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# CONTAMINATION ASSESSMENT/ REMEDIAL ACTIVITIES INVESTIGATION WORK PLAN -- GROUP A NAVAL AIR STATION PENSACOLA PENSACOLA, FLORIDA

Sanitary Landfill (Site 1)

**July, 1990**

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

**ecology and environment, inc.**
316 SOUTH BAYLEN STREET, PENSACOLA, FLORIDA 32501, TEL. (904) 435-8925
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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 Sanitary Landfill (Site 1) 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:



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

- Focused placement of sampling locations and focused selection of analytical parameters in later phases of the investigation, thereby 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, which will provide all the information necessary for the development and completion of a Feasibility Study.

The Sanitary Landfill (Site 1) is known to contain potentially hazardous materials and contamination in the site vicinity has been documented. Consequently, it is probable that the scope-of-work at Site 1 will encompass a full-scale RI/FS effort.

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## 2. SITE DESCRIPTION

The Sanitary Landfill (Site 1) is located approximately 1/2 mile northeast of Sherman Field (see Figure 2-1). The site occupies approximately 80 acres and is situated 10 to 20 feet above mean sea level (see Figure 2-2). The landfill is inactive, and currently has a dense vegetative cover of planted 15-foot pine trees and naturally occurring scrub vegetation. To the north of the site are a Boy Scout Camp, two ponds, a picnic area which includes Buildings *3554* and *3487*, and Bayou Grande. To the east of the site is the A.C. Read Golf Course. West of Site 1 is a wooded area and a former brush disposal and burning area (Site 16). To the south of the site is Taylor Road and naturally occurring scrub vegetation. The nearest residential area is located approximately 1,000 feet south of Site 1.

Construction details for existing monitoring wells associated with Site 1 are shown in Table 2-1.



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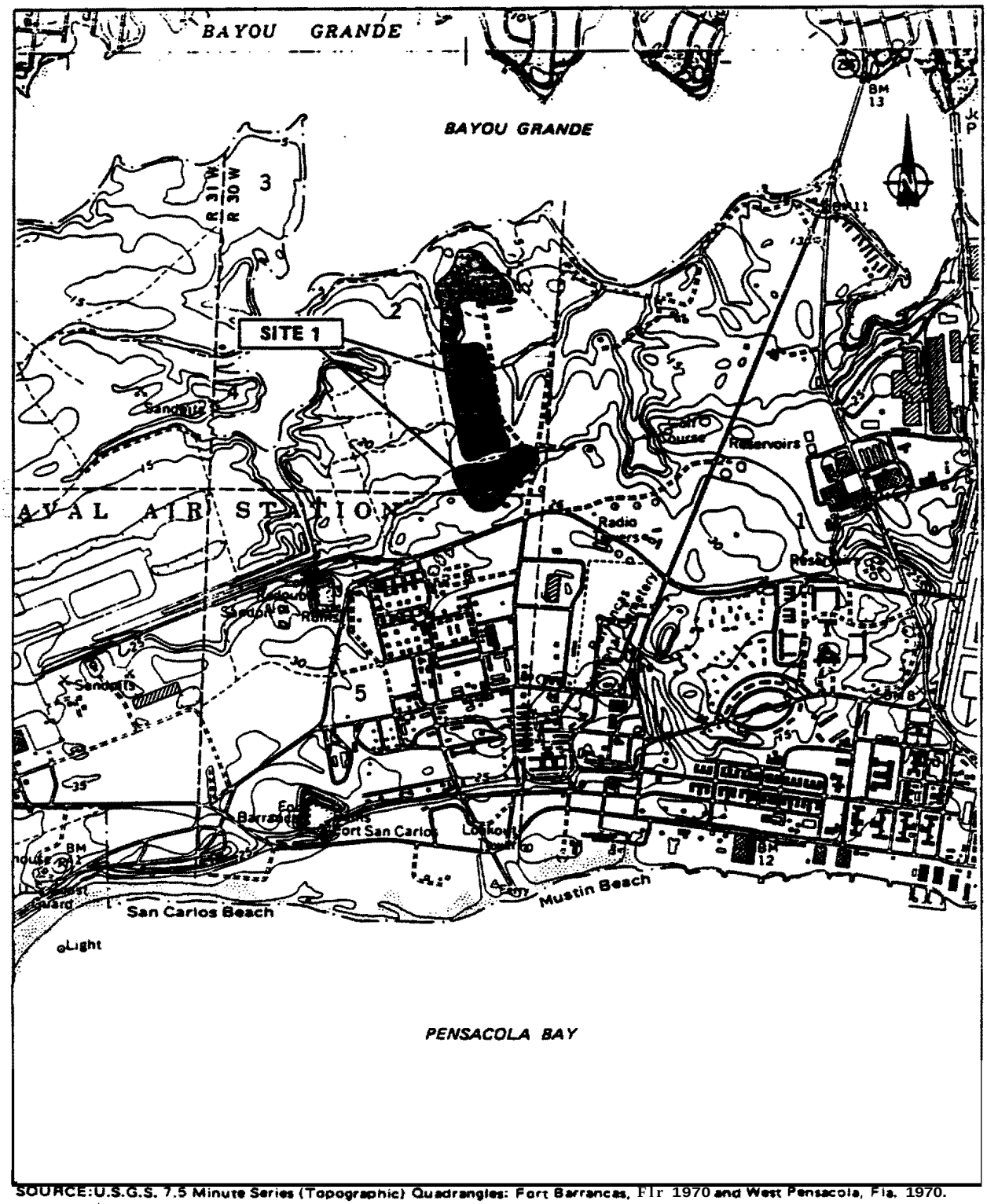


SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangles: Fort Barrancas, Fla. 1970 and West Pensacola, Fla. 1970. Photorevised 1987

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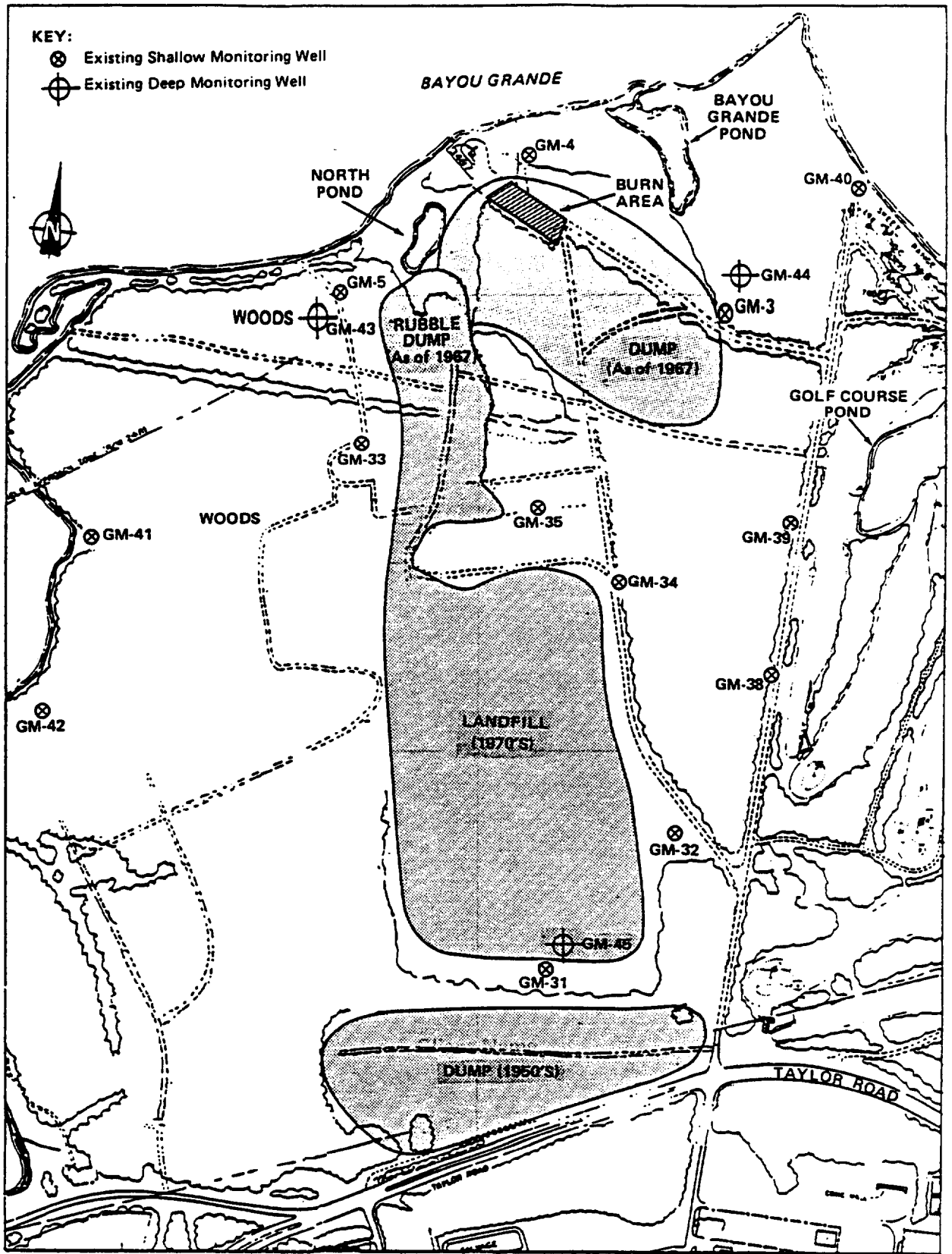
Figure 2–1 LOCATION MAP – NAS PENSACOLA SITE 1




SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1986, 1987, and 1988; and Geraughty & Miller, 1986

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Figure 2–2 SITE MAP – NAS PENSACOLA – SITE 1

TABLE 2-1

**CONSTRUCTION DETAILS OF MONITORING WELLS AND PIEZOMETERS INSTALLED BY G & M AT NAS PENSACOLA SITE 1**

| Well Designation | Surface Elevation (ft msl) | TOC Elevation (ft msl) | Total Depth Drilled (ft) | screened Interval (ft) | Depth to Filter Pack (ft) |
|---|---|---|---|---|---|
| GH-3 | 18.7 | 20.08 | 18.0 | 15.5 - 18.0 | 11.5 |
| GU-4 | 10.2 | 11.36 | 17.0 | 14.5 - 17.0 | 10.5 |
| Gn-5 | 7.4 | 8.25 | 12.0 | 9.3 - 11.8 | 5.5 |
| GM-31 | 19.1 | 20.49 | 11.5 | 8.8 - 11.3 | 4.9 |
| GU-32 | 18.3 | 19.36 | 11.5 | 9.1 - 11.6 | 5.1 |
| GM-33 | 14.0 | 15.25 | 11.5 | 9.0 - 11.5 | 5.0 |
| GH-34 | 15.2 | 16.15 | 11.5 | 9.1 - 11.6 | 5.0 |
| GM-35 | 15.0 | 16.15 | 11.5 | 9.0 - 11.5 | 5.0 |
| GM-38 | 18.1 | 20.83 | 15.0 | 12.5 - 15.0 | 11.0 |
| GM-39 | 5.8 | 8.24 | 15.0 | 12.5 - 15.0 | 10.0 |
| GH-40 | 11.8 | 14.34 | 15.0 | 12.5 - 15.0 | 9.0 |
| GM-41 | 1.5 | 3.96 | 15.0 | 12.5 - 15.0 | 10.0 |
| GM-42 | 13.5 | 14.48 | 16.5 | 14.0 - 16.5 | 10.0 |
| GM-43 | 6.7 | 9.13 | 68.0 | 63.0 - 68.0 | 52.0 |
| GH-44 | 18.5 | 21.04 | 58.0 | 53.0 - 58.0 | 47.0 |
| GM-45 | 19.0 | 20.51 | 107.0 | 102.0 - 107.0 | 97.0 |

SOURCE: Geraghty and Hiller (G & M) 1984, 1986

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

# 3. SITE HISTORY

The Sanitary Landfill was used by NAS Pensacola from the early 1950's until 1976. During this time, nearly all solid waste generated on the station, as well as waste from outlying Navy installations, was disposed in this area. A partial list of wastes and quantities disposed of at Site 1 includes (NEESA 1983):

- Ketone soaked rags;
- PCB and transformer oil soaked rags (6,500 $ft.^3$); Paint chips;
- Paint sludge from water well paint booth (170,000 lbs.);
- Paint sludge (5,200 gallons);
- Dry air filter pads from paint booth;
- Compressed gas cylinders (200);
- Asbestos from building demolition;
- Wood soaked with plating solutions (1,667 $ft.^3$);
- Pesticide rinseate;
- Garbage (64,000 tons);
- Mercury; and
- Containers from paints, pesticides, oils, strippers, solvents, thinners, plating, chemicals, etc.

During the early years of operation, wastes were burned and the resulting ashes were landfilled. Due to citizens expressed concerns over air pollution, the practice was discontinued in the 1970's. The



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area of active landfilling'at the site shifted over the years, as shown in Figure 2-2. The specific methods of disposal at the landfill are unknown.

In 1974, an abandoned drain field began discharging leachate from the landfill into a pond on the golf course. A drain tile outlet was temporarily plugged, causing the local water table to rise, and eventually resulted in leachate seepages at the surface. Following the incident, the landfill vas closed and 11 galvanized steel monitoring wells were installed. Groundwater samples were collected in October 1974 and November 1975. Neither the party responsible for the installation nor the locations of all the wells are known. The sampling results indicated the presence of phenol (0.02-14.4 mg/L), cyanide (0.02-4.56 mg/L), chromium (0.11 mg/L), copper (0.01-0.03 mg/L), iron (0.02-166 mg/L), magnesium (0.77-25 mg/L), manganese (0.02-3.58 mg/L), mercury (0.002-0.0052 mg/L), potassium (0.24-63 mg/L), and zinc (0.04-25.1 mg/L). Some of the wells have since deteriorated and are no longer usable for leachate monitoring (Geraghty and Hiller, Inc. [G & M] 1986).

Navy Assessment and Control of Installation Pollutant team, during a 1982 site survey, sampled the leachate discharging at the eastern edge of the landfill, and sediment from ponds north and east of the landfill. The analytical results showed mercury (0.016-0.2 mg/L), cadmium (0-2.3 mg/L), chromium (0-19 mg/L), nickel (0.7-4.0 mg/L), and lead (26-51 mg/L) contamination (NEESA 1983).

In 1984, G & M installed and sampled eight 2-inch polyvinyl chloride (PVC), shallow monitor wells as part of a Verification Study of Site 1. These wells were analyzed for acid and base/neutral extractable organic compounds, volatile organic compounds, pesticides, PCBs, metals, and cyanide. Organic and inorganic contaminants in groundwater are summarized in Table 3-1. The analytical results for the Verification Study groundwater samples indicated the presence of one or more volatile organic contaminants in each of the wells, and significantly high concentrations of methylene chloride in wells GH-3, GH-33, and GH-35



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

**TABLE 3-1**
**SUMMARY OF ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES COLLECTED AT SITE 1 (1984)**
(All results in ug/L unless noted)

| Contaminants | Well Numbers | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 31 | 32 | 33 | 34 | 35 |
| Chloromethane | - | - | - | - | - | - | - | 5.4 |
| Chlorethane | 0.9 | 27. | - | - | - | - | 165. | 1.2 |
| Methylene Chloride | 11,000. | 1. | 0.6 | 5.5 | 2.3 | 2,400. | - | 430.0 |
| 1,1-dichloroethene | - | - | - | 0.2 | - | - | - | 0.9 |
| 1.1-dichloroethane | - | - | 1. | - | - | - | - | 3.2 |
| Trans-1,2-dichloroethene | - | - | 55. | - | - | - | - | 1.7 |
| 1,1,1-Trichloroethane | - | 59.0 | - | 2.1 | - | - | 44 | - |
| Trichloroenthene | - | - | 0.7 | - | - | - | - | - |
| Chlorobenzene | - | - | - | - | - | - | - | 20.0 |
| 2.4-dimethylphenol | - | - | - | - | - | - | - | 8.0 |
| 1,2-dichlorobenzene | - | - | - | - | - | - | 3.0 | 5.0 |
| 1.4-dichlorobenzene | - | 5. | - | - | - | 15.0 | 9.0 | 10.0 |
| Napthalene | - | 2. | - | - | - | 8.0 | 8.0 | 47.0 |
| Diethylphtha1ate | - | - | - | - | - | 2.0 | - | 3.0 |
| 2 ethyl naphthalene | NA | NA | NA | NA | NA | NA | 14.0 | 11.0 |
| 2,4-Dimethylphenol | - | - | - | - | - | - | - | 8.0 |
| Cadmium (mg/L) | 0.002 | 0.001 | - | - | - | 0.001 | 0.002 | 0.01 |
| Chromium(mg/L) | 0.003 | 0.004 | 0.002 | 0.002 | 0.001 | 0.005 | 0.003 | 0.003 |
| Lead (mg/L) | 0.01 | 0.02 | - | 0.02 | - | - | 0.02 | 0.02 |
| Si1ver(mg/L) | - | 0.001 | - | - | 0.002 | 0.002 | 0.031 | 0.00 |
| Nickel(mg/L) | 0.004 | 0.009 | 0.001 | 0.002 | 0.005 | 0.008 | 0.009 | 0.00 |
| Zinc (mg/L) | 0.023 | 0.008 | 0.013 | 0.028 | 0.035 | 0.009 | 0.365 | 0.012 |

NOTE: Hyphen (-) denotes compound not detected;
(NA) indicates analysis not conducted

SOURCE: G & M 1984

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(present at 11,000 ug/L, 2,400 ug/L, and 430 ug/L respectively). Methylene chloride was not detected in well GM-34; hovever, chloroethane was detected at 165 ug/L. Concentrations of metals were belov Florida Department of Environmental Regulation (FDER) Primary and Secondary Drinking Water Standards. The investigation also determined that shallow groundwater moves north and northwestward toward Bayou Grande, and northeastward toward the Golf Course Pond, where it discharges to surface waters (G & M 1984).

