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PHASE II

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

Navy Yard Disposal Area (Site 9)
Commodore's Pond (*Site* 10)
Chevalier Field Pipe Leak Area (Site 23)
Soil South of Building 3460 (Site 29)
Solvent North of Building 3557 (Site 34)

April 1992

Prepared for:

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SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
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Contract Number N62467-88-C-0200

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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 Navy Yard Disposal Area (Site 9), Commodore's Pond (Site 10), Chevalier Pipe Leak Area (Site 23), Soil South of Building 3460 (Site 29), and Solvent North of Building 3557 (Site 34) 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 in January 1989.

E & E has developed a phased approach for performing the NAS Pensacola site investigations. Phase I (Field Screening) is directed toward identifying the principal area(s) and primary contaminants of concern at a site, thereby providing a mechanism for focusing the sampling and analytical efforts during subsequent phases of the investigation. Phase 11 (Characterization) is directed toward the formal confirmation and quantification of the full spectrum of site contaminants (if any), thereby allowing determination 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:

- o Efficient identification of those sites where environmental contamination has actually occurred as a result of past and/or present operations, thereby allowing non-contaminated sites to be eliminated from the program in the most environmentally sound, cost-effective, and timely manner possible;
- o 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
- o Early screening of potential remedial alternatives, vhich, 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 vork, and hence will coaprise a full-scale Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Remedial Investigation/ Feasibility Study (RI/FS). For simplicity, the investigations for all NAS Pensacola sites will be referred to as Contamination Assessment/ Remedial Activities Investigations. The final results of site investigations that do not require study beyond Phase II will be incorporated into a Contamination Assessment Report. If appropfiate, these sites will be recommended for No Further Action. The final results of site investigations that require work beyond Phase II will be incorporated into a Remedial Investigation Report, vhich will provide all the information necessary for the development and completion of a Feasibility Study (FS).

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2. SITE DESCRIPTION

2.1 Site 9 - Navy Yard Disposal *Area*

The Navy Yard Disposal Area (Site 9) is located at the southwestern corner of Chevalier Field (see figures 2-1 and 2-2). The southwestern perimeter of the site encloses portions of Hurray Road, Industrial Road, and the intersection of Hurray and Hoffett roads with Ellyson Avenue. The southeastern corner of the site contains a portion of the extensive Chevalier Field concrete apron. The majority of the land area occupied by this site is paved with concrete and/or asphalt.

Land surface elevations are approximately 5 feet above mean sea level (MSL) and the terrain is relatively flat. Surface soils are mostly fine-grained sand.

No groundwater monitoring wells are located within the actual boundary of Site 9; however, four monitoring wells were constructed in the vicinity of the site to characterize groundwater conditions for the sites located within the southwest Chevalier Field area. Figure 2-2 shows the locations of the monitoring wells and neighboring sites. Well GM29 is located approximately 200 feet from the southern perimeter of Site 9; well GM30 is located approximately 50 feet east of the site perimeter. Well GH6 is located approximately 750 feet north-northeast of the site; and well GH7 is located approximately 400 feet southeast of the site. **[Construction details are presented in Table 2-1.]**

2.2 Site 10 - Commodore's Pond

Commodore's Pond site (Site 10) is located due west of Chevalier Field and occupies portions of an open field and the wooded area southeast of the intersection of Hurray and Taylor roads (see Figure 2-2). Building

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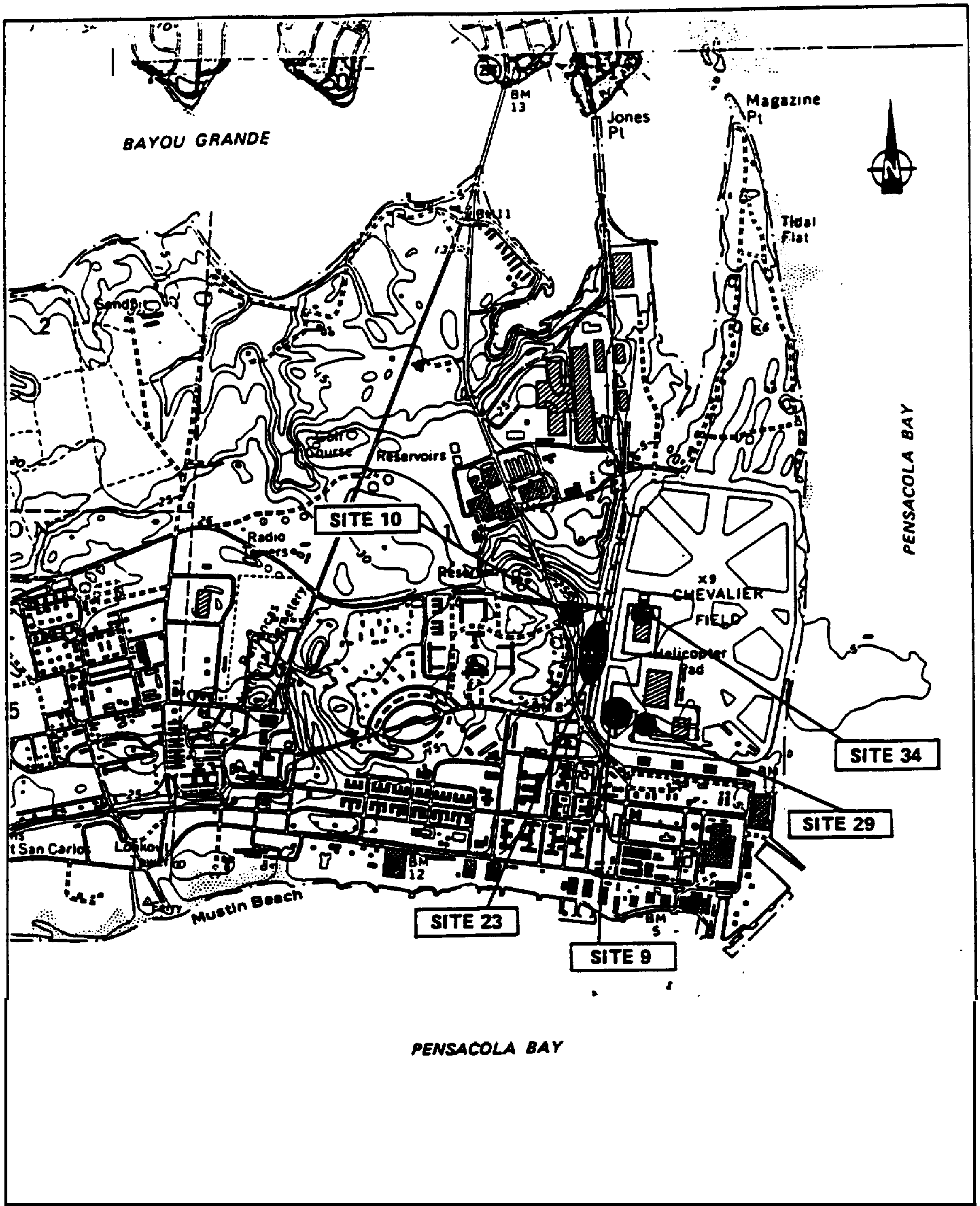


