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CONTAMINATION ASSESSMENT/ REMEDIAL ACTIVITIES INVESTIGATIONWORK PLAN -- GROUP K NAVAL AIR STATION PENSACOLA PENSACOLA, FLORIDA

Firefighting School Area (Site 7)
Pier Pipe Leak Area (Site 20)
Sludge at Fuel Tanks Area (Site 21)

July, 1990

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 Firefighting School Area (Site 7), Pier Pipe Leak Area (Site 20), and the Sludge at Fuel Tanks Area (Site 21) 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 of 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:

- Efficient identification of those sites where environmental contamination has actually occurred as a result of past and/or present operations, thereby allowing 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 allowing full characterization of site contamination in the most environmentally sound, cost-effective, and timely manner possible; and

- Early screening of potential remedial alternatives, which, in turn, allows 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 may not require investigation beyond Phase II and hence will comprise Contamination Assessment-type investigations. On the other hand; sites which have documented contamination will likely require the additional phases of work, and hence will comprise a full-scale 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 work 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.

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2. SITE DESCRIPTION

2.1 Site 7 - Firefighting School Area

The Firefighting School Area (Site 7) is located in Building 1713 near' the intersection of Redoubt and Taylor Roads, approximately 400 feet southeast of Fort Redoubt (see Figures 2-1 and 2-2). The area surrounding Building 1713 is primarily wooded to the north and south with mobile homes to the southeast. The immediate vicinity is primarily unpaved. A 1983 Initial Assessment Study (IAS) conducted by the Naval Energy and Environmental Support Activity (NEESA) states that the remains of a raised open tank [exist] on the west side of the building that was used in the training exercises. The tank was [formerly] filled with water and topped with gasoline which was ignited to provide a sustained fire for the training exercises. There is a firefighting tower to the east-southeast of the building and a large clearing adjacent to the tower which may also have been used for firefighting exercises.

The site vicinity is topographically flat with a land surface elevation of approximately 20 to 25 feet above Mean Sea Level (MSL). An NAS Pensacola water supply well (Well No. 3) is located 0.25 mile south-southwest of the site. There are no existing monitoring wells at Site 7.

2.2 Site 20 - Pier Pipe *Leak* Area

A berthing pier is located near the southeast corner of NAS Pensacola on the Pensacola Bay shoreline (see Figure 2-1). The pier area consists of an approximately 30 foot wide concrete loading area immediately adjacent to the pier seawall, surrounded by a large asphalt parking lot see Figure 2-3). There is a 1,300,000 gallon aboveground fuel storage

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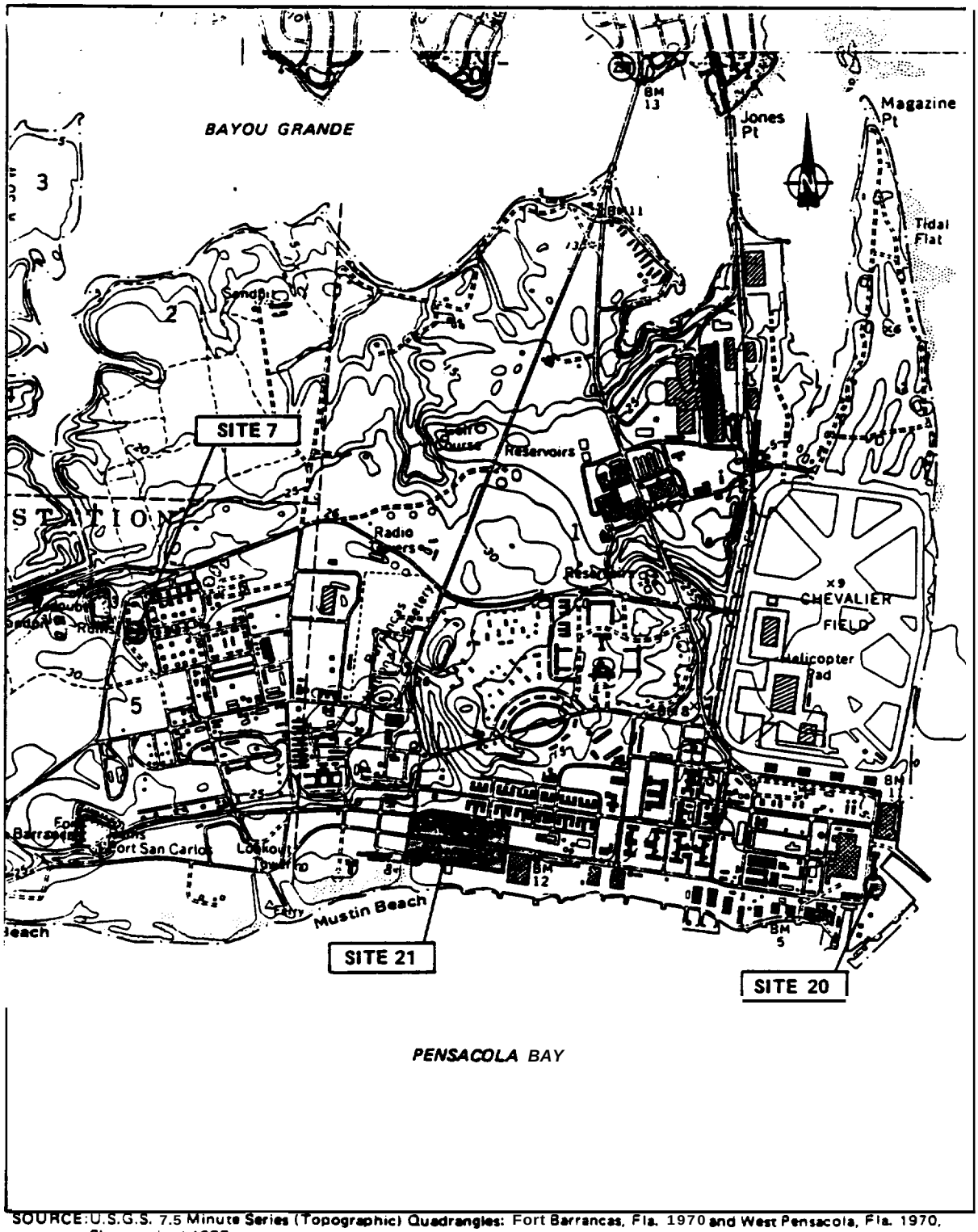

SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangles: Fort Barrancas, Fla. 1970 and West Pensacola, Fla. 1970, Photorevised 1987

SCALE

0 ½ 1 MILE

0 .5 1 KILOMETER

Figure 2–1 LOCATION MAP – NAS PENSACOLA SITES 7, 20, and 21

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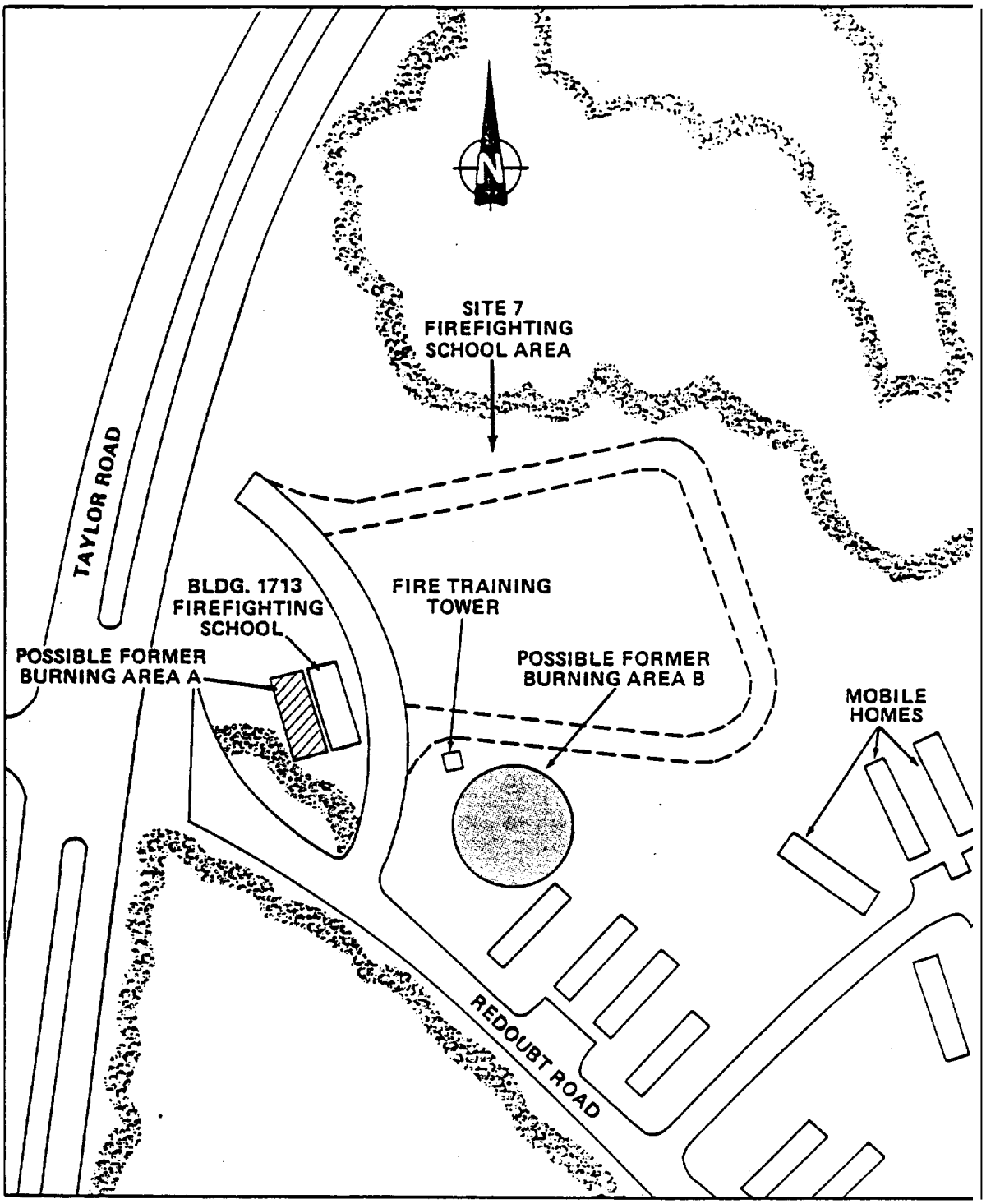


SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1988

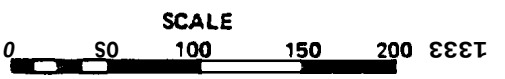
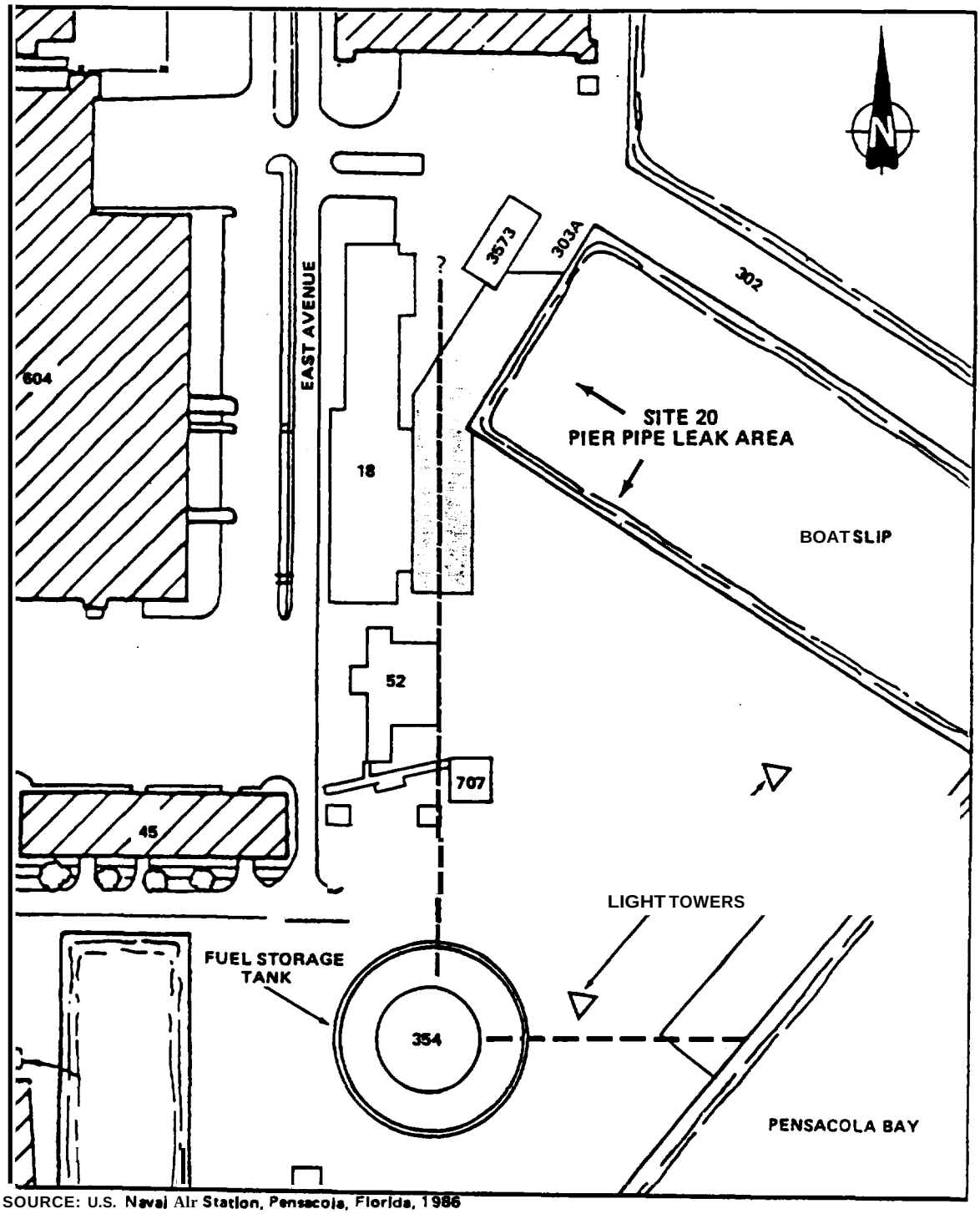


Figure 2–2 SITE MAP – NAS PENSACOLA SITE 7



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

SCALE

0 100 200 400 FEET

KEY:

Possible Fuel Pipeline

Approximate Areas Of Previously Identified Potential Contamination

Building

Figure 2-3 SITE MAP – NAS PENSACOLA SITE 20

tank (tank number 354) on the southern end of the site with a surrounding concrete containment wall. The site area extends approximately 1,000 feet to the north of the storage tank and interfaces with Buildings 707, 52, 18, and 3573.

The aboveground storage tank has [been used to contain] Navy Special Fuel Oil, Distillate DFM, and JP-5 jet fuel (NEESA 1983). The tank has been in use since 1926 (NEESA 1983); however, the structure may have been modified or replaced one or more times in the past 63 years. One or more pipelines extend from the fuel storage tank, presumably north toward Building 3573 to the berthing pier (structure number 303), and possibly to other ship fueling areas. The exact location of the pipeline(s) are not known at this time.

Site 20 is located approximately 1.2 and 1.0 mile from NAS Pensacola water supply wells Nos. 1 and 2, respectively. According to NEESA (1983) there are four monitoring wells located on the berthing pier and on the seawall (structure number 303A). The exact location and the construction details of these wells [are] not known at this time. The site vicinity is topographically flat with a land surface elevation of approximately 5 feet above MSL.

2.3 Site 21 - Sludge at Fuel Tank Area

Former sludge disposal areas are located around the perimeters of nine aviation gasoline (AVGAS) aboveground storage tanks near the intersection of Duncan Road and Radford Boulevard (Figure 2-4). These tanks were in use from the 1940's through the 1960's, with annual cleaning and sludge removal performed from about 1951 to 1967 (NEESA 1983). Five of the tanks and containment structures located north of Radford Boulevard have been removed. These five tanks (former tank numbers 638, 640, 641, 642, and 402) each had a capacity of 90,000 gallons. Of the four remaining tanks, two (numbers 643 and 644) have 100,000 gallon capacities and two (numbers 356 and 357) have 90,000 gallon capacities. The remaining four tanks may still be in use. All The tanks are or were presumably asphalt-coated steel, each with a concrete containment wall and a surrounding wire fence.

