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PHASE II

CONTAMINATION ASSESSMENT/ REMEDIAL ACTIVITIES INVESTIGATION WORK PIAN — GROUP C NAVAL AIR STATION PENSACOIA PENSACOLA, FLORIDA

Watsrfront Sediments (Site 2)
Magazine Point Rubble Disposal Area (Site 13)
Dredge Spoil Fill Area (Site 14)

July 1992

Prepared for:

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1. INTRODUCTION

The purpose of this work plan is to outline the procedures and methodologies to be used in conducting a Contamination Assessment/ Remedial Activities Investigation at the Vaterfront Sediments Site (Site 2), Magazine Point Rubble Disposal Area (Site 13), and the Dredge Spoil Pill Area (Site 14), located at the Naval Air Station (NAS) in Pensacola, Escambia County, Florida. This work plan has been prepared by Ecology and Environment, Inc., (E & E) for the Southern Division, U.S. Navy, Naval Facilities Engineering Command, under Contract No. N62467-88-C-0200. The work plan has been developed based on information and file documents provided by the Navy and on information gathered by E & E during preliminary site inspections conducted during January of 1989.

E & E has developed a phased approach for performing the NAS Pensacola site investigations. Phase I (Field Screening) is directed toward identifying the principal area(s) and primary contaminants of concern at a site, thereby providing a mechanism for focusing the sampling and analytical efforts during subsequent phases of the investigation. Phase II (Characterization) is directed toward the formal confirmation and quantification of the full spectrum of site contaminants (if any), thereby allowing determination of whether further investigation is warranted. Thus, the necessity of implementing phases III and IV (Extent Delineation) will be dependent on the results of phases I and 11. Phases III and IV, if required, will be directed not only toward fully identifying the horizontal and vertical extents of contamination, but also toward providing the quantitative data base necessary to support the screening and evaluation of potential remedial alternatives. The main objectives/advantages of this phased approach are as follows:

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- Efficient identification of those sites where environmental contamination has actually occurred as a result of past and/or present operations, thereby alloving non-contaminated sites to be eliminated from the program in the most environmentally sound, cost-effective, and timely manner possible;

- Focused placement of sampling locations and focused selection of analytical parameters in later phases of the investigation, thereby alloving full characterization of site contamination in the most environmentally sound, cost-effective, and timely manner possible; and

- Early screening of potential remedial alternatives, vhich, in turn, allovs critical parameters necessary to the evaluation of these alternatives to be incorporated.into the analytical program in later phases of the investigation.

It is anticipated that some of the NAS Pensacola sites my not require investigation beyond Phase II and hence will comprise Contamination Assessment-type investigations. On the other hand, sites vhich have documented contamination will likely require the additional phases of work, and hence will comprise a full-scale Comprehensive, Environmental Response, Compensation, and Liability Act (CERCLA) Remedial Investigation/Feasibility Study (RI/FS). For simplicity, the investigations for all NAS Pensacola sites will be referred to as Contamination Assessment/ Remedial Activities Investigations. The final results of site investigations that do not require study beyond Phase II will be incorporated into a Contamination Assessment Report. If appropriate, these sites will be recommended for No Further Action. The final results of site investigations that require vork beyond Phase II will be incorporated into a Remedial Investigation Report, vhich will provide all the information necessary for the development and completion of a Feasibility Study.

Sites 13 and 14 and their surrounding vicinities likely do not contain potentially hazardous materials and contamination. Consequently, it is probable that the scope-of-vork at these sites will not encompass a full-scale RI/FS effort. Site 2, hovever, has been found to contain potentially hazardous materials. Consequently, it is probable that the scope-of-vork at this site will encompass a full-scale RI/FS effort.

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2. SITE DESCRIPTION

The Naval Air Station (NAS) Pensacola facility occupies approximately 5,589 acres on a peninsula in southern Escarnbia County, five miles southwest of the City of Pensacola. This peninsula is bounded on the north by Bayou Grande and on the east and south by Pensacola Bay.

Three sites, each along the Pensacola Bay waterfront of NAS Pensacola, have been considered as one group in this workplan package (see Figure 2-1). These three sites will be considered separately in each of the workplan sections as described below.

2.1 Site 13 - Magazine Point Rubble Disposal Site

The Magazine Point Rubble Disposal Site (Site 13) is located on the east side of a north to south-oriented peninsula on the eastern border of NAS Pensacola. Site 13 extends north from the northeast corner of Chevalier Field along Pensacola Bay to Magazine Point (see Figures 2-1 and 2-2). The site covers approximately half of the land on the northern portion of the peninsula. The southern end of the site extends west from the waterfront to the edge of Chevalier Field. The site has little topographic relief, even after years of building material disposal, and there are no surface water bodies or monitoring wells found on site.

A road that traverses the entire length of the site is clay-surfaced except for the southern portion which is paved. The rest of the site is undeveloped and covered primarily by shrubs and small stands of deciduous and pine trees. Soils are primarily sands with packed clay on the unpaved road.

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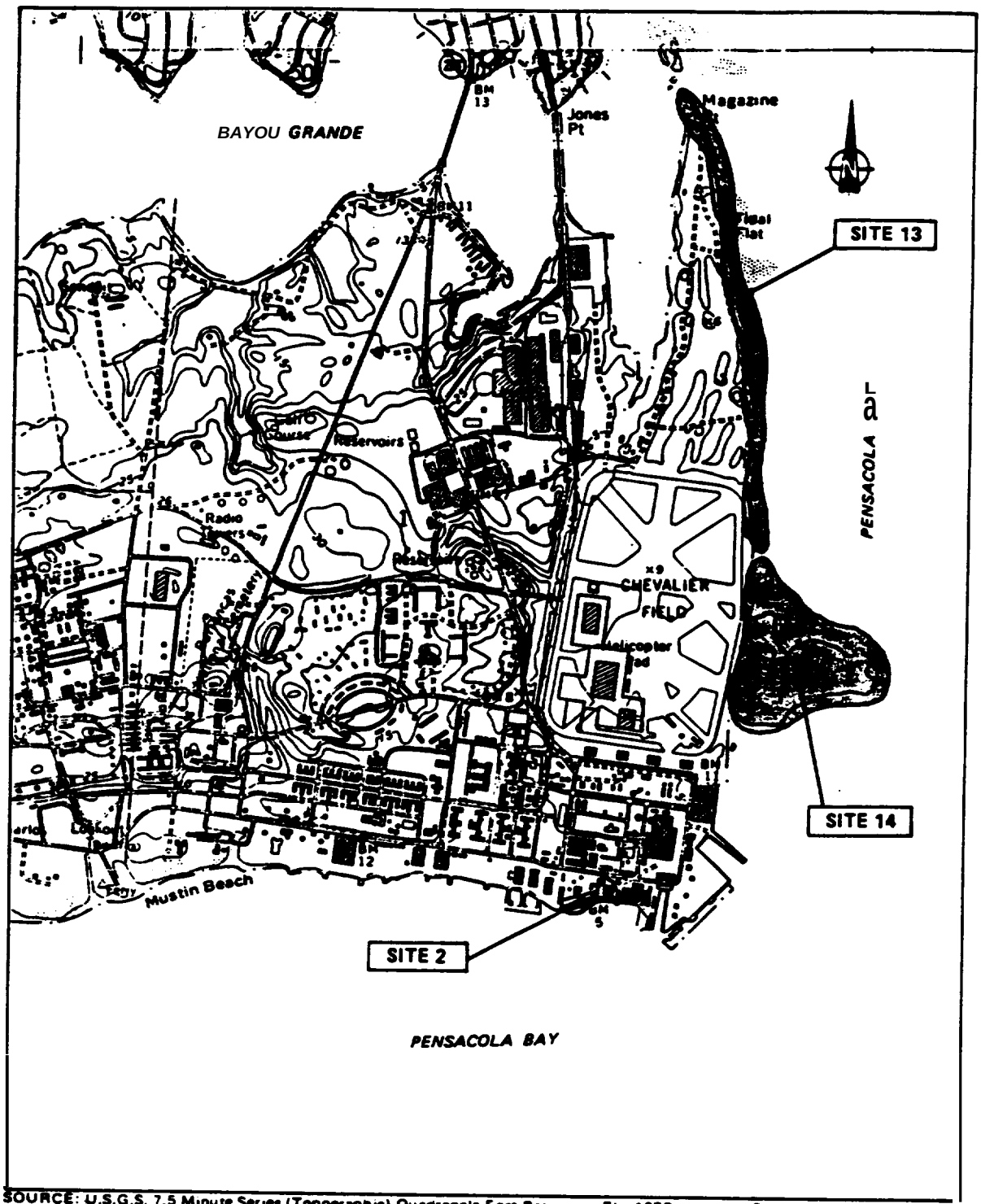

SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangle Fort Barrancas, Fla. 1970 and West Pensacola, Fla. 1970, Photorevised 1987

SCALE

0 ½ 1 MILE

0 .5 1 KILOMETER

Figure 2–1 LOCATION MAP – NAS PENSACOLA – SITES 2, 13, and 14

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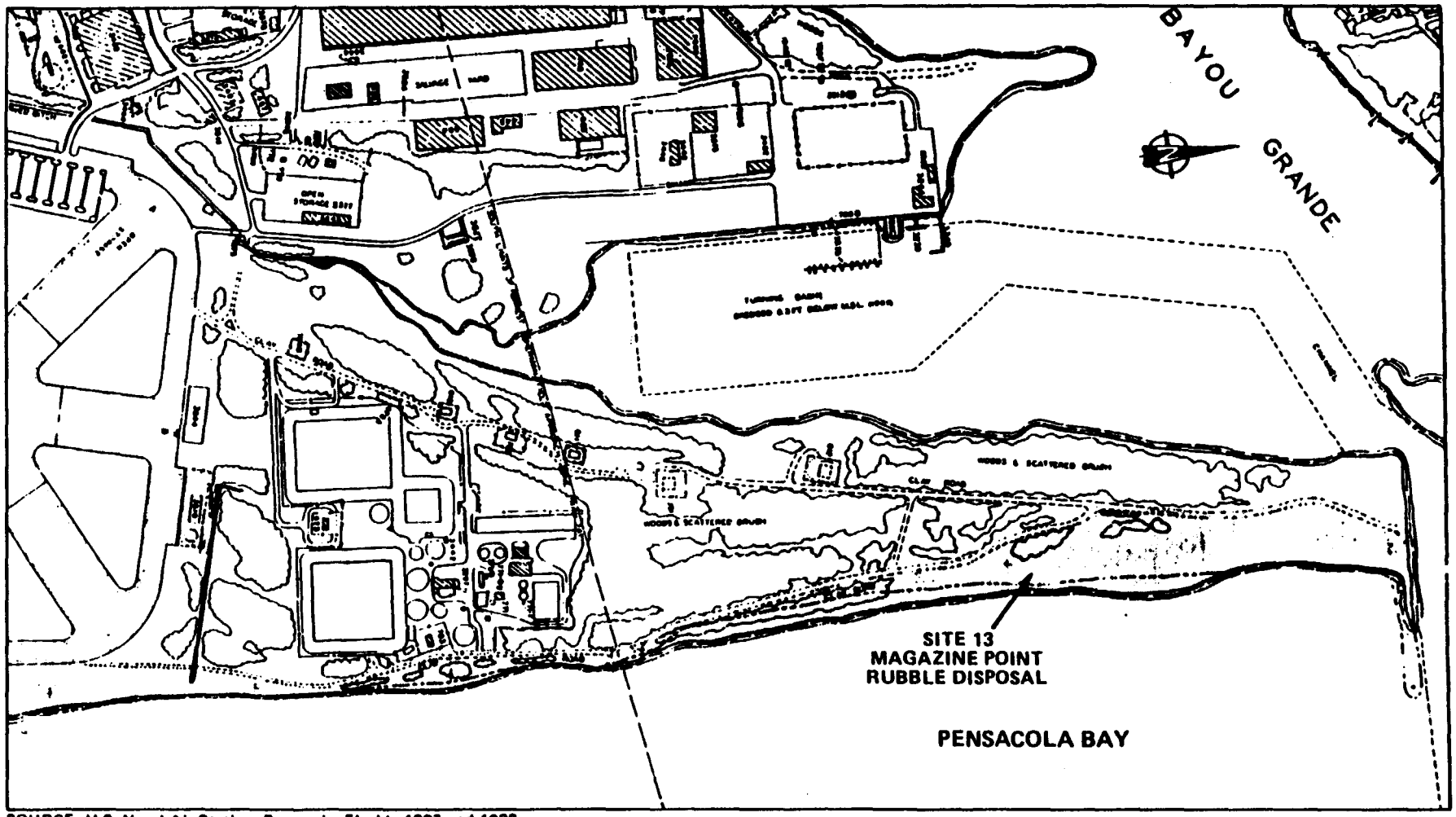

SOURCE: U.S. Naval Air Station, Pensacola, Florida 1987 and 1988.

SCALE
0 200 400 600 800 1000 FEET

Figure 2–2 SITE MAP – NAS PENSACOLA SITE 13

There are several sites located in the vicinity of Site 13. Site 14, the Dredge Spoil Fill area, is located approximately 200 feet from the southernmost extent of Site 13. The sites vhich are identified as part of the Industrial Wastewater Treatment Plant (IWTP) include: Site 32--IWTP Sludge Drying Beds, Site 33--IWTP Ponds, and Site 35--Miscellaneous IVTP SWMUs, are located approximately 200 to 300 feet vest of Site 13, and north of Chevalier Field. Site 11, the North Chevalier Field disposal area, is located approximately 1,000 feet to the vest of Site 13, along the vaterfront of Bayou Grande.

22 Site 14 - Dredge Spoil Pill Area

The Dredge Spoil Fill Area (Site 14) lies along the vaterfront east of Chevalier Field approximately 200 feet south of the southern edge of Site 13 (see Figures 2-1 and 2-3). The east side of Site 14 is bordered by Pensacola Bay. The site area vas created by the dredging activities conducted in the late 1970s to create an aircraft carrier turning basin and port. Since this area of land vas created by dredge spoil materials from the Bay, it is considered state-owned land and not Navy property (Naval Energy and Environmental Support Activity [NEESA] 1983).

There are no buildings, monitoring vellr, or paved areas found on site. Two major depressions are found vithin the site, one in the northern area and a larger one along the southern edge of the site (see Figure 2-3). It is speculated that these depressions were created during the disposal of dredge material to control runoff during spoil discharge. These depressions have acted, to SOH degree, as settling basins for turbid runoff associated vith dredging activities. Grassy vegetation currently occupies the bottom of each depression. The spoil areas around these depressions are approximately 10 feet above mean tea level (MSL).

23 Site 2 - Waterfront Sediment Site

The Vaterfront Sediment Site (Site 2) is located on the southeastern corner of the NAS Pensacola facility (see Figures 2-1 and 2-4). This site is the area of nearshore sediment along the vaterfront, adjacent to the base of the storm sever outfalls. These outfalls range in size from

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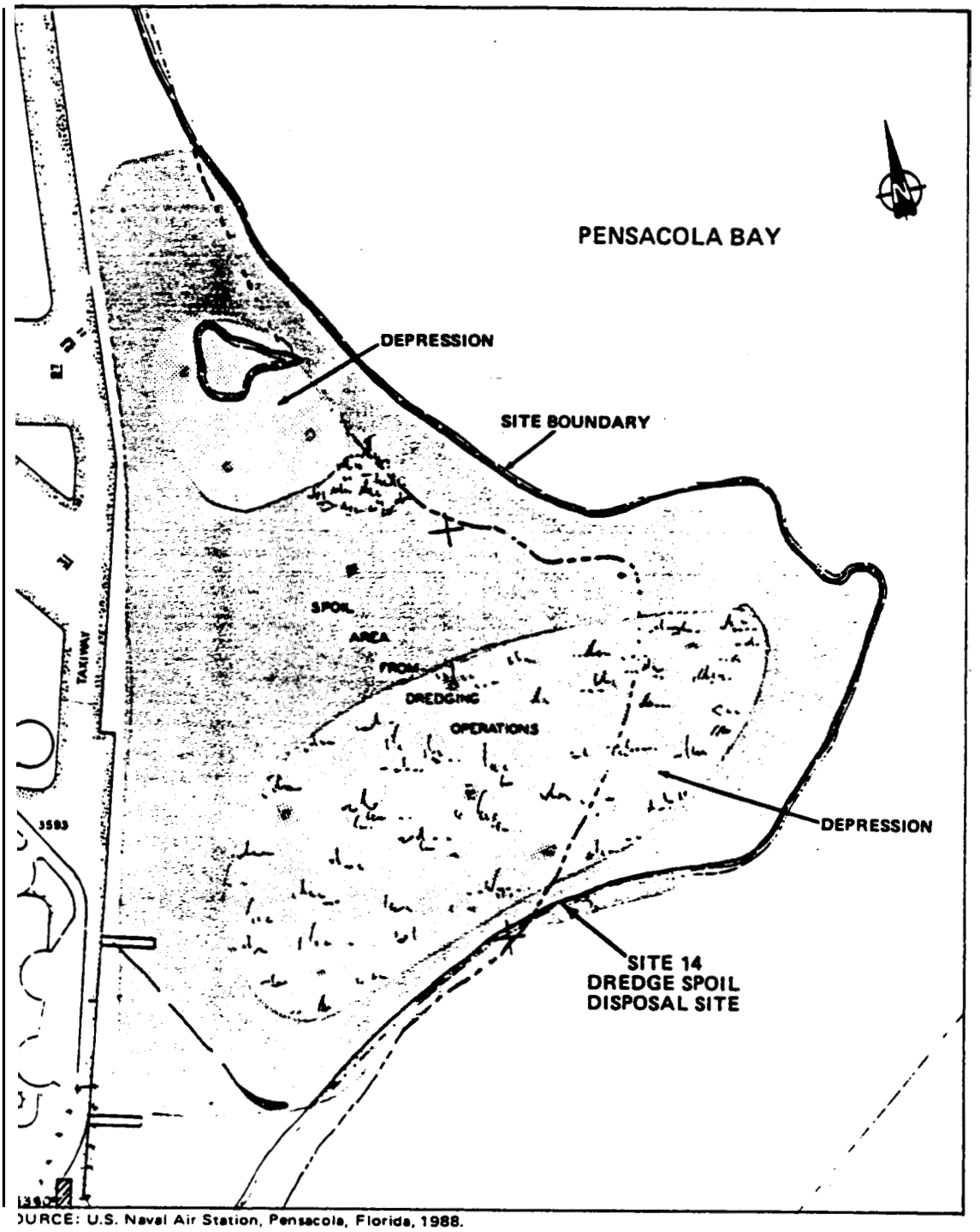


SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1988.

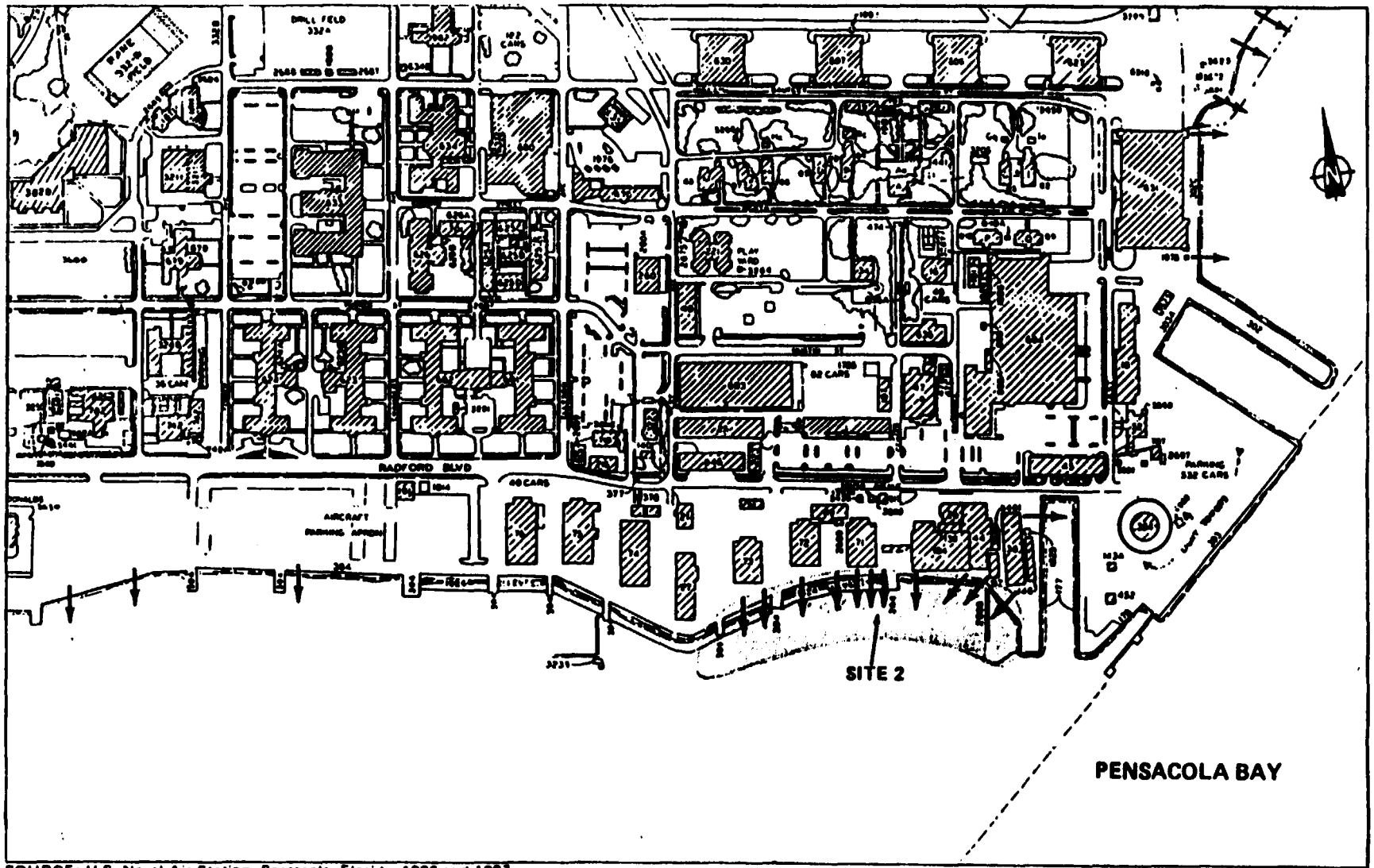
SCALE

0 200 400 600 800 FEET

KEY:

Grasses

Figure 2-3 SITE MAP – NAS PENSACOLA SITE 14



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1986 and 1987.

KEY:
→ Storm Sewer Outfalls

SCALE
0 200 400 600 800 FEET

Figure 2–4 SITE MAP – NAS PENSACOLA SITE 2

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6 to 36 inches in diameter and emptied hazardous wastes into Pensacola Bay from approximately 1935 to 1973 (NEESA 1983). The outfalls are located from Building 632 east past the dock for the USS Lexington and north to the waste water treatment plant discharge outfalls (Figure 2-4).

An extensive concrete levee has been constructed along the southeastern portion of the base that extends underwater into Pensacola Bay. The levee was constructed to protect the NAS facility perimeter from wave action associated with the bay. It consists of a vertical seawall 3 to 4 feet high built on top of a concrete platform which covers the Bay bottom and extends out into the subtidal zone of the Bay. Storm sewer outlets are located along the vertical seawall (see Figure 2-4) and empty an unknown amount of storm water runoff into Pensacola Bay (Geraghty and Miller [G 6 M] 1986).

The nearshore sediments have been described in a Gulf Eomeporting study conducted by the Navy for facility expansion in 1986 (Navy 1986). Although few sediment samples were taken immediately offshore from the NAS facility, other Bay studies have found the bottom to consist of fine sands to a depth of 30 feet and from 30 feet to the deepest portions of the shipping channel, the sediments range from silty sands to fine muds (Navy 1986).

Five hundred feet to the north of Site 2 lies Site 18--PCB Spill Area, and approximately 500 feet to the northeast, along the berthing pier, lies Site 20--Pier Pipe Leak. Approximately 1,000 feet west of the westernmost storm sewer outfall lie Site 21--Sludge at the Fuel Tanks, and Site 28--the Transformer Accident.

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3. SITE EISTORY

3.1 Site 13 - Magazine Point Rubble Disposal Site

Site 13 was used for the deposition of clean fill materials for an unknown period of time. Most of the materials disposed at this site consist of building rubble, bricks, metal, concrete, and wood. Materials were primarily disposed from the clay road east to the waterfront and in some places in the water close to shore. It is not known how many cubic yards of the material were disposed on site. According to the IAS completed by the Navy, no hazardous wastes were disposed on this site (NEESA 1983).

3.2 Site 14 - Dredge Spoil Pill Area

As discussed in Section 2, Site 14 was created by disposing dredge material from Pensacola Bay along the shorefront east of Chevalier Field. This area of land was at one time the site of state-owned submerged lands and is presently not considered Navy property. Dredge material was disposed between 1975 and 1977 from dredging operations for the aircraft carrier turning basin (NEESA 1983). Contaminants that may be found in the dredge material are unknown. It is probable that whatever compounds were present in the marine sediments offsore of NAS Pensacola are still present in these dredge sediments.

3.3 Site 2 - Waterfront Sediment Site

Beginning in 1939, untreated industrial wastes from the Naval Aviation Depot (NADEP) and the Naval Air Rework Facilities (NARF) operations vere discharged directly into Pensacola Bay. At least 83 million gallons of untreated waste consisting of paint, paint solvents and thinners, ketones, trichloroethylene, Alodine, mercury, radium paint, and concentrated plating wastes (primarily chromium, cadmium, lead, nickel,

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and cyanide) vere disposed into the Bay until 1973 when the IWTP vas put into operation (G & M *1984).*

Environmental studies of Site 2 vere first conducted under the direction of the Navy Assessment and Control of Installation Pollutants (NACIP) Department (NEESA 1983). During this study, sediment samples vere collected and analyzed vith EP toxicity methods (see Table 3-1 for analytical results). Elevated levels of lead (11 and 5 parts per million [ppm]) and chromium (8 ppm) vere detected in nearshore sediments. Methodologies for these studies did not utilize the current methods approved by the Florida Department of Environmental Regulation (FDER; Schropp and Vindom 1988). FDER has developed a tvo-acid digestion protocol as a first step in an atomic absorption technique for analyzing total metals concentrations in marine sediments (essentially modified U.S. Environmental Protection Agency [EPA] SW 846 methods). Results are then compared to a set of background data to determine vhether the concentration of certain metals is elevated in the sediments.

A study conducted in 1984 by Thompson Engineering and Testing, Inc. (TET) collected four sediment samples along the four edges of the turning basin (see Figure 3-1) and analyzed them for sediment grain size, retals, polychlorinated biphenyls (PCBs), and other organic compounds. The sediments at the northeastern side of the turning basin are sandy silt, clayey silt vith sand, and silty clay and are characterized as fine-grained. The sediments at the southvestern side of the turning basin are fine sands and fine sands vith silts and are characterized as coarse-grained. No elevated levels of metals or PCBs vere detected; hovever, some of the analytical methods used in the study vere not the currently approved methods for marine sediment analysis.

G & M (1984, 1986) conducted a verification and characterization study at the NAS facility that examined Site 2. Six sediment samples vere collected approximately 300 feet offshore from the storm sever outfalls in about 30 feet of water (see Figure 3-1). These samples vere analyzed vith EP toxicity methods, but the laboratory analysis table in the

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TABLE 3-1

METALS CONCENTRATIONS IN MARINE SEDIMENTS NEAR NAS PENSACOLA

Station Number	Date	Study	Metal Concentrations (mg/kg dry weight)							
			Cd	Cr	Hg	Ni	Pb	Al	Zn	As
2	1/82	NACIP *	0.37	3.1	0.006	1.4	11	-	-	-
3			ND	8.0	0.022	-	-	-	-	-
4			0.13	1.1	0.01	-	-	-	-	-
5			0.12	0.69	0.031	0.06	5.0	-	-	-
1A	4/84	G&M **	<.01	<.01	<.005	<.1	<.1	-	-	<.001
1%			<.01	<.01	<.005	<.1	<.1	-	-	0.002
1C			<.01	<.01	<.005	<.1	<.1	-	-	<.001
1D			<.01	<.01	<.005	<.1	<.1	-	-	<.001
1E			<.01	<.01	<.005	<.1	<.1	-	-	0.003
1F			<.01	<.01	<.005	<.1	<.1	-	-	<.001
3	11/84	TET	0.007	1.82	0.096	0.63	0.7	920	1.9	-
4			0.032	6.94	<.02	3.99	1.9	4,320	7.7	-
5			0.094	60.2	<.02	20.9	17.4	30,900	47.8	-
6			0.080	44.9	0.062	13.4	8.9	21,700	32.5	-
1	3/86	WAR ***	0.25	91.7	0.175	-	2.1	34,400	56.4	-
3			0.06	28.0	<.1	-	<1.	10,835	15.8	-
6			<.05	3.15	0.125	-	<1.	1,385	4.1	-
8			<.05	3.36	<.1	-	<1.	565	2.8	-
10			<.05	2.41	<.1	-	<1.	284	2.1	-
49			0.09	40.9	0.12	-	<1.	14,850	68.3	-
50			0.08	4.27	<.1	-	1.1	3,595	14.0	-
51			0.06	33.0	<.1	-	<1.	13,795	26.5	-
BIL-1	7/85	FDER	0.89	-	0.43	-	16.7	55,333	103.3	10.0
BIL-2	7/85		0.53	-	0.27	-	10.9	47,667	83.3	8.9
PNB-2	4/82		0.16	-	0.78	13.7	19.3	59,333	57.0	-
PNB-5	9/82		0.21	-	0.18	6.8	8.9	6,767	9.5	-
PNB-6	9/82		0.17	-	0.05	3.1	15.3	2,033	5.7	-
PNB-10	7/85		0.02	-	0.05	-	0.62	260	1.0	0.25

- = Not analyzed.
* EP Toxicity Analytical Methods.
** EP Toxicity Analytical Methods, results reported in mg/L.
*** Unknown analytical methods.

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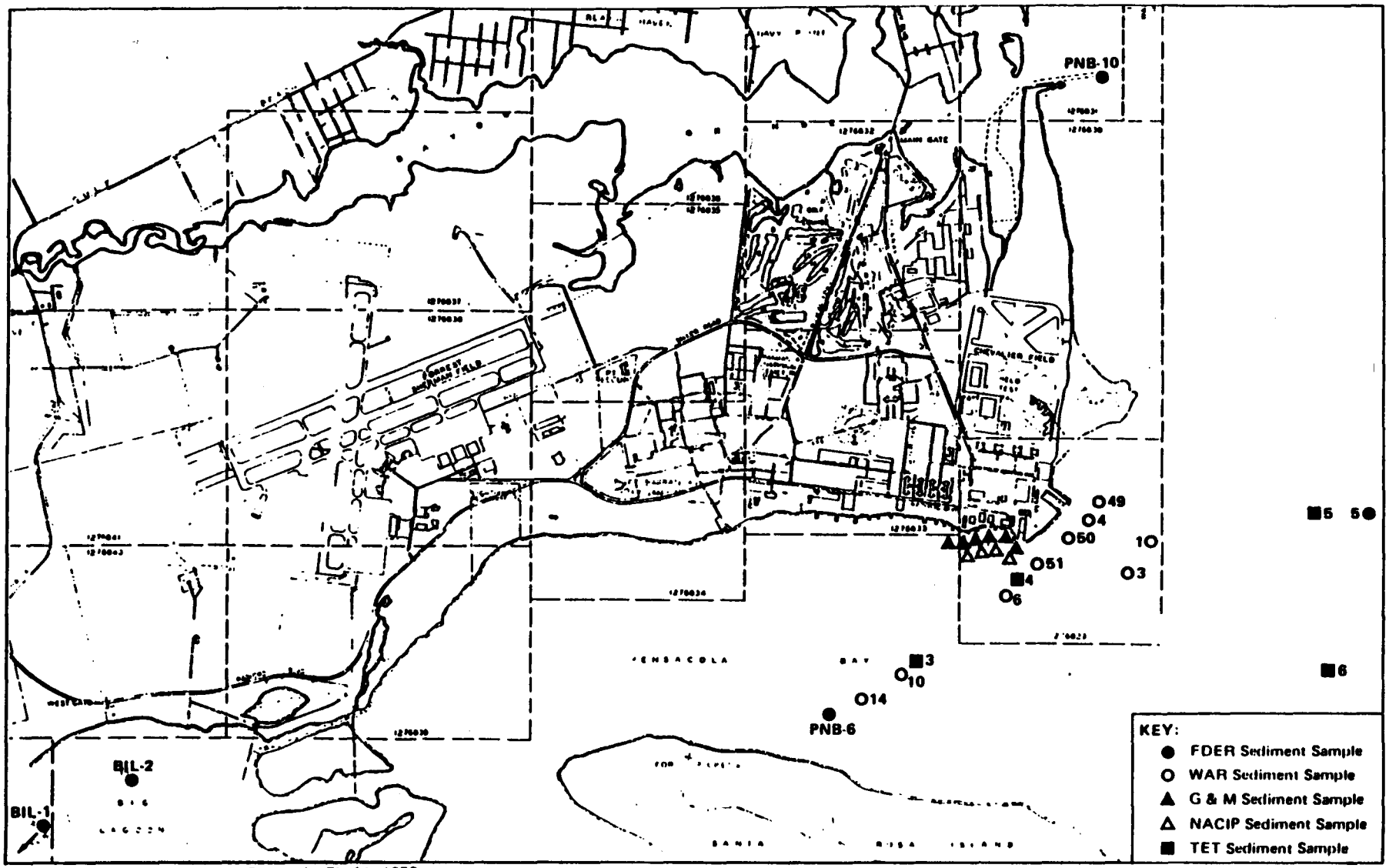

SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1972.

SCALE
0 2000 5000 FEET

Figure 3 - 1 SEDIMENT SAMPLING LOCATIONS FROM PREVIOUS STUDIES CONDUCTED BY NAS PENSACOLA OR FDER

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report indicated that the samples were first filtered and then extracted for metal concentrations. Trace amounts of arsenic (0.002 and 0.003 ppn) were detected in two samples. The laboratory results are reported in milligrams per liter (mg/L) and not milligrams per kilogram (mg/kg); therefore, it is suspected that an elutriate test was performed on the sediment samples instead of a metals extraction test.

A study in support of an environmental impact statement was conducted in 1986 by the Navy, regarding the feasibility of expanding the facilities at NAS Pensacola. Water and sediment samples were collected in the turning basin and analyzed for heavy metals (see Figure 3-1 and Table 3-1). Even though the FDER recommended methodology was employed to evaluate the sediment data, the results for both water and sediments are suspect because several metals were analyzed vith the wrong analytical methods, and detection limits and laboratory quality assurance/quality control (QA/QC) data are not provided. According to their report: stations 49 and 51 sediments had elevated levels of chromium and zinc; stations 1 and 3 sediments had elevated levels of chromium; and station 50 sediments had elevated levels of zinc. Analytical methods reportedly used for analysis of samples for chromium, polynuclear aromatic hydrocarbons, PCBs, phenols and other analytes were incorrect for marine sediments.

To determine if sediments have been enriched with anthropogenic sources of nitrogen (both organic and ammonia nitrogen) ratios of total Kjedahl nitrogen (TKN) to total organic carbon (TOC) concentrations were examined. If sediments are enriched vith organic or ammonia nitrogen, the ratio will exceed 0.13; if not enriched, the ratio will be less than 0.13. WAR Station 10 was found to have TKN:TOC ratios exceeding that of natural sediments. Water quality data could not be evaluated from their report because the station numbers from their figure and analytical table did not match, and the methodologies for TOC and TKN were incorrect for marine sediments (WAR 1986).

FDER has collected sediment data from all of Pensacola Bay and has made this information available to E & E. Analytical results and sample

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station locations from FDER's study vithin Bayou Grande and the turning basin are given in Figure 3-1 and Table 3-1. The tvo stations located southvest of the storm water outfalls, BIL-1 and BIL-2 in Big Lagoon, contained elevated levels of mercury, as did Station PNB-2, northeast of the turning basin (see Figure 3-1). Stations located east of the turning basin, PNB-5 and PNB-6, had elevated levels of lead. Ratios of TKN:TOC indicated nitrogen enriched sediments at stations PNB-5, PNB-6, and PNB-10 (FDER 1988).

Prom all of these studies it can be concluded that inadequate sampling vas performed near the storm sever outfalls (improper analytical methods), and not all suspected pollutants were analyzed for in the sediment analysis (metals analysis only). The levels of heavy metals found near UAS Pensacola indicate sow possible contamination problem in the nearshore Bay sediments; however, the data base at band does not indicate a clear source of the contamination. None of these studies addressed the bioaccumulation which may be occurring in shellfish in the area adjacent to the NAS facility. The concentrations of contaminants in the shellfish may be higher than those of the surrounding sediments due to bioaccumulation. The potential for human health effects from ingestion of contaminated shellfish in intertidal waters near NAS Pensacola exists, and therefore warrants further investigation of nearshore sediments.

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4. CLIMATOLOGY

NAS Pensacola is located in an area that typically experiences a mild, subtropical climate. This climate is a result of the latitude (approximately 30° North) and the stabilizing effect of the adjacent Gulf of Mexico (Wolfe et al. 1988). The average annual temperature ranges from 55° Fahrenheit (F) in the winter to 81° F in the summer. Although the annual temperature range is fairly stable, actual daily values can be more extreme, ranging from less than 7° F in the winter to more than 102° F in the summer. Thunderstorms occur during approximately half of the days during the summer months and can cause a 10° to 20° F drop in temperature in only a few minutes (Wolfe et al. 1988).

Precipitation rates in the NAS Pensacola vicinity are relatively high with an average annual rainfall of approximately 60 inches. Rainfall amounts are highest in July and August during almost daily thunderstorms (averaging 7 inches per month) and lowest during spring and fall (averaging 4 inches per month; Kennedy 1982). High intensity thunderstorms are common, producing as much as 3 to 4 inches of rainfall during a single hour. Evaporation rates are also highest in the summer months, which reduces the potential recharge resulting from heavy summer rains. Spring and fall rains are generally less intense, but longer in duration, producing less surface runoff and higher rates of infiltration and net .recharge.

Wind velocities are generally moderate except during thunderstorms (Carlisle 1960). Prevailing winds are northerly during the winter and southerly during the summer. An ocean-land temperature differential produces a daily clockwise rotation of the surface wind direction near

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the coast, commonly known as the'sea-breeze effect (Flood and Associates 1978). Hurricanes and tornadoes are infrequent but can cause substantial daaage to the nearshore environment. Six hurricanes have passed vithin 50 miles of Pensacola since 1980.

5. BIOLOGICAL RESOURCES

The NAS Pensacola facility consists of approximately 5,800 acres and encompasses approximately 15 terrestrial and aquatic habitats. The majority of the land on the eastern side of the facility is developed for military use or is designated as a historical or cultural resource. However, the NAS Pensacola installation has approximately 3,500 acres in natural or semi-natural (plantation) condition, primarily in the western portion of the facility.

5.1 Regional Biological Resources

5.1.1 Terrestrial

Vegetation. The primary vegetated communities of the NAS Pensacola facility can be considered one of two types: north Florida coastal strand communities, and sand pine scrub communities. The north Florida coastal strand communities are stabilized coastal dunes with a sand substrate, vegetatively characterized by the plants Uniola paniculata (sea oats), Hydrocotyle bonariensis (beach pennywort), Ipomoea stolonifera (beach morning-glory), Coccoloba uvifera (sea grape), Quercus geminata (twin live oak), and the stunted shrubs species Yucca aloifolia (yucca), Opuntia, and Cereus. This community type has been ranked by the Florida Natural Areas Inventory (FNAI) as locally restricted and vulnerable to extinction due to developmental activities. This community type can have three to five distinct habitat types (Wolfe et al. 1988).

The sand pine scrub community is a more upland coastal community characterized by coastal dune formations from an older geologic age with deep, fine, white sand substrate and the plants Pinus clausa (sand

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pine), Quercus spp. (scrub *oak* species, geminata, champanii, myrtifolia, and inopina), Cladonia species, and Ceratiola ericoides (rosemary). This community type has been ranked by FNAI as imperiled statevide because of its rarity and because of its vulnerability to extinction due to some artificial or biological factor. This community type can have three to five distinct habftats (Uolfe et al. 1988).

Two other community types may be found in the western portions of the NAS Pensacola facility. These are flatwoods and sandhill vegetative communities. Flatwoods vegetation occupies areas which were ocean bottoms in recent geologic times. Primary overstory vegetation is dominated by Pinus palustris (longleaf pine), Pinus elliottii (slash pine), and Serenoa repens (saw palmetto). Flatvoods communities also occupy areas of lov depressions and small creeks and drainage courses, but the overstory Vegetation is usually replaced by Taxodium ascendens (pond cypress), Cliftonia monophylla (black titi), Cyrilla racemiflora (swamp titi), and other hydric or riparian species. Open moist savannah areas within flatwoods are dominated by the herbaceous plants Pinguicula spp. (butterwort), Sarracenia spp. (pitcher-planes), Uticularia spp. (bladdervorts), Polygala spp. (milkworts), and Drosera spp. (sundevs; Wolfe et al. 1988).

Sandhill communities are found in dry soils which are lover in fertility than flatwoods soils. The overstory of this community type is dominated by Pinus palustris (longleaf pine), Quercus laevis (turkey *oak)*, Q. marilandica (bluejack *oak)*, Q. stellata (post *oak)*, and Q. falvata (southern red oak). The understory is dominated by Diospyros virginiana (wild persimmon) and Crataegus lacrimata (Pensacola havthorn). The more abundant herbaceous plants found in moist areas are Pteridium aquilinum (bracken fern) and Aristida stricta (wire grass). These habitats were verified with valk-through surveys and ground truthing by the Navy in March of 1986 (Navy 1986).

Freshwater Vetland Vegetation. Huch of the geological material 'underlying the NAS Pensacola facility is deep, porous sand often containing relatively impermeable clay lenses. In combination with high

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annual rainfall, this geologic condition causes the formation of small areas of perched groundwater. In areas with relatively steep slopes, groundwater seepage escapes into well-defined stream channels called steepheads as found near Site 30. In gently sloping areas, the presence of perched groundwater conditions results in the formation of wetland bogs, as found near Sherman Field. Wetland or seepage bogs are characterized by herbaceous plant species as described in the sections above for flatwoods and sandhill communities. Host of these communities and other vegetative communities east of Sherman Field have been considerably altered by development on the base that has changed surface and/or groundwater flow (NEESA 1983).

Shrub bogs are found within flatwoods, downslope of herbaceous bogs. These evergreen bogs are dominated by Cliftonia monophylla (black,titi) and/or Cyrilla racemiflora (swamp titi). Associated species include Clethra almifolia (sweet pepperbush), Ilex cassine (dahoon holly), and Lyonia spp. (fetterbushes; Wolfe ~~et al~~. 1988).

Intermittent streams found on NAS Pensacola have lost most of the original vegetation associated with this habitat. For example, at Site 30, the stream that empties the small swamp into Bayou Grande has lost a considerable amount of vegetation along the stream banks and near Bayou Grande as a result of base development. In areas unaffected by development, hardwoods dominate the canopy around the stream. Such species as Hagnolia virginiana (sweetbay), Illicum floridanum (star anise), and ~~Smilax bona-nox~~ (spiked cat brier) are dominants of seepage or steephead streams (Wolfe ~~et al~~. 1988).

Biota surveys must be conducted for any wetland or stream habitat that is influenced by a site to determine which specific flora and fauna may be affected by site activities.

Birds. A literature search reveals 250 possible bird species associated with the area. Thirteen of these species are endangered, and seven are species of concern (see Appendix C). In March 1986, the Navy conducted a survey and found 23 species of birds on the NAS Pensacola facility.

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The Navy recorded moderate site rookeries of the great blue heron and found large numbers of nesting osprey in the southvestern portions of the NAS Pensacola facility. Because of the large nunber and diversity of habitats found around the facility and considering that the survey vas conducted during a predominantly non-mating season, it is likely that there are more species of birds using the facility and surrounding vaters as feeding and nesting sites than have been found.

Reptiles and Amphibians. During the 1986 survey conducted by the Navy, only four out of a possible 30 species of reptiles and amphibians associated with the area vere identified on the NAS Pensacola facility, none of which are endangered. A recent check of the FNAI files confirms that the presence of the gopher tortoise, Gopherus polyphemus, can most likely be found in suitable habitats on the western portions of the facility (see Appendix C). Most of the reptiles and amphibians that may be found on the facility can be expected to use the surface vater bodies in some stage of their life cycle. Any contamination of surface vater bodies can be detrimental to existing populations of reptiles and amphibians utilizing that va ter body.

5.1.2 Aquatic

Freshwater. Little is knovn of the flora and fauna inhabiting the stream, swamps, and bogs found on NAS Pensacola. These habitats may have been significantly altered for drainage control and base development. Some of the species associated vith aquatic habitats are Semotilus atromaculatus (creek chub), Gambusia affinis (mosquitofish), and Etheostoma sp. (darters). Birds, mammals, reptiles, and amphibians that associate with aquatic habitats may also be found in and around those sites with surface vaters (Wolfe et al. 1988).

Coastal Vetlands. There are no reported coastal marshes or estuarine vctlands around the NAS Pensscola facility, principally along the lov energy shores of Bayou Grande. The habitat type is usually dominated by saltmarch cordgrass (Spartina alternaflora) or black needlerush (Juncus roemarianus). A biota survey of these and other potential habitat areas will be conducted to determine the extent of estuarine flora and fauna.

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Seagrass beds are reported to be present within Big Lagoon along the southwestern portion of the NAS facility. These grassbeds are composed primarily of Thalassia testudinum, Syringodium filiforme, and Halodule beaudettei. Seagrass beds in the area surrounding the facility have not been historically mapped, and very little is knovn of their composition, locality, or areal extent. Grass beds of unknown species composition extending along the north shore of Pensacola Bay in the 1950s disappeared by 1961. An examination of historical aerial photographs (see Section 12) may elucidate past distributions of seagrasses.

Plankton. The only existing study of the phytoplankton and zooplankton in the waters surrounding the NAS Pensacola facility was conducted by the Navy in March of 1986. The phytoplankton has been characterized as lov in productivity (as compared to other Gulf coast estuaries), and mainly dominated by the diatoms Navicula tripuncata, Bacteriastrum spp., Chaetocerus spp., Thalassionema nitzschoides, and Hemiaulus spp. The zooplankton is primarily dominated by Calonoid copepods and benthic invertebrate larvae. This study is very limited by the fact that samples were collected with undefined methods and only during the early spring. This sampling protocol does not define population fluctuations that are characteristic of low population abundances commonly found in estuaries during the summer months. Examination of the zooplankton data results in the same conclusions. It should be pointed out that any contamination entering Pensacola Bay from either groundwater or surface water sources may be accumulated in the invertebrate larvae that predominate most estuarine water bodies.

Benthos. Marine soft-sediment communities are found adjacent to the northern, eastern, and southern areas of the NAS Pensacola facility in Pensacola Bay. Although no intensive benthic surveys were conducted along the perimeter of the facility, surveys at nearby sites by FDER and the Navy have described the benthic communities vithin Pensacola Bay as a whole.

FDER collected benthic samples in most of Pensacola Bay and found that the sediments were dominated by polychaetes (Aricidea spp., Capitella

spp. , various spionids, and Eaploscoloplos spp.) and bivalves (Anodontia alba and Tellina spp.) during most of the year. FDER saaples collected along the wastewater treatment plant outfall show a drastic drop in species abundance and diversity close to the sewage outfall (Navy 1986). This indicates that the benthic community might have been negatively influenced by the sewage outfall.

Samples collected by the Navy (1966) indicate a low density yet moderate diversity of benthic infaunal organisms when compared to other estuarine systems within and around the turning basin. A coaplete comparison of the Navy's data can not be made to other literature at this time because their data are not given in numbers per unit area. Eovever, the Navy's data reveal that very few deep dvclling organisms reside in the areas around the turning basin, and a lack of deep dwelling benthic organisms may be an indication of a benthic community under stressed conditions (Luckenbach et at. 1988).

Fish and Shellfish. Early studies of Pensacola Bay have identified 180 bony fish species and seven cartilaginous fish species (Cooley 1978). The 13 most abundant species were spot (Leiostomus xanthurus), pinfish (Lagodon rhomboides), Atlantic croaker (Micropogonias undulatus), gulf menhaden (Brevoortia patronus), bay anchovy (Anchoa aitchilli), longspine porgy (Stenotus caprinus), silver perch (Bairdiella chrysoura), southern hake (Urophycis floridana), inshore lizardfish (Synodus foetens), gafftopsail catfish (Bagre marinus), sand seatrout (Cynoscion arenarius), and spotted hake (Urophycis regia; Heil 1988).

Fish diversity was highest in the more saline waters near the NAS Pensacola facility during spring and summer. In the less saline waters of East Bay, diversity was lowest in summer and highest during the winter months. Fish population density vas the highest in the more saline waters, with peaks throughout the summer (Cooley 1978). Moderate densities of blue crab (Callinectes sapidus), shrimp (Penaeus duorarum, P. setiferus, and P. aztecus), and oysters (Crassostrea virginica) have been collected throughout Pensacola Bay (Heil 1989). Shriap are caught in greater abundances near NAS Pensacola because

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of the higher salinities. Blue crab and oysters are more readily caught in the East Bay area. In fact, the only legal shellfishing areas recognized by FDNR are in the East Bay area. Scallops (Aequipecten irradians) are collected only within grassbed areas. No information is available at this time on where scallops are collected by the general public and how many are removed. The nearest seagrass beds to the NAS facility are located in Big Lagoon along the southwest portion of the facility.

Sport and Commercial Fishing. A moderate amount of commercial fishing occurs in Escambia County, accounting for 2% of the total Florida landings for 1980 to 1985 (Navy 1986). The dominant finfish species in terms of total veight was the black mullet. The most economically important species of finfish was the red snapper. E & E examined the commercial landing data for Escambia County for 1987 and 1988 (Heil 1989) and found that the most important commercial species by veight were: black mullet (24% of county landings), brown shrimp (21%), vermillion snapper (19.5%), red snapper (7.6%), porgies (4.7%), and amberjack (4%). Other less important commercial fish caught were Spanish mackerel, sand seatrout, black grouper, spotted seatrout, blue crab, and squid. These data, as well as the Navy's data, also suggest that a significant tuna fishery may be developing in the Pensacola Bay area (0 pounds landed in 1983; 1,582 pounds in 1987).

Sport fisheries data are not available for the State of Florida at this time due to the lack of a state saltwater fishing license (Heil 1989). A telephone survey conducted by the U.S. Fish and Wildlife Service ranks the spotted seatrout as a primary fish species sought by fisherman in 1987. Following this species were: king mackerel, red drum, Spanish mackerel, groupers, red snapper, flounders, and sand seatrout. It is likely that the sport fishing catch equals or exceeds commercial landings for species sought by both interests (Navy 1986).

The estuarine system is a very important element in the life history of most of the commercial and sport fishing species sought. Between 65 and 90 percent of all commercially valuable fish species are estuarine

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dependent during some phase of their'life cycle. Shrimp, blue crab, and shellfish are known to release larvae that feed in and around estuaries until settlement. During early life history stages, the juveniles reside vithin seagrass beds or other protected habitats until maturity. Any contamination of the vater or sediments around NAS Pensacola could be detrimental to fish and shellfish population structure or could be accumulated by the organisms residing near the facility.