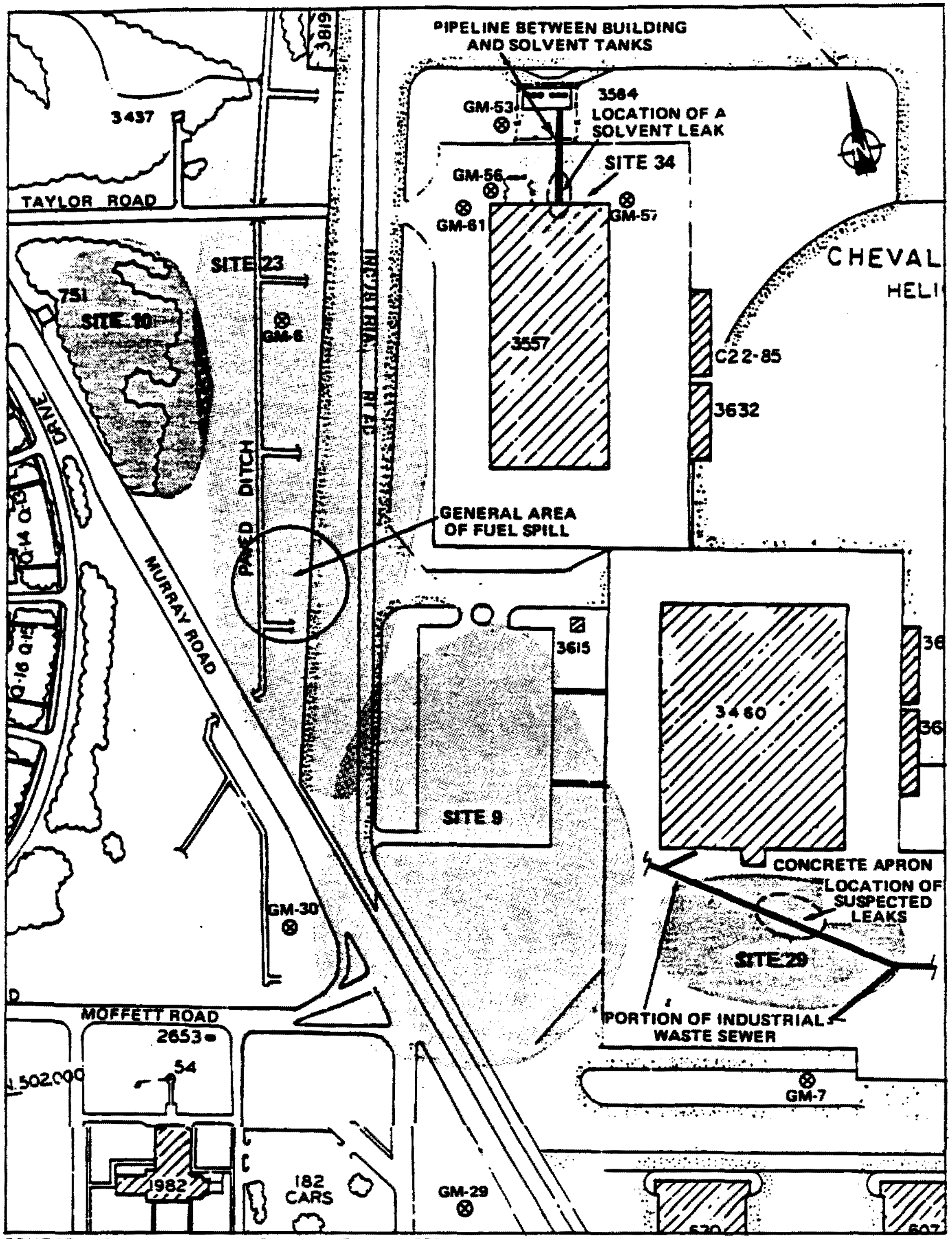
SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangles: Fort Barrancas, Fla. 1970 and West Pensacola, Fla. 1970, Photorevised 1987

SCALE

0 ½ 1 MILE

0 .5 1 KILOMETER

Figure 2–1 LOCATION MAP – NAS PENSACOLA SITES 9, 10, 23, 29, and 34



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

SCALE

0 200 400 600 800 FEET

KEY:

⊗ Existing Monitoring Well

▨ Building

Figure 2-2 SITE MAP – NAS PENSACOLA SITES 9, 10, 23, 29, AND 34

TABLE 2-1

CONSTRUCTION DETAILS OF MONITORING WELLS RELATED TO SITES 9, 10, 23, 29, AND 34 AT NAS PENSACOLA

Well Designation	Surface Elevation (ft msl)	TOC Elevation (ft msl)	Total Depth Drilled (ft)	Screened Interval (ft)	Depth to Filter Pack (ft)
GM-6	6.0	6.40	12.0	9.7 - 12.2	5.7
GM-7	7.6	8.92	11.5	8.8 - 11.3	4.8
GM-29	7.0	7.91	11.5	9.2 - 11.7	5.2
GM-30	5.1	6.14	11.5	9.2 - 11.7	5.0
GM-53	3.7	6.20	15.0	12.5 - 15.0	6.0
GM-56	9.3	8.98	12.5	10.0 - 12.5	4.0
GM-57	9.6	9.31	12.5	10.0 - 12.5	4.0
GM-61	9.3	8.91	87.5	82.5 - 87.5	76.0

Source: G & M 1984, 1986

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751 is located adjacent to the northwest corner of the site boundary. Site 10 may partially overlay portions of the Chevalier Field Pipe Leak Area (Site 23).

The completely unpaved Site 10 area occupies a fine-grained sandy tract that is vegetated with native grasses, live oaks, pines, and other varieties of native plant species. The land surface elevations are approximately 6 to 7 feet above HSL and slope slightly down and east to the paved ditch.

The northern boundary of Site 10 is adjacent to the base of an extensive escarpment, the most prominent physiographic feature of the NAS Pensacola facility. The escarpment rises to elevations greater than 25 feet above HSL.

No groundwater monitoring wells are located on site. However, shallow monitoring well GH6 is located 200 feet east of Site 10 (see Table 2-1).

23 Site 23 - Chevalier Field Pipe Leak Area

The Chevalier Field Pipe Leak Area (Site 23) is located near the south-western corner of Chevalier Field (see figures 2-1 and 2-2).

The majority of the Site 23 land area can be characterized as a flat, fine-grained, sandy tract vegetated with native grasses. The paved sections of the site include Hurray Road, Taylor Road, a paved drainage ditch area, and a concrete apron. The land surface elevations are approximately 6 feet above HSL.