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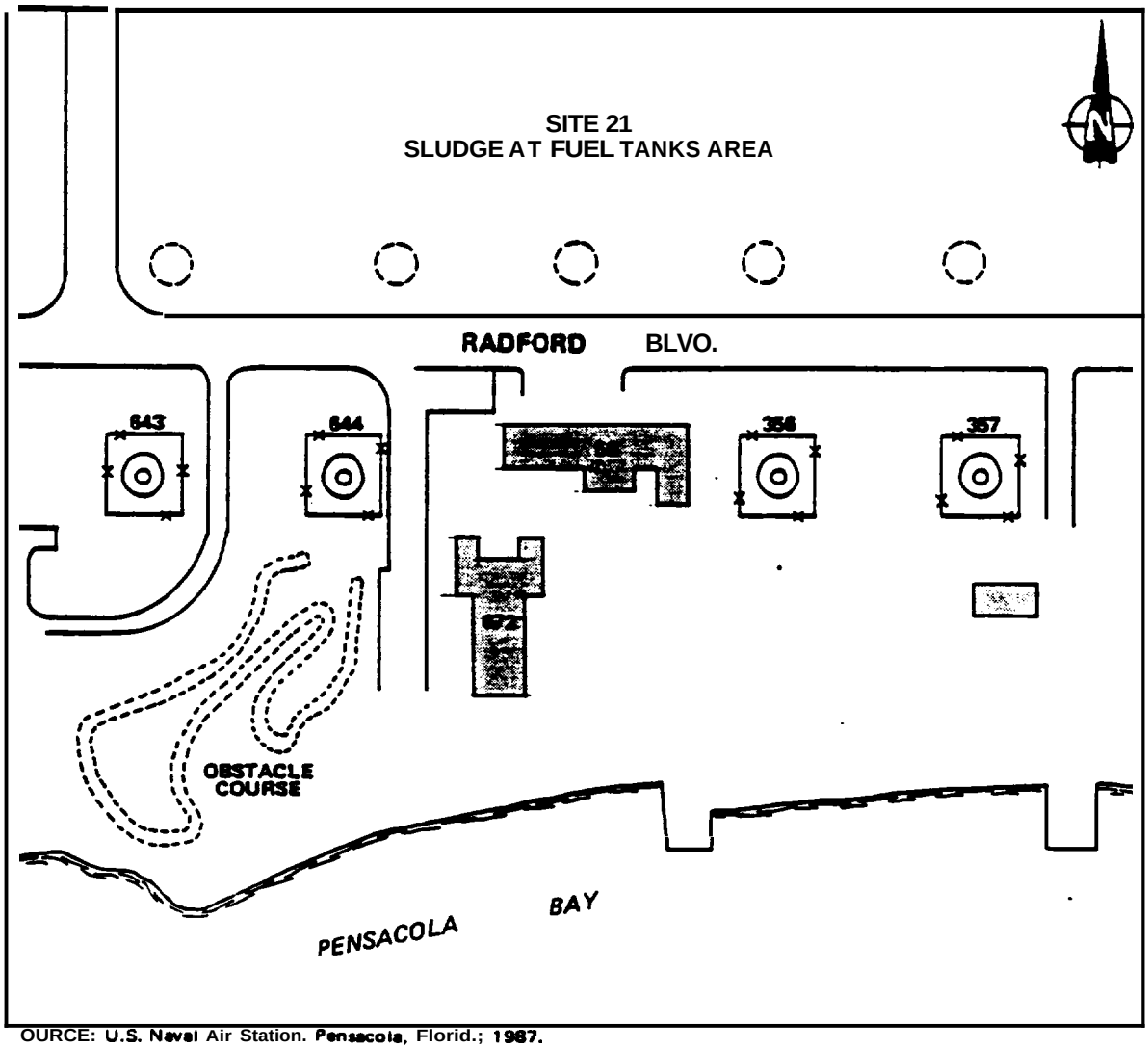

OURCE: U.S. Naval Air Station. Pensacola, Florid.; 1987.

SCALE

0 100 200 300 400 500 FEET

KEY:

Aboveground Fuel Storage Tank and Containment Wall

Former Aboveground Fuel Storage Tank and Containment Wall

Figure 2-4 SITE MAP - NAS PENSACOLA SITE 21

The majority of the area in the immediate vicinity of the tanks is unpaved, with the exceptions of Radford Boulevard and smaller access roads. Buildings 672 and 58 lie in the south-central portion of the tank area. The tank area is located approximately 400 feet north of Pensacola Bay.

NAS Pensacola water supply Well No. 1 is located 0.4 mile north of Site 21. There are no reported monitoring wells at the site. The Site 21 vicinity is nearly level to gently sloping toward the Bay with a land surface elevation of approximately 5 feet above MSL.

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3. SITE HISTORY

3.1 Site 7 - Firefighting School Area

The Firefighting School in Building 1713 has been in operation since 1940. Training exercises were performed on fires started with gasoline, and possibly other flammable liquids, in an open tank of water. This tank was reportedly located on the west side of the building (NEESA 1983). There is also a clearing and a firefighting tower to the east-southeast of the building which suggests that Braining may also have been performed in these areas. NEESA (1983) concluded that, as there was no apparent evidence of hazardous waste disposal, the site did not constitute a threat to human health or the environment and further study was not recommended.

3.2 Site 20 - Pier Pipe Leak Area

In 1981, a leak was discovered in the fuel pipeline leading to the berthing pier while a contractor was driving piling for the pier. The pipelines apparently had not been in active use for several years, and either the lines had broken during construction or residual fuel had leaked from the pipes over the years of usage (NEESA 1983). The soil in the excavation area appeared to be soaked with fuel oil which was reportedly either Navy special fuel oil or marine diesel fuel (NEESA 1983). The excavation activities resulted in the release of oil to Pensacola Bay. This release was cleaned up and the excavated soils were removed. Four monitoring wells were installed on the berthing pier and on the seawall (structure number 303A); the precise location and construction details of these wells is not known at this time. At the time of the IAS investigation, there was no apparent free product in these wells; however, no groundwater samples were collected for laboratory analyses. The 1983 IAS stated that station personnel reported that they commonly observed oil slicks near the berthing pier.

NEESA concluded that, because the leak was repaired and oil-soaked soil removed, the site did not constitute a threat to human health or to the environment, and no further investigation was recommended.

3.3 Site 21 - Sludge at Fuel Tank Area

From the 1940's through the 1960's, tank-bottom sludges were removed from the nine AVGAS aboveground storage tanks at Site 21 and were disposed of in the surrounding soils. During an approximately 20 year period, an estimated 360 cubic yards of sludge was disposed of around the perimeter of the tanks (NEESA 1983). This reportedly created a doughnut-shaped disposal site around each tank with an area of approximately 1,650 square feet and an outside diameter of approximately 50 feet (NEESA 1983). The sludge was buried to an unknown depth and'may contain lead, tetra ethyl lead, and other gasoline components and additives. The site's proximity to Pensacola Bay (vithin 400 feet) suggests that groundwater levels are probably less than 5 feet beneath land surface. This; together with the high permeability of the soils, creates a high potential for contaminant migration to the bay. NEESA (1983) concluded that the potential for migration from this site warranted further investigation and recommended the collection of soil and surface vater samples.

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4. CLIHATOLOGY

The 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** 19821). High intensity thunderstorms are common, producing as much as three to four 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 the coast, commonly known as the sea-breeze effect (Flood and Associates

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1978). Hurricanes and tornadoes are infrequent but can cause substantial damage to the nearshore environment. Six hurricanes have passed within 50 miles of Pensacola since 1980.

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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 Uniuola paniculata (sea oats), Hydrocotyle bonariensis (beach pennywort), Ipomea 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 3 to 5 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 pine), Quercus spp. (scrub oak species, geminata, champanii, myrtifolia, and

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inopina), Cladonia species, and Ceratiola ericoides (rosemary). This community type has been ranked by FNAI as imperiled statewide because of its rarity and because of its vulnerability to extinction due to some man-made or biological factor. This community type can have 3 to 5 distinct habitats (Wolfe et al. 1988).

Two other community types MY be found in the western portions of the NAS Pensacola facility. These are flatwoods and sandhill vegetative communities. Platwoods 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). Flatwoods communities also occupy areas of low 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-plants), Uticularia spp. (bladderworts), Polygala spp. (milkworts), and Drosera spp. (sundews)(Wolfe et al. 1988).

Sandhill communities are found in dry soils which are lower in fertility than flatwoods soils. The overstory of this community type is dominated by Pinus palustris (longleaf pine), Quercus laevis (turkey oak), Q. uarilandica (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 hawthorn). The more abundant herbaceous plants found in moist areas are Pteridium aquilinum (bracken fern) and Aristida stricta (wire grass). These habitats were verified with walk-through surveys and ground truthing by the Navy in March of 1986 (Navy 1986).

Freshwater Wetland Vegetation. Much of the geological material underlying the NAS Pensacola facility is deep, porous sand often containing relatively impermeable clay lenses. In combination with high annual rainfall, this geologic condition causes the formation of small

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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. Most 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 Magnolia virginiana (sweetbay), Illicum floridanum (star anise), and Smilax ~~bona-nox~~ (spiked cat brier) are domihants 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. The Navy recorded moderate size rookeries of the great blue heron, and

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found large numbers of nesting osprey in the southwestern portions of the NAS Pensacola facility. Because of the large number and diversity of habitats found around the facility and considering that the survey was conducted during a predominantly non-mating season, it is likely that there are more species of birds using the facility and surrounding waters 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 were 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). Host all of the reptiles and amphibians that may be found on the facility can be expected to use the surface water bodies in some stage of their life cycle. Any contamination of surface water bodies can be detrimental to existing populations of reptiles and amphibians utilizing that water body.

5.1.2 Aquatic

Freshwater. Little is known of the flora and fauna inhabiting the streams, 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 with 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 waters (Volfe et al. 1988).

Coastal Wetlands. There are no reported coastal marshes or estuarine wetlands around the NAS Pensacola facility, principally along the low energy shores of Bayou Grande. The habitat type is usually dominated by saltmarsh cordgrass (Spartina alterniflora) 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 known of their composition, locality, or aerial 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 low in productivity (as compared to other Gulf coast estuaries), and mainly dominated by the diatoms Navicula tripuncata, Bacteriastrum spp., Chaetoccrus 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 the Florida Department of Environmental Regulation (FDER) and the Navy have described the benthic communities within 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

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

Samples collected by the Navy (1986) indicate a low density yet moderate diversity of benthic infuanal organisms when compared to other estuarine systems within and around the turning basin. A complete comparison of the Navy's data can not be made to other literature at this time because their data is not given in numbers per unit area. However, the Navy's data reveals that very few deep dwelling 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 al. 1988).

Fish and Shellfish. Early studies of Pensacola Bay have identified 180 bony fish species and 7 cartilaginous fish species (Cooley 1978). The 13 most abundant species were spot (Leiostomus xanthurus), pinfish (Lagodon rhomboides), atlantic croaker (Hicropogonias undulatus), gulf menhaden (Brevoortia patronus), bay anchovy (Anchoa mitchilli), 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 was the highest in the more saline waters, with peaks throughout the summer (Cooley 1978).

Moderate densities of the blue crab (Callinectes sapidus), shrimp (Penaeus duorarum, P. setiferus, and P. aztecus), and oysters (Crassostrea virginica) have been collected throughout Pensacola Bay

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(Heil 1989). Shrimp are caught in greater abundances near NAS because of the higher salinities. Blue crabs 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 the 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 1980-85 (Navy 1986). The dominant finfish species in terms of total weight 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 weight 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, bluecrabs, and squid. This data, as well as the Navy's data, also suggests 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 is not available in 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 dependent during some phase of their life cycle. Shrimp, bluecrab and shellfish are known to release larvae that feed in and around estuaries until settlement. During early life history stages the juveniles reside within seagrass beds or other protected habitats until maturity. Any contamination of the water 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. Few mammals have been sighted within the area of the NAS Pensacola facility, most of the 13 species of mammals reported for the northeastern Gulf of Mexico stay predominantly in Gulf waters. The atlantic bottlenose dolphin (Tursiops truncatus), hovever, has been sighted regularly off the NAS Pensacola facility. Manatees have been sighted irregularly, with one recent sighting in the area recorded by the FNAI in October 1988. A goosebeaked whale (Ziphius cavirostris) was reported stranded on Santa Rosa Island, and a pilot whale (Globicephala macrorhynchus) was 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 are quantitatively ranked as uncommon to common in abundance within the waters surrounding the NAS Pensacola facility.

Threatened and Endangered Species. A number of threatened and endangered species (listed in Appendix C) have been identified in the vicinity of the NAS Pensacola facility. Many rare, threatened, and endangered species are associated with the wetland or bog habitats found on NAS Pensacola. A total of 57 occurrences for six plant species were recorded in an inventory conducted by FNAI (1988b) of the NAS Pensacola facility (see Appendix C). Host of these plants were found in the area around Sherman Field and habitats'to the west. Any site remediation and, more importantly, any assessment of environmental endangerment, must consider the water level requirements of rare and endangered plant species, the foraging activities of birds in the waters surrounding the NAS Pensacola facility, as well as nesting and feeding animals on the facility grounds. Complete biotic surveys may be necessary to determine

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the presence of threatened or endangered species and potential pathways of contamination to these species.

5.2 Site-Specific Biological Resources

Site 7 lies within a sand pine scrub vegetated community that has been altered by NAS Pensacola activities. All understory vegetation has been eliminated, and the overstory vegetation, composed primarily of pine'and *oak* tree species, has been reduced. Areas to the north and south of the site are composed of more natural stands of the sand pine scrub community. It is expected that many faunal species associated with the sand pine scrub community use the site as a feeding area, and as a migration corridor between the wooded areas north and south of the site. There are no aquatic habitats found on-site; however, Bayou Grande is located approximately 1/2 mile to the north.

Terrestrial habitats on Sites 20 and 21 have been completely removed the development of NAS Pensacola facilities. Vegetated communities have been replaced by buildings, paved roads, storage facilities, and berthing piers. It is expected that few, if any, faunal species use these sites as migration corridors, and no faunal species use these sites for feeding or nesting. Pensacola Bay is located within *400* feet of both sites. If contamination is present in the groundwater, the possibility exists that site contamination will affect the nearshore marine communities in those areas. Primary faunal species that may be affected are benthic populations of polychaetes, bivalves, decapods and fish. Organisms which feed on these benthic populations could also be affected by site contamination.

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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 man-made 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 (USGS 1970a and b).

The southwestern and northern portions of NAS Pensacola contain areas of freshwater wetlands. 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 waters into Pensacola Bay, Bayou Grande, and the coastal wetland areas presents the potential for transport of contaminants 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 groundwater, into wetland areas found on-site could also have a significant impact on the biotic communities that are dependent on those habitats.

6.2 Site-Specific Surface Water Hydrology

Sites 20 and 21 are located within a few hundred feet of Pensacola Bay. Any soil or groundwater contamination present at these sites has a potential to impact the Bay mainly via groundvater contaminant transport. The sampling of Pensacola Bay sediments near these areas is planned as part of the investigation of Site 2 (Waterfront Sediments).

No significant surface water bodies are known to be in the vicinity of Site 7.

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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 mean sea level (MSL). 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 and b). 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 Floridian 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

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of unconsolidated to poorly indurated clastic deposits (Vagner et al. 1984). In this portion of Florida the Surficial Aquifer constitutes an important source of water supply and is called the Sand-and-Gravel Aquifer (SEGS 1986). The sediments making up this aquifer belong to all or part of the Pliocene to Holocene Series which, 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 with 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 peracabilities. These zones are referred to as the surficial zone, the low permeability zone, and the main producing zone (Yilkins ~~et al~~. 1985).

Surficial Zone. The surficial zone is contiguous with land surface and contains groundwater under water table or perched water 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 brown fine to medium-grained quartz sand. Depth to the water table within the surficial zone is variable depending on location and ranges from less than one foot near surface water bodies to more than 20 feet in areas of higher elevation. In general, the direction of groundwater flow is controlled by the topography and by discharge to surface water bodies. Consequently shallov groundwater'in the surficial zone moves toward areas of lower elevation and/or the nearest surface water body. Overall, the surficial zone has a high permeability. Numerous aquifer (slug) tests and laboratory permeability tests conducted on wells 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 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.

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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 x 10^{-5} to 9.9 x 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 the 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 below land surface at HAS 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 wells 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 wells are infrequently used (G & M 1986). The principal sources of water for NAS Pensacola are wells 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 wells open to the main producing zone at NAS

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Pensacola to determine direction of groundwater flow within this zone; however, the flow direction is assumed to be generally southward under ambient conditions. Pumpage'of the supply wells would locally cause groundwater in this zone to flow toward the wells.

As a result of the overlying low permeability zone groundwater within the main producing zone occurs under confined or semi-confined conditions. At one nested well location on NAS Pensacola (east of Building 648) the vater level elevation in a well open to the main producing zone is approximately 7 feet lover than that in an adjacent well open to the surficial zone (G & M 1986). This indicates that a significant downward hydraulic gradient exists between these two zones. Thus, a considerable potential exists for vertical groundwater flow from the surficial to the main producing zone at this location. It is not known to what extent this potential exists elsewhere at NAS Pensacola.

7.1.2.2 Intermediate System

The lower limit of the Sand-and-Gravel Aquifer coincides with the top of a regionally extensive and vertically persistent hydrogeologic unit of much lower permeability. This unit is referred to as the Intermediate System. In the vicinity of NAS Pensacola the top of the Intermediate System generally lies within 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 (Wilkins et al. 1985). In general the Intermediate System consists of fine-grained sediments, and functions as an effective confining unit which retards the exchange of .water between the overlying Sand-and-Gravel Aquifer and the underlying Floridan Aquifer System (SEGS 1986). For the most part the entire sequence is poor to non-water bearing. However, relatively thin beds of sand exist within the unit which may yield small quantities of water. In the NAS Pensacola area the Intermediate System is approximately 1,100 feet thick and is composed of the lower 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.