During a 1986 Confirmation Study of Site 1, G & H installed five additional shallow monitoring wells and three deep wells (GH-43, GH-44, and GH-45) to further assess the presence of groundwater contamination. The locations of all existing wells are shown on Figure 2-2. Wells GM-3, GM-4, GM-5, and GH-31 through GM-35 were analyzed for volatile organic compounds only, and wells GM-38 through GH-45 were analyzed for volatile organic compounds, acid and base/neutral organics, pesticides, and PCBs. Organic and inorganic compounds detected in the groundwater samples are summarized in Table 3-2. The analytical results indicated that volatile organic compounds were the only contaminants present within the suite of parameters analyzed. As few as one, and as many as six volatile organic compounds were detected in 12 of the sixteen wells; however, the presence of these compounds in the samples vas often not consistent. For example, the highest benzene concentrations detected in the groundwater samples occurred in water collected from deep wells GH-44 and GH-45 (76 and 67 ug/L respectively). Vinyl chloride was not detected in groundwater samples collected during the Verification Study (G & H 1984); hovever, it was present in 9 samples collected in the second phase (G & M 1986), often at high concentrations. Methylene chloride was detected at very high concentrations in several samples during the Verification Study, but was not detected in any of the Confirmation Study samples. Water levels in the deep vells during the 1986 Confirmation Study indicated a slight gradient to the south (G & H 1986).

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

**TABLE 3-2**
**SUMMARY OF ANALYTICAL RESULTS FOR**
**GROUNDWATER SAMPLES COLLECTED AT SITS 1**
(April - June, 1985)
(All results in ug/L unless noted)

| | Well numbers | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Contaminants** | **3** | **4** | **5** | **31** | **32** | **33** | **34** | **35** | **38** | **39** | **40** | **41** | **42** | **43** | **44** | **45** |
| Benzene | - | 7 | - | - | - | 3 | 43 | 10 | 41 | - | - | - | 6 | - | 76 | 67 |
| Chloroethane | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chloromethane | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Methlyene Chloride | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,1-dichloroethene | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1.1-dichloroethane | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| trans-1,2-dichloroethene | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1,1,1-trichloroethane | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| trichloroethene | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Chlorobenzene | - | 5 | - | - | 1 | 10 | 3 | 7 | - | 8 | - | - | - | - | - | - |
| Ethyl benzene | - | 6 | - | - | - | 20 | 14 | 7 | - | - | - | - | - | - | 8 | - |
| Methyl Chloride | - | - | - | - | - | - | - | - | - | 2 | - | - | - | - | - | - |
| Vinyl Chloride | - | 3 | 56 | 1 | 2 | 2 | 250 | 3 | - | 30 | - | - | 7 | - | - | - |
| Toluene | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | 2 |
| Naphthalene | NA | NA | NA | NA | NA | NA | NA | NA | - | - | - | - | - | - | - | - |
| 2-methlnaphthalene | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| 1,2-dichlorobenzene | NA | NA | NA | NA | NA | NA | NA | NA | - | - | - | - | - | - | - | - |
| 1,4-dichlorbenzene | NA | NA | NA | NA | NA | NA | NA | NA | - | - | - | - | - | - | - | - |
| Diethylphthalate | NA | NA | NA | NA | NA | NA | NA | NA | - | - | - | - | - | - | - | - |
| 2,4-dimethylphenol | NA | NA | NA | NA | NA | NA | NA | NA | - | - | - | - | - | - | - | - |
| PCBs | NA | NA | NA | NA | NA | NA | NA | NA | - | - | - | - | - | - | - | - |
| Pesticides | NA | NA | NA | NA | NA | NA | NA | NA | - | - | - | - | - | - | | |

NOTE: Hyphen (-) denotes compound not detected;
(NA) indicates analysis not conducted

SOURCE: G L M 1986



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# 4. CLIMATOLOGY

**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~~. **1988I.**

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 [seven] inches per month) and lowest during spring and fall (averaging [four] 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



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the coast, commonly known as the sea-breeze effect (Flood and Associates 1978). Hurricanes and tornadoes are infrequent but can cause substantial 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),



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

Two other community types may be found in the western portions of the NAS Pensacola facility. These are flatwoods and sandhill vegetative communities. Flatwoods vegetation occupies areas which were ocean bottoms in recent geologic times. Primary overstory vegetation is dominated by Pinus palustris (longleaf pine), Pinus elliottii (slash pine), and Serenoa repens (saw palmetto). Platvoods 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 foun in dry soils vh ch are lover in fert lity than flatwoods soils. The overstory of this community type is dominated by Pinus palustris (longleaf pine), Quercus laevis (turkey oak), Q. marilandica (bluejack *oak)*, Q. stellata (post *oak)*, and Q. falvata (southern red *oak).* The understory is dominated by Diospyros virginiana (wild persimmon) and Crataegus lacrimata (Pensacola hawthorn). The more abundant herbaceous plants found in moist areas are Pteridium aquilinum (bracken fern) and Aristida stricta (vire 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


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annual rainfall, this geologic condition causes the formation of small areas of perched groundwater. In areas with relatively steep slopes, groundwater seepage escapes into well-defined stream channels called steepheads as found near Site 30. In gently sloping areas, the presence of perched groundwater conditions results in the formation of wetland bogs, as found near Sherman Field. Wetland or seepage bogs are characterized by herbaceous plant species as described in the sections above for flatwoods and sandhill communities. 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 dominants of seepage or steephead streams (Wolfe et al. 1988).

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

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


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The Navy recorded moderate size rookeries of the great blue heron and 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 (Wolfe 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 saltmarch cordgrass (Spartina alternaflora) or black needlerush (Juncus roemarianus). A biota survey of these and other potential habitat areas will be conducted to determine the extent of estuarine flora and fauna.



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Seagrass beds are reported to be present within Big Lagoon along the southwestern portion of the NAS facility. These grassbeds are composed primarily of Thalassia testudinum, Syringodium filiforme, and Halodule beaudettei. Seagrass beds in the area surrounding the facility have not been historically mapped and very little is 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., Chaetocerus spp., Thalassionema nitzschoides, and Hemiaulus spp. The zooplankton is primarily dominated by Calonoid copepods and benthic invertebrate larvae. This study is very limited by the fact that samples were collected with undefined methods and only during the early spring. This sampling protocol does not define population fluctuations that are characteristic of low population abundances commonly found in estuaries during the summer months. Examination of the zooplankton data results in the same conclusions. It should be pointed out that any contamination entering Pensacola Bay from either groundwater or surface water sources may be accumulated in the invertebrate larvae that predominate most estuarine water bodies.

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


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FDER collected benthic samples in most of Pensacola Bay and found that the sediments were dominated by polychaetes (Aricidea spp., Capitella spp., various spionids and Eaploscoloplos spp.) and bivalves (Anodontia alba and Tellina spp.) during most of the year. FDER samples collected along the wastewater treatment plant outfall show a drastic drop in species abundance and diversity close to the sewage outfall (Navy 1986). This indicates that the benthic community 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. Eowever, 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 (Micropogonias 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).

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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 (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).



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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), however, 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 quantatively 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). Most 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


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

## 5.2 Site-Specific Biological Resources

Site 1 and the immediate surrounding area contain several of the major community types that are found on the NAS Pensacola facility. Vegetated community types found in the vicinity of Site 1 include: sand pine scrub forests, semi-natural pine plantations, semi-natural grassy savannahs and freshwater and estuarine marsh areas. On the actual landfill site, there is a relatively new (5-8 years old) stand of pines. This pine plantation, as it is sometimes called, is usually maintained by fire which reduces accumulations of understory growth, thereby inducing faster growth of planted species.

Outside of the landfill boundaries (see Figure 2-1) the sand pine scrub and marsh communities, found primarily on the north, east, and south sides of the site, are in a relatively undisturbed natural state. Interdispersed within these habitats are open savannah areas of grasses and shrubs.

Because of the extensive area (approximately 0.6 square miles) covered by the landfill site and the condition of the vegetation found in the vicinity of the site, it is expected that many species of fauna which are associated with these habitats will utilize this site to a large degree for feeding, nesting, and as a migration corridor. An extensive survey of the flora and fauna using this site must be conducted to determine potential: contaminant pathways for each of the communities found in the vicinity of Site 1.



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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 water 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]

A number of surface water bodies are located in the vicinity of Site 1. These include Bayou Grande, Bayou Grande Pond, North Pond, the Golf Course Pond, and a large volume drainage ditch originating from the Forrest Sherman Field complex.

The landfill is situated on an area of land that juts somewhat north into Bayou Grande, hence the surface water body surrounds the site from west to northeast. The northern extent of the landfill is within 250 feet of the Bayou.

Bayou Grande Pond is northeast of the landfill. This coastal backwater feature is connected to the Bayou by a small tidal inlet. The natural origin of the pond, and its subsequent man-made alterations are not known, nor is its water quality status. The pond will be investigated and sampled as described in Section 14.

North Pond is located north of, and adjacent to the landfill and rubble disposal area. Its natural origins and/or man-made alterations are not known. North Pond will be inspected and sampled as discussed in Section 14.

The Golf Course Pond is located east of the landfill, and about 750 feet from the nearest known disposal area at the landfill. Connected by tidal inlet from Bayou Grande, the pond is surrounded by golf course fairways and wooded plots. Natural origins of the pond and subsequent



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man-made modifications are not known. As discussed in Section 2, a leachate drain was discovered to be discharging into the pond in 1974. Although the pipe was plugged, the current status of the leachate situation in this area of the Golf Course Pond is not known.

Twelve hundred feet southwest of the landfill is a large volume drainage ditch that drains the eastern section of Forrest Sherman Field to Bayou Grande.

Overland flow of runoff in the Site 1 area is discouraged by the sandy and highly permeable nature of surficial soils and sediments, and the nearly level topography. Precipitation infiltrates rapidly to the shallow surficial aquifer.

All of the ponds are downgradient from the landfill area, based on shallow well water table data (G & M, 1984, 1986). The degree to which the landfill has affected any of the nearby surface water bodies is not known.

[An objective] of the multi-phased investigation for Site 1 is to gain understanding of the hydrological nature of these surface water bodies [to aid in evaluating] the degree to which [they have been impacted by the site.]



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# 7. PHYSIOGRAPHY AND HYDROGEOLOGY

## 7.1 Physiography and Regional Eydrogeology

### 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 Eydrogeology

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



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**7.1.2.1 Surficial/Sand-and-Gravel** Aquifer

The Surficial Aquifer occurs from land surface to a depth of approximately 300 feet at NAS Pensacola and is [composed] of a sequence of unconsolidated to poorly indurated clastic deposits (Wagner 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 permeabilities. These zones are referred to as the surficial zone, the low permeability zone, and the main producing zone (Wilkins 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 shallow 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 6 M 1986) yielded hydraulic conductivity values ranging from 16 to 56 ft/day. Eorizontal

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

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

The results of laboratory permeability tests conducted on samples from this zone indicate that vertical hydraulic conductivities are low, ranging from 4.2 **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 **19844 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 NAS Pensacola. This zone generally has the highest permeability characteristics due **to** thicker, and more persistent sand and gravel beds, and is tapped by most of the major 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



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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 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 vells 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 lover 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 (Yilkins 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 vater. In the NAS Pensacola area the Intermediate System is



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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 Lower Member of the Pensacola Clay; all of Miocene Age.

#### 7.1.2.3 Floridan Aquifer System

Immediately underlying the Intermediate System and occurring at a depth of approximately 1,500 feet 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

In the immediate vicinity of Site 1, the surficial zone of the Sand-and-Gravel Aquifer occurs from land surface to depths of approximately 40 to 60 feet. The lithologic descriptions of cuttings collected during the installation of the sixteen existing monitoring wells (shown on Figure 2-2) indicate that the zone primarily [consists] of tan to brown, fine to medium-grained sand. Water table conditions occur at approximately 5 to 10 feet below land surface. Based on water level data collected from shallow wells (G & M 1984, 1986), groundwater flow is generally radial from the landfilled area, and toward the coastal areas of Bayou Grande to the west, north, and northeast. Aquifer tests were performed on shallow wells as part of Verification Study (1984) and Characterization Study (1986) efforts. Hydraulic conductivity was determined from a slug test at GM-5 to be 17.3 ft/day. Assuming a hydraulic gradient of 0.008 and an effective porosity of 0.35 for the surficial sands, the horizontal seepage velocity for the shallow groundwater at the site was calculated to be approximately 140 feet per year (G & M 1984). At an unnamed shallow well hydraulic conductivity was determined to be 19 ft/day. Assuming a hydraulic gradient range of 0.0048 to 0.007 and an effective porosity of 0.20, the horizontal groundwater flow velocity was calculated to be from 190 to 275 feet/year (G & M 1986).



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Immediately underlying the surficial zone in the vicinity of Site 1, and extending to depths of 48 to 100 feet, is the low permeability zone of the Sand-and-Gravel Aquifer. Based on the cuttings from the installation of deep wells 43, 44, and 45, this zone primarily [consists] of gray to dark gray clay with very thin beds of fine to coarse quartz sand and shell fragments. Clay samples, collected from this zone during the installation of the three deep wells, were tested in the laboratory, and hydraulic conductivities were determined to range from $5.7 \times 10^{-8}$ to $3.5 \times 10^{-5}$ cm/sec ($1.6 \times 10^{-4}$ to $1.0 \times 10^{-1}$ ft/day).

Although water level elevation data collected from the deep wells during the 1986 Characterization Study is not provided in the final report, it is stated that an upward vertical gradient was observed in well clusters at the north end of the site, and a downward gradient in a well cluster to the south. Based on these qualitative descriptions, it can be expected that the low permeability zone functions as a confining or semi-confining unit, restricting the flow of groundwater between the surficial zone and the underlying main producing zone. The direction of groundwater flow within the low permeability zone is unknown (G 6 H 1986).

The top of the main producing zone occurs at depths between 48 and 100 feet, based on deep well data in the vicinity of Site 1. The three deep wells GH-43, GH-44, and GH-45, are open to the upper portion of this zone and screened at 63 to 68, 53 to 58, and 102 to 107 feet respectively, below land surface. As mentioned above, water level data for the deep wells is not provided; however, it is reported that both downward and upward gradients were observed between the surficial and main producing zones, and a slight horizontal gradient is oriented to the south in the main producing zone (G & M 1986).

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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 Site 1 will follow the GSMP, and any updated versions. Data Quality Objectives (DQOs), and all applicable or relevant and appropriate requirements (ARARs) have been considered in developing the initial phases of fieldwork described here, and will be updated and revised for any subsequent phases of fieldwork.


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# 10. HEALTH AND SAFETY PLAN

A comprehensive General Health and Safety Plan (GHSP) and individual site-specific safety plans (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 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. Photographs 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.



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# 14. FIELDWORK METHODOLOGY

## 14.1 Phase I — Field Screening

The primary objective of the Phase I field screening investigation is to effectively and efficiently focus the Site Characterization (Phase 11) and subsequent Extent Delineation (Phase III and 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 the landfill areas. 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, areas of exposed landfill debris, and leachate seeps.

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


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investigation is discussed in the following sections.

The reconnaissance survey team will utilize radiation and air monitoring equipment during walkovers of landfilled areas, in accordance vith Sections 6.1.1 and 6.3.2 of the 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 reconnaissancce will be mapped in detail and recorded in the field logbook.

**14.1.1.2 HNu/OVA Surface Emissions *Survey* [and Particulate Air Sampling]**

During the establishment of the geophysical survey grid network (discussed in Section 14.1.2), an emissions survey will be conducted using HNu and/or OVA air monitoring equipment. The survey will be conducted in accordance vith 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.

[In addition, preliminary air screening will be conducted vith 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 vith Section 6.1.3 of the GQAPP.]

**14.1.1.3 Radiation Survey**

During the establishment of the geophysical survey grid network, a radiation survey will be conducted using a micro-R-meter and gamma scintillation detector. The survey will be conducted in accordance with Section 6.3.2 of the GQAPP. Measurements will be made at each estalbished grid point, and readings will be recorded in the field logbook.

**14.1.1.4 Habitat/Biota Survey**

During the physical reconnaissance, an E & E biologist/ecologist will determine the on-site terrestrial and aquatic habitats, and the surrounding habitats which may be affected by off-site contaminant

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migrations. During the walkover survey, rare, threatened, and endangered species and their potential habitats will be identified, and an evaluation will be made of general site conditions to support viable populations of plants and animals. A habitat/biota survey will be conducted for Site 1; as well as an evaluation of the literature.

**14.1.1.5** Asbestos Survey

**An** asbestos survey will be conducted on Site 1 during the physical reconnaissance. This survey will consist of locating and identifying suspect building materials that could potentially contain asbestos. **No** sampling will be conducted, and suspect building materials will 'be mapped for future reference.

**14.1.2** Geophysical Survey

The landfill areas, landfill fringes, and surrounding local areas will require an electromagnetic terrain conductivity survey (EM-31 and **EM-34XL),** and magnetometer (Mag) survey. The geophysical survey area is shown on Figure 14-1. The survey will be performed in accordance with field methodologies and data interpretation techniques discussed in Section 6.2 of the GQAPP.

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 an x and y axis), and flagged at 100-foot 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 grid spacing will be based on 100-foot centers.

The EM-31 and Mag surveys will be conducted by obtaining measurements at each 100-foot interval grid point. EM-34XL readings will be obtained at alternating grid point locations with a spacing of 200 feet.