The perimeter of Site 23 is approximated. A section of Hurray Road occupies most of the southwestern portion of the site. A paved drainage ditch crosses the length of the site and is directed south beneath Hurray Road via a culvert. The eastern edge of the site is occupied by a portion of Chevalier Field's extensive concrete apron.

Shallow groundwater monitoring well GM6 is located on the site approximately 400 feet north of the fuel spill general area (see Figure

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2-2). Five other monitoring wells were clustered 400 to 600 feet east of this site: GM53, GM56, GM57, and GM61. Monitoring well GH30 is located approximately 400 feet south of the southern perimeter of this site. The construction details of these wells are listed in Table 2-1.

2.4 Site 29 - Soil South of Building 3460

The soil south of Building 3460 (Site 29) is located at the southwestern corner of Chevalier Field, approximately 100 feet south of the southeastern corner of Building 3460.

The entire site is covered by the Chevalier Field concrete apron. Land surface elevations are estimated at 7 to 8 feet above MSL. No groundwater monitoring wells are located within this site boundary; however, two monitoring wells were constructed in the vicinity of this site. Well GH7 is located 100 feet off the southern perimeter of the site, and GM29 is located approximately 600 feet southwest of the site. The construction details of these wells are listed in Table 2-1.

2.5 Site 34 - Solvent North of Building 3557

Site 34 is located at the western edge of Chevalier Field, immediately north of Building 3557 (see figures 2-1 and 2-2). The site is covered by the Chevalier Field concrete apron. A tank farm is located approximately 100 feet north of Building 3557 and consists of seven aboveground vertical storage tanks designated as: T-101 (containing epoxy stripper MIL-R-81294); T-105 (detergent HIL-C-43616); T-106 (stoddard solvent PD 680-Type II); and T-107 (unknown). The tanks are aligned east to west and are located on a raised concrete foundation. Building 3557 is connected to the tank farm via a paved trench. The land surface elevations are approximately 4 feet above HSL and the concrete apron on which Building 3557 is located is raised to an elevation of 9.3 feet above MSL.

Three shallow groundwater monitoring wells (GM53, GM56, and GM57) and one deep well (GM61) are located within the area of concern for Site 34. Figure 2-2 shows the locations of the four monitoring wells.

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3. SITE HISTORY

3.1 Site 9 - Navy Yard Disposal Area

Site 9 vas used for the disposal of trash and refuse between 1917 and the early 1930s. Reportedly, the site is shown on several old maps as the Navy Yard Dump or the Warrington Village Dump (Naval Energy and Environmental Support Activity [NEESA] 1983).

In the late 1960s, while trenching for the Industrial Waste Water Treatment Plant (IWTP) system, part of Site 9 vas excavated. Glass, scrap metal, and debris were unearthed. No unusual odor vas reported associated with the site.

Previous environmental studies of Site 9 were conducted under the Navy Assessment and Control of Installation Pollutants (NACIP) program. Former environmental inquests of the site consisted of an Initial Assessment Study (IAS) and a Verification Study.

The Navy's 1983 IAS report evaluated Site 9 based on information from historical records, field inspections, and personnel interviews. The IAS report concluded that no further study of the site vas necessary and that the site did not constitute a threat to human health or to the environment. These conclusions were based on an assumption that no hazardous materials were ever disposed of on site and that dumping practices had ceased. No environmental sampling vas performed on site during the IAS to substantiate the recommendations (NEESA 1983).

A Verification Study of Site 9 was conducted by Geraghty & Hiller, Inc., (G & H 1984). This verification study report indicates that monitoring wells GM6, GH7, GM29, and GH30 were constructed in the vicinity of the southwest corner of Chevalier Field to determine shallov groundvater flow and further delineate contamination in the general area of sites 9, 10, 23, and 29. Groundvater samples from the four wells were analyzed for volatile organic compounds (VOCs) using EPA Method 601. No VOCs vere detected in any of the samples obtained from the four monitoring wells.

3.2 Site 10 - Commodore's Pond

Site 10 is the former location of a small surface water body. In the mid-1800s, the pond was used for the underwater storage of shaped oak timbers. This underwater storage method preserved the vood prior to its use for shipbuilding. The original pond is no longer in existence; therefore, its exact dimensions are unknovn (NEESA 1983).

Site debris vere unearthed in the late 1960s during trenching operations for the IWTP system. Abandoned oak timbers vere exhumed and reburied on Magazine Point. It is reported that no hazardous materials vere encountered during this effort.

The Navy's 1983 IAS report evaluated Site 10 based on information from historical records, field inspections, and personnel interviews. The IAS report concluded that no further study of the site vas necessary and that the site did not constitute a threat to human health or to the environment. No environmental sampling of the site was performed to substantiate the IAS findings (NEESA). However, due to the proximity of Site 10 to the Chevalier Field Pipe Leak Area (Site 23), subsurface contamination possibly exists.

3.3 Site 23 - Chevalier Field Pipe Leak Area

Site 23 is the location of two separate underground fuel leaks. One leak in 1965 consisted of the loss of an unknown quantity of Navy Special Fuel Oil (NSFO). Reportedly, the fuel vas pumped from the groundwater table, and the contaminated soil vas removed (NEESA 1983).

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In 1970, a leak of unknown quantities was discovered in the same area in a pipeline carrying Diesel Fuel Marine (DFM). A layer of fuel is suspected on the water table surface, and soil in the area is suspected to be contaminated with oil.

G & M conducted a Verification Study of Site 23, constructing monitoring wells GM6, GM7, GM29, and GM30 in the vicinity of the southwest corner of Chevalier Field to determine shallow groundwater flow and to collect groundwater samples associated with this site. Groundwater samples from the four wells were analyzed for VOCs; however, none were detected. It was recommended that no further study of Site 23 be conducted because the absence of VOCs in groundwater suggested that contaminants were very localized or had been purged from the groundwater system (G & M *1984).* However, the same report indicated that a strong odor had been detected during the installation of well GM6.

3.4 Site 29 - Soil South of Building 3460

In the spring of 1981, several workers sustained chemical burns vhile working in an excavation south of Building 3460. Reportedly, a slimy black substance in excavation soils was responsible for the injuries. In addition, station personnel reported a noticeable odor of "paint stripper" in the excavation.

A portion of the IWTP lies beneath the concrete apron in the vicinity of Site 29. The NAS Pensacola IWTP begin operating in 1971. Some parts of the sewer system are pressurized. Industrial wastes disposed of in the sewer reportedly include paint stripper, thinners, chromic acid, phenolic compounds, cyanides, and sulfuric acid. A leak in the industrial waste sewer line may have caused contamination at this site: however, the type and extent of contamination is unknown. It is also unknown whether the suspected leak was located and repaired. At present, it is suspected that the original site contamination encountered still exists. No environmental samples were collected during the IAS investigation.