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7.1.2.3 Floridan Aquifer System

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

7.2 Site Hydrogeology

7.2.1 Site 7 - Pirefighting School Area

The soils of Escambia County are primarily derived from marine and stream deposit parent material. The IAS soil association map (NEESA 1983) indicates that the surface soils at Site 7 are predominately sands and sandy loams. Lithologic information from nearby borings indicate that there are primarily fine to medium-grained quartz sands to depths of approximately 15 to 20 feet below land surface.

There are currently no monitoring wells on-site and there is no currently available site-specific hydrogeologic data. However, land surface elevations are approximately 20 to 25 feet above mean sea level and the depth to groundwater has been roughly estimated to be 15 feet. Based on well drilling logs for other areas on NAS Pensacola, a confining or semi-confining zone of low permeability can be expected to occur at a depth from approximately 40 to 70 feet.

There is an NAS Pensacola water supply well (Well No. 3) approximately 0.25 miles south-southwest of Site 7. This well is infrequently used as a secondary water supply to augment the primary well field located at Corry Station. The supply well was installed in 1969 to a depth of 240 feet with stainless steel screen from approximately 185 to 240 feet (open to the main producing zone). The well yield, when in use, is about 1,200 gallons per minute (gpm) and depth to the static water level, in 1969, was approximately 45 feet.

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7.2.2 Site 20 - Pier Pipe Leak Area

The soils of Escambia County are primarily derived from marine and stream deposit parent material. The IAS soil association map (NEESA 1983) indicate that the surface soils at Site 20 are predominately undifferentiated coastal soils, including dune land and beach-tidal marsh. Lithologic information from nearby borings indicate that there are primarily fine to medium-grained quartz sands to depths of approximately 15 to 50 feet below land surface.

Site 20 is currently completely paved and is part of a pier that borders Pensacola Bay. There are reportedly four monitoring wells on-site, however the location, construction information, and water elevation data are not known at this time. Considering the site's proximity to Pensacola Bay, the depth to groundwater has been roughly estimated to be 5 feet, and groundvater flow is presumably to the east and the south, toward the Bay. Based on well logs froa'other areas of NAS Pensacola, a confining or semi-confining zone of low permeability *can* be expected to occur beginning at a depth of from 40 to 70 feet.

There is an NAS Pensacola water supply well (Well No. 2) approximately one mile northwest of Site 20. This well is infrequently used as a secondary water supply to augment the primary well field located at Corry Station. The supply well was installed in 1942 to a depth of 178 feet (open to the main producing zone). The well yield, when in use, is about 650 gallons per minute (gpm) and depth to the static water level, in 1942, was approximately 38 feet.

7.2.3 Site 21 - Sludge at Fuel Tank Area

The soils of Escambia County are primarily derived from marine and stream deposit parent material. The IAS soil association map (NEESA 1983) indicate that the surface soils at [Site 21] are predominately undifferentiated coastal soils, including dune land and beach-tidal marsh.

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Site 21 is located approximately 400 feet north of Pensacola Bay. There are currently no monitoring wells on-site and there is no currently available site-specific hydrogeologic data. However, due to the site's proximity to Pensacola Bay, the depth to groundwater has been roughly estimated to be 5 feet, and groundwater flow is presumably to the south toward the Bay. Based on well logs from other areas of NAS Pensacola, a confining or semi-confining zone of low permeability can be expected to occur beginning at a depth of from 40 to 70 feet.

In addition, there is an NAS Pensacola water supply well (Well No. 1) approximately 0.4 miles north of Site 21. This well is infrequently used as a secondary water supply to augment the primary well field located at Corry Station. The supply well was installed in 1942 to a depth of 174.5 feet (open to the main producing zone). The well yield, when in use, is about 650 gallons per minute (gpm) and depth to the static water level, in 1942, was approximately 32 feet.

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8. PROJECT MANAGEMENT PLAN

The Generic Project Management Plan (GPMP), submitted to the Navy for approval, 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 E & E's project management guidelines (see Section 22).

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9. SITE MANAGEMENT PLAN

The Generic Site Management Plan (GSMP), submitted to the Navy for approval, 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 each site 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.

10. HEALTH AND SAFETY PLAN

A comprehensive General Health and Safety Plan (GHSP) and individual site-specific safety plans (SSP) have been developed to provide readily available emergency information and preventative safety measures. The GHSP, submitted to the Navy for approval, outlines health and safety procedures and protocols to be followed during all field investigations at each of the 37 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 GHSP 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 (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 GHSP and the SSP will comply with the Occupational Safety and Health Administration (OSHA) Guidelines for Hazardous Waste Operations (29 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 for approval. This comprehensive document will be referenced for all field and laboratory procedures for this program, and will be used to develop the Site-Specific Quality Assurance Plans (SQAP).

The SQAP will provide site-specific quality assurance/quality control (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 GQAPP and SQAP will be in accordance with applicable professional technical standards, U.S. Environmental Protection Agency [(EPA)] requirements, and specific Navy goals and requirements for this project. All samples will collected, handled, packaged, preserved, and transported in accordance with the GQAPP and SQAP, and with 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. Photogra'phs showing the history of site activities will be analyzed to obtain information regarding the evolution of site features which may 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.

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13. UTILITIES SURVEY

Prior to conducting any augering, boring, drilling, or excavation activities, E & 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.

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 IV) studies. The field screening phase will employ a variety of field investigation techniques, including the collection of samples for laboratory analysis. However, the analysis of these samples will be subject to less rigorous Quality Assurance/Quality Control (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 analysis, 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

A field reconnaissance survey will be conducted on and around each site area (Sites 7, 20, and 21). Available aerial photographs and maps will be used as guides in locating surface features. Visual inspections will be made regarding surface conditions, stressed vegetation, surface drainage patterns, and seeps.

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During the reconnaissance survey, the field team will identify areas which 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 following sections.

The reconnaissance survey team will utilize air monitoring equipment during walkovers of the site areas, in accordance with Sections 6.1.1 and 6.3.2 of GQAPP. In the event that any "hot spots" are located, the area(s) will be flagged and identified on a site map for future reference. All findings of the physical reconnaissance will be mapped in detail and recorded in the field logbook.

14.1.1.2 HNU/OVA Surface Emission Survey

During the establishment of the geophysical survey grid network (discussed in Section 14.1.2), a surface emission survey will be conducted at Sites 7 and 21 using HNu and/or OVA air monitoring equipment. The survey will be conducted in accordance with Section 6.1.1 of the GQAPP. Measurements will be made at each established grid point, and readings will be recorded in the field logbook. Due to Site 20 being entirely paved, a limited survey will be conducted by checking for volatile emissions at cracks or joints in the pavement, or at other appropriate locations.

[In addition, 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 sampling will be conducted in accordance with Section 6.1.3 of the GQAPP.]

14.1.1.3 Habitat/Biota Survey

On-site and surrounding vegetation and wildlife will be examined to determine any past, present, or future potential threat resulting from existing contamination, migration of contaminants, investigative work, and remedial action, if any.

[Bold items enclosed in brackets denote changes from original text]

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14.1.2 Geophysical Survey

At Sites 7 and 21 an electromagnetic conductivity (EM) survey will be performed in conjunction with the magnetometry survey, using a hand-held EM-31 instrument. The survey for Site 7 will be conducted along transects at 25 foot intervals. The survey for Site 21 will be conducted at intervals of 50 feet. The EM-31 can detect and measure small subsurface changes in conductivity caused by chemical contamination, or other variations in soil water and groundwater constituents. In addition, by measuring the in-phase response, the EM-31 can detect the presence of shallow buried metallic objects with considerable accuracy.

The effort will initially require the establishment of a grid system over the study area. To accomplish this, at least two baseline transects will be established (providing x and y axis), and flagged at the specified intervals. A transit survey instrument will be used to establish the baselines, and a Brunton compass and tape measure used to complete the grid system for the study area.

The EM survey is intended to identify the location and orientation of potential contaminant plumes, and will serve as a confirmatory survey for the presence of buried pipes, drums, tanks, etc. The results will aid in the final selection of drilling and sampling sites. The survey will be performed in accordance with procedures detailed in the GQAPP (Section 6.2.1).

At Sites 7 and 21 a magnetometry (Mag) survey will be conducted using a proton magnetometer or gradiometer. The magnetometer will be carried along transects at 25 foot intervals at Sites 7 and at 50 foot intervals at Site 21 to identify potential metallic subsurface -obstructions such as pipes, drums, or storage tanks. The identification of such objects may aid in the identification of potential contaminant sources and in the selection of appropriate monitoring well and soil boring locations. The Mag survey and data interpretation will be performed in accordance with procedures discussed in the GQAPP (Section 6.2.3)

14.1.3 Analytical Screening

Phase I sampling activities #or Sites 7, 20, and 21 will require a soil headspace survey, soil sampling, the installation of shallow temporary monitoring wells, and groundwater sampling. Samples will be analyzed in the laboratory for analytical screening parameters. The analytical screening program has been developed for the Phase I effort as a measure to efficiently and cost-effectively provide focus for subsequent phases of site characterization and contamination 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.

14.1.3.1 Soil Headspace Survey

Soil samples will be collected for headspace analysis at 25-foot grid intervals at Site 7, and at 50-foot grid intervals at Sites 20 and 21. Composite soil samples will be collected from each 5 foot depth interval (0-5, 5-10 feet, etc.) to the depth of the water table. The depth to water is assumed to be 15 feet at Site 7 and 5 feet at Sites 20 and 21.

The purpose of the soil headspace survey will be to aid in identifying suitable locations for monitoring well installation and soil borings.

The collection and processing of soil samples for headspace analysis, and the recording of OVA measurements taken, are discussed in detail in Section 6.4 of the GOAPP.

14.1.3.2 Laboratory Analyses

Soil — Soil samples will be collected using either a solid stem auger extraction method or a hand-operated bucket auger. Borings will be completed to an approximate depth of 15 feet at Site 7, and to 5 feet at Sites 20 and 21, or to the water table, whichever is greater. The soil samples will be collected from 5-foot intervals (0-5, 5-10 feet, etc.). In some instances, the soil sampling will be conducted during shallow well installation (discussed in the following section).

[Bold items enclosed in brackets denote changes from original text]

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TABLE 14-1

PHASE I SAMPLING AND ANALYTICAL REQUIREMENTS—GROUP K

SITE 7

Medium	no. of Samples	Duplicates	Total	Analytical suite[a,b]
Soil	39	2	41	A
Groundwater	3	1	4	A
TOTAL	42	3	45	

S I R 20

Medium	No. of Samples	Duplicates	Total	Analytical Suite[a,b]
Soil	20	1	21	A
Groundwater	7	1	6	A
TOTAL	27	2	29	

SITE 21

Medium	NO. of Samples	Duplicates	Total	Analytical
Soil	37	2	39	A
Groundwater	11	1	12	A
TOTAL	46	3	51	

[a]Analytical suite designations are as follows:

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

[b]Specific constituents encompassed by the various chemical groups included within analytical suite A are identified in Tables 9-1 through 9-4 of tho Generic Quality Assurance Project Plin.

Tentative sample locations are shown in Figures 14-1 through 14-3. The approximate locations indicated were selected based on site history information pertaining to potential source areas (see Section 2). Sample numbers and locations are tentative and may be altered subject to the collection of more detailed site-specific data from the physical and geophysical surveys.

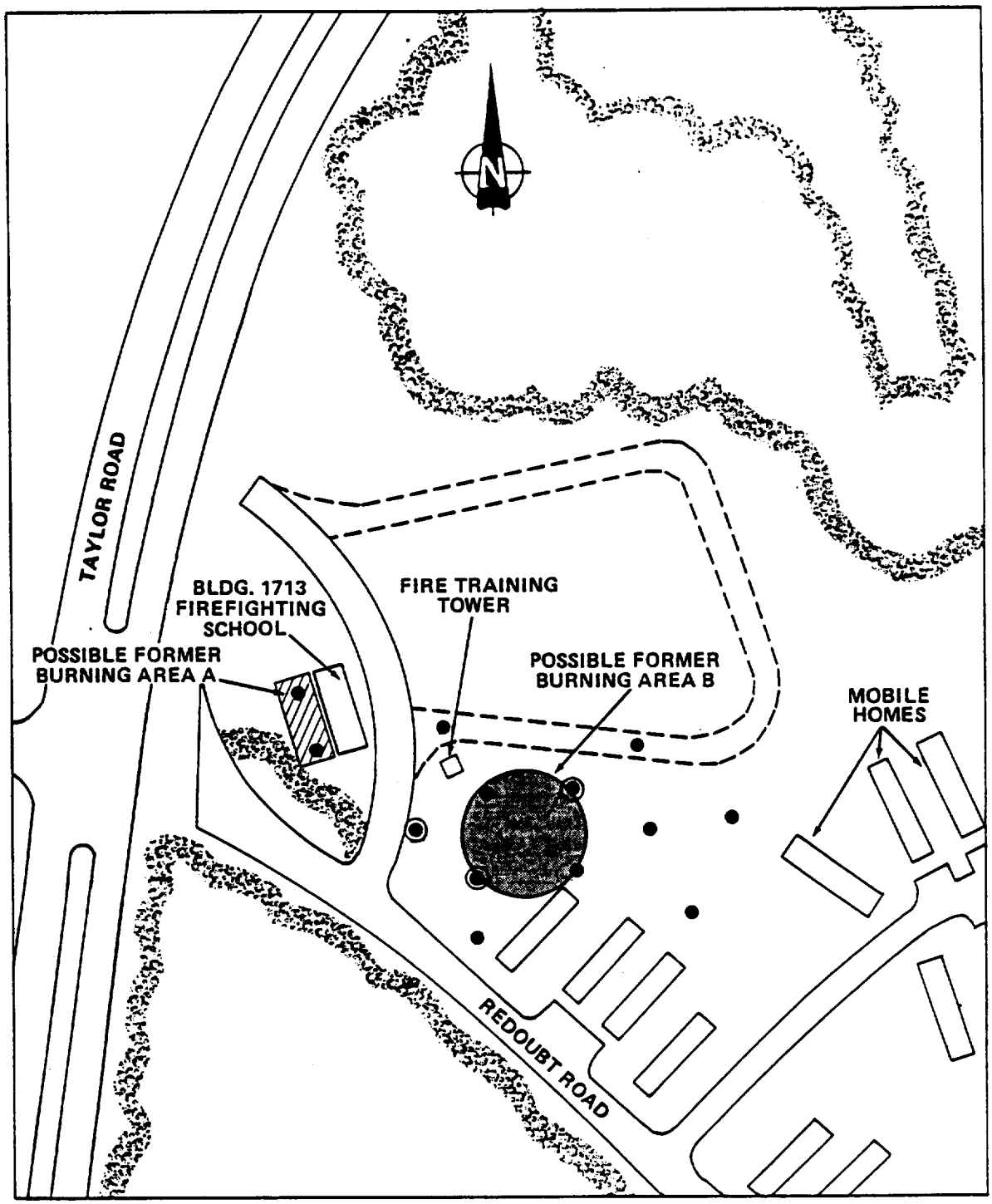
Assuming the water table is at a depth of 15 feet at Site 7, and 5 feet at Sites 20 and 21, a total of 39 samples will be collected at Site 7, 20 samples at Site 20, and 37 samples at site 21.

All soil sampling, compositing, and lithologic logging will be conducted in accordance with Section 6.6 of the GQAPP. Equipment decontamination will be conducted in accordance with Section 6.10 of the GQAPP.

Groundwater — Tentatively 3 stainless steel temporary monitoring wells .will be installed on Sites 7 and 20, and 11 will tentatively be installed on Site 21 (see Figures 14-1 through 14-3). The wells will be installed with 5 feet of 0.010-inch screen set to bracket the water table to allow for the collection of immiscible, floating contaminants, if any. In conjunction with well drilling, soil samples will be collected at 5-foot intervals as described above.

Tentative temporary monitoring well locations are shown in Figures 14-1 through 14-3. The approximate locations indicated were selected based on both site history information pertaining to potential source areas (see Section 2). Sample numbers and locations are tentative and may be altered subject to the attainment of more detailed site-specific data from the site reconnaissance and geophysical surveys.

All well drilling, development, purging, and sampling activities will be conducted in accordance with Section [6.8] of the GQAPP. Equipment decontamination will be conducted in accordance with GQAPP Section 6.10.

