Jar	2/23/00	2/24/00	PP Metals
B10	B10-A	2-4	SUB	SO	1 - 4oz Glass Jar	2/23/00	2/24/00	PP Metals
B10	B10-A(DUP)	2-4	SUB	SO	1 - 4oz Glass Jar	2/23/00	2/24/00	PP Metals
B10	B10-B	6-8	SUB	SO	1 - 4oz Glass Jar	2/23/00	2/24/00	PP Metals
B11	B11-A	2-4	SUB	SO	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	2/28/00	2/28/00	PP Metals; VOCs; PAHs
B11	B11-B	20-22	SUB	SO	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	2/28/00	2/28/00	PP Metals; VOCs; PAHs
B11	B11-B(RINSATE)	NA	RINS	W	2 - 40ml Septa, 1 - 1L Poly & 1 - 1L Amber Glass Bottles	2/28/00	2/28/00	PP Metals; VOCs; PAHs
B11	B11-C	38-40	SUB	SO	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	2/28/00	2/28/00	PP Metals; VOCs; PAHs
B11	B11-C(RINSATE)	NA	RINS	W	1 - 1L Amber Glass Bottle	2/28/00	2/28/00	PAHs
W1	W1-A	14-16	SUB	SE	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	3/1/00	3/1/00	PP Metals; VOCs; PAHs
W1	W1-B	28-30	SUB	SE	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	3/1/00	3/1/00	PP Metals; VOCs; PAHs
W1	W1-C	38-40	SUB	SE	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	3/1/00	3/1/00	PP Metals; VOCs; PAHs

TABLE 2-1 - SOIL, SEDIMENT AND GROUNDWATER SAMPLES COLLECTED

Sediment and Groundwater Quality Investigation in Support of EA and Permitting for Harbor Ops/Small Craft Berthing and Adjacent Facilities at Naval Station Mayport Jacksonville, Florida (February/March, 2000)

(Key is shown on last page of table)

Boring ID	Sample ID	Depth (in Feet)	Sample Type	Sample Matrix	Sample Container(s)	Date Collected	Date Shipped	Analyses Conducted
W2	W2-A	14-16	SUB	SE	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	3/1/00	3/1/00	PP Metals; VOCs; PAHs
W2	W2-B	28-30	SUB	SE	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	3/1/00	3/1/00	PP Metals; VOCs; PAHs
W2	W2-C	38-40	SUB	SE	1 - 4oz Glass Jar; 3 - 5g EnCore Samplers	3/1/00	3/1/00	PP Metals; VOCs; PAHs
MW1(B3)	MW1(B3)	NA	GW	W	2 - 40ml Septa, 1 - 1L Poly & 1 - 1L Amber Glass Bottles	2/29/00	3/1/00	PP Metals; VOCs; PAHs
MW1(B3)	MW1(B3)(RINSATE)	NA	W	W	2 - 40ml Septa & 1 - 1L Poly Bottles	2/29/00	2/29/00	PP Metals; VOCs
MW2(B9)	MW2(B9)	NA	GW	W	2 - 40ml Septa, 1 - 1L Poly & 1 - 1L Amber Glass Bottles	2/29/00	2/29/00	PP Metals; VOCs; PAHs
	B3/B6 Composite	NA	Elutriate	SUB/SW	2 - 1 Quart Glass Jars; 10 - 1L Gass Bottles	2/23 & 2/25/00	2/28/00	PP Metals; SVOCs
	W1/W2 Composite	NA	Elutriate	SUB/SW	2 - 1 Quart Glass Jars; 10 - 1L Gass Bottles	3/1/00	3/1/00	PP Metals; SVOCs
	Trip Blank	NA	TB	W	2- 40 ml Septa Bottles	2/24/00	2/24/00	VOCs
	Trip Blank	NA	TB	W	2- 40 ml Septa Bottles	2/25/00	2/25/00	VOCs
	Trip Blank	NA	TB	W	2- 40 ml Septa Bottles	2/28/00	2/28/00	VOCs
	Trip Blank	NA	TB	W	2- 40 ml Septa Bottles	3/1/00	3/1/00	VOCs

TABLE KEY:

VOCs = Volatile Organic Compounds (EPA Method 8260B)
PAHs = Polynuclear Aromatic Hydrocarbons (EPA Method 8310)
PP Metals = Priority Pollutant Metals (EPA Methods 6010B & 7471A-soil or 7470-water)
SVOCs - Semi-Volatile Organic Compounds (EPA Method 8270)
NA = Not Applicable
DUP = Duplicate Sample
RINS = Equipment Rinsate Sample
TB = Trip Blank (one for each shipment to laboratory)
SUB = Subsurface Soil Sample
GW = Groundwater Sample
SW = Surface Water Sample
SE = Sediment Sample
Elutriate = Samples collected for separate Lab extraction technique for Elutriate Analysis as per Army Corps of Engineers Methodology
W = Water
SO = Soil
ml = Milliliter
L = Liter
g = Gram

3 Results of Investigation

3.1 Site Lithology

Based upon field observations and boring logs provided by LAWGIBB (see Appendix F), the general site lithology is described as follows (all depths are approximate):

Surface soils consisted of medium dense, tan, fine grained sands with shell and sparse vegetation. Subsurface soil layers consisted of differing densities of fine grained sands, ranging from brown to gray coloring, and shell fragments. Clay seams and lenses occurred sporadically between 20 feet to 35 feet deep throughout the investigation area. Typically, soils at the sampling depths consisted of medium dense, fine grained sands, with silt and/or clay seams, and shell fragments. The water table encountered during soil boring activities varied from 5 feet to 8 feet deep, with shallower depths in borings closer to open water (B1 and B11), and deeper depths encountered in the borings located further inland (B9 and B10).

The in-water borings (W1 and W2) were originated at the sediment/water interface 14 feet below the water surface. These borings consisted of fine grained sands with clay seams and shell fragments, and were terminated at a depth of 40 feet below the water surface.

3.2 Soil/Sediment Sample Analytical Results

Table 3-1 lists those analytes which were detected in the soil/sediment and QC samples collected as part of this investigation. The laboratory analytical results, which are provided in Appendix G, were compared (where applicable) to the following sources of regulatory criteria:

- EPA Region 3 RBCs (EPA 1999) for soils:
  - Soil – Residential, and

- Soil – Industrial;

- FDEP Soil Cleanup Target Levels (SCTLs) listed in Florida Administrative Code Chapter 62-777 (FDEP 1999):

  - Direct Exposure – Residential,

  - Direct Exposure – Industrial, and

  - Leachability Based Upon Marine Surface Waters.

Table 3-1 highlights those analytes that exceeded one or more of the comparative criteria, while Figure 3-1 indicates the geographic location of these exceedences within the investigation area. To summarize this data, the following synopsis is presented:

A total of 27 samples (plus four rinsates and two duplicates) were collected from the nine borings conducted within the proposed soil removal zone (or in very close proximity), while a total of six samples (plus one duplicate) were collected from the three borings located south of the proposed soil removal zone closer to SWMU 23. Of the 27 samples collected within the soil removal zone, 18 were analyzed for VOCs, SVOCs/PAHs and PP metals, while nine were analyzed for PP metals only. All of the six samples collected outside of the proposed soil removal area were analyzed for PP metals only.

The laboratory analysis of the samples and duplicates collected within the proposed soil removal area indicated the presence of 11 PP metals, seven VOCs and 14 SVOCs/PAHs above the laboratory method detection limits (MDLs). Of these, one PP metal (arsenic) and four SVOCs/PAHs (benz[a]anthracene, benzo[a]pyrene, chrysene and pyrene) exceeded one or more of the comparative criteria. Benz(a)anthracene, chrysene and pyrene exceeded their respective FDEP marine surface water leachability criteria, while benzo(a)pyrene exceeded the EPA soil residential criteria, as well as both of the FDEP direct exposure criteria. However, these exceedences occurred in only one sample, B1-A (2 to 4 feet deep). Arsenic exceedence occurred in 12 of the samples, but at varying depths, and without any noticeable pattern.

The laboratory analysis of the samples and duplicate collected south of the proposed soil removal area indicated the presence of seven PP metals above the laboratory MDLs, but not at levels in exceedence of the comparative criteria.

3.3 Groundwater Sample Analytical Results

Table 3-2 lists those analytes that were detected in the groundwater samples (as well as the rinsate and trip blank samples) collected as part of this investigation. The laboratory analytical results, which are provided in Appendix G, were compared (where applicable) to the following sources of regulatory criteria:

- FDEP Groundwater Cleanup Target Levels (GWCTLs) listed in Florida Administrative Code Chapter 62-777 (FDEP 1999):
  - Groundwater, and
  - Low Quality Groundwater,
- FDEP Criteria for Surface Water Quality Classifications listed in Florida Administrative Code Chapter 62-302 530:
  - Class III Predominantly Marine Waters.

Monitoring wells MW1 and MW2 were installed to a depth of 12 feet below land surface. Depth to water table at these locations was approximately 6 feet. Samples collected were analyzed for VOCs, SVOCs/PAHs and PP metals. In addition, a rinsate sample was collected for MW1, and was analyzed for VOCs and PP metals. Three SVOCs/PAHs (fluoranthene, phenanthrene, and pyrene) and one PP metal (aluminum) were detected in the groundwater samples collected from each of these wells at levels above the laboratory MDLs. The SVOCs/PAHs were detected at levels below the laboratory Practical Quantitative Limits (PQLs), and therefore, were statistically derived values. Aside from phenanthrene, none of the constituents exceeded groundwater or surface water criteria. The surface water quality standard for phenanthrene is based on an annual average value, which will likely not be exceeded since the construction period will last only several months.

3.4 Elutriate Extraction Analysis Sample Analytical Results

Two separate elutriate extraction analyses were performed for this investigation. Each of these analyses required collection of soil/sediment samples from two separate groups of borings and the collection of surface water from two separate locations relative to the borings. Elutriate sample B3/B6 composite was a collection of soils from those two borings. Conversely, elutriate sample W1/W2 composite consisted of sediments from each of those borings. Surface water samples were collected from the cove-like area to the east of Foxtrot Wharf, and to the south of the existing turning basin. Laboratory results for the elutriate analyses are provided in Appendix H.