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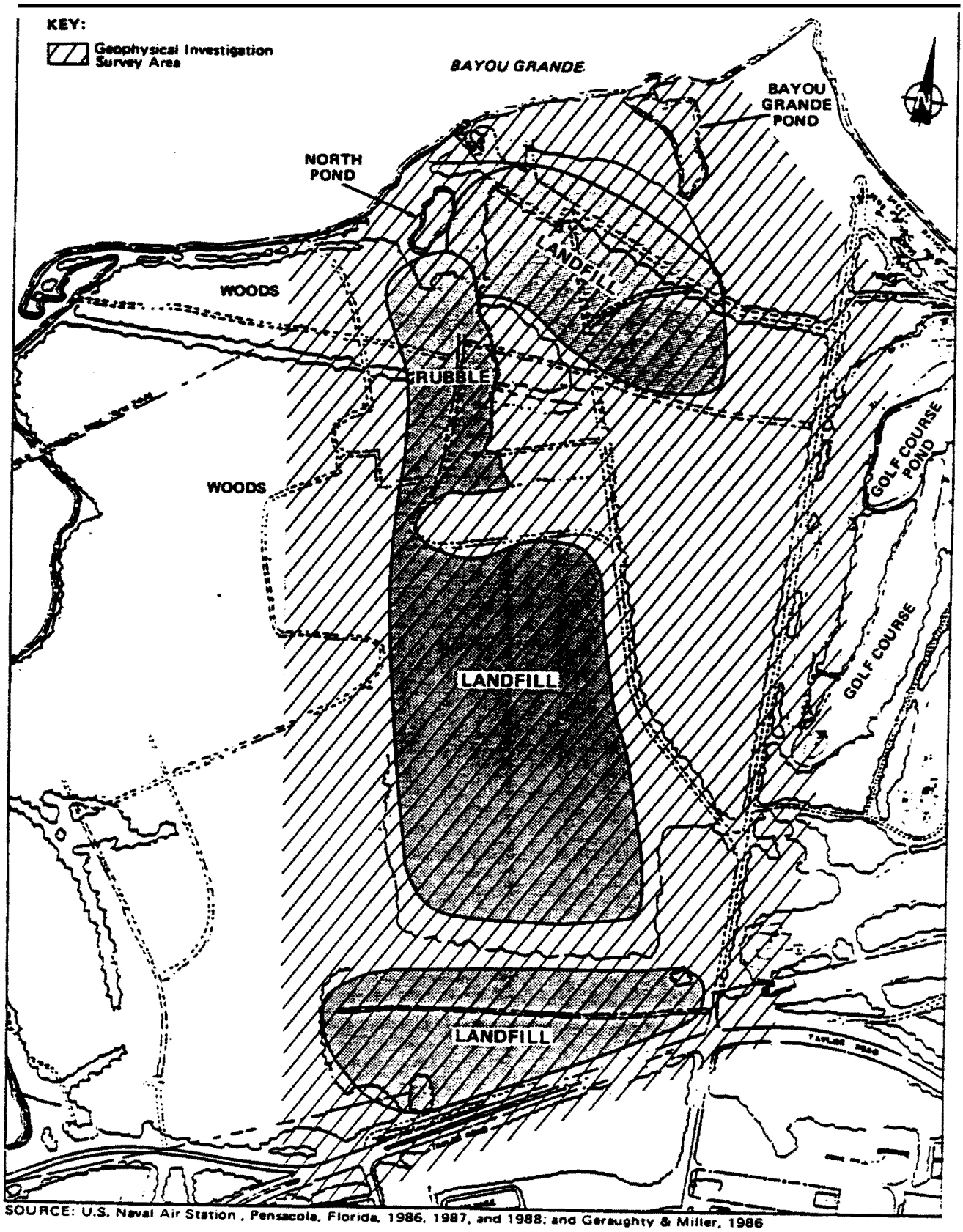


SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1986, 1987, and 1988; and Geraughty & Miller, 1986

SCALE

0 250 500 1000 1500 FEET

Figure 14–1 GEOPHYSICAL INVESTIGATION SURVEY AREA, SITE 1 – PHASE I

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The geophysical data will be used in conjuction with other background data obtained to identify: anomolous conditions in the landfilled areas; the horizontal extent of landfilled debris; water table conditions; the location of potential subsurface contaminant plumes and leachate streams; and to ascertain the horizontal and vertical orientation of contaminant plumes, if located. Ultimately, the interpretation of this data will be a primary consideration in the development of a rationale for Phase I and II monitoring well placement strategies.

### 14.1.3 Analytical Screening

#### 14.1.3.1 Laboratory Analyses

Phase I sampling activities for Site 1 will require the installation of shallow temporary monitoring wells, groundwater sampling, and the collection of surface water, sediment, [and soil] samples. All of the 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. [It should be noted that chlorobenzene has been added to the Phase I analytical screening parameters for Site 1 due to its detection in previous investigation sampling.]

Surface Water -- [Three] surface water samples will be collected from the Golf Course Pond east of the landfill, [two surface water samples will be collected from the marshy area/Beaver Pond west of the Golf Course Pond,] two surface water samples will be collected from North Pond, and three surface water samples will be collected from Bayou Grande Pond north of the landfill (see Figure 14-2). In each of the surface water bodies, water samples will be collected [from a zone 1 foot above bottom] using a Kemmerer sampling device. A small boat will



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Table 14-1

PHASE I SAMPLING AND ANALYTICAL REQUIREMENTS-GROUP A

SITE 1

| Medium | No. of Samples | Duplicates | Total | Analytical Suite[a,b] |
|---|---|---|---|---|
| Surface Water | [10] | 1 | [11] | A |
| Sediment | [15] | [1] | [16] | A |
| [Soil] | [14] | [1] | [15] | [A] |
| Groundwater[c] | [28] | 2 | [30] | A |
| TOTAL | [67] | [5] | [72] | |

| [Medium | No. of Samples | Dupli-cates | Trip Blanks[f] | Field Blanks | Rinsate Blanks | Preservative Blanks[g] | Total | Analytical Suite[a,c] |
|---|---|---|---|---|---|---|---|---|
| Groundwater[d] | 16 | 2 | 2 | 1 | 2 | [1] | 23 | B] |

[a]Analytical suite designations are as follows:

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

[B = Target Compound List (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, gross alpha, total organic carbon, hardness (water only), and alkalinity (only).]

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

[[c]Specific constituents encompassed by tho various chemical groups included within analytical Suite B are identified in Tables 9-5 through 9-13 of tho GQAPP.

[d]Groundwater samples and analytical requirements shown are for Phase I temporary wlls *only.*

[e]Groundwater samples and analytical requirements shown are for existing permanent wlls.

[f]Trip blanks will be analyzed for TCL volatile organic compounds only.

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

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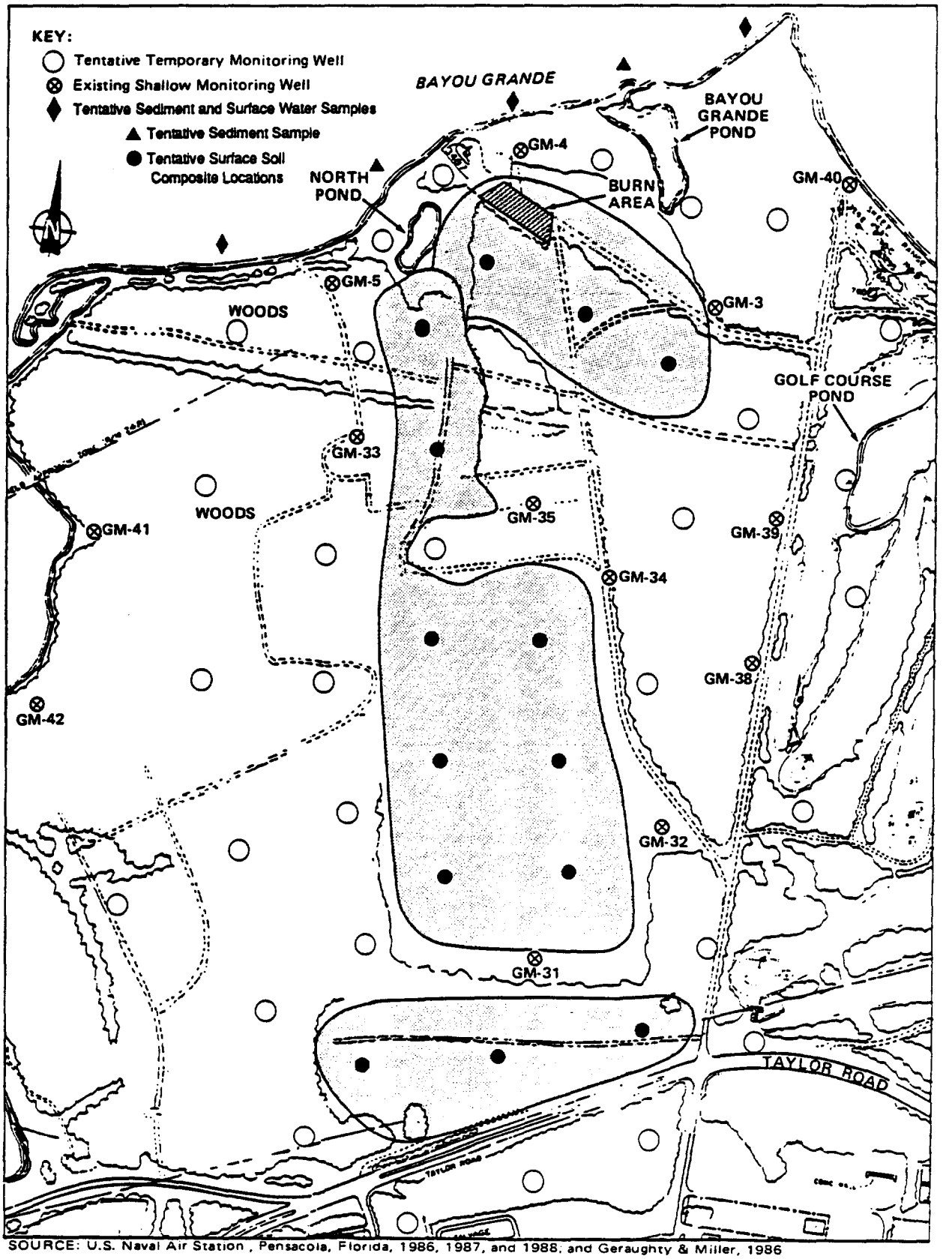


SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1986, 1987, and 1988; and Geraughty & Miller, 1986

SCALE

0 250 500 1000 1500 FEET

**Figure 14-2 TENTATIVE TEMPORARY MONITORING WELL LOCATIONS AND SURFACE WATER, SEDIMENT, AND SOIL SAMPLING LOCATIONS, SITE 1 PHASE I**

be used as necessary to access desired sample locations. All sampling and equipment decontamination activities will be conducted in accordance with Sections 6.9.1 and 6.10 of the GQAPP.

Sediment — [Three] sediment samples will be collected from the Golf Course Pond, two sediment samples will be collected from North Pond, [two sediment samples will be collected from the marshy area/Beaver Pond vest of the Golf Course Pond,] and three sediment samples will be collected from Bayou Grande Pond. In each of the ponds, the samples will be collected from a depth interval of surface to [approximately 4 inches]. The samples will be retrieved using either a bucket-type mud auger (in areas where the depth of the pond is less than six feet), or an Eckman Dredge (in areas where the depth of the pond is greater than six feet). The composition of bottom materials retrieved by the sampling devices will be recorded in the field notebook. All sediment sampling and equipment decontamination activities will be conducted in accordance with Sections 6.9.2 and 6.10 of the GQAPP.

[Soils — Approximately 14 composite surface soil samples will be collected from the surface of the landfilled areas *(see* Figure 14-2). The purpose of this sampling is to determine the focus of Phase II soil sampling and ultimately to provide the data to evaluate the need for formal air sampling. The data will also be pertinent to risk assessment tasks. If surface runoff pathways to Bayou Grande are identified, soil samples will be collected in the areas of the pathways.

Each sample will be collected as a composite of five aliquots from within a 50-foot diameter area. Each aliquot will be collected at a depth interval of surface to 6 inches. For each location, the five aliquots will be homogenized to comprise a single sample. All sampling and compositing will be performed in accordance with Section 6.6 of the GQAPP. Equipment decontamination will be performed in accordance vith Section 6.10 of the GQAPP.]

Groundwater — Approximately 28 temporary stainless steel'monitoring wells will be installed around the landfill area. Each well will have 5


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

feet of 0.01-inch slotted screen and will be installed to a depth at which the well screen brackets the water table (i.e., the top of the screen extends slightly above the water level). As shown on Figure 14-2, the locations for these wells are tentative. The interpreted results of the geophysical investigation, as well as information gained from field reconnaisance surveys and aerial photograph interpretations, will allow adjustments and finalization of the temporary shallow well network. Also, as shown on Figure 14-2, the existing shallow wells around Site 1 will be utilized as part-of the Phase I shallow groundwater screening network, where practical.

The 28 temporary wells and 16 existing monitoring wells will be purged and sampled in accordance with Section 6.8 of the GQAPP.

### 14.1.4 Hydrologic Assessment

The temporary wells and existing well network will be surveyed to obtain top of casing elevations referenced to USGS datum or to a suitable established benchmark located within the vicinity of Site 1. Static water levels will be measured in each well to determine shallow groundwater flow direction and horizontal hydraulic gradient.

In conjunction with the well head survey, the elevations of other nearby features such as ponds, streams, and leachate seeps will be established. A staff gauge will be emplaced in the Golf Course Pond and monitored over the course of field investigation activities. At least one rain gauge station will be established in the vicinity of Site 1 and precipitation monitored during field work activities.

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



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

## 14.2 Phase II — Characterization

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

- To characterize the nature and magnitude of the full spectrum of potential site contaminants;
- 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;
- To support the preliminary identification, screening, and evaluation data requirements of potential remedial alternatives.

The actual Phase II sampling locations, especially with respect to the Phase I locations, will primarily be a function of how uniform the Phase I results were with respect to contaminant type, magnitude, and distribution across the site.

Phase II investigation of Site 1 will involve the collection of surface water, sediment, leachate, and groundvater samples. Additional permanent, shallow monitoring wells will be installed. Air sampling will be conducted only if warranted by the results of Phase I efforts. In addition, limited aquifer testing will be performed.

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

[During the Phase II investigation of Site 1, 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.]

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

Table 14-2

**PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS—GROUP A**

**SITE 1**

| Medium | No. of Samples | Dupli-cates | Trip Blanks[a] | Field Blanks | Rinsate Blanks | [Preservative Blanks[b]] | Total' | Analytical Suite[c,d] |
|---|---|---|---|---|---|---|---|---|
| Surface Water | 6 | 1 | 1 | 1 | 1 | 111 | [11] (2) | A B |
| Sediment | 24 | 3 | 2 | [NR] | 2 | [NR] | [31] (4) | A C |
| Soil | [25] | [3] | 3 | [NR] | [4] | [NR] | [35] (4) | A C |
| Groundwater | [13] | [1] | 2 | [NR] | 2 | [NR] | [18] [(3)] | A B |
| TOTAL | [68] | [8] | 8 | [1] | [9] | [1] | [95(13)] | |

[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, dissolved TCL metals, end cyanide.]

[c]Analytical suite designations are as follows:

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

B = total suspended solids, total Kjeldahl nitrogon, ammonia nitrogen, orthophosphate phosphorus, dissolved oxygen (in field), 5-day biological oxygen demand ($BOD_5$), and chemical oxygen demand (COD).

C = pH, alkalinity, percent moisture, grain size, BTU content, ash content, total organic halogens, sulfur, ignitability, and cation exchange capacity.

[d]Specific constituents encompassed by the various chemical groups included within the above-listed analytical suites are identified in Tables 9-5 through 9-13 of the Generic Quality Assurance Project Plan.

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

[NR = Not required.]

[14.2.1 Biota Sampling

The need for formal biological sampling will be based on the results of the Phase I habitat/biota survey and analytical screening results. If biological sampling is required, a separate biological sampling plan will be prepared which outlines sample locations, sampling methodologies, analytical parameters, etc.]

[14.2.2] Surface Water and Sediment Sampling

The actual number of surface water and-sediment samples, as well as appropriate sampling locations, will be determined pending the results of Phase I. However, for planning purposes it is assumed that [two] surface water samples will be collected from the Golf Course Pond, [one will be collected from the marshy area/Beaver Pond vest of the Golf Course Pond,] one from North Pond and two from Bayou Grande Pond. Sample collection techniques will be the same as those employed for Phase I. It is also assumed that [four] sediment sample locations will be required in the Golf Course Pond, [two in the marshy area/Beaver Pond vest of the Golf Course Pond,] two in North Pond and [four) in the Bayou Grande Pond. At each location, sediment samples will be collected from two depth intervals, namely, surface to [4] inches, and from 18 to 24 inches. Sediment samples will be collected using an Eckman Dredge and/or manually driven split spoons or other suitable coring devices.

At locations where known or suspected leachate seeps are identified during Phase I field reconnaisance surveys, samples will be collected. As a general rule, no more than one sample will be collected from each seepage area. Liquid phase samples will be collected from active seeps. Sediment samples will be collected from suspected seepage locations which are inactive or dry. However, potential instances of overland flow, ponding, discharge to surface water bodies, and multi-phase liquids may present a need for the collection of multiple samples.

[14.2.3] Soil Sampling

[Composite surface soil samples will be collected from landfilled areas. For planning purposes, a total of five samples are assumed at locations based on the Phase I soil sample results. Each sample will consist of



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

five aliquots and be collected and composited similarly to the Phase I soil samples (see Section 14.1.3.1) and in accordance with Section 6.6 of the GQAPP. Equipment decontamination will be performed in accordance with Section 6-10 of the GQAPP.]

Soil samples will be collected as part of the shallow monitoring well installation, described below in Section [14.2.4]. At each location, samples will be collected from two composite intervals; surface to 5 feet and from 5 feet to the water table. Where the water table is observed to occur within 5 feet of the surface, only one sample will be collected. The soil samples will be collected using a split-spoon sampling device during well drilling. All sampling, compositing, and lithologic logging will be performed in accordance with Section 6.6 of the GQAPP. Equipment decontamination will be performed in accordance with Section 6.10 of the GQAPP.

For planning purposes, two soil samples are assumed at each well location. The following Section [14.2.4] assumes ten shallow monitoring well locations in Phase II, thus a total of 20 soil samples is tentatively projected.