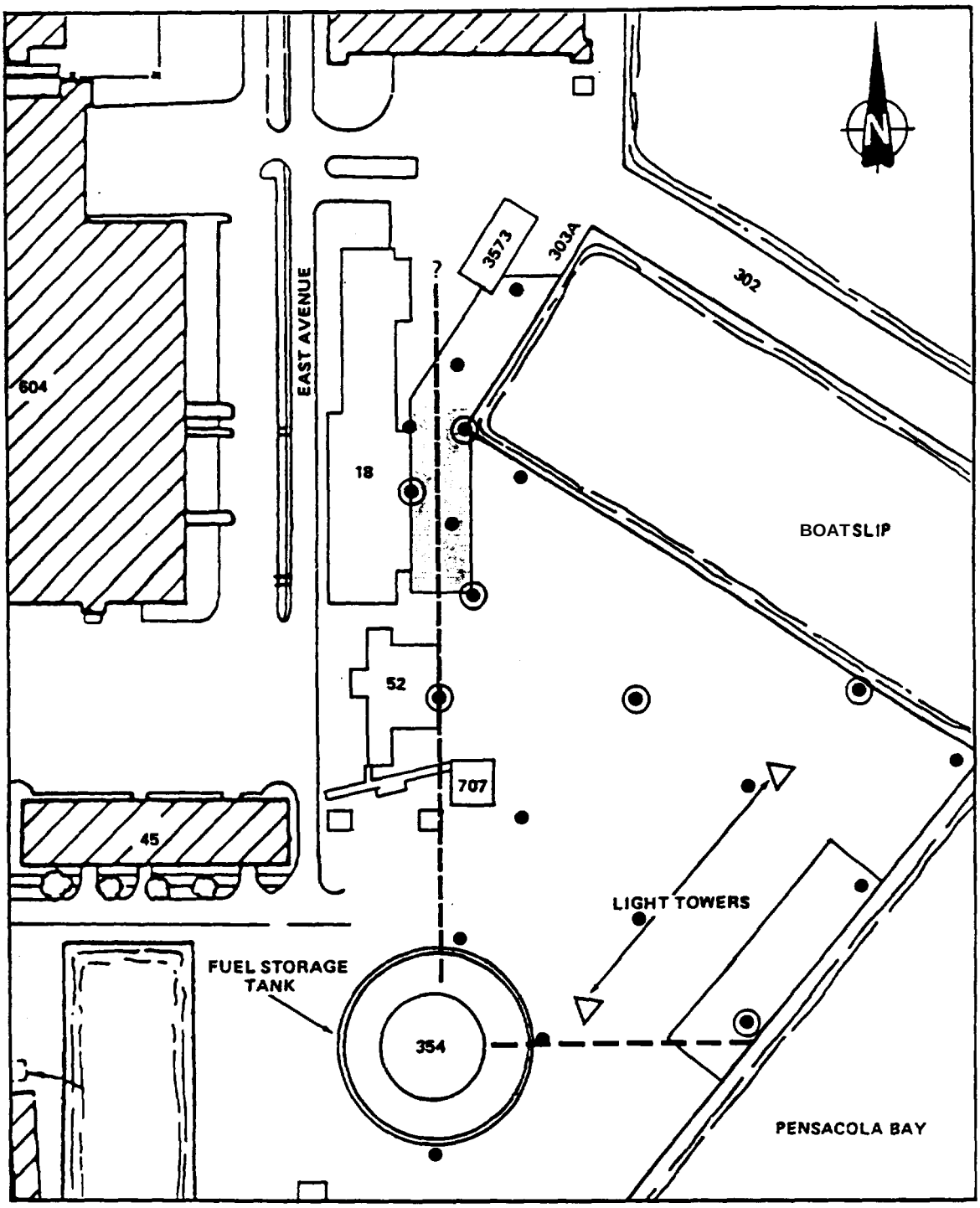


SOURCE: U.S. Naval Air Station. Pensacola, Florida, 1988

SCALE
0 '50 100 150 200 FEET

KEY:
● Tentative Soil Boring
○ Tentarive Temporary Monitoring Well

Figure 14–1 TENTATIVE SOIL BORING ANDTEMPORARY MONITORING WELL LOCATIONS, SITE 7 – PHASE I



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

SCALE
0 100 200 400 FEET

KEY:

- Possible Fuel Pipeline
- Approximate Areas Of Previously Identified Potential Contamination
- Building
- Tentative Soil Boring
- Tentative Shallow Monitoring Well

Figure 14–2 TENTATIVE SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS, SITE 20 – PHASE I

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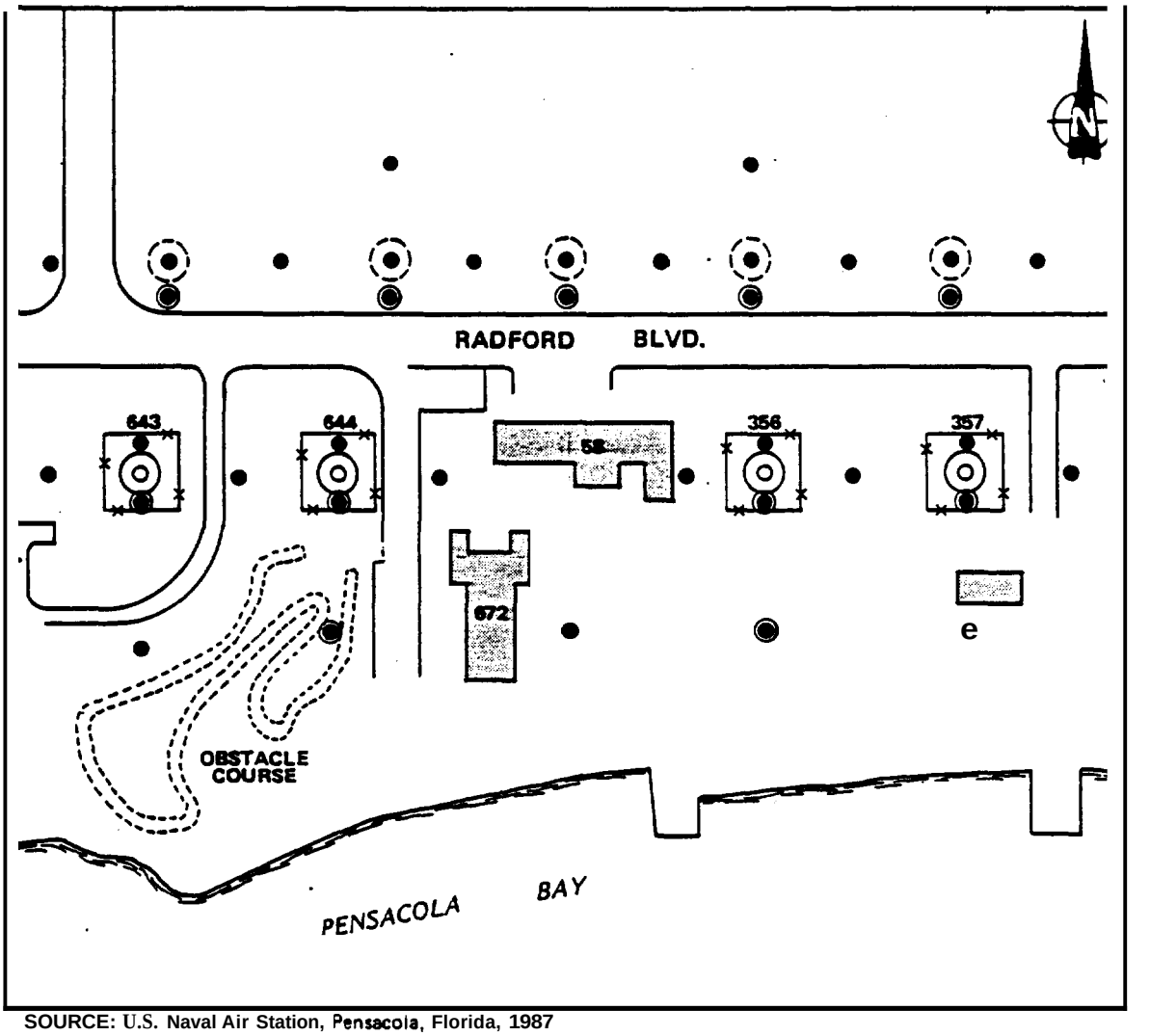

SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1987

SCALE

0 100 200 300 400 500 FEET

KEY:

Aboveground Fuel Storage Tank and Containment Wall

Former Aboveground Fuel Storage Tank and Containment Wall

Tentative Soil Boring

Tentative Temporary Monitoring Well

Figure 14–3 TENTATIVE SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS, SITE 21 – PHASE I

14.1.4 Eydrologic Assessment

The hydrogeologic assessment will consist of a well head elevation survey of all temporary monitoring wells installed in Phase I, and the measurement of static water levels in all wells. For the well head survey, one well head will be assigned an arbitrary elevation and all other recorded elevations will be referenced to this 'datum.

Hydrologic data collected during Phase I will be evaluated alongside geophysical and analytical screening data. Potential evidence of lateral contaminant migration in shallow groundvater will be assessed from these data. Conclusions drawn from these evaluations will 'form the basis for permanent monitoring well installations during Phase II and III.

'14.2 Phase II - Characterization

The primary objectives of the Phase II field investigation are as follows:

- 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;

Phase II characterization will consist of limited soil sampling, and the installation, development, and sampling of shallow monitoring wells. In addition, limited aquifer testing will be performed. This phase of the investigation is intended to characterize the concentrations of individual contaminant constituents within the most highly contaminated areas, as determined from the Phase I results.

The analytical requirements for Phase II samples are shown in Table *14-2*.

[Bold items enclosed in brackets denote *changes* from original text)

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TABLE 14-2

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS—GROUP K

SITE 7

Medium	No. of Samples	Dupli-cates	Trip Blanks'	Field Blanks	Rinsata Blanks	[Preservative Blanks[b]]	Total[e]	Analytical Suite[c,d]
Soil	30	3	2	[1]	2	[1]	39 (10)	A C
Groundwater	3	1	1	[NR]	1	[NR]	[6] (2)	A B
TOTAL	33	4	3	[1]	3	[1]	[45](12)	

SITE 20

Medium	No. of Samples	Dupli-cates	Trip Blanks[a]	Field Blanks	Rinsata Blanks	[Preservative Blanks[b]]	Total[e]	Analytical Suite[c,d]
Soil	15	2	[1]	111	[1]	[1]	[21] (6)	A C
Groundwater	3	1	[1]	[NR]	[1]	[NR]	[6] (2)	A B
TOTAL	18	3	[2]	[1]	[2]	[1]	[27](8)	

SITE 21

Medium	No. of Samples	Dupli-cater	Trip Blanks[a]	Field Blanks	Rinsata Blanks	[Preservative Blanks[b]]	Total[e]	Analytical Suite[c,d]
Soil	27	3	[2]	[1]	[2]	[1]	[36] (6)	A C
Groundwater	9	1	[1]	[NR]	[1]	[NR]	[12] [(2)]	A B
TOTAL	36	4	[3]	[1]	[3]	[1]	[48(8)]	

Table 14-2 (Cont.)

[a]Trip blanks will bo analyzed for Target Compound List (TCL) volatile organic compounds only.

[[b]Preservative blanks will be analyzed for TCL volatile organic compounds, total recoverable hydrocarbons, total TCL metals, and cyanide.]

[c]Analytical suite designations are as follows:

A = TCL volatile organic compounds plus xylene and ketones, TCL base/neutral and acid extractable organic compounds, TCL pesticides and PCBs, total recoverable hydrocarbons, TCL metals (total [i.e., unfiltered] and dissolved [i.e., millipore-filtered]), cyanide, total organic carbon. hardness (water only), and alkalinity (water only).

B = total suspended solids, total Kjeldahl nitrogen, amnia nitrogen, orthophosphate phosphorus, dissolved oxyqon (in field), 5-day biological oxygon demand (BOD_5), and chemical oxygon demand (COD).

C = pH, alkalinity, percent moisture, grain size, BTU content, ash contont. total 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 9-5 through 9-13 of the Generic Quality Assurance Project Plan.

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

[NR = Not required.]

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[During the Phase II investigation of Site 21, which 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 samples may be required depending on the extent of contamination detected.

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] Soil Sampling

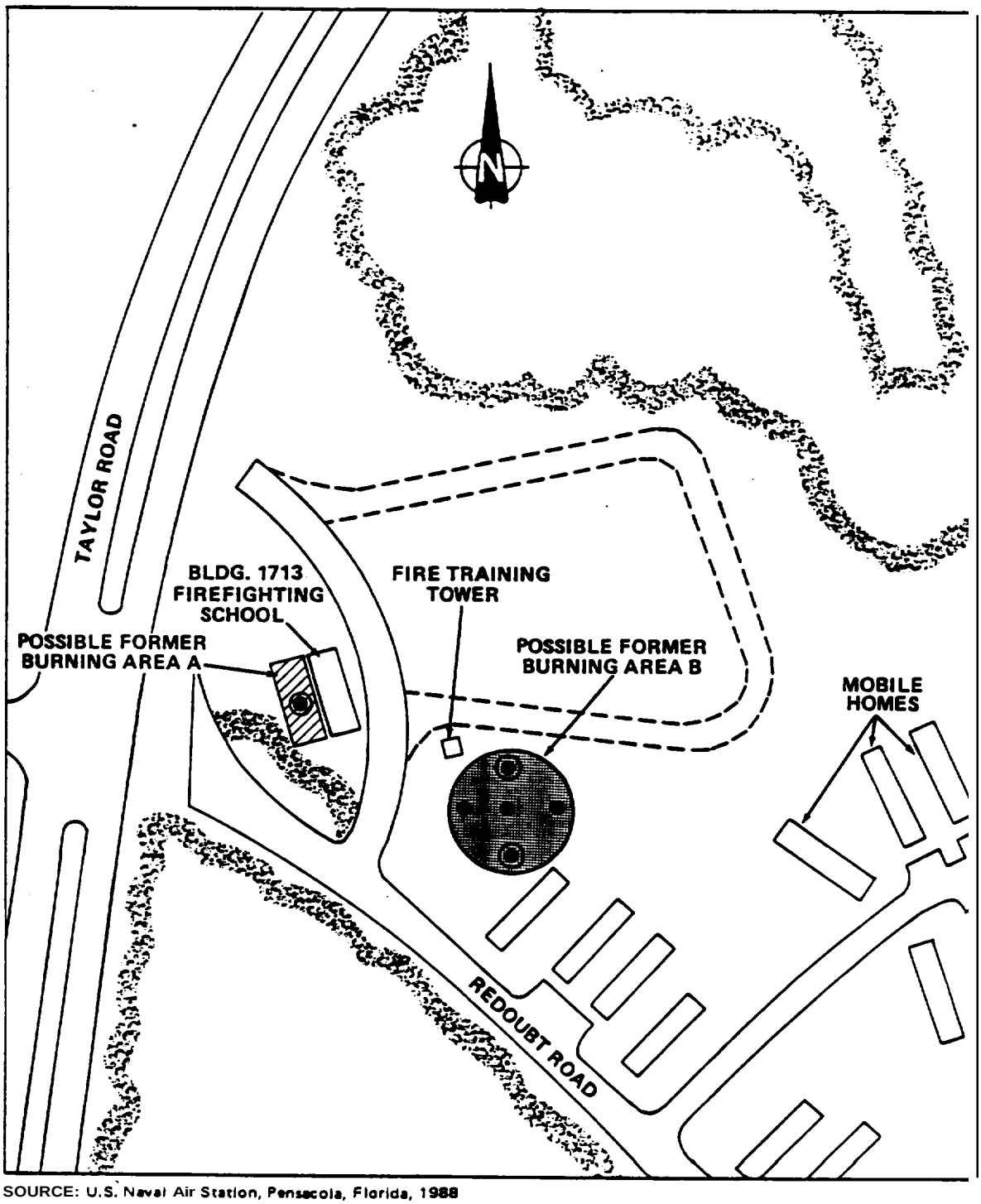
Soil samples will be collected as part of the shallow monitoring well installation (described below in Section 4.2.2), and from shallow soil borings at each of Sites 7, *20* and *21.*

At Site 7, it is tentatively planned that soil samples will be collected during the installation of three wells, and during three shallow borings for a total of six locations (shown on Figure *14-4).*

At Site 20, it is tentatively planned that soil samples will be collected during the installation of three shallow wells and two soil borings, for a total of five locations (shown on Figure *14-5).*

At Site 21, it is tentatively planned that soil samples will be collected from nine soil borings (shown on Figure 14-6).