Both composite samples were analyzed for SVOCs/PAHs and PP metals. No SVOCs/PAHs or PP metals were detected in the background water or the post-extraction elutriate for either set of samples.

TABLE 3-1 - SOIL AND SEDIMENT SAMPLE ANALYTICAL RESULTS

Sediment and Groundwater Quality Investigation in Support of EA and Permitting for Harbor Ops/Small Craft Berthing and Adjacent Facilities at Naval Station Mayport Jacksonville, Florida (February/March, 2000)

(Key is shown on last page of table)

Boring # Sample ID Depth (feet below surface) Date Collected	CAS #	USEPA REG. III RBC's Residential	USEPA REG. III RBC's Industrial	FDEP 62-777 SCTL Direct Exposure Residential	FDEP 62-777 SCTL Direct Exposure Industrial	FDEP 62-777 SCTL Leachability Marine Water	B10 B10-A 2-4 2/23/00	B10 B10A(DUP) 2-4 2/23/00	B10 B10-B 6-8 2/23/00	B9 B9-A 2-4 2/23/00	B9 B9-B 6-8 2/23/00
Volatile Organic Compounds (mg/kg)											
Acetone	67-64-1	7800	200000	780	5500	6.8	NS	NS	NS	NS	NS
2-Butanone	78-93-3	47000	1200000	3100	21000	490	NS	NS	NS	NS	NS
Carbon Disulfide	75-15-0	7800	200000	200	1400	0.8	NS	NS	NS	NS	NS
Chloroethane	75-00-3	220	2000	2.9	4	NA	NS	NS	NS	NS	NS
Ethylbenzene	100-41-4	7800	200000	1100	8400	12	NS	NS	NS	NS	NS
Methylene Chloride	75-09-2	85	760	16	23	7.3	NS	NS	NS	NS	NS
Toluene	108-88-3	16000	410000	380	2600	5.6	NS	NS	NS	NS	NS
Semi-Volatile Compounds/PAHs (mg/kg)											
Acenaphthene	83-32-9	4700	120000	1900	18000	0.7	NS	NS	NS	NS	NS
Anthracene	120-12-7	23000	610000	18000	260000	0.7	NS	NS	NS	NS	NS
Benz(a)anthracene	56-55-3	0.87	7.8	1.4	5	0.7	NS	NS	NS	NS	NS
Benzo(a)pyrene	50-32-8	0.087	0.78	0.1	0.5	1.2	NS	NS	NS	NS	NS
Benzo(b)fluoranthene	205-99-2	0.87	7.8	1.4	4.8	1.6	NS	NS	NS	NS	NS
Benzo(g,h,i)perylene	191-24-2	No Value	No Value	2300	41000	4.8	NS	NS	NS	NS	NS
Benzo(k)fluoranthene	207-08-9	8.7	78	15	52	1.6	NS	NS	NS	NS	NS
Chrysene	218-01-9	87	780	140	450	0.7	NS	NS	NS	NS	NS
Dibenz(a,h)anthracene	53-70-3	0.087	0.78	0.1	0.5	4.7	NS	NS	NS	NS	NS
Fluoranthene	206-44-0	3100	82000	2900	48000	1.3	NS	NS	NS	NS	NS
Fluorene	86-73-7	3100	82000	2200	28000	17	NS	NS	NS	NS	NS
Indeno(1,2,3-cd)pyrene	193-39-5	0.87	7.8	1.5	5.3	4.3	NS	NS	NS	NS	NS
Phenanthrene	85-01-8	No Value	No Value	2000	30000	0.7	NS	NS	NS	NS	NS
Pyrene	129-00-0	2300	61000	2200	37000	1.3	NS	NS	NS	NS	NS
PP Metals (mg/kg)											
Aluminum	7429-90-5	78000	2000000	72000	No Value	Site Specific	896	656	521	242	963
Antimony	7440-36-0	31	820	26	240	Site Specific	ND	ND	ND	ND	ND
Arsenic	7440-38-2	0.43	3.8	0.8	3.7	Site Specific	ND	ND	ND	ND	ND
Beryllium	7440-41-7	160	4100	120	800	Site Specific	ND	ND	ND	ND	ND
Cadmium	7440-43-9	39	1000	75	1300	Site Specific	ND	ND	ND	ND	ND
Chromium	18540-29-9	230	6100	210	420	Site Specific	7.41	7.04	2.89	1.70	4.90
Copper	7440-50-8	3100	82000	110	76000	Site Specific	6.63	ND	ND	ND	ND
Lead	7439-92-1	No Value	No Value	400	920	Site Specific	5.80	0.786	0.460	ND	0.701
Nickel	7440-02-0	1600	41000	110	28000	Site Specific	2.56	ND	ND	ND	ND
Selenium	7782-49-2	390	1000	390	10000	Site Specific	1.17	ND	ND	1.25	1.20
Zinc	7440-66-6	23000	610000	23000	560000	Site Specific	33.3	11.2	2.29	1.50	3.62

TABLE 3-1 - SOIL AND SEDIMENT SAMPLE ANALYTICAL RESULTS

Sediment and Groundwater Quality Investigation in Support of EA and Permitting for Harbor Ops/Small Craft Berthing and Adjacent Facilities at Naval Station Mayport Jacksonville, Florida (February/March, 2000)

(Key is shown on last page of table)

Boring # Sample ID Depth (feet below surface) Date Collected	CAS #	USEPA REG. III RBC's Residential	USEPA REG. III RBC's Industrial	FDEP 62-777 SCTL Direct Exposure Residential	FDEP 62-777 SCTL Direct Exposure Industrial	FDEP 62-777 SCTL Leachability Marine Water	B7 B7-A 2-4 2/23/00	B7 B7-B 20-22 2/23/00	B7 B7-C 38-40 2/23/00	B4 B4-A 2-4 2/24/00	B4 B4-B 20-22 2/24/00
Volatile Organic Compounds (mg/kg)											
Acetone	67-64-1	7800	200000	780	5500	6.8	NS	NS	NS	NS	NS
2-Butanone	78-93-3	47000	1200000	3100	21000	490	NS	NS	NS	NS	NS
Carbon Disulfide	75-15-0	7800	200000	200	1400	0.8	NS	NS	NS	NS	NS
Chloroethane	75-00-3	220	2000	2.9	4	NA	NS	NS	NS	NS	NS
Ethylbenzene	100-41-4	7800	200000	1100	8400	12	NS	NS	NS	NS	NS
Methylene Chloride	75-09-2	85	760	16	23	7.3	NS	NS	NS	NS	NS
Toluene	108-88-3	16000	410000	380	2600	5.6	NS	NS	NS	NS	NS
Semi-Volatile Compounds/PAHs (mg/kg)											
Acenaphthene	83-32-9	4700	120000	1900	18000	0.7	NS	NS	NS	NS	NS
Anthracene	120-12-7	23000	610000	18000	260000	0.7	NS	NS	NS	NS	NS
Benz(a)anthracene	56-55-3	0.87	7.8	1.4	5	0.7	NS	NS	NS	NS	NS
Benzo(a)pyrene	50-32-8	0.087	0.78	0.1	0.5	1.2	NS	NS	NS	NS	NS
Benzo(b)fluoranthene	205-99-2	0.87	7.8	1.4	4.8	1.6	NS	NS	NS	NS	NS
Benzo(g,h,i)perylene	191-24-2	No Value	No Value	2300	41000	4.8	NS	NS	NS	NS	NS
Benzo(k)fluoranthene	207-08-9	8.7	78	15	52	1.6	NS	NS	NS	NS	NS
Chrysene	218-01-9	87	780	140	450	0.7	NS	NS	NS	NS	NS
Dibenz(a,h)anthracene	53-70-3	0.087	0.78	0.1	0.5	4.7	NS	NS	NS	NS	NS
Fluoranthene	206-44-0	3100	82000	2900	48000	1.3	NS	NS	NS	NS	NS
Fluorene	86-73-7	3100	82000	2200	28000	17	NS	NS	NS	NS	NS
Indeno(1,2,3-cd)pyrene	193-39-5	0.87	7.8	1.5	5.3	4.3	NS	NS	NS	NS	NS
Phenanthrene	85-01-8	No Value	No Value	2000	30000	0.7	NS	NS	NS	NS	NS
Pyrene	129-00-0	2300	61000	2200	37000	1.3	NS	NS	NS	NS	NS
PP Metals (mg/kg)											
Aluminum	7429-90-5	78000	2000000	72000	No Value	Site Specific	205	9820	200	207	243
Antimony	7440-36-0	31	820	26	240	Site Specific	ND	ND	ND	ND	ND
Arsenic	7440-38-2	0.43	3.8	0.8	3.7	Site Specific	ND	[illegible]	ND	ND	ND
Beryllium	7440-41-7	160	4100	120	800	Site Specific	ND	0.786	ND	ND	ND
Cadmium	7440-43-9	39	1000	75	1300	Site Specific	ND	1.21	ND	ND	ND
Chromium	18540-29-9	230	6100	210	420	Site Specific	1.42	23.6	1.08	2.17	1.68
Copper	7440-50-8	3100	82000	110	76000	Site Specific	ND	4.19	ND	ND	ND
Lead	7439-92-1	No Value	No Value	400	920	Site Specific	ND	6.47	ND	0.631	0.826
Nickel	7440-02-0	1600	41000	110	28000	Site Specific	ND	5.82	ND	ND	ND
Selenium	7782-49-2	390	1000	390	10000	Site Specific	1.01	2.52	0.901	0.746	1.20
Zinc	7440-66-6	23000	610000	23000	560000	Site Specific	1.16	21.6	1.11	1.27	1.52

TABLE 3-1 - SOIL AND SEDIMENT SAMPLE ANALYTICAL RESULTS

Sediment and Groundwater Quality Investigation in Support of EA and Permitting for Harbor Ops/Small Craft Berthing and Adjacent Facilities at Naval Station Mayport Jacksonville, Florida (February/March, 2000)

(Key is shown on last page of table)