[14.2.4] Shallow Monitoring Well Installation and Development

The actual number and locations for shallow monitoring wells to be installed in Phase II will be determined based on Phase I findings. For planning purposes, the number of permanent shallow monitoring wells to be installed is ten. All shallow wells will be constructed of two-inch PVC, and bracket the water table with 10 feet of screen. [To investigate the potential for groundwater contamination by "sinker" solvents at Site 1, several wells will also be installed to greater depths during Phase 11. For planning purposes, three deeper wells will be installed to a completion depth of 40 feet. Each of these deeper monitoring wells will be clustered with shallow monitoring wells in order to enable determination of vertical hydraulic gradient.] The wells will be installed utilizing hollow-stem auger techniques and in accordance with Sections 6.7 and 6.10 of the GQAPP.



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

**[14.2.5] Groundwater Sampling**

Groundwater samples will be collected from the estimated **[13]** newly installed permanent wells, shown on Figure 14-2. The purging and sampling of wells will be conducted in accordance with Scetions 6.8 and 6.10 of the GQAPP.

**[14.2.6] Hydrologic Assessment**

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

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

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

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.

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

[14.2.7] 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 the Phase I shallow soil sampling.]

## 14.3 Phase III - Bxtent 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 the findings of Phases I and 11, [additional] biota sampling may be conducted in Phase 111. [However, as for Phase II, a separate biological sampling plan will be prepared.] Biota sampling for Site 1 may potentially include the collection of aquatic vegetation and fauna from the Golf Course Pond, North Pond, the Bayou Grande Pond[, and/or Bayou Grande.]

### 14.3.2 Soil Sampling

Soil sampling will be conducted in conjunction with any new shallow, intermediate or 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 any shallow groundwater contamination detected in Phases I and 11.

### 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



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Table 14-1

PHASE I SAMPLING AND ANALYTICAL REQUIREMENTS-GROUP A

SITE 1

| Medium | No. of Samples | Duplicates | Total | Analytical Suite[a,b] |
|---|---|---|---|---|
| Surface Water | [10] | 1 | [11] | A |
| Sediment | [15] | [1] | [16] | A |
| [Soil] | [14] | [1] | [15] | [A] |
| Groundwater[d] | [28] | 2 | [30] | A |
| TOTAL | [67] | [5] | [72] | |

| [Medium | No. of Samples | Dupli-cates | Trip Blanks[f] | Field Blanks | Rinsate Blanks | Preservative Blanks[g] | Total | Analytical Suite[a,c] |
|---|---|---|---|---|---|---|---|---|
| Groundwater[e] | 16 | 2 | 2 | 1 | 2 | [1] | 24 | B |

[a]Analytical suite designations are as follows:

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

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

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

[[c]Specific constituents encompassed by the various chemical groups included within analytical Suite B are identified in Tables 9-5 through 9-13 of the GQAPP.

[d]Groundwater samples and analytical requirements shown are for Phase I temporary wells only.

[e]Groundwater samples and analytical requirements shown are for existing permanent wells.

[f]Trip blanks will be analyzed for TCL volatile organic compounds only.

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

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

## 14.5 Topographic Survey and Base Map

Following the completion of Phases III and IV, a topographic survey of the Site 1 area 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 Field 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 Site 1 will be performed in accordance with Section 6.10 of the GQAPP.



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### 14.7.2 Vaste Management Procedures

All water generated during monitoring well purging and development activities on Site 1 will be discharged onto the ground surface avay 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 landfill 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.

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## 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.



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# 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.



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# 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.



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# 18. BASELINE RISK ASSESSMENT

As part of the Remedial Activities Investigation, a baseline risk assessment will be conducted to determine the level of effort required in the Feasibility Study (FS) for remedial actions. The baseline risk assessment will provide an evaluation of the potential threat to human health and the environment in the absence of any remedial action, by providing the basis for determining whether or not remedial action is necessary and the justification for performing any remedial actions.

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

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

## 18.1 Contaminant Identification

The main purpose of this step is to screen available information on the hazardous wastes present at the site and to identify contaminants of



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concern to focus on in subsequent efforts in the risk assessment process. It may be useful at some of the NAS Pensacola sites to select "indicator chemicals" to represent the most toxic, persistent, and/or mobile substances among those identified that are most likely to contribute significantly to the overall risk posed by the site. Sometimes this indicator chemical can be selected to represent a "class" of chemicals (e.g., trichloroethylene to represent all volatiles).

## 18.2 Exposure Assessment

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

1) A source mechanism of chemical release into the environment;

2) An environmental transport medium (e.g., air, ground water, biota);

3) A point of potential contact with the medium of concern; and

4) An exposure route to the population from the contact point.

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

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

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## 18.3 Toxicity Assessment

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

## 18.4 Risk Characterization

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

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

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



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- Records of any environmental and/or health complaints regarding the sites; and

- Log of *any* actions taken by a health unit regarding health issues, complaints, and concerns.]

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

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

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# 19. FEASIBILITY STUDY

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

As part of the initial scoping activities of the FS, E & E will prepare a summary of field data collected during the RI to compare and evaluate the concentration of the contaminants of concern against the cleanup criteria developed. E & E will prepare a qualitative and quantitative summary of contamination for the scenarios identified during risk assessment evaluation. Results of this evaluation will serve as a basis for the screening of applicable remedial technologies for the development and evaluation of remedial action technologies.

## 19.1 Screening of Applicable Remedial Technologies

E & E will screen and develop applicable technologies for the remediation of any on-site contamination. In the process of screening applicable technologies, E & E will consider all ARARs and identify problems, and determine pathways of contamination using a receptor-oriented approach based on the threat to the public health, welfare, and the environment. In this summary, pathways will be outlined for each medium of concern. E & E then will identify applicable remedial technologies for each general response action such as contaminant removal, treatment, disposal, and so on. The identification of technologies will be based on technical selection criteria and E & E's engineering judgment.



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## 19.2 Assessment of Applicable Remedial Technologies

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

## 19.3 Risk Assessment

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

## 19.4 Development and Evaluation of Remedial Action Alternatives

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

## 19.5 Selection of Recommended Remedial Action Alternatives

During this task, E & E will select a single remedial action alternative for the remediation of the site. The alternatives assembled during the preceding task will be compared using technical, environmental, and economic criteria. E & E will consider present worth of total costs, environmental effects, technical aspects, the extent to which alternatives comply with ARARs, community effects, and other factors,



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when comparing alternatives. E & E will apply these evaluation criteria uniformly to each alternative along with any additional criteria that may result from the Navy project coordination. E & E will discuss the selection of the chosen alternative by means of a statement of the relative advantages of the alternative over the other alternatives considered.

## 19.6 FS Report

A draft and final FS report will be provided to the Navy for review and comments.



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## 20. REPORT

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

E & E will prepare a 90% draft, [for each of the above-described] reports, [which summarizes] the activities and results of the [investigation tasks performed]. Upon receipt of comments [from] the Navy concerning the 90% draft reports, E & E will prepare a draft final report for the Navy and the Technical Review Committee (TRC) review. The TRC review comments will be incorporated into final reports. Each report will be written as an independent document, complete in its own right, and fully supportive of the conclusions that it contains. [Where appropriate,] public participation issues will be summarized, as will interim remedial measures necessary to protect against continued



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conditions at the site(s). Information used in analyses, but supplemental to the analytical results, will be provided in a series of appendices.

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

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## 21. DOCUMENT REVISION

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



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## 22. PROJECT MANAGEMENT

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



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# 23. PROJECT SCHEDULE

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



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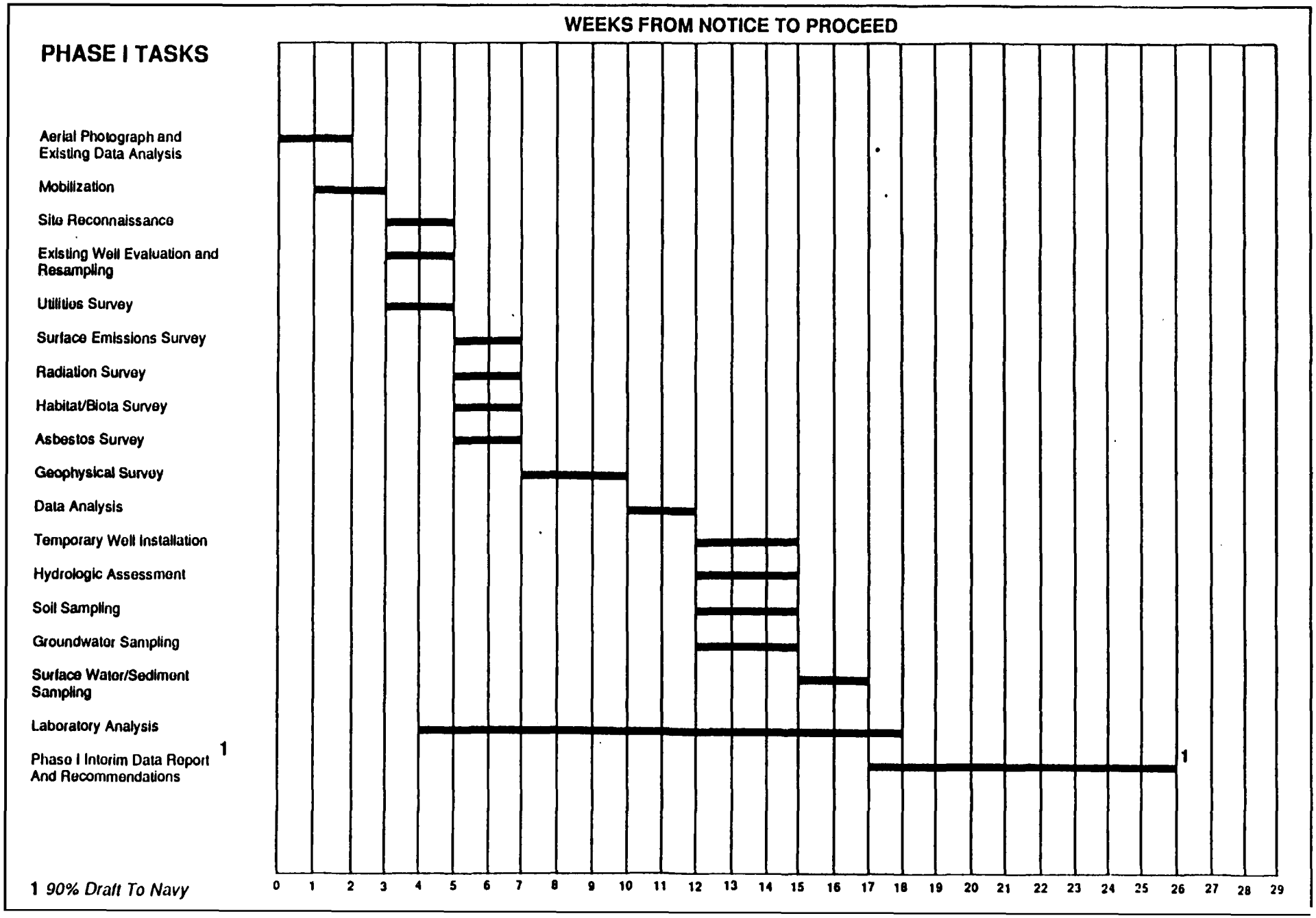


Figure 23-1 PHASE I PROJECT SCHEDULE - GROUP A

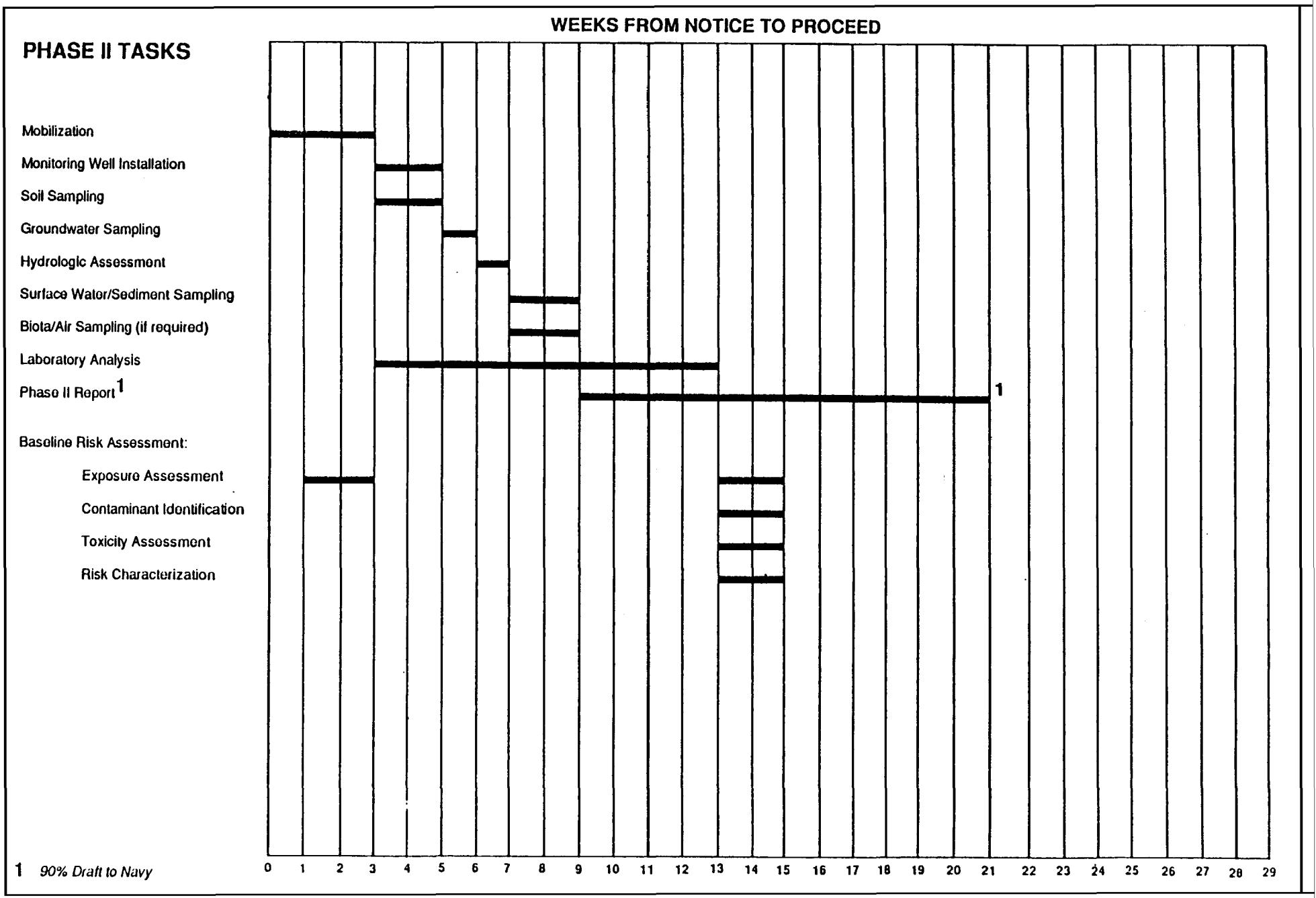


Figure 23-2 PHASE II PROJECT SCHEDULE -- GROUP A



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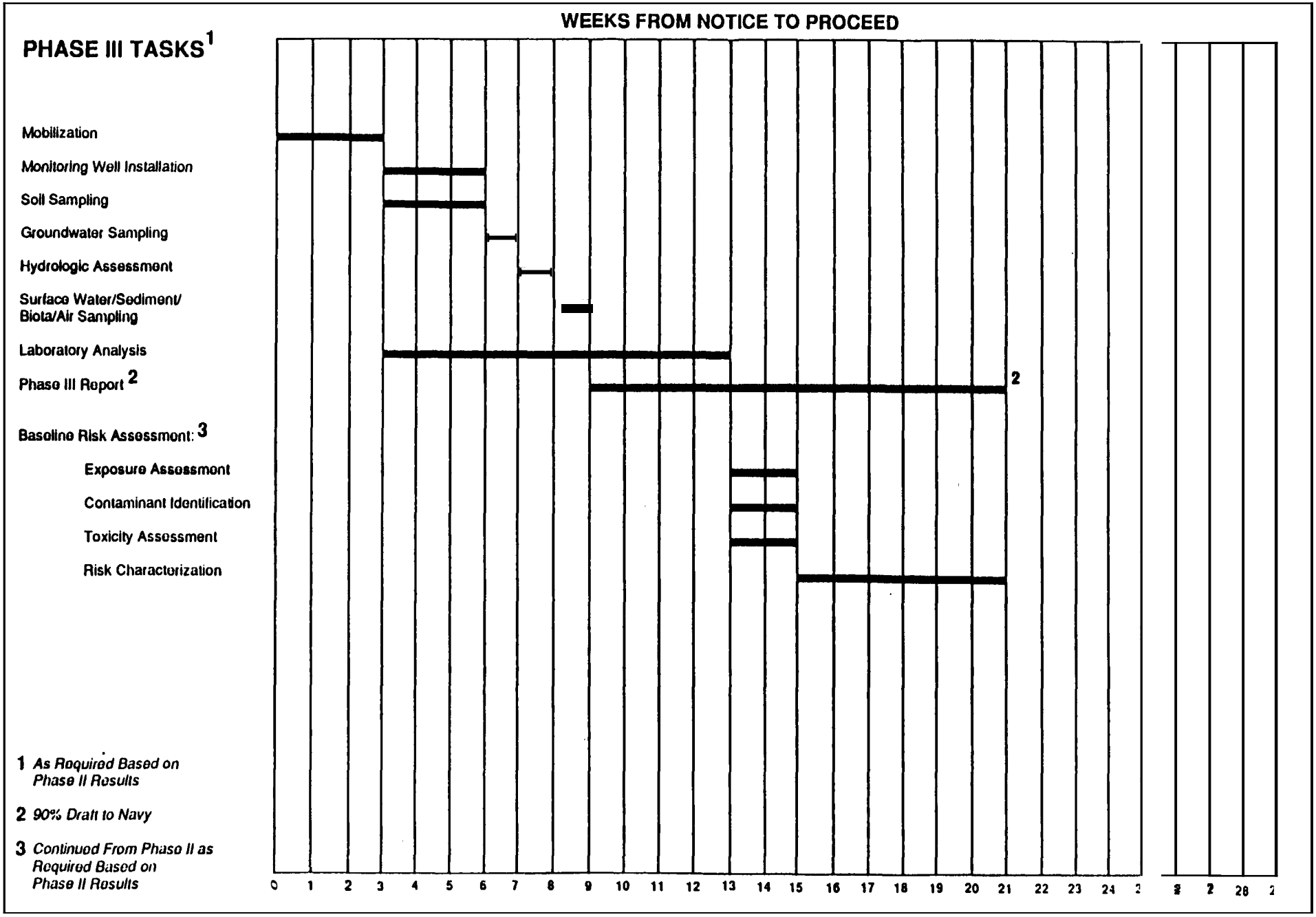