Soil samples will be coliected using split-spoon samplers, when the effort is in conjunction with well drilling. All other soil borings which are made separate from the well installation activity, will be conducted using either the solid-stem auger extraction technique, or by manual hand auger techniques, as practical. The soil samples will be

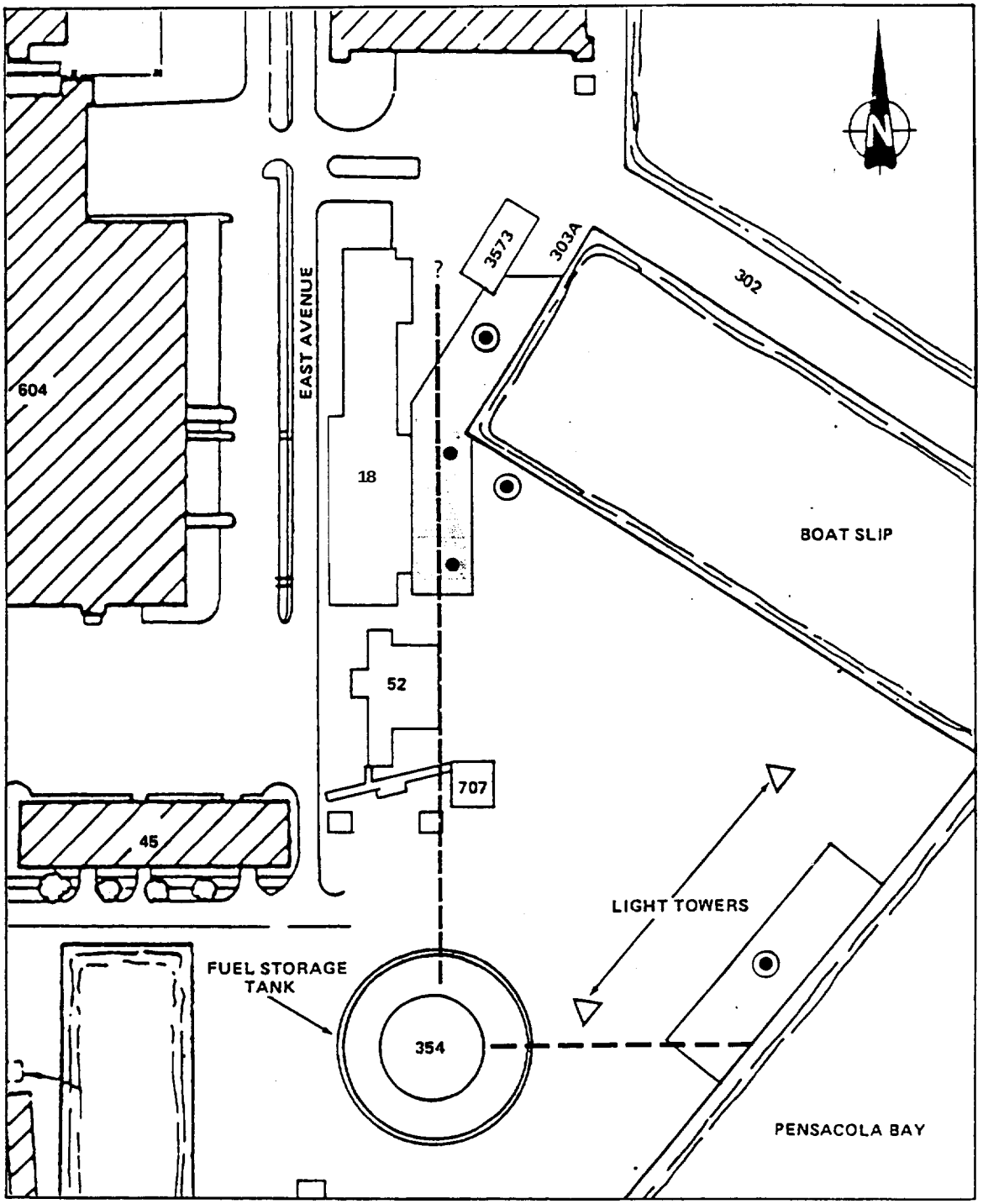


SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1988

SCALE
0 50 100 150 200 FEET

UEY:
● Tentative Soil Boring
◯ Tentative Shallow Monimring Well

Figure 14–4 TENTATIVE SOIL BORING AND SHALLOW MONITORING WELL LOCATIONS, SITE 7 – PHASE II



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

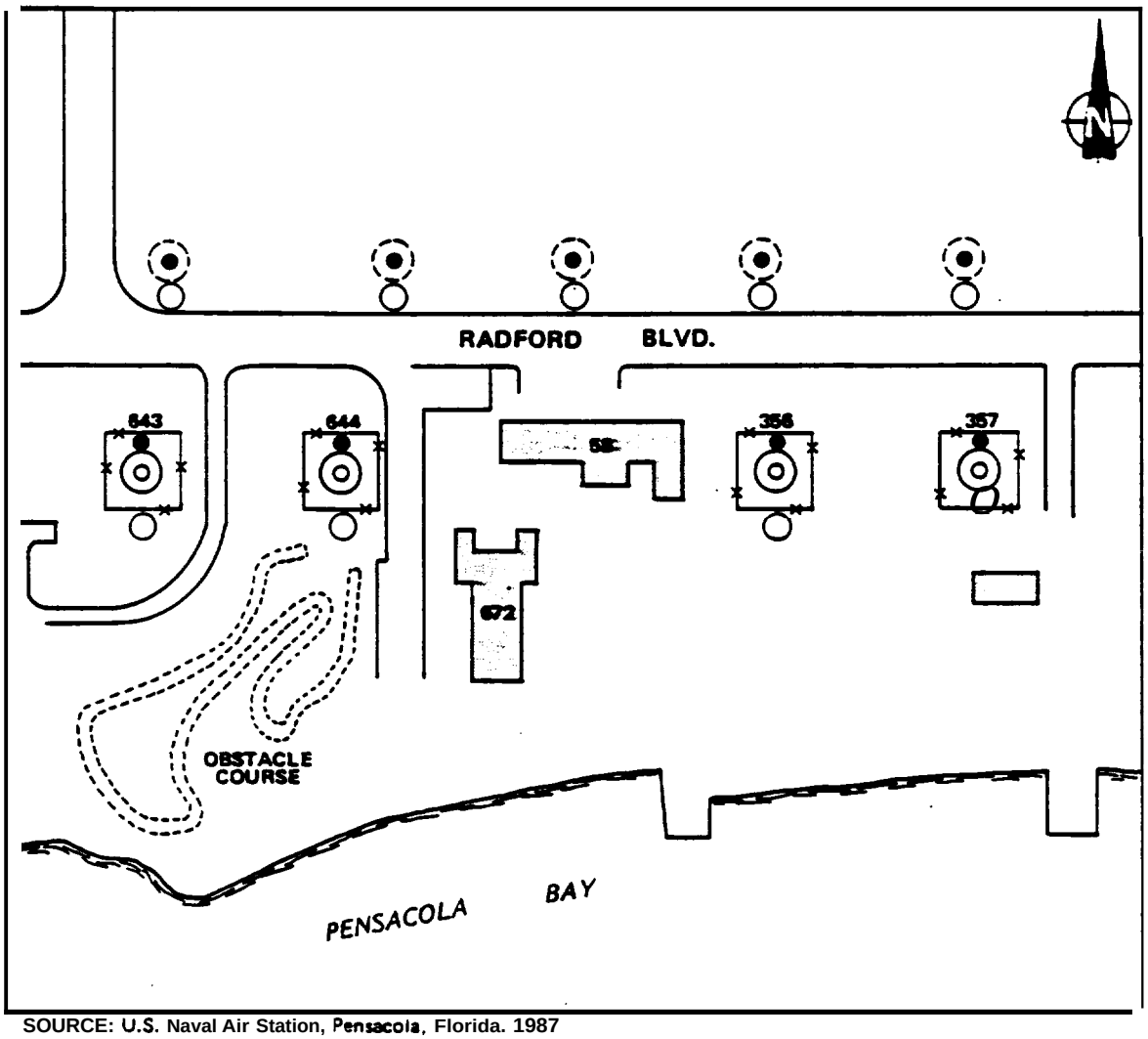
SCALE

0 100 200 400 FEET

KEY:

- Possible Fuel Pipeline
- Approximate Areas Of Previously Identified Potential Contamination
- Building
- Tentative Soil Boring
- Tentative Shallow Monitoring Well

Figure 14–5 TENTATIVE SOIL BORING AND-SHALLOW MONITORING WELL LOCATIONS, SITE 20 – PHASE II



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

SCALE

0 100 200 300 400 500 FEET

KEY:

- Aboveground Fuel Storage Tank and Containment Wall
- Former Aboveground Fuel Storage Tank and Containment Wall
- Tentative Soil Boring
- Tentative Shallow Monitoring Well

Figure 14–6 TENTATIVE SOIL BORING AND SHALLOW MONITORING WELL LOCATIONS, SITE 21 – PHASE II

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collected as composites from depth intervals of surface to 0.5 feet, 0.5 to 2.5 feet., and every 2.5-foot interval thereafter to a maximum depth of 10 feet or where water table conditions are encountered, whichever is less. Based on an assumption that water table occurs at a depth of 15 feet at Site 7, it is planned that 30 soil samples will be collected. Based on an assumption that water table occurs at a depth of 5 feet at Site 20, it is planned that 15 soil samples will be collected. Based on an assumption that water table occurs at a depth of 5 feet at Site 21, it is planned that 27 soil samples will be collected.

Each soil sample will be collected as a composite of the material retrieved from a depth interval. All sampling, compositing, and lithologic logging will be conducted in accordance with Section 6.6 of the GQAPP. Equipment decontamination will be conducted in accordance with GQAPP Section 6.10.

It is not anticipated that the above Phase II soil sampling plan will change appreciably, however, the findings of Phase I will ultimately determine Phase II information requirements and sampling strategies.

[14.2.3] Shallow **Monitoring Well** Installation and Development

The actual number and locations of monitoring wells to be installed in Phase II will be based on Phase I findings. For planning purposes, the number of permanent shallow monitoring wells to be installed at Sites 7 and 20 is three for each site. For Site 21, it is estimated that nine permanent shallow wells will be installed in Phase 11. All shallow wells will be of two-inch diameter PVC construction, and bracket the water table with 10 feet of .010-inch screen. Anticipated well depths at Sites 20 and 21 are 15 feet, and at Site 7 are 25 feet. The wells will be installed utilizing hollow-stem auger techniques, constructed, and developed in accordance with Section 6.7 of the GQAPP. Drilling equipment will be decontaminated in accordance with Section 6.10 of the GQAPP.

[Depending on the results obtained during Phase I, the delineation of the extent of shallow groundwater contamination may be possible during

[Bold items enclosed in brackets denote changes from original text]

Phase II by the installation of a few monitoring wells in addition to' the number proposed, When and where possible and/or practical, additional monitoring wells will be installed during Phase II in order to expedite the overall investigation schedule.]

[14.2.4] Groundwater Sampling

Groundwater samples will be collected from the three nev shallow monitoring wells at both Sites 7 and 20, and at the nine new shallow wells at Site 21. The purging and sampling of these wells will be in accordance with the GQAPP Section 6.8.' Equipment decontamination will be in accordance vith Section 6.10 of the GQAPP.

[14.2.5] Hydrologic Assessment

Well head elevations will be surveyed for all newly installed monitoring wells and water levels will be measured in all wells. At Sites 20 and 21 surface water staff gauges will be installed and monitored during the investigation and the elevations will be recorded.

Limited aquifer testing will be conducted on all newly installed and any existing monitoring wells. These will consist primarily of performing short-duration specific capacity test during development of newly installed monitoring wells. Specific capacity tests are particularly useful for deriving first estimates of aquifer hydraulic properties (i.e., hydraulic conductivity, transmissivity).

The advantages of conducting specific capacity test in conjunction with well development is that the test itself does not generate additional potentially contaminated water which requires disposal.

Physical and chemical aquifer data collected during Phase II will be evaluated to determine lateral contaminant migration characteristics. A plan for deep well installation will be developed based on the findings of Phases I and 11.

[Bold items enclosed in brackets denote changes from original text]

[14.2.6] Air Sampling

The need for formal air sampling will be based on the findings of the Phase I surface emissions survey [and particulate air sampling, and and Phase I shallow soil sampling.]

14.3 Phase III - Extent Delineation

Phase III tasks will be conducted based on the results of Phases I and 11. 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 toward further delineating the horizontal and vertical extents of contamination.

14.3.1 Biota Sampling

If deemed appropriate based on findings of Phases I and 11, [additional] biota sampling may be conducted in Phase 111. [However, as for Phase 11, a separate biological sampling plan will be prepared.]

14.3.2 Soil Sampling

Soil sampling will be conducted in conjunction with any new shallow, intermediate, and deep monitoring well installations.

14.3.3 Shallow Monitoring Well Installation and Development

Additional shallow monitoring wells may be required to further determine the horizontal extent of shallow groundwater contamination.

14.3.4 Intermediate and Deep Monitoring Well installation and Development

The installation of additional monitoring wells into deeper zones of the aquifer may be required in order to assess horizontal and vertical hydraulic gradients, aquifer physical characteristics, and vertical extent of contamination. The number of wells and their locations and depths are dependent upon Phase I and II findings.

[Bold items enclosed in brackets denote changes from original text]

14.3.5 Groundwater Sampling

All wells installed in Phase III will be sampled, and analytical requirements for the samples will be developed based on the results of previous phases. Monitoring wells installed prior to Phase III will be sampled as required.

14.3.6 Hydrologic Assessment

All wells installed during Phase III will require a well head survey to obtain top of casing 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 determine aquifer physical characteristic. [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, etc. 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.]

14.3.7 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:

- Soil Sampling;
- Shallow Monitoring Well Installation and Development;
- Intermediate and Deep Monitoring Well Installation and Development;
- Groundwater Sampling; and
- Hydrologic Assessment

[Bold items enclosed in brackets denote changes from original text]

14.5 Topographic Survey and Base Map

Following the completion of Phases III and IV, a topographic survey of the site areas will be conducted and a base map will be developed. Base map coverage, contour intervals, scale, and requirements for horizontal and vertical control will be established and approved by the Navy. The topographic base map will be developed for the requirements of remedial planning and will include the locations of surface features such as: roads, structures, nearby surface waters, monitoring wells, and above ground utilities. The location of subsurface utilities and drainage structures will be reflected on the base map as indicated on existing NAS Pensacola General Development and utilities maps, and/or as located during field investigations.

14.6 Field Quality Assurance/Quality Control

14.6'.1 Documentation

Field activities and sample management will entail certain strict documentation requirements as described in Section 7.0 of the GQAPP.

14.6.2 QA/QC Samples

Samples collected for laboratory analysis (both screening and non-screening) during all phases of fieldwork will require the preparation of field QA/QC samples as described in Section 6.12 of the GQAPP. The estimated numbers of required field QA/QC samples for Phases I and II are shown in Tables 14-1 and 14-2.

14.7 Decontamination and Waste Management Procedures

14.7.1 Decontamination Procedures

All equipment decontamination procedures for each site will be performed in accordance with Section 6.10 of the GQAPP.

[Bold items enclosed in brackets denote changes from original text]

14.7.2 Waste Management Ptocedures

All water generated during monitoring well purging and development activities on each site will be discharged onto the ground surface away from the well, or will be containerized, 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 the site or will be containerized, 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 containerized, labeled, and moved to a storage area on NAS Pensacola.

[bold items enclosed in brackets denote changes from original text)

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 Generic Quality Assurance Project Plan (GQAPP) and Generic Site Management Plan (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 QSMP.

[Bold items enclosed in brackets denote changes from original text]

16. GROUNDWATER MODELING

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

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

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 from the phases of fieldwork described above.

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: PLASM, a two-dimensional, finite-difference groundwater flow model; GWTRANS, a two-dimensional, finite-difference solute transport model; FEMWATER, a finite-element groundwater model; and FEMWASTE, a finite-element solute transport model.

[Bold items enclosed in brackets denote changes from original text]

17. TREATABILITY STUDY

As indicated in Table 14-2, 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 Table 14-2, 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.

[Bold items enclosed in brackets denote changes from original text]

ecology and environaont, inc.

SITE SAFETY PLAE

Version 988

A. GENERAL INFORMATION

Projoct Title: Site 21-Sludgo At Fuel Tanks Area

Projoct No.: UH1303

TDD/Pan No.:

Projoct Manager: John Barksdale

Project Dir.: Rick Rudy

Location(s): Sludge at Fuel Tanks Area - Near tho intersection of Duncan Road and Radford Boulevard

Prepared by: Hal Davis

Dato Prepared: 4-26-89

Approval by: Mary Miller MM

Dato Approved: 5-5-89

Site Safety Officer Review:

Dato Reviewed:

Scope/Objective of Work: Field Screening will include physical surveys, soil sampling, temporary well installation and groundwater sampling.

Proposed Dato of Field Activities: August 1989

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

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	[X]	Gas/Vapor	[X 1

Characteristic(s):

Flammable/ Ignitable	[X]	Volatile	[X]	Corrosive	[ ]	Acuto1y Toxic	[X]
Explosive	[ ]	Reactive	[ ]	Carcinogen	[X 1	Radioactive*	[1

Other:

Physical Hazards:

Overhead	[X]	Confined* Space	[ ]	Below Grade	[ ]	Trip/Fall	[X]
Puncture	[ ]	Burn	[ ]	cut	[1	Splash	[X]
Noise·	[X]	Other:	Four of t ▪ nine fue	tan 5 may still bo in use.			

Requires completion of additional form and special approval from the Corporate Health/Safety group. Contact RSC or HQ.

Site History/Description and Unusual Features (see Sampling Plan for detailed description): From tho 1940's through tho 1960's tank bottom sludges were removed from tho nine AVGAS aboveground storage tanks and disposed of in tho surrounding soils. Tho sludge was buried to an unknown depth.