Boring # Sample ID Depth (feet below surface) Date Collected	CAS #	USEPA REG. III RBC's Residential	USEPA REG. III RBC's Industrial	FDEP 62-777 SCTL Direct Exposure Residential	FDEP 62-777 SCTL Direct Exposure Industrial	FDEP 62-777 SCTL Leachability Marine Water	B4 B4-C 38-40 2/24/00	B4 B4-C(RINS) * 2/24/00	B6 B6-A 2-4 2/24/00	B6 B6-B 20-22 2/24/00	B6 B6-C 38-40 2/24/00
Volatile Organic Compounds (mg/kg)											
Acetone	67-64-1	7800	200000	780	5500	6.8	NS	NS	0.238	0.478	0.0999
2-Butanone	78-93-3	47000	1200000	3100	21000	490	NS	NS	0.00947 (J)	ND	0.00530
Carbon Disulfide	75-15-0	7800	200000	200	1400	0.8	NS	NS	ND	ND	ND
Chloroethane	75-00-3	220	2000	2.9	4	NA	NS	NS	ND	ND	ND
Ethylbenzene	100-41-4	7800	200000	1100	8400	12	NS	NS	ND	ND	ND
Methylene Chloride	75-09-2	85	760	16	23	7.3	NS	NS	ND	ND	ND
Toluene	108-88-3	16000	410000	380	2600	5.6	NS	NS	ND	ND	ND
Semi-Volatile Compounds/PAHs (mg/kg)											
Acenaphthene	83-32-9	4700	120000	1900	18000	0.7	NS	NS	ND	ND	ND
Anthracene	120-12-7	23000	610000	18000	260000	0.7	NS	NS	ND	ND	ND
Benz(a)anthracene	56-55-3	0.87	7.8	1.4	5	0.7	NS	NS	ND	ND	ND
Benzo(a)pyrene	50-32-8	0.087	0.78	0.1	0.5	1.2	NS	NS	ND	ND	ND
Benzo(b)fluoranthene	205-99-2	0.87	7.8	1.4	4.8	1.6	NS	NS	ND	ND	ND
Benzo(g,h,i)perylene	191-24-2	No Value	No Value	2300	41000	4.8	NS	NS	ND	ND	ND
Benzo(k)fluoranthene	207-08-9	8.7	78	15	52	1.6	NS	NS	ND	ND	ND
Chrysene	218-01-9	87	780	140	450	0.7	NS	NS	ND	ND	ND
Dibenz(a,h)anthracene	53-70-3	0.087	0.78	0.1	0.5	4.7	NS	NS	ND	ND	ND
Fluoranthene	206-44-0	3100	82000	2900	48000	1.3	NS	NS	ND	ND	ND
Fluorene	86-73-7	3100	82000	2200	28000	17	NS	NS	ND	ND	ND
Indeno(1,2,3-cd)pyrene	193-39-5	0.87	7.8	1.5	5.3	4.3	NS	NS	ND	ND	ND
Phenanthrene	85-01-8	No Value	No Value	2000	30000	0.7	NS	NS	ND	ND	ND
Pyrene	129-00-0	2300	61000	2200	37000	1.3	NS	NS	ND	0.00628 (J)	ND
PP Metals (mg/kg)									ND	ND	ND
Aluminum	7429-90-5	78000	2000000	72000	No Value	Site Specific	277	ND	172	591	391
Antimony	7440-36-0	31	820	26	240	Site Specific	ND	ND	ND	ND	ND
Arsenic	7440-38-2	0.43	3.8	0.8	3.7	Site Specific	ND	ND	ND	0.765	ND
Beryllium	7440-41-7	160	4100	120	800	Site Specific	ND	ND	ND	ND	ND
Cadmium	7440-43-9	39	1000	75	1300	Site Specific	ND	ND	ND	ND	ND
Chromium	18540-29-9	230	6100	210	420	Site Specific	2.13	ND	2.10	3.28	1.54
Copper	7440-50-8	3100	82000	110	76000	Site Specific	ND	ND	ND	ND	ND
Lead	7439-92-1	No Value	No Value	400	920	Site Specific	ND	ND	ND	1.64	ND
Nickel	7440-02-0	1600	41000	110	28000	Site Specific	ND	ND	ND	ND	ND
Selenium	7782-49-2	390	1000	390	10000	Site Specific	2.06	ND	0.901	ND	1.11
Zinc	7440-66-6	23000	610000	23000	560000	Site Specific	1.44	ND	1.14	2.53	1.60

TABLE 3-1 - SOIL AND SEDIMENT SAMPLE ANALYTICAL RESULTS

Sediment and Groundwater Quality Investigation in Support of EA and Permitting for Harbor Ops/Small Craft Berthing and Adjacent Facilities at Naval Station Mayport Jacksonville, Florida (February/March, 2000)

(Key is shown on last page of table)

Boring # Sample ID Depth (feet below surface) Date Collected	CAS #	USEPA REG. III RBC's Residential	USEPA REG. III RBC's Industrial	FDEP 62-777 SCTL Direct Exposure Residential	FDEP 62-777 SCTL Direct Exposure Industrial	FDEP 62-777 SCTL Leachability Marine Water	B8 B8-A 2-4 2/24/00	B8 B8-B 6-8 2/24/00	TB * 2/24/00	B3 B3-A 2-4 2/25/00	B3 B3-B 20-22 2/25/00
Volatile Organic Compounds (mg/kg)											
Acetone	67-64-1	7800	200000	780	5500	6.8	NS	NS	ND	1.370 (E)	0.177
2-Butanone	78-93-3	47000	1200000	3100	21000	490	NS	NS	ND	ND	ND
Carbon Disulfide	75-15-0	7800	200000	200	1400	0.8	NS	NS	ND	ND	ND
Chloroethane	75-00-3	220	2000	2.9	4	NA	NS	NS	ND	ND	ND
Ethylbenzene	100-41-4	7800	200000	1100	8400	12	NS	NS	ND	ND	ND
Methylene Chloride	75-09-2	85	760	16	23	7.3	NS	NS	ND	0.00231 (J)	0.00318 (J)
Toluene	108-88-3	16000	410000	380	2600	5.6	NS	NS	ND	0.00341 (J)	ND
Semi-Volatile Compounds/PAHs (mg/kg)											
Acenaphthene	83-32-9	4700	120000	1900	18000	0.7	NS	NS	NS	ND	ND
Anthracene	120-12-7	23000	610000	18000	260000	0.7	NS	NS	NS	ND	ND
Benz(a)anthracene	56-55-3	0.87	7.8	1.4	5	0.7	NS	NS	NS	ND	ND
Benzo(a)pyrene	50-32-8	0.087	0.78	0.1	0.5	1.2	NS	NS	NS	ND	ND
Benzo(b)fluoranthene	205-99-2	0.87	7.8	1.4	4.8	1.6	NS	NS	NS	ND	ND
Benzo(g,h,i)perylene	191-24-2	No Value	No Value	2300	41000	4.8	NS	NS	NS	ND	ND
Benzo(k)fluoranthene	207-08-9	8.7	78	15	52	1.6	NS	NS	NS	ND	ND
Chrysene	218-01-9	87	780	140	450	0.7	NS	NS	NS	ND	ND
Dibenz(a,h)anthracene	53-70-3	0.087	0.78	0.1	0.5	4.7	NS	NS	NS	ND	ND
Fluoranthene	206-44-0	3100	82000	2900	48000	1.3	NS	NS	NS	ND	ND
Fluorene	86-73-7	3100	82000	2200	28000	17	NS	NS	NS	ND	ND
Indeno(1,2,3-cd)pyrene	193-39-5	0.87	7.8	1.5	5.3	4.3	NS	NS	NS	ND	ND
Phenanthrene	85-01-8	No Value	No Value	2000	30000	0.7	NS	NS	NS	ND	ND
Pyrene	129-00-0	2300	61000	2200	37000	1.3	NS	NS	NS	ND	ND
PP Metals (mg/kg)											
Aluminum	7429-90-5	78000	2000000	72000	No Value	Site Specific	213	338	NS	330	413
Antimony	7440-36-0	31	820	26	240	Site Specific	ND	ND	NS	ND	ND
Arsenic	7440-38-2	0.43	3.8	0.8	3.7	Site Specific	ND	ND	NS	0.697	0.396
Beryllium	7440-41-7	160	4100	120	800	Site Specific	ND	ND	NS	ND	ND
Cadmium	7440-43-9	39	1000	75	1300	Site Specific	ND	ND	NS	ND	ND
Chromium	18540-29-9	230	6100	210	420	Site Specific	1.36	3.00	NS	2.35	2.15
Copper	7440-50-8	3100	82000	110	76000	Site Specific	ND	ND	NS	ND	ND
Lead	7439-92-1	No Value	No Value	400	920	Site Specific	ND	0.514	NS	0.781	0.865
Nickel	7440-02-0	1600	41000	110	28000	Site Specific	ND	ND	NS	ND	ND
Selenium	7782-49-2	390	1000	390	10000	Site Specific	2.15	ND	NS	ND	ND
Zinc	7440-66-6	23000	610000	23000	560000	Site Specific	0.948	1.72	NS	2.41	1.77

TABLE 3-1 - SOIL AND SEDIMENT SAMPLE ANALYTICAL RESULTS

Sediment and Groundwater Quality Investigation in Support of EA and Permitting for Harbor Ops/Small Craft Berthing and Adjacent Facilities at Naval Station Mayport Jacksonville, Florida (February/March, 2000)

(Key is shown on last page of table)