Marine Mammals. Fev mammals have been sighted vithin the area of the NAS Pensacola facility; most of the 13 species of mammals reported for the northeastern Gulf of Hexico stay predominantly in gulf vaters. The Atlantic bottlenose ph rsi truncatus), however, has been sighted regularly off the NAS Pensacola facility. Manatees have been sighted irregularly, vith one recent sighting in the area recorded by the Florida Natural Areas Inventory (FNAI) in October 1988. A goosebeaked vhale (Ziphius cavirostris) vas reported stranded on Santa Rosa Island, and a pilot vhalc (Globicephala macrorhynchus) vas found stranded on a beach near Pensacola (Navy 1986).

Although no surveys of marine mammals have been conducted, it can be assumed that they are quantitatively ranked as uncommon to common in abundance vithin the vaters surrounding the NAS Pensacola facility.

Threatened and Endangered Species. A number of threatened and endangered species (see Appendix C) have been identified in the vicinity of the NAS Pensacola facility. Many rare, threatened, and endangered species are associated vith the wetland or bog habitats found on NAS Pensacola. A total of 57 occurrences for six plant species vere recorded in an inventory conducted by FNAI (1988b) of the NAS Pensacola facility (see Appendix C). Host of these plants vere found in the area around Sherman Field and habitats to the vest. Any site remediation and, more importantly, any assessment of environmental endangerment must consider the vater level requirements of rare and endangered plant species, the foraging activities of birds in the waters surrounding the

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NAS Pensacola facility, as well as nesting and feeding animals on the facility grounds. Complete biotic surveys may be necessary to determine the presence of threatened or endangered species and potential pathvays of contamination to these species.

5.2 Site-Specific Biological Resources

Habitats within Sites 13 and 14 have been disturbed to varying degrees by base activities. Site 13 has a vegetative community dominated by pioneer-stage understory shrub-species and some associations of longleaf-slash pines. Hammals, amphibians, reptiles, and birds associated with coastal vegetated communities, as well as waterfront habitats, could be found in and around this site. Waterfront and wading birds may also utilize this site for resting areas. Site 14 is dominated by coastal dune grasses and some shrubs. Since the site is essentially a created sand dune area, it is expected that fauna associated with this coastal habitat may utilize this site for feeding, resting, and/or nesting. Site 2 can most likely support large numbers of waterfowl during the migration periods of October through March, and wading birds throughout the year. These bird species will be feeding on marine organisms and plants that may have been in contact with contaminated sediments around the NAS Pensacola facility. Site 2 would not directly affect any of the reptiles or amphibians found in this area, except for the American alligator (Alligator mississippiensis), which feeds on fish and birds possibly contaminated by ingestion of sediments.

Site 2 may have some impact on the production of invertebrate larvae and their survival if contamination exists in the nearshore sediments. This site may also have affected the benthic populations adjacent to NAS Pensacola in some way. Sediment samples taken near the storm water outfalls have been shown to contain various levels of heavy metals. These metals can bioaccumulate within benthic polychaetes and bivalves, and can then be consumed by other organisms higher in the food chain (e.g., shrimp, flounder, blue crabs, and coastal birds); or these metals

may have had an immediate toxicological effect on the structures of these benthic populations, thereby reducing the food resource found near the NAS Pensacola facility.

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6. SURFACE WATER HYDROLOGY

6.1 General Occurrence and Significance of Surface Water

The NAS Pensacola facility is located on a coastal peninsula bounded by Bayou Grande to the north, Pensacola Bay to the south and east, and Big Lagoon to the southwest. Pensacola Bay and Big Lagoon are partially separated from the Gulf of Mexico by Santa Rosa Island and Perdido Key, both of which are barrier islands.

Surface soils consist primarily of permeable sands which allow rapid infiltration of precipitation. This direct infiltration limits stream formation and constitutes the major source of recharge to the underlying Sand-and-Gravel Aquifer.

There are no naturally occurring perennial streams on NAS Pensacola; however, there are approximately 10 naturally occurring intermittent streams and numerous artificial drainage pathways which include many stormwater outfalls. Discharge is mainly to the south into Pensacola Bay; however, some small' intermittent streams discharge into Bayou Grande to the north from Sherman Field and Chevalier Field (U.S. Geological Survey [USGS] 1970a and b).

The southwestern and northern portions of NAS Pensacola contain areas of freshwater vetlands. These are particularly sensitive areas formed by the intersection of the water table with the land surface. These systems are defined by and dependent upon a dynamic water-cycle, with periodic inundation and exposure corresponding to seasonal fluctuations in the water table.

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The discharge of surface vaters into Pensacola Bay, Bayou Grande, and the coastal vetland areas presents the potential for transport of contaainants into these systems. This could have a significant impact on seagrass and other sensitive plant communities, as well as on shell fishing, recreational fishing, and swimming in these coastal zones. Discharges, either through the surface vater or groundvater, into vetland areas found on site could also have a significant impact on the biotic communities that are dependent on those habitats.

62 Site-Specific Surface Water Hydrology

Sites 13 and 14 do not have any lentic or lotic bodies of vater; however, both sites are adjacent to Pensacola Bay.

Site 2 is located vithin Pensacola Bay, and, excluding tidal influence, bay vater moves generally from the northeast portions of the bay to the southvest into the Gulf of Mexico, primarily due to the river inputs in the central and eastern portions of the bay. Tidal influence is slight, with a mean amplitude of 1.2 feet, and total bay flushing is estimated to occur every 3 to 4 weeks (98,000 cfs out Pensacola Pass during tidal cycles; Ketchen and Staley 1979). With each 'tidal period, a vedge of salt vater can move up into Pensacola Bay underneath the lens of freshvater floving out (Wolfe et al. 1988). Currents immediately offshore from the U S facility have been modeled by the Navy (WAR 1986), and although this information has not been revieved by E & E, it is predicted that currents vould carry vastes in a southwesterly direction away from the NAS facility and out of the bay through Pensacola Pass. The influence of tidal currents along the bay bottom is not known at this time, but facility vastes may be carried up into Pensacola Bay if disposed of vithin the tidal current.

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7. PHYSIOGRAPHY AND HYDROGEOLOGY

7.1 Physiography and Regional Hydrogeology

7.1.1 Physiography

NAS Pensacola is located in the Gulf Coastal Lowlands Subdivision of the Coastal Plain Province physiographic division (Brooks 1981). The 5,800-acre facility is located on a peninsula bounded on the east and south by Pensacola Bay and Big Lagoon and on the north by Bayou Grande. The most prominent topographic feature on the peninsula is an escarpment or bluff which parallels the southern and eastern shorelines and on which Fort Barrancas was built. In the eastern portion of NAS Pensacola the bluff runs north-south just to the west of Chevalier Field. Seaward of the escarpment is a nearly level marine terrace with surface elevations of approximately 5 feet above HSL. The central part of the peninsula, located landward of the escarpment, is a broad gently rolling upland area with surface elevations up to 40 feet MSL (USGS 1970a, 1970b). Sandy soils occur throughout the NAS Pensacola area. As a result, most of the rainfall infiltrates directly into the subsurface. Consequently there are few streams or surface water bodies on the peninsula.

7.1.2 Regional Hydrogeology

There are three principal hydrogeologic units of importance which underlie the NAS Pensacola. These are, in descending order, the Surficial Aquifer, the Intermediate System, and the Floridan Aquifer System.

7.1.2.1 Surficial/Sand-and-Gravel Aquifer

The Surficial Aquifer occurs from land surface to a depth of approximately 300 feet at NAS Pensacola and is composed of a sequence of

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unconsolidated to poorly indurated clastic deposits (Wagner et al. 1984). In this portion of Florida, the Surficial Aquifer constitutes an important source of vater supply and is called the Sand-and-Gravel Aquifer (Southeastern Geological Society [SEGS] 1986). [Based on the total dissolved solids (TDS) content of groundvater from vells that tap the Sand-and-Gravel Aquifer in southern Escambia County (Clemens et al. 1989), the groundwater is classified as Class G-1 (FDER 1988b).] The sediments making up this aquifer belong to all or part of the Pliocene to Holocene Series vhich, in this area, consist mainly of the Citronelle Formation overlain by a thin cover of marine terrace deposits. Given that the Sand-and-Gravel Aquifer is contiguous vith land surface and recharge occurs principally by the direct infiltration of precipitation, the aquifer is particularly susceptible to contamination from surface sources. In the NAS Pensacola vicinity, the Sand-and-Gravel Aquifer is made up of three zones based on contrasting permeabilities. These zones are referred to as the surficial zone, the lov permeability zone, and the main producing zone (Vilkins et al. 1985).

Surficial Zone. The surficial zone is contiguous vith land surface and contains groundvater under vater table or perched vater table conditions. The results of numerous borings conducted at NAS Pensacola (G & M 1984, 1986) indicate that the surficial zone ranges in thickness between 40 and 70 feet and consists of tan and brovn, fine- to medium-grained quartz sand. Depth to the vater table vithin the surficial zone is variable depending on location and ranges from less than 1 foot near surface vater bodies to more than 20 feet in areas of higher elevation. In general, the direction of groundvater flov is controlled by the topography and by discharge to surface vater bodies. Consequently, shallov groundvater in the surficial zone moves tovard areas of lover elevation and/or the nearest surface vater body. Overall, the surficial zone has a high permeability. Numerous aquifer (slug) tests and laboratory permeability tests conducted on vells in or sediments from the surficial zone at NAS Pensacola (G & M 1986) yielded hydraulic conductivity values ranging from 16 to 56 ft/day. Horizontal

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groundwater flow velocities in the surficial zone will depend on site-specific hydraulic conductivities and horizontal hydraulic gradients; however, velocities would generally be expected to be high.

Low Permeability Zone. Underlying the surficial zone is a zone of lower permeability sediments dominated by clay and silt-sized material. This zone is referred to as the low permeability zone. At NAS Pensacola, this zone is generally composed of gray to blue, sandy, silty, slightly fossiliferous (shelly) clay and clayey sand ranging in thickness from 8 to 40 feet (G & M 1984, 1986).

The results of laboratory permeability tests conducted on samples from this zone indicate that vertical hydraulic conductivities are low, ranging from 4.2×10^{-5} to 9.9×10^{-2} ft/day. Thus, the low permeability zone probably functions as a confining or semi-confining unit inhibiting the flow of groundwater between the surficial zone and the underlying main producing zone. The low permeability zone has been encountered in at least 16 borings at widely spread locations throughout NAS Pensacola (G & M 1984, 1986). Although additional boring or geophysical techniques would be required to confirm its presence at a given location, it is likely that this unit is ubiquitous at NAS Pensacola. Few, if any, wells are open to the low permeability zone at NAS Pensacola; thus, no information is available regarding groundwater flow direction.

Main Producing Zone. The bottom portion of the Sand-and-Gravel Aquifer is called the main producing zone and consists mainly of sand and gravel interbedded with thin beds of silt and clay. The depth at which the main producing zone is encountered is somewhat variable, ranging from 60 to approximately 120 feet below land surface (BLS) at NAS Pensacola. This zone generally has the highest permeability characteristics due to thicker and more persistent sand and gravel beds, and is tapped by most of the major vells in the Pensacola area (Wilkins et al. 1985). NAS Pensacola has three supply wells which produce water from this zone; however, due to high iron content in the water, the vells are infrequently used (G & M 1986). The principal sources of water for NAS

Pensacola are vells located at Corry Field, approximately 3 miles to the north. The thickness of the main producing zone can be highly variable; however, it is estimated to be up to about 100 feet at NAS Pensacola. Insufficient data exist for vells open to the main producing zone at NAS Pensacola to determine direction of groundvater flov vithin this zone; however, the flov direction is assumed to be generally southvard under ambient conditions. Pumpage of the supply vells vould locally cause groundvater in this zone to flov toward the vells.

As a result of the overlying lov permeability zone, groundvater vithin the main producing zone occurs under confined or semi-confined conditions. At one nested vell location on NAS Pensacola (east of Building 648), the vater level elevation in a vell open to the main producing zone is approximately 7 feet lover than that in an adjacent vell open to the surficial zone (G & M 1986). This indicates that a significant dovnvard hydraulic gradient exists betveen these tvo zones. Thus, a considerable potential exists for vertical groundvater flov from the surficial to the main producing zone at this location. It is not known to vhat extent this potential exists elsevhere at NAS Pensacola.

7.1.2.2 Intermediate System

The lover limit of the Sand-and-Gravel Aquifer coincides with the top of a regionally extensive and vertically persistent hydrogeologic unit of much lover permeability. This unit is referred to as the Intermediate System. In the vicinity of NAS Pensacola, the top of the Intermediate System generally lies vithin the sediments termed Miocene Coarse Clastics or corresponds to the top of the Upper Member of the Pensacola Clay and occurs at a depth of approximately 300 feet (Vilkins et al. 1985). In general, the Intermediate System consists of fine-grained sediments and functions as an effective confining unit vhich retards the exchange of vater betveen the overlying Sand-and-Gravel Aquifer and the underlying Floridan Aquifer System (SBGS 1986). For the most part, the entire sequence is poor to non-water bearing. Hovever, relatively thin beds of sand vhich exist vithin the unit may yield small quantities of vater. In the NAS Pensacola area the Intermediate System is

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approximately 1,100 feet thick and is composed of the lover portion of the Miocene Coarse Clastics, the Upper Member of the Pensacola Clay, the Escambia Sand Member of the Pensacola Clay, and the Lover Member of the Pensacola Clay; all are of Miocene Age.

7.1.2.3 Floridan Aquifer System

Immediately underlying the Intermediate System and occurring at a depth of approximately 1,500 feet BLS at NAS Pensacola is the Floridan Aquifer System. The Floridan Aquifer in this area is composed of the Middle to Lower Miocene Chickasavhay Limestone and undifferentiated Tampa Stage Limestone. Groundwater vithin the Floridan Aquifer in this area is highly mineralized and is not used for water supply (Wagner et al. 1984).

7.2 Site Hydrogeology

In the immediate vicinity of Sites 13 and 14, .the surficial zone of the Sand-and-Gravel Aquifer occurs from land surface to a depth of approximately 42 to 48 feet. This lithologic description of 'cuttings collected during the installation of monitoring vells GH-65, GH-66, and GM-67, located vest of Site 13, indicates that this zone primarily consists of white to buff, fine- to medium-grained quartz sand (G & H 1987b). Thirteen shallow monitoring vells exist around the IVTP that are open to the surficial zone in the vicinity of Site 13 (G & H 1988). These wells indicate that the vater table along the peninsula occurs approximately 1 to 3 feet BLS depending on land surface elevation and tidal influence. Based upon studies conducted by G & M on the IWTP, ambient groundvater flov in the surficial zone is generally towards the Pensacola Bay or Bayou Grande, depending on proximity to either vater body. However, seven recovery vells have been installed into the surficial zone to treat groundwater contaminated by the IWTP (G & M 1987a), with an average total pumping rate of 46 gallons per minute (gpm) or 1.987 million gallons per month (G 6 M 1988). This recovery system has been shown to locally influence groundwater flov near the western side of Site 13, redirecting groundwater flov towards the recovery system (G & H 1988). G & H (1987a) has information on the recovery vells installed around the IWTP that indicates specific.

capacities ranging from 0.35 to 1.7 gpm/ft at a pumping rate of 6.2 to 45 gpm. Immediately underlying the surficial zone in the vicinity of Sites 13 and *14* and extending to a depth of approximately 55 feet is the lov permeability zone of the Sand-and-Gravel Aquifer. Based on the cuttings from the installation of vells GU-63, GH-65, GM-68, and GM-74, this zone primarily consists of gray clayey silt with some shell fragments. No monitoring vells opening into the lov permeability zone exist in the vicinity of Sites 13 and 14; hovever, based on the lithology, this zone vould be expected to function as a confining or semi-confining unit restricting the flov of groundvater betveen the surficial zone and the underlying main producing zone. The direction of groundvater flov within the low permeability zone is unknown.

The top of the main producing zone occurs approximately 55 to 60 feet belov land surface in the vicinity of Sites 13 and 14 (G & M 1987b) and consists of gray, fine- to medium-grained sand to a depth of at least 120 feet. Monitoring vells GH-63, GM-65, GH-68, and GM-74 are screened betveen 62 and 65 feet and apparently open to the main producing zone. Water level elevations in these vells are approximately 1 foot lover than in the nearby shallov vells, indicating a downward hydraulic gradient between the surficial zone and the main producing zone (G 6 M 1987a).

The direction of groundvater flov vithin the main producing zone at these sites is unknown; hovever, a generally southern flov is expected under ambient conditions. *An* NAS Pensacola supply well (Well No. 2) is located approximately 0.75 mile west-southvest of Sites 13 and 14, is screened betveen 105 and 160 feet BLS, and thus is open to the main producing zone. The vell is utilized by NAS Pensacola for backup vater supply only during periods of peak demand. Eovever, during these periods of pumping the direction of flov in the main producing zone would be directly tovard the supply vell. Insufficient data exist for vells open to the main producing zone to allow a determination of hydraulic gradient at NAS Pensacola.

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8. PROJECT MANAGEMENT PLAN

The Generic Project Management Plan (GPMP) defines the technical approach and schedule as well as the qualifications of personnel who will be directing and performing this Contamination Assessment/Remedial Activities Investigation. This work plan will incorporate and reference applicable technical and schedule sections, as appropriate, and will follow B & E's project management guidelines (see Section 22).

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9. SITE MANAGEMENT PLAN

The Generic Site Management Plan (GSHP) defines the management procedures for field activities on both the site and program level. The management and implementation of all field activities conducted as part of the Contamination Assessment/Remedial Activities Investigation of Site 1 will follow the GSMP and any updated versions. Data Quality Objectives (DQOs) and all applicable or relevant and appropriate requirements (ARARs) have been considered in developing the initial phases of fieldwork described here and will be updated and revised for any subsequent phases of fieldwork.

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10. HEALTH AND SAFETY PLAN

A comprehensive General Health and Safety Plan (GHSP) and individual site-specific safety plans (SSPs; [see Appendix A]) have been developed to provide readily available emergency information and preventative safety measures. The GHSP outlines health and safety procedures and protocols to be followed during all field investigations at each of the 39 sites on NAS Pensacola. The plan includes standard operating procedures (site entry, decontamination, etc.); hazard communication and training (safety training, briefings, documentation, etc.); safety equipment and instrumentation (monitoring, personnel protective equipment, etc.); hazard evaluation by contaminant class (metals, organics, etc.); and hazard evaluation for each task (drilling, sampling, etc.). The GHSP will be periodically updated, as required, during the course of this program.

In addition, the GBSP and the individual SSPs will define the toxicological properties and health hazards associated with each site. The SSP will include emergency action information pertinent to the safety of the field personnel and of the public (e.g., hospitals, ambulatory units, poison control centers, fire departments, and police/sheriff departments). The SSP will also identify first-aid and personal safety equipment, and will provide recommended site security precautions. The GBSP and the SSP will comply with the Occupational Safety and Health Administration (OSHA) Guidelines for Hazardous Vaste Operations (29 Code of Federal Regulations [CFR] Section 1910).

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11. QUALITY ASSURANCE PROJECT PLAN

A Generic Quality Assurance Project Plan (GQAPP) has been prepared and submitted to the Navy. This comprehensive document will be referenced for all field and laboratory procedures for this program used to develop the Site-Specific Quality Assurance Plans (SQAPs; [see Appendix B)).

The SQAP will provide site-specific QA/QC measures used to obtain accurate and precise data for all site investigation activities. The SQAP will address all phases of the investigation from development of the initial sampling plan through verification and reporting of the analytical results. All of the QA/QC procedures described in the GOAPP and SQAP will be in accordance'with applicable professional technical standards, EPA requirements, and specific Navy goals and requirements for this project. All samples will be collected, handled, packaged, preserved, and transported in accordance with the GQAPP and SQAP and vith U.S. Navy and EPA procedures.

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12. AERIAL PHOTOGRAPH ANALYSIS

Prior to the initiation of fieldwork, E & E will examine all available aerial photographs of NAS Pensacola for past and present conditions, features, and developments which may have direct relevance to the fieldwork methodology. The aerial photograph analysis task will involve assembling and stereoscopically analyzing historical photographic imagery and topographic maps available for the site area. For the purpose of supporting the development of field investigation strategies, efforts will be made to obtain photographs of an appropriate scale that will allow for analysis of past and present surface conditions, drainage, and land use. Photographs showing the history of site activities will be analyzed to obtain information regarding the evolution of site features that might have affected hydrologic conditions. The historical perspective gained by studying aerial photographs will provide insight applicable to such tasks as field reconnaissance and monitoring well placement. In addition, the analysis of historical and current aerial photographs, performed in conjunction with geophysical investigation, will aid in the accurate determination of the extent of the formerly used area at the site.

13. UTILITIES SURVEY

Prior to conducting any augering, boring, drilling, or excavation activities, E 6 E will locate all underground cables, pipes, utilities, or other obstructions which may become damaged or otherwise hinder fieldwork. The appropriate authorities (e.g., NAS Pensacola Public Works and Southern Bell) will be contacted to identify the location of all underground utilities in the site area. In addition, E & E will examine available maps and documents and will conduct a metal detector survey on site to determine the presence of any other potentially hazardous subsurface features. If appropriate and applicable, other surface geophysical techniques may be used to locate deeper obstructions not readily detected with a metal detector. The locations of all underground utilities or obstructions will be marked with surveyors flags, day-glow paint, or by other methods as appropriate. This task may be conducted as part of the physical survey but will be considered a separate task for cost purposes.

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14. FIELDWORK METHODOLOGY

14.1 Phase I — Field Screening

The primary objective of the Phase I field screening investigation is to effectively and efficiently focus the Site Characterization (Phase 11) and subsequent Extent Delineation (Phase III and Phase IV) studies. The field screening phase will employ a variety of field investigation techniques, including the collection of samples for laboratory analysis. Hovever, the analysis of these samples will be subject to less rigorous QA/QC requirements, which reflect the "focusing" objective--rather than a formal contaminant quantification objective--of this phase. Each field screening task will utilize all existing information from preceding tasks, including aerial photograph analyses, to adjust the locations of the various surveys and sampling locations, thereby achieving optimum results. The objectives/advantages of the field screening methods are discussed in detail in Section 9.1 of the GQAPP.

14.1.1 Physical *Survey*

14.1.1.1 Overall Physical Reconnaissance

Site 2 -- At the present time, the exact location of the storm sewer outfalls is unknown. **More** information regarding the outfalls will be obtained during Phase I. A walkover survey will be conducted along the waterfront from Building 632 to the east and beyond the dock for the USS Lexington, and to the north of the waste water treatment plant, in order to map the exact location of storm sewer outfalls. At low tide, a walkover survey'of the shallow bay bottom will be conducted to determine the lateral extent of the concrete platform that extends out into Pcnsacola Bay.

Sites 13 and 14 -- A field reconnaissance survey will be conducted on and around Sites 13 and 14. Available aerial photographs and maps will be vwed as guides in locating surface features. Visual inspections will be made regarding surface conditions, surface drainage patterns, areas of exposed debris, leachate seeps, and stained soils.

During the reconnaissance survey, the field team will identify areas that present the most suitable conditions for the establishment of grid survey baselines. The use of a grid system as part of the Phase I field investigation is discussed in the folloving subsections.

The reconnaissance survey team will utilize radiation (Site 13 only) and air monitoring (Sites 13 and 14) equipment during walkovers of site areas, in accordance with Section 6.1.1 of the GQAPP. In the event that any **[areas** vitb readings above **background]** are located, the area(s) will be flagged and identified'on a site u p for future reference.

14.1.1.2 Radiation Survey

Sites 2 and 13 -- A radiation survey will be conducted using a Micro-R-meter and gamma scintillation detector on sites 2 and 13. The survey will be conducted in accordance with Section 6.3.2 of the GQAPP. For Site 13, measurements will be made at each 100-foot center grid point. For Site 2, measurements will be made vithin and around each storm sewer outfall. All readings will be recorded in the field logbook.

14.1.1.3 HNu/OVA Surface Emissions Survey and Particulate Air **[Screening]**

Preliminary air screening will be conducted with a particulate monitor, such as a Mini-Ram, to determine if the site represents a source of particulates in the air. The air **[screening]** will be conducted in accordance with Section 6.1.[1] of the GQAPP.

Site 2 -- A surface emissions survey will be conducted for each of the storm sever outfalls located during the physical survey to detect vapors and provide indications of whether the conduits are discharging volatile

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wastes. The surface emissions survey will be performed only at outfalls that are above the bay water level. For this survey, an HNu, organic vapor analyzer (OVA), or other equivalent piece of monitoring equipment will be used in accordance with Section 6.1.1 of the GQAPP.

Sites 13 and 14 -- A surface emissions survey will be conducted utilizing a grid system and HNu and/or OVA air monitoring equipment. Grid points will be established at 100-foot intervals. Measurements will be made at each established grid point, and readings will be recorded in the field logbook. The survey will be conducted in accordance with Section 6.1.1 of the GQAPP.

14.1.1.4 Habitat/Biota *Survey*

During the physical reconnaissance, an E 6 E biologist/ecologist will determine the on-site terrestrial and aquatic habitats, and the surrounding habitats which may be affected by off-site contaminant migrations. During the walkover survey, rare, threatened, and endangered species and their potential habitats will be identified, and an evaluation will be made of general site conditions to support viable. populations of plants and animals. [Using historical aerial photographs and the *survey* results, a map illustrating the identified habitats will be generated.] A habitat/biota survey will be conducted for sites 13 and 14; an evaluation of the literature will be made for Site 2; and a visual confirmation of habitat types identified for Site 2 will be made during the sediment sampling.

14.1.1.5 Asbestos *Survey*

An asbestos survey will be conducted on Site 13 during the physical reconnaissance. This survey will consist of locating and identifying suspect building materials that could potentially contain asbestos. No sampling will be conducted, and suspect building materials will be mapped for future reference.

14.1.2 Analytical Screening

14.1.2.1 Laboratory Analyses

Phase I sampling activities for sites 2, 13, and 14 will require the installation of shallow temporary monitoring wells, groundwater sampling, and the collection of soil and sediment samples. All samples will be analyzed in the laboratory for analytical screening parameters. The analytical screening program has been developed for the Phase I effort to efficiently and cost effectively focus subsequent phases of site characterization and contaminant extent delineation. Analytical screening is addressed in detail in Section 9.1 of the GQAPP. Analytical requirements for samples collected in Phase I are shown in Table 14-1.

Marine Sediments -- Approximately 24 sediment samples will be collected from nearshore NAS Pensacola (see Figure 14-1). Metals analysis will be in accordance with the methods developed by FDER (Schropp and Windom 1988). The samples will be collected by divers using self-contained underwater breathing apparatus (SCUBA) and 4-inch diameter stainless steel cores taken to a depth of 6 inches.

Soils -- Approximately 16 soil samples will be collected from Site 13, and approximately 57 soil samples will be collected from 19 locations at Site 14. Soil samples will be collected from 5-foot intervals to the water table. For the purpose of estimating numbers of samples, the depth to the water table is assumed to be 5 feet at Site 13 and 15 feet at Site 14. Collection of the soil will be from either hand-held four-inch stainless steal bucket augers, or from the flights of a four-inch solid stem auger, extracted from the boring. As shown in figures 14-2 and 14-3, the locations for these soil borings are tentative. The information gained from field reconnaissance surveys and aerial photograph interpretations will allow adjustments and finalization of the soil boring locations. All sampling activities conducted at sites 13 and 14 will be conducted in accordance with Section 6.6 of the GQAPP.

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Table 14-1

PHASE I SAMPLING AND ANALYTICAL REQUIREMENTS—GROUP C

SITE 2

Medium	no. of Samples	Duplicates	Total	Analytical suit.[a,b]
Sediment	24	1	25	A

SITE 13

Medium	No. of Samples	Duplicates	Total	Analytical suit.[a,b]
Soil	16	1	17	A
Groundwater	4	1	5	A
TOTAL	20	2	22	

SITE 14

Medium	No. of Samples	Duplicates	Total	Analytical suite[a,b]
Soil	57	3	60	A
Groundwater	10	1	11	A
TOTAL	67	4	71	

14[NASP]UH1103:T0395/1798/11

Key:

[a]Analytical suite designations are as follows:

A = Volatile organic compounds, polynuclear aromatic hydrocarbons, phenols, pesticides and total PCBs, total recoverable hydrocarbons, and metals (total, unfiltered).

[b]Specific constituents encompassed by tho various chemical groups included within analytical suite A are identified in tables 9-1 through 9-[5] of the Generic Quality Assurance Project Plan.

[Source: Ecology and Environment, Inc., 1992.]

[Bold items enclosed in brackets denote changes to the last version of document]

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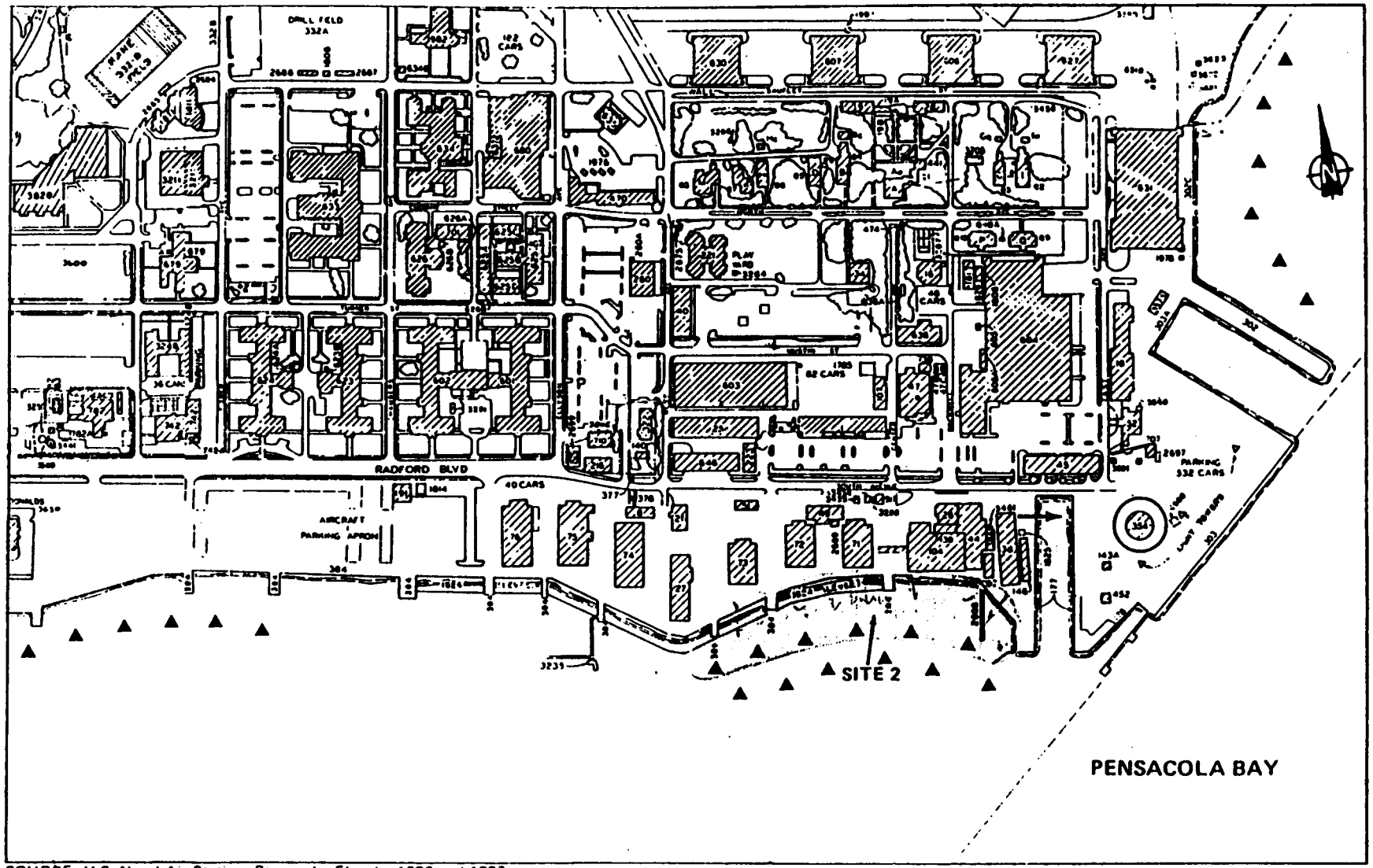

SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1986 and 1987.

KEY:

▲ Sampl

SCALE

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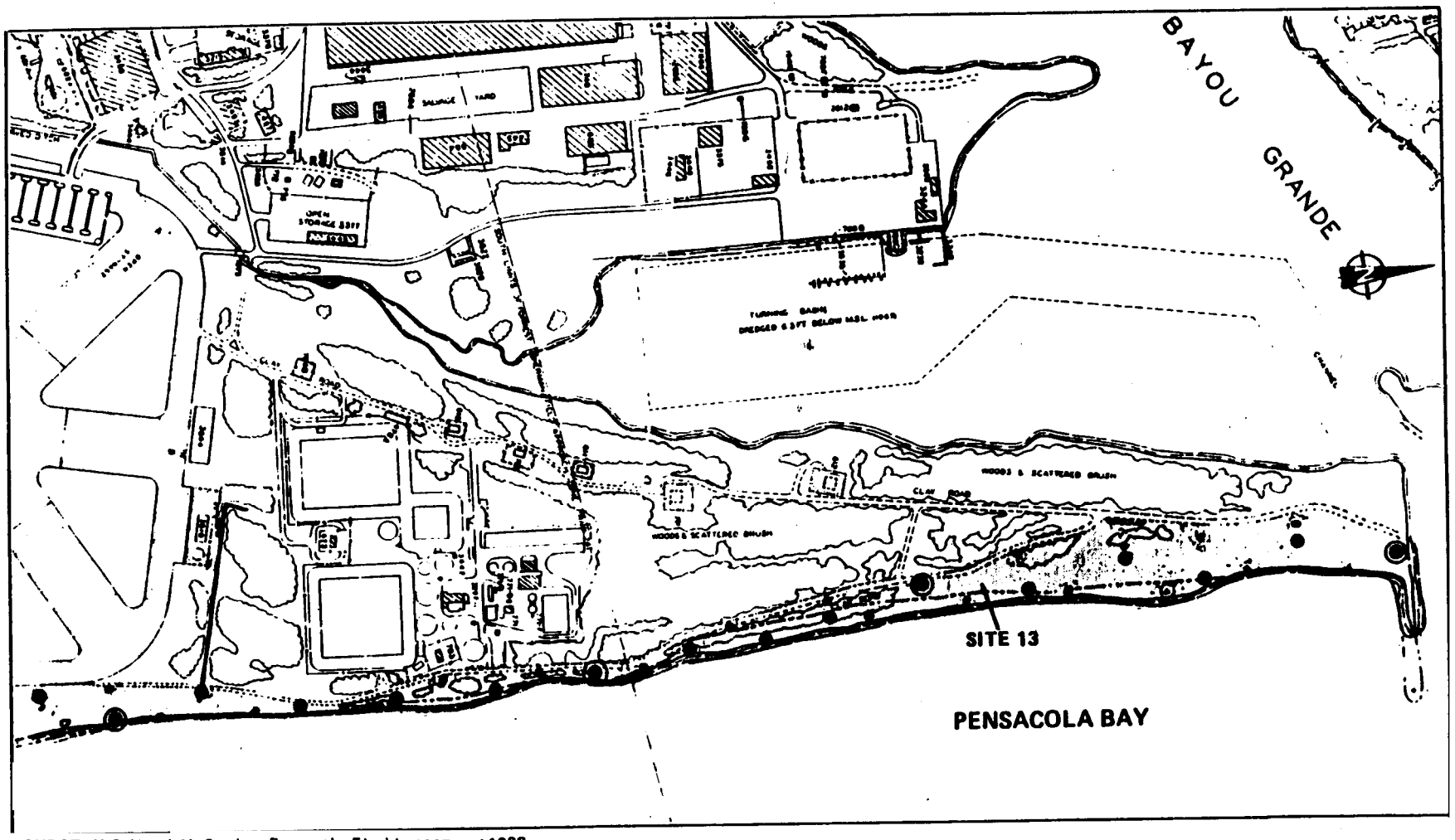
Figure 14-1
PROPOSED NEARSHORE SEDIMENT SAMPLING LOCATIONS, SITE 2 - PHASE I



OURCE: U.S Naval Air Station, Pensacola, Florida 1987 and 1988.

SCALE
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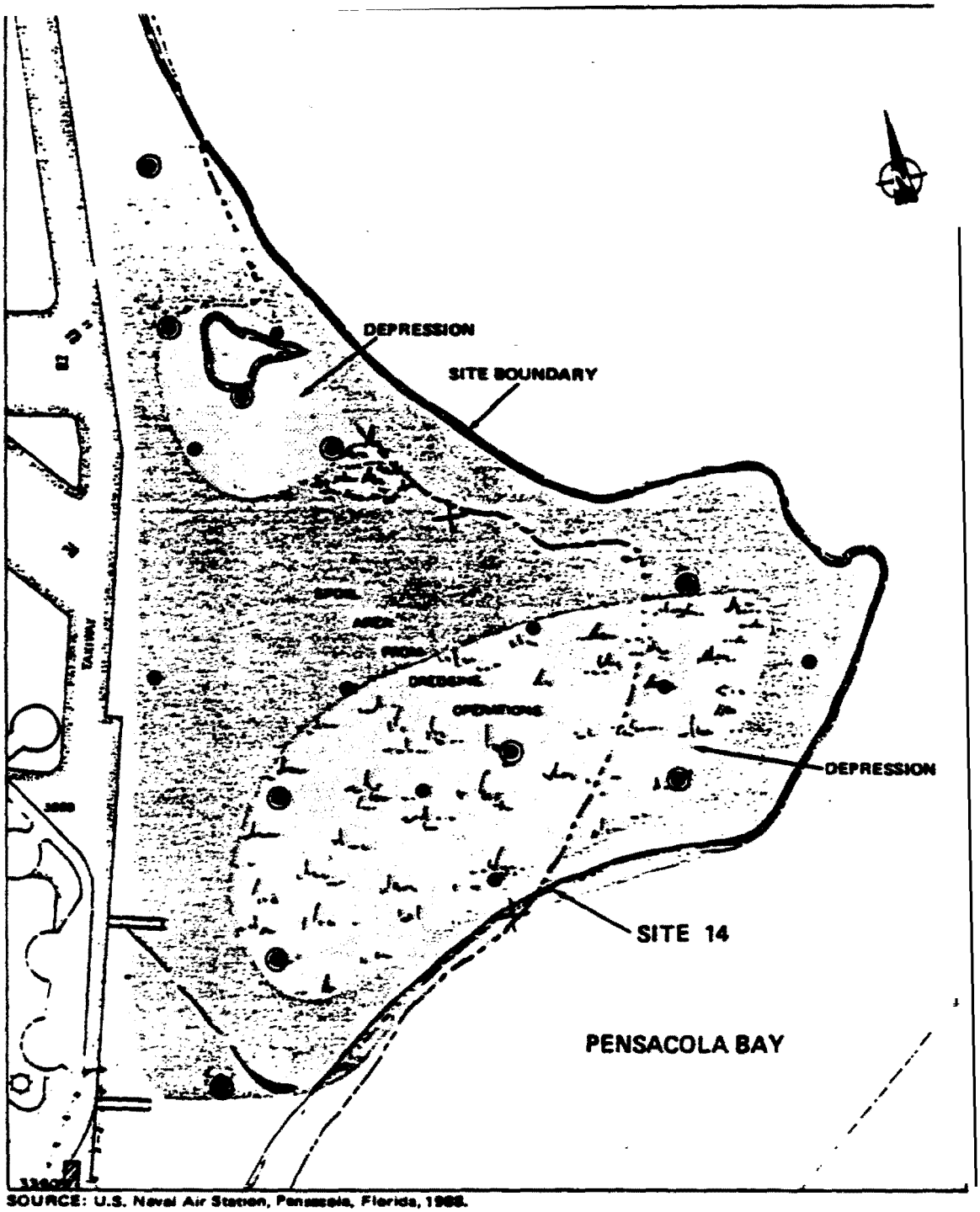
KEY:
● Tentative Soil Boring
◯ Tentative Temporary Monitoring Wall

Figure 14-2
TENTATIVE SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS
SITE 13 - PHASE I



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1988.

SCALE

0 200 400 600 800 FEET

KEY:

- Tentative Soil Boring
- Grasses
- Tentative Temporary Monitoring Well

Figure 14-3
TENTATIVE SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS
SITE 14 - PHASE I

Groundwater -- Approximately four temporary stainless steel monitoring wells will be installed on Site 13 and approximately 10 temporary monitoring wells will be installed on Site 14. The wells will be installed manually with a 75-pound slide hammer, and to a depth at which well screens bracket the water table. As shown in Figures 14-2 and 14-3, the locations for these wells are tentative. The information gained from field reconnaissance surveys and aerial photograph interpretations will allow adjustments and finalization of the temporary shallow well network. The 14 temporary wells will be purged and sampled in accordance with Section 6.8 of the GOAPP.

14.1.3 Hydrologic Assessment

The temporary wells and existing well network will be surveyed to obtain top of casing [TOC] elevations referenced to USGS datum or to a suitable established benchmark located within the vicinity of the sites. Static water levels will be measured in each well to determine shallow groundwater flow direction and horizontal hydraulic gradient. In conjunction with the wellhead survey, the elevations of other nearby features such as ponds, streams, and leachate seeps will be established. At least one rain gauge station will be established in the vicinity of sites 13 and 14, and precipitation will be monitored during fieldwork activities.

Eydrologic data and analytical screening data collected during Phase I will be evaluated, and evidence of lateral contaminant migration in shallow groundwater will be assessed. Conclusions drawn from these evaluations will form the basis for permanent monitoring well installations in phases II and 111.

14.2 Phase II--Characterization/Extent Delineation

This section of the Contamination Assessment/Remedial Activities Investigation Vork Plan--Group C (Site 2, Waterfront Sediments; Site 13, Magazine Point Rubble Disposal Area; and Site 14, Dredge Spoil Pill Area), Naval Air Station Pensacola, Pensacola, Florida, has been entirely revised to reflect the results of the Phase I activities proposed in the original work plan document ([June) 1990). The original

version ([June] 1990) of Section 14.2 of this vork plan is presented in Appendix D. Figures 14-4, 14-5, and 14-6 shov the actual Phase I sampling locations and location designations. The results of the Phase I investigations of sites 2, 13, and 14 are presented in E 6 E's Final Interim Data Report, Contamination Assessment/Remedial Activities Investigation, Waterfront Sediments (Site 2), Naval Air Station Pensacola, Pensacola, Florida, October 1991; E 6 E's Final Interim Data Report, Contamination Assessment/Remedial Activities Investigation, Magazine Point Rubble Disposal Area (Site 13), Naval Air Station Pensacola, Pensacola, Florida, October 1991; and E 6 E's Final Interim Data Report, Contamination Assessment/Remedial Activities Investigation, Dredge Spoil Pill Area (Site 14), Naval Air Station Pensacola, Pensacola, Florida, October 1991.

In general, the results of E & E's Phase I investigations of sites 2, 13, and 14, reviewed in combination vith those of previous investigations of the sites (NEESA 1983; and [Site 2 only] TET 1984, G&M 1984, and G&M 1986), indicated the folloving:

Site 2

- Sediments exhibit metal, total recoverable petroleum hydrocarbon (TRPH), volatile organic compound (VOC), and polynuclear aroutic hydrocarbon (PAH) contamination;

- Sediment contamination is concentrated along the eastern vaterfront, between building 27 and 44; most of this contamination may be associated vith former discharges of untreated industrial vastes from outfalls concentrated in this area; hovever, contributions from various off-site sources cannot be discounted;

- Sediments along the vaterfront vest of Building 27 exhibit isolated areas of contamination, potentially attributable to stormvater discharge, discharge from former industrial vastevater outfalls, and a past fuel spill near the McDonalds restaurant; and

- Minor TRPH sediment contamination occurs along the vaterfront, north of the aircraft carrier berth.

Site 13

- On-site contamination associated vith rubble disposal appears to be minimal; and

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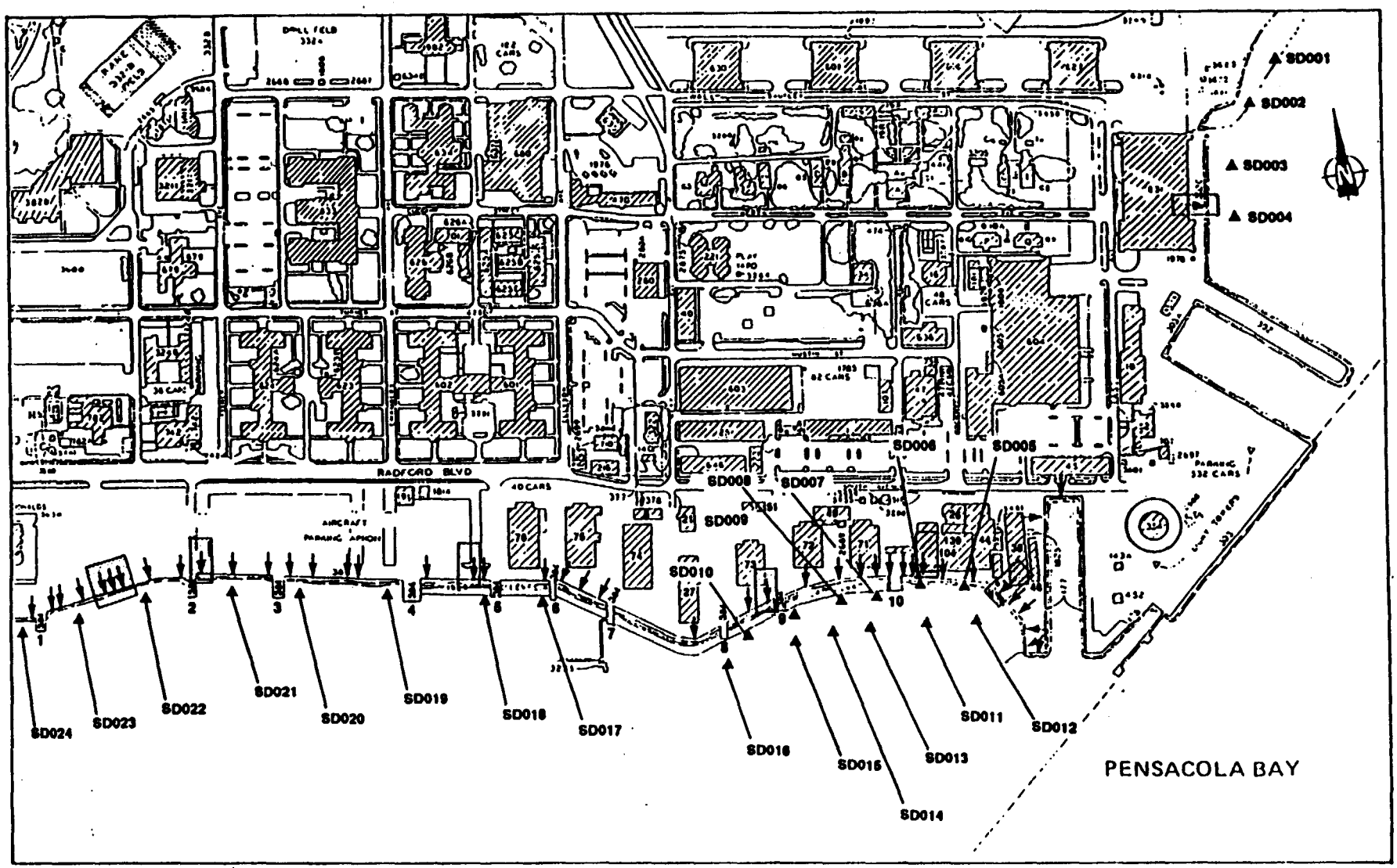

SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1986 and 1987; Ecology and Environment, Inc., 1991

KEY:

▲ Sediment Sample

SD001 Sediment Sample Number

Outfall

Stormwater Outfall

3 Seaplane Ramp

SCALE

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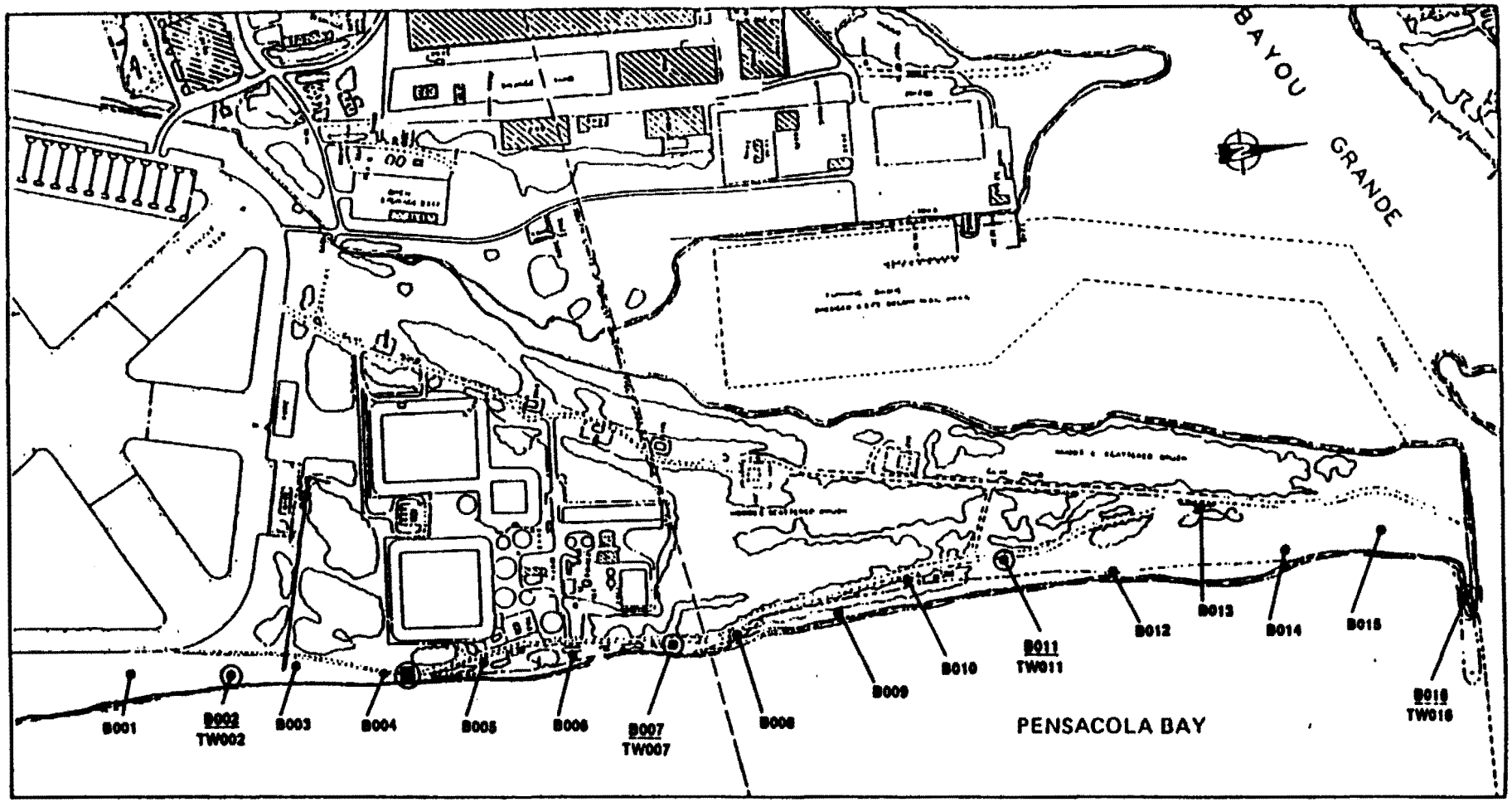
Figure 14-4 SEDIMENT SAMPLE LOCATIONS — NAS PENSACOLA SITE 2 — PHASE I



SOURCE: U.S. Naval Air Station, Pensacola, Florida 1987 and 1988; Ecology and Environment, Inc., 1991

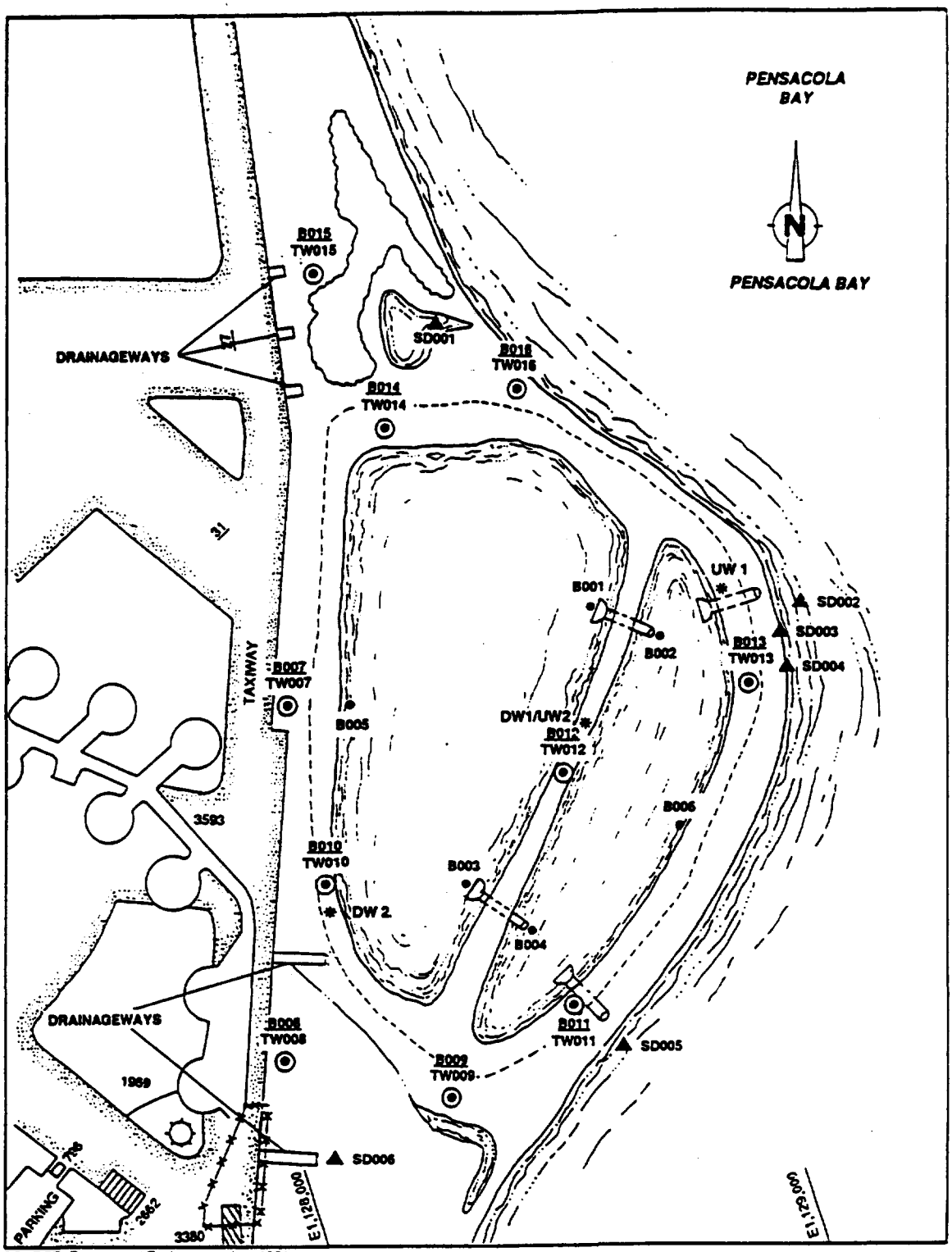
KEY:

- ○ Temporary Monitoring Well
- ● Soil Boring
- ▣ Asbestos Sample
- TW007 Temporary Monitoring Well 007
- B007 Soil Boring 007

SCALE

0 200 400 600 800 1000 FEET

Figure 14-5 ASBESTOS SAMPLE, TEMPORARY MONITORING WELL, AND SOIL BORING LOCATIONS— NAS PENSACOLA SITE 13— PHASE I



SOURCE: Ecology and Environment, Inc. 1991

SCALE

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KEY:

Water Control Stucture	SD001	Sediment Sample Number	*	Particulate Air Sampling Location
Soil Boring	B001	Soil Boring Number	DW 1/UW 2	Particulate Air Sampling Location Number (downwind/upwind)
Temporary Monitoring Well	TW007	Temporary Monitoring Well Number		
Sediment Sample Location				

Figure 14-6 PARTICULATE AIR SCREENING, SEDIMENT SAMPLE, SOIL BORING, AND TEMPORARY MONITORING WELL LOCATIONS — NAS PENSACOLA SITE 14 — PHASE I

- o Soil and groundvater contamination (TRPHs, VOCs, PAHs, and phenols) do occur adjacent to and east of the Industrial Wastewater Treatment Plant (IWTP, Group O sites), and this contamination appears clearly associated vith IWTP activities; in some cases, detected groundvater contaminant concentrations exceed federal and state standards.