The Verification Study conducted by G & M (1984) indicated that no VOCs were detected in any of the samples collected from the four nearby monitoring wells (GM6, GH7, GM29, and GM30). It vas recommended that no further study vas necessary because the absence of VOCs in groundwater samples suggested that contaminants vere very localized or had been purged from the groundwater system (G 6 M 1984).

3.5 Site 34 - Solvent North of Building 3557

During May 1984, a leak occurred in a pipeline at the north end of Building 3557. The leak reportedly resulted in the loss of approximately 45,000 gallons of a solvent detergent used for cleaning aircraft. The solution contained 1.7% chlorinated aromatic hydrocarbon solvent or approximately 750 gallons of solvent.

Contamination of site soils and groundwater may have occurred as the result of the solvent detergent release. Contamination may have penetrated beneath the apron via the expansion jointing which separates individual concrete tiles and via runoff of escaped solvent to the unpaved storage tank area. The unpaved drainage ditch in the tank area is suspected to have carried contamination off site and is presumed to be connected to the paved drainage ditch located vest of Chevalier Field. It is unknown whether site contamination entered the NAS Pensacola storm sever system.

During the 1986 characterization Study, a faint hydroçarbon odor vas observed when monitoring wells GM56 and GM61 were constructed (G & H 1986). Groundwater samples from monitoring wells GM53, GM56, GM57, GM61, and GM6, as vell as three surface water samples collected from a dovnstream portion of the 'paved ditch vest of Chevalier Field, were collected and analyzed for VOCs. The results shoved that VOCs were present in shallow well GM53 (2 mg/L of benzene and 4 mg/L of toluene) and in all three surface water samples (2 to 42 mg/L total VOCs). The Characterization Study report suggested that the source of VOCs in the surface water samples vas not related to Site 34 because the types of VOCs detected in the groundwater and surface water were different from those that were released (G 6 M 1986).

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4. CLIMATOLOGY

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

Precipitation rates in the NAS Pcnsacola 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 1982). High intensity thunderstorms are common, producing as much as 3 to 4 inches of rainfall during a single hour. Bvaporation rates are also highest in the summer months; therefore, the potential recharge from heavy summer rains is reduced. Spring and fall rains are generally less intense but longer in duration, producing less surface runoff and higher rates of infiltration and net recharge.

Wind velocities are generally moderate except during thunderstorms (Carlisle 1960). Prevailing winds are northerly during the winter and southerly during the summer. An ocean-land temperature differential produces a daily clockwise rotation of the surface wind direction near the coast, commonly knovn as the sea-breeze effect (Flood and Associates

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

5. BIOLOGICAL RESOURCES

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

5.1 Regional Biological Resources

5.1.1 Terrestrial

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

The sand pine scrub community is a more upland coastal community characterized by coastal dune formations from an older geologic age with deep, fine, white sand substrate and the plants Pinus clausa (sand pine), Quercus spp. (scrub oak species, geminata, champanii, myrtifolia, and inopina), Cladonia species, and Ceratiola ericoides (rosemary). This community type has been ranked by FNAI as imperiled statewide because of its rarity and because of its vulnerability to extinction due to some artificial or biological factor. This community type can have three to five distinct 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). Flatwoods communities also occupy areas of low depressions and small creeks and drainage courses, but the overstory vegetation is usually replaced by Taxodium ascendens (pond cypress), Cliftonia monophylla (black titi), Cyrilla racemiflora (swamp titi), and other hydric or riparian species. Open moist savannah areas within flatwoods are dominated by the herbaceous plants Pinguicula spp. (butterwort), Sarracenia spp. (pitcher-plants), Uticularia spp. (bladderworts), Polygala spp. (milkworts), and Drosera spp. (sundews; Wolfe et al. 1988).

Sandhill communities are found in dry soils which are lower in fertility than flatwoods soils. The overstory of this community type is dominated by Pinus palustris (longleaf pine), Quercus laevis (turkey oak), Q. 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 (wire grass). These habitats were verified with walk-through surveys and ground truthing by the Navy in March 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. Host of these communities and other vegetative communities east of Sherman Field have been considerably altered by development on the base that has changed surface and/or groundwater flow (NEESA 1983).

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

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

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

The Navy recorded moderate size rookeries of the great blue heron and 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 vas 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 vere identified on the NAS Pensacola facility, none of which are endangered. A recent check of the FNAI files confirms that the presence of the gopher tortoise (Gopherus polyphemus) can most likely be found in suitable habitats on the western portions of the facility (see Appendix C). Most of'the reptiles and amphibians that may be found on the facility can be expected to use the surface 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

Freshvater. 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 contrul 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 saltmarsh cordgrass (Spartina alterniflora) or black needlerush (Juncus roemarianus). A biota survey of these and other potential habitat areas will be conducted to determine the extent of estuarine flora and fauna.

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

Plankton. The only existing study of the phytoplankton and zooplankton in the waters surrounding the NAS Pensacola facility was conducted by the Navy in March 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.

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 might have been negatively influenced by the sewage outfall.

Samples collected by the Navy (1986) indicate a low density yet moderate diversity of benthic infaunal organisms when compared to other estuarine systems within and around the turning basin. A complete comparison of the Navy's data with other literature cannot be made at this time because their data are not given in numbers per unit area. However, the Navy's data reveal 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 seven cartilaginous fish species (Cooley 1978). The 13 most abundant species were spot (Leiostomus xanthurus), pinfish (Lagodon rhomboides), Atlantic croaker (Micropogonias undulatus), gulf aenhaden (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 vas highest in the more saline waters near the NAS Pensacola facility during spring and summer. In the less saline waters of East Bay, diversity vas lowest in summer and highest during the winter months. Fish population density was the highest in the more saline waters, vith peaks throughout the summer (Cooley 1978).

Moderate densities of blue crab (Callinectes sapidus), shrimp (Penaeus duorarum, P. setiferus, and P. aztecus), and oysters (Crassostrea virginica) have been collected throughout Pensacola Bay (Heil 1989).

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Shrimp are caught in greater abundances near NAS Pensacola 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 the Florida Department of Natural Resources (FDNR) are in the East Bay area. Scallops (Aequipecten irradians) are collected only within grassbed areas. No information is available at this time on where scallops are collected by the general public and how many are removed. The nearest seagrass beds to the NAS facility are located in Big Lagoon along the southwest portion of the facility.

Sport and Commercial Fishing. A moderate amount of commercial fishing occurs in Escambia County, accounting for 2% of the total Florida landings for 1980 to 1985 (Navy 1986). The dominant finfish species in terms of total weight was the black mullet. The most economically important species of finfish vas 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, blue crab, and squid. These data, as well as the Navy's data, also suggest that a significant tuna fishery may be developing in the Pensacola Bay area (0 pounds landed in 1983; 1,582 pounds in 1987).