Boring # Sample ID Depth (feet below surface) Date Collected	CAS #	USEPA REG. III RBC's Residential	USEPA REG. III RBC's Industrial	FDEP 62-777 SCTL Direct Exposure Residential	FDEP 62-777 SCTL Direct Exposure Industrial	FDEP 62-777 SCTL Leachability Marine Water	B3 B3-B(DUP) 20-22 2/25/00	B3 B3-C 38-40 2/25/00	B2 B2-A 2-4 2/25/00	B2 B2-B 20-22 2/25/00	B2 B2-C 38-40 2/25/00
Volatile Organic Compounds (mg/kg)											
Acetone	67-64-1	7800	200000	780	5500	6.8	0.209	0.302	NS	NS	NS
2-Butanone	78-93-3	47000	1200000	3100	21000	490	ND	ND	NS	NS	NS
Carbon Disulfide	75-15-0	7800	200000	200	1400	0.8	ND	ND	NS	NS	NS
Chloroethane	75-00-3	220	2000	2.9	4	NA	ND	ND	NS	NS	NS
Ethylbenzene	100-41-4	7800	200000	1100	8400	12	ND	ND	NS	NS	NS
Methylene Chloride	75-09-2	85	760	16	23	7.3	ND	ND	NS	NS	NS
Toluene	108-88-3	16000	410000	380	2600	5.6	ND	ND	NS	NS	NS
Semi-Volatile Compounds/PAHs (mg/kg)											
Acenaphthene	83-32-9	4700	120000	1900	18000	0.7	ND	ND	NS	NS	NS
Anthracene	120-12-7	23000	610000	18000	260000	0.7	ND	ND	NS	NS	NS
Benz(a)anthracene	56-55-3	0.87	7.8	1.4	5	0.7	0.00413 (J)	ND	NS	NS	NS
Benzo(a)pyrene	50-32-8	0.087	0.78	0.1	0.5	1.2	ND	ND	NS	NS	NS
Benzo(b)fluoranthene	205-99-2	0.87	7.8	1.4	4.8	1.6	ND	ND	NS	NS	NS
Benzo(g,h,i)perylene	191-24-2	No Value	No Value	2300	41000	4.8	ND	ND	NS	NS	NS
Benzo(k)fluoranthene	207-08-9	8.7	78	15	52	1.6	ND	ND	NS	NS	NS
Chrysene	218-01-9	87	780	140	450	0.7	ND	ND	NS	NS	NS
Dibenz(a,h)anthracene	53-70-3	0.087	0.78	0.1	0.5	4.7	ND	ND	NS	NS	NS
Fluoranthene	206-44-0	3100	82000	2900	48000	1.3	ND	ND	NS	NS	NS
Fluorene	86-73-7	3100	82000	2200	28000	17	ND	ND	NS	NS	NS
Indeno(1,2,3-cd)pyrene	193-39-5	0.87	7.8	1.5	5.3	4.3	ND	ND	NS	NS	NS
Phenanthrene	85-01-8	No Value	No Value	2000	30000	0.7	ND	ND	NS	NS	NS
Pyrene	129-00-0	2300	61000	2200	37000	1.3	ND	ND	NS	NS	NS
PP Metals (mg/kg)											
Aluminum	7429-90-5	78000	2000000	72000	No Value	Site Specific	482	371	1770	212	504
Antimony	7440-36-0	31	820	26	240	Site Specific	ND	ND	ND	ND	ND
Arsenic	7440-38-2	0.43	3.8	0.8	3.7	Site Specific	0.571	ND	0.287	0.376	ND
Beryllium	7440-41-7	160	4100	120	800	Site Specific	ND	ND	ND	ND	ND
Cadmium	7440-43-9	39	1000	75	1300	Site Specific	ND	ND	ND	ND	ND
Chromium	18540-29-9	230	6100	210	420	Site Specific	2.68	1.81	2.44	1.17	2.79
Copper	7440-50-8	3100	82000	110	76000	Site Specific	ND	ND	ND	ND	ND
Lead	7439-92-1	No Value	No Value	400	920	Site Specific	1.15	ND	2.19	ND	1.10
Nickel	7440-02-0	1600	41000	110	28000	Site Specific	ND	ND	ND	ND	ND
Selenium	7782-49-2	390	1000	390	10000	Site Specific	ND	ND	ND	ND	ND
Zinc	7440-66-6	23000	610000	23000	560000	Site Specific	2.48	2.74	0.941	1.20	2.23

TABLE 3-1 - SOIL AND SEDIMENT SAMPLE ANALYTICAL RESULTS

Sediment and Groundwater Quality Investigation in Support of EA and Permitting for Harbor Ops/Small Craft Berthing and Adjacent Facilities at Naval Station Mayport Jacksonville, Florida (February/March, 2000)

(Key is shown on last page of table)

Boring # Sample ID Depth (feet below surface) Date Collected	CAS #	USEPA REG. III RBC's Residential	USEPA REG. III RBC's Industrial	FDEP 62-777 SCTL Direct Exposure Residential	FDEP 62-777 SCTL Direct Exposure Industrial	FDEP 62-777 SCTL Leachability Marine Water	B1 B1-A 2-4 2/25/00	B1 B1-B 20-22 2/25/00	B1 B1-B(DUP) 20-22 2/25/00	B1 B1-C 38-40 2/25/00	B1 B1-C(RINS) 2/25/00
Volatile Organic Compounds (mg/kg)											
Acetone	67-64-1	7800	200000	780	5500	6.8	0.175	0.167	0.143	0.145	ND
2-Butanone	78-93-3	47000	1200000	3100	21000	490	ND	ND	ND	ND	ND
Carbon Disulfide	75-15-0	7800	200000	200	1400	0.8	0.00250 (J)	0.00777 (J)	0.00364 (J)	0.00281 (J)	ND
Chloroethane	75-00-3	220	2000	2.9	4	NA	ND	ND	ND	ND	ND
Ethylbenzene	100-41-4	7800	200000	1100	8400	12	ND	ND	ND	ND	ND
Methylene Chloride	75-09-2	85	760	16	23	7.3	ND	ND	ND	0.00183 (J)	ND
Toluene	108-88-3	16000	410000	380	2600	5.6	ND	ND	ND	ND	ND
Semi-Volatile Compounds/PAHs (mg/kg)											
Acenaphthene	83-32-9	4700	120000	1900	18000	0.7	ND	0.496	ND	ND	NS
Anthracene	120-12-7	23000	610000	18000	260000	0.7	0.0870 (J)	0.00970 (J)	ND	ND	NS
Benz(a)anthracene	56-55-3	0.87	7.8	1.4	5	0.7	0.808	0.00901 (J)	0.00894 (J)	ND	NS
Benzo(a)pyrene	50-32-8	0.087	0.78	0.1	0.5	1.2	0.854	0.0171 (J)	ND	ND	NS
Benzo(b)fluoranthene	205-99-2	0.87	7.8	1.4	4.8	1.6	0.721	0.0935	0.0188 (J)	ND	NS
Benzo(g,h,i)perylene	191-24-2	No Value	No Value	2300	41000	4.8	0.154 (J)	0.0286 (J)	ND	ND	NS
Benzo(k)fluoranthene	207-08-9	8.7	78	15	52	1.6	0.887	0.0390 (J)	ND	ND	NS
Chrysene	218-01-9	87	780	140	450	0.7	0.827	0.0249 (J)	0.0169 (J)	ND	NS
Dibenz(a,h)anthracene	53-70-3	0.087	0.78	0.1	0.5	4.7	0.0679 (J)	ND	ND	ND	NS
Fluoranthene	206-44-0	3100	82000	2900	48000	1.3	1.090	ND	0.0286 (J)	ND	NS
Fluorene	86-73-7	3100	82000	2200	28000	17	ND	0.0537	ND	ND	NS
Indeno(1,2,3-cd)pyrene	193-39-5	0.87	7.8	1.5	5.3	4.3	0.102 (J)	ND	ND	ND	NS
Phenanthrene	85-01-8	No Value	No Value	2000	30000	0.7	0.323 (J)	0.0475	0.0168 (J)	ND	NS
Pyrene	129-00-0	2300	61000	2200	37000	1.3	1.610	0.188	ND	ND	NS
PP Metals (mg/kg)											
Aluminum	7429-90-5	78000	2000000	72000	No Value	Site Specific	410	10200	17100	301	ND
Antimony	7440-36-0	31	820	26	240	Site Specific	ND	ND	2.54	ND	ND
Arsenic	7440-38-2	0.43	3.8	0.8	3.7	Site Specific	ND	10.6	11.7	1.55	ND
Beryllium	7440-41-7	160	4100	120	800	Site Specific	ND	0.783	0.991	ND	ND
Cadmium	7440-43-9	39	1000	75	1300	Site Specific	ND	1.95	1.61	ND	ND
Chromium	18540-29-9	230	6100	210	420	Site Specific	2.14	31.0	29.9	1.22	19.0
Copper	7440-50-8	3100	82000	110	76000	Site Specific	1.70	8.41	7.67	ND	ND
Lead	7439-92-1	No Value	No Value	400	920	Site Specific	2.30	7.22	6.52	ND	ND
Nickel	7440-02-0	1600	41000	110	28000	Site Specific	ND	7.98	9.07	ND	ND
Selenium	7782-49-2	390	1000	390	10000	Site Specific	ND	3.52	1.89	ND	ND
Zinc	7440-66-6	23000	610000	23000	560000	Site Specific	6.00	35.7	30.1	1.61	ND

TABLE 3-1 - SOIL AND SEDIMENT SAMPLE ANALYTICAL RESULTS

Sediment and Groundwater Quality Investigation in Support of EA and Permitting for Harbor Ops/Small Craft Berthing and Adjacent Facilities at Naval Station Mayport Jacksonville, Florida (February/March, 2000)

(Key is shown on last page of table)