[**Based** on these **Phase I** results, the investigation of Site 13 is no longer limited to screening but **will encompass a** full-scale RI/FS.]

Site 14

- o Sediments and soil exhibit metal, TRPH, VOC, PAH, and/or phenol contamination; concentrations are generally lov, vith several localized exceptions; contamination is fairly videspread, and the overall distribution suggests on-site sources associated vith the dredged material, off-site sources on Chevalier Field, and possibly ambient sources; and

- o Metals vere the primary groundvater contaminants detected, vith concentrations in six samples exceeding federal and state standards; hovever, the detected concentrations may reflect aquifer matrix soil contributions (i.e., these turbid samples vere not filtered prior to acid pteservation) rather than actual groundvater contamination; trace levels of **PAHs** and/or phenols vere detected in tvo samples.

[Based on these Phase I results, the investigation of Site 14 is no longer limited to screening but will encompass a full-scale RI/FS.]

In light of the Phase I results summarized above, the objectives of the Phase II investigations of sites 2, 13, and 14 will be **as** follovs:

Site 2

- o Identify to the greatest extent possible any additional off-site sources of contamination, as well as potential ambient sources of contamination in the site vicinity;

- o Determine the nature, magnitude, and extent of nearshore surface vater and sediment contamination and off-shore sediment contamination; and

- o Initiate the Risk Assessment and Feasibility Study for the site.

Site 13

- o Identify to the greatest extent possible any additional off-site sources of contamination, as well as potential ambient sources of contamination in the site vicinity;

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- o Determine the presence, nature, magnitude, and extent of nearshore surface water and sediment contamination up- and down-current from the IWTP;

- o Confirm the absence of significant soil and groundwater contamination on the site in areas not impacted by the IWTP; and

- o Initiate the Risk Assessment and, as warranted, Feasibility Study for the site.

Site 14

- o Identify to the greatest extent possible any additional off-site sources of contamination, as well as potential ambient sources of contamination in the site vicinity;

- o Determine the presence, nature, magnitude, and extent of nearshore and on-site surface water and sediment contamination;

- o Fully characterize the nature and magnitude and delineate the overall extent of on-site soil and groundwater contamination; and

- o Initiate the Risk Assessment and, as warranted, Feasibility Study for the site.

In order to meet the above objectives, the Phase II investigations of sites 2, 13, and 14 will include the following elements:

- o Contaminant source survey;

- o Surface water, sediment, and soil sampling;

- o Installation of shallow monitoring wells;

- o Collection of groundwater samples from all newly installed wells;

- o Hydrologic assessment; and

- o Engineering survey.

The specific scope of work associa ed with each of the above elements is described in sections 14.2.1 through 14.2.[4]. In developing the specific scopes of work, the Phase I and previous analytical results have both been evaluated regarding all requirements of the CERCLA and Superfund Amendments and Reauthorization Act (SARA), as well as all other ARARs. For sites 2, 13, and 14, these ARARs include:

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- o Resource Conservation and Recovery Act (RCRA);
- o Clean Vater Act (CWA);
- o Safe Drinking Vater Act (SDWA);
- o 40 CFR Parts 264, 265, 270, and 271 (Corrective Action for Solid Vaste Management Units at Hazardous Waste Management Facilities; Proposed Rule);
- o Chapter 17-3, Florida Administrative Code (FAC; Water Quality Standards);
- o Chapter 17-301, FAC (Surface Vaters of the State);
- o Chapter 17-302, PAC (Surface Vater Quality Standards);
- o Chapter 17-550, FAC (Drinking Vater Standards, Monitoring, and Reporting); and
- o Chapter 17-770, FAC (State Underground Petroleum Environmental Response).

Formal, quantitative air sampling will not be conducted during Phase II at sites 2, 13, and 14 because no evidence that any one of these sites represents a potential source of airborne volatile or particulate contaminants vas revealed by the Phase I surface emissions survey, particulate air [screening), or fieldvork air monitoring activities. Biota sampling will not be conducted during Phase II because the potential contaminants of concern have not been sufficiently characterized. **[However, basevide** biota sampling will be conducted in conjunction vith the investigation of operable units (OUs) 15, 16, and 17 (Bayou Grande *Area,* NAS Pensacola Wetlands, and Pensacola Bay Area, respectively).]

No intermediate or deep monitoring vells will be installed and sampled during the Phase II investigation of Site 13 because shallov groundvater contamination appears to be present only downgradient of the IWTP; consequently, groundvater contanination in this area of Site 13 will be further assessed in conjunction with the planned assessment activities at the IWTP (Group O sites). No intermediate or deep monitoring vells will be installed and sampled during the Phase II investigation of Site 14 because the presence, nature, distribution, and source area(s) of shallow groundvater contamination have not been adequately established.

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(Every effort will be made to complete the investigation of sites 2, 13, and 14 during Phase 11. To the greatest extent possible, the results of the Phase I investigation, as well as field data and/or observations generated during the Phase II investigation, will be utilized to adjust and/or redirect the Phase II efforts in order to maximize the amount of information obtained regarding the horizontal and vertical extents of possible contamination at these sites. Adjustments to the Phase II scope of vork may include, but may not be limited to: 1) sampling of additional media which are not already included in this vork plan; 2) installation of additional and/or deeper (i.e., intermediate and/or deep) permanent monitoring vells; 3) collection and analysis of additional samples from any given medium; and 4) performance of full-scale aquifer tests or other studies to further characterize the hydraulic properties of the soil or aquifer matrix. However, sampling and/or analysis will not be performed on media for vhich the associated procedures are not described in the approved GQAPP. Furthermore, additional data from other site investigations may become available prior to or during the completion of Phase II activities at these sites. This could varrant either an increase or decrease in the scope of work proposed in this vork plan.]

Based on the results of the activities identified above, during Phase II, E 6 E will initiate the appropriate Risk Assessment and, as warranted, Feasibility Study activities. Risk Assessment activities will be directed toward identification of contaminants of concern, as well as identification of data gaps that must be eliminated to support the eventual completion of a Baseline Risk Assessment for the sites. [If no data gaps are identified, the Baseline Risk Assessment will be completed during Phase II.]

Feasibility Study activities, which will probably be required for Site 2 and may be required for sites 13 and 14, will be directed toward identification of data gaps that must be eliminated to support the eventual completion of a comprehensive Feasibility Study for the sites. [If no data gaps are identified, the Feasibility Study will be completed during Phase II.]

In addition, if varranted, E 6 E will evaluate the Phase II results to identify vhether any interim remedial measures (IRMs) are required and develop recommendations for implementation of these IRMs (see Section 14.2.[5]). [IRMs will only be implemented following receipt of EPA approval.]

All Phase II investigation activities and results will be discussed in a separate interim data report for each site, structured in the required format of a formal draft Remedial Investigation report. This Phase II interim data report will provide a complete data synthesis incorporating the results of E & E's Phase I and Phase II investigations, as well as the results of previous investigations. The interim data report will specify vhether additional Phase III assessment activities are required or vhether the formal draft Remedial Investigation report for the site can be prepared.

All Phase I investigation activities vere completed in accordance vith E & E's 1990 GQAPP for Contamination Assessments and Remedial Activities at NAS Pensacola. All Phase II investigation activities will be completed in accordance vith the newly revised, updated [1992] version of this document, subject to its approval. [In this section (14.2),] all references apply to the [1992] version of the GQAPP.

14.2.1 Contaminant Source Survey

A detailed contaminant source survey will be performed at sites 2, 3, and 14 in order to obtain a comprehensive understanding of potential contaminant source(s) at the sites. The survey will focus on existing information in NAS Pensacola files, previous investigative reports, and intervievs vith current and former employees of the NAS Pensacola facility. Based on the information obtained from these sources, on-site past and/or present vaste streams(s) and vaste stream-related activities, on-site buildings and associated activities, on-site past and/or present underground utilities, and potential former and/or existing ambient sources of contamination will be delineated. All background source survey vork will be conducted in close communication vith

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the facility Installation Restoration (IR) coordinator as the survey may need to access repositories and/or individuals at several locations among the various tenant commands.

The identification of possible past and/or current waste streams, including volumes, disposal: methods, and/or any leaks, that may have occurred at or impacted the sites will be based on a review of the Phase I historical aerial photograph analyses and Phase I and Phase II on-site field observations. The compilation of a list of former and existing on-site buildings/structures and delineation of all associated activities will include the development of a detailed summary table and the provision of former and existing building/structure plans, if available. The evaluation of former and existing underground utilities at the site will include determining the former and current use of each utility structure. All former and existing utilities will be shown graphically on a site map (see Engineering Survey, Section 14.2.[4]), based on the detail available in the data base. Finally, the identification of potential former and existing ambient contaminant sources will involve an evaluation of existing files and literature to determine whether any normal daily activities at each facility, such as aircraft operations, may have created potential, low-level ambient contaminant source(s).

At sites 2, 13 and 14, specific tasks associated with the contaminant source survey will also include:

- Identification and detailed description of the numerous buildings at Site 2 and the buildings of Chevalier Field west of Site 14. This will include providing a description of past and current activities that have been associated with each particular building;
- Identification and location of past and present underground utilities (if any) associated with the buildings at sites 2 and 14; and
- Identification and location of drainage systems and structures that may act as outfalls from sites 2 and 14 to Pensacola Bay.

14.2.[2] Sampling and Analysis

Figures 14-7 and 14-8 shov the proposed Phase XI nearshore surface water and sediment and offshore sediment sampling locations for Site 2, respectively. Figures 14-9 and 14-10 shov the proposed surface vater and sediaent sample, soil boring, and monitoring well locations for sites 13 and 14, respectively. Tables 14-2, 14-3, and 14-4 summarize the sampling and analytical requirements, including QA/QC samples, for the Phase II investigation of sites 2, 13, and 14, respectively. Table 14-5 provides the specific rationale for each proposed Phase II surface water and/or sediment saaple location and for the analytical suite associated vith each proposed Phase II sampling location at Site 2. Tables 14-6, 14-7, and 14-8 provide the specific rationale for each proposed Phase II surface vater and sediment sample, soil boring, and monitoring well location, respectively, and for the analytical suite associated vith each proposed Phase II sampling location at Site 13. Tables 14-9, 14-10, and 14-11 provide the specific rationale for each proposed Phase II surface vater and sediment saaple, soil boring, and monitoring well location, respectively, and for the analytical suite associated vith each proposed Phase II sampling location at Site 14.

The sample location reference nuabers listed in Table 14-5 correspond to the location numbers on figures 14-7 and 14-8 (Site 2); the sample location reference nwbers listed in tables 14-6 through 14-8 and 14-9 through 14-11 correspond to the location nwbers on figures 14-9 (Site 13) and 14-10 (Site 14), respectively. The analytical suite designations used in tables 14-5 through 14-11 correspond to the designations used and defined in tables 14-2, 14-3, and 14-4.

During Phase II field activities at NAS Pensacola site groups A through E, soil borings, shallow aonitoring vells, and intermediate aonitoring vells will be completed at three background locations across the base, [clustered vith the existing deep supply wells. These background soil borings and monitoring wells,] together vith the three existing **[on-base]** deep supply wells, [vill be] sampled for analytical suite A **[(see E & B 1992a].** (Soil samples collected belov the vater table [BWT] **will** be analyzed for [Target Analyte List (TAL) metals]. These.

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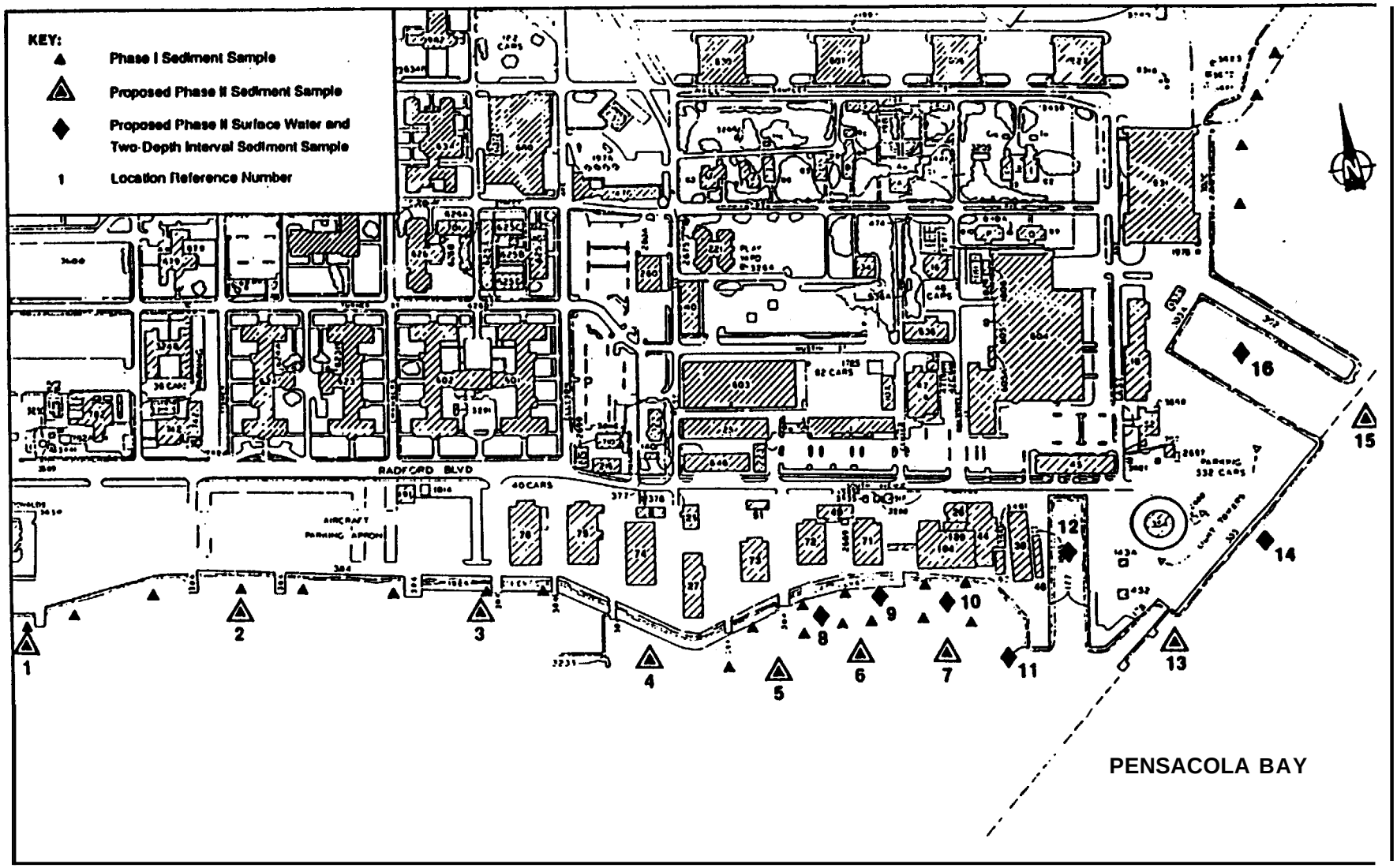
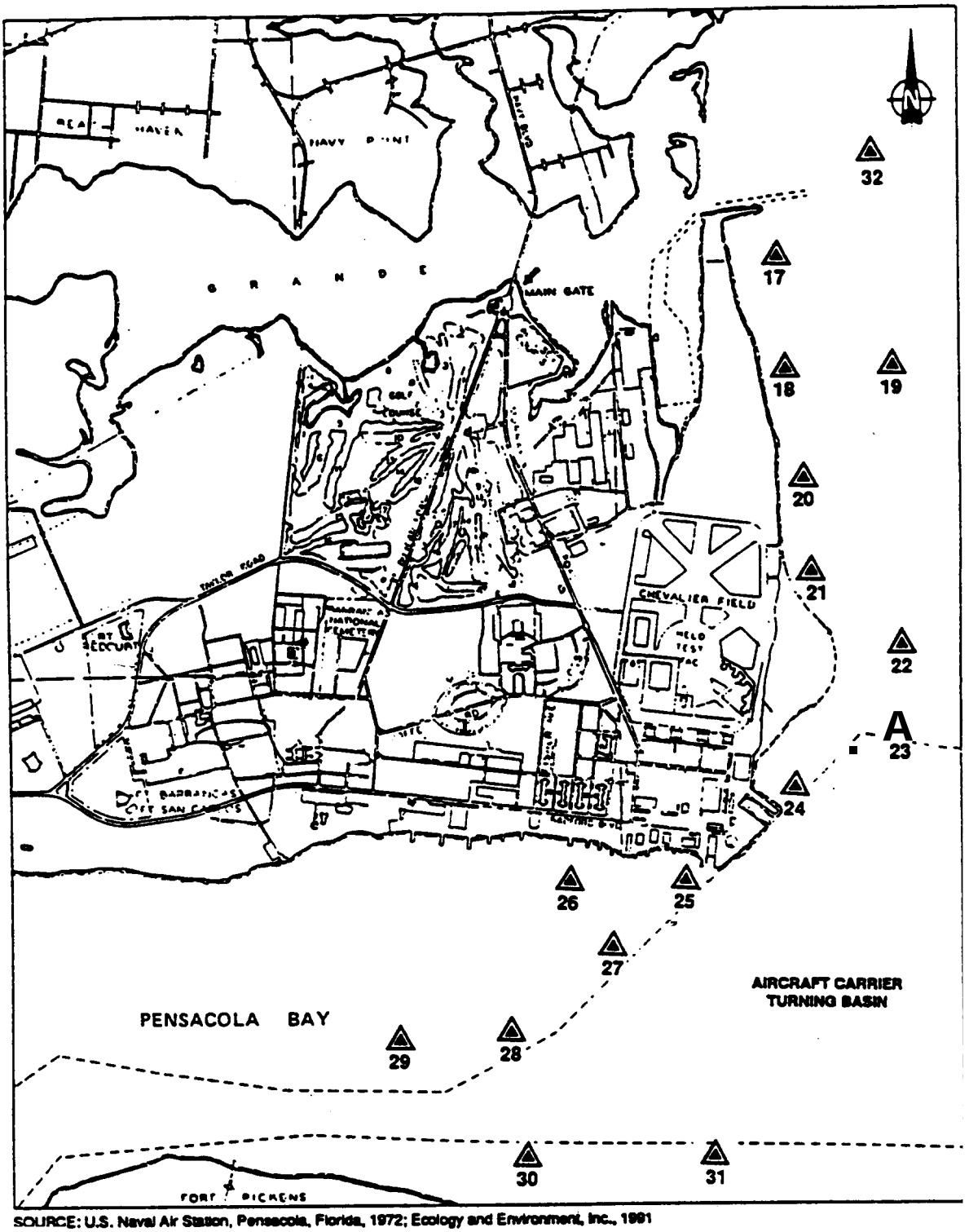


SOURCE: U.S. U.S. Naval Air Station, Pensacola, Florida, 1986 and 1987; Ecology and Environment, Inc., 1991

SCALE

0 200 400 600 800 1000 FEET

Figure 14-7 PROPOSED NEARSHORE SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS — NAS PENSACOLA SITE 2 — PHASE II



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1972; Ecology and Environment, Inc., 1991

SCALE

0 1000 2000 3000 4000 FEET

KEY:

Proposed Phase II Sediment Sample — 17 Location Reference Number

Figure 14-8 PROPOSED OFFSHORE SEDIMENT SAMPLE LOCATIONS — NAS PENSACOLA SITE 2 — PHASE II

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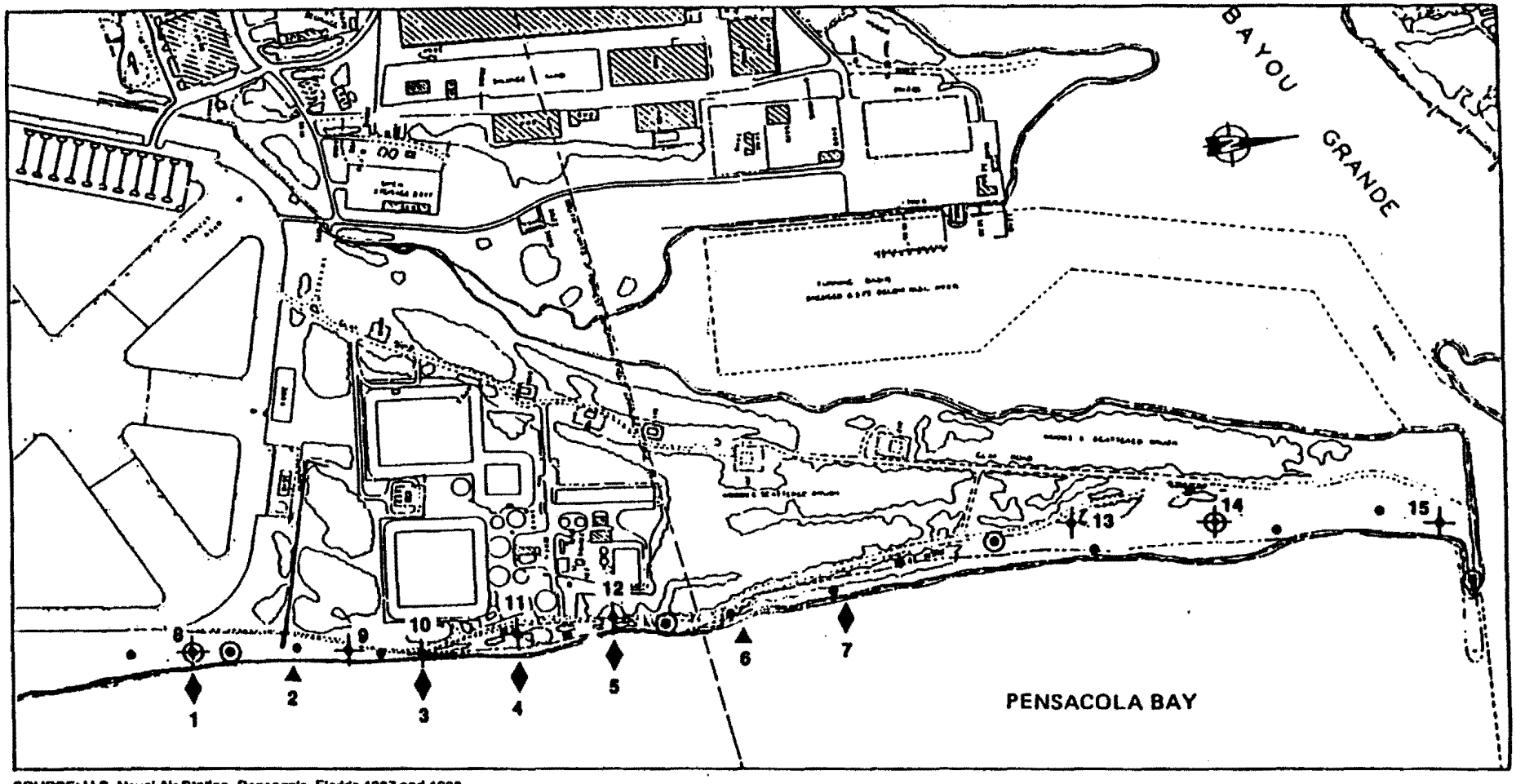


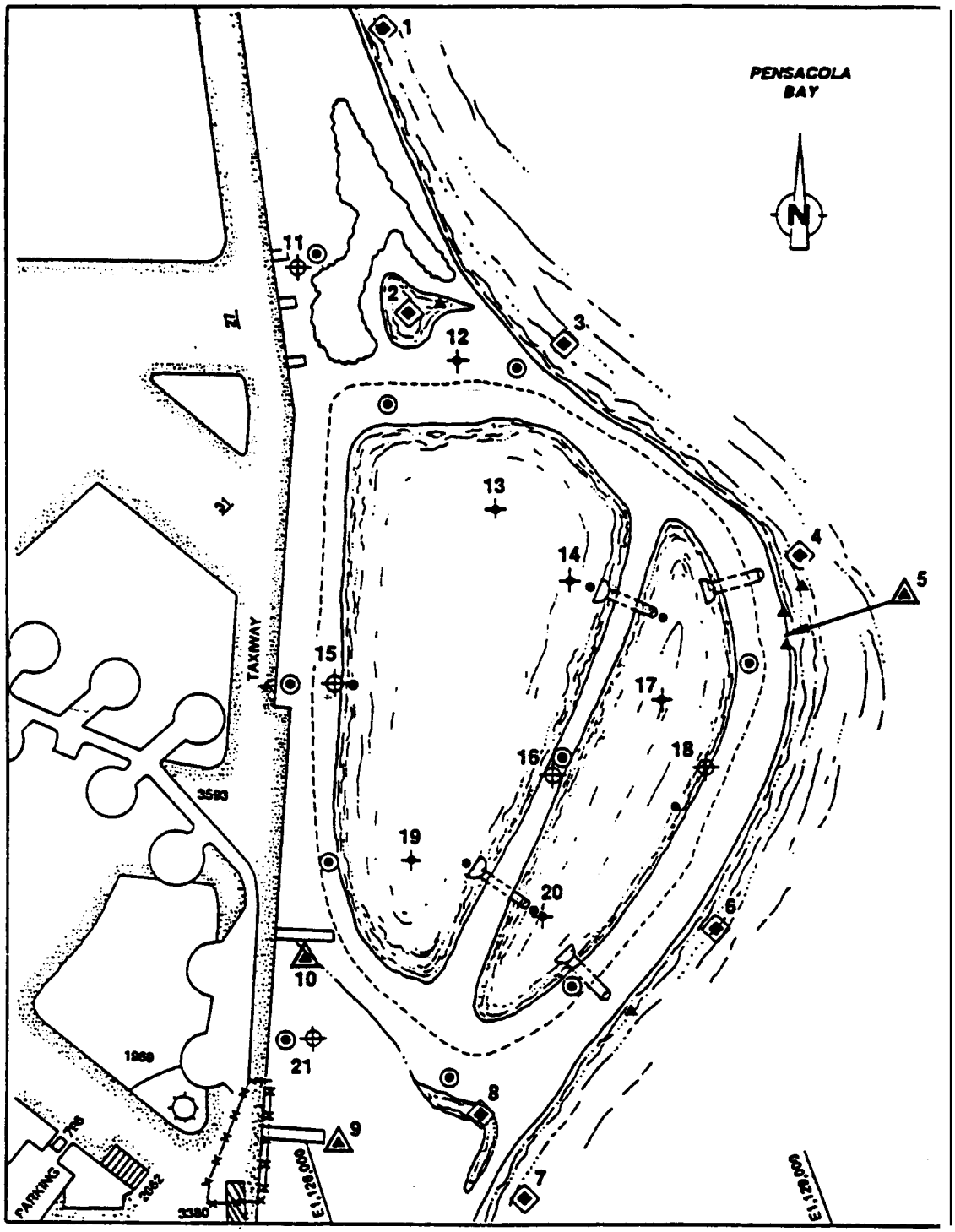
SOURCE: U.S. Naval Air Station, Pensacola, Florida 1987 and 1988.

KEY:

- ○ Phase I Temporary Monitoring Well
- ● Phase I Soil Boring
- ▲ Proposed Phase II Sediment Sample
- ♦ Proposed Phase II Surface Water and Sediment Sample
- ✦ Proposed Phase II Soil Boring
- 1 Location Reference Number
- ⊕ Proposed Phase II Soil Boring and Shallow Monitoring Well

SCALE
0 200 400 600 800 1000 FEET

Figure 14-9 PROPOSED SURFACE WATER/SEDIMENT SAMPLE, SOIL BORING, AND MONITORING WELL LOCATIONS— NAS PENSACOLA SITE 13— PHASE II



SOURCE: Ecology and Environment, Inc. 1991

SCALE

0 200 400 FEET

KEY:

- Water Control Structure
- Phase I Soil Boring
- Phase I Temporary Monitoring Well
- Berm
- Phase I Sediment Sample
- Proposed Phase II Sediment Sample
- Proposed Phase II Surface Water and Sediment Sample
- Proposed Phase II Soil Boring
- Proposed Phase II Soil Boring and Shallow Monitoring Well
- 1 Location Reference Number

Figure 14-10 PROPOSED SURFACE WATER/SEDIMENT, SOIL BORING, AND MONITORING WELL LOCATIONS — NAS PENSACOLA SITE 14 — PHASE II

Table 14-2

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS
NAS PENSACOLA SITE 2

Medium	lo. of Samples[a]	Dupli-cates	Trip Blanks[b]	Preservative Blanks[b]	Field Blanks	Rinsate Blanks	Total[a]	Analytical Suite[c,d]
Surface	7	1	--	1	1	1	. 11	A
Water	(1)	--	1	--	--	--	(1),1	B
	(2)	NR[e]	--	--	--	--	(2)	D
Sediment[f]	103	10	--	NR	NR	5	118	A
	(1)	--	5	m?	NR	--	(1),5	B
	(4)	NR	m?	NR	NR	NR	(4)	E
TOTAL	110	11	6	1	1	6	135	
	(8)	NR	m?	NR	NR	NR	(8)	

14[NASP]UH1103:T0395/874/14

Key :

[a]The number of samples shown in parentheses will bo analyzed for tho additional parameters indicated.

[b]Trip blanks will bo analyzed for Appendix IX volatile organic compounds (VOCs) only. Preservative blanks will bo analysod for Target Compound List (TCL) VOCs, total recoverable hydrocarbons (TRPHs), dissolved Target Analyte List (TAL) motals, and cyanido.

[c]Analytical suite designations are as follows:

A = TCL VOCs, TCL base-neutral/acid extractable organic compounds (BNAs); TCL posticidos and polychlorinated biphenyls (PCBs); TRPHs; TAL metals (total [i.e., unfiltered] and dissolved [i.e., millipore-filtered, water only]); cyanide; gross alpha, beta, and gamma radioactivity (nearshore samples only); total Kjeldahl nitrogen; total organic carbon: grain size (sediment only): hardness (water only): and alkalinity (water only).

B = Appendix IX VOCs, BNAs, dioxins, posticidos, PCBs, organophosphorus posticidos, herbicides, total motals, cyanide, and sulfide.

D = Total surpandod solids. ammonia nitrogon, orthophosphate phosphorus, dissolved oxygen (in field), 5-day biological oxygen demand (BOD_5), and chemical oxygen demand (COD).

E = pH, alkalinity, percent moisture, BTU contont. ash contont. total organic halogens, sulfur, ignitability, and cation exchange capacity.

[d]Specific constituents encompassed by tho various chemical groups included within tho above-listed analytical suites are identified in tables 9-[6] through 9-[15] of tho GQAPP.

[e]NR = lot required.

[f]7 locations x 2 depth intervals; 25 locations x 1 depth interval. Shallow samples at a11 32 locations collected in triplicate.

Source: Ecology and Environment, Inc., 1992.

[Bold items enclosed in brackets denote changes to the last version of document]

Table 14-3

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS
NAS PENSACOLA SITE 13

Medium	No. of Samples[a]	Duplicates	Trip Blanks[b]	Preservative Blanks[b]	Field Blanks	Rinsate Blanks	Total[a]	Analytical Suite[c,d]
Surface Water	5 (2)	1 NR[e]	1 NR	— NR	1 NR	1 n	9 (2)	A D
Sediment[f]	21 (2)	2 n	1 n	NR n	NR NR	1 NR	25 (2)	A E
Soil[g]	21 (8)	3 n	1 NR	— NR	1 NR	1 n	33 (8)	A E
Groundwater[h]	2	1	1	1	1	1	7	A
TOTAL	55 (12)	7 NR	4 NR	1 NR	3 NR	4 n	74 (12)	

14[NASP]UH1103:T0395/869/10

Key:

[a]The number of samples shown in parentheses will be analyzed for the additional parameters indicated.

[b]Trip blanks will be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs) only. Preservative blanks will be analyzed for TCL VOCs, total recoverable petroleum hydrocarbons (TRPHs), dissolved Target Analyte List (TAL) metals, and cyanide.

[c]Analytical suite designations are as follows:

A = TCL VOCs; TCL base/neutral and acid extractable organic compounds (BNAs); TCL pesticides and polychlorinated biphenyls (PCBs); TRPHs; TAL metals (total [i.e., unfiltered] and dissolved [i.e., millipore-filtered], water only); cyanide; gross alpha, beta, and gamma radioactivity; total organic carbon; total Kjeldahl nitrogen (TKN; surface water and sediment only); grain size (sediment only); hardness (water only); and alkalinity (water only).

D = Total suspended solids, TKN (groundwater only), ammonia nitrogen, orthophosphate phosphorus, dissolved oxygen (in field), 5-day biological oxygen demand (BOD_5), and chemical oxygen demand (COD).

E = pH, alkalinity, percent moisture, grain size (soil only), BTU content, ash content, total organic halogens, sulfur, ignitability, and cation exchange capacity.

[d]Specific constituents encompassed by the various chemical groups included within the above-listed analytical suites are identified in tables 9-[6] through 9-[15] of the GQAPP.

[e]NR = Not required.

[f]Samples collected in triplicate.

[g]Total of 5 boring locations X 3 depth intervals = 15 samples, plus 3 boring locations X 4 depth intervals = 12 samples.

[h]Additional wells will be installed and groundwater samples collected east of the Industrial Wastewater Treatment Plant (IWTP) in conjunction with the investigation of the IWTP facility (Group O).

Source: Ecology and Environment, Inc., 1992.

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[Bold items enclosed in brackets denote changes to the last version of document]

Table 14-4

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS
NAS PENSACOLA SITE 14

Medium	No. of Samples[a]	Dupli-cates	Trip Blanks[b]	Preservative Blanks[b]	Field Blanks	Rinsate Blanks	Total'	Analytical suite[c,d]
Surface Water	7 (3)	1 NR[e]	I NR	-- NR	1 NR	1 NR	11 (3)	A D
Sediment[t]	20 (6)	2 NR	1 NR	NR NR	NR NR	1 NR	24 (6)	A E
Soil[g]	41 4 (26)	4 1 NR	2 NR NR	NR NR NR	NR NR NR	2 -- NR	49 5 (26)	A C C
Groundwater[h]	5 (5)	1 NR	1 NR	1 NR	1 NR	1 NR	10 (5)	A D
TOTAL	7 (40)	9 NR	5 NR	1 NR	2 NR	5 NR	99 (40)	

14[NASP]UH1103:T0395/876/10

Key :

[a]The number of samples shown in parentheses will bo analyzed for the additional parameters indicated.

[b]Trip blanks will be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs) only. Preservative blanks will be analyzed for TCL VOCs, total rocoverable petroleum hydrocarbons (TRPHs), dissolvod Target Analyte List (TAL) metals, and cyanide.

[c]Analytical suite designations are as follows:

A = TCL VOCs; TCL base-neutral/acid extractable organic compounds (BNAs); TCL pesticides and polychlorinated biphenyls (PCBs); TRPHs; TAL metals (total [i.e., unfiltered1 and dissolvod [i.e., millipore-filtered], water only): cyanide: gross alpha, beta, and gamma radioactivity; total organic carbon: total Kjeldahl nitrogen (TKN; surface water and sediment only): grain site (sediment only): hardness (water only): and alkalinity (water only).

C = TAL metals.

D = Total suspended solids, TKN (groundwater only), ammonia nitrogon. orthophosphate phosphorus, dissolvod oxygen (in field), 5-day biological oxygen demand (BOD_5), and chemical oxygen demand (COD).

E = pH, alkalinity, percent moisture, grain size (soil only), BTU contont. ash content, total organic halogens, sulfur, ignitability, and cation exchange capacity.

[d]Specific constituents encompassed by tho various chemical groups included within the above-listed analytical suites are identified in tables 9-[6] through 9-[15] of the GQAPP.

[e]NR = Not required.

[f]Bay samples collected in triplicate; therefore, 5 x 3 = 15 samples, plus 5 x 1 = 5 samples.

'Total of 8 boring locations X 3 depth intervals = 24 samples; 1 boring location x 5 dopth intervals = 5 samples: 1 boring location x 7 dopth intervals = 7 samples; 1 boring location x 9 dopth intervals = 9 samples.

[h]Total of 5 now shallow wells = 5 samples.

Source: Ecology and Environment, Inc., 1992.

[Bold items enclosed in brackets denote changes to tbe last version of document]

Table 14-5

RATIONALE FOR PROPOSED PHASE II SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 2

Location Reference Number(s)	Sample Type(s)[a]	Location Rationale	Analytical Suite(s)[b]	Analytical Rationale
1-4, 5-7	SD	Low levels PAHs dotoctod in Phase I sediment samples SD016-SD024 and SD011-SD015, respectively; also low levels VOCs dotoctod in Phase I sediment sample SD024.	A	Characterize full spectrum of potential contaminants.
8-10	SW SD	Elevated motels, PAHs, and/or TRPHs dotoctod in Phase 1 sediment samples SD005-SD007.	A	Characterize lull spectrum of potential contaminants.
			B (Location 9; Interva1 4-12 in.)	Meet RCRA requirements.
			D,E (Location 9)	Support potential site remediation planning activities.
11, 12, 14, 16	SW/SD	Potential source areas.	A	Characterize Lull spectrum of potential contaminanto.
			D,E (Location 16 only)	Support potential site remediation planning activities.
13, 15	SD	Determine extent of potential sediment contamination in this area.	A	Characterize Lull spectrum of potential contaminanto.
17-12	SD	Determine presence, nature, and extent of potential offshore sediment contamination.	A	Characterize full spectrum Of potential contaminants.

14[NASP]UN1103:T0395/1038/7

Key:

[a] SW = Surface water; SD = sediment.
[b] Specific parameters included within each analytical suite are given in Table 14-2.

VOCs = Volatile organic compounds.
PAHs = Polynuclear aromatic hydrocarbons.
TRPHs = Total recoverable petroleum hydrocarbons.
RCRA = Resource Conservation and Recovery Act.

Source: Ecology and Environment, Inc., 1992.

[Bold items enclosed in brackets denote changes to the last version of document]

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Table 14-6

RATIONALE FOR PROPOSED PHASE II SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 13

Location Reference Number(s)	Sample Type(s)[a]	Location Rationale	Analytical Suite(s)[b]	Analytical Rationale
1, 2, 6, 7	SW/SD SD	Determine extent of potential surface water and sediment contamination up- and down-current from IWTP (based on high PAH, TRPH, and/or phenol concentrations detected in Phase I soil borings B004, 0005, and 8006).	h	Characterize full spectrum of potential contaminants.
3, 4, 5	SW/SD	Determine presence and nature of potential surface water and sediment contamination downslope/downgradient from IWTP (based on high PAH, TRPW, and/or phenol concentrations detected in Phase I soil borings 8004, BOOS, and B006).	A	Characterize full spectrum of potential contaminants.
			D,E (Locations 3 and 4)	Support potential site remediation planning activities.

14[NASP]UH1103:T0395/1039/7

Key:

[a]SW = Surface water; SD = sediment.
[b]Specific parameters included within each analytical suite are given in Table 14-3.

PAH = Polynuclear aromatic hydrocarbon.
TRPH = Total recoverable petroleum hydrocarbon.
IWTP = Industrial Wastewater Treatment Plant (Group O).

Source: Ecology and Environment, Inc.. 1992.

[Bold items enclosed in brackets denote changes to the last version of document]

Table 14-7

RATIONALE FOR PROPOSED PHASE II SOIL SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 13

Location Reference Number(s)	Sample Type(s)[a]	Location Rationale	Analytical Suite(s)[b]	Analytical Rationale
8, 13, 14, 15	AWT	Apparently non-contaminated areas based on Phase I soil borings completed in these areas.	A	Confirm the absence of soil contamination in these areas.
9, 10, 11, 12	AWT	Determine tho nature and extent of soil contamination detected in Phase I soil borings B004, BOOS, and B006, east of IWTP.	A	Characterise full spectrum of potential contaminants.
			E (Locations 10, 11)	Support potential site remediation planning activities.

14[NASP]UN1103:T0395/1044/7

Key:

[a]AWT = Soil samples collected above water table at following intervals (BLS): Location reference numbers 10, 11, and 12 (0-[1.0] toot, [1.0]-2.5 feet, 2.5-5 Coot; and 5-10 foot); location reference numbers 8, 9, 13, 14, 15 (0-[1.0] Coot; [1.0]-2.5 Coot; and [illegible] feet).

[b]Specific parameters included within each analytical suite are given in table 14-3.

IWTP = Industrial Wastewater Treatment Plant (Group O).

Source: Ecology and Environment, Inc., 1992.

[Bold items enclosed in brackets denote changes to the last version of document]

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Table 14-8

RATIONALE FOR PROPOSED PHASE II MONITORING WELL LOCATIONS AND GROUNDWATER SAMPLE ANALYSES[a] NAS PENSACOLA SITE 13

Location Reference Number(s)	Sample Type(s)[b]	Location Rationale	Analytical Suite(s)[c]	Analytical Rational.
8, 14	SGW	Apparently non-contaminated areas based on Phase I temporary wells and soil borings completed in these areas.	A	Confirm tho absence of groundwater contamination in these areas.

14[NASP]UH1103:T0395/1046/7

Key:

[a]Additional site 13 monitoring wells will bo installed and sampled as part of tho remedial investigation of tho Industrial Wastewater Treatment Plant (Group O sites).
[b]SGW = Groundwater sample from shallow monitoring well.
[c]Specific parameters included within each analytical suite are given in Table 14-3.

Source: Ecology and Environment, Inc., 1992.

[Bold items enclosed in brackets denote changes to tho last version of document]

Table 14-9

RATIONALE FOR PROPOSED PHASE II SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 14

Location Reference Number(s)	Sample Type(s)[a]	Location Rational.	Analytical Suite(s)[b]	Analytical Rational.
1, 3, 4, 6, 7	SW/SD	Determine nature and extent of potential surface water and sediment contamination along coastline (based on presence of PAHs and/or phenols in Phase I sediment samples SD002 and SD005.	A	Characterize full spectrum of potential contaminantr.
			D,E (Location 4)	Support potential site remediation planning activities.
2	SW/SD	Phenols and PAHs detected in Phase I sediment sample SD001.	A	Characterize the full spectrum of potential contaminantr.
			D,E	Support potential site remediation planning activities.
5	SD	Metals, PAHs, and phenolr detected in Pharo I nearshore clay layer sediment samples SD003 and 10004.	A	Characterize full spectrum of potential contaminanta.
			E	Support potential site remediation planning activities.
8	SW/SD	Location not sampled during Phase I.	A	Characterize full spectrum of potential contaminanta.
			D,E	Support potential site remediation planning activities.
9	SD	High PAHs and TRPHs detected in Phase I sediment sample SD006.	A	Characterize full spectrum of potential contaminantr.
			E	Support potential site remediation planning activities.

Key at end of table.

14[NASP]UN1103:T0395/1040/7

[Bold items enclosed in brackets denote changes to the last version of document]

Table 14-9 (Cont.)

Location Reference Number(s)	Sample Type(s)[a]	Location Rational.	Analytical Suite(s)[b]	Analytical Rational.
10	SD	Location not sampled during Phase I.	A	**Characterize full spectrum of potential contaminants.**
			E	Support potential site remediation planning activities.

14[NASP]UH1103:T0395/1040/7

Key:

[a]SW = Surface water; SD = sediment.
[b]Specific parameters included within each analytical suite are given in Table 14-4.

PAHs = Polynuclear aromatic hydrocarbons.
TRPHs = Total recoverable petroleum hydrocarbons.

Source: Ecology and Environment, Inc., 1992.

[Bold items enclosed in brackets denote changes to the last version of document]

Table 14-10

RATIONALE FOR PROPOSED PHASE II SOIL SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 14

Location Reference Number(s)	Sample Type(s)[a]	Location Rationale	Analytical Suite(s)[b]	Analytical Rationale
11	AUT	VOCs detected in Phase I soil boring B015.	A	Characterize full spectrum of potential contaminants.
			E	Support potential site remediation planning activities.
12	AWT	VOCs detected in Phase I soil borings B014 and B016.	A	Characterize full spectrum of potential contaminants.
13, 14, 15, 17, 19, 20	AUT	High contaminant concentrations detected in Phase I settling pond soil borings B001 through B006.	A	Characterize full spectrum of potential contaminants.
			E (Locations 14, 15, and 20)	Support potential site remediation planning activities.
16	AWT	1,1,1-Trichloroethane detected in Phase I soil boring B012.	A	Characterize full spectrum of potential contaminants.
			I	Support potential site remediation planning activities.
	BWT	Evaluate potential presence of aquifer matrix soils contamination by metals based on high Phase I temporary well TW012 metal concentrations.	C	Metals are only concern here.
			I	Support potential site remediation planning activities.

14[NASP]UH1103:T0395/1045/7

Key at end of table.

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Table 14–10 **(Cont.)**

Location Reference Number(s)	Sample Type(s)[a]	Location Rationale	Analytical Suite(s)[b]	Analytical Rational.
18	AWT	PAHs and TRPHs detected in Pharo I roil boring B006.	A	Characterize Cull spectrum of potontial contaminant..
21	AWT	High TRPHs detected in Pharo I soil boring B008.	A	Characterize full spectrum of potontial contaminants.
			e	support potontial site remediation planning activitios.
	BWT	Evaluate potontial presence of aquifer matrix soils contamination by metals based on high Phase I temporary well TW008 metal concentrations.	C	Metals are only concern here.
			E	support potontial site remediation planning activitios.

14[NASP]UH1103:T0395/1045/7

Key:

[a]AWT = Soil samples collected above water table At following intervals BLS): 0 - [1.0], [1.0] - 2.5, 2.5 - 5, 5 - 10, 10 - 15, 15- 20, 20 - 25;
BWT = Soil samples colloctod below water table at following intervals BLS): Location 16 (20 - 25, 25 - 30 : Location 21 (5 - 10, 10 - 25).
[b]Specific parameters included within each analytical suite are given in Table 14-4.
VOCs = Volatile organic compoundr.
PAHs = Polynuclear aromatic hydrocarbons.
TRPHs = Total recoverable petroleum hydrocarbons.