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

The estuarine system is a very important element in the life history of most of the commercial and sport fishing species sought. Between 65 and

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90% of all commercially valuable fish species are estuarine dependent during some phase of their life cycle. Shrimp, blue crab, and shellfish are knovn 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 quantitatively ranked as uncommon to common in abundance within the waters surrounding the NAS Pensacola facility.

Threatened and **Endangered Species.** A number of threatened and endangered species (see Appendix C) have been identified in the vicinity of the NAS Pensacola facility. Hany 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 vest. Any site remediation and, more importantly, any assessment of environmental endangerment must consider the water level requirements of rare and endangered plant species, the foraging activities of birds in the waters surrounding the NAS Pensacola facility, and 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

Eabitats on sites 9, 29, and 34 have been completely altered by NAS Pensacola activities. Native vegetation has been replaced by buildings, roads, easements, and/or concrete aprons. It is expected that few species of birds, reptiles, or rodents utilize these sites for feeding, nesting, or migration corridors.

The habitats on Site 23 also have been altered by Navy base activities. Terrestrial vegetation has been removed and replaced with cultivated grass which is periodically maintained. A paved drainage ditch, which has a heavy cover of grassy Vegetation, exists along the length of the site. This aquatic habitat may attract vading birds as well as amphibians and small mammals for feeding from other nearby vegetated communities. If the site contamination has affected the paved ditch, then the fauna which utilize the ditch may be affected. It is not known whether fish and invertebrates are found within the paved ditch.

The habitats on Site 10 have been altered to some degree by Navy base activities. A seminatural community consisting of planted and maintained pine trees exists along the southeast perimeter of this site. Construction of a water tower, small buildings, and storage tanks has reduced the cover of native vegetation. However, some of the site still has a native sand pine scrub community. Fauna associated with this type of community are expected to utilize this site for feeding, nesting, and as a migration corridor.

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6. SURFACE WATER HYDROLOGY

6.1 General Occurrence and Significance of Surface Water

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

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

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

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.

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

The principle surface water bodies related to sites 9, 10, 23, 29, and 34 are a small unnamed creek and associated paved ditches and Bayou Grandc, which is located west and north of these areas (see figures 2-1 and 2-2).

A paved ditch, apparently associated with the NAS Pensacola storm water system, runs south to north through Site 23. The ditch contains vater which flows northward toward Bayou Grande. The water in the ditch appears to be derived at least partly from groundvater in-flow. The extent to which the paved ditch represents a previously existing stream or is artificial is unknown. Given that groundwater may feed the ditch and that the water ultimately is discharged into Bayou Grande, any soil or groundwater contamination associated with these sites may impact these surface water bodies. No sampling associated with the investigations of these sites is anticipated in the ditches, the creek, or Bayou Grande as these features are being investigated as part of the Site 30 investigation.

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7. PHYSIOGRAPHY AND HYDROGEOLOGY

7.1 Physiography and Regional Hydrogeology

7.1.1 Physiography

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

7.1.2 Regional Hydrogeology

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

7.1.2.1 Surficial/Sand-and-Gravel Aquifer

The Surficial Aquifer occurs from land surface to a depth of approximately 300 feet at NAS Pensacola and is composed of a sequence of unconsolidated to poorly indurated clastic deposits (Wagner et al.

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1984). In this portion of Florida, the Surficial Aquifer constitutes an important source of water supply and is called the Sand-and-Gravel Aquifer (Southeastern Geological Society [SEGS] 1986). [Based on the total dissolved solids (TDS) content of groundwater from wells that tap the Sand-and-Gravel Aquifer in southern Escambia County (Clemens et al. 1989), the groundwater is classified as Class G-1 (FDER 1988b).] The sediments making up this aquifer belong to all or part of the Pliocene to Holocene Series 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 & H 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 1 foot near surface vater 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 yielded hydraulic conductivity values ranging from 16 to 56 ft/day (G & M 1986). Horizontal groundwater flow velocities in the surficial zone will depend on site-specific hydraulic conductivities and horizontal hydraulic gradients, however, velocities would generally be expected to be high.

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

The results of laboratory permeability tests conducted on samples from this zone indicate that vertical hydraulic conductivities are low, ranging from 4.2×10^{-5} to 9.9×10^{-2} ft/day. Thus, the low permeability zone probably functions as a confining or semiconfining unit inhibiting the flow of groundwater between the surficial zone and the underlying main producing zone. The low permeability zone has been encountered in at least 16 borings at widely spread locations throughout NAS Pensacola (G & M 1984, 1986). Although additional boring or geophysical techniques would be required to confirm its presence at a given location, it is likely that this unit is ubiquitous at NAS Pensacola. Pew, 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 intcrbeddcd 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 (BLS) at NAS Pensacola. This zone generally has the highest permeability characteristics due to thicker and more persistent sand and gravel beds, and is tapped by most of the major wells in the Pensacola area (Wilkins et al. 1985). NAS Pensacola has three supply wells which produce water from this zone, however, due to high iron content in the water, the wells are infrequently used (G & M 1986). The principal sources of water for NAS Pensacola are wells located at Corry Field, approximately 3 miles to the north. The thickness of the main producing zone can be highly variable; however, it is estimated to be up to about 100 feet at NAS Pensacola. Insufficient data exist for wells open to the main producing zone at NAS

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

As a result of the overlying low permeability zone, groundwater within the main producing zone occurs under confined or semiconfined conditions. At one nested well location on NAS Pensacola (east of Building 648), the water level elevation in a well open to the main producing zone is approximately 7 feet lower than that in an adjacent well open to the surficial zone (G 6 M 1986). This indicates that a significant downward hydraulic gradient exists between these two zones. Thus, a considerable potential exists for vertical groundwater flow from the surficial to the main producing zone at this location. It is not known to what extent this potential 'exists elsewhere at NAS Pensacola.

7.1.2.2 Intermediate System

The lower limit of the Sand-and-Gravel Aquifer coincides vith 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 (Vilkins 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). The entire sequence is primarily poor to non-water bearing. However, relatively thin beds of sand which exist within the unit may yield small quantities of water. In the NAS Pensacola area the Intermediate System is approximately 1,100 feet thick and is composed of the lower portion of the Miocene Coarse Clastics, the Upper Hember of the Pensacola Clay, the Escambia Sand Member of the Pensacola Clay, and the Lower Member of the Pensacola Clay; all are of Miocene Age.

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7.1.2.3 Floridan Aquifer System

Immediately underlying the Intermediate System and occurring at a depth of approximately 1,500 feet BLS at NAS Pensacola is the Floridan Aquifer System. The Floridan Aquifer in this area is composed of the Hiddle 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 at. 1984).