Figure 23-3 PHASE III PRO[illegible]CT SCHEDULE -- GROUP A (SITE 1)

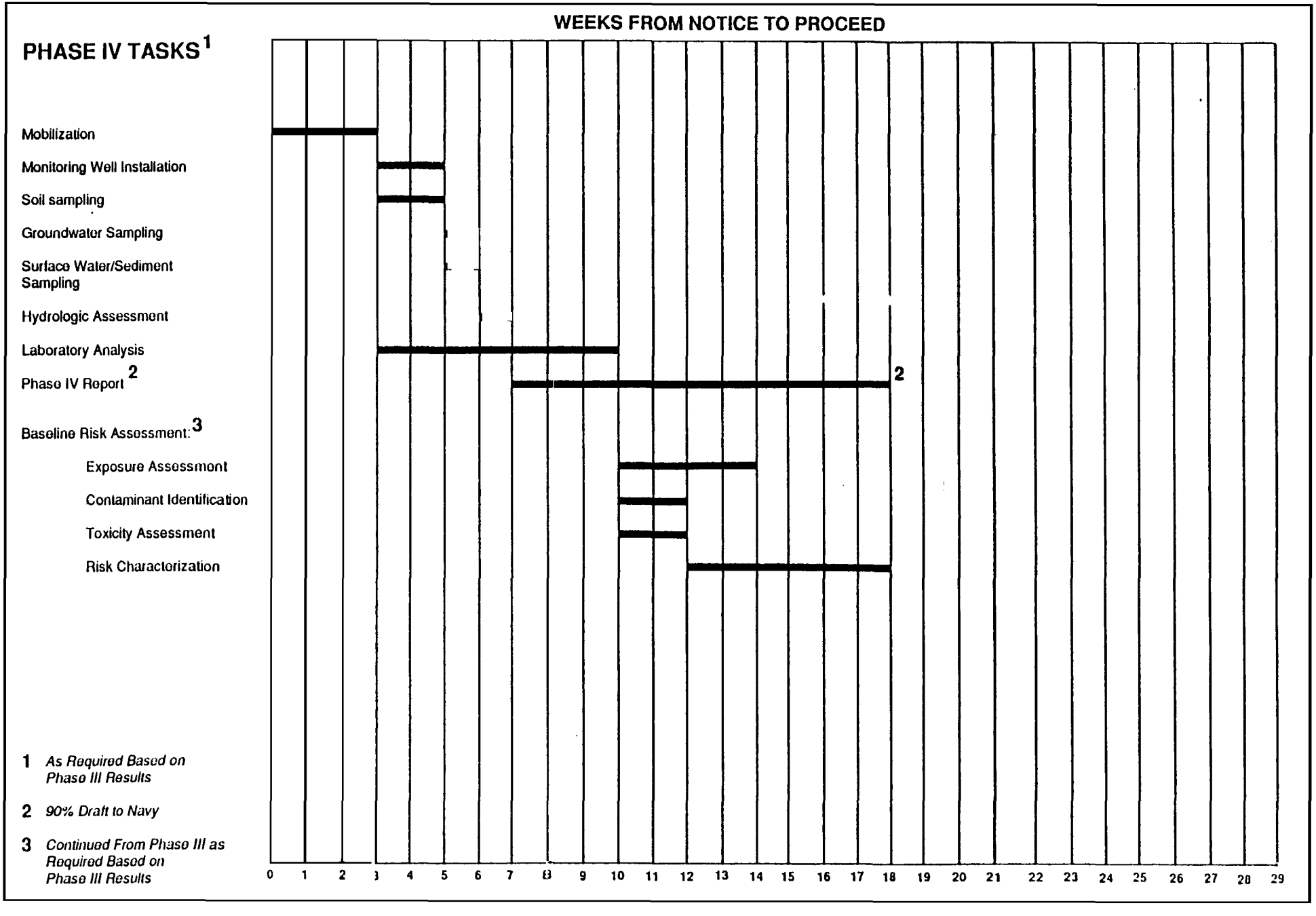


Figure 23-4 PHASE IV PROJECT SCHEDULE -- GROUP A

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

# APPENDIX A

## SITE-SPECIFIC *SAFETY* PLAN

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# SITE SAFETY PLAN

Version 988

## A. GENERAL INFORMATION

Project Title: Site 1 - Sanitary Landfill

Project No.: UH1101

TDD/Pan lo.:

Projrct Manager: John Barksdale

Project Dir.: Rick Rudy

Location(s): Sanitary Landfill - 1/2 mile northoart of Shrraan Field

Prepared by: Jon Schmidt

Date Prepared: 4-25-89

Approval by: Mary Miller MM

Date Approved: 5-5-89

Site Safety Officer Review:

Date Reviewed:

Scope/Objective of Work: Field Screening will include physic81 surveys, soil, surface water and sediment sampling, temporary monitoring well installation and groundwater sampling.

Proposed Date of Field Activities: September 1989

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

Documentation/Summary:

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

## B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

| | | | |
|---|---|---|---|
| Liquid [ X ] | Solid [ X ] | Sludgo [ X ] | Gas/Vapor [ X ] |

Characteristic(s):

| | | | |
|---|---|---|---|
| Flammable/ Ignitable [ X ] | Volatile [ X ] | Corrosive [ X ] | Acute1y Toxic [ X ] |
| Explosive [ ? ] | Reactive [ X ] | Carcinogen [ X ] | Radioactive* [ ? ] |

Other:

Physical Hazards:

| | | | |
|---|---|---|---|
| Overhead [ X ] | Confined* Space [ ] | Below Grade [ X ] | Trip/Fa11 [ X ] |
| Puncture [ ] | Burn [ ] | Cut [ ] | Splash [ X ] |
| Noise [ X ] | Other: Landfill within flight path of Sherman Field, sampling may involve working from a boat and working within woods. | | |

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



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sire History/Description and Unusual Features (s o Sampling Plan for detailed description): Tho landfill occupies approximately 80 acres northwest of Sherman Field along Bayou Grande. The site is heavily vegetated by pine flatwoods in some areas, and covered with grassy/shrub vegetation in others. From tho 1950's until 1976 largo quantities of a varied collection of solid and liquid wastes were disposed of within the landfill. Compressed gas cylinders, asbestos and radioactive waste are potontially buried in tho landfill.

Locations of Chemicals/Wastes: Liquid and solid wastes were buried at three locations over the 80-acre st.

Estimated Volume of Chemicals/Wastes: unknown

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

---

## C. HAZARD EVALUATION

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

Physical Hazard Evaluation:

1) Physical Surveys - Walking in swamps and crook;

2) Temporary Monitoring Well Installation - Using portable drill rig;

3) soil Sampling - Using portable drill rig:

4) Surface Water and Sediment Sampling - Working in confined spaces and from a boat (in some cases)

5) Decontamination Procedures - Using solvents.

Chemical Hazard Evaluation:

| Compound | PEL/TWA | Route of Exposure | Acute Symptoms | Odor Threshold | Odor Description |
|---|---|---|---|---|---|
| Methylene chloride | 500 ppm | Inh, Cong | Dizzy, Naus, Vomit | 214 ppm | sweet odor |
| 1,1,1-tichloroethane | 350 ppm | Inh, Ing, Con | Dizzy, Naus, Vomit | 20-100 ppm | chloroform-like |
| Isopropyl Alcohol | 400 ppm | " " | drowsiness,head. | 7.5-200 ppm | rubbing alcohol |
| Nitric Acid | 2 ppm | " " | corrosive | 0.3-1 ppm | acrid |
| Napthalene | 10 ppm | Inh, Ing, Con | naus, sweat, vomit | 0.3 ppm | mothballs |
| Mercury | 0.1 $mg/m^3$ | Inh, Abs, Con | cough, head | odorless | odorless |
| Benzene | 1 ppm | Inh, Ing, Con | naus, dizzy, vomit | 4.68 ppm | aromatic |
| Vinyl chloride | 1 ppm | Inh, Con | drowsy, cough | 260 ppm | |
| PCBs | 0.15 $mg/m^3$ | Inh, Ing, Con | nausea, vomit | N/A | varies |
| Asbestos | 0.01 f/cc | Inh. | N/A | N/A | N/A |

Note: Complete and attach a Hazard Evaluation Shoat for major known contaminant.



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## D. SITE SAFETY WORK PLAN

Site Control: Attach map, use back of this page, or sketch of site showing hot zone, contamination reduction. zone, etc.

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

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

Personnel Protection (TLD badges required for a11 field personnel):

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

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

Modifications: Modified level D with tyveck, neoprene gloves and boots, safety glasses, APR available when level C upgrade is necessary based on OVA readings. Since landfil may be generating methane, an HNu will also be used to determine the composition of volatile organic compounds (% nothane).

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

- o Lovel D: $O_2$ <19.5% or >25%, explosive atmosphere >10% LEL, organic vapors above background levels, particulates >_____ $mg/m^3$, other _____
- o Lovel C: $O_2$ <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapor (in breathing zone) >5 ppm, particulates >_____ $mg/m^3$, other _____
- o Lovel B: $O_2$ <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors (in breathing zone) >500 ppm, particulates >_____ $mg/m^3$, other _____
- o Lovel A: $O_2$ <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors >500 ppm, particulates >_____ $mg/m^3$, other _____

Air Monitoring (daily calibration unless otherwise noted):

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

(Expand if necessary)

Decontarination solutions and Procedures for Equipment, Sampling Gear, etc.:
Trisodium phosphate wash, tap water rinse, isopropanol rinse, distilled water rinse, isopropanol rinse, and final distilled water rinse.



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

Decon Solution Monitoring Procedures, if Applicable: Decontamination will bo performed in a well-ventilated area upwind of the sampling zone.

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

N l drilling safety procedures will bo strictly adhered to as outlined in Attachment A. An indepth goophysical exploration will bo conducted prior to drilling to locate buried metallic materials.

Site Entry Procedures and Special Considerations: E & E's "Buddy System" will bo employed at a11 times during fieldwork activities. Personnel will exercise caution in the vicinity of the landfill and paved ditch. 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 (tin of day. weather conditions, etc.) and Heat/Cold Stress Requirements:

All fieldwork activities will bo performed during daylight hours. Team members will take breaks as necessary to avoid heat stress a d 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 vasto, cuttings):

All fieldwork waste materials will bo double bagged, drummed, labeled urd transported to a designated location for final disposal by the Navy.

Sample Handling Procedures Including Protective Wear:

During a11 handling of samples, a11 field tear members will wear surgical gloves. Goggles will bo worn during sample preservation with acids.

| Team Member* | Responsibility |
|---|---|
| Team members to bo determined | Team Leader |
| | Sit. Safety Officer/Sampler |
| | Geologist/Sampler |
| | |

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

## E. EMERGENCY INFORMATION

(Use supplemental shoots, if necessary)

### LOCAL RESOURCES

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

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

Hospital Emergency Rood NAS Dispensary - 904-452-2733, Baptist Hospital 904-434-4811 (Life ?light)

Poison Control Center

Police (include local, county sheriff, state) 911

Fire Department 911

Airport

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

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

Fed. Express 1-800-238-5355

Client Contact U.S. Navy Southern Division, Enginoor-In-Chargo, 1-803-743-0574

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

### SITE RESOURCES

Site Emergency Evacuation Alarm Method N/A

Water Supply Source on-sit.

Telephone Location, Number To bo determined on-sit.

Cellular Phone, if available N/A

Radio

Other On-site warehouse number to bo 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 (home)

3. Regional Office Contact ..... M.Miller.... 656-2854 (home)
   877-1978 (office)

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



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## MEDTOX HOTLINE

1. Twenty-four hour answering service: (501) 370-6263

   What to report:

   - State: "this is an emergency."
   - Your name, region, and site.
   - Telephone number to reach 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 the information given to the answering service.

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

   a. 24 hour hotline - (716) 684-8940
   b. Corporate Safety Director - Paul Jonmaire - homo # (716) 655-1260
   c. Assistant Corp. Safety Officer - Steven Sherman - home # (716) 600-0084

## EMERGENCY ROUTES

(NOTE: Field Teas rut Know Route(s) Prior to Start of *Ark)

Directions to hospital (include map)

**NAS Dispensary** - Follow Taylor Road east to Murray Road. Turn right onto Murray Road and follow it south to the intersection of Bllyson Avenue and Xurray Road. The NAS Dispensary is located on the northwest corner of tbe intersection of Ellyson Avenue and Turner Street, in Building 625-A.

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

Emergency Egress Routes to Get Off-Site Emergency egress routes will be located if emergency exit routes become blocked by construction, etc.



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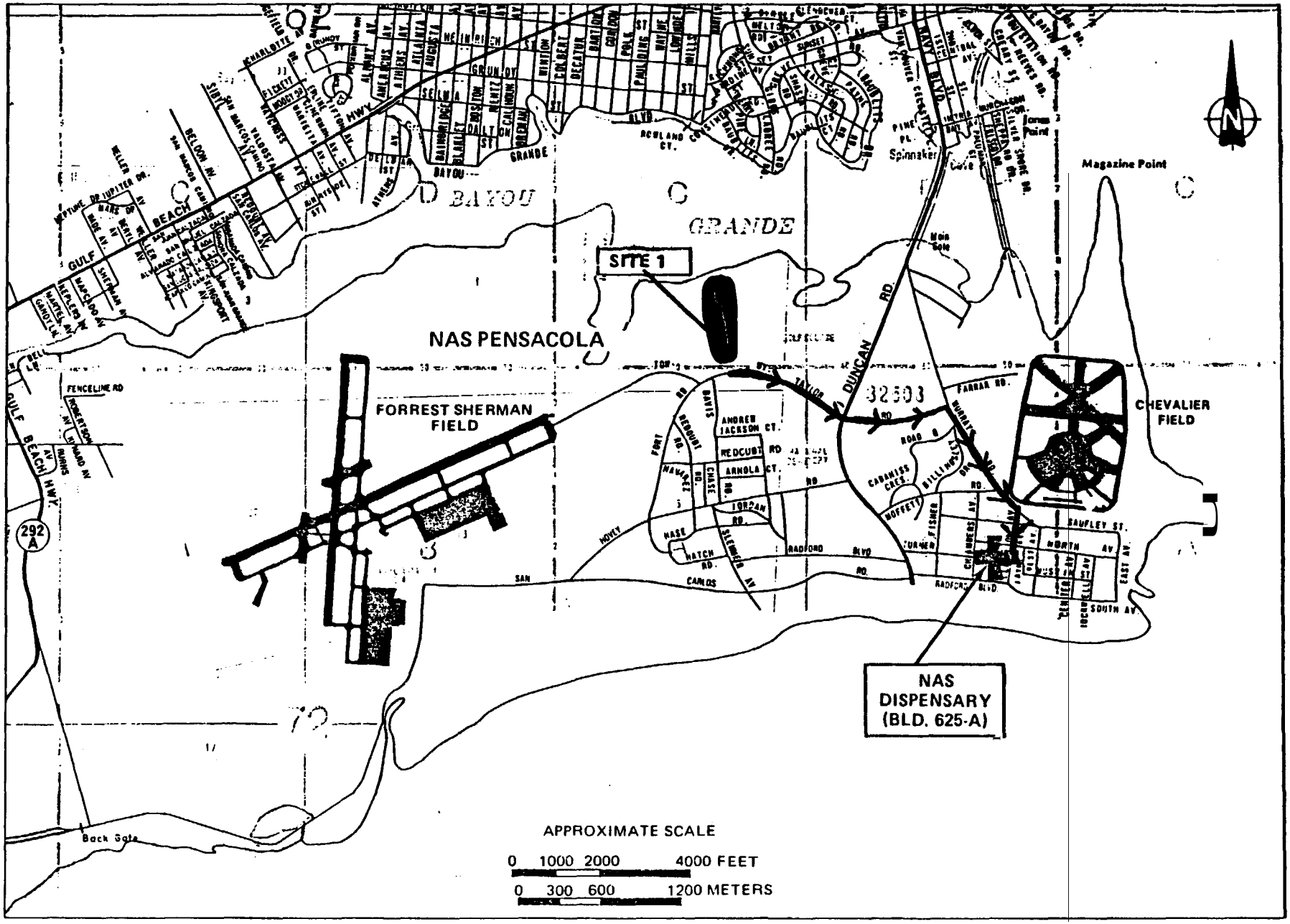


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# DRILL RIG SAFETY

* Bard 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 when not in use.
* Level and stabilize the drill rig prior to raising the mast.
* watch for slippery ground when working in the area of the rig.
* All unattended boreholes must be properly covered.
* Do not drill during an electrical storm.
* Maintain a safe distance from the rig mechanisms during drive sampling and auger removal operations.

# 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 of 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 add 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 exhaustion, 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 and abdomen,
- Pain accompanying the cramps,
- Faintness, and
- Profuse perspiration.