Source: Ecology and Environment, Inc., 1992.

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Table 14-11

RATIONALE FOR PROPOSED PHASE II MONITORING WELL LOCATIONS AND GROUNDWATER SAMPLE ANALYSES NAS PENSACOLA SITE 14

Location Reference Number(s)	Sample Type(s)[a]	Location Rationale	Analytical Suite(s)[b]	Analytical Rationale
11	SOW	Trace level PAHs and phenols dotoctod in Phase I tomporary well TW015.	A	Characterise full spectrum of potontial contaminants.
			D	Support potontial site remediation planning activities.
15	SGW	Potential shallow qroundwator contamination associated with PAHs and phenols dotoctod in Phase I roil boriq BOOS.	A	Characterise full spectrum ot potontial contaminants.
			D	Support potontial site remediation planning activities.
16	SGW	Downgradient ot western settling pond; metals dotoctod in Phase I temporary well TW012.	A	Characterise full spectrum of potential contaminants.
			C	Support potontial site remediation planning activities.
18	SGW	Downgradient of eastern rattling pond; potontial shallow qroundwator contamination associated with PAHs and TRPHs dotoctod in Phase I roil boring B006.	A	Characterise lull spectrum of potontial contaminants.
			C	Support potontial site remediation planning activities.
21	SGW	High total metals and trace phenols dotoctod in Phase I tomporary well TW008.	A	Characterise full spectrum ot potential contaminantr.
			C	Support potential site remediation planning activities.

14[NASP]UM1103:T0395/1047/7

Key:

[a]SGW = Groundwater sample from shallow monitoring woll.
[b]Specific parameters included within each analytical suite are given in Table 14-4.
PAHs = Polynuclear aromatic hydrocarbons.
TRPHs = Total recoverable petroleum hydrocarbon..

Source: Ecology and Environment, Inc., 1992.

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background locations will help provide a perspective regarding on-site occurrences of potential contaminants, as well as aid' in evaluating the impact of potential,base-wide ambient contaminant sources. The collection of these groundvater samples is discussed in the work plan for [Group A--]Site 1 (Sanitary Landfill(; see B 6 E 1992a]).

Table 14-2 indicates that one sample from each medium at Site 2 will be additionally analyzed for analytical suite B (Appendix IX parameters). It should be noted that for these samples, suite A analyses will only be performed for parameters not encompassed by Appendix IX (e.g., gross alpha, beta, and gamma radioactivity). Furthermore, it should be noted that trip blanks will not be analyzed for the full suite A (sites 13 and 14) or B (Site 2) parameters, but only for VOCs. Finally, it should also be noted that the number of required trip blanks shown on Table 14-2 reflects the total number of trip blanks required to be collected for the entire sampling program.

As noted above, tables 14-5 through 14-11 provide specific rationales for proposed Phase II sampling locations and analyses. Sampling locations were selected based on the Phase I results in accordance vith one of the following criteria:

- Area of known contamination,
- Area of potential contamination, or
- Knovn or suspected area of no contamination.

Sampling locations selected according to the first criterion are required to allow identification of the full spectrum of potential on-site contaminants, as well as the maximum levels of occurrence. Locations selected according to the second criterion are required to delineate the distribution of contamination on site and in the site vicinity. Locations selected according to the third criterion are required to confirm that the extent of contamination has been completely delineated. The specific, detailed rationales provided in tables 14-5 through 14-11 for each sampling location or group of locations clearly meet one or more of the three general criteria defined above.

All three of the above criteria must be met in order to complete a Baseline Risk Assessment and, as varranted, Feasibility Study for the site. Furthermore, in 'most instances, meeting the above criteria requires that the collected samples be analyzed for the full suite of parameters in analytical suite A However, in some cases (e.g., evaluation of potential aquifer matrix contributions to the high total metal concentrations detected in Phase I temporary well groundvater samples), a more limited analytical program (e.g., metals only in soils collected BWT) is varranted.

Finally, to support potential remediation planning activities for these sites, selected samples from each medium also must be analyzed for those parameters vhich directly control the viability of various remediation alternatives (see analytical suites D and E, tables 14-2, 14-3, and 14-4).

14.2.[2].1 Surface Water and Sediment Sampling

Surface vater samples will be collected in accordance vith Section 6.9.1 of the GQAPP. Surface vater samples collected at locations in surface vater bodies shallower than 1 foot will be collected at the surface [and, whenever possible, directly into the sampling container. If wt possible,) a glass or stainless steel beaker or similar sampling device [will be used.] Samples collected from vater deeper than 1 foot will be collected vithin 1 foot of the bottom using a Kemmerer or similar sampling device. During collection of surface vater samples, the surface vater pH, temperature, specific conductance, dissolved oxygen, and turbidity will be recorded in the field notebook. In addition, the water depth and tidal stage for each sample will be recorded in the field notebook. Equipment decontamination will be conducted in accordance vith Section 6.10 of the GQAPP.

Sediment samples will be collected in accordance vith Section 6.9.2 of the GQAPP. Sediment samples will be collected using either a stainless steel trovel, a bucket-type mud auger, an Eckman dredge, or other coring device. The composition of sediment materials retrieved will be recorded in the field notebook. To conform vith FDER methodology and

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enable comparison with PDER sediment data on Pensacola Bay at all shallow sediment sample locations in the bay, triplicate samples will be collected. The analytical results will be averaged to produce mean values for each analyte. Equipment decontamination activities will be conducted in accordance with Section 6.10 of the GQAPP,

The number and types of sediment field QA/QC samples to be collected during Phase II were determined in accordance with Section 11.1 of the GQAPP.

Site 2

During th Phase II investigation, surface water samples will be collected at seven locations, and sediment samples rill be collected at 32 locations at Site 2. As shown on Figure 14-7, the seven combined nearshore surface vater and sediment sampling locations are as follows: four (sample locations 8 through 11) approximately 30 to 50 feet south of the seawall near the eastern end of the site; one (sample location 12) within the westernmost slip; one (sample location 14) along the southeast corner of the site; and one (sample location 16) within the easternmost slip. At these seven sediment sample locations, two depth intervals will be sampled: from the surface water/sediment interface to 4 inches below the interface and from 4 to 12 inches below the interface. Nine additional nearshore sediment sample locations are as follows: seven (sample locations 1 through 7) south of the seawall; and two (sample locations 13 and 15) along the southeastern corner of the site.

As shown on Figure 14-8, the 16 offshore sediment sample locations are as follows: seven (sample locations 25 through 31) south of the site; and nine (sample locations 17 through 24 and 32) north and east of Site 2 near sites 13 and 14 (Magazine Point Rubble Disposal Area and Dredge Spoil Fill Area, respectively).

All seven surface water and 103 sediment samples will be analyzed for the parameters included in analytical suite A (see figures 14-7 and 14-8 and tables 14-2 and 14-5). Note that the total number of sediment

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sample includes collecting triplicates at the shallov interval of all 32 locations. In addition, one surface vater and one 4- to 12-inch-deep sediment sample (saaple location 9) will also be analyzed for the paraaeters included in analytical suite B. In addition, tvo surface water samples (saaple locations 9 and 16) will be analyzed for the paraaeters included in analytical suite D (see Figure 14-7 and tables 14-2 and 14-5). Pour sediaent samples (one from both intervals at locations 9 and 16) will also be analyzed for the paraaeters included in analytical suite E (see Figure 14-7 and tables 14-2 and 14-5).

Site 13

During the Phase II sampling, surface vater samples will be collected at five locations, and sediaent samples will be collected at seven locations at Site 13. As shovn on Figure 14-9, the five combined surface vater and sediment samples (sample locations 1, 3 through 5, and 7) and the tvo additional sediment samples (saaple locations 2 and 6) will be collected along the shoreline of Pensacola Bay.

All five surface water and 21 sediment samples will be analyzed for the paraaeters included in analytical suite A (see Figure 14-9 and tables 14-3 and 14-6). Note that the total number of sediment samples includes collecting triplicates at seven locations. In addition, tvo surface vater samples will also be analyzed for the paraaeters included in analytical suite D (sample locations 3 and 4; see Figure 14-9 and tables 14-3 and 14-6). Two sediaent samples will also be analyzed for the parameters included in analytical suite E (locations 3 and 4; see Figure 14-9 and tables 14-3 and 14-6).

Site 14

During the Phase II investigation, surface vater samples will be collected at seven locations, and sediment samples will be collected at 10 locations at Site 14. As shovn on Figure 14-10, the seven coabined surface vater and sediment sampling locations are as follovs: five (saaple locations 1, 3, 4, 6, and 7) approximately 30 to SO feet offshore; one (saaple location 2) in the pond north of the berm; and one (saaple location 8) in the pond south of the berm. Additional sediment

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sample locations are as follows: two (sample locations 9 and 10) southwest of the berm near the drainageways; and one (sample location 5) east of the berm near the bay.

All seven surface water and 20 sediment samples will be analyzed for the parameters included in analytical suite A (all locations: see Figure 14-10 and tables 14-4 and 14-9). Note that the total number of sediment samples includes collecting triplicates at five locations. In addition, three surface water samples (sample locations 2, 4, and 8) will also be analyzed for the parameters included in analytical suite D, and six sediment samples will also be analyzed for the parameters included in analytical suite E (sample locations 2, 4, and 8; see Figure 14-10 and tables 14-4 and 14-9).

14.2.[2].2 Soil Sampling

All soil sampling, compositing, and lithologic logging activities will be performed in accordance with Section 6.6 of the GQAPP, At soil boring locations where a monitoring well will not be installed, soil borings will be completed using hollow-stem auger methods and split-spoon samplers in accordance with Section 6.6.2 of the GQAPP. Equipment decontamination will be performed in accordance with Section 6.10 of the GQAPP. The number and types of soil field QA/QC samples to be collected during Phase II were determined in accordance with Section 11.1 of the GQAPP.

Site 13

During the Phase II soil boring and shallow monitoring well installation (Section 14.2.[2].3), soil samples will be collected at eight locations across Site 13 (see Figure 14-9). At each location, samples will be collected from the following depth intervals: 0 to [1.0] foot BLS, [1.0] to 2.5 feet BLS, 2.5 to 5 feet BLS, and then every 5-foot interval BLS to the water table. For the purpose of estimating sample numbers, the depth to the water table is assumed to be between 6 and 9 feet BLS across the site.

All 27 soil samples will be analyzed for the parameters included in analytical suite A (all sample locations; see Figure 14-9 and tables 14-3 and 14-7). Eight of the 27 soil samples will also be analyzed for the parameters included in analytical suite E (sample locations 10 and 11; see Figure 14-9 and tables 14-3 and 14-7).

Site 14

During the Phase II investigation, soil boring and shallov monitoring well installation (Section 14.2.[2].3), soil samples will be collected at 11 locations across Site 14 (see Figure 14-10). At each location, except as noted below, composite samples will be collected from each of the folloving depth intervals: 0 to [1.0] foot BLS, [1.0] to 2.5 feet BLS, 2.5 to 5 feet BLS, and then every 5-foot interval BLS to the vater table. In addition, at tvo locations (16 and 21) samples will be collected from tvo depth intervals BWT: the vater table to 5 feet BWT and 5 to 10 feet BUT. For the purpose of estimating sample numbers, the depth to the vater table is assumed to be 25 feet BLS across the site.

Forty-one of the 45 soil samples will be analyzed for the parameters included in analytical suite A (all sample locations), and four of the 45 soil samples (not of the 41) will be analyzed for the parameters included in analytical suite C (sample locations 16 and 21; see Figure 14-10 and tables 14-4 and 14-10).

In addition, 26 of the 45 soil samples will also be analyzed for the parameters included in analytical suite E (sample locations 11, 14 through 16, and 21; see Figure 14-10 and tables 14-4 and 14-10).

14.2.[2].3 On-Site Permanent Monitoring Vell Installation and Development

A total of tvo permanent shallov monitoring vells will be installed at Site 13, and five will be installed at Site 14. These vells will be located and designed to supplement the Phase I investigation results regarding the lateral and vertical extent of groundwater contamination. The number and target completion depths of these vells are as follovs:

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Site 13:

- o Two shallow wells, each of which will be approximately 15 feet deep.

Site 14:

- o Five shallow wells, three of which will be approximately 30 feet deep and two of which will be approximately 15 feet deep.

Figures 14-9 and 14-10 show the locations of the proposed monitoring wells at each site, and tables 14-8 and 14-11 provide the detailed rationale for each of the monitoring well locations, target depths, and corresponding sampling analytical requirements at sites 13 and 14, respectively.

In order to detect the presence of any floating product that may be present at sites 13 and 14, the shallow wells will be completed into the upper portion of the surficial zone of the Sand-and-Gravel Aquifer so that the well screen brackets the water table.

The shallow wells will be installed using hollow-stem auger methods and constructed of 4-inch-diameter, flush-threaded, polyvinyl chloride (PVC) casing terminating in 10 feet of 0.015-inch, factory-slotted screen. All drilling and finished monitoring well construction will be conducted in accordance with sections 6.7.2 and 6.7.3 of the GQAPP. In addition, all newly installed wells will be protected above surface grade with a steel surface casing and locking wellhead cover. In paved or heavily [traveled] areas, newly installed wells will be protected at surface grade with a flush-mount security cover and locking cap.

In conjunction with the drilling of the shallow well boreholes, continuous split-spoon samples will be collected to the target completion depth of the wells in accordance with Section 6.7.2.3 of the GQAPP.

After installation, each of the nev monitoring vells will be developed using a submersible pump and/or bailer in accordance vith Section 6.7.S of the GQAPP. Development vaste will be contained in 55-gallon drums, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy (see also Section 14.[6].2).

All drilling equipment will be decontaminated prior to use and between installation of each well in accordance vith Section 6.10 of the GQAPP.

All borehole cuttings and drilling fluids will be stored in 55-gallon drums, labeled, and moved to a storage area on NAS Pcnsacola, as directed by the Navy (see also Section 14.[6].2).

14.2.[2].4 Groundvater Sampling

Purging and sampling of each well will be conducted in accordance vith sections 6.8.2 and 6.8.3 of the GQAPP, respectively. Equipment decontamination activities will be performed in accordance vith Section 6.10 of the GOAPP. The number and types of groundvater field QA/QC samples to be collected during Phase II were determined in accordance vith Section 11.1 of the GQAPP. All shallov monitoring vclls will be checked for floating and/or sinking immiscible hydrocarbons vith an oil/water interface probe.

Site 13

During Phase II, groundvater samples will be collected from tvo nevly installed, on-site, shallov monitoring vells at Site 13 (sample locations 8 and 14; see Figure 14-9). The tvo groundvater samples will be analyzed for the parameters included in analytical suite A (see tables 14-3 and 14-8).

Site 14

During Phase II, groundvater samples will be collected from five nevly installed, on-site, shallov monitoring vells at Site 14 (all sample locations; see Figure 14-10). The five groundvater samples vill be analyzed for the parameters included in analytical suites A and D (see tables 14-4 and 14-11).

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14.2. [3] Hydrologic Assessment

The main objective of the Phase II hydrologic assessment is to further delineate the (hydrogeologic character] of the underlying aquifer at sites 2, 13, and 14. Slug and short-term specific capacity tests, rather than a (long-term] pump test, have been proposed for Phase II because the location and distribution of contaminants in the various zones of the underlying aquifer have not yet been precisely determined. The hydrologic assessment at sites 2, 13, and 14 will include a wellhead elevation survey of all the newly installed permanent monitoring wells; static water level measurements in all the on-site wells and on-site and/or adjacent surface water bodies; short-term specific capacity and/or slug tests on all the newly installed permanent wells; and measurement of tidal currents, wind, and/or stream flow at appropriate surface water locations.

All of the newly installed monitoring wells will be surveyed during the engineering survey (Section 14.2.[4]) and referenced to a USGS benchmark, in accordance with Section 6.7.6 of the GQAPP. In addition, staff gauges will be placed in all surface water bodies on site and will be surveyed relative to the same datum as the wells.

At sites 13 and 14, static water levels will be measured in all the existing and proposed on-site wells and in the on-site water bodies on at least four occasions: once during the sample of the newly installed wells; once approximately two to four weeks after sampling to obtain an estimate of the short-term temporal variability in water levels; once during a low tidal phase; and once during a high tidal phase. The measurements taken during opposing tidal phases will be collected on the same day in order to accurately evaluate tidal influences on water level elevations at these sites.

Limited aquifer testing will be conducted on all newly installed monitoring wells. This testing will consist primarily of performing short-term specific capacity tests on wells that are capable of sustaining a measurable yield. The specific capacity testing at sites 13 and 14 will be conducted during the development of the newly

installed vells. The procedure for specific capacity testing involves measuring the initial static vater level in the vell and then vithdraving groundvater from the vell at a constant rate for a designated period. The sustained vater level during pumping is then noted, and the pump is turned off. The vater level recovery in the vell is then recorded continuously over time until the vater level equilibrates to the intial static level. In addition to measuring drawdovn in the developing vell during the specific capacity testing, vater levels will be measured in adjacent shallow, intermediate, and/or deep monitoring vells to determine the extent to vhich the respective, monitored zones may be hydraulically connected.

Injection or vithdraval-type slug tests will be performed on nevly installed vells that are not capable of sustaining a **measurable** yield. The procedure for slug testing involves measuring the initial static vater level in the vell and then injecting or vithdraving a knovn volume from the vell, using a solid stainless steel cylinder, to create an instantaneous change in vater level. The water level is then recorded continuously over time until the vater level equilibrates to the initial static level.

The purposes of the specific capacity and slug testing are to obtain site-specific, first estimate values for hydraulic conductivity (K), transmissivity (T), and groundvater flov velocity (V) for each of the monitored depth zones. During each of these tests, a calibrated tape and/or electronic data logger will be used to monitor and record the vater levels in the well(s) being tested or observed.

For the Site 2 hydrologic assessment, at each surface water sampling location in Pensacola Bay, the prevailing current direction and velocity, vind direction and velocity, vater depth, and tidal phase will be recorded during the time of sampling. In addition, in order to evaluate tidal effects on nearshore areas, these measurements will be recorded at these same locations during high tide, low tide, and mid tide. For all inland surface vater bodies on sites 13 and 14 in vhich a flov is noted, velocity, discharge, and stream elevation data will be

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recorded at the same time that water levels are measured in the on-site monitoring wells. A rain gauge will be installed at or near sites 2, 13, and 14 and monitored regularly over the course of the fieldwork.

14.2.[4] Engineering Survey

A comprehensive engineering survey will be conducted to accurately identify all site sampling locations and cultural and topographic features. All sampling and monitoring well locations will be identified both horizontally and vertically. In addition, any utilities, aboveground structures, and improvements (such as pavement) will be located. Any pertinent information found during the contaminant source survey (Section 14.2.1) will be incorporated into this survey. The survey also will delineate topographic variability using contour intervals of 2 feet.

All engineering survey information will be integrated with any existing computer-aided design *(CAD)* base maps so that all updated, site-related information can be precisely and efficiently added to the base map. The development of a CAD base map will include the addition of previous data point locations (i.e., coordinates of latitude and longitude). The survey drawing will be produced in mylar and blueline copies; the CAD file for the drawing will be kept on diskette.

14.2.[5] Interim Remedial Measures

During the field investigation, circumstances on site may require IRMs. IRMs will be initiated on a case-by-case basis [and only folloving receipt of EPA approval.] Rapid response will be emphasized. An IRM could involve the installation of security fences and warning signs; construction of berms, caps, and/or recovery and treatment systems; and' removal of soil, sediment, and/or drums. If an IRH is conducted, a detailed, explanatory report of the IRM will be developed by E & E and provided to the Navy [and EPA.]

14.2.[6] Report

Refer to Section 20 of this work plan (revised [July 1992)) for a description of the Phase 11 report.

14.3 Phase III--Extent Delineation

Phase III tasks will be conducted based on the results of phases I and II, (if deemed necessary.] Although the earlier phases are intended to identify and characterize areas and contaminants of primary concern as they extend laterally from the landfill source(s), Phase III activities will be geared tovard delineating the horizontal and vertical extents of contamination.

14.3.1 Biota Sampling

If deemed appropriate based on the findings of Phases I and II, additional flora and fauna sampling may be conducted in Phase 111. (If required,] a separate biological sampling plan will be prepared. Biota sampling for sites 13 and 14 may potentially include the collection of vegetation and small mammals from on-site populations. Biota sampling for Site 2 may potentially include the collection of marine fish and/or benthic invertebrates from near shore populations. [Basevide biota sampling will be conducted as part of the investigation of OUs 15, 16, and 17.]

14.3.2 Sediment Sampling

Sediment sampling will be conducted as needed for Site 2 to delineate the areas of contamination in Pwacola Bay.

14.3.3 Soil Sampling

For sites 13 and 14, soil sampling will be conducted in conjunction with any nev shallov or intermediate well installations.

14.3.4 Shallov Monitoring Well Installation and Development

Additional shallov monitoring vells may be required at sites 13 and 14 to further determine the horizontal extent of any shallov groundvater contamination.

14.3.5 Intermediate and Deep Monitoring Well Installation and Development

The installation of additional monitoring vells into deeper zones of the aquifer may be required to assess horizontal and vertical hydraulic

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gradients, aquifer physical characteristics, and vertical extent of contamination for sites 13 and 14. The number of wells and their locations and depths are dependent upon Phase I and Phase II findings.

14.3.6 Groundwater Sampling

All wells installed for Sites 13 and 14 in Phase III will be sampled, and analytical requirements for the samples will be developed based on the results of previous phases. It is anticipated that a select number of wells will not be sampled as part of this extensive delineation phase.

14.3.7 Eydrologic Assessment

All wells installed during Phase III will require a wellhead survey to obtain TOC elevations. Water level measurements will be made for all site monitoring wells and nearby surface water bodies. Horizontal and vertical hydraulic gradients will be determined. Aquifer testing will be performed, as required, to ascertain aquifer physical characteristics. On sites where contamination is found in the surficial zone during phases I and/or 11, the low permeability zone will be further characterized during Phase III and any subsequent phases. It is intended that soil sample results, lithologic logs, isopach maps, permeability testing, aquifer testing, and other information will be utilized as required to determine the lateral extent and/or continuity of the low permeability zone, as well as the degree to which hydraulic connection exists between the surficial zone and underlying main producing zone at each site.

[14.3.8 Engineering Survey

A comprehensive engineering survey will be conducted to accurately identify all new site sampling locations. All sampling and monitoring well locations will be identified both horizontally and vertically. In addition, any improvements (such as pavement} will be located. All engineering survey information will be integrated with the existing Phase II CAD base maps so that all updated, site-related information can be precisely and efficiently added to the base map. The survey drawing will be produced in mylar and blueline copies; the CAD file for the drawing will be kept on 'diskette.]

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14.3.[9] Air Sampling

The need for formal air sampling during Phase III and the techniques to be employed are dependent upon the findings of phases I and 11.

14.4 Phase IV--Extent Delineation

The following tasks, if required, will be performed as a continuation in the effort of delineating the extent of contamination for Sites 2, 13, and 14.

- o Sediment sampling;
- o Soil sampling;
- o Shallov monitoring well installation and development;
- o Intermediate and deep monitoring well installation and development;
- o Groundwater sampling;
- o Hydrologic assessment; [and
- o **Engineering survey.]**

14.[5] Field Quality Assurance/Quality Control

14.[5].1 Documentation

Field activities and sample management will entail strict documentation requirements as described in Section 7 of the GQAPP.

14.[5].2 Field QA/QC Samples

Samples collected for laboratory analysis during all phases of fieldvork will require the collection of field QA/QC samples as described in Section [11.1] of the GQAPP. The estimated numbers of required field QA/QC samples for phases I and II are shown in tables 14-1 [through 14-4].

14.[6] Decontamination and Waste Management Procedures

14.[6].1 Decontamination Procedures

Equipment decontamination requirements for sites 2, 13, and 14 will be performed in accordance vith Section 6.10 of the GQAPP.

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14.[6].2 Waste Management Procedures

[All investigation-derived waste handling will be performed in accordance vith Section 6.11 of the GQAPP and EPA's guidance for investigation-derived vaste.) All water generated during monitoring well purging and development activities on Sites 2, 13, and 14 will be discharged onto the ground surface away from the well or will be contained, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy.

Any excess soil auger cuttings generated by soil boring or monitoring well installation activities will be disposed of on-site or will be contained, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy.

Other investigation-derived wastes, such as potentially contaminated clothing and disposable materials, will be contained, labeled, and moved to a storage area on NAS Pensacola.

15. LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

Laboratory QA/QC procedures are designed to ensure the accuracy, precision, completeness, representativeness, and comparability of all analytical data. Laboratory QA/QC has been addressed both in the GQAPP and GSMP. All phases of fieldwork will incorporate a different level of data quality and requisite laboratory QA/QC. These levels are discussed in detail in the GQAPP and GSHP.

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16. GROUNDWATER MODELING

E 6 E will use the data generated in the previous field investigation phases to conduct limited computer modeling when applicable and appropriate. The following two scenarios will be considered to assess the potential for off-site contamination:

- Estimated future plume movement without any remedial action effects (i.e., no action); and
- Estimated total time periods required, for a total contaminant mass at variable pumping rates, to extract contaminants from the aquifer in order to meet previously established standards for drinking water (ARARs).

E & E will use the two-dimensional analytical RANDOMWALK model (Prickett et al. 1981) to arrive at these estimates. E & E will calculate flow velocity field input data for the solute transport simulation from a simplified model based on Darcy's Law. E & E will utilize parameters including transmissivity, storativity, and hydraulic conductivity determined from the previous phases of fieldwork.

To obtain a prediction of plume extent without remediation, E & E will illustrate organic and inorganic simulations for the current time and for one, five, and ten years into the future. Additional simulations will include different remedial pumping scenarios for both organic and inorganic contamination. E & E then will use information generated by these computer simulations for remedial alternative development. Other computer models that can be utilized to assess on-site groundwater conditions include: PLASH, a two-dimensional, finite-difference groundwater flow model: GWTRANS, a two-dimensional, finite-difference solute transport model; FEHWATER, a finite-element groundwater model; and FEMWASTE, a finite-element solute transport model.

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17. TREATABILITY STUDY

As indicated in tables 14-2, 14-3, and 14-4, a number of the analyses to be performed on the samples collected during phases II through IV are required in support of the treatability study. Characterization of samples in terms of parameters listed in tables 14-2, 14-3, and 14-4, together with treatability tests, will provide the basic data required for the evaluation of physical, chemical, and biological remedial technologies. Some of the treatability tests that may be examined are incineration tests, solubility tests, soil leaching tests, and coagulation-flocculation jar tests.

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18. BASELINE RISK ASSESSMENT

As part of the Remedial Activities Investigation, a baseline risk assessment will be conducted to determine the level of effort required in the Feasibility Study for remedial actions. The baseline risk assessment will provide an evaluation of the potential threat to human health and the environment in the absence of any remedial action by providing the basis for determining whether or not remedial action is necessary and the justification for.performing any remedial actions. (The risk assessment will be performed in accordance with EPA's 1989 documents, Risk Assessment Guidance for Superfund: Volumes I and II.)

The baseline risk assessment identifies and characterizes the toxicity and levels of hazardous substances present in the media of concern (e.g., air, groundwater, soil, surface water, sediment, or biota), the environmental fate and transport mechanisms within the media of concern (e.g., physical, chemical, biological degradation processes, and hydrogeological conditions), the potential human and environmental receptors, the potential exposure routes and the extent of actual or expected exposure, the extent of impact or threat (i.e., risk characterization), and the level or levels of uncertainty associated with all of the above. The complexity of the site will determine the level of effort required to conduct the baseline risk assessment. The conclusions of the baseline risk assessment will determine the level of effort required in the risk assessment to be conducted in the Feasibility Study.

The baseline risk assessment can be divided into four tasks: contaminant identification, exposure assessment, toxicity assessment, and risk characterization.

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18.1 Contaminant Identification

The main purpose of this step is to screen available information on the hazardous vastes present at the site and to identify contaminants of concern to focus on in subsequent efforts in the risk assessment process. [The identification of contaminants of concern will be conducted in accordance with the previously referenced risk assessment guidance documents (BPA 1988a, 1988b).]

18.2 Exposure Assessment

In this subtask, actual or potential pathways are identified, populations potentially exposed are characterized, and the extent of exposure is determined. Identification of potential exposure pathvays helps to conceptualize the migration of contaminants from an existing source to an existing or potential point of contact. An exposure pathvay may be viewed as identifying four elements:

1) A source mechanism of chemical release into the environment;
2) An environmental transport medium (e.g., air, groundvater, and/or biota);
3) A point of potential contact with the medium of concern; and
4) An exposure route to the population from the contact point.

The purpose of this analysis is to provide decision makers vith an understanding of both the current and potential future risks if no action is taken. Therefore, as part of this evaluation a reasonable maximum exposure scenario should be developed to reflect the type(s) and extent(s) of exposures that could occur based on the expected future use of the site.

The final step in the exposure assessment is to integrate the information and develop a qualitative and/or quantitative estimate of the expected exposure levels resulting from the actual or potential release of contaminants from the site.

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18.3 Toxicity Assessment

This step considers: (1) the types of adverse human or environmental effects associated with contaminant exposure; (2) the relationship between the magnitude of exposure(s) and the adverse effects: and (3) related uncertainties such as the evidence for a chemical's potential carcinogenicity in humans. Typically, this process relies heavily on existing toxicity information and rarely involves the development of new data on toxicity or dose-response relationships. The Integrated Risk Information System (IRIS) will be utilized [during the toxicity assessment.]

18.4 Risk Characterization

In the final stages of the baseline risk assessment, a characterization of the potentially adverse effects to human health or environment of each scenario derived is developed and summarized. By integrating information developed during the exposure and toxicity assessments, estimates of risk can be developed to include carcinogenic risks, noncarcinogenic risks, and environmental risks. To characterize environmental risks, the potential exposures to the surrounding ecological receptors must be identified, and the potential effects associated with such exposure(s) must be determined. Important factors to examine include disruptive effects to populations (plant and animal) and the extent of perturbations to the ecological community.

The following data will be obtained for each site as part of the baseline risk assessment:

- Distance to the closest residence (on or off NAS Pensacola);
- Type of barrier, if any, to prevent access;
- Approximate population within 0.25 mile of the site (including NAS Pensacola);
- Sensitive land uses in the vicinity of the site (e.g., schools, hospitals, and retirement homes);
- Activities (recreational and/or occupational) which take place near the sites and the estimated number of people involved;

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- Records of any environmental and/or health' complaints regarding the sites; and
- Log of any actions taken by a health unit regarding health issues, complaints, and concerns.

The results of the baseline risk assessment may indicate that the site poses little or no threat to human health or the environment. In such cases, the Feasibility Study should be appropriately scaled dovn or eliminated. The results of the Remedial Activities Investigation and baseline risk assessment will serve as the primary basis of documenting a no further action decision.

It should be emphasized that all the tasks conducted as part of the baseline risk assessment will be performed on an interactive basis between the various disciplines required (e.g., hydrogeologists, chemists, risk assessors), the Navy, and the reviewing regulatory agencies (i.e., FDER and EPA) and that the goal of these tasks is to produce appropriate, sufficient, and high quality data to complete the baseline risk assessment.

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19. FEASIBILITY STUDY

Further details on the specific tasks to be performed as part of the Feasibility Study will be described in detail during the update of this work plan after the initial phases of the fieldwork have been completed. However, it is anticipated that if contamination of some degree is identified on site, the general approach described below will be followed.

As part of the initial scoping activities of the Feasibility Study, E & E will prepare a summary of field data collected during the Remedial Investigation to compare and evaluate the concentration of the contaminants of concern against the cleanup criteria developed. E & E will prepare a qualitative and quantitative summary of contamination for the scenarios identified during the risk assessment evaluation. Results of this evaluation will serve as a basis for screening applicable remedial technologies for the development and evaluation of remedial action alternatives. [All Feasibility Study tasks will be performed in accordance with EPA's current document, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA 1988b). If any of the procedures described in this section are in conflict vith the current EPA guidance document, the methods described in the EPA guidance document will be folloved.]

19.1 Screening of Applicable Remedial Technologies

E & E will screen and develop applicable technologies for the remediation of any on-site contamination. In the process of screening applicable technologies, E & E will consider all ARARs, identify problems, and determine pathways of contamination using a receptor-oriented approach based on the threat to the public health,

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velfare, and the environment. In this summary, pathways will be outlined for each medium of concern. E & E then will identify applicable renedial technologies for each general response action such as contaminant removal, treatment, disposal, and so on. The identification of technologies will be based on technical selection criteria and E & E's engineering judgment.

19.2 Assessment of Applicable Remedial Technologies

During the assessment process, E & E will consider the relative applicability of each technology. In addition, criteria such as environmental, institutional, and public health impacts, and technical feasibility will be applied. A discussion of the applicable technologies will be provided for each general response action. The summary will include any appropriate comments concerning the reliability and implementability of the technology.

19.3 Risk Assessment

Based on the results of the baseline risk assessment conducted during the Remedial Activities Investigation, E & E will perform a detailed risk analysis to determine the acceptable levels of risk. This will allov the Navy to balance the increase in costs associated vith each alternative against gains in safety. The risk analysis will include consideration of site contaminant toxicity, transport mechanisms, persistence in the environment, and impacts on human health and the environment.

19.4 Development and Evaluation of Remedial Action Alternatives

During the preceding task, remedial technologies will be assessed independently without considering potential advantages or disadvantages of technologies applied in combination. In this task, individual technologies will be assembled into remedial action alternatives for the site. During the assembly and evaluation of the action alternatives, criteria including technical feasibility, environmental and public health, institutional impacts, and comparative costs will be considered.

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19.5 Selection of Recommended Remedial Action Alternatives

During this task, E 6 E will select a single remedial action alternative for the remediation of the site. The alternatives assembled during the preceding task will be compared using technical, environmental, and economic criteria. E & E will consider present worth of total costs, environmental effects, technical aspects, the extent to which alternatives comply with ARARs, community effects, and other factors. E & E will apply these evaluation criteria uniformly to each alternative along with any additional criteria that may result from the Navy project coordination. E & E will discuss the selection of the chosen alternative by means of a statement of the relative advantages of the alternative over the other alternatives considered.

19.6 Feasibility Study Report

A draft and a final Feasibility Study report will be provided to the Navy for review and comments.

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20. REPORT

Following the Phase I investigation, E & E will prepare a Phase I Interim Data Report for each site. The purpose of this report will be to summarize briefly the findings of Phase I and provide recommendations for the Phase II investigation; the Phase I interim report will not be a formal report. (In general, during the proposed multi-phase investigation process, formal reports will be generated only when little or no additional assessment work appears to be required.) Following the Phase I interim report, the work plans for the Phase II work will be updated accordingly. If the results of Phase II indicate that additional investigation is not warranted, a formal Remedial Investigation report will be produced. However, if the Phase II results indicate that additional investigation is required, the Phase II report will be produced as the Phase II Interim Data Report and will only summarize the Phase II results and provide recommendations for the Phase III investigation. Thus, the Phase II interim report will not be a formal document. Following production of the Phase II interim report, the work plans for the Phase III work will be updated. Once the Phase III investigation is complete, all results will be synthesized and presented in a Remedial Investigation report.

In addition, following any treatability studies and Feasibility Study work, formal reports will be produced €or these efforts. These reports will include detailed narratives associated with the respective tasks.

For all reports, E & E will prepare a 100% draft report for the Navy and Technical Review Committee (TRC) review. The TRC review comments will

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be incorporated into draft final reports vhich will be resubmitted to the TRC for final approval. The draft final report will then become final if no further comments are received from the TRC.

Each report will be vritten as an independent document, complete in its ovn right, and fully supportive of the conclusions vhich it contains. **Where** appropriate, public participation issues will be summarized, as will IRMs necessary to protect against continued degradation of conditions at the site(s). Information used in analyses, but supplemental to the analytical results, will be provided in a series of appendices.

Monthly progress reports during all field activities will be submitted to keep the Navy apprised of fieldvork status and site conditions. Current and planned activities, as well as cost tracking, will be provided.

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21. DOCUMENT REVISION

Periodic updating of all administrative documents (GOAPP, GSHP, GHSP, GPHP, and work plans) will be necessary due to changes in site conditions and/or program conditions or requirements. The schedules shown in the GPHP and GSHP indicate document revisions approximately every two months for the GQAPP, GSMP, GHSP, and GPHP. Work plans will be revised after each phase of fieldwork, with phases III and IV, if required, fully developed after Phase II with separate cost estimations. Revised documents will undergo the same review process (e.g., Navy and TRC) as the original documents.

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22. PROJECT MANAGEMENT

Project management will be an ongoing process throughout this investigation. This process includes preparation of bi-weekly project status reports, coordination of schedules, mobilizations, and other project incidentals with the Navy, management of project staff, coordination with the E & E support groups (e.g., publications, laboratory), and ongoing project review by E & E technical managers and directors. These project management steps are described in detail in the GPMP submitted to the Navy.

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23. PROJECT SCHEDULE

Figures 23-1, 23-2, 23-3, and 23-4 show the project schedules for phases I, 11, 111, and IV, respectively. Given that the scopes of work for Phase II and beyond are dependent on the results of the preceding phases, the project schedules for phases 11, 111, and IV are tentative. In addition, the length of time betveen phases is subject to the schedule in the Federal Facilities Agreement Site Management Plan (FFA SMP). The schedule in the FFA SHP will be updated yearly.

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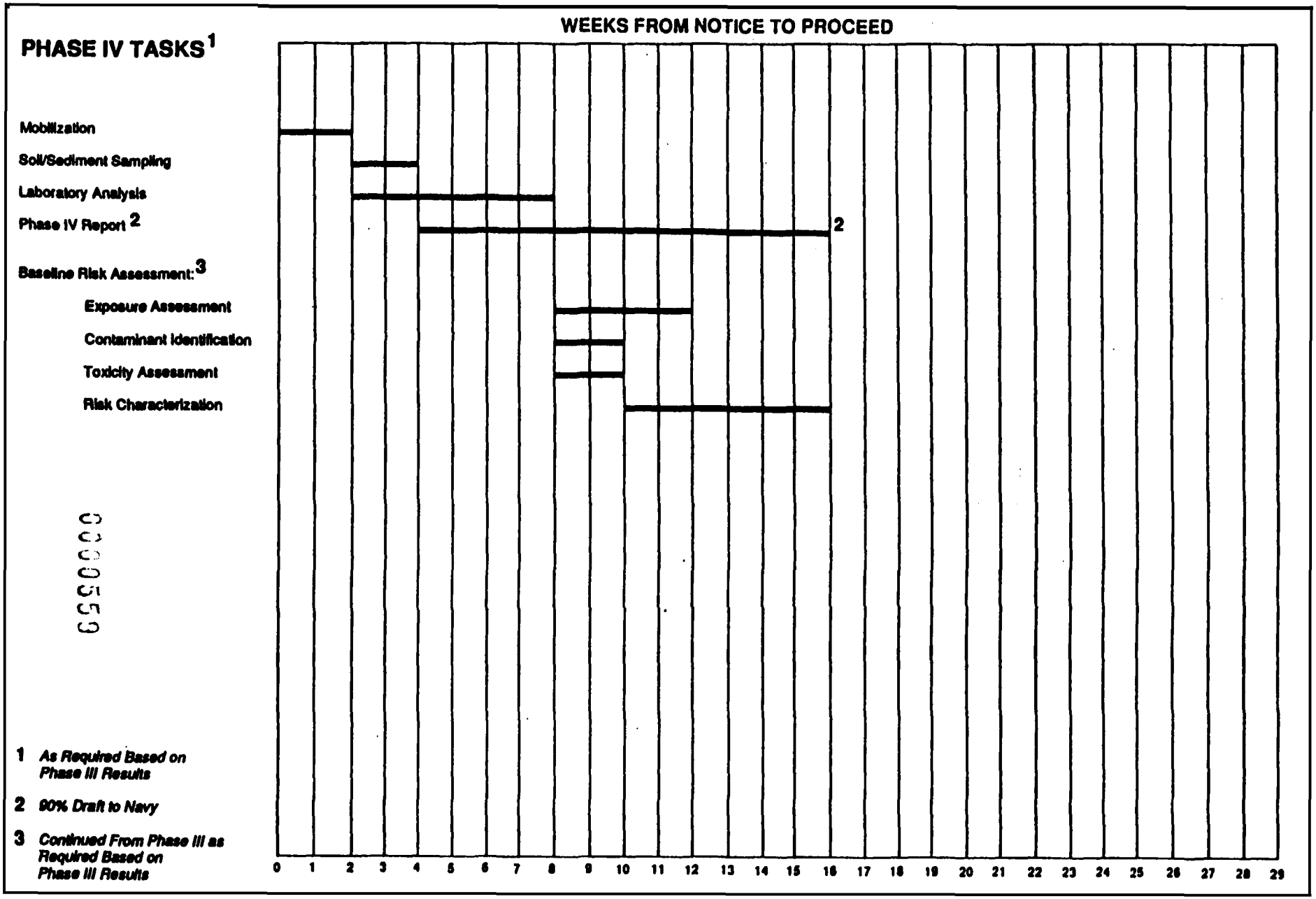

Figure 23-4 PHASE IV PROJECT SCHEDULE – GROUP C

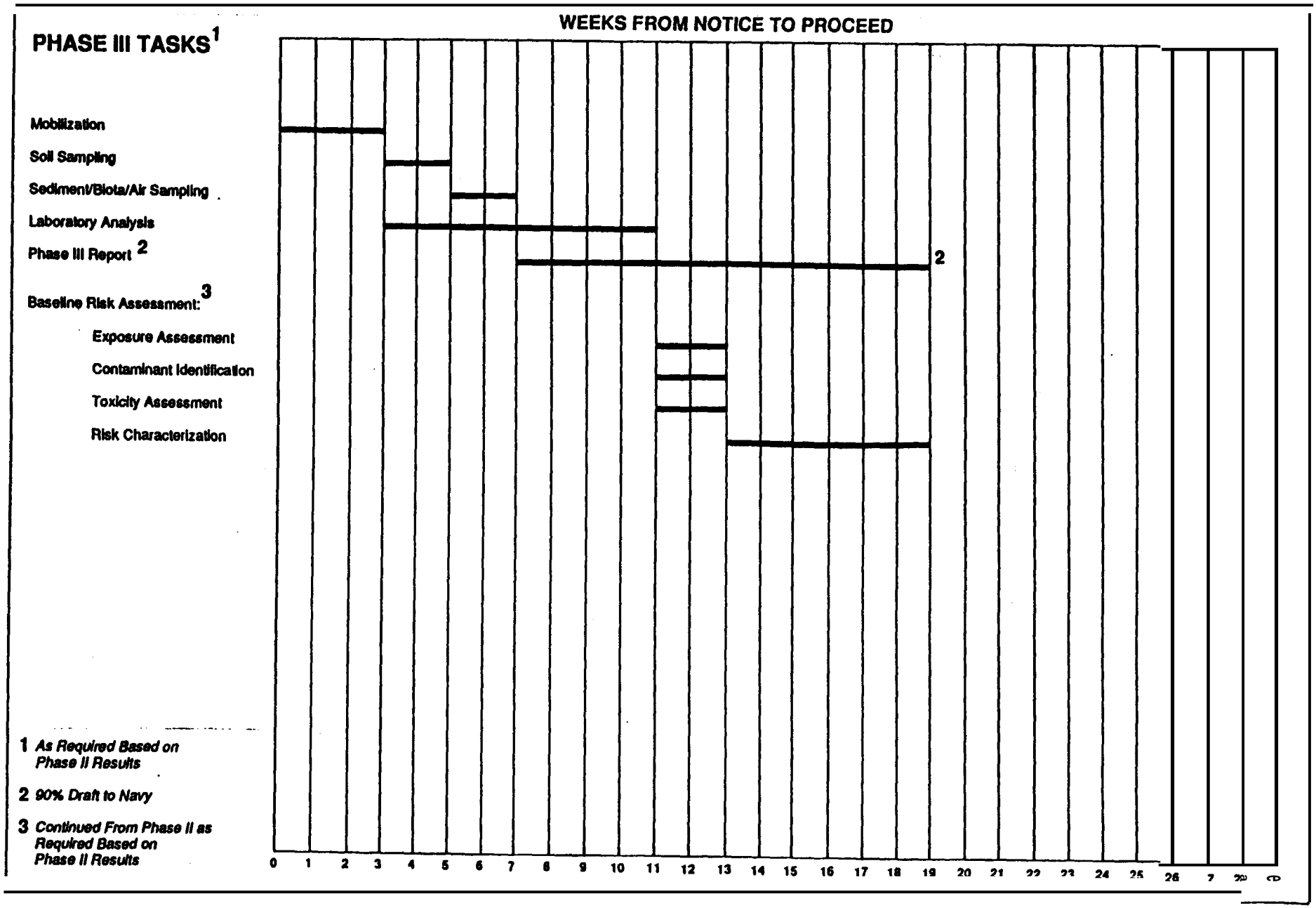

Figure 23-3 PHASE III PROJECT SCHEDULE -- GROUP C

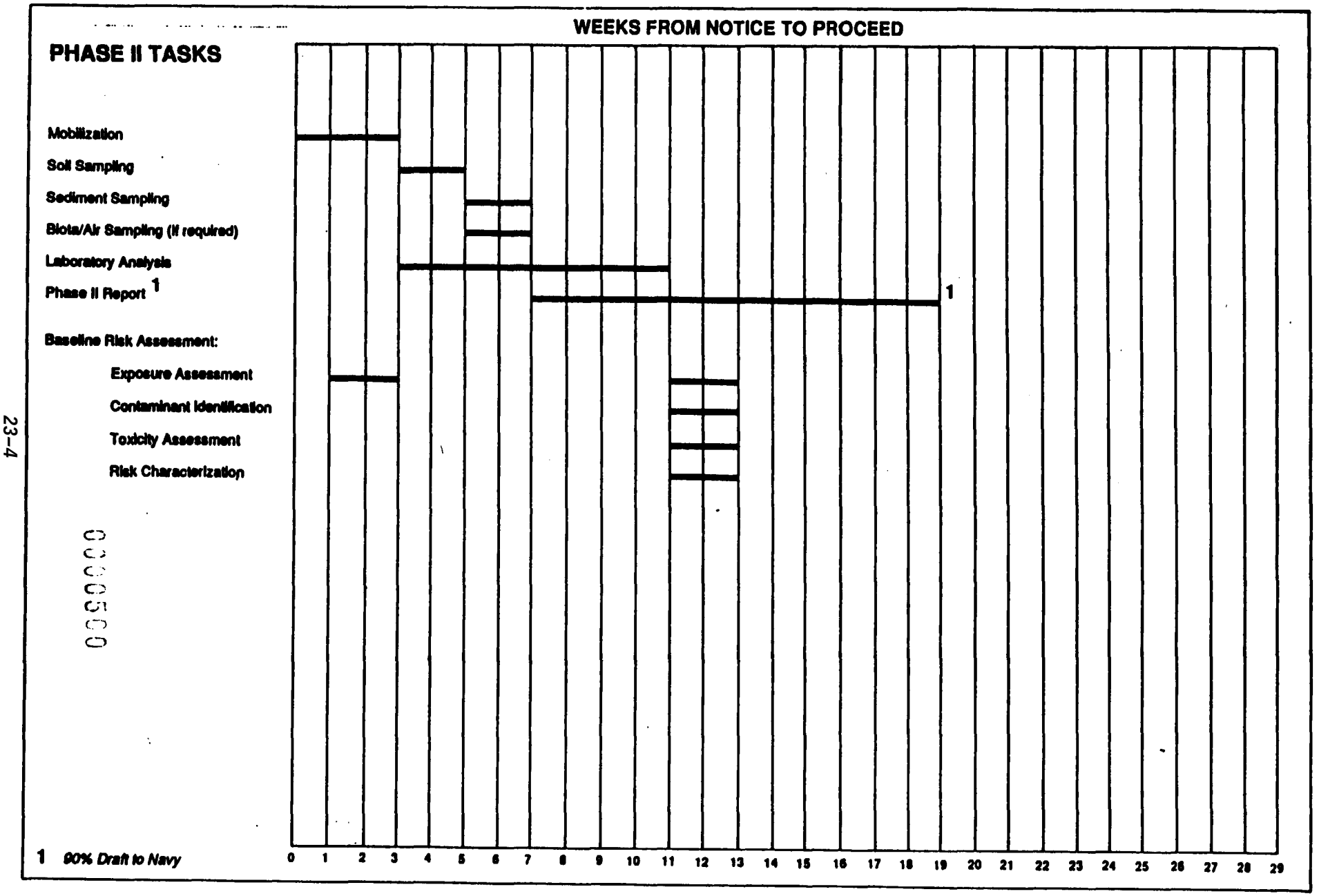

Figure 23-2 PHASE II PRO[illegible]T SCHEDULE – GROUP C

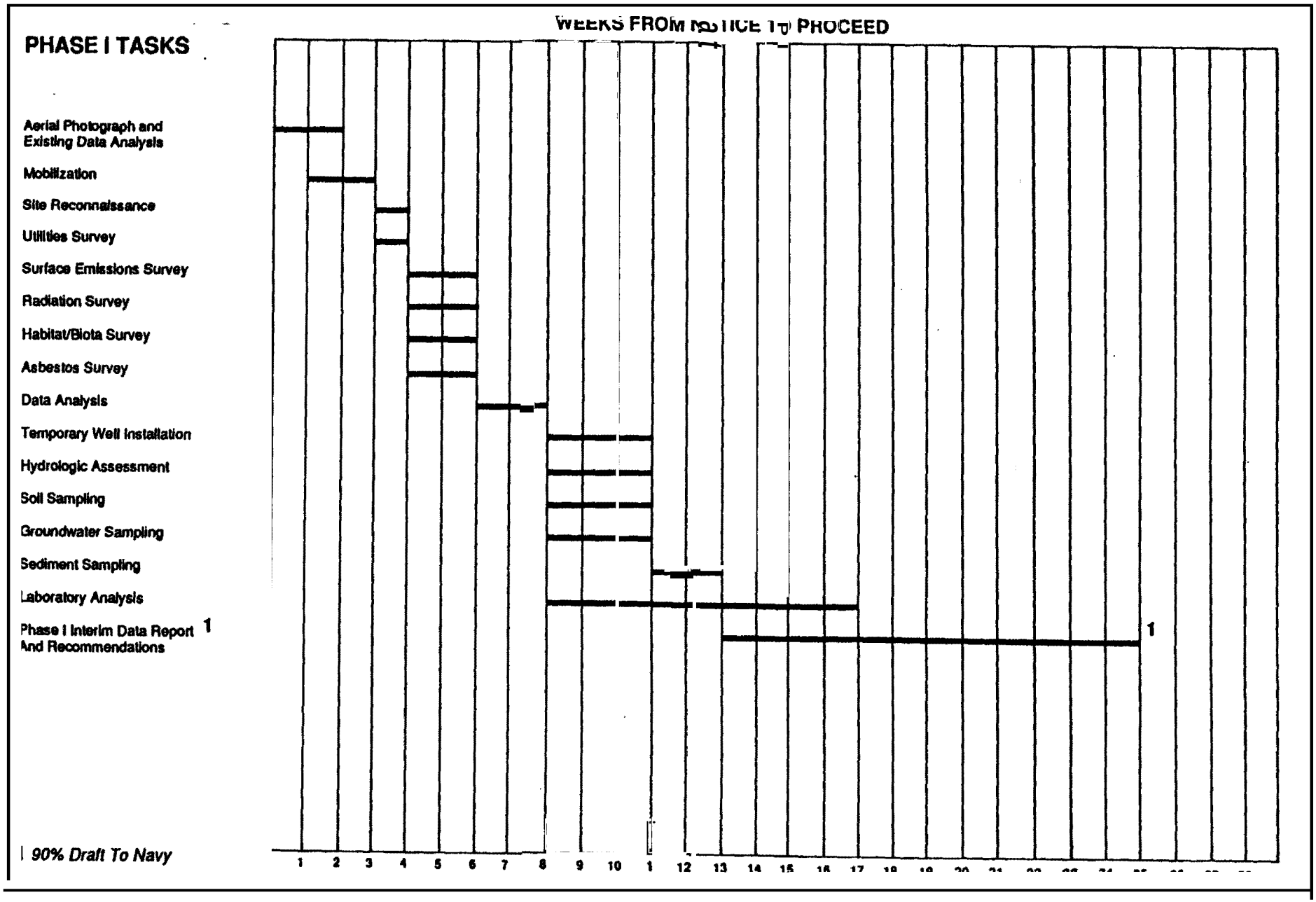

Figure 23-1 PHASE I PROJECT SCHEDULE -- GROUP C

24. REFERENCES

Barraclough, J. T. and O. T. Harsh, 1962; Aquifers and Quality of Ground Water along the Gulf Coast of Western Florida: Florida Bureau of Geology, Report of Investigations 29.