7.2 Site Hydrogeology

In the immediate vicinity of sites 9, 10, 23, 29, and 34, the surficial zone of the Sand-and-Gravel Aquifer occurs from land surface to a depth of approximately 50 feet. The lithologic description of cuttings collected during the installation of monitoring well GM61, located on Site 34 (see Figure 2-2), indicates'that this zone primarily consists of tan and brown, fine- to medium-grained quartz sand. Seven shallow monitoring wells open to the surficial zone exist in the immediate proximity of sites 9, 10, 23, 29, and 34 (see Figure 2-2). These wells indicate that the water table in this area occurs approximately 2 to 3.5 feet BLS. Based on water-level data collected from these wells (G & M 1984), groundwater flow is generally west or northwest toward the paved ditch, except on Site 10, and the horizontal hydraulic gradient is approximately 0.0005. On Site 10, the groundwater flow is generally eastward. Aquifer tests have been conducted on well GM56, and G & M (1986) reported a hydraulic conductivity of 57 ft/day. Assuming an effective porosity of 0.20, a groundwater flow velocity for the surficial zone in this area is estimated to be approximately 0.14 ft/day or 52 ft/year.

The low permeability zone of the Sand-and-Gravel Aquifer immediately underlies the surficial zone in the vicinity of sites 9, 10, 23, 29, and 34 and extends to a depth of approximately 62 feet. Based on the cuttings from the installation of well GM61, this zone primarily consists of gray, sandy, clayey silt vith some shell fragments. No monitoring wells open to the low permeability zone exist in the vicinity of sites 9, 10, 23, 29, and 34; however, based on the lithology, this zone would be expected to function as a confining or semiconfining unit, restricting the flow of groundwater between the surficial and underlying main producing zones. The direction of groundwater flow within the low permeability zone is unknown.

The top of the main producing zone occurs at approximately 77 feet BLS in the site vicinity and consists of medium- to coarse-grained quartz sand to a depth of at least 87 feet. Monitoring well GH61 is screened between 82.5 and 87.5 feet BLS and is open to the upper portion of this zone. The water level elevation in well GM61 is approximately 4 feet lover than that in well GM56 (open to the surficial zone), indicating a significant downward hydraulic gradient between the surficial and main producing zones in this area (approximately 0.08; G & H 1984). Thus, depending on the vertical hydraulic conductivity of the low permeability zone at this site location, a significant potential for downward groundwater flow from the surficial zone into the main producing zone exists.

The direction of groundwater flow within the main producing zone at these sites is unknown; however, a generally southward flow is expected under ambient conditions. NAS Pensacola supply well (Well No. 2) is located approximately 2,000 feet west-northwest of sites 9, 10, 23, 29, and 34, and is screened between 110 and 160 feet BLS, to the main producing zone. This well is utilized by NAS Pensacola for backup water supply only during periods of peak demand. However; during these periods of pumping, the direction of flow in the main producing zone would be directly toward the supply well. Insufficient data exist for wells open to the main producing zone to allow a determination of hydraulic gradient at NAS Pensacola.

8. PROJECT MANAGEMENT PLAN

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

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9. SITE MANAGEMENT PLAN

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

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10. HEALTH AND SAFETY PLAN

A comprehensive General Health and Safety Plan (GHSP) and individual site-specific safety plans (SSPs) have been developed to provide readily available emergency information and preventative safety measures. The GHSP outlines health and safety procedures and protocols to be followed during all field investigations at each of the **[39]** sites on NAS Pensacola. The plan includes standard operating procedures (e.g., site entry and decontamination); hazard communication and training (e.g., safety training, briefings, and documentation); safety equipment and instrumentation (e.g., monitoring and personnel protective equipment); hazard evaluation by contaminant class (e.g., metals and organics); and hazard evaluation for each task (e.g., drilling and sampling). 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 (i.e., 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 Code of Federal Regulations [CFR] Section 1910).

11. QUALITY ASSURANCE PROJECT PLAN

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

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 GOAPP and SOAP 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 GOAPP and SOAP and with U.S. Navy and EPA procedures.

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 fieldvork 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 vhich might have affected hydrologic conditions. The historical perspective gained by studying aerial photographs will provide insight applicable to such tasks as field reconnaissance and monitoring well placement. In addition, the analysis of historical and current aerial photographs, performed in conjunction with geophysical investigation, will aid in the accurate determination of the extent of the formerly used area at the site.

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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 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 (phases 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 QA/QC requirements, reflecting the "focusing" objective (as opposed to a formal contaminant quantification objective) of this phase. Each field screening task will utilize all existing information from preceding tasks, including aerial photograph analyses, to adjust the locations of the various surveys and sampling locations, thereby achieving optimum results. The objectives/advantages of the field screening methods are discussed in detail in Section 9.1 of the GQAPP.

14.1.1 Physical Survey

14.1.1.1 Overall Physical Reconnaissance

A field reconnaissance survey will be conducted on and around the sites 9, 10, 23, 29, and 34 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, and surface drainage patterns.

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

The reconnaissance survey team will utilize radiation and air monitoring equipment during walkovers of each site areas, in accordance vith Section 6.1.1 of the GOAPP. In the event that any [areas vith readings above **background]** are located, the area(s) will be. flagged and identified on a site map for future reference. All findings of the physical reconnaissance will be mapped in detail and recorded in the field logbook.

14.1.1.2 Radiation Survey

A radiation survey will be conducted on sites 9 and 10. A micro-R-meter will be used at 1 meter above the ground to approximate site team exposure. A gamma scintillation detector also will be used directly at ground level to locate source "hot spots." The performance of the radiation survey vill be in accordance with Section 6.3.6 of the GQAPP.

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

This survey will be performed at sites 9, 10, 23, 29, and 34 across all unpaved areas and at cracks and openings on the paved areas using a Poxboro organic vapor analyzer (OVA) or other equivalent monitoring equipment. Readings will be taken 2 inches above the surface at grid points set at 25-foot centers (see Section 14.1.2) to identify potential source areas of VOCs. A more detailed survey, including readings in the breathing zone, will be conducted across these potential source areas as well as the areas deemed necessary by the results of the reconnaissance survey.

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

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 migration. 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 each site as well as an evaluation of the literature.

14.1.2 Geophysical Survey

The sites 10, 23, and 34 areas will require electromagnetic terrain conductivity (En-31 and EM-34XL) and magnetometer (Hag) surveys. The surveys will not be conducted on sites 9 and 29 due to interferences from steel rebar in the concrete apron. These surveys will be performed in accordance with field methodologies and data interpretation techniques discussed in Section 6.2 of the GQAPP.

The effort will require the initial 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 the specified intervals. A transit survey instrument will be used to establish the baselines, and a Brunton compass and tape measure will be used to complete the grid system for the study area;

The EM-31 and Hag surveys will be conducted by obtaining measurements at each 25-foot interval grid point. EM-34XL readings will be obtained at alternating grid point locations (a spacing of 50 feet).

The geophysical data, in conjunction with other background data, will be used to identify water table conditions and the location of potential subsurface contamination, and to ascertain the horizontal and vertical orientation of contamination, if located. Ultimately, the interpretation of these data will be a primary consideration in the development of a rationale for phases I and II monitoring well placement strategies.