Boring # Sample ID Depth (feet below surface) Date Collected	CAS #	USEPA REG. III RBC's Residential	USEPA REG. III RBC's Industrial	FDEP 62-777 SCTL Direct Exposure Residential	FDEP 62-777 SCTL Direct Exposure Industrial	FDEP 62-777 SCTL Leachability Marine Water	TB * 2/25/00	B11 B11-A 2-4 2/28/00	B11 B11-B 20-22 2/28/00	B11 B11-B(RINS) * 2/28/00	B11 B11-C 38-40 2/28/00
Volatile Organic Compounds (mg/kg)											
Acetone	67-64-1	7800	200000	780	5500	6.8	ND	0.244	0.0680	ND	0.967 (E)
2-Butanone	78-93-3	47000	1200000	3100	21000	490	ND	0.0140	ND	ND	0.0360
Carbon Disulfide	75-15-0	7800	200000	200	1400	0.8	ND	ND	0.00444 (J)	ND	0.0990
Chloroethane	75-00-3	220	2000	2.9	4	NA	ND	ND	ND	ND	ND
Ethylbenzene	100-41-4	7800	200000	1100	8400	12	ND	ND	ND	ND	ND
Methylene Chloride	75-09-2	85	760	16	23	7.3	ND	ND	ND	ND	ND
Toluene	108-88-3	16000	410000	380	2600	5.6	ND	ND	ND	ND	ND
Semi-Volatile Compounds/PAHs (mg/kg)											
Acenaphthene	83-32-9	4700	120000	1900	18000	0.7	NS	ND	ND	ND	ND
Anthracene	120-12-7	23000	610000	18000	260000	0.7	NS	ND	ND	ND	ND
Benz(a)anthracene	56-55-3	0.87	7.8	1.4	5	0.7	NS	ND	0.00442 (J)	ND	0.0482
Benzo(a)pyrene	50-32-8	0.087	0.78	0.1	0.5	1.2	NS	ND	ND	ND	ND
Benzo(b)fluoranthene	205-99-2	0.87	7.8	1.4	4.8	1.6	NS	ND	ND	ND	0.0116 (J)
Benzo(g,h,i)perylene	191-24-2	No Value	No Value	2300	41000	4.8	NS	ND	ND	ND	ND
Benzo(k)fluoranthene	207-08-9	8.7	78	15	52	1.6	NS	ND	ND	ND	ND
Chrysene	218-01-9	87	780	140	450	0.7	NS	ND	ND	ND	0.104
Dibenz(a,h)anthracene	53-70-3	0.087	0.78	0.1	0.5	4.7	NS	ND	ND	ND	ND
Fluoranthene	206-44-0	3100	82000	2900	48000	1.3	NS	ND	ND	ND	0.0338 (J)
Fluorene	86-73-7	3100	82000	2200	28000	17	NS	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	193-39-5	0.87	7.8	1.5	5.3	4.3	NS	ND	ND	ND	ND
Phenanthrene	85-01-8	No Value	No Value	2000	30000	0.7	NS	ND	ND	ND	0.0126 (J)
Pyrene	129-00-0	2300	61000	2200	37000	1.3	NS	ND	ND	ND	ND
PP Metals (mg/kg)											
Aluminum	7429-90-5	78000	2000000	72000	No Value	Site Specific	NS	544	168	ND	26900
Antimony	7440-36-0	31	820	26	240	Site Specific	NS	ND	ND	ND	1.97
Arsenic	7440-38-2	0.43	3.8	0.8	3.7	Site Specific	NS	ND	ND	ND	15.8
Beryllium	7440-41-7	160	4100	120	800	Site Specific	NS	ND	ND	ND	1.68
Cadmium	7440-43-9	39	1000	75	1300	Site Specific	NS	ND	ND	ND	3.29
Chromium	18540-29-9	230	6100	210	420	Site Specific	NS	2.44	1.03	ND	49.9
Copper	7440-50-8	3100	82000	110	76000	Site Specific	NS	ND	ND	ND	11.6
Lead	7439-92-1	No Value	No Value	400	920	Site Specific	NS	ND	ND	ND	13.2
Nickel	7440-02-0	1600	41000	110	28000	Site Specific	NS	ND	ND	ND	14.5
Selenium	7782-49-2	390	1000	390	10000	Site Specific	NS	ND	ND	ND	4.56
Zinc	7440-66-6	23000	610000	23000	560000	Site Specific	NS	1.92	1.07	ND	49.9

TABLE 3-1 - SOIL AND SEDIMENT SAMPLE ANALYTICAL RESULTS

Sediment and Groundwater Quality Investigation in Support of EA and Permitting for Harbor Ops/Small Craft Berthing and Adjacent Facilities at Naval Station Mayport Jacksonville, Florida (February/March, 2000)

(Key is shown on last page of table)

Boring # Sample ID Depth (feet below surface) Date Collected	CAS #	USEPA REG. III RBC's Residential	USEPA REG. III RBC's Industrial	FDEP 62-777 SCTL Direct Exposure Residential	FDEP 62-777 SCTL Direct Exposure Industrial	FDEP 62-777 SCTL Leachability Marine Water	B11 B11-C (RINS) * 2/28/00	TB * 2/28/00	W2 W2-A 14-16 3/1/00	W2 W2-B 28-30 3/1/00	W2 W2-C 38-40 3/1/00
Volatile Organic Compounds (mg/kg)											
Acetone	67-64-1	7800	200000	780	5500	6.8	NS	ND	0.0320	0.0335	0.0447
2-Butanone	78-93-3	47000	1200000	3100	21000	490	NS	ND	ND	0.0104	ND
Carbon Disulfide	75-15-0	7800	200000	200	1400	0.8	NS	ND	0.00939	0.00466 (J)	0.00346 (J)
Chloroethane	75-00-3	220	2000	2.9	4	NA	NS	ND	0.0500	ND	ND
Ethylbenzene	100-41-4	7800	200000	1100	8400	12	NS	ND	ND	ND	0.00584 (J)
Methylene Chloride	75-09-2	85	760	16	23	7.3	NS	ND	ND	ND	ND
Toluene	108-88-3	16000	410000	380	2600	5.6	NS	0.00171 (J)	ND	ND	0.00291 (J)
Semi-Volatile Compounds/PAHs (mg/kg)											
Acenaphthene	83-32-9	4700	120000	1900	18000	0.7	ND	NS	ND	ND	ND
Anthracene	120-12-7	23000	610000	18000	260000	0.7	ND	NS	ND	ND	ND
Benz(a)anthracene	56-55-3	0.87	7.8	1.4	5	0.7	0.0000769 (J)	NS	0.00691 (J)	ND	ND
Benzo(a)pyrene	50-32-8	0.087	0.78	0.1	0.5	1.2	ND	NS	ND	ND	ND
Benzo(b)fluoranthene	205-99-2	0.87	7.8	1.4	4.8	1.6	ND	NS	ND	ND	ND
Benzo(g,h,i)perylene	191-24-2	No Value	No Value	2300	41000	4.8	ND	NS	ND	ND	ND
Benzo(k)fluoranthene	207-08-9	8.7	78	15	52	1.6	ND	NS	ND	ND	ND
Chrysene	218-01-9	87	780	140	450	0.7	0.0000637 (J)	NS	ND	ND	ND
Dibenz(a,h)anthracene	53-70-3	0.087	0.78	0.1	0.5	4.7	ND	NS	ND	ND	ND
Fluoranthene	206-44-0	3100	82000	2900	48000	1.3	0.000290 (J)	NS	ND	ND	ND
Fluorene	86-73-7	3100	82000	2200	28000	17	ND	NS	ND	ND	ND
Indeno(1,2,3-cd)pyrene	193-39-5	0.87	7.8	1.5	5.3	4.3	ND	NS	ND	ND	ND
Phenanthrene	85-01-8	No Value	No Value	2000	30000	0.7	0.000118 (J)	NS	0.00731 (J)	0.00777 (J)	ND
Pyrene	129-00-0	2300	61000	2200	37000	1.3	0.000213 (J)	NS	ND	ND	ND
PP Metals (mg/kg)											
Aluminum	7429-90-5	78000	2000000	72000	No Value	Site Specific	NS	NS	2210	98.2	4250
Antimony	7440-36-0	31	820	26	240	Site Specific	NS	NS	ND	ND	ND
Arsenic	7440-38-2	0.43	3.8	0.8	3.7	Site Specific	NS	NS	[illegible]	ND	[illegible]
Beryllium	7440-41-7	160	4100	120	800	Site Specific	NS	NS	ND	ND	ND
Cadmium	7440-43-9	39	1000	75	1300	Site Specific	NS	NS	ND	ND	0.686
Chromium	18540-29-9	230	6100	210	420	Site Specific	NS	NS	8.20	1.24	17.8
Copper	7440-50-8	3100	82000	110	76000	Site Specific	NS	NS	2.78	ND	2.24
Lead	7439-92-1	No Value	No Value	400	920	Site Specific	NS	NS	2.77	ND	ND
Nickel	7440-02-0	1600	41000	110	28000	Site Specific	NS	NS	ND	ND	2.54
Selenium	7782-49-2	390	1000	390	10000	Site Specific	NS	NS	ND	ND	ND
Zinc	7440-66-6	23000	610000	23000	560000	Site Specific	NS	NS	9.26	ND	7.22

TABLE 3-1 - SOIL AND SEDIMENT SAMPLE ANALYTICAL RESULTS

Sediment and Groundwater Quality Investigation in Support of EA and Permitting for Harbor Ops/Small Craft Berthing and Adjacent Facilities at Naval Station Mayport Jacksonville, Florida (February/March, 2000)

(Key is shown on last page of table)