Barraclough, J. T., 1967, Ground-water Features in Escambia and Santa Rosa Counties, Florida: Florida Geological Survey, Map Series No. 26.

Brooks, E. K., 1981, Physiographic Divisions of Florida: Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, Gainesville, Florida.

Carlisle, V. W., 1960, Soil Survey of Escambia County, Florida: Series 1955, No. 8, U.S. Department of Agriculture, Washington, D.C.

Coe, C. J., 1979, Geology of the Plio-Pleistocene Sediments in Escambia and Santa Rosa Counties, Florida: Florida State University, Master Thesis.

Coffin, J. E., 1982, Summary of Ground-water and Surface-water Data for City of Pensacola and Escambia County, Florida: U. S. Geological Survey Open-file Report 82-361.

Cooke, C. W., 1939, Scenery of Florida Interpreted by a Geologist: Florida Geological Survey, Bulletin No. 17.

_____, 1945, Geology of Florida: Florida Geological Survey, Bulletin No. 29.

Cooley, N. R., 1978, An Inventory of Estuarine Fauna in the Vicinity of Pensacola, Florida: Florida Marine Research Publications No. 31. Florida Department of Natural Resources, Marine Research Laboratory, St. Petersburg, Florida.

Driscoll, F.G., 1986, Groundwater and Wells, Second Edition: Johnson Division, St. Paul, Minnesota.

Ecology and Environment, Inc., (E 6 E), 19[90a], General Health and Safety Plan, contamination Assessments and Remedial Activities, Naval Air Station Pensacola, Pensacola, Florida.

[Bold items enclosed in brackets denote changes to the last version of document]

_____, 19[90b], General Project Management Plan, Contamination Assessments and Remedial Activities, Naval Air Station Pensacola, Pensacola, Florida.

_____, 19[90c], General Site Management Plan, Contadnation Assessnents and Remedial Activities, Naval Air Station Pensacola, Pensacola, Florida.

_____, 1990[d], Generic Quality Assurance Project Plan, Contamination Assessments and Remedial Activities, Naval Air Station Pensacola, Pensacola, Florida.

[_____, 1991a, Contamination Assessment/Remedial Activities Investigation, Dredge Spoil Fill Area (Site 14), Naval Air Station Pensacola, Pensacola, Florida.

_____, 1991b, Contamination Assessment/Remedial Activities Investigation, Magazine Point Rubble Disposal Site (Site 13), Naval Air Statim Pensacola, Pensacola, Florida.

_____, 1991c, Contamination Assessment/Remedial Activities Investigation, Waterfront Sediments (Site 2), Naval Air Station Pensacoh, Pensacola, Florida.

_____, 1992a, Contamination Assessment/Remedial Activities Work Plan--Group A, Naval Air Station Pensacola, Pensacola, Florida.

_____,1992b, General Health and Safety Plan, Contamination Assessments and Remedial Activities, Naval Air Station Pensacola, Pensacola, Florida.

_____, 1992c, *General* Project Management Plan, Contamination Assessments and Remedial Activities, Naval Air Station Pensacola, Pensacola, Florida.

_____, 1992d, General Site Management Plan, Contamination Assessments and Remedial Activities, Naval Air Statim Pensacola, Pensacola, Florida.

_____, 1992e, Generic Quality Assurance Project Plan, Contamination Assessments and Remedial Activities, Naval Air Station Pensacola, Pensacola, Florida.)

ERM-Southeast, Inc. (ERM), 1988, Draft Site Investigation Report NIRP Site 31 at Building 649, Naval Air Station Pensacola, Pensacola, Florida.

Flood and Associates, Inc., 1978, South Escambia and Santa Rosa Counties, 201 Facilities Plan, City of Pensacola, Escambia and Santa Rosa Counties, City of Gulf Breeze, Santa Rosa Island Authority, and Santa Rosa County Beach Administration.

[Bold items enclosed in brackets denote changes to the last version of document]

Florida Department of Environmental Regulation (FDER), 1988[a], Unpublished Harine Sediment Data from Pensacola Bay Sediment Study, 1985-1987, Tallahassee, Florida.

[_____, 1988b, Uater Quality Standards, Classification of Groundwater, Usage, Reclassification, Chapter 17-3.403, Florida Administrative Code.]

Florida Natural Areas Inventory (FNAI), 1988a, Special Plants and Animals List, Escambia County, Florida, Tallahassee, Florida.

_____, 1988b, Survey of Pensacola Naval Air Station and Outlying Bronson Field for Rare and Endangered Plants, Tallahassee, Florida.

Geraghty and Miller, Inc. (G & M), 1984, Verification Study, Assessment of Potential Ground-water Pollution at Naval Air Station, Pensacola, Florida.

_____, 1986, Characterization Study, Assessment of Potential Ground-water Pollution at Naval Air Station, Pensacola, Florida.

_____, 1987a, Quarterly Report, Corrective Action Program, Wastewater Treatment Plant, NAS Pensacola, Florida.

_____, 1987b, Lithologic Logs, NAS Pensacola Wastewater Treatment Facflity, Pensacola, Florida.

_____, 1988, Semi-Annual Report, Corrective-Action and Compliance-Honitoring Programs, Surge Pond Operation Permit, Wastewater Treatment Facility, Naval Air Station, Pensacola, Florida.

Green, K. Michael, 1989, personal communication, Navy Engineer in Charge.

Heil, D. C., 1989, personal communication, Florida Department of Natural Resources, Tallahassee, Florida.

Jacob, C. E. and E. R. Cooper Jr., 1940, Report on the Ground-water Resources of the Pensacola Area in Escambia County, Florida: U. S. Geological Survey, Open-file Report 400001.

Kennedy, L. R., 1982, Rainfall Summary for the Northwest Florida Water Management District: Water Resources Special Report 82-3.

Ketchen, H. G. and R. C. Staley, 1979, A Hydrographic Survey in Pensacola Bay, Florida State University, Department of Oceanography, Tallahassee, Florida.

Lohman, S. W., 1972, Ground-Water Hydraulics: U. S. Geological Survey Professional Paper 708, Washington, D.C.

[Bold items enclosed in brackets denote changes to the last version of document]

Luckenbach, M. V., R. J. Diay, and L. C. Schaffner, 1988, Scientific Consultation and Analytical Services: Benthic Assessment Procedures. Project 5, Virginia Vater Control Board, Gloucester Point, Virginia.

Harsh, O. T., 1966, Geology of Escambia and Santa Rosa Counties, Western Florida Panhandle: Florida Geological Survey, Bulletin 46, 140 p.

Musgrove, R. E., J. T. Barraclough, and O. T. Marsh, 1961, Interim Report on the Water Resources of Escambia and Santa Rosa Counties, Florida: Florida Geological Survey, Information Circular No. 30.

Musgrove, R. E., J. T. Barraclough, and R. G. Grantham, 1965, Vater Resources of Escambia and Santa Rosa Counties, Florida: Florida Geological Survey, Report of Investigations No. 40.

_____, 1966, Vater Resources Records of Escambia and Santa Rosa Counties, Florida: Florida Geological Survey, Information Circular No. 50.

Naval Energy and Environmental Support Activity (NEESA), 1983, Initial Assessment Study of Naval Air Station, Pensacola, Florida. NEESA 13-015.

National Institute for Occupational Safety and Health Association, 1985, Occupational Safety and Health Guidance Manual for Hazardous Vaste Site Activities.

Northwest Florida Water Management District, 1981, Public Water Supply Systems in the Coastal Areas of Escambia, Santa Rosa, Bay, Okaloosa and Valton Counties: Northwest Florida Vater Management District, Vater Resources Special Report 81-3.

Pike, E., 1989, personal communication, NAS Pensacola Public Works Department.

Prickett, T. A., T. G. Naymik, and C. G. Lonnquist, 1981, A Random Valk Solute Transport Model for Selected Groundwater Quality Evaluations, Bulletin 654, Illinois State Vater Survey, Champaign, Illinois.

Schropp, S. J., and E. L. Windom, 1988, A Guide to the Interpretation of Metals Concentrations in Estuarine Sediments, Florida Department of Environmental Regulation, Coastal Zone Management Section, Tallahassee, Florida.

Southeastern Geological Society (SEGS), 1986, Florida Rydrogeologic Units: Southeastern Geological Society Ad Hoc Committee on Florida Hydrostratigraphic Unit Definition (SEGS), Florida Geologic Survey, Special Publication No. 28.

Trapp, E., Jr., 1972, Availability of Ground Water for Public-Vater Supply in the Pensacola Area, Florida - Interim Report, June 1971: U. S. Geological Survey, Open-File Report FL72002.

0000503

[Bold items enclosed in brackets denote changes to the last version of document]

_____, 1973, Availability of Ground Water for Public-Water Supply in Central and Southern Escambia County, Florida - Interim Report, July 1973; U. S. Geological Survey, Open-File Report FL 72029.

_____, 1975, Hydrology of the Sand-and-Gravel Aquifer in Central and Southern Escambia County, Florida - Preliminary Report - November 1973: U. S. Geological Survey, Open-File Report FL74027.

_____, 1978, Preliminary Hydrologic Budget of the Sand-and-Gravel Aquifer under Unstressed Conditions, with a Section on Water Quality Honitoring, Pensacola, Florida: U. S. Geological Survey, Water-Resources Investigations 77-96.

U.S. Environmental Protection Agency (EPA), 1984, Standard Operating Safety Guidelines.

_____, 1985, Guidance on Remedial Investigations under CERCLA, EPA, OSWER, HWERL; EPA report #540/6-85/002; NTIS ref XPB-85-268616; OSWER Directive 9355.0-06B, U.S. EPA, Cincinnati, Ohio.

_____, 1985, Guidance on Feasibility Studies under CERCLA, EPA, OSWER, OWPE, EPA report #540/G-85/003; NTIS ref #PB-85-238-590; OSWER Directive 9355.0-05c, U.S. EPA, Washington, D.C.

_____, 1987, Data Quality Objectives for Remedial Response Activities, OSWER Directive 9335.0-7B, U.S. EPA, Washington, D.C.

_____, 1987, Compendium of Superfund Field Operations Methods, OSWER Directive 9355.0-14, EPA/540/P-87/00/a.

_____, 1988[a], CERCLA Compliance with Other Laws Manual, Draft, OSWER Directive 9234.1-01, U.S. EPA, Washington, D.C.

_____, 1988[b], Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Draft, OSWER Directive 9355.3-01 OERR # 68-01-7090 and 68-W8-0098, U.S. EPA, Washington, D.C.

I_____, 1989a, Risk Assessment Guidance for Superfund: Volume I - Human Eealth Evaluation Manual (Part A), Washington, D.C.

_____, 1989b, Risk Assessment Guidance for Superfund: Volume II - Environmental Bvaluation Manual, Washington, D.C.]

U.S. Fish and Wildlife Service, 1987, Long Range Fish and Wildlife Section, Naval Air Station Pensacola and Outlying Field Bronson, Pensacola, Florida, USFUS Field Office, Panama City, Florida.

U.S. Geological Survey (USGS), 1970a, 7 1/2 Minute Topographic Map, Fort Barrancas, Florida Quadrangle.

_____, 1970b, 7 1/2 Minute Topographic Map, West Pensacola, Florida Quadrangle, Photorevised 1987.

(Bold items enclosed in brackets denote changes to the last version of document]

U.S. Navy, 1986, U.S. Navy Gulf Coast Strategic Homeporting Environmental Impact Statement, Appendix IV, Pensacola, Florida. Southern Division, Naval Facilities Engineering Command, Charleston, South Carolina.

_____, 1987, General Development Map Nos. 1276829 to 1276839, U.S. Naval Air Station, Pensacola, Florida, Southern Division Naval Facilities Engineering Command, Charleston, South Carolina.

Wagner, J. R., 1982, Hydrogeology of the Northvest Florida Water Hanagement District, in Ground Vater in Florida - Proceedings of the First Annual Symposium on Florida Hydrogeology: Northvest Florida Water Hanagement District, Public Information Bulletin 82-2.

_____, 1989, Hydrogeologic Framework of the Northvest Florida Water Management District.

Wagner, J. R., T. V. Allen, L. A. Clemens, and J. B. Dalton, 1984, Ambient Ground Water Monitoring Program - Phase 1: Northvest Florida Water Hanagement District, DER Contract Number WM65.

Walton, W. C., 1970, Ground Water Resource Evaluation: McGraw-Hill Book Co., Nev York.

Water and Air Research, Inc. (WAR), 1986, Report of Collection and Analyses of Sediment, Water, and Elutriate Samples for Navy Gulf Coast Strategic Homeporting Project, Pensacola, Florida.

Wilkins, K. T., J. R. Wagner, and T. V. Allen, 1985, Hydrogeologic Data for the Sand-and-Gravel Aquifer in Southern Escambia County, Florida: Northvest Florida Water Management District, Technical File Report 85-2.

Wolfe, S. H., J. A. Reidenauer, and D. B. Means, 1988, An Ecological Characterization of the Florida Panhandle, U.S. Fish and Wildlife Service Biological Report 88(12); Minerals Management Service OCS Study\MMS 88-0063.

[Bold items enclosed in brackets denote changes to the last version of document]

25. FLORIDA PROFESSIONAL GEOLOGIST SEAL

I hereby affix my seal to the Contamination Assessment/Remedial Activities Investigation Work Plan, Group C, Naval Air Station Pensacola, Pensacola, Escambia County, Florida, in accordance with Chapter 492 of the Florida Statutes and applicable rules and regulations developed pursuant thereto:

Name: Richard J. Rudy

License Number: P.G. No. 97

State: Florida

Expiration Date: July 31, 1992

Richard J. Rudy

Date

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APPENDIX A

SITE-SPECIFIC SAFETY PLANS

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SITE SAFETY PLAN

Version 988

A. GENERAL INFORMATION

Project Title: Site 2 - Waterfront Sediments

Project lo.: UH1103

TDD/Pan No.:

Project Manager: John Barksdale

Project Dir.: Rick Rudy

Location(s): Waterfront Sediments - Marine sediments offshore from NAS Pensacola on East and South sides

Prepared by: Jon Schmidt

Date Prepared: 4-25-19

Approval by: nary Miller

Date hpprovod:

Site Safety Officer Review:

Date Reviewed:

Scope/Objective of Work:. Field Screening will include physical surveys, sediment and surface water sampling

Proposed Date of Field Activities: September 1989

Background Info: Complete: [X] Preliminary (No analytical data available) [ ]

Documentation/Summary:

Overall Chemical Hazard:	Serious	[ ]	Moderate	[X]
	Low	[ ]	Unknown	[ ]
Overall Physical Hazard	Serious	[ ]	Moderate	[ ]
	Low	[X]	Unknown	[ ]

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

Liquid	[ ]	Solid	[ ]	Sludge	[X]	Gas/Vapor	[ ]

Characteristic(s):

Flammable/ Ignitable	[ ]	Volatile	[ ]	Corrosive	[ ]	Acutelv Toxic	[ ]
Explosive	[ ]	Reactive	[ ]	Carcinogen	[ ]	Radioactive*	[ ]

Other: Unknown

Physical Hazards:

Overhead	[X]	Confined* Space	[ ]	Below Grade	[X]	Trip/Fall	[X]
Puncture	[ ]	Burn	[ ]	Cut	[ ]	Splash	[X]
Noise	[ ]	Othor: Scuba diving to collect sediment samples. Heat/cold stress.					

*Requires completion of additional form and special approval fror tho Corporato Health/Safety group. Contact RSC or HQ.

Site Hist:
Site History/Description and Unusual Features (see Sampling Plan for detailed description): This sits is comprised of nearshore sediments along the southeastern perimeter of tho NAS Pensacola facility. Liquid vasto were disposed of within tho stormwater system from tho 1930's to 1973. This waste was carried out into tho Pensacola Bay by way of stormwater outfalls located along the southeastern portions of NAS Pensacola. At leas 83 million gallons of paints, paint solvents, ketones, alodine, wrcury, radium paint, and plating solutions were disposed, untreated, into Pensacola Bay.

Locations of Chemicals/Wastes: Unknown. It is assumed tbat wastes are bound to tho organic fraction of nearshore sediments.

Estimated Volume of Chemicals/Wastes: At least 83 million gallons of paint, paint thinner and solvent, plating solutions, mercury, trichloroethylene and ketones.

Site Currently in Operation Yes: [ ] No: [X]

C. HAZARD EVALUATION

List Hazards by Task (i.e., drum sampling, drilling, etc.) and number them. (Task numbers are cross-reference in Section D)

Physical Hazard Evaluation:
1) Physical Surveys - Walking along sewage outtalls:
2) Sediment Sampling - SCUM Diving for sediment samples;
3) Decontamination Procedures - Using solvents.

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	odor Description
Mercury	0.1 mg/m^3	Inh/Absor/Cont	cough, weak	N/A	odorless
Trichloroethylene	100 ppm	Inh/Ingst/Cont	naus,vomit,vertigo	0.082 ppm	sweet odor
Isopropyl Alcohol	440 ppm	Inh, Abs	drowsiness,head.	7.5-200 ppm	rubbing alcohol
Nitric Acid	2 ppm	" "	corrosive	0.3-1 ppm	acrid
Cadmium	0.2 mg/m^3	Inhale/Ingest	cough, tight chest	N/A	varies
Cyanide	5 mg/m^3	Inhale/Ingest	weak, headache	N/A	almond odor(HCN
Nickel	1 mg/m^3	Inh/Ingst/Cont	allergic, asthma	N/A	varies
Lead	0.05 mg/m^3	Inh/Ingst/Cont	insomnia, hyperten	N/A	varies
Chromium	500 mg/m^3	Inhale/Ingest	fibrosis of lungs	N/A	varies
Sulfuric Acid	1 mg/m^3	Ing/Derm/Inh	corrosive	N/A	odorless
Hydrochloric Acid	5 ppm	Inh/Ing/Derm	corrosive	Unknown	acrid
Sodium Hydroxide	2 mg/m^3	Inh/Ing/Con	corrosive	N/A	odorless

Note: Complete and attach a Hazard Evaluation Shoot tor each major known contaminant.

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D. SITE SAFETY WORK PLAN

Site Control: Attach nap, use back of this page, or rkotch of site showing hot zone, contamination reduction, zone, otc.

Perimeter identified? [no] Site secured? I no I

Work Areas Designated? [yes] Zone(s) of Contamination Idontifiod? [no]

Personnel Protection (TLD badges required for all field personnel):

Anticipated Level of Protection (Cross-reference task numbers to Section C):

	A	B	C	D
Task 1				x
Task 2				x
Task 3				x

Modifications: Modified level D with wetsuit, neoprene gloves and dive mask.

Action Levels for Evacuation of Work Zone Pending Reassessment of Conditions:

- o Level D: O_2 t19.51 or >25%, explosive atmosphere >10% LEL, organic vapors above background levels, particulator >_____ mg/m^3, othor _____
- o Level C: O_2 <19.5% or >25%, oxplosivo atmosphere >25% LEL_3 (California-20%), unknown organic vapor (in breathing zone) >1 ppm, particulatos >_____ mg/m^3, othor _____
- o Level B: O_2 <19.5% or >25%, explosive atmosphere >25% LEL_3 (California-201). unknown organic vapors (in breathing zone) >5 ppm, particulatos >_____ mg/m^3, othor _____
- o Level A: O_2 <19.5% or >25%, oxplosivo atmosphere >25% LEL (California-201). unknown organic vapors >500 ppm, particulatos >_____ mg/m^3, othor _____

Air Monitoring (daily calibration unless otherwise noted):

Contaninant of Interest	Type of Sample (area, personal)	Monitoring Equipment	Frequency of Sampling

Decontamination Solutions and Procoduras for Equipment, Sampling Gear, otc.:

Trisodium phosphate wash, tap wator rinso, deionized wator rinso, isopropanol rinso (twice), final organic-free water rinso, and allow to air dry as long as possible.

Personnel Decon Protocol: Boot and glove wash - trisodium phosphate wash with clean water rinse. Expendables will bo double bagged and drummed for disposal. Field personnel will take a hygienic shower, off-sit., following each day's field work.

Decon Solution Monitoring Procedures, if Applicable: Decontamination will be performed on tho boat

Special Site Equipment, tacilitios. or Procedures (Sanitary tacilitios and Lighting Must Meet 29 CFR 1910.120):

SCUBA procedures and equipment will follow N.A.U.I. and P.A.D.I. guidelines

Site Entry Procedures and Special Considerations: E & E's 'Buddy System' will be employed at all tins during fieldwork activities. Personnel will exercise caution in tho vicinity of tho outfalls and underwater. It above background radiation levels are encountered team members will evacuate tho sampling area, and contact the corporate health physics group to reassess tho site.

work Limitations (tin of day, weather conditions, etc.) and Heat/Cold Stress Requirements:

All fieldwork activities will bo performed during daylight hours. Team members will take breaks as necessary to avoid heat stress and replace fluid..

General Spill Control, if applicable: N/A

Investigation-Derived Material Disposal (i.e., expendables, decon waste, cuttings):

All fieldwork waste materials will be double bagged, drummed, labeled and transported to a designated location for final disposal by tho Navy.

Sample Handling Procedures Including Protective Wear:

During all handling of samples, all fiold team members will wear surgical gloves. Goggles will be worn during sample preservation with acids.

Team Member*	Responsibility
Team members to bo determined	Team Leader
	Site Safety Officer/Sampler
	Geologist/Sampler

*All entries into exclusion zone require Buddy System use. All C & C fiold staff participate in medical monitoring program and have completed applicable training per 29 CFR 1910.120. Respiratory protection program meets requirements of 29 CFR 1910.134, and ANSI Z88.2 (1980).

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E. EMERGENCY INFORMATION

(Use supplemental shoots, if necessary)

LOCAL RESOURCES

(Obtain a local telephone book from your hotel, if possible.)

Ambulance On Base -- 904-452-4138, Off Base -- 911

Hospital Emergency Room NAS Dispensary - 904-452-2733, Baptist Hospital 904-434-4811 (Life Flight)

Poison Control Center

Police (include local, county sheriff, state) 911

Fire Department 911

Airport

U.S. Coast Guard Emergency - 904-453-8178, General Information 904-453-8282

Laboratory E & E ASC 1-716-631-0360

Fed. Express 1-800-238-5355

Client Contact U.S. Navy Southern Division, Engineer-In-Charge, Suzanne D. Sanborn -- 1-803-743-0574

Site Contact NAS Pensacola Enviromental coordinator, Ron Joyner -- 904-452-4515

Decompression Chamber NAS Pensacola for life threatening situations. All other cases will bo taken by life flight to Bay Memorial Hospital in Panama city, Florida.

SITE RESOURCES

Site Emergency Cvacuation Alar8 Method N/A

Water Supply Source On-site

Telephone Location, Number To bo dotorminod on-sit.

Cellular Phone, it available N/A

Radio

Other On-stto warehouse number to bo dotorminod

EMERGENCY CONTACTS

1. Dr. Raymond Harbison (Univ. of Florida) ..... (501) 221-0465 or (904) 462-3277, 3281
   Alachua, Florida (501) 370-8263 (24 hours)

2. Ecology and Environment, Inc., Safety Director
   Paul Jonmaire ..... (716) 684-8060 (office
   (716) 655-1260 (home)

3. Regional Safety Coordinator, Sybil Novchurch ..... (904) 878-2336 (homo)
   (904) 877-1978 (office

4. Regional offico Manager, R. Rudy ..... (904) 893-7245 (home)
   (904) 877-1978 (office

MEDTOX HOTLINE

1. Twenty-four hour answering sorvico: (501) 370-8263

   What to report:

   - State: "this is an emergency."
   - Your name, rogion, and site.
   - Telephone number to roach you.
   - Your location.
   - Name of person injured or exposed.
   - Nature of emergency.
   - Action taken.

2. A toxicologist, (Drs. Raymond Harbison or associate) will contact you. Repeat tho information given to tho answering service.

3. If a toxicologist does not return your call within 15 minutos, call tho following persons in order until contact is made:

   a. 24 hour hotlino - (716) 684-8940
   b. Corporato Safety Director - Paul Jonmaire - homo # (716) 655-1260
   c. Assistant Corp. Safety Officer - Steven Sherman - homo # (716) 688-0084

EMERGENCY ROUTES

(NOTE: Field Team must Know Route(s) Prior to Start of Work)

Directions to hospital (include map) from Site 2

NAS Dispensary - Follow South Avenue west to Radford Boulevard. Bear loft onto Radford Boulevard and continuo west to Fisher Stroot. Turn right onto Fisher Stroot and continuo to Turnor Stroot. Turn loft onto Turnor Stroot. Tho NAS Dispensary is located on Turnor Stroot in Building 3600.

Baptist Hospital - Take Duncan Road (Navy Blvd.) north to exit tho base. Navy Blvd. becomes HWY 98 and curves to the east. Follow Navy Blvd./Hwy. 98 east approx. 3mi to Pace Blvd. Turn loft (north) on Pace Blvd. and proceed approx. 1mi to Cervantes St. (Hwy. 90). Turn right on Cervantes/Hwy. 90 and follow this road for about 8 blocks and turn loft (north) onto E street. Tho hospital is about 6 blocks north on tho loft.

Emergency Egress Routes to Got Off-Sit. Emergency egress routes will bo located if emergency exit routes become blocked by construction, otc.

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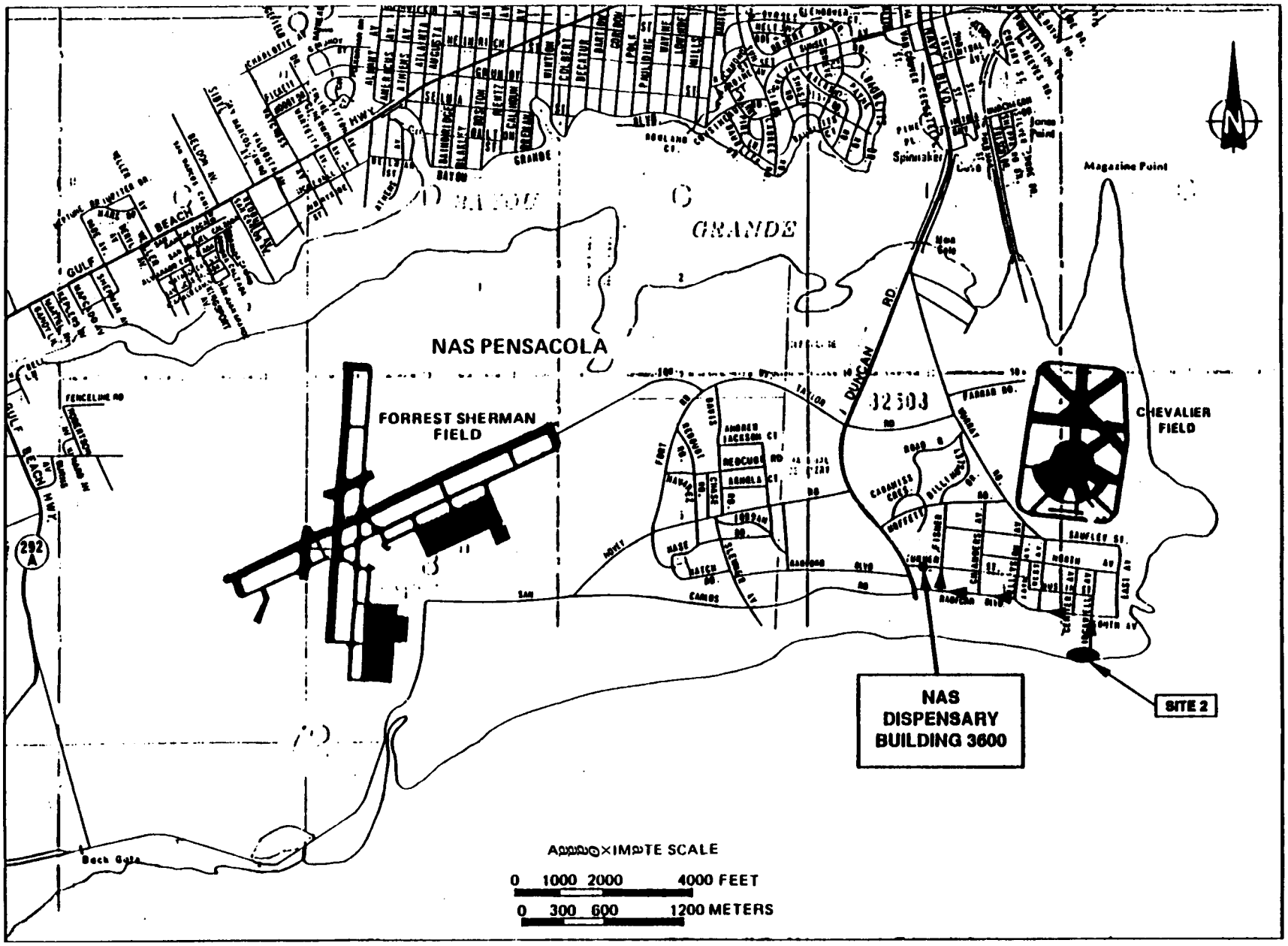
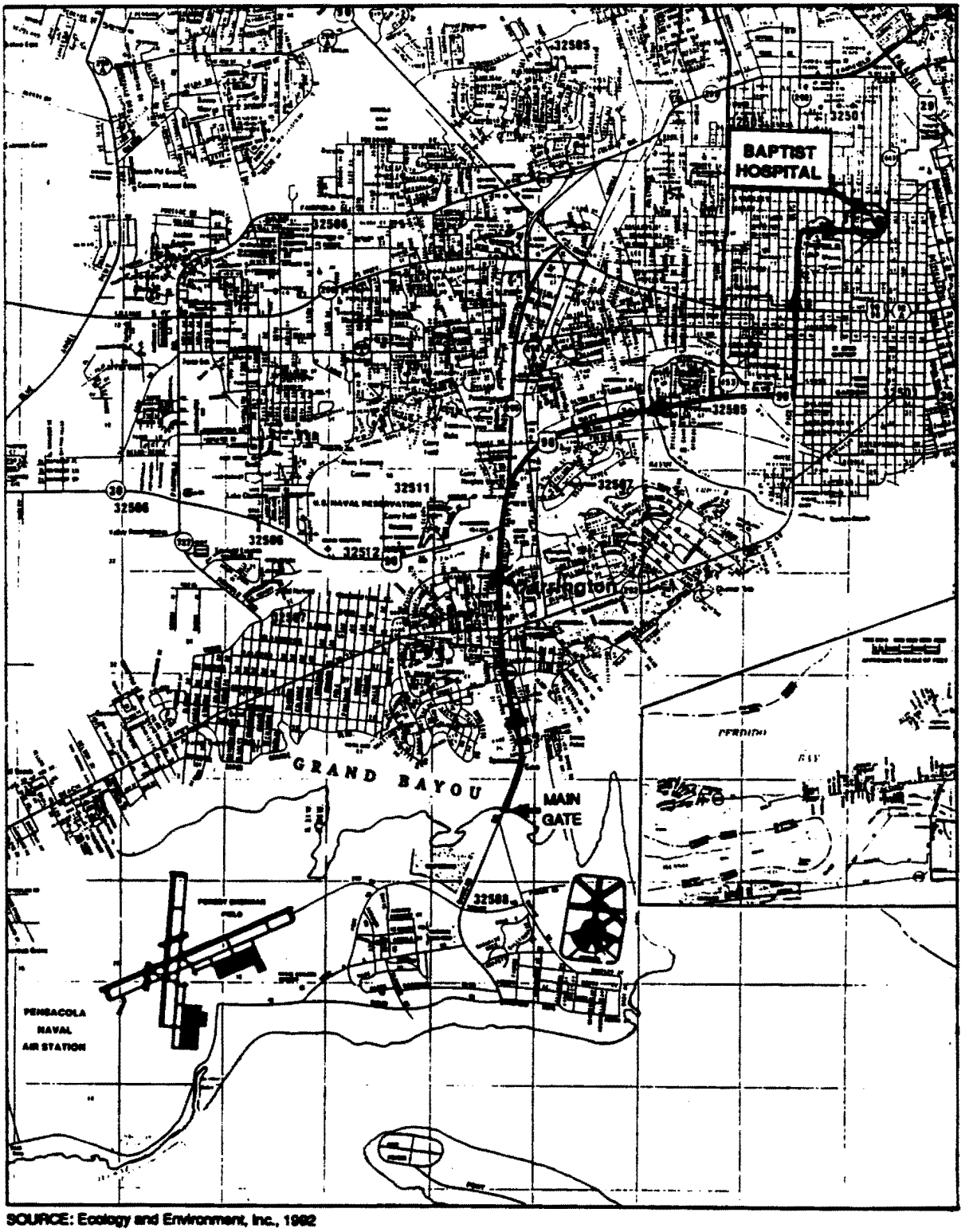


Figure A-1 LOCATION OF NAS DISPENSARY



SOURCE: Ecology and Environment, Inc., 1992

APPROXIMATE SCALE IN FEET

0 2000 4000 6000 8000

Figure A-2 **LOCATION OF BAPTIST HOSPITAL**

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DRILL RIG SAFETY

* Hard hats must be worn.
* All team members must be know the procedure to shut the rig off and the location of the "kill" switch.
* When moving a rig off the road, pay attention to obstacles in route of travel. walk the intended route first.
* Have someone guide the rig driver when clearance is at a minimum or when hazards are in close proximity.
* Set rig brakes and block the wheels when rig is set up at the desired drilling location.
* The mast must be lowered when the rig is moved.
* Always consider overhead wires to be live, watch for sagging lines and do not operate rig within 15 feet of overhead lines.
* Hake sure the site, platforms and walkways are free of obstructions.
* Hake sure proper housekeeping is practiced around and on the rig at all times. Tools should be stored in a manner that permits convenient access and provides for adequate safety.
* Store gasoline in approved containers that have a spark arrestor and keep them clear of the drilling work area.
* Check rig equipment prior to starting work. Repair or replace faulty and worn items.
* Handle augers with care. Use proper lifting techniques when picking up samplers and augers. Use a tool hoist if possible and stay clear of rotating augers. Keep cables and ropes secured when not in use.
* Level and stabilize the drill rig prior to raising the mast.
* watch for slippery ground when working in the area of the rig.
* All unattended boreholes must be properly covered.
* Do not drill during an electrical storm.
* Maintain a safe distance from the rig mechanisms during drive sampling and auger removal operations..

Category:	H & S, TRAINING 2.8	Revised: ANUARY 1990 Approved: H. Van Cleave

STANDARD OPERATING PROCEDURE
FOR
EMERGENCIES DUE TO HEAT AND HEAT STRESS MONITORING

REVISED JANUARY 1990

Prepared by

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1 INTRODUCTION

Field operations present a variety of hazards to the employee. During hot days or vhen wearing protective clothing, heat stress can be experienced and, if not remedied, can threaten the health or life of field personnel. Therefore, it is important that all employees are able to recognize the symptoms of heat stress as well as perform first aid vithout delay.

2 SCOPE

This standard operating procedure (SOP) describes the symptoms and treatment for the three classical types of heat stress presented here in ascending order of severity: heat cramps, heat exhaustion, and heat stroke. Field personnel should take immediate action to prevent a less severe form of heat stress from escalating into one requiring hospital treatment.

In addition, this SOP recommends vays to avoid heat stress, such as frequent rest periods, carefully timed excursions in protective clothing, and monitoring heartrate and body temperature. The Site Safety Officer (SSO) has overall responsibility for seeing that these guidelines are folloved in the field. However, each individual must be cautious when vorking in conditions where heat stress is possible.

3 OBJECTIVES

The prevention of heat stress is of paramount importance for field personnel, particularly vhen they must wear heavy or confining protective clothing. The SSO must ensure that all personnel monitor themselves for possible heat stress, and know what to do in a heat emergency. For example, a person who recognizes the symptoms of heat stroke can provide lifesaving first-aid to another, while medical assistance is summoned.

4 EFFECTS OF HEAT

Normal oxidation processes within the body produce a predictable amount of heat. If the heat is liberated as it is formed, there is no change in body temperature. If the heat is liberated slightly more rapidly, the body cools to a point at which the production of heat is accelerated and the excess is available to bring the body temperature back to n o d .

Interference vith the elimination of heat leads to its accumulation and thus to the elevation of body temperature. As a result, the person is said to have a fever. Such a condition produces a cycle in vhich certain body processes speed up and generate additional hart. Then the body must eliminate not only the normal but also the additional quantities of heat.

Heat produced vithin the body is brought to the surface largely by the bloodstream and escapes to the cooler surroundings by conduction and radiation. If air movement such as a breeze strikes the body, additional hut is lost by convection. However, vhen the temperature of the surrounding air becomes equal to or rises above that of the body, all of the heat must be lost by vaporization of the moisture (sveat) from the skin surface. As the air becomes more humid (contains more moisture), vaporization from the skin slovs dovn. Thus, on a day vhen the temperature is 95°F to 100°F, vith high humidity and little or no breeze, heat is retained vithin the body. It is on such a day or, more commonly, after a succession of such days (a heat vave) that medical emergencies due to heat are likely to occur. Such emergencies are classified in three categories: hut cramps, hut exhaustion, and heat stroke.

4.1 HEAT CRAMPS

Heat cramps usually affect people vho vork in hot environments and perspire a great deal. Loss of salt from the *body* causes painful cramps of the leg, arm, or abdominal muscles. Heat *cramps* also may result from drinking iced vater or other drinks either too quickly or in too large a quantity. Heat cramps generally occur during vork, but m y appear hours later in some *cues.*

4.1.1 Symptoms

The symptoms of hut cramps include the folloviag:

- Muscle cramps in legs, arms, or abdomen;
- Pain accompanying the cramps;
- Profuse perspiration: and
- Faintness.

4.1.2 Emergency Care

Place the victim in a cool location, observing safety and decontamination considerations (see Section 6) if the victim is coming fra the hot zone. Give the person sips of vater or an electrolyte liquid *such* as Gatorade or its equivalent. Apply manual pressure to the cramped muscle. The victim should not require medical treatment but be alert for any indication of a more serious problem.

1.2 HEAT EXHAUSTION

Heat exhaustion occurs in individuals vorking in hot environments and may be associated vith hut *cramps.* But exhaustion is caused by the pooling of blood in the vessels of the skin. The hut is

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transported from the interior of the body to the surface by blood. The blood vessels in the skin become dilated and a large amount of blood is pooled in the skin. This condition, plus the blood pooled in the lover extremities vhen an individual is in an upright position, may lead to an inadequate return of blood to the heart and eventually to physical collapse.

4.2.1 Symptoms

The symptoms of heat exhaustion are as follows:

- Pale clammy skin,
- Profuse perspiration,
- Generalized weakness,
- Dizziness,
- Weak pulse,
- Rapid and usually shallov breathing,
- Unconsciousness, and
- Appearance of having fainted (the patient will respond to the same treatment that is administered in cases of fainting).

4.2.2 Emergency Care

Place the victim in a cool location and remove as much clothing as possible while observing proper decontamination procedures. Administer cool vater, Gatorade, or its equivalent. If possible, fan the patient continually to remove heat by convection, but do not allov chilling or overcooling. Trut for shock, and take the victim to a medical facility if there is any indication of a more serious problem.

4.3 **HEAT STROKE**

Heat stroke is a profound disturbance of the heat-regulating mechanism, associated vith high fever and collapse. Sometimes this Condition results in convulsions, unconsciousness, and even death. Direct exposure to sun, poor air circulation, poor physical condition, and advanced age (over 40) bear directly on the tendency to heat stroke. It is a serious threat to life and carries a 20-percent mortality rate. Alcoholics are extremely susceptible.

4.3.1 Symptoms

Polloving are the symptoms of heat stroke (note the absence of perspiration):

- o Dry, hot, and flushed skin:
- o Sudden onset:
- o Full and fast pulse:
- o Dilated pupils;
- o Early loss of consciousness;
- o Body (core) temperature's exceeding 105°F;
- o Muscle twitching, groving into convulsions; and
- o Breathing deeply at first, later shallovly or even almost absent.

4.3.2 Emergency Care

Remember that this is a true emergency, therefore, transporta ion to a medical facility should not be delayed. In the meantime, place the victim in a cool environment and remove as much clothing as possible. Ensure an open airvay. Reduce body temperature promptly, preferably by vrapping the victim in a vet sheet or dousing the body with vater. If cold packs are available, place them under the arms, around the neck, on the ankles, or any place vhere blood vessels located close to the skin can be cooled. Protect the victim from injury during convulsions, especially tongue biting.

5 PREVENTION OF HEAT STRESS

Please note that in the case of hut cramps or hut exhaustion, Gatorade or it8 equivalent it suggested as part of the treatment regime. The reason for this type of liquid refreshment is that such beverages will return much-needed electrolytes to the body's system. Without these electrolytes, body systems cannot function properly, and the represented health hazard will be increased. Therefore, vhen personnel are vorking in situations vhere the ambient temperatures and humidity are high, and especially in situations vhere levels A, B, and C of protective apparel are required, the SSO must follov the procedures listed below:

- o Ensure that all employees have sufficient quantities of fluids (Gatorade or its equivalent). Personnel should prepare ahead of time for field work in heat stress environments by consuming extra fluids;

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- Ensure that frequent breaks are scheduled so that overheating is less likely to occur;
- Revise work schedules, when necessary, to take advantage of the cooler parts of the day (i.e., 5:00 a.m. to 1:00 p.m., and 6:00 p.m. to nightfall); and
- Cooling vests should be worn if available.
- NOTE: Taking salt tablets is NOT currently recommended.

5.1 GUIDELINES FOR USE OF PROTECTIVE CLOTHING

If protective clothing must be worn, especially levels A and B, the suggested guidelines for ambient temperature and maximum wearing time per excursion are as follows:

Ambient Temperature (°F)	Maximum Wearing Time per Excursion (min)
Above 90	15
85 to 90	30
80 to 85	60
70 to 80	90
60 to 70	120
50 to 60	180

5.2 HEARTRATE MONITORING

One method of measuring the effectiveness of an employee's rest-recovery regime is by monitoring the heartrate. The "Brouha guideline" is one such method:

- During a 3-minute period, count the pulse rate for the last 30 seconds of the first minute, the last 30 seconds of the second minute, and the last 30 seconds of the third minute.
- Double the count.

If the recovery pulse rate during the last 30 seconds of the first minute is at 110 beats/minute or less and the deceleration between the first, second, and third minutes is at least 10 beats/minute, the work-recovery regime is acceptable. If the employee's rate is above that specified, a longer rest period is required, accompanied by an increased intake of fluids.

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5.3 HONITORING PERSONNEL BODY TEMPERATURE AND BLOOD PRESSURE

When personnel are in respiratory protective gear for extended periods, or when air temperatures are very high, the monitoring of body temperature and blood pressure is another vay of checking for symptoms of heat stress. Careful adherence to existing medical guidelines could identify an individual vho may not have fully stabilized and therefore, is not ready to continue vorking in the hot zone.

5.4 MONITORING THE WORK AREA FOR HEAT STRESS CONDITIONS

Air temperature and relative humidity are the two most important measurements for determining the likelihood that a hut stress situation rill occur. The reading can be achieved using both a dry urd vet bulb thermometer.

6 DECONTAMINATION

As in ocher medical emergencies, decontamination should proceed as normally as possible without contributing unduly to the victim's stress or injury. At a minimum, the protective clothing should be removed as he or she is taken from the hazardous zone. The "buddy system" is always in effect and backup personnel should be available at the decontamination station to either suit up and assist in extraction or to help decontaminate and undress the victim. If other serious injuries or more life-threatening conditions exist, and the victim cannot be disrobed or decontaminated completely, the victim (or contaminated portions) should be wrapped in plastic (or other protective material) for his or her own safety as well as the safety of ambulance and hospital personnel. Carefully avoid action that vould result in the victim's being further overheated.

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STANDARD OPERATING PROCEDURES FOR HEALTH AND SAFETY ON DRILLING RIG OPERATIONS

REVISED: JANUARY 1990

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1 INTRODUCTION

This document is meant to be used in conjunction vith B 6 E SOPs for field operations and hazardous vaste site operations, and incorporates by reference all the safety precautions required therein. It specifically addresses the functions and responsibilities of personnel working on or around drilling operations.

B & E personnel are frequently required to vork in the field with drill rigs, taking soil and rock samples, installing piezometers, and monitoring vells. Two general situations discussed separately are the supervision of Subcontract Drillers by E & E, and the direct operation of B & E's ovn drill rig by our personnel.

2 OPERATION OF DRILLING EQUIPMENT BY E & E

2.1 RESPONSIBILITIES AND AUTHORITY OF SITE SAFETY OFFICER

The duties of the Site Safety Officer (SSO) on drilling sites are the same as in other types of operations with the exception of the increased emphasis on the hazards unique to drilling vork. This section details specific drilling concerns of an SSO.

B & E personnel are restricted from the borehole area during active drilling. When E & E personnel are doing drilling; they will be restricted from the borehole area by means of a "super exclusion tone" delineated by placing a 4- by 8-foot sheet of plyvood over the borehole.

2.2 RESPONSIBILITIES AND AUTHORITY OF E 6 E DRILLER

At the beginning of each vork day, the E & E driller must inspect the rig to ensure the following components have been properly inspected, maintained, or replaced, or procedures have been performed:

- Kill svitches tripped and operation verified;
- Chain guards in place:
- Belt guards in place;
- Belts set to proper tension (visual);
- Loose belts;
- Presence of any fluid leaks;
- Any damaged hoses, cables, ropes, chains;
- Control panel is clean;
- Control lever functions labeled;
- Pressure relief valves function:
- Cathead free of rust and grease;
- Cathead grooves less than 118 inch in depth:
- All tools in proper working order;
- Rig leveled and stabilized;
- Check for veld cracks in mast; and
- Safety hooks operational.

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The Driller will report items needing attention to the SSO: hovever, it is the Driller's responsibility to make sure that these items are corrected prior to drilling.

During the drilling operations, the folloving safety practices will be in effect:

- All vheels will be blocked.
- Rig will be leveled using jacks or stabilizers.
- Rig engine vill be in neutral vhen not actively turning augers.
- Plywood (or suitable substitute material) "super exclusion zone" pad will be in place over borehole.
- Rig engine key will be properly labeled.
- Rig equipment vill be kept in an orderly manner within drilling vork zone.
- All equipment will be properly lubricated.
- Tools will be used only for their intended purpose.
- Safety glasses, hearing protection will be vorn vhcn hammers are operated.
- Javs of all vrenches will be clean and free of mud to prevent slippage.
- All lift hooks will have jaw clasps.
- Fire extinguisher vill be staged at rear of rig.
- Rig will not be moved vhen mast is in raised position.
- Cables and ropes vill be tied back or secured on stabilizer posts.
- All unattended drill holes will be covered.
- Check for overhead obstructions vhen raising rig mast, boom will not be raised vithin 25 feet of overhead utilities.
- No refueling will be permitted vhile equipment is running.

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The Driller has authority to direct personnel vithin the area while drilling operations are in progress. Access to the hazardous area around the auger and borehole is restricted by the "super exclusion zone" delineated by the 4- by I-foot sheet of plywood centered over the borehole before drilling. A large hole cut in the plywood allow penetration of the augers. No personnel are alloved in this zone pad at any time while drilling it actively underway.

Housekeeping around the rig is the responsibility of the Driller, but all team members must participate in this effort as vell.

23 RESPONSIBILITY AND AUTHORITY OF OTHER E 6 E PERSONNEL

E & E personnel vorking at a drilling site must act as support to the Drilling Team by providing any necessary support functions; however, it is important that personnel are careful not to interfere vith the drilling process. Personnel are restricted from approaching the "super exclusion zone" while drilling is underway. If an E 6 E crev member recognizes an unsafe condition in the vork area or on the rig, he should bring it to the attention of the SSO and Tau Leader, if it is not resolved in a timely manner. If conditions are still deemed 'to be hazardous, team members have the option to contact their Regional Safety Coordinator (RSC) or Corporate Health and Safety in Buffalo.

It is the responsibility of all E & E personnel to carry their issued nondisposable gear, including hard hat, face shield, respirator, ateel-toed boots, eyepiece inserts, safety glasses, and appropriate outervear for the expected climate.

All personnel should be avare of emergency facilities, egress routes, and special medical conditions of their team members. As vith all E & E field vork, the buddy system is to be enforced.

3 TRAINING REQUIREMENTS FOR SITE PERSONNEL

31 E 6 E SITE SAFETY OFFICER

In addition to Basic Health and Safety Training and other OSM mandated training, first aid, CPR, and necessary training in field monitoring of personnel, an SSO should have previously worked as a team member on field drilling projects in order to have a vorking knowledge of the drill rig and its inherently hazardous nature. Where monitoring instrumentation is to be vved, the SSO must be properly trained prior to field vork. The SSO must have an understanding of the hazards of heat and cold stress, their associated symptoms, and proper vork modifications to protect field staff from potential injury.

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3.2 E & E DRILLER AND HELPER

The E 6 E driller and helper shall have taken and passed the basic 40-hour Bealth and Safety Training as prescribed by E & E and mandated by OSHA. They shall also meet the other minimum requirements for field vork including medical approvals and respirator fit test. Based on previous experience and training, the Driller will be critiqued by the E & E Drilling Team upon employment vith E & E, by performing various types of drilling. This reviev will be the basis for determining vhcther additional training or apprenticeship will be required before alloving this employee to act as Driller. An existing E 6 E employee shall have a minimum of 1 year experience as a Driller's Eelper on an assortment of field projects before he or she can be reviewed for advancement to the position of Driller. If a Driller is uninvolved in drilling efforts for 1 year or more, he or she will be required to act as a Driller's Helper on a project, as well as receive rig-specific training on the equipment, before being permitted to act as a Driller again. The Driller's Helper position requires prior attendance at a drilling training school program. Folloving successful completion of such a course, the Driller's Eelper will be observed on sites for a period of approximately 6 months, during which time he or she will work on several drilling projects performing assorted types of drilling. The E 6 E Drilling Team will determine, based on these field observations, vhcther additional training is required for this individual.