Locations of Chemicals/Wastes: Contamination will probably bo found in surface and subsurface soils.

Estimated Volume of Chemicals/Wastes: 360 cubic yards

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

. . . . . .

C. — m a

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 - Aircraft, Automobile hazards;

2) Temporary Monitoring Well Installation - Aircraft, Automobile Hazards, Using portable drill rig:

3) Soil Sampling - Using portable drill rig;

4) Decontamination Procedures - Using solvents.

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Odor Description
Lead	0.05 ug/m3	Inhale,Ingst,Derm	vomit, diarrhea	N/A	N/A
Tetraethyl load	0.075 mg/m^3	Inh,Ing,Con,Derm	anxiety, nausea	—	musty odor
Isopropyl Alcohol	400 ppm	Inh, Dermal	drowsiness,head.	7.5-200 ppm	rubbing alcohol
Nitric Acid	2 ppm	" "	corrosive	0.3-1 ppm	acrid .
Gasoline	300 ppm	"	dizziness,CNS depr	0.005 ppm	aromatic

Note: Coqloto and attach a Hazard Evaluation Shoot for major known contaminant.

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D. SITE SAFETY WORK PLAN

Site Control: Attach map, use back of this page, or skmtch of site showing hot zona, contarination reduction, zona, mtc.

Perimeter identified? [yes] Site secured? [no 1

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

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

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

	A	B	C	D
Task 1				X
Task 2				X
Task 3				X
Task 4				X

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 (California-20%), unknown organic vapor (in breathing aono) >5 ppm, particulatms >_____ mg/m^3, other _____
- o Lovml 8: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapor6 (in breathing zone) >500 ppm, particulatms >_____ mg/m^3, othmr _____
- o Level A: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors >500 ppm, particulates >_____ mg/m^3, othmr _____

Air Monitoring (daily Calibration unless otherwise noted):

Contaminant of Interest	Type of Sample (area, personal)	Monitoring Equipment	Frequency of Sampling
VOC's	Area	OVA	Continuous
Radiation	Area	Mini-Rad	Continuous
Explosive Gases	Area	O_2/Explosimeter	Continuous

Decontamination Solutions and Procedures for Equipment, Sampling Gear, otc.:
Trisodium phosphate wash, tap watmr rinsm, isopropanol rinsm, distilled water rinse, isopropanol rinse, and final distilled watmr rinsm.

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 Procoduros, it Applicable: Decontamination will bo performed in a well-ventilated area upwind of tho sampling zone.

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

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 bo employed at all times during tioldwork activities. 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 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 vasto materials will bo double bagged, drummed, labeled and transported to a designated location for final disposal by tho Navy.

Sample Handling Procoduros Including Protective Wear:

During a11 handling of samples, a11 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 L 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).

E. EMERGENCY INFORMATION

(Use supplemental sheets, 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

lire 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, 1-803-743-0574

Site Contact NAS Pensacola Environental Coordinator, W. Dewayne Ray -- 904-452-4515

SITE RESOURCES

Site Emergency Evacuation Alarm Method N/A

ater Supply Source On-site

Telephone Location, lumber To be determined on-site

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) 370-8263 (24 hours)

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

3. Regional Office Contact .....M.Miller.... 656-2854 (home)
   877-1918 (office)

4. Office Manager.. .....R.Rudy..... 893-7245 (hone)

MEDTOX HOTLINE

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

   What to report:

   - State: "this is an emergency."
   - Tour 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 ordor until contact is made:

   a. 24 hour hotline - (716) 684-0940
   b. Corporate Safety Director - Paul Jonmaire - how # (716) 655-1260
   c. Assistant Corp. Safety Officer - Steven Sherman - home # 1716) 688-0084

EMERGENCY ROUTES

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

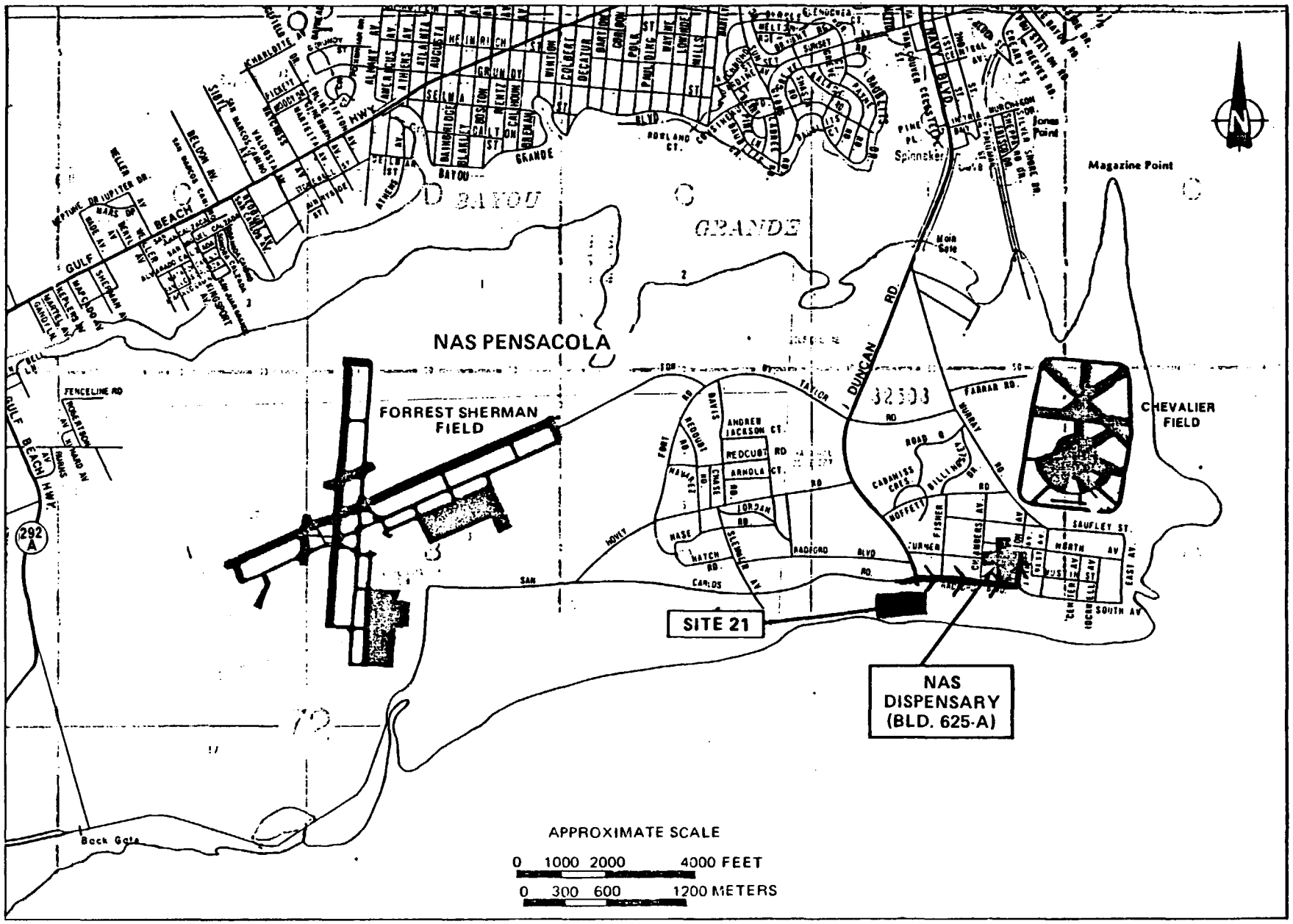
Directions to hospital (include map)

NAS Dispensary - Take radford Boulevard east to it's intorsoction with Cllyson Avenue. Turn left (north) on Ellyson Avenue and continuo to it's intersection with Turner Stroot. Tho NAS Dispensary is located on tho corner of tho intersection of Ellyson Avenue and Turner Stroot, in Building 625-A.

Baptist Hospital - Take Duncan Road (Navy Blvd.) north to exit tho base. Navy Blvd. becomes HWY 98 and curves to tho east. Follow Navy Blvd./Hwy. 98 oast approx. 3mi to Paco Blvd. Turn loft (north) on Paco 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-Site Emergency egress routes will bo located if emergency exit routes become blocked by construction, etc.

a


NAS PENSACOLA
FORREST SHERMAN FIELD
CHEVALIER FIELD
SITE 21
NAS DISPENSARY (BLD. 625-A)
Magazine Point
Jones Point
Spinnaker
Main Gate
Back Gate
BAYOU GRANDE
DUNCAN RD.
TAYLOR RD.
FARRAR RD.
HOVEY RD.
SAN CARLOS
RADFORD BLVD
GULF BEACH HWY.
FENCELINE RD
APPROXIMATE SCALE
0 1000 2000 4000 FEET
0 300 600 1200 METERS

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.
* Make 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 whsn 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.

ECOLOGY AND ENVIRONMENT, INC.,
STANDARD OPERATING PROCEDURES FOR EMERGENCIES DUE TO HEAT AND HEAT STRESS MONITORING

Field operations during the summer months can create a variety of hazards to the employee. Heat cramps, heat exhaustion. and heat stroke can be experienced and, If not remedied, can threaten life or health. Therefore, It Is important that all employees be able to recognize symptoms of these conditions and be capable a arresting the problem as quickly as possible.

THE EFFECTS OF HEAT

As the result of normal oxidation processes within the body, a predictable amount of heat is generated. If the heat Is liberated as It is formed, there Is no change In body temperature. If the heat is liberated 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 normal.

Interference with 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. When such a condition exists, it produces a vicious cycle In which certain body processes speed up and generate additional heat. Then the body must eliminate not only the normal but also the additional quantities of heat.

Heat produced within the body is brought to the surface largely by the bloodstream and 'escapes to the cooler surroundings by conduction and radiation. If air movement or a breeze strikes the body, additional heat is lost by convection. However, when 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 or sweat from the skin surface. As the air becomes more humid (contains more moisture), vaporization from the skin slows down. Thus, on a day when the temperature Is 95 to 100°F, with high humidity and little or no breeze, conditions are ideal for the retention of heat within the body. It is on such a day or, more commonly, a succession of such days [a heat wave) that medical emergencies due to heat are likely to occur. Such emergencies are classified in three categories; heat cramps, heat exhaurtion, and heat stroke.

HEAT CRAMPS

Heat cramps usually affect people who work in hot environments and perspire a great deal. Loss of salt from the body causes very painful cramps of the leg and abdominal muscles. Heat cramps also may result from drinking iced water or other drinks either too quickly or in too large a quantity.

<u>Heat Cramp Symptoms.</u> The symptoms of heat cramp are:,

- Muscle cramps in legs arid abdomen,
- Pain accompanying the cramps,
- Faintness, and
- Profuse perspiration.

Heat Cramp Emergency Care. Remove the patient to a cool place. Give him sips of liquids such as "Gatorade" or its equivalent. Apply manual pressure to the cramped muscle. Remove the patient to a hospital if there is any indication of a more serious problem.

HEAT EXHAUSTION

Heat exhaustion occurs in individuals working in hot environments, and may be associated with heat cramps. Heat exhaustion is caused by the pooling of blood in the vessels of the skin. The heat is transported from the interior of the body to the surface by the 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 lower extremities when an individual is in an upright position, may lead to an inadequate return of blood to the heart and eventually to physical collapse.

Heat Exhaustion Symptoms. The symptoms of heat exhaustion are:

- Weak pulse;
- Rapid and usually shallow breathing;
- Generalized weakness;
- Pale, clammy skin;
- Profuse perspiration;
- Dizziness;
- unconsciousness; and
- Appearance of having fainted (the patient responds to the same treatment administered in cases of fainting).

Heat Exhaustion Emergency Care. Remove the patient to a cool place and remove as much clothing as possible. Administer cool water, "Gatorade," or its equivalent. If possible, fan the patient continually to remove heat by convection, but do not allow chilling or overcooling. Treat the patient for shock, and remove him to a medical facility if there is any indication of a more serious problem.

HEAT STROKE

Heat stroke is a profound disturbance of the heat-regulating mechanism, associated with 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% mortality rate. Alcoholics are extremely susceptible.

Heat Stroke Symptoms. The symptoms of heat stroke are:

- Sudden onset;
- Dry, hot, and flushed skin;
- Dilated pupils:
- Early loss of consciousness;
- Full and fast pulse:
- Breathing deep at first, later shallow and even almost absent;
- Muscle twitching, growing into convulsions; and
- Body temperature reaching 105 to 106°F or higher.

Heat Stroke Emergency Care. Remember that this is a true emergency. Transportation to a medical facility should not be delayed. Remove the patient to a cool environment if possible, and remove as much clothing as possible. Assure an open airway. Reduce body temperature promptly--preferably by wrapping in a wet sheet or else by dousing the body with water. If cold packs are available, place them under the arms, around the neck, at the ankles, or at any place where blood vessels that lie close to the skin can be cooled. Protect the patient from injury during convulsions, especially from tongue biting.

AVOIDANCE OF HEAT-RELATED EMERGENCIES

Please note that, in the case of heat cramps or heat exhaustion, "Gatorade" or its equivalent is 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 system. Without these electrolytes, body systems cannot function properly, thereby increasing the represented health hazard. Therefore, when personnel are working in situations where the ambient temperatures and humidity are high--and especially in situations where protection Levels A, B, and C are required--the site safety officer must:

- Assure that all employees drink plenty of fluids ("Gatorade" or its equivalent):
- Assure that frequent breaks are scheduled so overheating does not occur; and
- 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).

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

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

One method of measuring the effectiveness of employees' rest-recovery regime is by monitoring the heart rate. The "Brouha guideline" is m e such method:

- o During a three-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.
- o 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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Material Safety Data

Emergency Phone Number: 314-982-5000

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Mallinckrodt, Inc., Science Products Division, P.O. Box M, Paris, KY 43061.

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.

RGEN(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 minutes. 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, acetadehyde, 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

0000116

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:
Maycause irritation of the nose and throat. Exposure to high concentrations h u a narcotic effect, producing symptoms of drowsiness, headache, staggering, unconsciousness and possibly death.

Ingestion:
May cause drowsiness, unconsciousness, and death. Gastrointestinal pain, cramps, nausea, vomiting, and diarrhea may also result. The single lethal dose for a human adult = about 250 mls (SAX Sixth Edition).

Skin Contact:
Has a defatting action of the skin that can cause irritation. May cause irritation with a stinging effect and burning sensation.

Eye Contact:
Vapors may irritate the eyes. Splashes may cause severe irritation, possible corneal burns and eye damage.

Chronic Exposure:
Prolonged contact with skin may cause mild irritation, drying, cracking, or contact dermatitis may develop.

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 *b* difficult, give oxygen. Call a physician.

Ingestion:
Give water to drink. Induce vomiting if medical help not is immcdirtely available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Exposure:
Remove any contaminated clothing. Wash skin with soap or mild detergent and water for at least 15 minutes. Get medical attention if irritation develops or persists.

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: 5840 mg/kg. Skin rabbit LD50: 13 gm/kg. Inhalation rat LC50: 16000 ppm/8H. Mutation references cited Aquatic Toxicity rating TLm96: 1000-10 ppm.

SECTION 6 Occupational Control Measures

Airborne Exposure Limits:
-OSHA Permissible Exposure Umit (PEL):
400 ppm (TWA).
-ACGIH Threshold Limit Value (TLV):
400 ppm (TWA); 500 ppm (STEL).

Ventilation System:
A system of local and/or general exhaust is recommended to kerp 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. lor details.

Personal Respirators: (NIOSH Approved)
If the TLV is exceeded 4 lull facepiece chemical cartridge respirator may be worn, in general, up to the maximum use concentration specified by the respirator supplier. 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

Protect against physical damage. Store in a cod, dry well-ventilated location, r m y from any area where thr fire hazard may k acute. Outside or detached storage is preferred. Separate from oxidizing materials. Containers should be bonded and grounded for transfers to avoid static sparks. Stomp and use areas should be No Smoking areas. Use non-sparking type tools and equipment.

Mallinckrodt
Material Safety Data

Emergency Phone Number: 314-982-5000

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

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

PRECAUTIONARY MEASURES

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 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: **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**

E x i

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 ordinance 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

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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.

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, 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.

Mallinckrodt
Material Safety Data

Emergency Phone Number: 314-982-5000

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

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): ca 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**

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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 burns 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):
1 mg/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 Gasoline Date 10-9-86

DOT Name/U.N. No. Flammable liquid UN1203 Job No. FP5000

CAS Number 8006-61-9

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Indor Hazardline Chris (Vol. II)

Toxic and Hazardous Safety Manual ACGIH Other: Sax

Chemical Properties: (Synonyms: Petrol, Motor spirits

Chemical Formula Mixture of hydrocarbons Molecular Weight

Physical State liquid Solubility (H_2O) insoluble Boiling Point 39-204°C

Flash Point -50°F Vapor Pressure/Density /3-4g/1 Freezing Point N/A

Specific Gravity greater than 1 Odor/Odor Threshold Flammable Limits 1.3-6%

Incompatabilities Strong oxidizers

Biological Properties:

TLV-TWA 300 ppm PEL Odor Characteristic aromatic

IDLH Human Aquatic Rat/Mouse

Rout8 of Exposure Inhalation, Dermal

Carcinogen X Teratogen Mutagen

Handling Recommendations: (Personal protcctivo measures)

Protective goggles, gloves, masks in heavy exposures to vapors.