Boring # Sample ID Depth (feet below surface) Date Collected	CAS #	USEPA REG. III RBC's Residential	USEPA REG. III RBC's Industrial	FDEP 62-777 SCTL Direct Exposure Residential	FDEP 62-777 SCTL Direct Exposure Industrial	FDEP 62-777 SCTL Leachability Marine Water	W1 W1-A 14-16 3/1/00	W1 W1-B 28-30 3/1/00	W1 W1-C 38-40 3/1/00	TB * 3/1/00
Volatile Organic Compounds (mg/kg)										
Acetone	67-64-1	7800	200000	780	5500	6.8	0.0225	0.0179	0.0119 (J)	ND
2-Butanone	78-93-3	47000	1200000	3100	21000	490	ND	0.00607 (J)	ND	ND
Carbon Disulfide	75-15-0	7800	200000	200	1400	0.8	0.00332 (J)	0.00428 (J)	ND	ND
Chloroethane	75-00-3	220	2000	2.9	4	NA	ND	ND	ND	ND
Ethylbenzene	100-41-4	7800	200000	1100	8400	12	ND	ND	ND	ND
Methylene Chloride	75-09-2	85	760	16	23	7.3	ND	ND	ND	ND
Toluene	108-88-3	16000	410000	380	2600	5.6	ND	ND	ND	ND
Semi-Volatile Compounds/PAHs (mg/kg)										
Acenaphthene	83-32-9	4700	120000	1900	18000	0.7	ND	ND	ND	NS
Anthracene	120-12-7	23000	610000	18000	260000	0.7	ND	ND	ND	NS
Benz(a)anthracene	56-55-3	0.87	7.8	1.4	5	0.7	ND	ND	ND	NS
Benzo(a)pyrene	50-32-8	0.087	0.78	0.1	0.5	1.2	ND	ND	ND	NS
Benzo(b)fluoranthene	205-99-2	0.87	7.8	1.4	4.8	1.6	ND	ND	ND	NS
Benzo(g,h,i)perylene	191-24-2	No Value	No Value	2300	41000	4.8	ND	ND	ND	NS
Benzo(k)fluoranthene	207-08-9	8.7	78	15	52	1.6	ND	ND	ND	NS
Chrysene	218-01-9	87	780	140	450	0.7	0.00372 (J)	ND	ND	NS
Dibenz(a,h)anthracene	53-70-3	0.087	0.78	0.1	0.5	4.7	ND	ND	ND	NS
Fluoranthene	206-44-0	3100	82000	2900	48000	1.3	0.0347 (J)	ND	ND	NS
Fluorene	86-73-7	3100	82000	2200	28000	17	ND	ND	ND	NS
Indeno(1,2,3-cd)pyrene	193-39-5	0.87	7.8	1.5	5.3	4.3	ND	ND	ND	NS
Phenanthrene	85-01-8	No Value	No Value	2000	30000	0.7	ND	ND	ND	NS
Pyrene	129-00-0	2300	61000	2200	37000	1.3	ND	ND	ND	NS
PP Metals (mg/kg)										
Aluminum	7429-90-5	78000	2000000	72000	No Value	Site Specific	1830	2200	555	NS
Antimony	7440-36-0	31	820	26	240	Site Specific	ND	ND	ND	NS
Arsenic	7440-38-2	0.43	3.8	0.8	3.7	Site Specific	0.825	0.699	0.397	NS
Beryllium	7440-41-7	160	4100	120	800	Site Specific	ND	ND	ND	NS
Cadmium	7440-43-9	39	1000	75	1300	Site Specific	ND	ND	ND	NS
Chromium	18540-29-9	230	6100	210	420	Site Specific	4.78	5.93	2.84	NS
Copper	7440-50-8	3100	82000	110	76000	Site Specific	ND	ND	ND	NS
Lead	7439-92-1	No Value	No Value	400	920	Site Specific	1.21	0.857	ND	NS
Nickel	7440-02-0	1600	41000	110	28000	Site Specific	ND	ND	ND	NS
Selenium	7782-49-2	390	1000	390	10000	Site Specific	ND	ND	ND	NS
Zinc	7440-66-6	23000	610000	23000	560000	Site Specific	5.81	4.90	2.73	NS

TABLE 3-1 - SOIL AND SEDIMENT SAMPLE ANALYTICAL RESULTS

Sediment and Groundwater Quality Investigation in Support of EA and Permitting for Harbor Ops/Small Craft Berthing and Adjacent Facilities at Naval Station Mayport Jacksonville, Florida (February/March, 2000)

TABLE KEY:

RBC = Risk Based Concentration (in mg/kg)
USEPA REG III - Region 3, United States Environmental Protection Agency - Risk Based Concentration Table, Revised April, 1999
FDEP = Florida Department of Environmental Protection
62-777 = Florida Administrative Code Chapter 62-777 - Contaminant Cleanup Target Levels, Revised August, 1999
SCTL = Soil Cleanup Target Level (in mg/kg)
mg/kg = milligrams per kilogram
PAHs = Polynuclear Aromatic Hydrocarbons
PP Metals = Priority Pollutant Metals
No Value = No value for this analyte was listed
NS = Not Sampled
NA = Not Applicable
DUP = Duplicate Sample
RINS = Equipment Rinsate Sample
TB = Trip Blank (one for each shipment to laboratory)
* = Trip Blanks and Rinsates reported in micrograms per liter
ND = Not Detected
(E) = Value above quantitation range
(J) = Analyte detected below reporting limits/estimated value
Site Specific = Leachability target level may be determined by using SPLP test to determine site specific SCTL
Shaded cells = analyte level exceeded one or more of the listed comparative criteria

TABLE 3-2 - GROUNDWATER SAMPLE ANALYTICAL RESULTS

Sediment and Groundwater Quality Investigation in Support of EA and Permitting for Harbor Ops/Small Craft Berthing and Adjacent Facilities at Naval Station Mayport Jacksonville, Florida (February/March, 2000)

Monitoring Well # Sample ID Depth to Water (Feet)** Depth to Bottom (Feet)** Screen Interval 1 Well Volume (Gallons) Total Volume Purged (Gallons) Date Purged and Sampled	CAS #	FDEP 62-777 GWCTL Groundwater	FDEP 62-302 Class III Predominately Marine Waters	MW1 MW1 8.86 15.08 2-12 1 4 2/29/00	MW1 MW1(RINS) 8.86 15.08 2-12 1 4 2/29/00	MW2 MW2 11.93 14.53 2-12 0.42 1.5 2/29/00	TB 3/1/00
Water Quality Parameters							
Dissolved Oxygen (PPM)				4	NA	5	
pH				7.6	NA	6.8	
Turbidity (NTU)				129	NA	NS	
Temperature (degrees Celcius)				20.8	NA	20.5	
Conductivity (uS)				474	NA	386	
Volatile Organic Compounds (ug/L)							
Carbon Disulfide	75-15-0	700	No Value	ND	4.64 (J)	ND	ND
Semi-Volatile Compounds/PAHs (ug/L)							
Fluoranthene	206-44-0	280	370	0.451 (J)	NS	0.332 (J)	NS
Phenanthrene	85-01-8	210	0.031 annual avg. #	0.181 (J)	NS	0.118 (J)	NS
Pyrene	129-00-0	210	11000	0.320 (J)	NS	0.307 (J)	NS
PP Metals (ug/L)							
Aluminum	7429-90-5	200*	1500	117	ND	154	NS

TABLE KEY:

FDEP = Florida Department of Environmental Protection
62-777 = Florida Administrative Code Chapter 62-777 - Contaminant Cleanup Target Levels, Revised August, 1999
GWCTL = Groundwater Cleanup Target Level (in ug/L)
PAHs = Polynuclear Aromatic Hydrocarbons
PP Metals = Priority Pollutant Metals
ug/L = micrograms per liter
NS = Not Sampled
NA = Not Applicable
RINS = Equipment Rinsate Sample
TB = Trip Blank
ND = Not Detected
(J) = Analyte detected below reporting limits/estimated value
Shaded cells = analyte level exceeded one or more of the listed comparative criteria
** = Depth measurements were recorded from the top of the Temporary Well Stick-up
PPM = Parts Per Million
NTU = Nephelometric Turbididty Units
uS = Microsiemens
# = As provided in Florida Administrative Code Chapter 62-302 - Criteria for Surface Water Quality Standards
* = As provided in Florida Administrative Code Chapter 62-550 - Drinking Water Standards
^ = As per Florida Administrative Code Chapter 62-777, this analyte's criteria is to be 10 times the criteria of Chapter 62-550

THIS PAGE LEFT BLANK INTENTIONALLY

4 Conclusions

4.1 Discussion of Soil/Sediment Issues

At seven boring locations within (or in close proximity to) the proposed soil removal area, arsenic concentrations were present above risk screening criteria in at least one of the soil samples. In the 14 samples analyzed in the 2- to 4-foot and 20- to 22-foot depths, seven were reported as below detectable limits (0.32 to 0.46 milligrams per kilogram [mg/kg]), five had detected concentrations less than 1 mg/kg, and the two remaining samples had the highest concentrations of 13.7 and 5.4 mg/kg. Similar arsenic levels were found at 38- to 40-foot depths with the highest level of 15.8 mg/kg found in boring B11, which is located just east of the proposed excavation area.

Naturally occurring arsenic concentrations often exceed risk values in many areas of the southeastern United States, including Duval County, Florida. However, some question exists as to whether all the arsenic concentrations detected at the project site are naturally occurring or have been influenced by anthropogenic activities. The distribution of arsenic is relatively random with respect to depth and does not readily point to a source. For example, arsenic was not detected in B11-A (2- to 4-foot depth) or B11-B (20- to 22-foot depth), but was detected at a level that exceeded all of the comparative criteria in sample B11-C (38- to 40-foot depth). Additionally, arsenic was not detected in B6-A (2- to 4-foot depth) or B6-C (38- to 40-foot depth) but exceeded the EPA residential RBC at B6-B (20- to 22-foot depth). Arsenic levels above comparison criteria were not found at the shallow samples south of the proposed soil area near SWMU 23. Given the random distribution of arsenic, SWMU 23 does not appear to be a source. And the arsenic could be naturally occurring. Alternately, some of the area to be excavated may have actually been filled with spoil many years ago, thus explaining the distribution of arsenic if the spoil contained this analyte. The limits of any historical filling efforts may need to be established. In discussions with FDEP (personal communication with

Ligia Mora-Applegate, FDEP 2000a), arsenic levels of 4 to 5 mg/kg are common in Duval County. Thomas Seal of FDEP indicated (personal communication, FDEP 2000b) that naturally occurring arsenic levels in sediments in Duval County may range from 5 to 10 mg/kg. However, some of the arsenic levels in this investigation are high enough to warrant further consideration particularly since the material may be disposed outside of Duval County. The resolution of this issue is critical since a final material disposal option must be identified and is dependent upon whether the material can be reused or must be taken to a landfill. The project is not currently funded for landfill disposal.