**Heat G— 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

Neat 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, "Catorade,' 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 arid 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. Tranrportation to a medical facility should not be delayed. Remove the patient to a cool environment if possibla, 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 exhausiion, "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 rltuatlons 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 8, the suggested guidelines for ambient temperature and maximum wearing time per oxcursion are:

| Ambient Temperature (°F) | Maximum Wearing Time per Excursion (Minutes) |
|---|---|
| Abovo 90 | 15 |
| 85 to 90 | 30 |
| 80 to aS | 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 one such method:

- 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.
- Double the count.

If the recovery pulse rate during the last 30 seconds 'of the first minute is at 110 beats/minute or kss and the deceleration between the first, second. and third minutes is at kast 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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# Mallinckrodt
# Material Safety Data

Emergency Phone Number: **314-982-5000**

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

# ISOPROPYL ALCOHOL

## PRODUCT IDENTIFICATION:

Synonyms: I-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.
Amid breathing vapor.
Wash thoroughly after handling.
A d d contact with eyes, skin and clothing.

## EMERGENCY/FIRST AID

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

Fin 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 NOSH-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 Datg

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 combinrtion, 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 **a n 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

## SECTION 5 Health Hazard Information

### A. EXPOSURE / HEALTH EFFECTS

Inhalation:
May cause irritation of the nose and throat. Exposure to high concentrations has a narcotic effect, producing sjmptoms 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.

Aggravation of Pre-existing Conditions:
Persons with preexisting 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:
Give water to drink. Induce vomiting if medical help not is immediately 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/3H. Mutation references cited Aquatic Toxicity rating TLm96: 1000-10 ppm.

## SECTION 6 Occupational Control Measures

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (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 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 a m . 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 the maximum use concentration specified by the respirator supplier. Alternatively, a supplied air full facepiece respirator or airlined hood may bo 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 cool, dry well-ventilated location, away from my a m where the fire hazard may be acute. Outside or detached storage is preferred. Separate from oxidizing materials. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be NO Smoking areas. Use non-sparking type tools and equipment.

# Mallinckrodt
# Mater( .l Safety Data

Emergency Phone Number: 314-982-5000

makes no representation as to its comprehensiveness or accuracy. Individuals receiving this informatio st exercise their independent judgment in determining its approp ss for a particular purpose.

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

## 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.**

### SECTION 2 Fire and Explosion Information

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

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

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

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

### SECTION 3 Reactivity Data

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

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

**Hazardous Polymerization:**
Will **not occur.**

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

### SECTION 4 Leak/Spill Disposal Information

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

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

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

**NFPA Ratings:** Health: 3 flammability 0 Reactivity: 0 Other: Oxidizer

## SECTION S Health Hazard Information

### A. EXPOSURE / HEALTH EFFECTS

**Inhalation:**
Corrosive! Inhalation of vapors a n cause breathing difficulties and lead o 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 c a w deep ulcers and stain skin a yellow or yellow-brown color.

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

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

**Aggrevation of Pre-existing Conditions:**
Persons with pre-existing skin disorders or eye disease may be mom susceptible to the effects cl 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:**
Ia 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 minuter. 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 a n 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", m a t 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 mol. dry, ventilated area. Protect from physical damage and direct sunlight. Isolate from incompatible substances. Protect from moisture.



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# Mallinckrodt
# Material Safety Data

Emergency Phone Number: **311-982-5000**

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

## SULFURIC ACID 96%

## PRODUCT IDENTIFICATION:

**Synonyms: Oil of** Vitriol

Formula **CAS No.:** 7664-93-9

Molecular Weight: **98.07**

Chemical Formula: $H_2SO_4$

Hazardous Ingredients: Not applicable.

## PRECAUTIONARY MEASURES

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

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

## EMERGENCY/FIRST AID

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

**DOT Hazard Class:** ***Corrosive*** **Material**

## SECTION 1 Physical Data

Appearance: Colorless, oily liquid.

Odor: Odorless.

Solubility: Infinite @ 20°C.

**Boiling** Point: **ca. 310°C (590°F)**

Melting Point: ca. -14°C (6°F).

Specific Gravity: 1.84

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

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

Evaporation Rate: **No** information **found.**

## SECTION 2 Fire and Explosion Information

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

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

**Fire Extinguishing Media:**
Dry chemical. **form** or carbon dioxide. Water spray maybe used to keep fire exposed containers ***cool.***

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

## SECTION 3 Reactivity Data

**Stability:**
Stable under ordinary conditions of *use* and **storage.**

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

**Hazardous Polymerization:**
**Will not** occur.

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

## SECTION 4 Leak/Spill Disposal Information

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

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

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

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: **2** Other: Water **reactive**

## SECTION 5 Health Hazard Information

### A. EXPOSURE / HEALTH EFFECTS

**Inhalation:**
Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. May cause lung edema. Symptoms may include irritation of the nose and throat, and labored breathing.

**Ingestion:**
Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting. diarrhea.

**Skin Contact:**
Corrosive. Symptoms of redness, pain, and severe burn can occur.

**Eye Contact:**
Corrosive. Splashes can cause blurred vision, redness, pain and severe tissue burns.

**Chronic Exposure:**
Long-term exposure to mist or vapors may cause damage to teeth.

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

### B. FIRST AID

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

**Ingestion:**
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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Chemical Pact Sheet* Version 2

## PCBs

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing 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 as is practical.

Chemical Names: Polychlorinated biphenyls.

**Trade Names:** Aroclor, Arochlor, Kaneclor, Clophen, Phenoclor, Pyralene, Askarel, Asbestol, Inerteen, Pyranol, Santotherm, Clorextol, Saf-Ti-Kuhl, No-Flamol, Chemko and others.

**Uses:** As an insulating, non-flammable, thermally conductive, fluid in electrical capacitors and transformers.

## PHYSICAL INFORMATION

**Appearance:** May be a clear, colorless oily liquid, light to dark yellow resin or wax, or white to yellow powder.

**Odor:** Aromatic, acrid.

**Evaporation:** Very slow.

**Behavior In Water:** Does not mix; sinks.

## HEALTH HAZARD INFORMATION

**OSHA Standard:** Average 8 hour exposure -- 1.0 $mg/m^3$ (42% chlorine).
Average 8 hour exposure -- 0.5 $mg/m^3$ (54% chlorine).

**NIOSH Recommended Limit:** Average 10 hour day/40 hour week -- 0.001 $mg/m^3$.

**ACGIH Recommended Limit:** Average 8 hour exposure -- 1.0 $mg/m^3$ (42% chlorine).
Average 8 hour exposure -- 0.5 $mg/m^3$ (54% chlorine).

**Short Term Exposure:**

**Inhalation:** May produce irritation to nose, throat and lungs, Levels above 10 $mg/m^3$ are reported to be unbearable. Inhalation may contribute significantly to all symptoms of long term exposure.

Skin: Absorption moderate. Contributes significantly to all symptoms of long term exposure. Sensitized individuals may develop a rash after 2 days exposure by contact or inhalation.

**Eyes:** May produce irritation. Levels of 10 $mg/m^3$ are severely irritatinq.

**Ingestion:** Absorption in digestive system contributus significantly to all symptoms of long term exposure, There are no reported deaths of humans due to a single ingestion. However, experiments in animals suggest that ingestion of 6 to 10 fluid ounces would cause death to a healthy 150 pound adult.

**Long Term Exposure:**

PCBs are readily absorbed into the body by all routes of exposure. They may persist in tissues for years after exposure stops. The symptoms belw may be due to PCBs or to chemical contaminants.

High levels of PCB vapor, 1 to 10 $mg/m^3$, may produce burning feeling in eyes, nose and face; dry throat; lung and throat irritant; nausea; dizziness and aggravation of acne. These may be felt immediately or be delayed weeks or months.

Chemical acne, black heads, dark patches on skin, and unusual eye discharge have been reported by all routes of exposure, Although some sensitive individuals have reported these effects after two days, onset may not occur for months. These effects may last for months. Liver damage and digestive disturbance have bean reproted in some individuals. PCBs may impair thm functioning of the immune system.

PCBs at high levels have been shown to produce cancer and birth defects in laboratory animals. Whether PCBs produce these affects in humans is not known.

*Prepared by the Bureau of Toxic Substance Assessment, New York Statu Department of Health. For an explanation of the terms and abbreviations used, See "Toxic Substances: How Toxic Is Toxic", available from the New York State Department of Health.

## EMERGENCY AND FIRST AID INSTRUCTIONS

**Inhalation:** Move parson to fresh air and get medical attention if symptoms continue.

**Skin:** Remove contaminated clothing immediately. Blot excess with paper towels. Wash affected area thoroughly with soap and water for at least 15 minutes.

**Eyes:** Rinse eyes with water for at least 15 minutes. A drop of vegetable oil may be added to relieve irritation. Seek medical attention if necessary.

**Ingestion:** Get immediate' medical attention.

**Note to Physician:** Serum SGOT, SGPT and triglyceride levels have been used to monitor liver damage.

## FIRE AND EXPLOSION INFORMATION

**General:** Non-flammable.

## REACTIVITY

**Conditions to Avoid:** High beat and electrical discharge may produce the highly poisonous substances phosgene, hydrochloric acid and chlorinated dibenzofurans.

## PROTECTIVE MEASURES

**Storage and Handling:** Store in a tightly closed container with proper EPA labelling. Storage for more than 30 days must be in an EPA approved facility.

**Engineering Controls:** Provide local exhaust ventilation system. Sinks, showers and eyewash stations should be readily available.

**Protective Clothing (Should not be substituted for proper handling and engineering controls):** Wear gloves and aprons made of neoprene, viton or polyethylene, safety glasses with side shields and impervious shoes.

**Protective Equipment:** For any detectable levels use a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode or a supplied-air respirator with a full facepiece and an auxiliary self-contained breathing apparatus both operated in positive pressure mode. For escape from a contaminated area wear a gar mask with an organic vapor canister and a high-efficiency particulate filter or an escape self-contained breathing apparatus.

## PROCEDURES FOR SPILLS AND LEAKS

Get workers out of spill area. Wearing protective clothing and equipment, ventilate area to reduce vapor levels. Absorb on nonreactive material such as sand or vermiculite. In the event of a spill and for disposal information, contact your regional office of the New York State Department of Environmental Conservation and the U.S. Environmental Protection Agency.

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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ecology and environment

Chemical Fact Sheet* Version 2

## NAPHTHALENE

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing 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 as is practical,

**Chemical Names:** Naphthaline; CAS 91-20-3.

**Trade Names:** White tar, moth balls, moth flakes and others.

**Uses:** Moth repellent, insecticide; in the manufacture of phthalic acid, anthranilic acid, dyes, resins, lampblack and others,

## PHYSICAL INFORMATION

**Appearance:** White-flakes, cakes or powder.

**Odor:** Mothball–like. **Minimum Detectable by Odor:** 0.03 ppm.

**Behavior in Water:** Insoluble.

**Evaporation:** Moderate rate of change from a solid directly to a gas,

## HEALTH HAZARD INFORMATION

**OSHA Standard:** Average 8 hour exposure -- 10 ppm.

**NIOSH Recommended Limit:** None established,

**ACGIH Recommded Limit:** Average 8 hour exposure -- 10 ppm.

**Short Term Exposure:**

**Inhalation:** Levels above 10 ppm may cause headache, nausea, excessive sweating and vomiting.

**Skin:** May Cause irritation. If hypersensitive to naphthalene, severe irritation may occur.

**Eyes:** Levels above 15 ppm may cause irritation. Direct contact may cause severe irritation, injury to the cornea and a blurring of vision.

**Ingestion:** Ingestion of *1f2* gram (1/60 ounce) may cause nausea, vomitinq, abdominal pain, irritation of the bladder, and brown or black coloration *of* the urine. The symptoms usually disappear after a few days, Animal studies indicate that the probable lethal dose for an adult is 5 to 15 grams (1/16 to 1/2 ounce).

**Long Term Exposure:**

Repeated ingestion of 1/2 gram doses may cause clouding of the eye. Inhalation of levels above 10 ppm may cause headaches, nausea, vomiting and a feeling *of* general discomfort, Chronic skin problems are rare, except in cases of hypersensitivity.

*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: How 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 or oxygen as required. Seek medical attention, if necessary.

**Skin:** Remove chemically soiled clothing. Wash affected area for at least 5 minutes. Seek medical attention, if necessary.

**Eyes:** Wash with large amounts of water for at least 15 minutes. See an eye doctor immediately.

**Ingestion:** Give person plenty of water, including one glass with about 1/6 ounce of baking soda. Seek medical attention immediately. **Note:** Never force an unconscious person to drink.

**Note to Physician:** May require emesis or gastric lavage, saline cathartic, and protein demulcents. Oils may speed absorption. Occurrence of hemolysis may require transfusion. Hemodialysis may be required in case of acute renal failure. Detection of alpha-naphthol in urine may be necessary for definitive diagnosis.

## FIRE AND EXPLOSION INFORMATION

Flammable. Ignites at 88°C (174°F).

**Explosive Limits:** Upper — 6%, lower — 0.9%.

**Extinguisher:** Water, carbon dioxide. dry chemical or foam. Direct water or spray on burning naphthalene can cause violent and excessive foaming.

## REACTIVITY

**Conditions to Avoid:** High temperatures.

**Materials to Avoid:** Reacts violently with strong oxidizing agents (permanganate, dichromate). Reacts explosively with dinitrogen pentoxide.

## PROTECTIVE MEASURES

**Storage and Handling:** Store in a cool, dry place away fr a sources of heat and ignition, Protect containers from damage.

**Engineering Controls:** Use with local exhaust ventilation. Sinks, showers and eyewash station should be mailable.

**Protective Clothing (Should not be substituted for proper handling and engineering controls):** If contact is likely war chemical goggles, face shield. plastic or rubber footwear, apro and gloves.

**Protective Equipment:** For levels up to 100 ppm use a chemical cartridge respirator with organic vapor cartridges and dust and mist filters, a supplied-air respirator or a self-contained breathing apparatus. For levels u to 150 ppm use a supplied-air respirator operated in continuous flow mode or a pavered-air purifying respirator vith organic vapor cartridges and dust and mist filters. For levels up to 500 ppm use a chemical cartridge respirator with organic vapor cartridges and high-efficiency particulate filters. a supplied-air respirator with a full facepiece or a self-contained breathing apparatus with.. full facepiece. For levels above 500 ppm or use in arras at unknown concentrations use a self-contained breathing apparatus with a 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 gar mask with an organic vapor canister and high-efficiency particulate filter or an escape self-contained breathing apparatus. For firefighting use a self-contained breathing apparatus with a full facepiece oprated in a positive pressure mode.

## PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of the spill area. Wearing proper protective clothing and equipment sweep into a fiber carton. 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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# ASBESTOS

The information in this sheet applies to vorkplace exposure resulting from processing, manufacturing, storing 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 minimize exposure to all chemicals,

**Chemical Names:** Amosite, amianthus, actinolite, tremolite, anthophyllite, amphiboles, crocidolite, *chrysotile,* calcium magnesium silicate; CAS 1332-21-4.

**Trade Names:** Ascarite and others.

**Uses:** Heat–resistant insulator, inert filler, component *of* cements or brake linings, and many others.

## PHYSICAL INFORMATION

**Appearance:** Fine, slender, flaxy fiber which can be white, green, blue or grey-brown in color.

**Odor:** None.

**Behavior in Water:** Insoluble.

## HEALTH HAZARD INFORMATION

**OSHA Standard:** Average 8 hour exposure -- 02 fiber/cubic centimeter (effective 7/86).

**NIOSH Recommended Limit:** Average 8 hour exposure -- 0.1 fiber/cubic centimeter.

**ACGIH Recommended Limit:** Averaqe 8 hour exposure -- amosite - 05 fiber/cubic centimeter, chrysotile - 2 fibers/cubic centimeter, crocidolite - 02 fiber/cubic centimeter, other forms - 2 fibers/cubic centimeter.

**Short Term Exposure:**

Short tera exposure to asbestos has been shown to increase the risk of developing lunq cancer, including mesothelioma. Such illnesses and their symptoms develop over a number of years and are usually associated vitb lonq term exposure to cancer–causing substances. However, due to the action *of* asbestos fibers trapped in the lung, no level or duration of exposure can be assumed to be free of risk and any exposure may contribute to the development of disease.

**Long Term Exposure:**

Exposure to asbestos fibers has been shown to cause an increased risk of developing several forms of cancer and other chronic lunq disease. These diseases usually develop over a number of years, but may appear more rapidly. Once established, the disease becomes progressively worse even if exposure has ceased. Due to the long period that may elapse between exposure and the onset *of* disease, OSHA requires medical monitoring of workers occupationally exposed to asbestos. There is a very large increase in the risk of developing lung cancer in workers exposed *to* asbestos vho also smoke cigarettes. Because asbestos can cause cancer, attempts should be made to reduce exposure Eo the lowest level possible through the use of engineering controls, protective equipment and appropriate work practices. The failure *of* workers exposed to asbestos to follow proper work practices (such as showering and changing to clean clothes before leaving work) can expose family members to asbestos fibers brought home on clothing.

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

## EMERGENCY AND FIRST AID INSTRUCTIONS

**Inhalation:** Wove perron to fresh air. Clean any fibers away from nose and mouth. Seek medical attention, if necessary.

**Skin:** Wash material from skin without inhaling fibers. Remove any sailed clothing.

**Eyes:** Wash with water for 15 minutes. Seek medial attention. If necessary.

**Ingestion:** Seek medical attention. If necessary.

## FIRE AND EXPLOSION INFORMATION

**General:** Non-flammable.

## REACTIVITY

**General:** Stable.

## PROTECTIVE MEASURES

**Note:** Several New York State agencies regulate aspects of the asbestos removal industry. The Department of Environmental Conservation addresses issues of transportation and disposal of materials containing asbestos. The Departments of Health and Labor are developing regulations for licensing of contractors, certification of workers and establishment of criteria for training and work practices in the asbestos removal industry. For more information, please contact the appropriate state agency.