Monitoring Recommendations:

Combustible gas O_2 meter-lined filter to prevent leaded gasoline from contaminating the elements, and HNU for air monitoring.

Disposal/Waste Treatment:

Health Hazards and first Aid:

Inhalation - remove to fresh air, administer O_2 if needed

Ingestion - use stomach wash followed by saline catharsis.

Symptoms: Acute: dizziness, unconsciouness, hyperemia, CNS depression

Chronic: Dermatitis, Pulmonary edema.

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HAZARD EVALUATION OF CHEMICALS

Chemical Name: Tetraethyl Lead Date: _____

DOT Name/U.N. No.: UN1649 Job No.: _____

Number: 78-002

References Consulted (circle):

NIOSH/OSHA Pocket Guide Verschueren Merck Index Hazardline Chris (Vol. II)

Toxic and Hazardous Safety Manual ACGIH Other: SAX

Chemical Properties: (Synonyms: TEL, anti-knock compound

Chemical Formula: $Pb[C_2H_5]_4$ Molecular Weight: 323

Physical State: liquid Solubility (H_2O): Insol. Boiling Point: 212°F

Flash Point: 200°F Vapor Pressure/Density: 0.2mm/1.659 Freezing Point: 12.3 mg/kg

Specific Gravity: _____ Odor/Odor Threshold: _____ Flammable Limits: _____

Incompatabilities: Strong oxidizers, sulfuryl chloride, potassium permanganate, heat

Biological Properties:

TLV-TWA: 0.075 mg/m^3 PEL: _____ Odor Characteristic: musty

IDLH: 40 mg/m^3 Human: _____ Aquatic: _____ Rat/House: 12.3 mg/Kg

Route of Exposure: Dermal, Inhalation, Ingestion, Ocular

Carcinogen: X Teratogen: _____ Mutagen: _____

Handling Recommendations: (Personal protective measures)

Avoid dermal contact and use APR with HEPA fiter for particulate concentration Greater than 0.1 mg/m^3

Monitoring Recommendations:

Soil samples, mini-rad for particulate monitoring

Disposal/Waste Treatment:

Dry chemical, CO, fine exstinguisher - will degrade to tri-ethyl lead, extremely toxic substance

Health Hazards and first Aid:

Extremely poisonous - Seek medical attention for significant contact.

Symptoms: Acute: hypotension, hypothermia, pallor, nausea, halucinations, convulsions, coma, eye irritation

Chronic: Insomia, tremors, heart irregulatities.

LEAD (Metallic and Inorganic Compounds)

The information in this sheet applies to workplace exposure resultinq from processing, manufacturing, rtorinq or handling and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrial hygiene practice is to maintain concentrations of all chemicals at levels as low aa is practical.

Chemical Names: Lead, CAS 7439-92-1; lead carbonate, CAS 598-63-0; lead chloride, CAS 7758-95-4; lead monoxide, CAS 1317-36-8; lead sulfide. CAS 1314-87-0; and others.

Trade Names: C.I. Pigment Metal 4, CI 77575, Lead flake. Whole lead, Litharge and others.

Uses: Tank linings, piping and other chemical reaction equipment; petroleum refininq; manufacture of gasoline additives; pigments for paint; storage batteries, solder and fusible alloys; radiation shielding. and others.

PHYSICAL INFORMATION

Appearance: Bluish white to silvery grey solid (lead metal).

Odor: None.

Behavior in Water: Insoluble.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 0.05 mg/m^3 (lead).

NIOSH Recommended Limit: Average 10 hour day or 40 hour week exposure -- 0.1 mg/m^3 (lead).

ACGIH Recommended Limit: Average 8 hour exposure -- 0.15 mg/m^3 (lead).

Note: Blood-lead level is a good indicator of total lead exposure. Current OSHA regulations require that if an individual has a blood-lead level greater than or equal to .050 mg lead per 100 ml, blood, he or she must be removed from all exposures to lead and cannot return to the exposure environment until the blood level falls to .040 mg lead per 100 ml. blood or less.

Short Term Exposure:

Note: Lead is a cumulative poison. Increasing amounts can build up in the body eventually reaching a point where symptoms and disability occur. Lead dust carried home on contaminated clothing can result in exposure and symptoms in other family members. Standards only protect for inhalation exposure. Extra precautions should be taken if skin exposure also occurs.

Inhalation: The effects of exposure to fumes and dusts of inorganic lead may not develop quickly. Symptoms may include decreased physical tithess, fatique, sleep disturbance, headache, achinq bones, and muscles, constipation, abdominal pains and decreased appetite. These effects are reported to be reversible if exposure ceases. Inhalation of large amounts of lead may lead to seizures, coma and death.

Skin: May cause irritiation.

Eyes: nay cause irritation.

Ingestion: See effects listed for inhalation. Ingestion of large amounts of lead may lead to seizures, coma and death,

Long Term Exposure:

Lead can accumulate in the body over a period of time. Therefore, lonq term exposures to lower levels can result in a build up of lead in the body and more severe symptoms. These may include anemia, pale skin. a blue line at the gum margin, decreased hand-grip strength, abdominal pain, severe constipation, nausea, vomiting, and paralysis of the wrist joint. Prolonged exposure may also result in kidney damage. If the nervous system is affected. usually due to very hiqh exposures, the resulting effects include severe headache, convulsions, coma, delirium and .death, In non-fatal cases, recovery is slow and not always complete. Alcohol ingestion and physical exertion nay bring on symptoms. Continuous exposure can result in decreased fertility. Elevated lead exposure of either parent before pregnancy can increase the chances of miscarriage or birth defects. Exposure of the mother during pregnancy can cause birth defects.

*Prepared by the Bureau of Toxic Substance Assessment, New York State Department of Health. For an explanation of the terms and abbreviations used, see 'Toxic Substances: Bow Toxic is Toxic. available from the New York State Department of Health.

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Move person to fresh air. Give artificial respiration as needed. Get medical attention immediately.

Skin: Wash area with plenty of soap and water. Remove any contaminated clothing.

Eyes: Rinse eyes with plenty of water for 15 minutes. Seek medical attention, if necessary.

Ingestion: If person is conscious, give water. Seek medical attention.

Note to Physician: Whole blood lead levels, circulating plasma/erythrocyte lead concentration ratio, urine ALA, and erythrocyte protoporphyrin fluorescent microscopy may all be useful in monitoring or assessing lead exposure. Chelating agents such as edetate disodium calcium and penicillamine are generally useful in the therapy of acute lead intoxification.

FIRE AND EXPLOSION INFORMATION

General: Not combustible. If exposed to fire, may release toxic fumes or sulfur and lead oxides.

Extinguisher: Use extinguisher appropriate to burning material. When fighting fire, wear a self-contained breathing apparatus with a full facepiece and operated in positive pressure mode.

REACTIVITY

Materials to Avoid: Reacts violently with potassium.

Conditions to Avoid: Excessive heat.

PROTECTIVE MEASURES

Storage and Handling: Store in an area away from heat and keep separate from potassium.

Engineering Controls: Adequate ventilation, sinks, showers and eyewash stations should be provided.

Protective Clothing (Should not be substituted for proper handling and engineering controls): Full body work clothing should be worn including bump caps or hard hats, rubber gloves, and eye protection. Employees should routinely wash their skin thoroughly and change clothing at the end of each work shift.

Protective Equipment: For levels up to 0.5 mg/m^3 use a supplied-air respirator, a self-contained breathing apparatus or an air-purifying respirator with high-efficiency particulate filter. For levels up to 1.25 mg/m^3 use a supplied-air respirator operated in continuous flow mode or a powered air-purifying respirator with high efficiency particulate filters. For levels up to 2.5 mg/m^3 use any of the above with a full facepiece. For levels up to 50 mg/m^3 use a Type C supplied-air respirator operated in a positive pressure mode. For levels up to 100 mg/m^3 use a Type C supplied-air respirator with a full facepiece operated in a positive pressure mode. For levels greater than 100 mg/m^3 or in areas of unknown concentrations use a self-contained breathing apparatus with full facepiece operated in a positive-pressure mode or a combination Type C supplied-air respirator with an auxiliary self-contained breathing apparatus, both with a full facepiece and operated in a positive pressure mode. For escape from a contaminated area use a respirator with high-efficiency particulate filters or an escape self-contained breathing apparatus.

Miscellaneous: No eating, drinking, or smoking in areas where the dusts or fumes of lead or its compounds are present.

PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of spill area. Put on necessary protective equipment including respirators. If spill is a solution cover with absorbent and shovel into suitable container. If Spill is in powder form, vacuum whenever possible to avoid raising dust by sweeping or blowing. Place in suitable container. For final disposal contact your regional office of the New York State Department of Environmental Conservation.

For more information:
Contact the Industrial Hygienist or Safety Officer at your worksite or the New York State Department of Health, Bureau of Toxic Substance Assessment, 2 University Place, Albany, New York 12203.

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APPENDIX B

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN

[Bold items enclosed in brackets denote changes from original text]

Section 1.0 -- Title Page

Work Plan Group: K
Site No.: 7
Site Name: Firefighting School Area

Prepared by: Mary L. Hiller
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Prepared for: Department of the Navy
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T. Yeates/R. Short

E & E ASC Director: A. Clifton
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E & E QA/QC Project Officer: Andrew Schuessler
A. Schuessler

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Section 3.0 -- Project Summary

Work Plan Group: K

Site No.: 7

Site Name: Pirefighting School 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):

- X Electromagnetic Conductivity:
  - X EM-31 ___ *En-34*
- X Magnetometry
- ___ Very Low Frequency
- ___ Ground Penetrating Radar
- ___ Seismic Refraction
- ___ Seismic Reflection

Analytical Screening (check all that apply):

- ___ Field Analyses:
- X Soil Headspace Analyses: Planned Number of Samples 110
- ___ 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 Eydrocarbons
Soil	39	X Phenols
Groundwater	3	___ Organophosphorus Pesticides
Duplicates	3	___ Chlorinated Herbicides
Trip Blanks	___	___ Carbamates
Field Blanks	___	X Pesticides/Polychlorinated Biphenyls
Rinsate Blanks	___	X Total Recoverable Hydrocarbons
Other	___	X Metals
		___ Gross Alpha

Section 3.0 -- Project Summary (Continued)

Phase II -- Characterization

PLANNED NUMBER OF SAMPLES

Surface Water	___	Air	___	Duplicates	4
Sediment	___	Biota:		Trip Blanks	3
Soil	30	Flora	___	Field Blanks	3
Groundwater	3	Fauna	___	Rinsate Blanks	3

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 Hydrocarbons
- X Metals
- X Cyanide

Additional analytical categories are identified below:

- ___ Gross Alpha
- 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 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 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.

*

Laboratory Screening Analyses						
Volatile Organic Compounds	S/W	--	N/M	N/M	N/M	N/M
Polynuclear Aromatic Hydrocarbons	S/W	--	N/M	N/M	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 Hydrocarbons	S/W	EPA 418.1				
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/M	N/M	N/M
Laboratory Analyses						
Volatile Halogenated Hydrocarbons	S/W	EPA 8010/601	N/M	N/M	N/M	N/M
Volatile Aromatic Hydrocarbons	S/W	EPA 8020/602	N/M	N/M	N/M	N/M
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 Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/M
TCL Metals:						
Aluminum	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Arsenic	S/W	EPA 70601206.2	N/M	N/M	N/M	N/M
Barium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Beryllium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Boron	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cadmium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Calcium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Chromium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cobalt	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Copper	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Iron	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Lead	S/W	EPA 7421/239.2	N/M	N/M	N/M	N/M
Magnesium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Manganese	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Mercury	S/W	EPA 7471/245.1	N/M	N/M	N/M	N/M

Analyte	Media	Method No.	A	P	C	DL
Nickel	S/W	EPA 6010/200.7	N/H	N/H	N/M	N/H
Selenium	S/W	EPA 77401270.2	N/H	N/M	N/M	N/H
Silver	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/H
Sodium	S/W	EPA 6010/200.7	N/H	N/M	N/M	N/H
Thallium	S/W	EPA 7841/279.2	N/M	N/H	N/M	N/M
Vanadium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/H
Zinc	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/H
Cyanide	S/W	EPA 9010/335.2	N/H	N/H	N/M	N/M
TOC	S/W	EPA 9060/415.1	N/A	N/H	N/H	N/M
fiardness	W	EPA 130.2	N/H	N/H	N/M	N/H
Alkalinity	W	EPA 310.1	N/H	N/H	N/H	N/M
Total Suspended Solids	W	EPA 160.2	N/H	N/H	N/M	N/M
Total Kjeldahl Nitrogen	S/W	EPA 351.3	N/M	N/H	N/M	N/H
Nitrogen-Ammonia	S/W	EPA 350.2	N/H	N/H	N/H	N/H
Orthophosphate Phosphorus	S/W	EPA 365.2	N/M	N/M	N/M	N/M
5-day Biological Oxygen Demand	W	SH 507	N/M	N/H	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/M	N/M
Percent Moisture	S	ASTH D-2216-80	N/H	N/M	N/M	N/M
Grain Size	S	ASTH D-422-63	N/H	N/M	N/M	N/H
BTU Content	S	ASTH D-2015-77	N/H	N/M	N/M	N/M
Ash Content	S	ASTH D-482	N/M	N/H	N/M	N/M
Total Halogens	S	ASTH D-808-81	N/H	N/M	N/M	N/M
		EPA 325.3	N/H	N/M	N/M	N/M
Sulfur	S	ASTH D-129-64	N/H	N/M	N/M	N/M
Ignitability	S/W	EPA 1010	N/H	N/H	N/H	N/M
Cation Exchange Capacity	S	EPA 9081	N/H	N/H	N/M	N/M
Field Parameters						
pH	W	Field	N/H	N/H	N/M	N/H
Specific Conductance	W	Field	N/M	N/H	N/M	N/H
Temperature	W	Field	N/H	N/M	N/M	N/H
Dissolved Oxygen	W	EPA 360.1	N/H	N/M	N/M	N/H

Notes: S = Soil and/or sediment
W = Groundwater and/or surface water
N/M = No Modifications from GQAPP

* With the exception of Total Recoverable Eydrocarbons and Gross Alpha, the laboratory screening analyses do not have EPA method numbers.

Section 6.0 -- Fieldwork and Sampling Procedures

Fieldwork and sampling procedures are presented in Section 6.0 of the GQAPP. Modifications to these procedures are described below:

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 below:

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 below:

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 below:

No Modifications

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 GQAPP. 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 GQAPP: 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

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: K
Site No.: 20
Site Name: Pier Pipe Leak Area

Prepared by: Mary L. Miller
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 QA/QC Director or
Assistant QA/QC Director: Russell Short
T. Yeates/R. Short

E & E ASC Director: A. Clifton

E & E QA/QC Project Officer: Andrea Schuessler
A. Schuessler

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Section 3.0 -- Project Summary

Work Plan Group: K

Site No.: 20

Site Name: Pier Pipe Leak 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:
  - ___ EM-31 ___ EM-34
- ___ Magnetometry
- ___ Very Low Frequency
- ___ Ground Penetrating Radar
- ___ Seismic Refraction
- ___ Seismic Reflection

Analytical Screening (check all that apply):

- ___ Field Analyses:
- X Soil Headspace Analyses: Planned Number of Samples 100
- ___ 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	20	X Phenols
Groundwater	7	___ Organophosphorus Pesticides
Duplicates	2	___ Chlorinated Herbicides
Trip Blanks	___	___ Carbamates
Field Blanks	___	X Pesticides/Polychlorinated Biphenyls
Rinsate Blanks	___	X Total Recoverable Hydrocarbons
Other	___	X Metals
		___ Gross Alpha

Section 3.0 -- Project Summary (Continued)

Phase II -- Characterization

PLANNED NUMBER OF SAMPLES

Surface Water	___	Air	___	Duplicates	3
Sediment	___	Biota:		Trip Blanks	2
Soil	15	Flora	___	Field Blanks	2
Groundwater	3	Fauna	___	Rinsate Blanks	2

CATEGORIES OF ANALYSES

- X Purgeable Aromatics
- X Purgeable Halocarbons
- X Base/Neutral Extractables
- X Acid Extractables
- ___ Polynuclear Aromatic Bydrocarbons
- X Pesticides
- X Polychlorinated Biphenyls
- X Total Recoverable Bydrocarbons
- X Hetals
- X Cyanide

Additional analytical categories are identified below:

- ___ Gross Alpha
- 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 Balogens
- 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 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/H	N/M	N/M	N/M
Pesticides	S/W	--	N/H	N/M	N/M	N/M
Polychlorinated Biphenyls	S/W	--	N/M	N/M	N/M	N/M
Total Recoverable Hydrocarbons	S/W	EPA 418.1				
Phenols	S/W	--	N/H	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/M	N/M	N/M
Laboratory Analyses						
Volatile Ealogenated Hydrocarbons	S/W	EPA 8010/601	N/M	N/M	N/M	N/M
Volatile Aromatic Hydrocarbons	S/W	EPA 8020/602	N/M	N/M	N/M	N/M
TCL Purgeables + xylene	S/W	EPA 8240/624	N/M	N/H	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 Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/M
TCL Metals:						
Aluminum	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Arsenic	S/W	EPA 7060/206.2	N/M	N/M	N/M	N/M
Barium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Beryllium.	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Boron	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cadmium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Calcium	S/W	EPA 6010/200.7	N/M	N/M	N/H	N/M
Chromium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cobalt	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Copper	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Iron	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Lead	S/W	EPA 7421/239.2	N/M	N/M	N/M	N/M
Magnesium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Manganese	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Mercury	S/W	EPA 7471/245.1	N/M	N/M	N/M	N/M

Analyte	Media	Method No.	A	P	C	DL
Nickel	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Selenium	S/W	EPA 7740/270.2	N/M	N/M	N/M	N/M
Silver	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Sodium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Thallium	S/W	EPA 7841/279.2	N/M	N/M	N/M	N/M
Vanadium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Zinc	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cyanide	S/W	EPA 9010/335.2	N/M	N/M	N/M	N/M
TOC	S/W	EPA 9060/415.1	N/M	N/M	N/M	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/M	N/M
Orthophosphate Phosphorus	S/W	EPA 365.2	N/M	N/M	N/M	N/M
5-day Biological Oxygen Demand	W	SM 507	N/M	N/M	N/M	N/M
Chemical Oxygen Demand	W	EPA 410.4	N/M	N/M	N/M	N/M
pH	W	EPA 150.1	N/M	N/M	N/M	N/M
Percent Moisture	S	ASTM D-2216-80	N/M	N/M	N/M	N/M
Grain Size	S	ASTM D-422-63	N/M	N/M	N/M	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/M
Total Halogens	S	ASTM D-808-81	N/M	N/M	N/M	N/M
		EPA 325.3	N/M	N/M	N/M	N/M
Sulfur	S	ASTM 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	N/M	N/M	N/M	N/M
<u>Field Parameters</u>						
pH	W	Field	N/M	N/M	N/M	N/M
Specific Conductance	W	Field	N/M	N/M	N/M	N/M
Temperature	W	Field	N/M	N/M	N/M	N/M
Dissolved Oxygen	W	EPA 360.1	N/M	N/M	N/M	N/M

Notes: S = Soil and/or sediment
W = Groundwater and/or surface water
N/M = No Modifications from GQAPP

* With the exception of Total Recoverable Hydrocarbons and Gross Alpha, the laboratory screening analyses do not have EPA method numbers.

Section 6.0 -- Fieldwork and Sampling Procedures

Fieldwork 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. Hodifications 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 below:

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 below:

No Modifications

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 GQAPP. 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 GQAPP. 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 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 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. Hodifications 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 GQAPP. Modifications to these procedures are described below:

No Modifications

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: K
Site No.: 21
Site Name: Sludge at Puel Tanks Area

Prepared by: Mary L. Miller
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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 QA/QC Director or
Assistant QA/QC Director: Russell Short
T. Yeates/R. Short

E 6 E ASC Director: RCC
A. Clifton

E 6 E QA/QC Project Officer: Andrew Schuessler
A. Schuessler

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Section 3.0 -- Project Summary

Work Plan Group: K

Site No.: 21

Site Name: Sludge at Fuel Tanks 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):

- X Electromagnetic Conductivity:
  - X EM-31 ___ *En-34*
- X Magnetometry
- ___ Very Low Frequency
- ___ Ground Penetrating Radar
- ___ Seismic Refraction
- ___ Seismic Reflection

Analytical Screening (check all that apply):

- ___ Field Analyses:
- X Soil Headspace Analyses: Planned Number of Samples 100
- ___ 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	37	X Phenols
Groundwater	11	___ Organophosphorus Pesticides
Duplicates	3	___ Chlorinated Eerbicides
Trip Blanks	___	___ Carbamates
Field Blanks	___	X Pesticides/Polychlorinated Biphenyls
Rinsate Blanks	___	X Total Recoverable Eydrocarbons
Other	___	X Metals
		___ Gross Alpha

Section 3.0 -- Project *Summary* (Continued)

Phase II -- Characterization

PLANNED NUMBER OF SAMPLES

Surface Water	___	Air	___	Duplicates	4
Sediment	___	Biota:		Trip Blanks	3
Soil	27	Flora	___	Field Blanks	3
Groundwater	9	Fauna	___	Rinsate Blanks	3

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 Hydrocarbons
- X Metals.
- X Cyanide

Additional analytical categories are identified below:

- ___ Gross Alpha
- 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 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 listed below:

Site Manager:
Team/Task Leader(s): To Be Determined
Field Support Personnel:

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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/M	N/M	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 Hydrocarbons	S/W	EPA 418.1				
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/M	N/M	N/M
Laboratory Analyses						
Volatile Halogenated Hydrocarbons	S/W	EPA 8010/601	N/M	N/M	N/M	N/M
Volatile Aromatic Hydrocarbons	S/W	EPA 8020/602	N/M	N/M	N/M	N/M
TCL Purgeables + xylenes	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 Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/M
TCL Metals:						
Aluminum	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Arsenic	S/W	EPA 7060/206.2	N/M	N/M	N/M	N/M
Barium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Beryllium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Boron	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cadmium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Calcium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Chromium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cobalt	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/H
Copper	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Iron	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Lead	S/W	EPA 7421/239.2	N/M	N/M	N/M	N/M
Magnesium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Manganese	S/W	EPA 6010/200.7	N/M	N/H	N/M	N/M
Mercury	S/W	EPA 7471/245.1	N/M	N/H	N/M	N/M

Analyte	Media	Method No.	A	P	C	DL
Nickel	S/W	EPA 6010/200.7	N/M	N/M	N/H	N/M
Selenium	S/W	EPA 7740/270.2	N/M	N/M	N/M	N/M
Silver	S/W	EPA 6010/200.7	N/M	N/H	N/M	N/M
Sodium	S/W	EPA 6010/200.7	N/M	N/M	N/H	N/H
Thallium	S/W	EPA 78411279.2	N/M	N/M	N/M	N/M
Vanadium	S/W	EPA 6010/200.7	N/H	N/M	N/M	N/M
Zinc	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cyanide	S/W	EPA 9010/335.2	N/M	N/M	N/M	N/M
TOC	S/W	EPA 9060/415.1	N/M	N/M	N/H	N/H
Hardness	W	EPA 130.2	N/M	N/M	N/H	N/H
Alkalinity	W	EPA 310.1	N/M	N/M	N/H	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/H	N/H	N/H	N/M
Nitrogen-Ammonia	S/W	EPA 350.2	N/H	N/M	N/M	N/H
Orthophosphate Phosphorus	S/W	EPA 365.2	N/H	N/M	N/M	N/H
5-day Biological Oxygen Demand	W	SM 507	N/M	N/H	N/H	N/H
Chemical Oxygen Demand	W	EPA 410.4	N/M	N/M	N/M	N/H
pH	W	EPA 150.1	N/H	N/M	N/H	N/M
Percent Moisture	S	ASTH D-2216-80	N/H	N/H	N/H	N/[illegible]
Grain Size	S	ASIH D-422-63	N/M	N/M	N/M	N/M
BTU Content	S	ASIH D-2015-77	N/M	N/M	N/M	N/M
Ash Content	S	ASIH D-482	N/M	N/M	N/M	N/H
Total Ealogens	S	ASIH D-808-81	N/H	N/M	N/H	N/M
		EPA 325.3	N/M	N/M	N/M	N/H
Sulfur	S	ASIH D-129-64	N/M	N/M	N/H	N/M
Ignitability	S/W	EPA 1010	N/M	N/H	N/H	N/H
Cation Exchange Capacity	S	EPA 9081	N/M	N/H	N/M	N/M
Field Parameters						
pH	W	Field	N/M	N/H	N/H	N/M
Specific Conductance	V	Field	N/M	N/H	N/M	N/H
Temperature	W	Field	N/M	N/H	N/H	N/M
Dissolved Oxygen	W	EPA 360.1	N/M	N/H	N/M	N/H

Notes: S = Soil and/or sediment
W = Groundwater and/or surface water
N/M = No Modifications from GQAPP

*
With the exception of Total Recoverable Hydrocarbons and Gross Alpha, the laboratory screening analyses do not have EPA method numbers.

Section 6.0 -- Fieldwork and Sampling Procedures

Fieldwork and sampling procedures are presented in Section 6.0 of the GQAPP. Modifications to these procedures are described below:

No Hodifications

Section 7.0 — Sample Custody

Sample custody procedures are presented in Section 7.0 of the GQAPP. Modifications to these procedures are described below:

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 below:

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 below:

No Modifications

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 GQAPP. 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 GQAPP. 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

Appendix A — Additional Personnel Biographies

Personnel assigned to this site investigation whose biographies do not appear in the GOAPP are listed below; 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 from original text]

APPENDIX C

THREATENED AND ENDANGERED FLORA AND FAUNA OBSERVED OR LIKELY TO OCCUR WITHIN THE NAS PENSACOLA FACILITY OR NEARBY

Scientific Name	Common Mar	Base * statu.	statu. FGFWFC(or FDA)	USFWS	Habitat
FISHES					
Acipenser oryrhynchus	Atlantic sturgeon	M	SSC	UR 2	Gulf coast, estuarine
Ammocrypta asprella	Crystal darter	U	T	UR 2	Fresh wator
Etheostoma histrio	Harelquin 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 water
Moxostoma carinatum	River redhorse	U	SSC		Crash water
AMPHIBIANS AND REPTILES					
Alligator mississippiensis	American Alligator	R	SSC	T(S/A)	Swamps, marshes, ponds
Caretta caretta caratta	Loggerhead turtlo	M ?	T	T	Marine, coastal
Chelonia mydas mydas	Green turtle	M ?	E	e	Marine, coastal
Dermochelys coriacea	Leatherback turtlo	M	E	E	Marine, coastal
Drymarchon corais couperi	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 turtle	U	SSC		Swamps, streams, marshes, ponds
Lepidochelys kempi	Atlantic ridley	M ?	E	e	Marina, coastal
Rana areolata aesopus	Florida gopher frog	P	SSC	UR 2	Sand hill communities
Macroclemys temmincki	Alligator snapping turtlo	SR	SSC	UR 2	Swamps, marshes, ponds
MAMMALS					
Mustela vison lutensis	Florida mink	U		UR 2	Terrestrial habitats
Peromyscus polionotus trissyllepsis	Perdido Koy beach mouse	N/A	T	E	Beach dunes
Trichechus manatus latirostris	West Indian manatee	M	E	E	Atlantic and Gulf coasts
Ursus americanus floridanus	Florida black boar	N/A	T	UR 2	Titi swamps

Appendix C (Cont).

Scientific Name	Common Name	Base * Status	Status FGFWFC(or FDA)	Status USFWS	Habitat
BIRDS					
Charadrius relodus	Piping Plover	P	T	T	Open dry, sandy beaches
Charadrius alexandrinus	Snowy plover	P	T	u R 2	Open dry, sandy beaches
Dendroida dorinica stoddardi	Stoddard's yellow-throatod warbler	P-u		u R 2	Wooded habitats
Dendroica kirtlandii	Kirtland's warbler	U	E	E	Wooded habitats
Haematopus palliatus	American oystercatcher	U	SSC		Coastal habitats
Egretta rufescens	Reddish egret	P-U	SSC	u R 2	Freshwater/coastal wetlands
Egretta caerulea	Little blue heron	P-U	SSC		Freshwater/coastal wetlands
Egrotta thula	Snowy egret	P-U	SSC		Freshwater/coastal wetlands
Grus canadensis pratensis	Florida sandhill crane	U	T		Freshwator wetlands
Falco peregrinus tundrius	Arctic peregrine falcon	M	E	T	Winters on coasts
Falco sparverius paulus	Southeastern kestrel	R	T	UR 2	Open pine forests, clearings
Haematopus palliatus	American oystercatcher	P-U	SSC		Opon coastal beaches
Haliaeetus leucocephalus	Bald eagle	P-U	T	E	Pine forests/coastal habitat
Pandion haliaetus	Osprey	R	SSC		Near water
Pelecanus occidentalis	Brown pelican	R	SSC	AC	Mangrove trees, coasts
Picoides borealis	Red-cockaded woodpecker	P-u	T	E	Cavity nests/old pine stands
Vermivora bachranii	Bachmann's warbler	U	E	E	Wooded habitats
Campephilus principalis	Ivory-billed woodpecker	U	E	E	Wooded habitats
Sterna antillarum	Least tern	U	T		Coastal habitats
Mycteria americana	Wood stork	U	E	E	Freshwater/coastal wetlands
Rostrhamus sociabilis	Snail kite	U	E	E	Freshwater/coastal wetlands
INVERTEBRATES					
Copris gopheri	Scarab beetle	P		UR 2	Associated w/Gopher Tortoise

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Appendix C (Cont.)

Scientific Name	Common Name	Base Status	Status FGFWFC(or FDA)	Status USFWS	Habitat
PLANTS					
Chrysopsis gorsypina cruiseana	Cruise's goldon-astor	P	E	UR 1	Coastal dunes
Drosera intermedia	Spoon-leaved sundew	R	T		Aquatic habitats
Epigaea repens	Trailing arbutus	U	E		Dry, acid, sandy soil
Kalmia latifolia	Mountain laurel	U	T		Rich, moist, shady woods
Lilaeopsis carolinensis	Carolina lilaeopsis	R		UR 2	
Lilium iridollae	Panhandlo lily	U	E	UR 2	Black, mucky soils
Pinguicula planifolia	Chapman's buttorwort	U	RE	UR 2	
Polygonella macrophylla	Large-leaved jointwood	R	T	UR 1	Sand pine-oak scrub
Rhododendron austrinum	Orange azalea	U	E	UR 5	Hoist, woody habitats
Sarracenia leucophylla	White-top pitchorplant	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

E = Endangered
T = Threatened
UR 1 = Under roviow, for Federal listing with substantial evidence in existence indicating at least some degree of biological vulnerability and/or throat.
UR 2 = Under roviow, insufficient biological data available.
UR 5 = Candidate species, but taxa has proven to bo more widespread than was previously believed and/or thoro species that are not aubjoct to any identifiable throat.
FDA = Florida Department ot Agriculture.
FGFWFC = Florida Game and Freshwater Fish Commission.
USFWS = U.S. Fish and Wildlife Sorvico.

Appendix C (Coot.)

Base *	=	Status of species on tho N U Pensacola facility.
R	=	Resident.
M	=	Migrant.
SR	=	Suspected rosidont.
P	=	Possible resident duo to available habitat; survey required.
U	=	Unknown, survey required.
N/A	=	Not expected to occur on tho **NAS** Pensacola facility.

Section 3.0 -- Project Summary (Continued)

Phase II — Characterization

PLANNED NUMBER OF SAMPLES

Surface Water	___	Air	___	Duplicates	4
Sediment	___	Biota:		Trip Blanks	3
Soil	27	Flora	___	Field Blanks	3
Groundwater	9	Fauna	___	Rinsate Blanks	3

CATEGORIES OF ANALYSES

- X Purgeable Aromati s
- X Purgeable Halocarbons
- X Base/Neutral Extractables
- X Acid Extractables
- ___ Polynuclear Aromatic Eydrocarbons
- X Pesti ides
- X Polychlorinated Biphenyls
- X Total Recoverable Eydrocarbons
- X Metals
- X Cyanide

Additional analytical categories are identified below:

- ___ Gross Alpha
- 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 Ealogens
- X Sulfur
- X Ignitability
- X Cation Exchange Capacity

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Analyte	Media	Method No.	A	P	C	DL
Laboratory Screening Analyses*						
Volatile Organic Compounds	S/W	--	N/H	N/M	N/M	N/M
Polynuclear Aromatic Hydrocarbons	S/W	--	N/M	N/M	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/H
Total Recoverable Hydrocarbons	S/W	EPA 418.1				
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/H	N/H
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/H	N/M
Zinc	S/W	--	N/M	N/M	N/H	N/M
Laboratory Analyses						
Volatile Halogenated Hydrocarbons	S/W	EPA 8010/601	N/M	N/M	N/M	N/M
Volatile Aromatic Hydrocarbons	S/W	EPA 8020/602	N/M	N/M	N/M	N/M
TCL Purgeables + xylenes	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 Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/M
TCL Metals:						
Aluminum	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010/200.7	N/H	N/M	N/M	N/H
Arsenic	S/W	EPA 7060/206.2	N/M	N/M	N/M	N/H
Barium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Beryllium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Boron	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cadmium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/H
Calcium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Chromium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cobalt	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Copper	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Iron	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Lead	S/W	EPA 7421/239.2	N/M	N/M	N/M	N/M
Magnesium	S/W	EPA 6010/200.7	N/M	N/M	N/M	
Manganese	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/
Mercury	S/W	EPA 7471/245.1	N/M	N/M	N/M	N/M