One way to gain further insight into the matter is to calculate the ratio of arsenic to aluminum at the site, and compare it to published ranges of naturally occurring ratios of arsenic to aluminum. A relatively consistent ratio has been observed by researchers between most trace element metals. Aluminum is often used as a point of reference since it is the most abundant metal in the earth's crust; is more refractory than most metals in estuarine sediments; and has such high natural concentrations that are less likely to be influenced by anthropogenic activities (FDEP 1984a). Based on naturally occurring metal data from a variety of sources worldwide, FDEP, in their Deepwater Ports Maintenance Dredging and Disposal Manual (1984a), established typical ranges of metal to aluminum ratios. FDEP also developed graphs representing metal to aluminum ratios versus total metal concentrations found in sediments. A comparative graph for arsenic is provided in Figure 4-1. Outliers from the cross-hatched area suggest potential anthropogenic arsenic inputs. Comparing the data obtained in this investigation to Figure 4-1, E & E plotted all arsenic levels which exceeded risk screening criteria. All arsenic levels below 1 mg/kg have arsenic to aluminum ratios which suggest that arsenic is naturally occurring. Samples at 20 to 22 feet BGS in borings B1 and B7 may contain unnaturally occurring levels of arsenic. Also, samples at 38 to 40 feet BGS in borings B1, B11, and W2 may have unnaturally levels of arsenic; however, soil at these depths will not be excavated. The soil at the 14- to16-foot depth at boring W2 is on the borderline of potentially containing unnatural levels of arsenic. While this investigation may suggest that some of the arsenic levels are not natural, it is not 100% definitive. FDEP cautions the comparison values are based on worldwide averages and may deviate in localized areas. While data from 13 estuaries in Florida (FDEP 1984b) indicated that many of the values observed in the state did not differ significantly from the global ratios, it is generally recognized that there are regional differences between the Piedmont crust material of north Florida and the carbonate geology of south Florida.

The maximum arsenic concentration for samples (13.7 mg/kg) within the depths to be excavated (-14 to -27 feet) exceeds both FDEP residential (0.8 mg/kg) and industrial (3.7 mg/kg) SCTLs. Statistical analysis (i.e. the Shapiro-Wilks test for normality) indicated the arsenic data were

transformation of the data is 4.1 mg/kg, which exceeds both the residential and industrial SCTLs. Additionally, the maximum arsenic value (13.7 mg/kg) observed is higher than the industrial SCTL of 3.7 mg/kg by more than a factor of three.

Therefore, based on the data currently available and in accordance with FDEP tentative disposal guidance, excavated material from the construction of the sub-basin could not be used within an industrial area and would require off-site transportation and landfill disposal. If off-site disposal (i.e. landfill) is the final disposition methodology for soils within areas where arsenic was characterized as above FDEP industrial target levels, it is important to note that these arsenic levels fall below FDEP leachability based upon groundwater criteria (29 mg/kg) as set forth in FAC 62-777. Therefore, these soils should be acceptable for disposal at a lined landfill, contingent upon specific local criteria.

An evaluation of the VOC data compiled for this investigation indicated that, of the seven VOCs detected within the proposed soil removal area, four are known typically as laboratory contaminants or byproducts of field decontamination procedures that utilize isopropanol (acetone, methylene chloride, carbon disulfide and 2-butanone). In many of the samples, VOCs were detected at levels that fell between the laboratory's MDL and PQL, which means the reported value is qualified as a statistically estimated value. In final evaluation of the VOCs detected, none exceeded the comparative criteria set forth for this investigation and, therefore, it is reasonable to conclude that no impact to the proposed Harbor Ops project should be inferred from these detections.

Four upland soil samples were analyzed for SVOCs/PAHs, as were the two in-water borings. Many of the SVOCs/PAHs were detected at levels that fell between the laboratory's MDL and PQL, which means that the reported value is qualified as a statistically estimated value. For all samples except B1-A (2 to 4 feet), concentrations reported for these analytes were below the comparative criteria utilized for this investigation. In sample B1-A, concentrations of benz(a)anthracene, chrysene and pyrene were slightly above the FDEP marine leachability criteria, but were below residential and industrial RBCs and STCLs. Therefore, soils removed from this area could be disposed of without restrictions except marine disposal, or where leaching to a marine environment may occur.

In the case of benzo(a)pyrene within this sample, the reported concentration (0.654 mg/kg) exceeded FDEP residential (0.1 mg/kg) and industrial (0.5 mg/kg) SCTLs, but was below the EPA RBCs and the FDEP marine leachability criteria. The exceedence of FDEP industrial criteria may require soils be removed from this area (2 to 4 feet deep, from the rubble riprap south to an existing parking area) and be disposed of within a landfill. Alternatively, with enough samples (i.e. seven or more) collected for each soil horizon, an estimate of the average concentration of benzo(a)pyrene

(specifically the 95% UCL) could be compared to the appropriate criterion to determine a suitable scenario for disposal. That is, if at least seven samples were analyzed for PAHs and the 95% UCL was less than the residential or industrial FDEP SCTL, and the maximum concentration of benzo(a)pyrene was less than three times the appropriate SCTL value, excavated soil could be disposed of in a residential or industrial setting, depending on which criterion was not exceeded. FDEP warns that should soil be disposed of in the industrial scenario, land use would have to be precluded from reverting to a residential use. Therefore, should three to six more soil samples be collected and analyzed for SVOCs, less costly disposal practices than landfilling could be employed for the excavated materials.

A similar approach might also be applied for arsenic where additional samples may yield an average concentration (95% UCL) below the industrial cleanup level or background concentrations. While the soils with higher levels of arsenic may have to be still landfilled (if not naturally occurring), the remainder of the soil could possibly be reused.

As another alternative, the excavation could be performed, the soil stockpiled and mixed, and samples collected for analysis of SVOCs and arsenic. If data from the analyses of these samples came back as below direct contact and marine leachability criteria, the soil could be disposed of accordingly. This, however, lends an uncertainty to the project since the ultimate disposal practice would not be known until the excavation had already been accomplished. It would seem more appropriate to know, beforehand, the disposal practice to be employed.

4.2 Discussion of Surface Water/Groundwater Issues

Issues associated with turbidity, contaminant resuspension, and return water quality during soil excavation do not appear to be of major concern.

Turbidity outside the construction area is not anticipated to be a problem, particularly if appropriate construction techniques are utilized. The soils at the site are predominantly fine grained sands and are less likely to stay entrained in the water column as opposed to predominantly silty and clayey soils. At a minimum, turbidity curtains will have to be deployed during soil removal efforts around the mouth of the proposed basin. Additional construction techniques can be implemented if needed to ensure that the surface water quality standards will not be significantly impacted. Provisions will need to be made to account for the high tide range and moderate water movement at the mouth of the Mayport basin.

Elutriate extraction analysis conducted during this investigation indicated that constituents in the subsurface soil will not likely be introduced to marine surface waters during, or as a result of, soil

Elutriate extraction analysis conducted during this investigation indicated that constituents in the subsurface soil will not likely be introduced to marine surface waters during, or as a result of, soil removal activities. This result is important, particularly with reference to arsenic, as arsenic levels above comparison criteria were detected in the soils collected for the elutriate analysis (from borings B3, B6, W1 and W2).

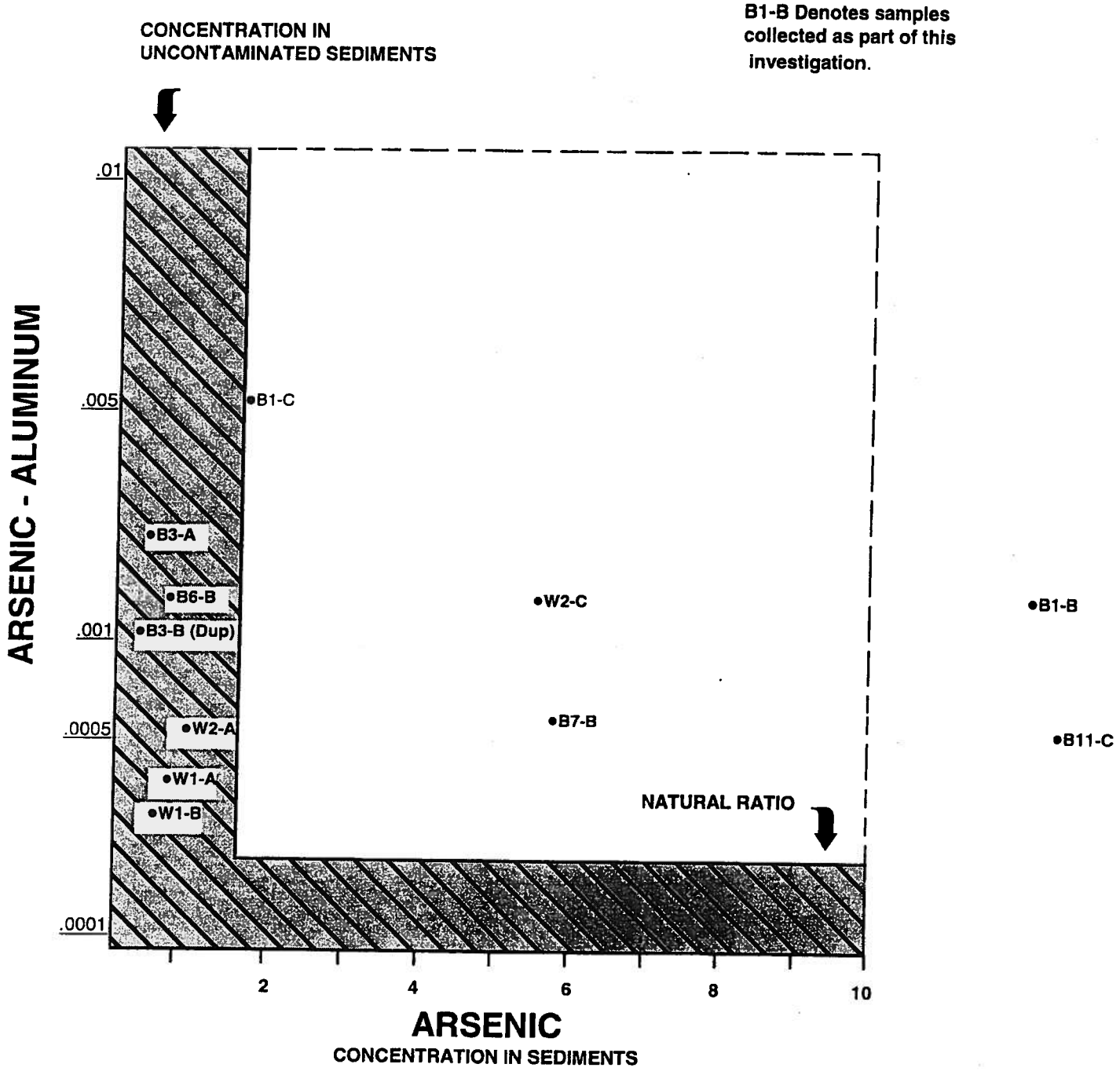
Three SVOCs/PAHs (fluoranthene, phenanthrene, and pyrene) and one PP metal (aluminum) were detected in both of the groundwater samples collected. The three SVOCs/PAHs were detected at levels that fell between the laboratory's MDL and PQL, which means the reported value has been qualified as a statistically estimated value. Fluoranthene, pyrene and aluminum were all below the groundwater standard and the Class III Surface Water Standard. The surface water standard for phenanthrene and a group of other PAHs (0.31 micrograms per liter [µg/L]) are based on annual average flow/discharge. As long as the discharge of return water, from a spoil basin back to the St. Johns River, does not last more than several months, phenanthrene should not be a problem. Further discussion should be held with FDEP for confirmation since FDEP could opt to use alternative comparison criteria.