**Storage and Handling:** . Use closed, heavy-gauge, impervious plastic bags in sealed rigid containers protected from physical damage. Do not smoke, eat, or drink in the work area.

**Engineering Controls:** To reduce the formation of dust, asbestos-containing materials should be wet doun. before being disturbed, with water that contains a surfactant or wetting agent (e.g. detergent). All hand-operated and power-operated tools which may release asbestos fibers in excess of OSHA standards must be supplied with local exhaust systems. Isolation, enclosure and dust collection methods should be used. Showers, sinks and eye wash stations should be readily available.

**Protective Clothing (Should not be substituted for proper handling and engineering controls):** Fiber concentrations in excess of 0.2 fiber/cubic ~~centimeter require we use~~ of special clothing I coveralls, head coverings, gloves and foot coverings), change rooms with two separate lockers (one for street clothes and one for wrk clothes) and a medical surveillance program. Employers are urged to contact their regional OSBA offices tot more detailed information on the requirements of the revised OSHA standard for occupational exposure to asbestos.

**Protective Equipment:** For levels up to 2 fibers/cubic centimeter use an air-purifying respirator with high-efficiency filters. For levels up to 10 fibers/cubic centimeter use the above with a Cull facepiece. For levels up to 20 fibers/cubic centimeter use a powered air-purifying respirator with high-efficiency filters or a supplied-air respirator operated in a continuous-flow mode. For levels up to 200 fibers/cubic centimeter use a supplied-air respirator with a full facepiece, operated in pressure demand mode. For levels above 200 fibers/cubic centimeter use a supplied-air respirator vita a full facepiece, operated in pressure demand rode and equipped uitb an auxiliary positive pressure self-contained breathing apparatus.

## PROCEDURES FOR SPILLS AND LEAKS

Wearing protective equipment. Use a wet-mop or high-efficiency vacuum to clean area. Avoid blowing, dry-broshing and dry-mopping, all of which may raise durt levels. For information on proper storage and disposal of wastes containing asbestos, contact your regional office of the New York State Department of Environmental Conservation.

?or 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.

00003112

# BENZENE

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

**Chemical Names:** Benzol, phenyl hydride, cyclohexatriene; CAS 71-43-2.

**Trade Names:** Benzole, Benzolene, Carbon Oil, Carbon Naphtha, Mineral Naphtha, Motor benzol, Nitration benzene, Phene, Pyrobenzol and others.

**Uses:** In the manufacture of styrene, phenol, detergents, organic chemicals, pesticides, plastics and resins, synthetic rubber, aviation furl, pharmaceuticals, dyes, explosives, gasoline, flavors and perfumes, paints and coatings. Used in the industrial processing of nylon, certain food products and photographic chemicals.

## PHYSICAL INFORMATION

**Appearance:** Colorless liquid.

**Odor:** Strong, pleasant. **Minimum Detectable by Odor:** 5 ppm.

**Behavior in Water:** Slightly soluble, floats,

**Evaporation:** Rapid.

## HEALTH HAZARD INFORMATION

**OSHA Standard:** Average 8 hour exposure limit -- 10 ppm.

**NIOSH Recommended Limit:** 1 PPI-

**ACGIH Recommended Limit:** Average 8 hour exposure limit -- 10 ppm.

**Short Term Exposure:**

**Inhalation:** Benzene may produce both nerve and blood effects, Irritataon of the nose, throat and lungs may occur (3,000 ppm may be tolerated for only 30 to 60 minutes). Lunq congestion may occur. Nerve effects may include an exaggerated feeling of well-being, excitement, headache, dizziness and slurred speech. At high levels, slowed breathing ana death may result. Death has occurred at 20,000 ppm for 5 to 10 minutes, or 7,500 ppm for 30 minutes.

**Skin:** Irritation may occur, with redness and blistecinq if not promptly removed. Benzene is poorly absorbed. Whole body exposure Cor 30 minutes has bern reported with no health effects.

**Eyes:** nay cause severe irritation.

**Ingestion:** Kay cause irritation of mouth, throat and stomach. Symptoms are similar to those listed under inhalation. One tablespoon may cause collapse, bronchitis. pneumonia urd death.

**Long Term Exposure:**

May cause loss of appetite, nausea. weight loss, fatigue, muscle weakness. headache, dizziness, nervousness and irritability. Mild anemia has been reported from exposures of 25 ppm for several years and 100 ppm Lor 3 months. At levels between 100 ana 200 ppm for periods of 6 months, or more, severe irreversible blood changes and damage to lrver and heart may occur. Temporary partial paralysis has been reported.

Benzene is a known human carcinogen. Exposure has been linkrd to increased risk of several forms of leukemia. Periodic blood tests of occupationally exposed individuals should be conducted,

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

**Inhalation:** Remove to fresh air. Give artificial respiration or oxygen if necessary. Seek medical attention.

**Skin:** Remove soiled clothing immediately. Wash thoroughly with soap and water for at least 5 minutes. Seek medical attention, if necessary.

**Eyes:** Irrigate eyes with water for at least 15 minutes. Seek medial attention.

**Ingestion:** Do not try to induce vomiting. Seek medical attention immediately.

**Note to Physician:** Severe exposure may require supportive measures for pulmonary edema.

## FIRE AND EXPLOSION INFORMATION

**General:** Flammable, vapor may spread considerable distance to a source of ignition and flash back. Ignites at -11°C (12°F).

**Explosive Limit:** Upper — 7.1% : Lower — 1.3%.

**Extinguisher:** Carbon dioxide, dry chemical or foam.

## REACTIVITY

**Materials to Avoid:** Contact with strong oxidizers, or iron in the presence of chlorine or bromine.

**Conditions to Avoid:** Exposure to sources of ignition.

## PROTECTIVE MEASURES

**Storage and Handling:** Protect containers against physical m e . Storage preferred in an outdoor or detached building. If storage is indoor, use a standard flammable liquid storage room.

**Engineering Controls:** Use only with efficient ventilation.

**Protective Clothing (Should not be substituted for proper handling and engineering controls):** If direct contact is likely. wear protective rubber clothing, gloves and eye goggles.

**Protective Equipment:** For any detectable levels use a self-contained breathing apparatus with a full facepiece and operated a positive pressure mode or a combination Type C supplied-air respirator with an auxiliary self-contained breathing apparatus, both with full facepiece and operated in a positive pressure mode. For escape from a contaminated area use a gas mask with organic vapor canister or an escape self-contained breathing apparatus.

## PROCEDURES FOR SPILLS AND LEAKS

Get all workers *out of* spill area. Put oa protective clothing and equipment when entering spill area for clean-up. Spread absorbent material on spill. sweep up and keep contained in fiber carton tightly sealed. 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.

0000313

**Chemical Fact Sheet***

version 2

## MERCURY (metallic)

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing 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 as is practical.

**Chemical Names:** Hydrargyrum; CAS 7439-97-6.

**Trade Names:** Quicksilver, liquid silver and others.

**Uses:** Used in the manufacture of scientific instruments, in electrical equipment, synthetic silk, solder, electrolytic processes, metal plating, tanning, dyeing, textiles, photography, photoengraving, paints and pigments.

## PHYSICAL INFORMATION

**Appearance:** A silvery-white, heavy liquid.

**Odor:** Odorless.

**Behavior in Water:** Does not mix. Will sink.

**Evaporation:** Slow, but even at room temperature. may evaporate to cause symptoms as listed under inhalation.

## HEALTH HAZARD INFORMATION

**OSHA Standard:** 0.1 mg/m$^3$.

**NIOSH Recommended Limit:** Average 8 hour exposure -- 0.05 mg/m$^3$.

**ACGIH Recommended Limit:** Average 8 hour exposure -- 0.05 mg/m$^3$.

**Short Term Exposure:**

**Inhalation:** Exposure to levels below 1 mg/m$^3$ has been shown to produce nonspecific symptoms such as shyness, insomnia, anxiety and loss of appetite. At higher levels (1-3 mg/m$^3$ for 2-5 hours) may cause headache, salivation, metallic taste, chills, cough, fever, tremors, abdominal cramps, diarrhea, nausea, vomiting, tightness in the chest. difficult breathing, fatigue, lung irritation and possible lung tissue damage. Symptoms may begin several hours after exposure and may last a week. Large doses may result in flu-like symptoms, which, in severe cases, may result in death due to pneumonia.

**Skin:** Can be absorbed through the skin. May cause irritation. Prolonged contact with skin can result in symptoms listed above.

**Eyes:** Can cause eye irritation.

**Ingestion:** Generally does not produce ill effects.

**Long Term Exposure:**

Mercury accumulates in the brain quickly during exposure but is released from the brain very slowly. This will result in a build-up in brain tissue over a long time. The liver and kidneys may also be damaged by mercury accumulation.

It may cause headache. dizziness. restlessness, irritability, sleepness, tremors, defective muscle control, increased salivation, loose teeth, irritation of the gums with a blue line between teeth and gums, loss of appetite, nausea, vomiting. diarrhea, liver damage, changes in urine, raised red areas and blisters of skin, impaired memory and possible permanent brain damage.

Frequency of complaints and severity of symptoms increase with levels of exposure, most notably above 01 mg/m$^3$. However, many of these symptoms have been reported at levels below recommended limits due to the accumulation of mercury over long term exposure.

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

## EMERGENCY AND FIRST AID INSTRUCTIONS

**Inhalation:** Get to fresh air. Give artificial respiration if breathing has stopped. Give oxygen if breathing is difficult. Keep warm and At rest. Get medical attention immediately.

**Skin:** Remove any liquid soaked clothing. Wash affected area with soap and water. Get medical attention if necessary.

**Eyes:** Immediately wash yes with large amounts of water. Get medical attention immediately. Contact lenses should not be worn when working with this material.

**Ingestion:** Seek medical attention.

**Note to Physician:** Gastric lavage with 5% solution of sodium formaldehyde sulfoxalate or 2-5% solution of sodium bicarbonate. Administer BAL (dimercaprol) intramuscularly as a 10% solutic in oil. Urine mercury determination may be useful a8 an index of absorption.

## FIRE AND EXPLOSION INFORMATION

**General:** Not flammable.

## REACTIVITY

**Materials to Avoid:** Reacts with nitrates, chlorates, bot sulfuric acid, amnia gas, acetylenes, alkalies and dry bromine.

**Conditions to Avoid:** Heat will speed up the rate of evaporation, increasing risk due to inhalation.

## PROTECTIVE MEASURES

**Storage and Handling:** Store in well-ventilated area, ia small amounts, in closed polyethylene bottles.

**Engineering Controls:** Provide adequate ventilation in both storage tanks and work areas and enclose operations where possible. Eyewash stations, showers and sinks should be available. Provide separate storage for work and street clothes. Flooring should not be able to absorb mercury or have cracks and spaces.

**Protective Clothing (Should not be substituted for proper handling and engineering controls):** Wea full body vcrk clothes with a minimum of seams, no pleats or cuffs, made from a material that will not readily absorb mercury. *Also* wear protective *shoes*, or shoe covers, rubber gloves an goggles if there is any danger of splashing. Clothing, *shoes*, gloves and goggles should be changed or washed daily. Laundering should be provided by the employer.

**Protective Equipment:** For levels up to 0.5 mg/m3 use a supplied-air respirator, a self-contained breaching apparatus or a chemical cartridge respirator vith cartridges providing protection against mercury vapors. 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 providing protection against mercury vapors. mg/m$^3$ use any of the above uith a full facepiece or a gas mask vith a canister providing protection against mercury vapors. levels up to 28 mg/m$^3$ use a Type C supplied-air respirator operated in a positive pressure mode. For levels above 28 mg/m$^3$ or at unknown concentrations use a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode or a carbination Type C supplied-air respirator uith 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 gas mask vith a canister providing protection against mercury vapors or an escape self-contained breathing apparatus. For firefighting use a gas u8k providing protection against mercury vapors or an escape self-contained breathinq apparatus.

## PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of spill area. Wearing protective equipment and clothing, clean up the spill with an industrial vacuum cleaner with a charcoal filter to absorb mercury vapor. For mercury Spilled in cracks cover with zinc dust to form an amalgam, or cover vth calcium polysulfide with excess sulfur. Do not sweep or use compressed air to blow mercury droplets as it can increase air concentrations. Store contaminated or waste mercury in tightly covered or vapor-proof containr pending removal. For final disposal contact your regional office of the New York State Depar 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.

Chemical Fact Sheet* Version 2

## VINYL CHLORIDE

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing 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 as is practical.

**Chemical Names:** Chloroethylene, chloroethene, ethylene monochloride, monochloroethene, monochloroethylene; CAS 75-01-4.

**Trade Names:** VC, VCM, Troviduer, and others.

**Uses:** In the manufacture of plastics, as a refrigerant, and in organic synthesis.

## PHYSICAL INFORMATION

**Appearance:** Colorless gas; may be liquified by refrigeration or pressurization.

**Odor:** Paint, sweet, ether-like. **Minimum Detectable by Odor:** 4000 ppm.

**Behavior in Water:** Slightly soluble, **Evaporation:** Rapid.

## HEALTH HAZARD INFORMATION

**OSHA Standard:** Average 8 hour exposure -- 1 ppm.

**NIOSH Recommended Limit:** Lowest reliably detectable level.

**ACGIH Recommended Limit:** .Average 8 hour exposure -- 5 ppm.

**Short Term Exposure:**

**Inhalation:** Exposure at 8,000 ppm for 5 minutes can cause a feeling of intoxication, tiredness, drowsiness, abdominal pain, numbness and tingling in fingers and toes, pains in joints, coughing, sneezing, irritability and loss of appetite and weight.

**Skin:** Contact with liquid may cause frostbite: contact with vapor may cause irritation and rash, Absorption is possible through the skin.

**Eyes:** Can cause severe and immediate irritation.

**Ingestion:** None found-

**Long Term Exposure:**

nay cause club-like swelling and shortening *of* finger tips. Skin may become thickened and stiff with coarse, whitish patches. Bones and joints of arms and legs may suffer damaqe. Liver and spleen damaqe may occur. Not all symptoms disappear after exposure stops.

Vinyl chloride has caused liver cancer in occupationally exposed individuals.

'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: How Toxic is Toxic' available from the New York State Department *of* Health.

## EMERGENCY AND FIRST AD INSTRUCTIONS

Inhalation: Move perron to fresh air. Give artificial respiration or oxygen as required. Seek medical attention.

Skin: Remove soaked clothing. Wash affected area with soap and water for at least 5 minutes. Seek medical attention if necessary.

Eyes: Wash with running water for at least 13 minutes. Seek medical attention,

Ingestion: Seek immediate medical attention.

## FIRE AND EXPLOSION INFORMATION

General: Flammable. Fumes may travel long distances and flash back. Ignites at -108°F (-78°C).

Explosive Limits: Upper — 33%, Lower — 3%.

Extinguisher: stop flow of gas. Use water to keep fire exposed containers cool.

## REACTIVITY

Conditions to Avoid: High temperatures may cause breakdown to phosgene and hydrochloric acid. Avoid sources of ignition.

Materials to Avoid: Long contact with air may result in formation of unstable peroxides which are explosive. Corrosive to iron at high temperatures in the presence of water.

## PROTECTIVE MEASURES

Storage and Handling: Protect against physical damage. Outside or detached storage preferred. Indoors, store in a cool, dry, well-ventilated area away from sources of ignition.

Engineering Controls: Provide ventilation or process enclosures. Sinks, showers and eyewash stations should be readily available.

Protective Clothing (Should not be substituted for proper handling and engineering controls): Goggles, gloves and impervious clothing should be worn if contact vith vinyl chloride is possible.

Protective Equipment: For any detectable levels we a self-contained breathing apparatus vith a full facepiece operated in a positive pressure mode or a supplied-air resirator 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 gas mask providing protection against vinyl chloride or an escape self-contained breathing apparatus.

## PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of the spill area. Put on respirator and other protective clothing.. Establish ventilation to keep levels below explosive limit. Remove possible sources of ignition. Move leaking cylinders to safe place in open air. For final disposal contact your regional office of the New York State Department of Environmental Conservation.

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

0000315

# 1,1,2-TRICHLOROETHANE

The information in this sheet applies to workplace exposure resulting from processing, manufacturing, storing 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 as is practical.

Chemical Names: Ethane trichloride: beta-trichloroethane: 1,2,2-trichloroethane; vinyl trichloride; NCI-C04579; CAS 79-00-5.

**Trade Names: Beta-T.**

**Uses:** As aa intermediate in the production of vinylidine chloride; as a solvent for fats, waxes, and natural resins; and as a component of adhesives.

## PHYSICAL INFORMATION

**Appearance:** Colorless liquid.

**Odor:** Chloroform-like, sweet,

**Evaporation:** Moderate. Vapors are heavier than air and tend to sink.

**Behavior In Water:** Only slightly soluble; sinks.

## HEALTH HAZARD INFORMATION

**OSHA Standard:** Average 8 hour exposure -- 10 ppm.

**NIOSH Recommended Limit:** Average 10 hour day/40 hour week -- 10 ppm.

**ACGIH Recommended Limit:** Average 8 hour exposure -- 10 ppm.

**Short Term Exposure:**

**Inhalation:** Inhalation may produce headache, lassitude, dizziness, incoordination, low blood pressure, irregular heart beat, coma and death from respiratory arrest. Exposure to vapor concentrations near 2000 ppm for 5 minutes causes central nervous system depression and anesthetic effects. Symptoms are nasal irritation, drowsiness and equilibrium disturbances. Death may result from 13,600 ppm for 2 hours.

**Skin:** May cause irritation and chemical burns if allowed to remain on the skin for a prolonged period. May be absorbed through the skin to cause or increase the severity of symptoms listed above.

**Eyes:** May cause irritation.

**Ingestion:** May cause effects similar to those listed under inhalation. Liver and kidney damage have occurred in animals. Laboratory studies with animals suggests that the probable lethal dose for humans is about 12 ounces.