3.3 OTHER E 6 E DRILLING PERSONNEL

All E & E personnel shall have taken the basic 40-hour Eealth and Safety Training course. Field personnel must meet medical and respiratory fit test requirements established by E 6 E and OSHA, as well.

3.4 SUBCONTRACT DRILLER AND OTHER SUBCONTRACT DRILLING PERSONNEL

Subcontract Drillers and their support personnel must, at a minimum, have passed basic 40-hour Eealth and Safety Training as prescribed by OSHA 29 CFR1910.120. They shall be medically approved and trained to use the level(s) of respiratory protection required onsite. Certification of training by the Subcontractor shall be required as a deliverable included in E 6 E's contractual documentation. This training shall be verbally verified and logged onsite by the SSO or Team Leader before starting vork.

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4 SUPERVISION OF SUBCONTRACT DRILLERS

41 RESPONSIBILITIES AND AUTHORITY OF SITE SAFETY OFFICER

The responsibilities of the SSO at a drilling rite where subcontracted drillers are used include the folloving: rig inspections, personnel monitoring, and personnel protection.

A rig inspection starts vitb, but is not limited to, verifying each item on the following checklist:

- The mast must be located at least 25 feet from any overhead or underground utility lines.
- The location and operation of operational and unencumbered kill switches must be reiterated to all site personnel.
- Outriggers, stabilizers, or jacks are in place, and the rig is level.
- A geophysical survey (electromagnetic or ground-penetrating radar) or a reliable site history must be obtained to verify absence of buried obstacles, tanks, or drums.
- A first aid kit and filled eyewash must be readily available.
- A fire extinguisher should be charged to the proper pressure and staged at rear of rig during drilling.
- The condition of ropes, chains, and cables must be checked.
- A lifeline or safety belt must be available if mast climbing is necessary.
- The Site Safety Plan (SSP) must be posted with emergency phone list and map of hospital route.
- A "super exclusion zone" must be established around the borehole, using a 4- by 8-foot sheet of plywood. This defined area uill be entered during active drilling only by the Driller, except in emergency situations.

If any of thue items need replacement or repair, .the SSO must make necessary arrangements and later verify that repair or replacement is sufficient before actual drilling begins. Working together, the SSO and the driller should verify that the rig has been checked against the Operator's checklist.

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The SSO's monitoring duties include calibration and setup of the appropriate monitoring devices, as specified in the SSP. At a minimum, this generally includes an O_2/explosimeter and realtime organic vapor monitoring capabilities (e.g., HNU, OVA). Noise monitoring, like heat stress monitoring, is employed vhere appropriate. If the SSO believes additional monitoring devices beyond the directive of the SSP should be employed (e.g., Rad Mini, Mini Ram), it is his or her responsibility to obtain this equipment with the cooperation of the RSC or the Corporate Eealth and Safety Group, from the nearest E 6 E office.

It is the responsibility of the SSO to ensure that all safety equipment is in good vorking order. Day-to-day operations, as well as calibration data, must be recorded in the equipment log or SSO log. Adequate supplies such as breathing air, drinking liquids, and calibration gas must be maintained.

E 6 E personnel are forbidden from entering the "super exclusion zone" around the borehole vhile the rig is actively drilling. The SSO must not attempt to take air readings in or around the auger vhile in use, nor are cutting samples taken vhile the auger is in motion. An O_2/explosimeter should be set up if possible for unmanned (alarmed) operations at the rig using an extension hose to continuously drav samples from the borehole area during drilling operations.

The SSO has the ultimate authority over the Subcontractor vith regard to whether vork practices meet the requirements of the SSP. Shutdovn of vork or restriction of personnel are options available to the SSO. The SSO should hold informal site safety briefings at the start of both field vork and daily work shifts throughout the course of the project. Although E & E contractually requires Subcontractors to provide properly trained and outfitted staff, the SSO should verify verbally at the start-up meeting that the field staff has necessary respiratory approval and OSHA-mandated training, especially on hazardous waste sites. Site safety briefing topics, as well as attendees, will be recorded in the site safety log.

If the SSO has reason to believe either E & E or Subcontractor personnel are under the influence of alcohol or drugs, or are otherwise ill before or during work onsite, he or she should consider restricting those team members from site work. Personnel arriving for vork requiring level C protection vho are not cleanly shaved may also be restricted at the discretion of the SSO.

The folloving is a list of basic topics to be covered at site safety meetings:

- Personnel responsibilities:
- Planned investigation and presumed potential hazards:
- Levels of protection, monitoring plan, and equipment;
- Emergency scenario plans, including kill svitch use;

- o Location and operation of kill switches, fire extinguisher, and first aid kit:
- o Heat and cold stress hazards:
- o "Super exclusion zone" around borehole: urd
- o Warnings to Subcontractors about hazards of climbing the mast without safety belt urd other equipment.

Because heat stress is a constant threat during warm weather, the SSO is responsible for determining whether conditions are unsuitable for work. Where workers cannot work vith the assistance of wrk modifications, cooling vests, and other cooling means, the SSO may decide that work should not continue. The need for worker monitoring through blood pressure and oral temperature *checks* will be determined by the SSO vith assistance from the RSC and Buffalo Health and Safety staff, if necessary.

The SSO will be responsible for shutdown of the drilling operation if electrical storms are in the site area.

No refueling operations vill be performed until rig engines are shut down. Motor fuels should be stored and dispensed from spring-loaded, OSHA/FM-approved gas cans constructed of metal or polyethylene.

The SSO should ensure and document that no boreholes are left open or unfilled after drilling equipment is moved. In instances where a hole must be left open and unattended, suitable barricades, or the equivalent, will be staged around the hole to prevent personnel and equipment from falling in.

4.2 RESPONSIBILITIES AND AUTHORITY OF OTHER E & E PERSONNEL

All B & E personnel on site are required to follov the terms of the SSP and the direction of the SSO. Because the SSO cannot be in all places at all times, the crev should observe the subcontractors and condition of their equipment at all times, and report immediately to the Team Leader and SSO any safety-related issues that are unresolved. Included are such details as dressout, site functions, and decontamination. It is important that the SSO be involved so that proper log entries can be made.

B & B, as policy, does not provide safety equipment or monitoring instrumentation to subcontractors. Some projects, however, MY be set up so that E & E personnel and subcontractors share the same expendable supplier.

B & B personnel are forbidden from approaching augers during drilling. Activities at the borehole, such as sampling, require that equipment be stopped.

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5 GENERAL DRILLING SITE SAFETY CHECKLISTS

5.1 SAFETY CHECKLISTS FOR SPECIFIC TYPES OF DRILLING ACTIVITIES

5.1.1 General Drilling Si t Checklist

- All E 6 E drilling personnel will have read and understood the terms of the E & E drilling SOP.
- Obvious or questionable safety conditions that arise during daily inspection of the rig and its components will be cause for vork interruption.
- Only approved Drillers will remain in proximity to the borehole during drilling, and an approximate 4- by 8-foot "super exclusion area" will be established around the moving auger at all times. No personnel, except the Driller and the Driller's Helper, will enter this zone during drilling. The SSO will issue varnings to those personnel vho breach this zone.
- Continuous O_2/explosimeter monitoring at borehole using remote sampling hose will exist at all times.
- All field team members will be briefed on planned drilling operations and possible problems before vork begins on day 1. All will be shown the location and operation of "kill switches," vhich will be operationally checked each morning..
- Fire extinguisher(s) will be staged next to the rig before drilling and refueling operations.
- Uelding and cutting activities will only be performed avay from ignition sources at a distance approved by the SSO or Team Leader.
- Appropriate personnel protective equipment (based on hazards associated vith assumed well contaminants) will be vorn as directed by the SSO and the SSP. At a minimum, steel-toed boots, hard hats, and face shields will be vorn during any active drilling.
- Outrigger stabilizers must be in place before drilling commences, and the rig must also be leveled.
- The drill rig mast must be horizontal during movement of rig and should not be erected vithin 25 feet of overhead lines.

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- Electrical storms within hearing range of the job site will signal work termination until the SSO and Team Leader notify personnel otherwise.

- The local utilities should be contacted prior to drilling so that their lines can be located and flagged. Situations of close proximity may involve isolating utility lines (i.e., shutdown and locking of gas lines).

- When buried drums or other material are suspected, a full survey of the drilling zone is required using appropriate instrumentation prior to ground breaking.

- Only trained, experienced staff who have studied proper drilling methods and served as a Helper under an experienced Driller will operate the cathead.

- Only properly licensed staff will drive the drill rig. A daily safety check of the vehicle, following E & S protocol, will be carried out by the driver.

- Climbing on the vertical mast is not permitted by B & E staff. Because the boom is not equipped with a ladder, it should be lowered for repairs.

5.1.2 Rotary and Core Drilling

The following precautionary measures should be taken during rotary and core drilling:

- Rotary drilling tools should be safety checked prior to drilling:

  - Rods and bit should be open and clear.

  - Water swivels and hoisting plugs should be lubricated and checked for "frozen" bearings before use.

  - Drill rod chuck jaws should be checked periodically and replaced when necessary.

  - The capacities of hoists and sheaves should be checked against the anticipated weight of the drill rod string, in addition to other expected hoisting loads.

  - All hoses to and from the pump should be checked for properly installed couplings; couplings should be secund with locking devices on "quick connect" fittings or wire on "Chicago-Style" couplings.

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- Hoses should be inspected daily for deterioration and leakage, and replaced if needed.

o Special precautions that should be taken for safe rotary or core drilling involve chucking, joint break, hoisting, and lowering of drill rods:

- Only the Operator of the drill rig should brake or set a aanual chuck so that rotation (of the chuck) will not occur before removing the vrench from the chuck.

- Drill rods should not be braked while being lovered into the hole with chuck jaws.

- Drill rods should not be held or lovered into the hole with pipe vrenches.

- If a string of drill rods are accidentally or inadvertently released into the hole, do not attempt to grab the falling rods vith hands or a wrench,

- In the event of a plugged bit or other circulation blockage, the high pressure in the piping and hose betveen the pump and the obstruction should be relieved or bled down before breaking the first tool joint.

- When drill rods are hoisted from the hole, they should be cleaned for safe handling with rubber or other suitable rod viper. Do not use your hands to clean drilling fluids from drill rods.

- If vork must progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough-surfaced, fitted, cover panels strong enough to hold drill rig personnel.

- Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage, or lay the rods down. As previously stated, hatdhats, steel-toed boots, safety glasses, and vork gloves are to be worn during such work, vith impervious gear and respiratory protection added as required by the SSP.

5.1.3 Cathead Usage

o Keep the cathead clean and free of rust, oil, and grease. If it becomes rusty, clean with a wire brush.

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- o *Check* the cathead periodically, vhen the engine is not running, for rope vear grooves. If a rope groove forms to a depth gruter than 1/8 inch (3 mm), the cathead should be replaced.

- o Always use a clean, dry, sound rope. A vet or oily rope may "grab" the cathead and cause drill tools or other items to be rapidly hoisted to the top of the mast.

- o Should the rope "grab" the cathead or othervise become tangled in the drum, release the rope and sound an appropriate alarm for all personnel, including the Operator, to rapidly back away and stay clear. If the rope "grabs" the cathead and tools are hoisted to the sheaves at the top of the mast, the rope will often break, releasing the tools. If the rope does not break, stay clear of the drill rig until the Operator can turn off the drill rig engine and initiate other appropriate actions to release the tools. The Operator should carefully watch the suspended tools, quickly backing away after turning off the engine.

- o Chemicals can cause deterioration of the rope that may not be visibly detectable, thus the rope should always be protected from any chemical contact.

- o Never vrap the rope from the cathead (or any other rope, wire rope, or cable on the drill rig) around a hand, vrist, arm, foot, d e , leg, or any other p u t of the body.

- o Always maintain a minimum of 18 inches of clearance between the operating hand and the cathead drum when driving samplers, casing, or other tools vith the cathead and rope method. Be aware that the rope advances toward the cathead with each hammer blow as the sampler or other drilling tool advances into the ground.

- o Do not use more rope vraps than are required to hoist a load.

- o Do not leave a cathead unattended vith the rope vrapped on the drum.

- o Position all other hoist lines to prevent contact with the operating cathead rope.

- o When using the cathead and *tope* for driving or back-driving, make sure that all threaded connections are tight, while staying u far away as possible from the hammer impact point.

- o The cathead Operator must be able to operate the cathead standing on a level surface vith sound, firm-footing conditions, vithout distraction or disturbance.

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5.1.4 Continuous-Flight or Hollow-Stem Augers

- Prepare to start an auger boring with the drill rig level, the clutch or hydraulic rotation control disengaged, the transmission in low gear, and the engine running at low RPM.
- Apply an adequate amount of dovn pressure before rotation to seat the auger head below the ground surface.
- Check auger flights for nicks or burrs that could catch clothing during rotation, and file them down.
- Watch the auger head vhile slovly engaging the clutch or rotation control, and start rotation. Stay clear of the auger.
- Slovly rotate the auger and auger head while continuing to apply dovn pressure. Keep one hand on the clutch or the rotation control at all times until the auger has penetrated about 1 foot or more below ground surface.
- If the auger head slides out of alignment, disengage the clutch or hydraulic rotation control, and repeat the starting process.
- An auger guide should be considered to facilitate the starting of a straight hole through hard ground or pavement.
- The Operator and,tool handler should establish a system of responsibility for the various activities required for auger drilling, such as connecting and disconnecting auger sections and inserting and removing the auger fork. The Operator must ensure that the tool handler is well avay from the auger column and that the auger fork is removed before starting rotation.
- Only use the manufacturer's recommended method of securing the auger to the power coupling. Do not touch the coupling or the auger vith your hands, a wrench, or any other tool during rotation.
- Whenever possible, use tool hoists to handle auger sections.
- Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- Never allov feet to get under the auger section that is being hoisted.

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- When rotating augers, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger.

- Use a long-handled shovel to move auger cuttings away from the auger. Never use your hands or feet to move cuttings away from the auger.

- Do not use hands to clean rotating augers when removing augers from the ground.

- The use of vire line hoists, wire rope, and hoisting hardware should conform to stipulations developed by the American Iron and Steel Institute Wire Rope Users Manual.

5.15 Use of Wire Line Hoists, Wire Rope, and Hoisting Equipment

- All wire ropes and fittings should be visually inspected during use and thoroughly inspected at least once a week for abrasion, broken vires, vear, reduction in rope diameter, reduction in vire diameter, fatigue, corrosion, damage from heat, improper veaving, jamming, crushing, bird caging, kinking, core protrusion, and damage to lifting hardware. All related equipment must conform to standards as established by the American Iron and Steel Institute Wire Rope Users Manual. Wire ropes should be replaced when inspection indicates excessive damage according to the Wire Rope Users Manual. All wire ropes which have not been used for a period of 1 month or more should be thoroughly inspected before being returned to service.

- End fittings and connections consist of spliced eyes and various manufactured devices. All manufactured end fittings and connections should be installed according to the manufacturer's instructions and loaded according to the manufacturer's specifications.

- If a ball-bearing type hoisting swivel is used to hoist drill rods, swivel bearings should be inspected and lubricated daily to ensure that the swivel freely rotates under load.

- If a rod slipping device is vved to hoist drill rods, do not drill through or rotate drill rods through the slipping device, and do not hoist the drill rod column higher than one-half the mast height above the top of the mast (derrick). Do not hoist a rod column vith loose tool joints and do not make up, tighten, or loosen tool joints while the rod column is being supported by a rod slipping device. If drill rods should slip back into the borehole, do not attempt to brake the fall of the rods vith hands or by tensioning the slipping device.

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- Host sheaves on exploration drill rigs are stationary with a single part line. The number of parts of line should never be increased without first consulting with the manufacturer of the drill rig.

- Wire ropes must be properly matched with each sheave--if the rope is too large, the sheave will pinch the wire rope--if the rope is too small, it will groove the sheave. Once the sheave is grooved, it will severely pinch and damage larger wire ropes.

- Use tool handling hoists only for vertical lifting of tools (except vhen angle hole drilling). Do not use tool handling hoists to pull objects avay from the drill rig; however, drills may be moved using the main hoist if the wire rope is spooled through proper sheaves according to the manufacturer's recommendations.

- When stuck tools or similar loads cannot be raised with a hoist, disconnect the hoist line and connect the stuck tools directly to the feed mechanism of the drill. Do not use hydraulic leveling jacks for added pull to the hoist line or the feed mechanism of the drill.

- When attempting to free a mired vehicle or drill carrier, use only a vinch on the front or rear of the vehicle, and stay as far as possible avay from the wire rope. Do not attempt to use tool hoists to pull out a mired vehicle or drill rig carrier.

- Minimize shock loading on a wire rope--apply loads smoothly and steadily.

- Avoid sudden loading in cold weather.

- Never use frozen ropes.

- Protect vire rope from sharp corners or edges.

- Do not operate the rig with damaged or faulty guides, rollers, sheave bearings, or latches on safety hooks.

- Clutches and brakes on hoists should be periodically tested.

- Know and do not exceed the rated capacity of hooks, rings, links, swivels, shackles, and other lifting aids.

- Alvays vear gloves vhen handling wire rope.

- Polloving the installation of a nev wire rope, first lift a light load to allow the wire rope to adjust.

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- Never carry out hoisting operations when weather conditions are such that hazards to personnel, the public, or property are created.
- Never leave a load suspended in the air when the hoist is unattended.
- Never hoist a lord over th8 head, body, or feet of personnel.
- Never use a hoist line to "ride" up the mast (derrick) of a drill rig.
- Replacement of wire ropes should conform to the drill rig manufacturer's specifications.

6 REFERENCES

Health and safety sections of the folloving operation manuals are incorporated by reference in this SOP:

Diedrich D-50 Safety Hanual.

Drilling Safety Guide, Diamond Core Drill Manufacturers Association and National Drilling Contractors Association.

Wire Rope Users Manual, American Iron and Steel Institute.

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MALLINCKRODT

Material Safety Data Sheet

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Mallinckrodt, Inc. Science Products Division, P.O. Box M Paris, KY 40361

Emergency Telephone Number: 314-982-5000

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HYDROCHLORIC ACID, 37%

PRODUCT IDENTIFICATION:

Synonyms: Muriatic acid

Formula CAS No.: 7647-01-0

Molecular Weight: 36.46 (HCl)

Chemical Formula: HCl

Hazardous Ingredients: Hydrogen chloride

PRECAUTIONARY MEASURES

DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

Do not get in eyes, on skin, or on clothing.
Avoid breathing mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
This substance is classified as a POISON under the Federal Caustic Poison Act.

EMERGENCY/FIRST AID

In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. If swallowed, DO NOT INDUCE VOMITING!
Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases call a physician.
SEE SECTION 5.

DOT Hazard Class: Corrosive Material

SECTION 1 Physical Data

Appearance: Clear, colorless fuming liquid.

Odor: Pungent odor of hydrogen chloride.

Solubility: Infinite in water with slight evolution of heat.

Boiling Point: 53°C (127°F); Azeotrope (20.2%) boils at 109°C (228°F)

Melting Point: -74°C (-101°F)

Specific Gravity: 1.18

Vapor Density (Air = 1): No information found.

Vapor Pressure (mm Hg): 190 @ 25°C (77°F)

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

Fire:
Can react with metals to release flammable hydrogen gas.

Explosion:
Not considered to be an explosion hazard.

Fire Extinguishing Media:
If involved in a fire, use water spray.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

SECTION 3 Reactivity Data

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.

Hazardous Decomposition Products:
When heated to decomposition, emits toxic hydrogen chloride fumes and will react with water or steam to produce heat and toxic and corrosive fumes.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
A strong mineral acid, concentrated hydrochloric acid is highly reactive with strong bases, metals, metal oxides, hydroxides, amines, carbonates and other alkaline materials. Incompatible with materials such as cyanides, sulfides, sulfites, and formaldehyde.

SECTION 4 Leak/Spill Disposal Information

Clean-up personnel should wear protective clothing and respiratory equipment suitable for toxic or corrosive fluids or vapors. Isolate or enclose the area of the leak or spill.
Small Spills: Flush with water and neutralize with alkaline material (soda ash, lime, etc.). Sewer neutralized material with excess water. Larger spills and lot sizes: Neutralize with alkaline material, pick up with absorbent material (sand, earth, vermiculite). Provide forced ventilation to dissipate fumes. Dispose in a RCRA-approved waste facility or sewer the neutralized slurry with excess water if local ordinances allow.

Reportable Quantity (RQ)(CWA/CERCLA) : 5000 lbs.

Ensure compliance with local, state and federal regulations.

AD

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 0

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:
Corrosive! Inhalation of vapors can cause coughing, choking, inflamation of the nose, throat, and upper respiratory tract. Inhalation of higher concentrations may cause lung damage.

Ingestion:
Corrosive! Swallowing hydrochloric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea.

Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burnt. Concentrated solutions cause deep ulcers and discolor skin

Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Splashes may cause severe burns and permanent eye damage.

Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

B. FIRST AID

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Exposure:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Exposure:
Wash eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

C. TOXICITY DATA (RTECS, 1986)

Oral rat LD50: 900 mg/kg (Hydrochloric acid concentrated) Mutation references cited.

SECTION 6 Occupational Control Measures

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
5 ppm Ceiling
- ACGIH Threshold Limit Value (TLV):
5 ppm Ceiling

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommer Practices", most recent edition, for details.

Personal Respirators: (NIOSH Approved)
If the TLV is exceeded a full facepiece chemical cartridge respirator may be worn, in general, up to 100 times the TLV or the maximum use concentration specified by the respirator supplier, whichever is less. Alternatively, a supplied air full facepiece respirator or airlined hood may be worn.

Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material. Maintain eye wash fountain and quick-drench facilities in work area.

SECTION 7 Storage and Special Information

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect from physical damage and direct sunlight. Isolate from incompatible substances. Protect from moisture.

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Emergency Phone Number: 314-982-5000

Mallinckrodt, Inc., Science Products Division, P.O. Box M, Paris, KY 40361.

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ISOPROPYL ALCOHOL

PRODUCT IDENTIFICATION:

Synonyms: 2-propanol; sec-propyl alcohol; isopropanol

Formula CAS No.: 67-63-0

Molecular Weight: 60.10

Chemical Formula: $(CH_3)_2$ CHOH

Hazardous Ingredients: Not applicable.

PRECAUTIONARY MEASURES

WARNING! FLAMMABLE LIQUID. HARMFUL IF SWALLOWED OR INHALED. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION.

Keep away from heat, sparks and flame.
Keep container closed.
Use with adequate ventilation.
Avoid breathing vapor.
Wash thoroughly after handling.
Avoid contact with eyes, skin and clothing.

EMERGENCY/FIRST AID

If swallowed, give water to drink. Induce vomiting if medical help **is not immediately** available. Never **give anything** by mouth to **an unconscious** person. If inhaled, **remove** to fresh air. If not **breathing, give** artificial respiration. If breathing **is** difficult, **give** oxygen. In case of contact, immediately flush skin or **eyes** with **plenty of water** for at least 15 minuter. In **all** cases call a **physician.**
SEE SECTION 5.

DOT Hazard Class: Flammable Liquid

SECTION 1 Physical Data

Appearance: Clear, **colorless** liquid.

Odor: Rubbing alcohol.

Solubility: Infinite in water.

Boiling Point: 82°C (180°F).

Melting Point: -89°C (-128°F).

Specific gravity: 0.79

Vapor Density (Air=1): 2.1

Vapor Pressure (mm Hg): 33 @ 20°C **(68°F)**

Evaporation **Rate:** (n-BUAC = 1) 2.83

SECTION 2 Fire and Explosion Information

Fire:
Flammable Liquid
Flashpoint: **12°C (53°F).** (closed cup).
Autoignition temperature: 399°C **(750°F).**
Flammable limits in air, % by volume:
lel: 2.0, **uel: 12.0.**

Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits **noted above. Contact** with **strong oxidizers may** cause fire **or** explosion.

Fire Extinguishing Media:
Water spray, dry chemical, **alcohol** foam, or carbon dioxide. Water spray may be **used** to keep **fire** exposed containers cool.

Special Information:
In **the** event of a fire, wear full protective clothing and **NIOSH-approved** self-contained breathing **apparatus** with full facepiece operated in the pressure demand or other positive pressure mode. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures. Vapors can flow along surfaces to distant ignition source **and** flash back.

SECTION 3 Reactivity Data

Stability:
Stable under ordinary **conditions** of use **and** storage. Heat **and** sunlight **can** contribute to instability.

Hazardous Decomposition Products:
Toxic gases and vapors such as carbon monoxide may be released in a **fire involving isopropyl alcohol.**

Hazardous Polymerization:
Will **not** occur.

Incompatibilities:
Heat, flame, strong oxidizers, acetaldehyde, chlorine, ethylene oxide, hydrogen-palladium combination, hydrogen peroxide-sulfuric acid combination, potassium tert-butoxide, hypochlorous acid, isocyanates, nitroform, phosgene, oleum and perchloric acid.

SECTION 4 Leak/Spill Disposal Information

Remove all sources of ignition. Ventilate area of leak or spill. Clean-up personnel require protective clothing and respiratory protection from vapors. Small spills may be absorbed on paper towels and evaporated in a fume hood. Allow enough time for fumes to clear hood, then ignite paper in a suitable location away from combustible materials. Contain and recover liquid for reclamation when possible. Larger spills and lot sizes can be collected as hazardous waste and atomized in a suitable RCRA approved combustion chamber, or absorbed with vermiculite, dry sand, earth or similar material for disposal as hazardous waste in a RCRA approved facility.

Ensure compliance with local, state and federal regulations.

NFPA Ratings: Health: 1 Flammability: 3 Reactivity: 0

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ISOPROPYL ALCOHOL

PRODUCT IDENTIFICATION:

Synonyms: 2-propanol; KC-propyl alcohol; isopropanol

Formula CAS No.: 67-63-0

Molecular Weight: 60.10

Chemical Formula: $(CH_3)_2CHOH$

Hazardous Ingredients: Not applicable.

PRECAUTIONARY MEASURES

WARNING! FLAMMABLE LIQUID. HARMFUL IF SWALLOWED OR INHALED. AFFECTS CENTRAL CDRVOUS SYSTEM. CAUSES IRRITATION.

Keep away from heat, sparks and flame.
Keep container closed.
Use with adequate ventilation.
Avoid breathing vapor.
Wash thoroughly after handling.
Avoid contact with eyes, skin and clothing.

EMERGENCY/FIRST AID

If swallowed, give water lo drink. Induce vomiting if medical help is not immediately available. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush skin or eyes with plenty of water lor at least 15 minuter. In all cases call a physician.
SEE SECTION 5.

DOT Hazard Class: Flammable Liquid

SECTION 1 Physical Data

Appearance: Clear, colorless liquid.

Odor: Rubbing alcohol.

Solubility: Infinite in water.

Boiling Point: 82°C (180°F).

Melting Point: -89°C (-128°F).

Specific gravity: 0.79

Vapor Density (Air = 1): 2.1

Vapor Pressure (mm Hg): 33 @ 20°C (68°F)

Evaporation Rate: (n-DUAC = 1) 2.83

SECTION 2 Fire and Explosion Information

Fire:
Flammable Liquid
Flashpoint: 12°C (53°F). (closed cup).
Autoignition temperature: 399°C (750°F).
Flammable limits in air, % by volume:
lel: 2.0, uel: 12.0.

Explosion:
Above flash point, vapor-air mixtures arc explosive within flammable limits noted above. Contact with strong oxidizers may cause fire or explosion.

Fire Extinguishing Media:
Water spray, dry chemical, alcohol loam, or carbon dioxide. Water spray may be used lo keep fire exposed containers cool.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures. Vapors can flow along surfaces to distant ignition source and flash back.

SECTION 3 Reactivity Data

Stability:
Stable under ordinary conditions of use and storage. Heat and sunlight can contribute to instability.

Hazardous Decomposition Products:
Toxic gases and vapors such as carbon monoxide may be released in a fire involving isopropyl alcohol.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
Heat, flame, strong oxidizers, acetadehyde, chlorine, ethylene oxide, hydrogen-palladium combination, hydrogen peroxide-sulfuric acid combination, potassium ten-butoxide, hypochlorous acid, isocyanates, nitroform, phosgene, oleum and perchloric acid.

SECTION 4 Leak/Spill Disposal Information

Remove all sources of ignition. Ventilate area of leak or spill. Clean-up personnel require protective clothing and respiratory protection from vapors. Small spills may be absorbed on paper towels and evaporated in a fume hood. Allow enough time lor fumes to clear hood, then ignite paper in a suitable location away from combustible materials. Contain and recover liquid lor reclamation when possible. Larger spills and lot rues can be collected as hazardous waste and atomized in a suitable RCRA approved combustion chamber. or absorbed with vermiculite, dry sand, earth or similar material lor disposal as hazardous waste in a RCRA approved facility.

Ensure compliance with local, state and federal regulations.

NFPA Ratings: Health: 1 Flammability: 3 Reactivity: 0

Material Safety Data

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0000587

NITRIC ACID, 70%

PRODUCT IDENTIFICATION:

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 70%

Formula CAS No.: 7697-37-2

Molecular Weight: 63.00

Chemical Formula: HNO_3

Hazardous Ingredients: Not Applicable

DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE.
CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

Do not get in eyes, on skin, or on clothing.
Avoid breathing mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
This substance is classified as a POISON under the Federal Caustic Poison Act.

EMERGENCY/FIRST AID

In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. If swallowed, DO NOT INDUCE VOMITING! Give large quantities of water or milk if mikbk. Never give anything by mouth to an unconscious person. If inhrkd. remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases call a physician.
SEE SECTION 5.

DOT Hazard Class: Oxidizer

SECTION 1 Physical Data

Appearance: Clear, colorless to slightly yellow liquid.

Odor: Suffocating acrid.

Solubility: Infinite in water.

Boiling Point: 122°C (252°F)

Melting Point: -34°C (-29°F)

Specific Gravity: 1.41

Vapor Density (Air = 1): 2-3 approximately

Vapor Pressure (mm Hg): 62 @ 20°C (68°F)

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.

Explosion:
Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc.

Fire Extinguishing Media:
If involved in a fire, use water spray.

Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

SECTION 3 Reactivity Data

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.

Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.

SECTION 4 Leak/Spill Disposal Information

Isolate or enclose the area of the leak or spill. Clean-up personnel should wear protective clothing and respiratory equipment suitable for toxic or corrosive fluids or vapors.
Small Spills: Flush with water and neutralize with alkaline material (soda ash, lime, etc.). Sewer with excess water.
Larger spills and lot sizes: Neutralize with alkaline material, pick up with absorbent material (sand, earth, vermiculite) and dispose in a RCRA-approved waste facility or sewer the neutralized slurry with excess water if local ordinances allow. Provide forced ventilation to dissipate fumes.

Reportable Quantity (RQ)(CWA/CERCLA) : 1000 lbs.

Ensure compliance with local, state and federal regulations.

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 0 Other: Oxidizer

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.

Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.

Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.

Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Splashes may cause severe burns and permanent eye damage.

Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.

Aggrevation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

B. FIRST AID

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Exposure:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Exposure:
Wash eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

C. TOXICITY DATA (RTECS, 1982)

Inhalation (Rat) LC50: 244 ppm
(NO_2)/30M

SECTION 6 Occupational Control Measures

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA)
-ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators: (NIOSH Approved)
If the TLV is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and cannisters that contain oxidizable materials, such as activated charcoal.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material. Maintain eye wash fountain and quick-drench facilities in work area.

SECTION 7 Storage and Special Information

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect from physical damage and direct sunlight. Isolate from incompatible substances. Protect from moisture.

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Emergency Phone Number: 314-982-5000

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000058

SODIUM HYDROXIDE

PRODUCT IDENTIFICATION:

Synonyms: Caustic soda; lye; sodium hydroxide solid; sodium hydrate

Formula CAS No.: 1310-73-2

Molecular Weight: 40.00

Chemical Formula: NaOH

Hazardous Ingredients: None.

PRECAUTIONARY MEASURES

DANGER! MAY BE FATAL IF SWALLOWED. CAUSES SEVERE BURNS.

Do not get in eyes, on skin, or on clothing.
Avoid breathing dust.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.
This substance is classified as a POISON under the Federal Caustic Poison Act.

EMERGENCY/FIRST AID

If swallowed, do NOT induce vomiting. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately. In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. In all cases call a physician.
SEE SECTION 5.

DOT Hazard Class: Corrosive Material

SECTION 1 Physical Data

Appearance: White, deliquescent pellets.

Odor: Odorless.

Solubility: 111 g/100 g of water.

Boiling Point: 1390°C (2534°F)

Melting Point: 318°C (604°F)

Specific Gravity (water = 1): 2.13

Vapor Density (Air = 1): No information found.

Vapor Pressure (mm Hg): Negligible.

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

Fire:
Not considered to be a fire hazard. Hot or molten material can react violently with water.
Can react with certain metals, such as aluminium, to generate flammable hydrogen gas.

Explosion:
Not considered to be an explosion hazard.

Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Adding water to caustic solution generates large amounts of heat.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

SECTION 3 Reactivity Data

Stability:
Stable under ordinary conditions of use and storage. Very hygroscopic. Can slowly pick up moisture from air and react with carbon dioxide from air to form sodium carbonate.

Hazardous Decomposition Products:
Sodium oxide.

Hazardous Polymerization:
This substance does not polymerize.

Incompatibilities:
Contact with water, acids, flammable liquids, and organic halogen compounds, especially trichloroethylene, may cause fire or explosion. Contact with nitromethane and other similar nitro compounds causes formation of shock-sensitive salts. Contact with metals such as aluminum, tin, and zinc causes formation of flammable hydrogen gas.

SECTION 4 Leak/Spill Disposal Information

This is a test line. 1000°C. Clean-up personnel require protective clothing and respiratory protection from dust. Sweep, scoop or pick up spilled material. Avoid dusting. Collected waste may be transferred to a closed, preferably metal, container and sent to a RCRA-approved waste disposal facility. Do not flush to the sewer. Caution! Floor and other surfaces may be slippery. Do not contact with water. Neutralize traces with dilute acid.

Ensure compliance with local, state and federal regulations.

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 1

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:
Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on severity of exposure. Severe pneumonitis may occur.

Ingestion:
Corrosive! Swallowing may cause severe burns of mouth, throat, and stomach. Severe scarring of tissue and death may result.

Skin Contact:
Corrosive! Contact of skin can cause irritation or severe burns and scarring with greater exposures.

Eye Contact:
Corrosive! May cause irritation of eyes, and with greater exposures, severe b u m with possibly blindness resulting.

Chronic Exporum:
Prolonged contact with dilute solutions or dust has a destructive effect upon tissue.

Aggrevation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

B. FIRST AID

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If Breathing is difficult, give oxygen. Call a physician.

Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Exporum:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician immediately.

Eye Exporum:
Wash eyes with plenty of water for at least 15 minutes. lifting lower and upper eyelids occasionally. Get medical attention immediately.

C. TOXICITY DATA (RTECS, 1982)

No LD50/LC50 information found relating to normal routes of occupational exposure. Irritation data: Skin, rabbit: 50 mg/24H Severe Eye, rabbit: 50 mg/24H Severe

Airborne Exporum Limits:
-OSHA Permissible Exposure Limit (PEL):
2 mg/m^3 (TWA)
-ACGIH Threshold Limit Value (TLV):
2 mg/m^3 (Ceiling)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators: (NIOSH Approved)
If the TLV b exceeded, a dust/mist respirator with chemical goggles may be worn. In general, up to ten times the TLV: Consul respirator supplier for limitations. Alternatively, a supplied air full facepiece respirator or airlined hood may be worn.

Skin Protection:
Wear impervious protective clothing, Including boots, gloves, lab coat, apron or coveralls to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with thb material. Maintain eye n r h fountain and quick-drench facilities in work area.

SECTION 7 Storage and Special Information

Keep in a tightly closed container. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Always add the caustic to water while stirring; never the reverse.

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Material Safety Data

Emergency Phone Number: 314-982-5000

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SULFURIC ACID 96%

PRODUCT IDENTIFICATION:

Synonyms: Oil of Vitriol

Formula CAS No: 7664-93-9

Molecular Weight: 98.07

Chemical Formula: H_2SO_4

Hazardous Ingredients: **Not** applicable.

PRECAUTIONARY MEASURES

DANGER! CORROSIVE. LIQUID *AND* **MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION** MAY **CAUSE LUNG DAMAGE.**

Do not get **in eyes,** on skin, or *on* clothing.
Do **not** breathe **mist.**
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
This substance **is classified** as a POISON under the Federal **Caustic Poison Act.**

EMERGENCY/FIRST AID

In all cases call a physician. In case of contact, immediately **flush skin or eyes** with **plenty of water** for at least 15 minutes. **If swallowed,** DO **NOT** INDUCE VOMITING! **Give** large quantities of **water. Never give anything** by **mouth** to an **unconscious person. If inhaled, remove** to **fresh** air. **If** not breathing, give artificial respiration. **If** breathing **is** difficult, give oxygen.
SEE SECTION 5.

DOT Hazard Class: Corrosive Material

SECTION 1 Physical Data

Appearance: Colorless, oily liquid.

Odor: Odorless.

Solubility: Infinite **@ 20°C.**

Boiling Point: ca. 310°C (590°F)

Melting Point: ca. -14°C (6°F).

Specific Gravity: 1.84

Vapor Density (Air=1): *< 0.3* **@ 25°C (77°F)**

Vapor Pressure (mm Hg): **1 @ 146°C (250°F).**

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

Fire:
Not combustible, but **substance is** a strong oxidizer and its heat **of** reaction with **reducing** agents or combustibles may cause ignition. Reacts with **most** metals releasing flammable, potentially **explosive** hydrogen gas.

Explosion:
Not combustible, but **substance is a** strong **oxidizer** and its **heat of reaction** with reducing agents or combustibles may cause ignition.

Fire Extinguishing Media:
Dry chemical, foam or **carbon** dioxide. Water spray may be used to keep fire exposed containers **cool.**

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

SECTION 3 Reactivity Data

Stability:
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:
Toxic fumes of oxides of sulfur. Will **react** with water or steam to produce **toxic** and corrosive fumes. Reacts with **carbonates** to generate carbon dioxide **gas,** and **with** cyanides and **sulfides** to form **poisonous** hydrogen cyanide and hydrogen sulfide **respectively.**

Hazardous Polymerization:
Will **not** occur.

Incompatibilities:
Water, **bases,** organic **material,** halogens, **metal acetylides, oxides** and **hydrides, strong oxidizing** and **reducing** agents and many other **reactive** substances.

SECTION 4 Leak/Spill Disposal Information

Dike and cover **leaking** or spilled liquid with dirt, vermiculite, kitty-litter or other **inert absorbent. Cover** spill with sodium **bicarbonate** or soda ash and mix. Clean-up personnel require protective clothing and respiratory protection from vapors and mists. Neutralized waste **may be containerized** and **disposed** in a **RCRA approved waste disposal** facility. Flush area of spill with dilute soda ash solution and **discard** to **sewer.**

Reportable Quantity **(RQ)(CWA/CERCLA) : 1000 lbs.**

Ensure compliance **with** local, state and federal regulations.

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 2 Other: Water reactive

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:
Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. May cause lung edema. Symptoms may include irritation of the nose and throat, and labored breathing.

Ingestion:
Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea.

Skin Contact:
Corrosive. Symptoms of redness, pain, and severe burn can occur.

Eye Contact:
Corrosive. Splashes can cause blurred vision, redness, pain and severe tissue burns.

Chronic Exposure:
Long-term exposure to mist or vapors may cause damage to teeth.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

B. FIRST AID

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
If swallowed, DO NOT induce vomiting. Give large quantities of water or milk if available. Call a physician immediately. Never give anything by mouth to an unconscious person.

Skin Exposure:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician.

Eye Exposure:
Wash eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

C. TOXICITY DATA (RTECS, 1982)

Oral rat LD50: 2140 mg/kg. Inhalation Guinea Pig LC50: 18 mg/m^3.

SECTION 6 Occupational Control Measures

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
1 mg/m^3 (TWA).
-ACGIH Threshold Limit Value (TLV):
1mg/m^3 (TWA).

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators: (NIOSH Approved)
If the TLV is exceeded a full facepiece chemical cartridge respirator may be worn, in general, up to 100 times the TLV or the maximum use concentration specified by the respirator supplier, whichever is less. Alternatively, a supplied air full facepiece respirator or airlined hood may be worn.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material. Maintain eye wash fountain and quick-drench facilities in work area.

SECTION 7 Storage and Special Information

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, always add the acid to water; never add water to the acid.

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Mercury Date 3/23/92

DOT Name/U.N. No. 2809 Job No.

CAS Number 7439-97-6

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)

Toxic and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Colloidal mercury, Metallic mercury, Quicksilver)

Chemical Formula Hg Molecular Weight 200

Physical State liquid Solubility (H2O) Insoluble Boiling Point 674° F

Flash Point N/A Vapor Pressure/Density 0.0012 mm Freezing Point -38° F

Specific Gravity 13.6 Odor Characteristic N/A Flammable Limits Non

Incompatabilities Acetylene, ammonina, chlorine dioxide, azides, calcium, sodium carbide, lithium, rubidium, and copper

Biological Properties:

TLV-TWA 0.05 mg/m^3 PEL 0.05 mg/m^3 Odor/Odor Threshold odorless

IDLH 28 mg/m^3 Human Aquatic Rat/Mouse

Route of Exposure Ingestion, Inhalation, Dermal

Carcinogen Teratogen Mutagen

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

INH & ING: seek medical attention promptly; DER: wash with soap and water.

Symptoms: Acute: cough; chest pain; temor; indecision; headache; weak; irrition of eyes and skin

Chronic: GI tract depression

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Trichloroethylene Date 3/23/92

DOT Name/U.N. no. 1710 Job No. UH8000

CAS Number 79-01-6

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)

Toxic and Hazardous Safety Manual ACGIH . Other:

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Trichloroethene -)

Chemical Formula $Cl_2C = CHCl$ Molecular Weight 131.39

Physical State Liquid Solubility (H2O) 0.1% Boiling Point 87°C(189°F)

Clash Point 90°F vapor Pressure/Density 100mm Freezing Point -86.4°C(123°F)

Specific Gravity 1.46 Odor Characteristic 50 ppm Flammable Limits 41%, 11%

Incompatabilities Chemically active metals (barium. lithium, sodium. magnesium, titanium)

Biological Properties:

TLV-TWA 50 ppm, 270 mg/m^3 PCL 100 ppm Odor/Odor Threshold Chloroform-like

IDLU 1,000 ppm Human 857 mg/kg Aquatic -- Rat/Mouse 4,920 mg/kg

Route of Exposure Inhalation, ingestion, dermal Contact

Carcinogen Toratogen Mutagen

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Impermeable clothes, gloves, and boots: eye protection (face shields); respirators with organic vapor cartridges at levels of 50 ppm; SCBAs at levels of 1,000 ppm

Monitoring Recommendations:

Periodic examination should include tho mkin, respiratory, cardiac, and central and peripheral nervous systems, and liver and kidney function

Disposal/Waste Treatment:

Incineration: mix with another combustible fuel--must assure complete combustion to prevent the formation of phosgene.

Health Hazards and First Aid:

Remove from exposure; perform artificial respiration if needed; wash skin with soap and water; irrigate eyes with water; induce vomiting if swallowed.

Symptoms: Acute: Irritating to eyes, nose, and throat: nausea; vomiting; difficulty breathing; loss of consciousness

Chronic: Central nervous system depression, cardiovascular damage; liver and kidney damage; double vision; blindness; loss of coordination; loss of sense of smell; anxiety

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Cadmium Date 3/23/92

DOT Name/U.N. No. 2570 Job No. UH8000

CAS Number 7440-43-9

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)

Toxic and Hazardous Safety Manual ACGIH Other: ____

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: ____)

Chemical Formula Cd Molecular Weight 112.4

Physical State solid Solubility (H2O) Insoluble Boiling Point 1409° F

Flash Point N/A Vapor Pressure/Density 0 r Freezing Point 610° F

Specific Gravity 8.65 Odor Characteristic — Flammable Limits ____

Incompatabilities Strong oxidisers

Biological Proportias:

TLV-TWA — PEL 0.2 mg/m^3 Odor/Odor Threshold Odorless

IDLH 50 mg/m^3 Human — Aquatic — Rat/Mouse —

Route of Exposure Inhalation, Ingestion

Carcinogen X Teratogen ____ Mutagen ____

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Monitoring Recommendations:

Mini-Ram

Disposal/Waste Treatment:

Health Hazards and First Aid:

Large quantities of water, induce vomiting, medical attention: remove to fresh air. medical attention immediately

Symptoms: Acute: irritation of nose and throat, coughing, chest pain, nausea, vomiting, dizziness, chills, stomach distress, diarrhea

Chronic: loss of smell, liver damage, kidney damage, cancer

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HAZARD EVALUATION OF CHEMICALS

Chemical Name: Cyanide Date: 5/02/92

DOT Name/U.N. lo.: 1680/1689 Job No.:

CAS Number: 151-50-8/143-33-9

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)

toxic and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Potassium cyanide/ sodium cyanide)

Chemical Formula: KCN/NaCN Molecular Weight: 65.1/49.0

Physical State: solid Solubility (H2O): 72/58 % Boiling Point: ?/2725°F

Flash Point: NA Vapor Pressure/Density: 0 mm Freezing Point: NA

Specific Gravity: 1.55/1.6 Odor Characteristic: Flammable Limits: Non

Incompatabilities: Acids, oxidizers, acid salts, chlorates • nitrates

Biological Properties:

TLV-TWA: 5 mg/m^3 PEL: 4.7 ppm Odor/Odor Threshold: bitter, almond-like

IDLH: 50 ppm Human: Aquatic: Rat/Mouse:

Route of Exposure: Inhalation, Ingostion, Dermal

Carcinogen: --- Teratogen: --- Mutagen: ---

Radiological Properties:

Handling Recommendations: (Personal protective measures)

modified Level D with gloves and tyvek at tho miminium.

Monitoring Recommendations:

OVA/Hnu/ Mini Ram

Disposal/Waste Treatment:

Health Hazards and First Aid:

ING: Give water, induce vomiting, medical attontion immediately; INH: move to fresh air, medical attontion: DER: wash with soap and water promptly.

Symptoms: Acute: stomach distress, vomiting, diarrhea, black stool, headache, dizziness, metallic taste

Chronic: muscle weakness, joint/muscle pain, insomnia, coma, death

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Nickel (metal) Date 7/02/92

DOT Name/U.N. No. _____ Job No. _____

CAS Number 7440-02-0

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)

Toxic and Hazardous Safety Manual ACGIH Other: _____

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Raney alloy; nickel particles)

Chemical Formula Ni Molecular Weight 58.7

Physical State solid (powder) Solubility (H2O) insoluble Boiling Point 4946°F

Flash Point N/A Vapor Pressure/Density N/A Freezing Point 2651°F

Specific Gravity N/A Odor Characteristic none Flammable Limits N/A

Incompatabilities strong acids, sulfur, wood, potassium perchlorate

Biological Properties:

TLV-TWA 1 mg/m3 PEL 1 mg/m3 Odor/Odor Threshold odorless

IDLH _____ Human _____ Aquatic _____ Rat/Mouse _____

Route of Exposure inh, ing, derm

Carcinogen Human/animal suspected Teratogen Experimental Mutagen Experimental

Radiological Properties:

N/A

Handling Recommendations: (Personal protective measures)

Tyvek, gloves (PVA, Viton); APR in windy/dusty areas.

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

Inh: move to fresh air, APR if necessary; Eye/skin: flush with water for 15 minutes, wash skin with soap/water; Ing: seek medical attention

Symptoms: Acute: Mental confusion, light-headedness, nausea/vomiting, headache, staggering, unconsciousness, irritation of eyes/resp/skin

Chronic: Dermatitis from skin sensitization. Cancer of lungs and nasal passages in nickel refining employees.

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HAZARD EVALUATION O? CHEMICALS

Chemical Nan Load Date 3/23/92

DOT Name/U.N. So. 2291 Job Io. UH8000

CAS Number 7439-92-1

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)

Toxic and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Plumbum)

Chemical Formula Pb Molecular Weight 207.2

Physical State solid solubility (H2O) insoluble Boiling Point 3164 F

Flash Point N/A Vapor Pressure/Density 0 mm Freezing Point N/A

Specific Gravity 11.34 Odor Characteristic N/A Flammable Limits N/A

Incompatabilities Strong oxidizers, hydrogen peroxide, acids

Biological Properties:

TLV-TWA .100 mg/m3 PEL .050 mg/m3 Odor/Odor Threshold N/A

IDLH 700 mg/m3 Human Aquatic Rat/Mouse

Route of Exposure Inhalation, Ingestion, Dermal

Carcinogen --- Teratogen --- Mutagen ---

Radiological Properties:

Handling Recommendations: (Personal protective measures)

5 mg/m^3 high efficiency particulate roapirator: other concentrations- SCBA; avoid akin contact or ingestion.

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

ING: Give water, induce vomiting, medical attontion immediately; INH: move to fresh air. medical attontion: DER: wash with soap and water promptly.

Symptoms: Acute: stomach distress, voriting, diarrhea, black stool, headache, dizziness, metallic taste

Chronic: muscle weakness, joint/muscle pain, insomnia, coma, death

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HAZARD EVALUATION OF CHEMICALS

Chemical Name: Chromium (hexavalent) Date: 3/23/92

DOT Name/U.N. No.: Job No.: UH8000

CAS Number: 7440-47-3

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)

Toxic and Hazardous Safety Manual ACGIH Other: SAX, Aldrich

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Chromic oxide, soluble chromic salts)

Chemical Formula: Cr Molecular Weight: s2

Physical State: solid Solubility (H2O): insoluble Boiling point: 4788°F

Flash Point: N/A Vapor Pressure/Density: 0 mm Freezing Point: 3452°F

Specific Gravity: 7.14 odor Characteristic: Flammable Limits:

Incompatabilities: Strong oxidizers

Biological Properties:

TLV-TWA: 0.5 mg/m^3 PEL: 1 mg/m^3 Odor/Odor Threshold:

IDLH: N/A Human: Aquatic: Rat/Mouse:

Route of Exposure: Inhalation, Ingestion

Carcinogen: Teratogen: Mutagen:

Radiological Properties:

Handling Recommendations: (Personal protective measures)

APR: any detectable limit- SCBA. Wear gloves mad booties. Prevent skin/eye contact.

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

ING: give large amounts of water, induce vomiting, immediate medical attention. INH: move to fresh air, CPR if necessary, immediate medical attention. DER: Rinse with large amounts of water.

Symptoms: Acute: Contact dermatitis; irritation of mucous membranes and upper respiratory tract, coughing, wheezing, headache, fever, nausea, vomiting.

Chronic: Carcinogen, liver and kidney damage, bronchitis, ulceration of skin, lung cancer.

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SITE SAFETY PLAN

Version 988

A. GENERAL INFORMATION

Project Title: Site 13 - Magazine Point

Project No.: UH1103

TDD/Pan lo.:

Project Manager: John Barksdale

Project Dir.: Rick Rudy

Location(s): Magazine Point - Eastern portion of land north of Chevalier Field, up to Magazine Point

Prepared by: Jon Schridt

Dato Proparod: 4-25-89

Approval by: Mary Miller

Date Approvod:

Site Safety Officer Review:

Dato Reviewed:

Scope/Objective of Work: Field Screening will include physical surveys, soil sampling, temporary well installation, groundwater sampling, and hydrologic assessment.