14.1.3 Analytical Screening

14.1.3.1 Laboratory Analyses

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

Soil -- Fifty-eight soil borings will be drilled in Group F sites: 15 on Site 9, six on Site 10, 17 on Site 23, eight on Site 29, and 12 on Site 34 (see Figure 14-1). At each location, soil samples will be collected and composited over 5-foot intervals to the water table.

The soil samples will be collected using either a solid stem auger or hand-operated bucket auger. 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, one soil sample is assumed at each soil boring location. Thus, a total of 58 soil samples is tentatively projected.

Groundwater -- Approximately 24 stainless steel temporary monitoring wells will be installed on these sites: six on Site 9, three on Site 10, seven on Site 23, three on Site 29, and five on Site 34. Each well will have 5 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 14-1, the locations for these wells are tentative. There are

TABLE 14-1

PHASE I SAMPLING AND ANALYTICAL REQUIREMENTS—GROUP F

SITE 9

Medium	No. of Samples	Duplicates	Total	Analytical Suite[a,b]
Soil	15	1	16	A
Groundwater[c]	6	1	1	A
TOTAL	21	2	23	

SITE 10

Medium	No. of Samples	Duplicator	Total	Analytical SL.[b]
Soil	6	1	7	A
Groundwater[c]	3	1	4	A
TOTAL	9	2	11	

SITE 23

Medium	No. of Samples	Duplicates	Total	Analytical suite[a,b]
Soil	17	1	1	A
Groundwater[c]	7	1	8	A
TOTAL	24	2	26	

Table [14-1] (Cont.)

SITE 29

Medium	No. of Samples	Duplicates	Total	Analytical Suite[a,b]
Soil	8	1	9	A
Groundwater[c]	3	1	4	A
TOTAL	11	2	13	

SITE 34

Medium	No. of Samples	Duplicates	Total	Analytical Suite[a,b]
Soil	12	1	13	A
Groundwater[c]	5	1	6	A
TOTAL	17	2	19	

[a] Analytical suite designations are as follows:

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

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

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

TABLE 14-2

PHASE I EXISTING WELL SAMPLING
AND ANALYTICAL REQUIREMENTS - GROUP F

Site Number	No. of Samples	Duplicates	Trip Blanks[a]	Field Blanks	Rinsate Blanks	Preservative Blanks[b]	Total	Analytical Suite[c,d]
9	2	1	1	1	1	1	7	A
23	1	1	1	1	1	1	6	A
29	1	1	1	1	1	1	6	A
34	4	1	1	1	1	1	9	A
TOTAL	8	4	4	4	4	4	28	

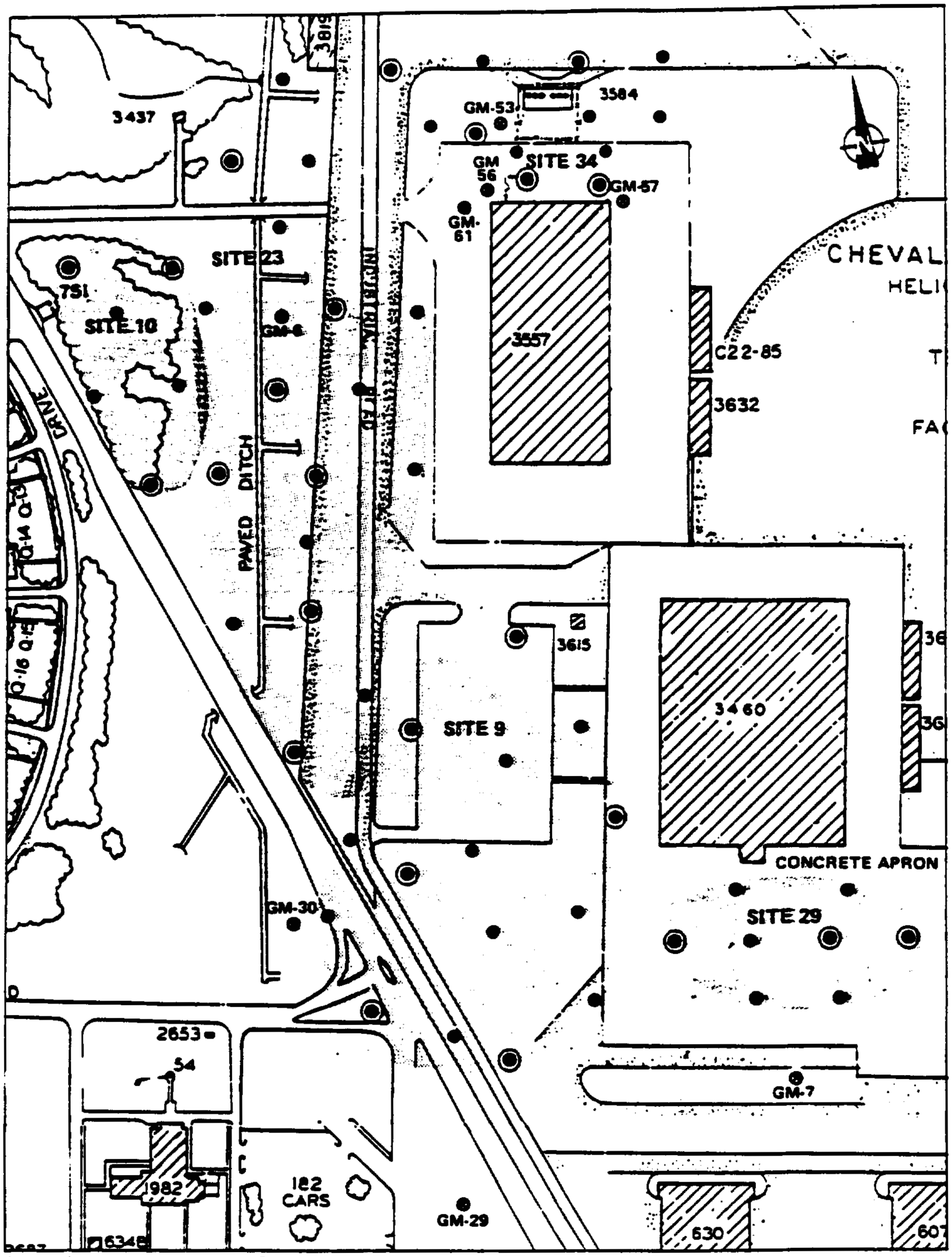
[a]Trip blanks will bo analysed for Target Coapound List (TCL) volatile organic compounds only.

[b]Preservative blanks will bo analysed for T U volatilo organic compounds, total recoverable hydrocarbons, total TCL metals, and cyanide.

[c]Analytical suite designations are as follows:

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

[d]Specific constituents encompassed by tho various chemical groups included within tho above-listed analytical suites are identified in Tables 9-5 through 9-13 of tho GQAPP.