**Long Term Exposure:**

Inhalation may cause liver and kidney damage. Has caused cancer in laboratory animals. Whether it does so in humans is unknown,

*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: How Toxic Is Toxic", available from the New York State Department of Health.

## EMERGENCY AND FIRST AID INSTRUCTIONS

**Inhalation:** Move to fresh air and perform artificial respiration if necessary. Keep warm and at rest. Get medical attention.

**Skin:** Remove contaminated clothing. Wash skin with soap or mild detergent and plenty of water for at least 15 minutes. Seek medical attention if necessary.

**Eyes:** Wash with water for 15 minutes. Seek medical attention.

**Ingestion:** Do not induce vomiting. Seek medical attention immediately.

## FIRE AND EXPLOSION INFORMATION

**General:** lot flammable under normal conditions.

**Explosive Limits:** Upper — 15.5%, lower — 6.0%. (High energy ignition source required.)

**Extinguisher:** Water fog, foam, carbon dioxide, dry chemical.

## REACTIVITY

**Materials to Avoid:** Fire and explosion may result from reaction with strong oxidizers such as peroxides and permanganates, strong caustics such as potassium hydroxide and sodium hydroxide and chemically active metals sucb as aluminum, magnesium powders, and potassium. Liquid will attack some forms of plastic, rubber and coatings.

**Conditions to Avoid:** When decomposed by bot metals, ultraviolet radiation, acids or acid fumes, highly toxic hydrogen chloride gas and small amounts of phosgene and carbon monoxide fumes are evolved. Open flames. welding arcs or other high temperature sources which induce thermal decomposition should be avoided.

## PROTECTIVE MEASURES

**Storage and Handling:** Store in a coal, dry and dark place. Do not store in aluminum containers. Contaminated clothing should be placed in cloud containers until it can be discarded or cleaned.

**Engineering Controls:** Provide proper ventilation. Sinks. showers and eyewash stations should be easily available.

**Protective Clothing (Should not be substituted for proper handling and engineering controls):** Splash-proof goggles, impervious clothing, gloves (not leather), and face shield. Wash clothing before reuse; it may not be possible to clean contaminated leather.

**Protective Equipment:** For any detectable levels use a self-contained breathing apparatus with a full facepiece and operated in a positive pressure mode oc 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 fire fighting use a self-contained breathing apparatus vith a full facepiece operated in a positive pressure mode. For escape use a gas mask prwiding protection against organic vapors or an escape self-contained breathing apparatus,

## PROCEDURES FOR SPILLS AND LEAKS

Warn other workers of spill. Put on proper protective clothing and equipment. Ventilate the area. Mop, wipe or soak up immediately in absorbent material such as vermiculite or dry sand and move to safe place out-of-doors. Contain liquid, transfer to closed metal containers. 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 Toric Substance Assessment, 2 University Place, Albany, New York 12203.

0000316

## EMERGENCY AND FIRST AID INSTRUCTIONS

**Inhalation:** Remove person to fresh air. Give artificial respiration or oxygen if breathing has stopped. Seek medical attention immediately.

**Skin:** Wash with large amounts of soap and water for at least 5 minutes. Seek medical attention if necessary.

**Eyes:** Wash with water for at least 15 minutes. Seek medical attention.

**Ingestion:** **Do not induce vomiting.** Seek medical attention.

**Note to Physician:** Gastric lavage with 3-58 sodium bicarbonate. Prompt hemodialysis if blood methanol level is above 50 mg/dl or if there is evidence of acidosis. Provide routine supportive measures and 100% oxygen until the carboxyhemoglobin level is satisfactory (less than 10% in an otherwise healthy patient).

## FIRE AND EXPLOSION INFORMATION

**General:** Considered non-flammable, but will burn in high concentrations such as near spills or in closed spaces. Ignites at 624°C (1224°F).

**Explosion Limits:** Upper -- 64.68: lower -- 15.5% in oxygen.

## REACTIVITY

**Conditions to Avoid:** Avoid heat: decomposes to highly poisonous gases (phosgene).

**Materials to Avoid:** Avoid contact with alkali metals (example: sodium or potassium); such contact *may* cause an explosion. Methylene chloride will corrode iron, stainless steel and copper, especially at high temperatures and if the metals are wet. Can is impervious and resistant to methylene chloride. Improper gloves or clothing can prevent evaporation and promote skin contact. Check with manufacturer's specification or your supervisor.

**Protective Equipment:** For any detectable levels use a self-contained breathing apparatus with a 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 pre is impervious and resistant to methylene chloride. Improper gloves or clothing can prevent evaporation and promote skin contact. Check with manufacturer's specification or your supervisor.

**Protective Equipment:** For any detectable levels use a self-contained breathing apparatus with a 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 use a gas mask with an organic vapor canister or an escape self-contained breathing apparatus. For firefighting use a self-contained breathing apparatus with a full facepiace operated in a positive pressure mode.

## PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of the spill area. Remove all sources of combustion. Ventilate the area. If you must enter the area, wear protective clothing and equipment. Since methylene chloride is extremely volatile, most will evaporate. For final disposal contact your regional office of the New Yotk State Department of Environmental Conservation.

For more information:
Contact the Industrial Rygienist 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.



recycled paper

ecology and environment

## METHYLENE CHLORIDE

The information in this sheet applies to workplace exposure-resulting from processing, manufacturing, rtotinq 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 as is practical.

Dichloromethane, Methylene dichloride) CAS 75-09-2.

**Trade Names:** Solaestine, Aerothene MM, Morkotel, Somethine, R30 and others.

**Uses:** The liquid is used as a solvent, degreasing and cleaning fluid, aerosol propellant, anesthetic and refrigerant. Also used in print removers, blowing agents in foams, in the process of decaffeinating coffee and extraction of spices.

## PHYSICAL INFORMATION

**Appearance:** Clear, colorless liquid.

**Odor:** Sweetish (like chloroform or ether). **Minimum Detectable by Odor:** 214 ppm.

**Behavior in Water:** Slightly soluble (1.32 g/100 g water), remainder will rink.

**Evaporation:** Liquid evaporates rapidly.

## HEALTH HAZARD INFORMATION

**OSHA Standard:** Average 8 hour exposure limit — 500 ppm.

**NIOSH Recommended Limit:** Reduce exposure to the lowest feasible level.

**ACGIH Recommended Limit:** Average 8 hour exposure -- 100 ppm.
(Proposed for change in 1988: 50 ppm).

**Short Term Exposure:**

**Note:** Methylene chloride is changed to carbon monoxide in the human body. This is a particularly hazardous condition for those who have a history of heart trouble or those who are also exposed to carbon monoxide, See carbon monoxide fact sheet. These persons should take extra precautions.

**Inhalation:** Levels of 300-700 ppm Lor 3-5 hours has caused slight loss of muscle contrcl and coordination. Effects of higher concentrations include stupor, dizziness, chest pain, arm and leg pains, Lou of feeling, loss of appetite. hot flashes and death.

**Skin:** May be irritating if confined on the skin by gloves or clothing. Hay be absorbed slowly throuqh the skin to cause symptoms listed under inhalation.

**Eyes:** May cause pain, irritation and burns.

**Ingestion:** Accidental ingestion of print removers containing methylene chloride as the main ingredient have reportedly caused headache, nausea, vomiting, visual disturbance, presence of blood in the urine, and unconsciousness.

**Long Term Exposure:**

Same symptoms as above. Prolonged exposure can cause changes in blood, hallucinations and decreased response to visual and auditory stimulation. Some long term exposures have also resulted in damage to the liver. Most of the effects vill disappear after exposure stops. Methylene chloride caused genetic effects in certain bacteria and caused birth defects in chickens. In laboratory studies, methylene chloride has also been shown to cause tumors in mice and Cats, Whether methylene chloride cuses birth defects or tumors in humans is not known.

*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: How Toxic is Toxic' available from the New York State Department of Health.

# APPENDIX B

## SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN

## Section 10 -- Title Page

Work Plan Group: A
Site No.: 1
Site Name: Sanitary Landfill

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: J. Barksdale

3

E & E QA/QC Director or
Assistant QA/QC Director: T. Yeates/R. Short

E & E ASC Director: A. 'Clifton

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

Section 2.0 — Table of Contents


| | | Page | Date |
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## Section 3.0 -- Project Summary

Work Plan Group: A

Site No.: 1

Site Name: Sanitary Landfill

Site Description: A complete site description and history are presented in Sections 2.0 and 3.8 of the attached work plan.

Phase I — Field Screening
Physical Survey (check all that apply):

- X Overall Physical Reconnaissance
- X HNu/OVA Surface Emission Survey
- X Radiation Survey
- X Habitat/Biota Survey
- X Asbestos Survey (in Rubble)
- X Hydrologic Assessment

Geophysical Survey (check all that apply):

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

Analytical Screening (check all that apply):

- ___ Field Analyses:
- ___ Soil Eeadspace Analyses: Planned Number of Samples ___
- ___ Soil Gas Analyses : Planned Number of Samples ___
- X Laboratory Analyses:

| PLANNED NUMBER OF SAMPLES | | CATEGORIES OF ANALYSES |
|---|---|---|
| Surface Water | 10 | X Volatile Organic Compounds |
| Sediment | 10 | X Polynuclear Aromatic Hydrocarbons |
| Soil | ___ | X Phenols |
| Groundwater | 41 | ___ Organophosphorus Pesticides |
| Duplicates | 4 | ___ 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 | 6 | Air | | Duplicates | 9 |
| Sediment | 24 | Biota: | | Trip Blanks | 8 |
| soil | 20 | Flora | | Field Blanks | 8 |
| Groundwater | 26 | Fauna | | Rinsate Blanks | 8 |

**CATEGORIES OF ANALYSES**

- X Purgeable Aromatics
- X Purgeable Balocarbons
- X Base/Neutral Extractables
- X Acid Bxtractables
- ___ Polynuclear Aromatic Eydrocarbons
- X Pesticides
- X Polychlorinated Biphenyls
- X Total Recoverable Eydrocarbons
- X Metals
- X Cyanide

Additional analytical categories are identified below:

- X 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.

| Analyte | Hedia | 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 |
| Gross Alpha | S/W | -- /EPA 900 | 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 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/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 |

| Analyte | Media | Method No. | A | P | C | DL |
|---|---|---|---|---|---|---|
| Mercury | S/W | BPA 7471/245.1 | N/H | N/M | N/M | N/M |
| Nickel | S/W | BPA 6010/200.7 | N/H | N/M | N/H | N/M |
| Selenium | S/W | EPA 7740/270.2 | N/H | N/M | N/M | N/M |
| Silver | S/W | BPA 6010/200.7 | N/M | N/M | N/M | N/H |
| sodium | S/W | BPA 6010/200.7 | N/H | N/H | N/H | N/M |
| Thallium | S/W | EPA 7841/279.2 | N/H | N/M | N/M | N/M |
| Vanadium | S/W | BPA 6010/200.7 | N/M | N/H | N/M | N/M |
| Zinc | S/W | BPA 6010/200.7 | N/H | N/M | N/H | N/M |
| Cyanide | S/W | BPA 9010/335.2 | N/H | N/H | N/H | N/H |
| TOC | S/W | EPA 90601415.1 | N/H | N/H | N/M | N/M |
| Hardness | V | EPA 130.2 | N/M | N/M | N/M | N/M |
| Alkalinity | V | EPA 310.1 | N/H | N/H | N/M | N/M |
| Total Suspended Solids | W | EPA 160.2 | N/M | N/H | N/M | N/M |
| Total Kjeldahl Nitrogen | S/W | EPA 351.3 | N/H | N/H | N/H | N/M |
| Nitrogen-Ammonia | S/W | EPA 350.2 | N/M | N/M | N/M | N/M |
| Orthophosphate Phosphorus | S/W | EPA 365.2 | N/M | N/H | N/H | N/H |
| 5-day Biological Oxygen Demand | V | SM 507 | N/M | N/M | N/M | N/M |
| Chemical Oxygen Demand | W | EPA 410.4 | N/M | N/H | N/H | N/M |
| pH | V | EPA 150.1 | N/M | N/M | N/M | N/M |
| Percent Moisture | S | ASTH D-2216-80 | N/M | N/M | N/H | N/M |
| Grain Size | S | ASTH D-422-63 | N/M | N/H | N/M | N/H |
| BTU Content | S | ASTH D-2015-77 | N/M | N/H | N/M | N/M |
| Ash Content | S | ASTH D-482 | N/M | N/H | N/M | N/M |
| Total Ealogens | S | ASTH D-808-81 | N/M | N/M | N/M | N/M |
| | | EPA 325.3 | N/M | N/M | N/M | N/M |
| Sulfur | S | ASTH D-129-64 | N/M | N/M | N/H | N/M |
| Ignitability | S/W | EPA 1010 | N/M | N/M | N/H | N/H |
| Cation Exchange Capacity | S | EPA 9081 | N/M | N/M | N/H | N/M |
| Field Parameters | | | | | | |
| pH | V | Field | N/M | N/H | N/H | N/M |
| Specific Conductance | W | Field | N/H | N/M | N/M | N/H |
| Temperature | W | Field | N/M | N/M | N/H | N/H |
| Dissolved Oxygen | W | EPA 360.1 | N/M | N/M | N/M | N/M |

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

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

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## 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 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. Hodifications to these procedures are described below:

No Modifications

## Section 12.0 -- Performance and System Audits

Performance and system audit procedures are presented in Section 12.0 of the 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. Hodifications 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

# APPENDIX C

## THREATENED AND ENDANGERED FLORA AND FAUNA ASSOCIATED WITH NAS PENSACOLA



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## APPENDIX C

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

| Scientific Name | Common Name | Base * Status | status FGFWFC(or FDA) | USFWS | Habitat |
|---|---|---|---|---|---|
| FISHES | | | | | |
| Acipenser oxyrhynchur | Atlantic sturgoon | M | SSC | UR 2 | Gulf coast, estuarine |
| Ammocrypta asprella | Crystal darter | U | T | UR 2 | Irorh water |
| Etheostoma histrio | Harelquin darter | U | SSC | | Irorh uator |
| Fundulur 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 | | Irorh water |
| AMPHIBIANS AND REPTILES | | | | | |
| Alligator mississippiensis | American Alligator | R | SSC | T(S/A) | Swamps, marshes, pondr |
| Caretta caretta caretta | Loggorhoad turtlo | M ? | T | T | Marine, coartal |
| Chelonia mydas mydas | Green turtlo | M ? | E | E | Marine, coartal |
| Dermochelys coriacea | Leatherback turtlo | M | E | E | narino, coartal |
| Drymarchon corais couperi | Eastern indigo snake | P | T | T | Open areas near uator |
| Eretmochelys imbricata | Hawksbill turtlo | M ? | E | E | narino, coartal |
| Gopherus polyphemus | Gopher tortoise | P | SSC | UR 1 | Sandy coartal plains |
| Graptemys pulchra | Alabama map turtlo | U | SSC | | Swamps, streams, marshes, pondr |
| Lepidochelys kempi | Atlantic ridley | M ? | E | E | Marine, coartal |
| Rana areolata aesopus | Florida gopher froq | P | SSC | UR 2 | Sand hill communities |
| Macroclemys temmincki | Alligator snapping turtle | SR | SSC | UR 2 | Swamps, marshes, pondr |
| MAMMALS | | | | | |
| Mustela vison lutensis | Florida mink | U | | UR 2 | Terrestrial habitats |
| Peromyscus polionotus trissyllepsis | Perdido Key beach mouse | N/A | T | E | Beach dunes |
| Trichechus manatus latiroetris | West Indian manatee | n | E | E | Atlantic and Gulf coartr |
| Ursus americanus floridanus | Florida black boar | N/A | T | UR 2 | Titi swamps |



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Appendix C (Cont).

| Scientific Name | Common Name | Base Status | Status FGFWFC(or FDA) | Status USFWS | Habitat |
|---|---|---|---|---|---|
| BIRDS | | | | | |
| Charadrius melodus | Piping Plover | P | T | T | Open dry, sandy beaches |
| Charadrius alexandrinus | snowy plover | P | T | UR 2 | Open dry, sandy beaches |
| Dendroida dominica stoddardi | Stoddard's yellow-throated warbler | P-u | | UR 2 | Wooded habitats |
| Dendroica kirtlandii | Kirtland's warbler | U | E | E | Wooded habitats |
| Haematopus palliatus | American oystercatcher | U | SSC | | Coastal habitats |
| Egretta rufescens | Reddish egret | P-U | SSC | UR 2 | Freshwater/coastal wetlands |
| Egretta caerulea | Little blue heron | P-u | SSC | | Freshwater/coastal wetlands |
| Egretta thula | Snowy egret | P-u | SSC | | Freshwater/coastal wetlands |
| Grus canadensis pratensis | Florida sandhill crane | U | T | | Freshwater 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 | | Open 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 bachmanii | 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 arericana | 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) | USFWS | Habitat |
|---|---|---|---|---|---|
| PLANTS | | | | | |
| Chrysopsis gossypina cruiseana | Cruise's golden-aster | 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 | Panhandle lily | U | E | UR 2 | Black, aucky soils |
| Pinguicula planifolia | Chapman's butterwort | U | RE | UR 2 | |
| Polygonella macrophylla | Large-leaved jointweed | R | T | UR 1 | Sand pine-oak scrub |
| Rhododendron austrinun | Orange azalea | U | E | UR 5 | Moist, woody habitats |
| Sarracenia leucophylla | White-top pitcherplant | R | E | | Open acid bogs |
| Sarracenia rubra | Sweet pitcherplant | 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 review, for Federal listing with substantial evidence in existence indicating at least some degree of biological vulnerability and/or threat.
UR 2 = Under review, insufficient biological data available.
UR 5 = Candidate species, but taxa has proven to be more widespread than was previously believed and/or those species that are not subject to any identifiable threat.
FDA = Florida Department of Agriculture.
FGFWFC = Florida Game and Freshwater Fish Commission.
USFWS = U.S. Fish and Wildlife Service.

Appendix C (Cont.)

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



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