Proposed Dato of Field Activities: September 1989

Background Info: Complete: [X] Preliminary (No analytical data available) [ ]

Documentation/Summary:

Overall Chemical Hazard:	Serious	[ ]	Moderate	[ ]
	Low	[X]	Unknown	[ ]
Overall Physical Hazard	Serious	[ ]	Moderate	[ ]
	Low	[X]	Unknown	[ ]

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

Liquid	[ ]	Solid	[X]	Sludge	[ ]	Gas/Vapor	[ ]

Characteristic(s):

Flammable/ Ignitable	[ ]	Volatile	[ ]	Corrosive	[ ]	Acutely Toxic	[ ]
Explosive	[ ]	Reactive	[ ]	Carcinogen	[ ]	Radioactive*	[ ]

Other: Unknown

Physical Hazards:

Overhead	[X]	Confined* Space	[ ]	Below Grado	[X]	Trip/Fall	[X]
Puncture	[ ]	Burn	[ ]	cut	[ ]	Splash	[X]
Noise.	[X]	Other: Sampling within a rubble disposal area. Heat/cold stress.					

*Requires completion of additional fora and special approval from tho Corporato Health/Safety group. Contact RSC or HQ.

Site History/Description and Unusual Features (see Sampling Plan for detailed description): Clean fill material was disposed of on Magazine Point from tho eastern edge of Chevalier Field, along the vatorfront. north to tho end of Magazine Point. An unknown quantity of materials were dumped over an unknown period of time.

Locations of Chemicals/Wastes: Solid vasto (building materials) were dumped along tho entire stretch of Magazine Point's eastern vatorfront.

Estimated Volume of Chemicals/Wastes: unknown

Site Currently in Operation Yes: [X] uo: [ ] .

C. HAZARD EVALUATION

List Hazards by Task (i.e., drum sampling. drilling, etc.) and number them. (Task numbers are cross-referenced in Section D)

Physical Hazard Evaluation:

1) Physical Surveys - Walking along rubble area;

2) Temporary Monitoring Well Installation - Using portable drill rig;

3) Soil Sampling - Using portable drill rig:

4) Groundwater Sampling - Splash, personal contaminatioa;

5) Decontamination Procedures - Using solvents;

6) Hydrologic Assessment - Splash, personal contamination.

Chemical Hazard Evaluation:

compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Description
Fuel Oil Uo. 2	N/A	Inh/Abs	CNS depressant	0.082 ppm	mild aromatic
Isopropyl Alcohol	440 ppm		drowsiness,head.	7.5-200 ppm	rubbing alcohol
Nitric Acid	2 ppm	"	corrosive	0.3-1 ppm	acrid
Sulfuric Acid	1 mg/m^3	Ing, Dorm, Inh	corrosive	N/A	odorless
Hydrochloric Acid	5 ppm	Inh, Ing, Derm	corrosive	Unknown	acrid
Sodium Hydroxide	2 mg/m^3	Inh. Ing, Con	corrosive	N/A	odorless
Asbestos	0.01 f/cc	Inhalation	N/A	N/A	N/A

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Task 1				X
Task 2				X
Task 3				X
Task 4				X
Task 5				X
Task 6				X

(Expand if necessary)

Modifications: Modified level D with tyveck, neoprene gloves and boots, safety glasses, APR available when level C upgrade is necessary based on OVA readings.

Action Levels for Evacuation of Work Zone Pending Reassessment of Conditions:

- o Level D: O_2 <19.5% or >25%, explosive atmosphere >10% LEL, organic vapors above background levels, particulates >_____ mg/m^3, other _____
- o Level C: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (in breathing zone) >1 ppm, particulates >_____ mg/m^3 (California-20%). unknown organic vapor other _____
- o Level B: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (in breathing zone) >5 ppm, particulates >_____ mg/m^3 (California-20%), unknown organic vapors other _____
- o Level A: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors >500 ppm, particulates >_____ mg/m^3, other _____

Air Monitoring (daily calibration unless otherwise noted):

Contaminant of Interest	Type of Sample (area, personal)	Monitoring Equipment	Frequency of Sampling
VOCs	Area	OVA	Continuous
Radiation	Area	Mini-Rad	Continuous
Explosive Gases	Area	O_2/Explosimeter	Continuous

(Expand if necessary)

Decontamination Solutions and Procedures for Equipment, sampling Gear, etc.:

Trisodium phosphate wash, tap water rinse, deionized water rinse, isopropanol rinse (twice), final organic-free water rinse, and allow to air dry as long as possible.

Personnel Decon Protocol: Boot and glove wash - trisodium phosphate wash with clean water rinse. Expendables will bo double bagged and drummed for disposal. Field personnel will take a hygienic shower, off-sit., following each day's field work.

Decon Solution Monitoring Procedures, if Applicable: Decontamination will bo performed in A well-ventilated area upwind of the sampling zone.

Special Site Equipment, Facilities, or Procedures (Sanitary Facilities and Lighting Must Meet 29 CFR 1910.1201:

All drilling safety procedures will bo strictly adhered to as outlined in Attachment A.

Site Entry Procedures and Special Considerations: E & E's "Buddy System" will be employed at all times during fieldwork activities. Personnel will exercise caution in the vicinity Of the rubble disposal area and along nearby roadways. If above background radiation levels are encountered team members will evacuate tho sampling area, and contact tho corporate health physics group to reassess tho site.

Work Limitations (time of dag, weather conditions, etc.) and Heat/Cold Stress Requirements:

All fieldwork activities will bo performed during daylight hours. Team members will take breaks as necessary to avoid heat stress and replace fluids. Cooling vests may bo used to prevent heat stress.

General Spill Control, if applicable: N/A

Investigation-Derived Material Disposal (i.e., expendables, decon waste, cuttings):

All fieldwork waste materials will bo double bagged, drummed, labeled and transported to a designated location for final disposal by the Navy.

Sample Handling Procedures Including Protective Wear:

During a11 handling of samples, all fiold team members will wear surgical gloves. Goggles will bo worn during sample preservation with acids.

Team Member*	Responsibility
Team members to bo determined	Team Leader
	sit. Safety Officer/Sampler
	Geologist/Sampler

*All entries into exclusion zone require Duddy System use. All E e E fiold staff participate in medical monitoring program and have completed applicable training per 29 CFR 1910.120. Respiratory protection program meets requirements of 29 CFR 1910.134, and ANSI Z88.2 (1980).

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E. EMERGENCY INFORMATION

(Use supplemental shoots, if necessary)

LOCAL RESOURCES

(Obtain a local telephone book from your hotel, if possible.)

Ambulance On Base -- 904-452-1138, Off Base -- 911

Hospital Emergency Room NAS Dispensary - 904-452-2733, Baptist Hospital 904-434-4811 (Life Flight)

Poison Control Center

Police (include local, county sheriff, state) 911

Fire Department 911

Airport

U.S. Coast Guard Emergency - 904-453-8178, General Information 904-453-8282

Laboratory E & E ASC 1-716-631-0360

Fed. Express 1-800-238-5355

Client Contact U.S. Navy Southern Division, Engineer-In-Charge, Suzanne D. Sanborn -- 803-743-0574

Site Contact NAS Pensacola Enviromental Coordinator. Ron Joyner -- 904-452-4515

SITE RESOURCES

Site Emergency Evacuation Alarm Method N/A

Water Supply Source on-sit.

Telephone Location, Number To be determined on-sit.

Cellular Phone, if available N/A

Radio

Other On-site warehouse number to be determined

EMERGENCY CONTACTS

1. Dr. Raymond Harbison (Univ. of Florida) ..... (501) 221-0465 or (904) 462-3277, 3281
   Alachua, Florida (501) 370-6263 (24 hours)

2. Ecoloqy and Environront. Inc.. Safoty Director
   Paul Jonmaire ..... (716) 684-8060 (office)
   (716) 655-1260 (homo)

3. Regional Safety Coordinator, Sybil Newchurch ..... (904) 876-2336 (homo)
   (904) 677-1978 (office)

4. Regional Office Manager, R. Rudy ..... (904) 893-7245 (home)
   (904) 877-1976 (office)

MEDTOX HOTLINE

1. Twenty-four hour answering service: (501) 370-0263

   What to report:

   - State: "this is an emergency."
   - Your name, region, and site.
   - Telephone number to roach you.
   - Your location.
   - Name of person injured or exposed.
   - Nature of emergency.
   - Action taken.

2. A toxicologist, (Drs. Raymond Harbison or associate) will contact you. Repeat tho information given to tho answering service.

3. If a toxicologist does not return your call within 15 minutes, call tho following persons in order until contact is made:

   a. 24 hour hotline - (711) 684-8940
   b. Corporate Safety Director - Paul Jonmaire - how # (716) 655-1260
   c. Assistant Corp. Safety Officer - Steven Sherman - home # (716) 600-0004

EMERGENCY ROUTES

(NOTE: Field Team must Know Route(s) Prior to Start of Work)

Directions to hospital (include map) from Site 13

NAS Dispensary - Cross Chevalier Field (west) to Murray Road: follow Murray Road south to Moffett Road. Turn right onto Moffett Road and continuo west to Fisher Stroot. Turn loft onto Fisher Stroot and continuo to its intersection with Turner Stroot. Turn right onto Turner Stroot. Tho NAS Dispensary is located on Turner Stroot in Building 3600.

Baptist Hospital - Take Duncan Road (Navy Blvd.) north to exit tho base. Navy Blvd. becomes HWY 90 and curves to the east. Follow Navy Blvd./Hwy. 90 east appror. 3mi to Pace Blvd. Turn left (north) on Pace Blvd. and proceed approx. 1mi to Cervantes St. (Hwy. 90). Turn right on Cervantes/Hwy. 90 and follow this road for about 0 blocks and turn loft (north) onto E street. The hospital is about 6 blocks north on tho loft.

Emergency Egress Routes to Got Off-Site Emergency egress routes will be located if emergency exit routes become blocked by construction. etc.

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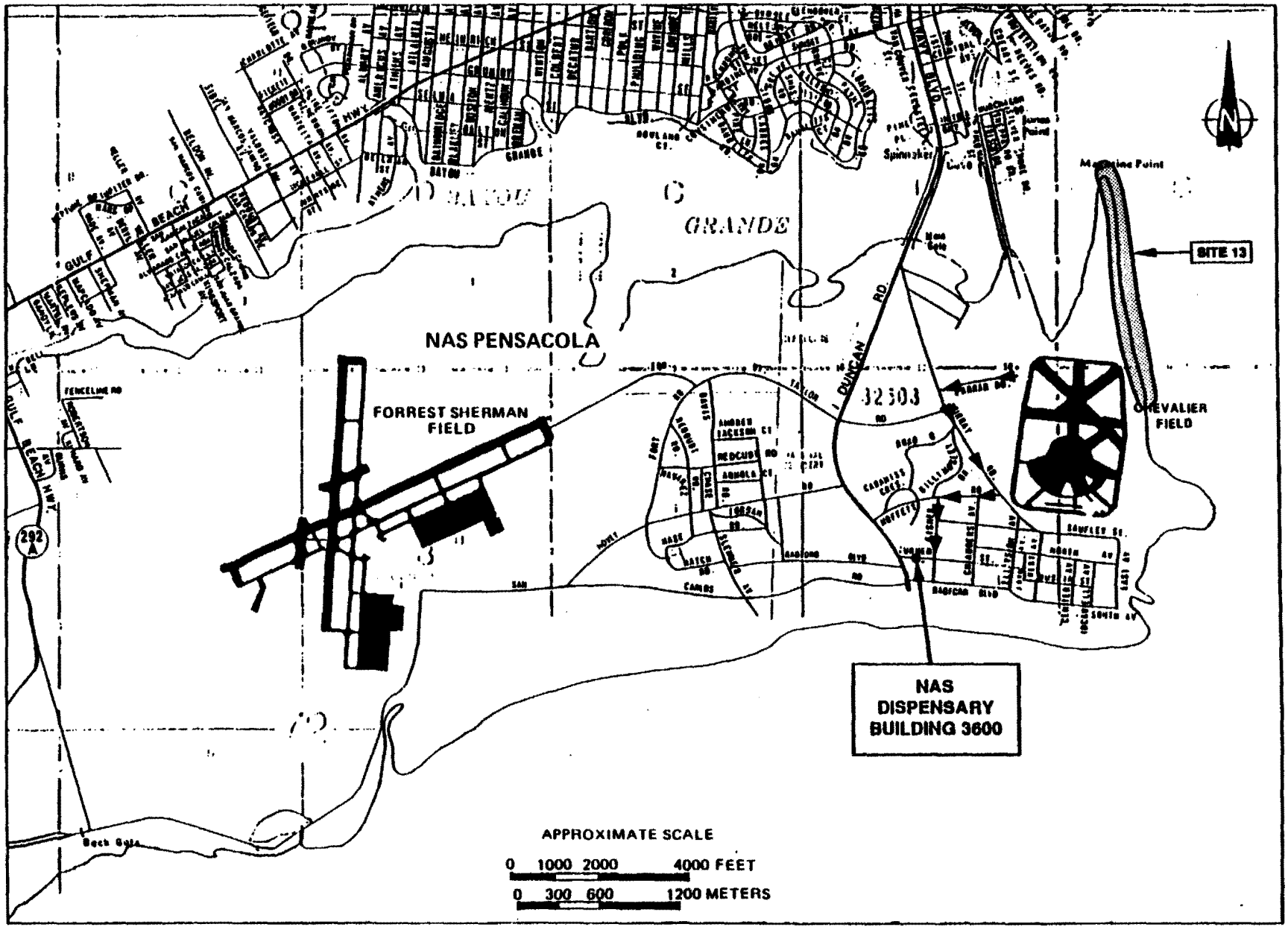

Figure A-3 LOCATION OF NAS DISPENSARY

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Diesel Fuel Date 3/23/92

DOT Name/U.N. No. 1993 Job No. 671000

CAS Number

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)

Toxic and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCLI 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: JP5, Jet Fuel, Diesel Oil, Fuel Oil #2)

Chemical Formula CHx (mixture of hydrocarbons) Molecular Weight varies

Physical State liquid Solubility (H2O) insoluble Boiling Point 340.1- 675°F

Flash Point 100 F- 136 F Vapor Pressure/Density A Freezing Point N/A

Specific Gravity 0.879 Odor Characteristic 0.012 ppm Flammable Limits

Incompatabilities Strong oxidizers

Biological Properties:

TLV-TWA --- PEL --- Odor/Odor Threshold petroleum odor

IDLH --- Human Aquatic Rat/Mouse

Route of Exposure Inhalation, Ingestion, Dermal

Carcinogen possible Teratogen Mutagen

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Impervious clothing, neoprene gloves and boots, APR at high concentrations

Monitoring Recommendations:

OVA or HNu with 10.2 eV probe.

Disposal/Waste Treatment:

Health Hazards and First Aid:

Wash skin upon contact: do not induce vomiting if ingested. Seek medical attention.

Symptoms: Acute: vomiting, diarrhea, pulmonary edema

Chronic: pneumonia, respiratory paralysis, CNS depressant

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Asbestos Date 7/06/92

DOT Name/U.N. lo. 2212 or 2590 Job lo.

CAS Number 1332-21-4

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)

Toxic and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: [Synonyms: Tremolite, Amosite, Chrysotile, Fibrous grunerite, Actinolite)

Chemical Formula Varies Molecular Weight 70.0

Physical State solid Solubility (H2O) Insoluble Boiling Point 1112°F

Flash Point N/A Vapor Pressure/Density 0 mm Hg Freezing Point

Specific Gravity 2.5 Odor Characteristic Flammable Limits N/A

Incompatabilities N/A

Biological Properties:

TLV-TWA .2 f/cc PEL .2 f/cc NOTE: See 29 CFR 1910.1001 & .1101

IDLH 1 f/cc 30 min. Human Aquatic Rat/Mouse

Route of Exposure Inh, Ing

Carcinogen Human/animal Toratogen Mutagen

Radiological Properties:

N/A

Handling Recommendations: (Personal protective measures)

Tyvek, gloves (PVA, Viton,Latex), APR

Monitoring Recommendations:

Gillian pump with an asbestos filter cassette.

Disposal/Waste Treatment:

Must bo disposed of am hazardous waste including protective clothing and debris.

Health Hazards and First Aid:

Inh: move to fresh air, blow nose to remove dust, do not sniffle. Der: remove contaminated, flush w/ soap/water for 15 min; Ing: seek medical attention.

Symptoms: Acute: sneesing, slight irritation of nose, irritation and watering eyes, inflamed conjunctivas

Chronic: lung cancer-mesothelioma, gastrointestinal cancer, cancer of larynx, asbestosis

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SITE SAFETY PLAN

Version 988

A. GENERAL INFORMATION

Project Title: Site 14 - Dredge Spoil Fill Area

Project No.: UH1103

TDD/Pan Uo.:

Project Manager: John Barksdale

Project Dir.: Rick Rudy

Location(s): Dredge Spoil Fill Area - East side of Chevalier Field

Prepared by: Jon Schmidt

Dato Proparod: 4-26-89

Approval by: nary Miller

Dato Approved:

Site Safety Officer Review:

Dato Reviewed:

Scope/Objective of Work: Field Screening will include physical surveys, soil sampling, temporary well installation, groundwater sampling, and hydrologic assessment.

Proposed Dato of Field Activities: September 1989

Background Info: Complete: [X] Preliminary (No analytical data available) [ ]

Documentation/Summary:

Overall Chemical Hazard:	Serious	[ ]	Moderate	[ ]
	LOU	[X]	Unknown	[ ]
Overall Physical Hazard	Serious	[ ]	Moderate	[ ]
	LOU	[X]	Unknown	[ ]

B. SITE CHARACTERISTICS

Waste Type(s):

Liquid	[ ]	Solid	[X]	Sludge	[X]	Gas/Vapor	[ ]

Characteristic(s):

Flammable/ Ignitable	[ ]	Volatile	[ ]	Corrosive	[ ]	Acutely Toxic	[ ]
Explosive	[ ]	Reactive	[ ]	Carcinogen	[ ]	Radioactive*	[ ]

Other: Wastes are dredged sediments from Pensacola Bay

Physical Hazards

Overhead	[X]	Confined* Space	[ ]	Below Grado	[X]	Trip/Fall	[X]
Puncture	[ ]	Burn	[ ]	Cut	[ ]	Splash	[X]
Noise	[X]	Other: Sampling within depressions on-site. Heat/cold stress.					

*Requires completion of additional fora and special approval from tho Corporato Health/Safety group. Contact RSC or HQ.

Site History/Description and Unusual Features (see Sampling Plan for detailed description): From 1975 to 1977 dredge material vas removed form tho aircraft carrier turning basin and disposed along tho eastern side of Chevalier Field, creating tho present point of land. The disposed material consists ot Bay bottom sand which could contain tbo same contamination as is found within tho bay sediments.

Locations of Chemicals/Wastes: Dredged sediments from Pensacola Bay were deposited alongthe eastern side of Chevalier Field, creating tho present point of land.

Estimated Volume of Chemicals/Wastes: unknown

Site Currently in Operation Yes: [ ] No: [X]

C. HAZARD EVALUATION

List Hazards by Task (i.e., drum sampling, drilling, etc.) and number them. (Task numbers are cross-referenced in Section D)

Physical Hazard Cvaluation:

1) Physical Surveys - Walking along rubble area;

2) Temporary Monitoring Well Inatallation - Using portable drill rip;

3) Soil Sampling - Using portable drill rig;

4) Groundwater Sampling - Splash, personal contamination:

5) Decontamination Procedures - Using solvents;

61 Hydrologic Assessment - Splash, personal contamination.

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Odor Description
cadmium	0.2 mg/m^3	Inh, Ing	head,cough,chills	inadequate	varies
chromium	1 mg/m^3	Inh, Ing	none	N/A	N/A
isopropyl alcohol	440 ppm	" "	drowsiness,head.	7.5-200 ppm	rubbing alcohol
nitric acid	2 ppm	" "	corrosive	0.3-1 ppm	acrid
sulfuric acid	1 mg/m^3	Ing, Derm, Inh	corrosive	N/A	odorless
hydrochloric acid	5 ppm	Inh, Ing, Derm	corrosive	Unknown	acrid
sodium hydroxido	2 mg/m^3	Inh, Ing, Con	corrosive	N/A	odorless
mercury	0.05 mg/m^3	Inh, con, abs	vomit,cough,naus	odorless	odorless
nickel	1 mg/m^3	inh, con, abs	naus,vomit,diarrhe	odorless	odorless
lead	50 ug/m^3	inh, ing, con	vomit, diarrhea	N/A	N/A
aluminum	15 mg/m^3	inh	emphysma,lethargy	N/A	N/A
zinc	5 mg/m^3	inh	naus,vomit,chills	N/A	N/A
arsenic	0.5 mg/m^3	inh, ing, con	naus,vomit,diarrhe	N/A	N/A

Note: Complete and attach a Hazard Evaluation Shoot tor each major known contaminant.

D. SITE SAFETY WORK PLAN

Site Control: Attach map, use back of this page, or sketch of site showing hot zone, contamination reduction, zone, otc.

Perimeter identified? [yes] Site secured? [no]

Work Areas Designated? [yes] Zone(s) of Contamination Identified? [no]

Personnel Protection (TLD badges required for all field personnel):

Anticipated Lovol of Protection (Cross-reference task numbers to Section C):

	A	B	C	D
Task 1				X
Task 2				X
Task 3				X
Task 4				X
Task 5				X
Task 6				X

(Expand if necessary)

Modifications: Modified level D with tyvock, neoprene gloves and boots. safety glasses, APR available when level C upgrade is necessary based on OVA roadings.

Action Levels for Evacuation of Work Zone Pending Reassessment of Conditions:

- Level D: O_2 <19.5% or >25%, explosive atmosphere >10% LEL. organie vapors above background levels, particulates > ____ mg/m^3, othor _____
- Level C: O_2 <19.5% or >25%, oxplosivo atmosphere >25% LEL (California-20%), unknown organic vapor (n bfeathing sono) >1 ppm, particulates > ____ mg/m^3, othor _____
- Lovol B: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors in bfeathing zone) >5 ppm, particulates >____ mg/m^3, othor _____
- Lovol A: O_2 <19.5% or >25%, oxplosivo atmosphere >25% LEL (California-202). unknown organic vapors >500 ppm, particulates > ____ mg/m^3, other _____

Air Monitoring (daily calibration unless otherwise noted):

Contaminant of Interest	Typo of Sample (area, personal)	Monitoring Equipment	Frequency of Sampling
VOCs	Area	OVA	Continuous
Radiation	Area		
Explosive Gases	Area	O$_2$/Explosimeter	Continuous

(Expand if necessary)

Decontamination Solutions and Procedures for Equipaont, Sampling Gear, otc.:

Trisodium phosphate wash, tap water rinse, deionized water rinse, isopropanol rinse (twice), final organic-free water rinse, and allow to air dry as long as possible.

Personnel Decon Protocol: mot and glove wash - trisodium phosphate wash with clean water rinse. Expendables will be double bagged and drummed for disposal. Field personnel will take a hygienic showr, off-sit.. following each day's field work.

Decon Solution Monitoring Procoduros, if Applicable: Decontamination will be performed in a well-ventilated area upwind of the sampling zone.

Special Site Equipment, Facilities, or Procedures (Sanitary Facilities and Lighting Must Meet 29 CFR 1910.120):

All drilling safety procedures will ba strictly adhered to as outlined in Attachment A.

Site Entry Procedures and Special Considerations: E & E's "buddy System" will be employed at all times during fieldwork activities. Personnel will exercise caution in tho site vicinity and along nearby roadways. If above background radiation levels are encountered team members will evacuate tho sampling area, and contact the corporate health physics group to reassess tho site.

Work Limitations (time of day, weather conditions, etc.) and Heat/Cold Stress Requirements:

All fieldwork activities will bo performed during daylight hours. Team members will take breaks as necessary to avoid heat stress and replace fluids. Cooling vests may bo used to prevent heat stress.

General Spill Control, if applicable: N/A

Investigation-Derived Material Disposal (i.e., expendables, decon waste, cuttings):

All fieldwork waste materials will be double bagged, drummed, labeled and transported to a designated location for final disposal by tho Navy.

Sample Handling Procoduros Including Protective Wear:

During all handling of samples, all field team members will wear surgical gloves. Goggles will bo worn during sample preservation with acids.

Team Member*	Responsibility
Team members to bo determined	Team Leader
	Site Safety Officer/Sampler
	Geologist/Sampler

*All entries into exclusion zone require Buddy System use. All E & E field staff participate in medical monitoring program and have completed applicable training per 29 CFR 1910.120. Respiratory protection program meets requirements of 29 CFR 1910.134, and ANSI Z88.2 (1980).

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E. EMERGENCY INFORMATION

(Use supplemental shoots, if necessary)

LOCAL RESOURCES

(Obtain a local telephone book from your hotel, if possible.)

Ambulance On Base -- 904-452-4138, Off Base -- 911

Hospital Emergency Rooa NAS Dispensary - 904-452-2733, Baptist Hospital 904-434-4811 (Life Flight)

Poison Control Center

Police (include local, county sheriff, state) 911

Fire Department 911

Airport

U.S. Coast Guard Emergency - 904-453-8178, General Information 904-453-8282

Laboratory E & E ASC 1-716-631-0360

Fed. Express 1-800-238-5355

Client Contact U.S. Navy Southern Division. Enginoor-In-Chargo, Suzanne D. Sanborn -- 1-803-743-0574

Site Contact NAS Pensacola Enviromental Coordinator, Ron Joyner -- 904-452-4515

SITE RESOURCES

Site Emergency Evacuation Alarm Method N/A

Water Supply Source On-sit.

Telephone Location, Number To bo dotorminod on-sit.

Cellular Phone, if available N/A

Radio

Other On-site warehouse number to bo dotorminod

EMERGENCY CONTACTS

1. Dr. Raymond Harbison (Univ. of Florida) ..... (501) 221-0465 or (904) 462-3277, 3281
   Alachua. Florida (501) 370-8263 (24 hours)

2. Ecology and Environnont, tnc., Safety Director
   Paul Jonmaire ..... (716) 684-8060 (office)
   (716) 655-1260 (home)

3. Regional Safety Coordinator, Sybil Newchurch ..... (904) 878-2336 (homo)
   (904) 877-1978 (office)

4. Regional Office Manager, R. Rudy ..... (904) 893-7245 (home)
   (904) 877-1978 (office)

MEDTOX HOTLINE

1. Twenty-four hour answering service: (501) 370-8263

   What to report:

   - State: "this is an emergency."
   - Your name, region, and site.
   - Telephone number to roach you.
   - Your location.
   - Name of person injured or exposed.
   - Nature of emergency.
   - Action taken.

2. A toxicologist, (Drs. Raymond Harbison or associate) will contact you. Repeat tho inforration given to the answering service.

3. If a toxicologist does not return your call within 15 minutes, call the following persons in order until contact is made:

   a. 24 hour hotline - (716) 684-8940
   b. Corporato Safety Director - Paul Jonmaire - home # (716) 655-1260
   c. Assistant Corp. Safety Officer - Steven Sherman - home I (716) 688-0084

EMERGENCY ROUTES

(NOTE: Field Team must Know Route(s) Prior to start of Work)

Directions to hospital (include rap) from Site 14

NAS Dispensary - Follow Saufley Street west to Fisher Stroot. Turn loft onto Fisher Stroot and follow it south to Turnor Stroot. Turn right onto Turnor Street. Tho NAS Dispensary is located on Turnor Stroot in Building 3600.

Baptist Hospital - Take Duncan Road (Navy Blvd.) north to exit tho base. Navy Blvd. becomes HWY 98 and curves to the east. Follow Navy Blvd./Hwy. 98 east approx. 3mi to Pace Blvd. Turn loft (north) on Pace Blvd. and proceed approx. 1mi to Cervantes St. (Hwy. 90). Turn right on Cervantes/Hwy. 90 and follow this road for about 8 blocks and turn loft (north) onto E street. Tho hospital is about 6 blocks north on tho loft.

Emergency Egress Routes to Get Off-Site Emergency ogress routes will bo located if emergency exit routes become blocked by construction, etc.

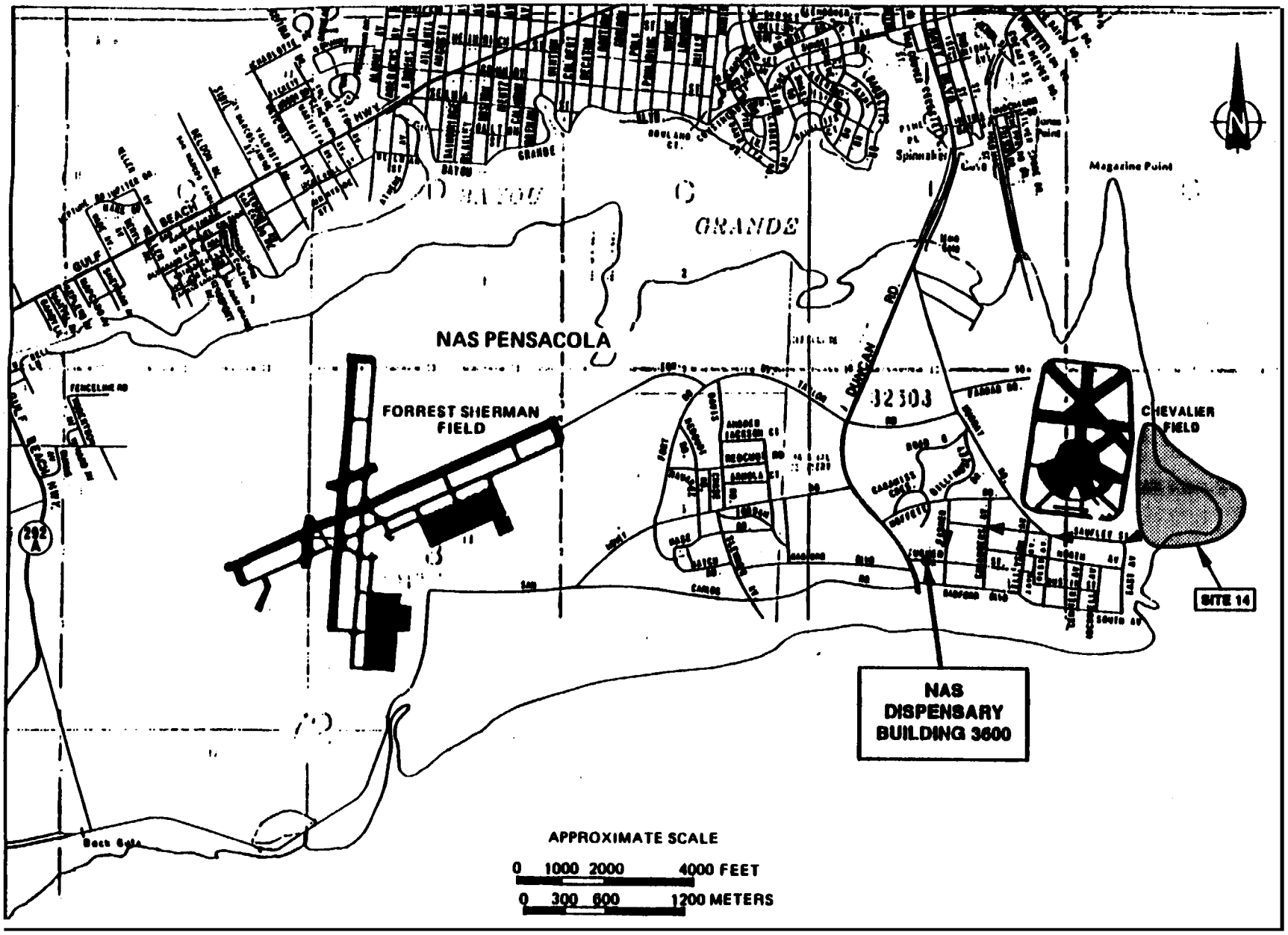

Figure A-4 LOCATION OF NAS DISPENSARY

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Arsonic Date 3/26/92

DOT Name/U.N. lo. 1558 Job No. UH8000

CAS Number 7784-42-1

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)

Toxic and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Arsenia)

Chemical Formula As Molecular Weight 74.9

Physical State Solid Solubility (H2O) Insoluble Boiling Point Sublimes

Flash Point N/A Vapor Pressure/Density 0 n Freezing Point N/A

Specific Gravity 5.73 Odor Characteristic N/A Flammable Limits Non

Incompatabilities STRONG OXIDIZERS, BROMINE AZIDE, HYDROGEN GAS

biological Properties:

TLV-TWA 0.002 mg/m^3 P6L 0.010 mg/m^3 Odor/Odor Threshold Odorless

IDLH 100 mg/m^3 Human Aquatic Rat/Mouse

Route of Exposure Inh, Abs, Jng, Con

Carcinogen Yes Teratogen Mutagen

Handling Recommendations: (Personal protective measures)

Tyvek and safety glasses with full-face respirator available tor upgrade.

Monitoring Recommendations:

Continuous Mini-Ram

Disposal/Waste Treatment:

Health Hazards and First Aid:

Eye: wash immediately; skin: wash immediately; Swallow: immediate medical attontion - irritation from exposure requires immediate medical attontion.

Symptoms: Acute: Headache, dissiness, nausea, vomiting, convulsions

Chronic: Coma

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Aluminum Date 1/06/92

DOT Name/U.N. no. Job No.

CAS Number 7429-90-5

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)

Toric and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms:)

Chemical Formula Al Molecular Weight 26.9

Physical State solid Solubility (H2O) Boiling Point

Flash Point Vapor Pressure/Density Freezing Point

Specific Gravity Odor Characteristic Flammable limits

Incompatabilities

Biological Properties:

TLV-TWA 10 mg/m^3 PEL 5 mg/m^3 Odor/Odor Threshold

IDLH Human Aquatic Rat/Mouse

Route of Exposure inh, ing, dorm

Carcinogen Teratogen Mutagen

Radiological Properties:

N/A

Handling Recommendations: (Personal protective measures)

Tyvek, gloves (OVA, Viton), APR in dusty or windy areas

Monitoring Recommendations:

Mini-Ram or equivalent.

Disposal/Waste Treatment:

Health Hazards and First Aid:

Inh: move to fresh air, APR if necessary; Eye/skin: flush with water for 15 minutes, wash skin with soap/water; Ing: seek medical attention

Symptoms: Acute: M onfu light headedn nausea headache, staggering, u ousn irritation of resp/s

Chronic:

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Zinc Date 7/02/92

DOT Name/U.N. No. 1436 Job No.

CAS Number 7440-66-6

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)

Toxic and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Blue powder, granular zinc)

Chemical Formula Zn Molecular Weight 65.38

Physical State solid Solubility (H_2O) insoluble Boiling Point 907°C

Flash Point N/A Vapor Pressure/Density 1 mm Hg Freezing Point N/A

Specific Gravity 7.14 Odor Characteristic Flammable Limits

Incompatabilities NH_4NO_3, oxidants, chlorates; explosive when mixed w/ acids.

Biological Properties:

TLV-PEL $ZnCl_2$(1 mg/m_3) TLV-PEL ZnO(5 mg/m_3) Odor/Odor Threshold odorless

IDLH Human Aquatic Rat/Mouse

Route of Exposure inh, ing

Carcinogen Teratogen Mutagen

Radiological Properties:

N/A

Handling Recommendations: (Personal protective measures)

Tyvek, gloves (PVA, Viton); APR in dusty/windy areas.

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

Inh: move to fresh air, APR if necessary; Eye/skin: flush with rater for 15 minutes, wash skin with soap/water; Ing: seek medical attention

Symptoms: Acute: Mental confusion, light-headedness, nausea/vomiting, headache, staggering, unconsciousness, irritation of eyes/resp/skin, skin burns

Chronic: Heart palpitations

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APPENDIX B

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLANS

[Bold items enclosed in brackets denote changes to the last version of document]

Section 1.0 -- Title Page

Vork Plan Group: C
Site No.: 2
Site Name: Waterfront Sediments

Prepared by: Amy Twitty
Ecology and Environment, Inc.
1203 Governor's Square Boulevard, Suite 401
Tallahassee, Florida 32301

Prepared for: Department of the Navy
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive, P.O. Box 10068
Charleston, South Carolina 29411-0068
Contract Number N62467-88-C-0200

Signature Approvals:

E & E Project Manager: John D. Barksdale
J. Barksdale

E & E Regional QA/QC Coordinator: Kimberly A. Walker
K. Walker

E & E ASC Director: Gary Hahn for
~~A. Gilchrist~~ W.F. Hall, Ph.

E & E QA/QC Project Officer: K. Walker for Marcia Meredith
M. Meredith

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Section 3.0 -- Project Summary

Work Plan Group: C

Site No.: 2

Site Name: Waterfront Sediments

Site Description: A complete site description and history are presented in Sections 2.0 and 3.0 of the attached work plan.

Phase I -- Field Screening
Physical Survey (check all that apply):

- X Overall Physical Reconnaissance
- X HNu/OVA Surface Emission Survey
- X Radiation Survey
- X Habitat/Biota Survey
- ___ Asbestos Survey (in Rubble)
- ___ Hydrologic Assessment

Geophysical Survey (check all that apply):

- ___ Electromagnetic Conductivity:
  - ___ En-31 ___ EM-34
- ___ Hagnetometry
- ___ Very Low Frequency
- ___ Ground Penetrating Radar
- ___ Seismic Refraction
- ___ Seismic Reflection

Analytical Screening (check all that apply):

- ___ Field Analyses:
- ___ Soil Readspace Analyses: Planned Number of Samples ___
- ___ Soil Gas Analyses : Planned Number of Samples ___
- X Laboratory Analyses:

PLANNED NUMBER OF SAMPLES		CATEGORIES OF ANALYSES
Surface Water	___	___ Volatile Organic Compounds
Sediment	24	___ Polynuclear Aromatic Hydrocarbons
Soil	___	___ Phenols
Groundwater	___	___ Organophosphorus Pesticides
Duplicates	1	___ Chlorinated Herbicides
Trip Blanks	___	___ Carbamates
Field Blanks	___	___ Pesticides/Polychlorinated Biphenyls
Rinsate Blanks	___	___ Total Recoverable Hydrocarbons
Other	___	___ Metals
		___ Gross Alpha

Section 3.0 -- Project Summary (Continued)

Phase II — Characterization

PLANNED NUMBER OF SAMPLES

Surface Vater	7	Air	-	Duplicates	11
Sediment	103	Biota:		Trip Blanks	6
Soil		Flora		Field Blanks	1
Groundvater		Fauna		Rinsate Blanks	6
				Preservative Blanks	1

CATEGORIES OF ANALYSES

- X Purgeable Aromatics
- X Purgeable Halocarbons
- X Base/Neutral Extractables
- X Acid Extractables
- ___ Polynuclear Aromatic Hydrocarbons
- X Dioxins
- X Organophosphorus Pesticides
- X Herbicides
- X Pesticides
- X Polychlorinated Biphenyls
- X Total Recoverable Petroleum Hydrocarbons
- X Metals
- X Cyanide

Additional analytical categories are identified below:

- X Gross Alpha
- X Gross Beta
- X Gamma Scan
- X Total Organic Carbon
- X Eardness (vater only)
- X Alkalinity
- X Total Suspended Solids (vater only)
- X Total Kjeldahl Nitrogen
- X Ammonia Nitrogen
- X Orthophosphate Phosphorus
- X Dissolved Oxygen (in field)
- X 5-day Biological Oxygen Demand
- X Chemical Oxygen Demand
- X pH
- X Percent Moisture
- X Grain Size
- X BTU Content
- X Ash Content
- X Total Organic Halogens
- X Sulfur
- X Ignitability
- X Cation Exchange Capacity
- X Sulfide

Section 4.0 -- Project Organization and Responsibility

The overall organizational structure for this site is discussed in Section 4.0 of the GQAPP. Site-specific designated personnel and their responsibilities are listed below:

Site Manager:
Team/Task Leader(s): To Be Determined
Field Support Personnel:

Biographies for those personnel listed above which are not included in the GQAPP are included in Appendix A of this document.

Section 5.0 — QA/QC Objectives for Measurement Data

Criteria for reporting the accuracy, precision, and completeness of data are presented in Section 5.0 of the GQAPP. Detection limits for screening and quantitative analyses are presented in Section 9.0 of the GOAPP. Procedures used to assess data accuracy, precision, and completeness are presented in Section 14.0 of the GQAPP. All analytes (including field parameters), sample media, and method numbers relevant to the investigation of this site are listed in the following table, which also identifies any modifications to the accuracy (A), precision (P), completeness (C), and detection limit (DL) criteria specified in the above-referenced GQAPP sections.

Analyte	Media	Method No.	A	P	C	DL
Laboratory Screening Analyses*						
Volatile Organic Compounds	S/W	--	N/M	N/M	N/M	N/M
Polynuclear Aromatic Bydrocarbons	S/W	--	N/M	N/M	N/M	N/M
Pesticides	S/W	--	N/M	N/M	N/M	N/H
Polychlorinated Biphenyls	S/W	--	N/M	N/M	N/M	N/M
Total Recoverable Petroleum Eydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	TBD
Phenols	S/W	--	N/M	N/M	N/M	N/M
Arsenic	S/W	--	N/M	N/M	N/M	N/M
Cadmium	S/W	--	N/M	N/M	N/M	N/M
Chromium	S/W	--	N/M	N/M	N/M	N/M
Copper	S/W	--	N/M	N/M	N/M	N/M
Lead	S/W	--	N/M	N/M	N/M	N/M
Nickel	S/W	--	N/M	N/M	N/M	N/M
Silver	S/W	--	N/M	N/M	N/M	N/M
Zinc	S/W	--	N/M	N/H	N/M	N/M
Laboratory Analyses						
Gross Alpha	S/W	EPA 900.0	N/M	N/M	N/M	N/M
Gross Beta	S/W	EPA 900.0	TBD	TBD	TBD	TBD
Gamma scan	S/W	EPA 901.1	TBD	TBD	TBD	TBD
TCL Purgeables + xylene	S/W	EPA 8240/624	N/M	N/M	N/M	N/M
TCL BNAs	S/W	EPA 8270/625	N/M	N/M	N/M	N/M
TCL Pesticides & PCBs	S/W	EPA 8080/608	N/M	N/M	N/M	N/M
Total Recoverable Petroleum Eydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/M
Dioxins	S/W	EPA 8280	N/M	N/H	N/M	N/M
Organophosphorus Pesticides	S/W	EPA 8140	N/M	N/M	N/M	N/M
Herbicides	S/W	EPA 8150 (Mod)/509B	N/M	N/H	N/M	N/M
TAL Metals:						
Aluminul	S/W	€PA 6010	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010	N/M	N/M	N/M	N/M
Arsenic	S/W	EPA 7060	N/M	N/M	N/M	N/M
Barium	S/W	€PA 6010	N/M	N/M	N/M	N/M
Beryl1ium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Boron	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cadmium	S/W	EPA 6010	N/M	N/M	N/M	N/M
calcium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Chromium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cobalt	S/W	EPA 6010	N/M	N/M	N/M	N/M
Copper	S/W	EPA 6010	N/M	N/M	N/M	N/M

Analyte	Media	Method No.	A	P	C	DL
Iron	S/W	EPA 6010	N/H	N/M	N/M	N/M
Lead	S/W	EPA 7421	N/M	N/M	N/M	N/M
Magnesium	S/W	EPA 6010	N/H	N/H	N/H	N/M
Manganese	S/W	EPA 6010	N/H	N/M	N/H	N/M
Mercury	S/W	EPA 7471/7470	N/H	N/H	N/H	N/H
Nickel	S/W	EPA 6010	N/H	N/H	N/M	N/M
Selenium	S/W	EPA 7740	N/H	N/H	N/H	N/M
Silver	S/W	EPA 6010	N/H	N/M	N/H	N/M
Sodium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Thallium	S/W	EPA 7841	N/M	N/H	N/M	N/M
Tin	S/W	EPA 7870	N/H	N/M	N/H	N/M
Vanadium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Zinc	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cyanide	S/W	EPA 9010/335.2	N/M	N/M	N/H	N/M
Sulfide	S/W	EPA 376.1	N/H	N/M	N/H	N/M
TOC	S/W	EPA 415.1	N/M	N/M	N/H	N/M
Hardness	W	EPA 130.2	N/M	N/H	N/M	N/M
Alkalinity	V	EPA 310.1	N/H	N/H	N/H	N/M
Total Suspended Solids	V	EPA 160.2	N/M	N/M	N/M	N/M
Total Kjeldahl Nitrogen	S/W	EPA 351.3	N/H	N/M	N/M	N/M
Nitrogen-Ammonia	S/W	EPA 350.2	N/M	N/H	N/M	N/M
Orthophosphate Phosphorus	S/W	EPA 365.2	N/M	N/H	N/M	N/M
5-day Biological Oxygen Demand	V	SM 5210	N/M	N/M	N/M	N/M
Chemical Oxygen Demand	V	EPA 410.4	N/M	N/M	N/M	N/M
pH	V	EPA 150.1	N/M	N/M	N/M	N/M
Percent Hoisture	S	ASTM D-2216-80	N/H	N/H	N/M	N/M
Grain Size	S	ASTH D-422-63	N/M	N/M	N/H	N/M
BTU Content	S	ASTM D-2015-77	N/M	N/M	N/M	N/M
Ash Content	S	ASTM D-482	N/M	N/M	N/M	N/H
Total Organic Halogens	S	SV 9020	TBD	TBD	TBD	TBD
Sulfur	S	ASTH D-129-64	N/M	N/M	N/M	N/M
Ignitability	S/W	EPA 1010	N/M	N/M	N/M	N/M
Cation Exchange Capacity	S	EPA 9081	75-125	35	95%	100 mg/kg
<u>Field Parameters</u>						
pH	W	150.1	N/H	N/M	N/M	N/M
Specific Conductance	V	120.1	N/H	N/H	N/M	N/M
Temperature	W	170.1	N/M	N/H	N/H	N/M
Dissolved Oxygen	W	EPA 360.1	N/H	N/M	N/M	N/M

Notes: S = Soil and/or sediment
W = Groundwater and/or surface water
N/M = No Modifications from GQAPP
TBD = To Be Determined

* With the exception of Total Recoverable Petroleum Hydrocarbons and Gross Alpha, the laboratory screening analyses do not have EPA method numbers.

Section 6.0 — Fieldwork and Sampling Procedures

Pieldvork and sampling procedures are presented in Section 6.0 of the GQAPP. Modifications to these procedures are described belov:

No Modifications

Section 7.0 — Sample Custody

Sample custody procedures are presented in Section 7.0 of the GQAPP. Modifications to these procedures are described belov:

No Modifications

Section 8.0 — Calibration Procedures and Frequency

Calibration procedures and frequency are presented in Section 8.0 of the GQAPP. Modifications to these procedures are described belov:

No Modifications

Section 9.0 — Analytical Procedures

Screening and quantitative analytical procedures are presented in Section 9.0 of the GOAPP. Site-specific accuracy, precision, completeness, and detection limit criteria are presented in Section 5.0 of this SQAPP. Modifications to any other of the analytical procedures are described belov:

- Marine sediments will be collected and analyzed folloving the methods outlined in the Florida Department of Environmental Regulation's Estuarine Chemical Handbook (1987).

Section 10.0 -- Data Reduction, Validation, and Reporting

Data reduction, validation, and reporting procedures are presented in Section 10.0 of the GQAPP. Modifications to these procedures are described belov:

No Hodifications

Section 11.0 — Internal Quality Control Checks

Internal quality control check procedures are presented in Section 11.0 of the GQAPP. Modifications to these procedures are described belov:

No Modifications

Section 12.0 — Performance and System Audits

Performance and system audit procedures are presented in Section 12.0 of the GOAPP. Specific audits planned for this site investigation are listed below:

Audit Type	Frequency/Date	Description
	To Be Determined	

Section 13.0 — Preventive Maintenance

Preventive maintenance procedures are presented in Section 13.0 of the GOAPP. Modifications to these procedures are described belov:

No Modifications

Section 14.0 — Procedures Used to Assess Accuracy, Precision, and Completeness of Data

Procedures used to assess the accuracy, precision, and completeness of data are presented in Section 14.0 of the GOAPP. Modifications to these procedures are described belov:

No Modifications

Section 15.0 — Corrective Action

Corrective action procedures are presented in Section 15.0 of the GOAPP. Modifications to these procedures *are* described belov:

No Modifications

Section 16.0 — Quality Assurance Reports to Management

Quality assurance report procedures are presented in Section 16.0 of the GOAPP. Modifications to these procedures are described belov:

No Modifications

Appendix A -- Additional Personnel Biographies

Personnel assigned to this site investigation whose biographies do not appear in the GQAPP are listed belov; biographies for these site personnel are presented on the following pages.

To Be Determined

Section 1.0 -- Title Page

Vork Plan Group: C
Site No.: 13
Site Name: Magazine Point Rubble Disposal Area

Prepared by: Amy Twitty
Ecology and Environment, Inc.
1203 Governor's Square Boulevard, Suite 401
Tallahassee, Florida 32301

Prepared for: Department of the Navy
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive, P.O. Box 10068
Charleston, South Carolina 29411-0068
Contract Number N62467-88-C-0200

Signature Approvals:

E & E Project Manager: John D. Barksdale
J. Barksdale

E & E Regional QA/QC Coordinator: Kimberly R. Walker
K. Walker

E & E ASC Director: Gary Hahn for
~~Axxfiixtem~~ W.F. Hall, Ph.D

E & E QA/QC Project Officer: K. Walker for Marcia Meredith
M. Meredith

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Section 3.0 -- Project Summary

Work Plan Group: C

Site No.: 13

Site Name: Magazine Point Rubble Disposal Area

Site Description: A complete site description and history are presented in Sections 2.0 and 3.0 of the attached work plan.