4.3 Harbor Ops Project Impact Issues

The key potential impact issue that has been identified from this investigation relates to the disposal of the excavated material. Specifically, concerns have been identified regarding the levels of arsenic, and to a lesser extent, the level of benz(a)anthracene, benzo(a)pyrene, chrysene and pyrene identified in soils within the limits of the proposed soil removal area. These constituents are present at high enough concentrations in the soils to cause a great deal of scrutiny regarding disposal options.

Low levels of PAHs and aluminum have been detected in the groundwater within the proposed dredged area; however, they are not anticipated to create problems during construction activities.

FIGURE 4-1
ARSENIC TO ALUMINUM IN SEDIMENT
RATIO GRAPH--HARBOR OPS PROJECT
NAVAL STATION MAYPORT
MAYPORT, FLORIDA



Background: Graph representing Arsenic to Aluminum ratio versus total arsenic concentration found in sediments. Outliers from the cross-hatched area (representing range of values reported) suggest anthropogenic arsenic inputs to the system (FDEP 1984a).

5 Recommendations

Based upon the activities undertaken in support of this investigation, the following recommendations are provided:

- A dialogue should commence between NAVSTA Mayport (and/or E & E on their behalf), FDEP and EPA (if appropriate) to discuss acceptable soil concentrations, disposal criteria and disposal options for the soils/sediments to be excavated;

- Confirm whether or not the arsenic levels present at the site are the result of contamination or are naturally occurring. Compile and evaluate regional specific data (if available) relating to naturally occurring levels of arsenic within soils and sediments in northeast Florida, particularly Duval County. This data would assist in determining disposal option recommendations for this project. In addition, an evaluation of existing data (if available) relating to the behavior of arsenic within soil types encountered as part of this investigation might prove useful to further clarify soil disposal options.

- Identify additional sampling and analysis needs as follows: number and location of samples necessary to further evaluate disposal options of soils as they relate to benzo(a)pyrene values at 95% UCLs in determining Shapiro-Wilks distribution of lognormal data; additional sampling necessary to meet requirements for characterizing arsenic levels and/or distribution within excavated soils to determine appropriate disposal option(s); and additional sampling necessary that has not yet been determined in order to satisfy agency review requirements;

- Compile and evaluate information regarding local landfills for possible disposal of removed soils that contain arsenic or PAH levels above FDEP industrial criteria (if required). This information should include, but not be limited to, criteria for acceptance of materials for disposal, testing requirements for characterization of materials for disposal and disposal costs;

- Evaluate alternative reuse options for the excavated material and estimate quantities of material that must be landfilled and can be reused for industrial application; and

- Confirm that FDEP will base water quality impacts using surface water criteria from Florida Administrative Code 62-550 (FDEP 1999a) and not 62-777 (FDEP 1999b).

6 References

ABB-Environmental Services, Inc., 1996, *RCRA Facility Investigation, Group III SWMUs, NAVSTA Mayport (Volumes I and II),* prepared for SOUTHDIV NAVFACENGCOM, North Charleston, South Carolina.

ABB-Environmental Services, Inc., 1998, *Interim Measure Performance Specifications, Group III SWMUs 23, 24 and 25, NAVSTA Mayport,* prepared for SOUTHDIV NAVFACENGCOM, North Charleston, South Carolina.

Bechtel Environmental, Inc., 1998, *Completion Report for Interim Measures at Group III SWMUs 14, 23 and 24, NAVSTA Mayport,* prepared for SOUTHDIV NAVFACENGCOM, North Charleston, South Carolina.

Florida Department of Environmental Protection, 1984a, *Deepwater Ports Maintenance Dredging and Disposal Manual.* Tallahassee, Florida.

Florida Department of Environmental Protection, 1984b, *Environmental Chemistry of Florida Estuaries: Deepwater Ports Maintenance Dredging Study.* Tallahassee, Florida.

Florida Department of Environmental Protection, 1996, *Florida Administrative Code Chapter 62-302, Surface Water Quality Standards,* Tallahassee, Florida.

Florida Department of Environmental Protection, 1999a, *Florida Administrative Code Chapter 62-550, Drinking Water Standards, Monitoring and Reporting,* Tallahassee, Florida.

Florida Department of Environmental Protection, 1999b, *Florida Administrative Code Chapter 62-777, Contaminant Cleanup Target Levels,* Tallahassee, Florida.

Florida Department of Environmental Protection, 2000a, *Personal Communication between Richard Freemanand Ligia-Mora Applegate.* March 29th, 2000.

Florida Department of Environmental Protection, 2000b, *Personal Communication between Evan Skornick and Thomas Seal.* April 6th, 2000.

Ecology and Environment, Inc, 2000, *Comprehensive Quality Assurance Plan 860165G.* Tallahassee, Florida.

United States Department of the Navy, 1998, *Memorandum Of Agreement Between The United States Environmental Protection Agency, The Florida Department of Environmental Protection and The United States Department of the Navy, Naval Station Mayport, Florida,* Jacksonville, Florida.

United States Environmental Protection Agency, Region III, 1999, *Risk Based Concentration Table,* Philadelphia, Pennsylvania.

THIS PAGE LEFT BLANK INTENTIONALLY

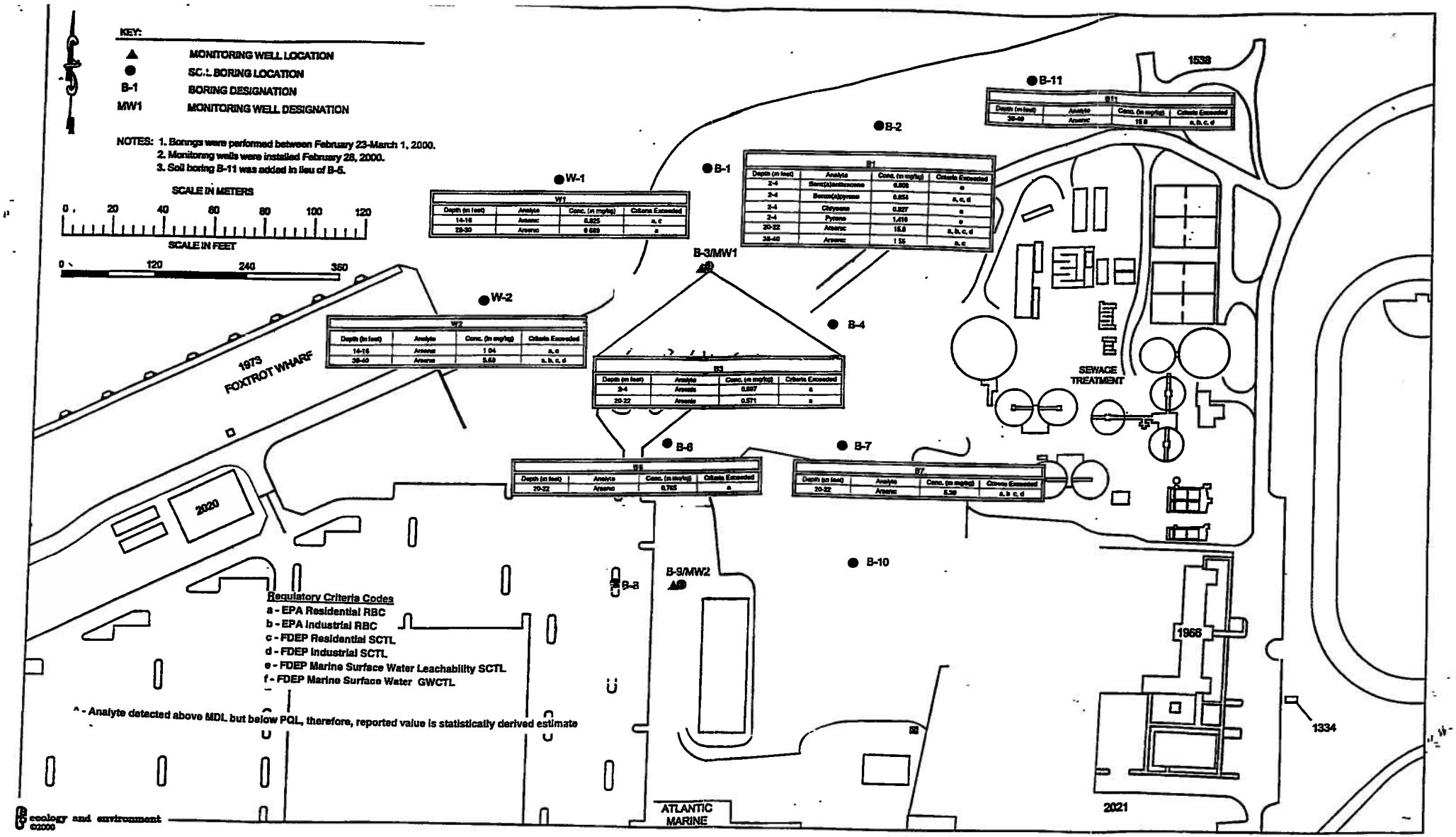


Figure 3-1 COMPARATIVE CRITERIA EXCEEDENCES LOCATION MAP—HARBOR OPS PROJECT NAVAL STATION MAYPORT MAYPORT, FLORIDA