Phase I -- Field Screening

Physical Survey (check all that apply):

- X Overall Physical Reconnaissance
- X HNu/OVA Surface Emission Survey
- X Radiation Survey
- X Habitat/Biota Survey
- X Asbestos Survey (in Rubble)
- X Hydrologic Assessment

Geophysical Survey (check all that apply):

- ___ Electromagnetic Conductivity:
  - ___ EM-31 ___ EU-34
- ___ Magnetometry
- ___ Very Low Frequency
- ___ Ground Penetrating Radar
- ___ Seismic Refraction
- ___ Seismic Reflection

Analytical Screening (check all that apply):

- ___ Field Analyses:
- ___ Soil Headspace Analyses: Planned Number of Samples ___
- ___ Soil Gas Analyses : Planned Number of Samples ___
- X Laboratory Analyses:

PLANNED NUMBER OF SAMPLES		CATEGORIES OF ANALYSES
Surface Water	___	X Volatile Organic Compounds
Sediment	___	X Polynuclear Aromatic Hydrocarbons
Soil	16	X Phenols
Groundwater	4	___ Organophosphorus Pesticides
Duplicates	2	___ Chlorinated Herbicides
Trip Blanks	___	___ Carbamates
Field Blanks	___	X Pesticides/Polychlorinated Biphenyls
Rinsate Blanks	___	X Total Recoverable Petroleum Hydrocarbons
Other	___	X Metals
		___ Gross Alpha

Section 3.0 -- Project Summary (Continued)

Phase II -- Characterization

PLANNED NUMBER OF SAMPLES

Surface Water	5	Air	___	Duplicates	7
Sediment	21	Biota:		Trip Blanks	4
Soil	27	Flora	___	Field Blanks	3
Groundwater	2	Fauna	___	Rinsate Blanks	4
				Preservative Blanks	1

CATEGORIES OF ANALYSES

- X Purgeable Aromatics
- X Purgeable Halocarbons
- X Base/Neutral Extractables
- X Acid Extractables
- ___ Polynuclear Aromatic Eydrocarbons
- X Dioxins
- X Organophosphorus Pesticides
- X Herbicides
- X Pesticides
- X Polychlorinated Biphenyls
- X Total Recoverable Petroleum Hydrocarbons
- X Metals
- X Cyanide
- X Sulfide

Additional analytical categories are identified below:

- X Gross Alpha
- X Gross Beta
- X Gamma Scan
- X Total Organic Carbon
- X Hardness (water only)
- X Alkalinity
- X Total Suspended Solids (water only)
- X Total Kjeldahl Nitrogen
- X Ammonia Nitrogen
- X Orthophosphate Phosphorus
- X Dissolved Oxygen (in field)
- X 5-day Biological Oxygen Demand
- X Chemical Oxygen Demand
- X pH
- X Percent Moisture
- X Grain Size
- X BTU Content
- X Ash Content
- X Total Organic Halogens
- X Sulfur
- X Ignitability
- X Cation Exchange Capacity

Section 4.0 -- Project Organization and Responsibility

The overall organizational structure for this site is discussed in Section 4.0 of the GQAPP. Site-specific designated personnel and their responsibilities are Iisted belov:

Site Manager:
Team/Task Leader(s): To Be Determined
Field Support Personnel:

Biographies for those personnel listed above which are not included in the GQAPP are included in Appendix A of this document.

Section 5.0 -- QA/QC Objectives for Measurement Data

Criteria for reporting the accuracy, precision, and completeness of data are presented in Section 5.0 of the GQAPP. Detection limits for screening and quantitative analyses are presented in Section 9.0 of the GQAPP. Procedures used to assess data accuracy, precision, and completeness are presented in Section 14.0 of the GQAPP. All analytes (including field parameters), sample media, and method numbers relevant to the investigation of this site are listed in the following table, which also identifies any modifications to the accuracy (A), precision (P), completeness (C), and detection limit (DL) criteria specified in the above-referenced GOAPP sections.

Analyte	Media	Method No.	A	P	C	DL
Laboratory Screening Analyses*						
Volatile Organic Compounds	S/W	--	N/M	N/M	N/M	N/M
Polynuclear Aromatic Eydrocarbons	S/W	--	N/M	N/M	N/M	N/M
Pesticidcs	S/W	--	N/M	N/M	N/M	N/M
Polychlorinated Biphenyls	S/W	--	N/H	N/M	N/M	N/M
Total Recoverable Petroleum Eydrocarbons	S/W	EPA 418.1	N/M	N/H	N/M	TBD
Arsenic	S/W	--	N/M	N/M	N/M	N/M
Cadmium	S/W	--	N/M	N/M	N/M	N/M
Chromium	S/W	--	N/M	N/M	N/H	N/M
Copper	S/W	--	N/M	N/H	N/M	N/M
Lead	S/W	--	N/M	N/M	N/M	N/M
Nickel	S/W	--	N/M	N/M	N/M	N/M
Silver	S/W	--	N/M	N/M	N/M	N/M
Zinc	S/W	--	N/M	N/M	N/M	N/M
Laboratory Analyses						
Gross Alpha	S/W	EPA 900.0	N/M	N/M	N/M	N/M
Gross Beta	S/W	EPA 900.0	TBD	TBD	TBD	TBD
Gamma scan	S/W	EPA 901.1	TBD	TBD	TBD	TBD
TCL Purgeables + xylene	S/W	EPA 8240/624	N/M	N/M	N/M	N/M
TCL BNAs	S/W	EPA 8270/625	N/M	N/M	N/M	N/M
TCL Pesticides 6 PCBs	S/W	EPA 8080/608	N/M	N/M	N/M	N/M
Total Recoverable Petroleum Rydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/M
TAL Metals:						
Aluminum	S/W	EPA 6010	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010	N/M	N/M	N/M	N/M
Arsenic	S/W	EPA 7060	N/M	N/M	N/H	N/M
Barium	S/W	EPA 6010	N/M	N/M	N/H	N/M
Beryllium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Boron	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cadmium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Calcium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Chromium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cobalt	S/W	EPA 6010	N/M	N/M	N/M	N/M
Copper	S/W	EPA 6010	N/M	N/M	N/M	N/M
Iron	S/W	EPA 6010	N/M	N/M	N/M	N/M
&ad	S/W	EPA 7421	N/M	N/M	N/M	N/M

Analyte	Media	Method No.	A	P	C	DL
Magnesium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Manganese	S/W	EPA 6010	N/M	N/H	N/M	N/M
Mercury	S/W	EPA 747117470	N/M	N/M	N/M	N/M
Nickel	S/W	EPA 6010	N/M	N/M	N/M	N/M
Selenium	S/W	EPA 7740	N/M	N/M	N/M	N/H
Silver	S/W	EPA 6010	N/M	N/M	N/H	N/M
Sodium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Thallium	S/W	EPA 7841	N/M	N/M	N/M	N/M
Vanadium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Zinc	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cyanide	S/W	EPA 90101335.2	N/M	N/M	N/M	N/M
TOC	S/W	EPA 415.1	N/M	N/H	N/M	N/M
Hardness	W	EPA 130.2	N/M	N/H	N/M	N/M
Alkalinity	W	EPA 310.1	N/M	N/M	N/M	N/M
Total Suspended Solids	W	EPA 160.2	N/M	N/H	N/M	N/M
Total Kjeldahl Nitrogen	S/W	EPA 351.3	N/M	N/H	N/M	N/M
Nitrogen-Ammonia	S/W	EPA 350.2	N/M	N/M	N/M	N/M
Orthophosphate Phosphorus	S/W	EPA 365.2	N/M	N/H	N/M	N/M
5-day Biological Oxygen Demand	W	SM 5210	N/M	N/M	N/H	N/M
Chemical Oxygen Demand	V	EPA 410.4	N/H	N/M	N/M	N/M
pH	W	EPA 150.1	N/M	N/M	N/M	N/M
Percent Moisture	S	ASTH D-2216-80	N/M	N/M	N/M	N/M
Grain Size	S	ASTH D-422-63	N/M	N/M	N/M	N/M
BTU Content	S	ASTH D-2015-77	N/H	N/M	N/M	N/M
Ash Content	S	ASTH D-482	N/M	N/M	N/M	N/M
Total Organic Halogens	S	SW 9020	TBD	TBD	TBD	TBD
Sulfur	S	ASTH D-129-64	N/H	N/M	N/M	N/M
Ignitability	S/W	EPA 1010	N/M	N/M	N/M	N/M
Cation Exchange Capacity	S	EPA 9081	75-125	35	95%	100 mg/kg
Field Parameters						
pH	W	150.1	N/M	N/M	N/M	N/M
Specific Conductance	W	120.1	N/M	N/M	N/M	N/M
Temperature	W	170.1	N/M	N/M	N/M	N/M
Dissolved Oxygen	W	EPA 360.1	N/H	N/M	N/M	N/M

Notes: S = Soil and/or sediment
V = Groundwater and/or surface water
N/H = No Hodifications from GOAPP
TBD = To Be Determined

*
With the exception of Total Recoverable Petroleum Hydrocarbons and Gross Alpha, the
laboratory screening analyses do not have EPA method numbers.

Section 6.0 -- Fieldwork and Sampling Procedures

Pieldvork and sampling procedures are presented in Section 6.0 of the GQAPP. Modifications to these procedures *are* described belov:

No Modifications

Section 7.0 -- Sample *Custody*

Saaple custody procedures are presented in Section 7.0 of the GQAPP. Modifications to these procedures are described belov:

No Modifications

Section 8.0 -- Calibration Procedures and Frequency

Calibration procedures and frequency are presented in Section 8.0 of the GQAPP. Modifications to these procedures are described belov:

No Modifications

Section 9.0 -- Analytical Procedures

Screening and quantitative analytical procedures are presented in Section 9.0 of the GQAPP. Site-specific accuracy, precision, completeness, and detection limit criteria are presented in Section 5.0 of this SQAPP. Modifications to any other of the analytical procedures are described belov:

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Section 10.0 -- Data Reduction, Validation, and Reporting

Data reduction, validation, and reporting procedures are presented in Section 10.0 of the GQAPP. Modifications to these procedures are described below:

No Nodifications

Section 11.0 — Internal Quality Control Checks

Internal quality control check procedures are presented in Section 11.0 of the GQAPP. Hodifications to these procedures are described below:

No Modifications

Section 12.0 -- Performance and'System Audits

Performance and system audit procedures are presented in Section 12.0 of the GOAPP. Specific audits planned for this site investigation are listed below:

Audit Type	Frequency/Date	Description
	To Be Determined	

Section 13.0 -- Preventive Maintenance

Preventive maintenance procedures are presented in Section 13.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 14.0 -- Procedures Used to Assess Accuracy, Precision, and Completeness of Data

Procedures used to assess the accuracy, precision, and completeness of data are presented in Section 14.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 15.0 -- Corrective Action

Corrective action procedures are presented in Section 15.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 16.0 -- Quality Assurance Reports to Management

Quality assurance report procedures are presented in Section 16.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

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Appendix A -- Additional Personnel Biographies

Personnel assigned to this site investigation whose biographies do not appear in the GQAPP are listed below; biographies for these site personnel are presented on the following pages.

To Be Determined

Section 1.0 -- Title Page

Work Plan Group: C
Site No.: 14
Site Name: Dredge Spoil Fill Area

Prepared by: Amy Twitty
Ecology and Environment, Inc.
1203 Governor's Square Boulevard, Suite 401
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Prepared for: Department of the Navy
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive, P.O. Box 10068
Charleston, South Carolina 29411-0068
Contract Number N62467-88-C-0200

Signature Approvals:

E & E Project Manager: John D. Barksdale
J. Barksdale

E & E Regional QA/QC Coordinator: Kimberly R. Walker
K. Walker

E 6 E ASC Director: Gary Hall for
~~Alex Gliddon~~ W.F. Hall, Ph

B & E QA/QC Project Officer: K. Walker for Marcia Meredith
M. Meredith

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Section 3.0 -- Project Summary

Vork Plan Group: C

Site No.: 14

Site Name: Dredge Spoil Fill Area

Site Description: A complete site description and history are presented in Sections 2.0 and 3.0 of the attached work plan.

Phase I -- Field Screening
Physical Survey (check all that apply):

- X Overall Physical Reconnaissance
- X HNu/OVA Surface Emission Survey
- ___ Radiation Survey
- X Habitat/Biota Survey
- ___ Asbestos Survey (in Rubble)
- X Hydrologic Assessment

Geophysical Survey (check all that apply):

- ___ Electromagnetic Conductivity:
  - ___ EU-31 ___ EU-34
- ___ Magnetometry
- ___ Very Low Frequency
- ___ Ground Penetrating Radar
- ___ Seismic Refraction
- ___ Seismic Reflection

Analytical Screening (check all that apply):

- ___ Field Analyses:
- ___ Soil Headspace Analyses: Planned Number of Samples ___
- ___ Soil Gas Analyses : Planned Number of Samples ___
- X Laboratory Analyses:

PLANNED NUMBER OF SAMPLES		CATEGORIES OF ANALYSES
Surface Water	___	X Volatile Organic Compounds
Sediment	___	X Polynuclear Aromatic Hydrocarbons
Soil	27	X Phenols
Groundwater	10	___ Organophosphorus Pesticides
Duplicates	3	___ Chlorinated Herbicides
Trip Blanks	___	___ Carbamates
Field Blanks	___	X Pesticides/Polychlorinated Biphenyls
Rinsate Blanks	___	X Total Recoverable Petroleum Hydrocarbons
Other	___	X Metals
		___ Gross Alpha

Section 3.0 — Project Summary (Continued)

Phase II -- Characterization

PLANNED NUMBER OF SAMPLES

Surface Water	7	Air	___	Duplicates	9
Sediment	20	Biota:		Trip Blanks	5
Soil	45	Flora	___	Field Blanks	2
Groundwater	5	Fauna	___	Rinsate Blanks	5
				Preservative Blanks	1

CATEGORIES OF ANALYSES

- X Purgeable Aromatics
- X Purgeable Halocarbons
- X Base/Neutral Extractables
- X Acid Extractables
- ___ Polynuclear Aromatic Hydrocarbons
- X Pesticides
- X Polychlorinated Biphenyls
- X Total Recoverable Petroleum Hydrocarbons
- X Metals
- X Cyanide

Additional analytical categories are identified belov:

- X Gross Alpha
- X Gross Beta
- X Gamma Scan
- X Total Organic Carbon
- X Eardness (vater only)
- X Alkalinity
- X Total Suspended Solids (vater only)
- X Total Kjeldahl Nitrogen
- X Ammonia Nitrogen
- X Orthophosphate Phosphorus
- X Dissolved Oxygen (in field)
- X 5-day Biological Oxygen Demand
- X Chemical Oxygen Demand
- X pH
- X Percent Moisture
- X Grain Site
- X BTU Content
- X Ash Content
- X Total Organic Balogens
- X Sulfur
- X Ignitability
- X Cation Exchange Capacity

0000019

Section 4.0 -- Project Organization and Responsibility

The overall organizational structure for this site is discussed in Section 4.0 of the GQAPP. Site-specific designated personnel and their responsibilities are listed below:

Site Manager:
Team/Task Leader(s): To Be Determined
Field Support Personnel:

Biographies for those personnel listed above which are not included in the GQAPP are included in Appendix A of this document.

Section 5.0 — QA/QC Objectives for Measurement Data

Criteria for reporting the accuracy, precision, and completeness of data are presented in Section 5.0 of the GQAPP. Detection limits for screening and quantitative analyses are presented in Section 9.0 of the GQAPP. Procedures used to assess data accuracy, precision, and completeness are presented in Section 14.0 of the GQAPP. All analytes (including field parameters), sample media, and method numbers relevant to the investigation of this site are listed in the following table, which also identifies any modifications to the accuracy (A), precision (P), completeness (C), and detection limit (DL) criteria specified in the above-referenced GQAPP sections.

Analyte	Media	Method No.	A	P	C	DL
Laboratory Screening Analyses*						
Volatile Organic Compounds	S/W	--	N/M	N/M	N/M	N/M
Polynuclear Aromatic Hydrocarbons	S/W	--	N/U	N/U	N/M	N/M
Pesticides	S/W	--	N/M	N/M	N/M	N/M
Polychlorinated Biphenyls	S/W	--	N/M	N/M	N/M	N/M
Total Recoverable Petroleum Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	TBD
Arsenic	S/W	--	N/M	N/M	N/M	N/M
Cadmium	S/W	--	N/M	N/M	N/M	N/M
Chromium	S/W	--	N/M	N/M	N/M	N/M
Copper	S/W	--	N/M	N/M	N/M	N/M
Lead	S/W	--	N/M	N/M	N/M	N/M
Nickel	S/W	--	N/M	N/M	N/M	N/M
Silver	S/W	--	N/M	N/M	N/M	N/M
Zinc	S/W	--	N/M	N/M	N/M	N/M
Laboratory Analyses						
TCL Purgeables + xylene	S/W	EPA 8240/624	N/M	N/M	N/M	N/M
TCL BNAs	S/W	EPA 8270/625	N/M	N/M	N/M	N/M
TCL Pesticides 6 PCBs	S/W	EPA 8080/608	N/M	N/M	N/M	N/M
Total Recoverable Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/M
Gross Alpha	S/W	EPA 900.0	N/M	N/M	N/M	N/M
Gross Beta	S/W	EPA 900.0	TBD	TBD	TBD	TBD
Gamma Scan	S/W	EPA 901.1	TBD	TBD	TBD	TBD
TAL Metals:						
Aluminum	S/W	EPA 6010	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010	N/M	N/M	N/M	N/M
Arsenic	S/W	EPA 7060	N/M	N/M	N/M	N/M
Barium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Beryllium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Boron	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cadmium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Calcium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Chromium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cobalt	S/W	EPA 6010	N/M	N/M	N/M	N/M
Copper	S/W	EPA 6010	N/M	N/M	N/M	N/M
Iron	S/W	EPA 6010	N/M	N/M	N/M	N/M
Lead	S/W	EPA 7421	N/M	N/M	N/M	N/M

Analyte	Media	Method No.	A	P	C	DL
Magnesium	S/W	EPA 6010	N/M	N/M	N/H	N/M
Hanganese	S/W	EPA 6010	N/M	N/M	N/M	N/M
Mercury	S/W	EPA 747117470	N/M	N/M	N/M	N/M
Nickel	S/W	EPA 6010	N/M	N/M	N/M	N/M
Selenium	S/W	EPA 7740	N/M	N/M	N/M	N/M
Silver	S/W	EPA 6010	N/M	N/M	N/M	N/M
Sodium	S/W	EPA 6010	N/M	N/M	N/H	N/M
Thallium	S/W	EPA 7841	N/M	N/M	N/M	N/M
Vanadium	S/W	EPA 6010	N/M	N/M	N/H	N/M
Zinc	S/W	EPA 6010	N/M	N/M	N/H	N/M
Cyanide	S/W	EPA 9010/335.2	N/M	N/M	N/M	N/M
TOC	S/W	EPA 415.1	N/M	N/M	N/H	N/M
Hardness	W	EPA 130.2	N/M	N/M	N/M	N/M
Alkalinity	W	EPA 310.1	N/M	N/M	N/M	N/M
Total Suspended Solids	W	EPA 160.2	N/M	N/M	N/M	N/M
Total Kjeldahl Nitrogen	S/W	EPA 351.3	N/M	N/M	N/M	N/M
Nitrogen-Ammonia	S/W	EPA 350.2	N/M	N/M	N/H	N/M
Orthophosphate Phosphorus	S/W	EPA 365.2	N/M	N/M	N/M	N/M
5-day Biological Oxygen Demand	W	SH 5210	N/M	N/M	N/H	N/M
Chemical Oxygen Demand	W	EPA 410.4	N/M	N/H	N/H	N/M
pH	W	EPA 150.1	N/M	N/M	N/H	N/H
Percent Moisture	S	ASTH D-2216-80	N/H	N/H	N/M	N/M
Grain Size	S	ASTH D-422-63	N/M	N/M	N/M	N/H
BTU Content	S	ASTH D-2015-77	N/M	N/M	N/M	N/M
Ash Content	S	ASTH D-482	N/M	N/M	N/H	N/M
Total Organic Halogens	S	SW 9020	TBD	TBD	TBD	TBD
Sulfur	S	ASTH D-129-64	N/M	N/H	N/M	N/M
Ignitability	S/W	EPA 1010	N/M	N/H	N/M	N/M
Cation Exchange Capacity	S	EPA 9081	75-125	35	95%	100 mg/kg
Field Parameters						
pH	U	150.1	N/M	N/H	N/M	N/M
Specific Conductance	U	120.1	N/M	N/H	N/H	N/M
Temperature	W	170.1	N/M	N/H	N/M	N/M
Dissolved Oxygen	W	EPA 360.1	N/M	N/M	N/M	N/H

Notes: S = Soil and/or sediment
W = Groundwater and/or surface water
N/M = No Modifications from GOAPP
TBD = To Be Determined

* With the exception of Total Recoverable Petroleum Eydrocarbons and Gross Alpha, the laboratory screening analyses do not have EPA method numbers.

Section 6.0 -- Pieldvork and Sampling Procedures

Pieldvork and sampling procedures are presented in Section 6.0 of the GQAPP. Modifications to these procedures are described belov:

No Modifications

Section 7.0 — Sample Custody

Sample custody procedures are presented in Section 7.0 of the GQAPP. Modifications to these procedures are described belov:

No Modifications

Section 8.0 — Calibration Procedures and Frequency

Calibration procedures and frequency are presented in Section 8.0 of the GQAPP. Modifications to these procedures are described belov:

No Modifications

Section 9.0 — Analytical Procedures

Screening and quantitative analytical procedures are presented in Section 9.0 of the GOAPP. Site-specific accuracy, precision, completeness, and detection limit criteria are presented in Section 5.0 of this SQAPP. Modifications to any other of the analytical procedures are described belov:

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Section 10.0 -- Data Reduction, Validation, and Reporting

Data reduction, validation, and reporting procedures are presented in Section 10.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 11.0 -- Internal Quality Control Checks

Internal quality control check procedures are presented in Section 11.0 of the GOAPP. Modifications to these procedures are described below:

No Modifications

Section 12.0 -- Performance and System Audits

Performance and system audit procedures are presented in Section 12.0 of the GOAPP. Specific audits planned for this site investigation are listed below:

Audit Type	Frequency/Date	Description
	To Be Determined	

Section 13.0 -- Preventive Maintenance

Preventive maintenance procedures are presented in Section 13.0 of the GOAPP. Modifications to these procedures are described belov:

No Modifications

Section 14.0 — Procedures Used to Assess Accuracy, Precision, and Completeness of Data

Procedures used to assess the accuracy, precision, and completeness of data are presented in Section 14.0 of the GOAPP. Modifications to these procedures are described below:

No Modifications

Section 15.0 — Corrective Action

Corrective action procedures are presented in Section 15.0 of the GOAPP. Modifications to these procedures are described below:

No Modifications

Section 16.0 — Quality Assurance Reports

Quality assurance report procedures are presented in Section 16.0 of the GOAPP. Modifications to these procedures arc described belov:

No Modifications

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Appendix A -- Additional Personnel Biographies

Personnel assigned to this site investigation whose biographies do not appear in the GQAPP are listed belov; biographies for these site personnel are presented on the following'pages.

To Be Determined

APPENDIX C

THREATENED AND ENDANGERED FLORA AND FAUNA ASSOCIATED WITH NAS PENSACOLA

(Bold items enclosed in brackets denote changes to the last version of document]

APPENDIX C

THREATENED AND ENDANGERED FLORA AND FAUNA OBSERVED OR LIKELY TO OCCUR WITHIN THE NAS PENSACOLA FACILITY OR NEARBY

Scientific Wan	Common Name	Base Status[a]	status[b] FGFWFC (or FDA)	status[b] USFWS	Habitat
FISHES					
Acipenser oxyrhynchur	Atlantic sturgeon	M	SSC	u R 2	Gulf coast, estuarine
Ammocrypta asprella	Crystal darter	U	T	u R 2	Fresh wator
Etheostoma histrio	Harlequin darter	U	SSC		Fresh wator
Fundulus jenkinsi	Salt marsh topminnow	P	SSC		Salt, fresh, brackish waters
Lepisosteus spatula	Alligator gar	U	SSC		Brackish, fresh, salt wator
Moxostoma carinatum	River redhorse	U	SSC		Fresh wator
AMPHIBIANS AND REPTILES					
Alligator mississippiensis	American alligator	R	SSC	T(S/A)	Swamps, marshes, ponds
Caretta caretta caretta	Loggerhead turtlo	M?	T	T	Mrino, coastal
Cholonia mydas mydas	Green turtlo	M?	E	E	Marine, coastal
Dermochelys coriacea	Leatherback turtlo	M	E	E	Mrino, coastal
Drymarchon corais coupori	Eastern indigo snake	P	T	T	Open areas near wator
Eretmochelys imbricata	Hawksbill turtlo	M?	E	E	Marine, coastal
Gopherus polyphemus	Gopher tortoise	P	SSC	UR 1	Sandy coastal plains
Graptemys pulchra	Alabama map turtlo	U	SSC		Swamps, streams, marshes, ponds
Lepidochelys kempi	Atlantic ridley turtlo	M?	E		Marine, coastal
Rana areolata aesopus	Florida gopher frog	P	SSC	UR 2	Sand hill communities
Macroclemys temmincki	Alligator snapping turtle	SR	SSC	u R 2	Swamps, marshes, ponds

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Key at end of table.

Table Appendix C (Cont.)

Scientific Name	Common Name	Base Status[a]	Status[b] FGFWFC (or FDA)	Status[b] USFWS	Habitat
MAMMALS					
Mustela vison lutensis	Florida mink	U		UR 2	Terrestrial habitats
Peromyscus polionotus trissyllepsis	Perdido Key beach mouse	N/A	T	E	Beach dunes
Trichechus manatus latirostris	West Indian manatee	M	E	E	Atlantic and Gulf coasts
BIRDS					
Charadrius melodus	Piping plover	P	T	T	Open, dry, sandy beaches
Charadrius alexandrinus	Snowy plover	P	T	UR 2	Open, dry, sandy beaches
Dendroida dominica stoddardi	Stoddard's yellow throated warbler	P-U		UR 2	Wooded habitats
Dendroica kirtlandii	Kirtland's warbler	U	E	E	Wooded habitats
Haematopus palliatus	American oystercatcher	U	SSC		Coastal habitatr
Egretta rufescens	Reddish egret	P-U	SIC	UR 2	Freshwater/coastal wetlands
Egretta caerulea	Little blue heron	P-U	SSC		Freshwater/coastal wetlands
Egretta thula	Snowy egret	P-U	SIC		Freshwater/coastal wetlands
Grus canadensis pratensis	Florida sandhill crane	U	T		Freshwater wetlands
Falco peregrinus tundrius	Arctic peregrine falcon	M	E	T	Winters on corrtr
Falco sparverius paulus	Southeastern kestrel	a	T	UR 2	Open pine forests, clearings
Haliaeetus leucocephalus	Bald eagle	P-U	T	E	Pine forests/coastal habitat
Pandion haliaetus	Osprey	R	SSC		Boar water
Pelecanus occidentalis	Brown pelican	a	SIC	AC	Mangrove trees, coasts

14[NASP]UH1103:T0395/1884/2

Key at end of table.

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Table Appendix C (Cont.)

Scientif £ N[illegible] e	Common Name	Base Status[a]	Status[b] FGFWFC (or FDA)	Status[b] USFWS	□abitot
Picoides borealis	Red-cockaded woodpecker	P-U	T	E	Cavity nests/old pine stands
Vermi o H bachmanii	Bachmann a ⊸ᗡler	U	E	E	Wo ded h⊳⊳tata
Campephilus principalis	Ivory-billed woodpecker	U	E	E	Wooded habitats
Sterna antillarum	ᗡat tern	U	ᒍ		C a t l h⊳itata
Mycteria americanH	Wood ato k	U	E	E	Fr shwat ωcoa tal wetlands
Rostrh o i⊳ilia	S ail kite	ω	E	E	Fr sh∞ t r/co atal ∞etlands
INVERTEBRATES					
Copris gopheri	S Hr b ᗡe tle	a		UR 2	Associ tω w/g her to toi e
Chrysopsis gossypina cruiseana	Cruise a g lden-aster	P	E	UR 1	Coastal dunes
Drosera intermedia	Spoon-leaved sundew	R	E		Aquatic h⊳itota
Epigaea repens	T a ili g arbutus	ω	E		Dry, cid andy oil
Kalmia latifolia	Mountain laurel	U	T		Rich, moist, shady woods
Lilaeopsis carolinensis	Carolina lilaeopsia			⊟ 2	
Lilium iridollae	Panh ndle lily	ω	⊀	UR 2	BlH k ⊓ky a ila
Pinguicula planifolia	Chapman'a butt ⊓rt	ω	RE	UR 2	
Polygonella macrophylla	Large-leaved ġ ṅtwe d	ᗡ	E	⊟ 1	Sand pine-oak acrω
Rhododendron austrinum	Orange H al a	U	E	UR 5	Moist, woody habitats

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Key at end f t⊳le.

Table Appendix C (Cont.)

Scientific Name	Common Name	Base Status[a]	status[b] FGFWFC (or FDA)	status[b] USFWS	Habitat
Sarracenia leucophylla	White-top pitcherplant	R	E		Open acid bogs
Sarracenia rubra	Sweet pitchorplant	U	E	UR 2	Acid bogs/slash pine woods
Stewartia malacodnedron	Silky camellia	U	E		Slopes of wooded ravines

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Key:

[a]status of species on tho NAS Pensacola facility:
R = Resident.
M = Migrant.
SR = Suspected resident.
P = Possible resident duo to available habitat; survey required.
U = Unknown. survey required.
N/A = lot expected to occur on tho NAS Pensacola facility.

[b]State and federal status:
E = Endangered.
T = Threatened.
T(S/A) = Threatened duo to similarity in appearance.
AC = Agency concern; not currently listed or a candidate Cor listing.
UR 1 = Under review for federal listing with substantial evidence indicating at least some degree of biological vulnerability and/or throat.
UR 2 = Under review, insufficient biological data available.
UR 3 = Candidate species but taxa baa proven to bo more widespread than previously believed and/or those species that are not subject to any identifiable throat.
FDA = Florida Department of Agriculture.
FGFWFC = Florida Game and Freshwater Fish Commission.
USFWS = U.S. Fish and Wildlife Service.

Source: Ecology and Environment, Inc., 1992 after Florida Natural Areas Inventory 1988.

APPENDIX D

JUNE 1990 SECTION *14.2*
PHASE **II--CHARACTERIZATION**

[Bold items enclosed in brackets denote
,changes to the last version of document)

14.2 Phase II--Characterization

The primary objectives of the Phase II field investigation are as f01lovs:

- o To characterize the nature and magnitude of the full spectrum of potential site contaminants;
- o To confirm and validate the contaminant distributions indicated by the Phase I analytical screening results by collecting and analyzing samples under full-scale CERCLA-type QA/QC requirements;
- o To support the preliminary identification, screening, and evaluation data requirements of potential remedial alternatives.

The actual Phase II sampling locations, especially with respect to the Phase I locations, will primarily be a function of hov uniform the Phase I results vere vith respect to contaminant type, magnitude, and distribution across the site. Phase II investigation of Sites 2, 13, and 14 will involve the collection of sediment and soil samples. Air sampling will be conducted only if warranted by the results of Phase I efforts.

Phase II investigation of sites 13 and 14 will involve the collection of soil samples. No additional permanent, shallow monitoring vells will be installed until verification of any contamination discovered during Phase I is made during Phase 11.

The analytical requirements for Phase II samples are provided in Table 14-2.

During the Phase II investigation of Site 2, vhich is covered by RCRA requirements, at least one sample per contaminated medium will also be analyzed for Appendix IX parameters (40 CFR, Part *264).* These samples will be collected from the area of highest contamination for each medium as determined during the Phase I investigation. Additional Appendix IX suples may be required depending on the extent of contamination detected.

[Bold items enclosed in brackets denote changes to the last version of document]

Table 14-2

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS—GROUP C

SITE 2

Medium	No. of Samples	Dupli-cates	Trip Blanks'	Field Blanks	Rinsate Blanks	Prosorvative Blanks[b]	Total[a]	Analytical suit.[c,d]
Sediment	84	9	NR	1	4	1	99 (10)	A B
TOTAL	84	9	NR	1	4	1	99(10)	

SITE 13

Medium	No. of Samples	Dupli-cates	Trip Blanks.	Field blanks	Rinsate blanks	Prosorvative blanks[b]	Total[a]	Analytical Suitec,d
Soil	24	2	1	1	1	1	30 (6)	C B
TOTAL	24	2	1	1	1	1	30(6)	

SITS 14

Medium	No. of Samples	Dupli-cates	Trip Blanks'	Field blanks	Rinsate Blanks	Preservative Blanks[b]	Total[a]	Analytical suit.[c,d]
Soil	32	3	2	1	7	1	41 (6)	A C
TOTAL	32	3	2	1	2	1	41(6)	

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[Bold items enclosed in brackets denote changes to the last version of document]

Table 14-2 (Cont.)

[a]Trip blank. will bo analyzed for Target Compound List (TCL) volatilo organic compounds only.

[b]Preservative blank. will bo analyzed for TCL volatilo organic compounds, total recoverable hydrocarbona. total TCL metals, and cyanide.

[c]Analytical suite designations are as follows:

A = Total rocovorablo hydrocarbona. metals (modified EPA SW methods Cor marine sediments), and total organic carbon and total Kjeldahl nitrogen.

B = pH, alkalinity, percent moisture, grain size, BTU contont. ash contont, total halogens, sulfur, ignitability, and cation exchange capacity.

C = TCL volatilo organic compounds plus xylene and ketones, TCL base/neutral and acid extractable organic compounds, TCL pesticides and PCBs, total recoverable hydrocarbona. TCL metals and cyanide.

[d]Specific constituents encompassed by tho various chemical groups included within tho above-listed analytical suites are identified in Tables 9-5 through 9-13 of the Generic Quality Assurance Project Plan.

[d]Trip blank. will bo analyzed for Target Compound List (TCL) volatilo organic compounds only.

[e]The number of samples shown in parentheses will be analyzed for the additional parameters indicated.

NR = Not required.

14.2.1 Biota Sampling

The need for formal biological sampling will be based on the results of the Phase I habitat/biota survey and analytical screening results. If biological sampling is required, a separate biological sampling plan will be prepared which outlines sample locations, sampling methodologies, analytical parameters, etc.

14.2.2 Sediment Sampling

To adequately assess the impact of NAS Pensacola operations on Pensacola Bay sediments, sediment sampling will be conducted on nearshore NAS Pensacola areas and offshore NAS Pensacola. This will allov a direct comparison of sediment samples from around the NAS Pensacola facility and sediments within Pensacola Bay that may be influenced by other Bay sources.

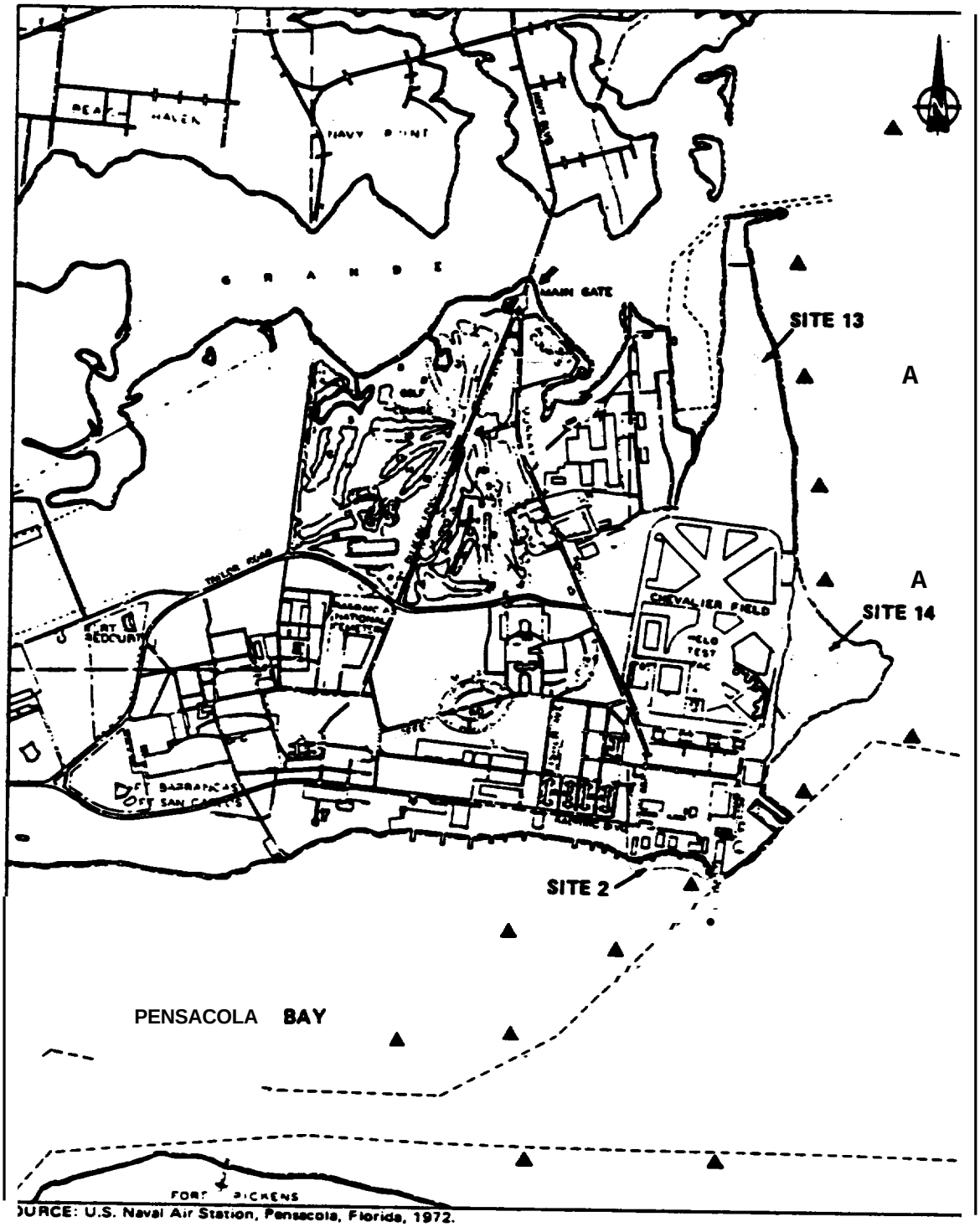
Metals analysis for marine sed ments will be in accordance with the methods developed by FDER (Schropp and Windom 1988). This will allow comparison of the data generated during this phase with data from other NAS Pensacola studies.

Approximately 87 sediment samples will be collected from 12 stations close to NAS Pensacola and from 16 stations within Pensacola Bay near the NAS Pensacola facility (see Figures 14-4 and 14-5). Field methods for sediment sample collection will be adapted in accordance with FDER official guidance for approved sediment sampling protocols (Ryan et al. 1984). Samples will be collected by SCUBA divers using 4-inch diameter stainless steel cores taken to a depth of 6 inches. Samples will be homogenized in stainless steel bowls and the appropriate sample aliquot removed from the homogenized sample. Triplicate samples will be taken from each station and averaged to produce mean values for each analyte.

14.2.3 Soil Sampling

Soil samples will be collected to verify the results of the Phase I analytical screening. Locations for the proposed soil borings on Sites 13 and 14 are shown in Figures 14-6 and 14-7. At each location, samples will be collected from three composite intervals: surface to 0.5 feet

[Bold items enclosed in brackets denote
changes to the last version'of document]



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1972.

KALE

0 1000 2000 3000 4000 FEET

KEY:

▲ Proposed Sediment Sampling

Figure 14-4
PROPOSED OFFSHORE SEDIMENT SAMPLING LOCATIONS
SITE 2 - PHASE II

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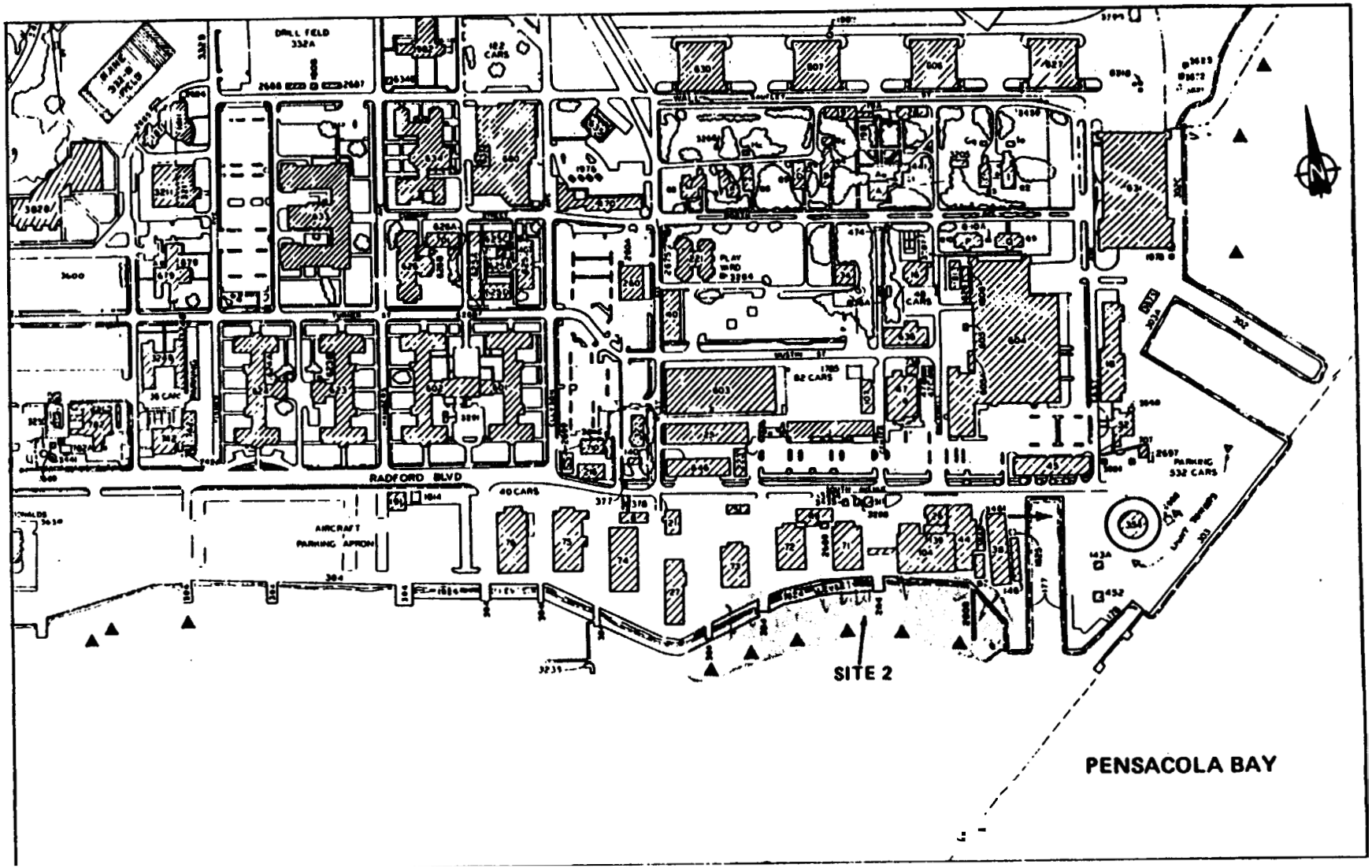
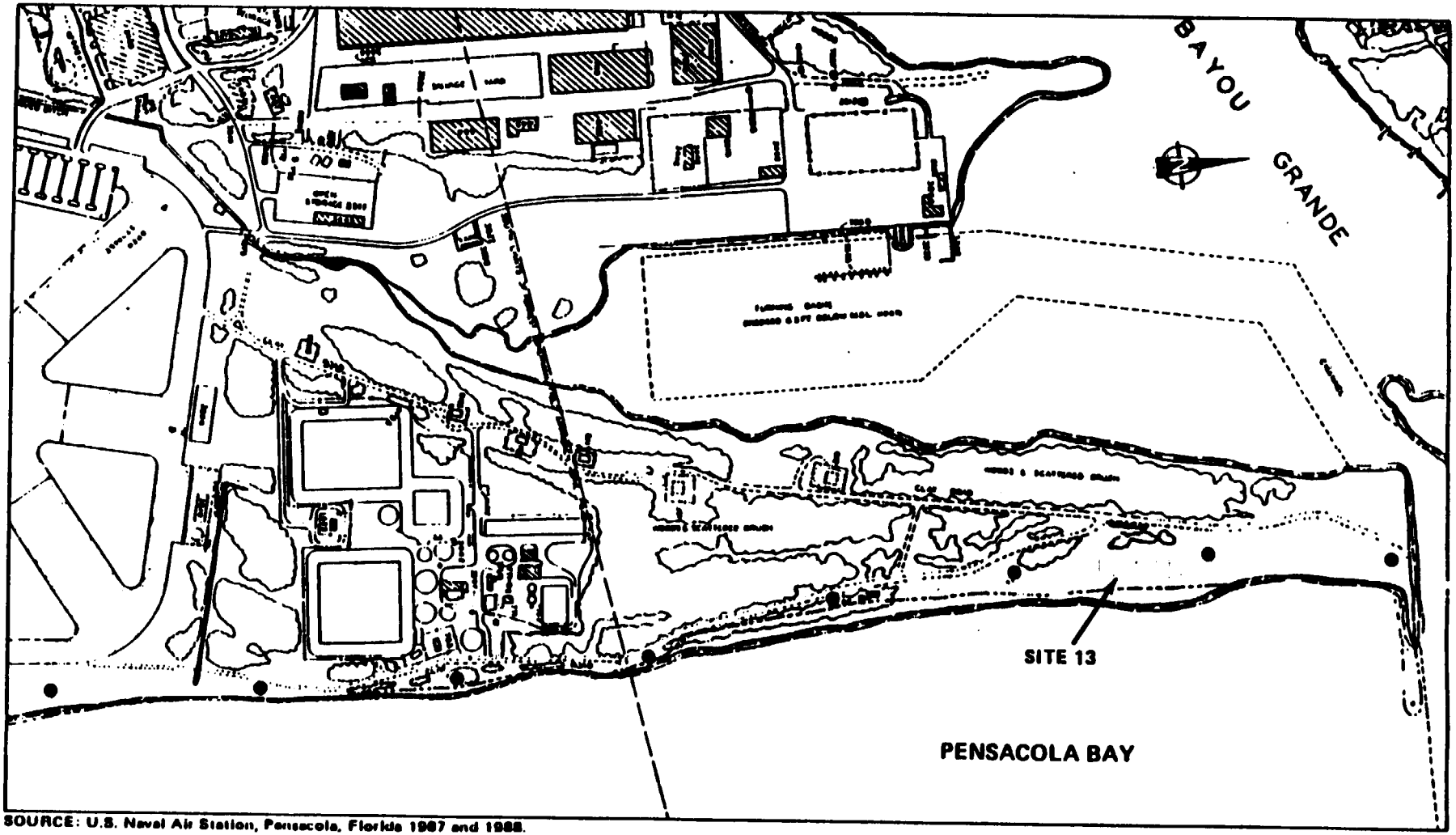


SOURCE: U.S. Naval Air Station, Pensacola, 1985 and 1988

KEY:
▲ Proposed Sediment Sampling

SCALE
0 200 400 600 800 FEET

Figure 14-5
PROPOSED NEARSHORE SEDIMENT SAMPLING LOCATIONS, SITE 2 - PHASE II



SOURCE: U.S. Naval Air Station, Pensacola, Florida 1987 and 1988.

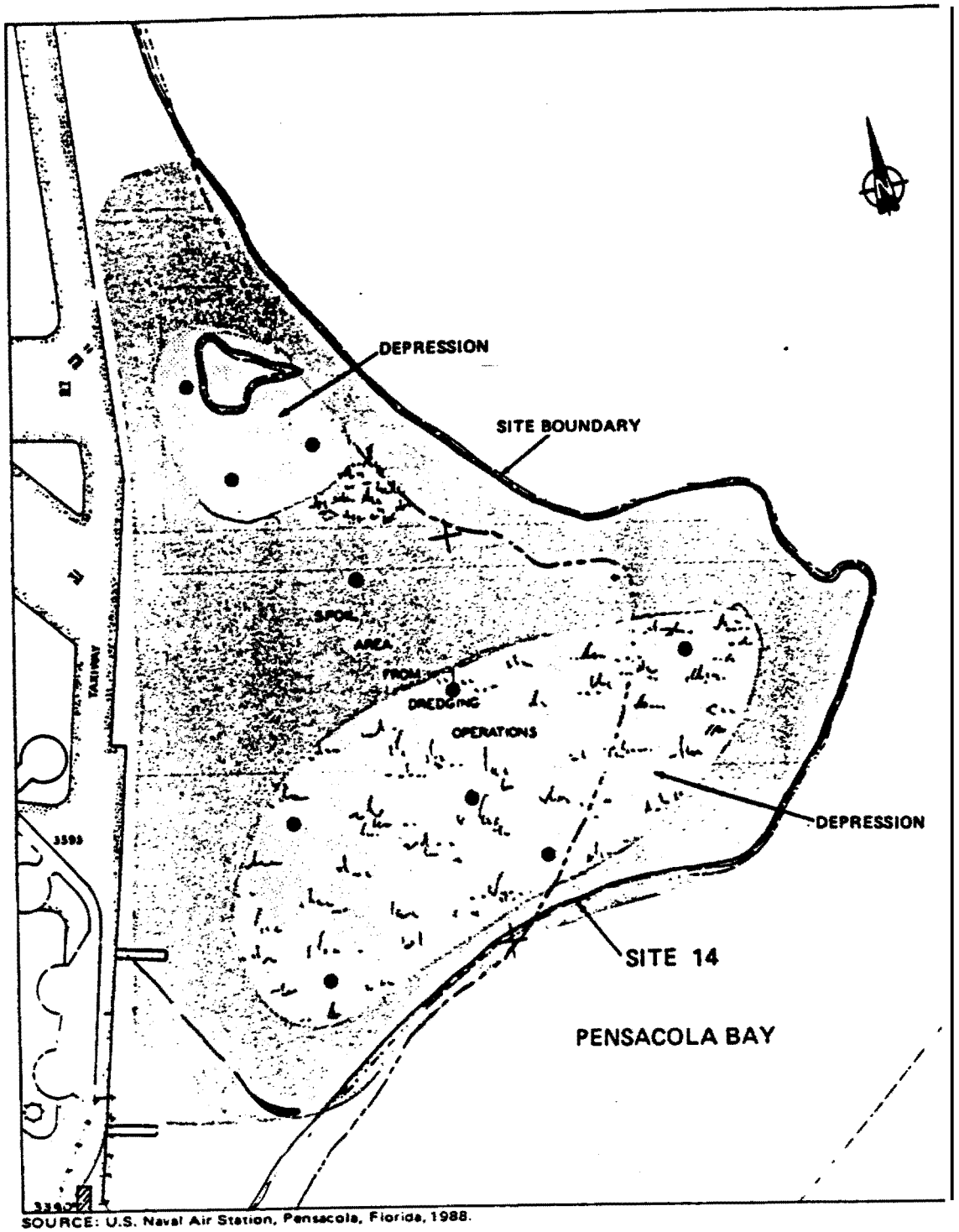
SCALE
0 200 400 600 800 1000 FEET

KEY:

● Tentative Soil Boring

Figure 14-6
TENTATIVE SOIL BORING LOCATIONS, SITE 13 - PHASE II

0000330



SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1988.

SCALE

0 200 400 600 800 FEET

KEY:

● Tentative Soil Boring

Grasses

Figure 14-7
TENTATIVE SOIL BORINGS, SITE 14 - PHASE II

belov ground surface (BLS); 0.5 to 2.5 feet BLS; and 2.5 feet BLS to the water table. In areas where the water table is observed to occur greater than 5 feet from the surface, saaples will only be collected to 10 feet at 2.5 feet intervals, unless Phase I saaples indicate contamination is present in a deeper zone.

The soil samples will be collected using a split-spoon sampling device or with hand-held augers. All sampling, compositing, and lithologic logging will be performed in accordance with Section 6.6 of the GQAPP. Equipment decontamination will be performed in accordance with Section 6.10 of the GQAPP.

For planning purposes, three soil samples are assumed at each boring location for Sites 13 and 14, except for the location outside of the shallow depressions on Site 14. It is assumed that five soil samples will be collected at each of these locations, thus a total of 24 soil samples will be collected at Site 13, and 32 soil samples will be collected at Site 14.

14.2.4 Air Sampling

Formal air sampling will be perforued only as required based on the results of the Phase I surface emission survey and particulate air sampling, and the Phase I shallov soil sampling.

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