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

SCALE

0 200 400 600 800 FEET

KEY:

- Existing Monitoring Well
- Tentative Soil Boring
- Tentative Temporary Monitoring Well
- Building

Figure 14–1 TENTATIVE SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS, SITES 9, 10, 23, 29, AND 34 – PHASE I eight existing monitoring wells associated with this group of sites. All eight wells will also be purged and sampled during Phase I. The interpreted results of the geophysical investigation, as well as information gained from field reconnaissance surveys and aerial photograph interpretations, will allow adjustments and finalization of the temporary shallow well network.

The 24 temporary vells and eight existing wells will be purged and sampled in accordance with sections 6.7 and 6.8 of the GOAPP.

14.1.4 Hydrologic Assessment

The temporary vells and existing well network will be surveyed to obtain top of casing (TOC) elevations referenced to a U.S. Geological Survey (USGS) datum or to a suitable established benchmark located within the vicinity of sites 9, 10, 23, 29, and 34. Static water levels will be measured in each well to determine shallow groundwater flow direction and horizontal hydraulic gradient.

In conjunction with the wellhead survey, the elevations of other nearby features such as ponds, streams, and ditches will be established.

Hydrologic data collected during Phase I will be evaluated in conjunction with geophysical and analytical screening data, and any evidence of lateral contaminant migration in shallov groundwater will be assessed. The conclusions of these evaluations will form the basis for permanent monitoring well installations during phases II and 111.

14.2 Phase II--Characterization/Extent Delineation

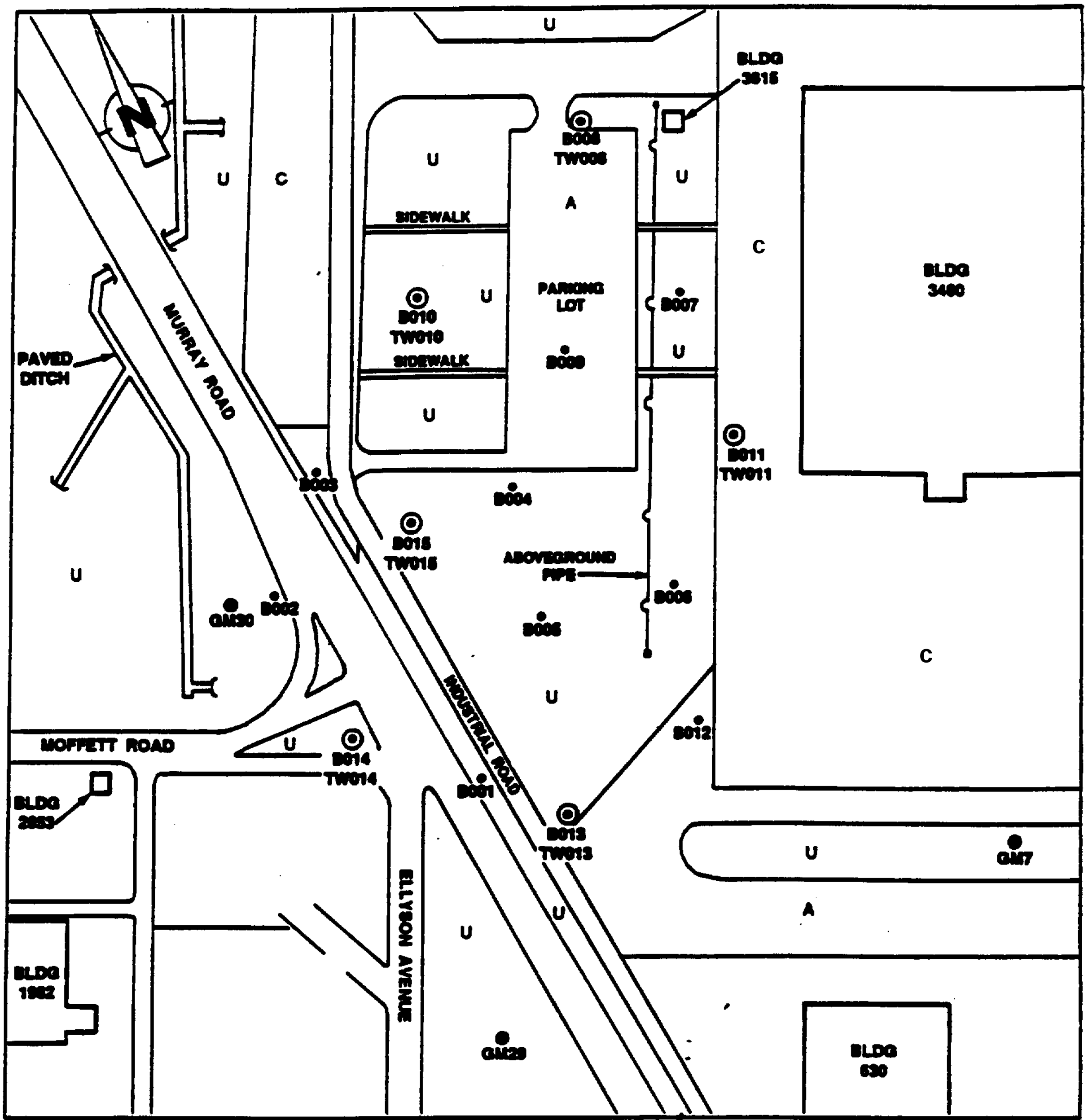
This section of the Contamination Assessment/Remedial Activities Investigation Work Plan--Group F (Site 9, Navy Yard Disposal Area: Site 10, Commodore's Pond; Site 23, Chevalier Field Pipe Leak Area; Site 29, Soil South of Building 3460; Site 34, Solvent North of Building 3557), Naval Air Station Pensacola, Pensacola, Florida, has been entirely revised to reflect the results of the Phase I activities proposed in the original work plan document (June 1990). The original version (June

1990) of Section 14.2 of this work plan is presented in Appendix D. Because portions of Group N Site 36 (Industrial Waste Sewer) occur across each Group F site, this revised Section 14.2 also reflects the relevant results of the Phase I investigation of Site 36. Figures 14-2 through 14-6 show the actual Phase I sampling locations and location designations. Figure 14-7 presents Phase I sampling locations for the five Group F sites and the adjacent portions of Group N Site 36 (Industrial Waste Sewer).

The results of the Phase I investigation of sites 9, 10, 23, 29, 34, and 36 are presented, respectively, in the following E & E documents:

- Final Draft Interia Data Report, Contamination Assessment/ Remedial Activities Investigation, Navy Yard Disposal Area (Site 9), Naval Air Station Pensacola, Pensacola, Florida, April 1992;
- Final Draft Interim Data Report, Contamination Assessment/ Remedial Activities Investigation, Commodore's Pond (Site 10), Naval Air Station Pensacola, Pensacola, Florida, April 1992;
- Final Draft Interim Data Report, Contamination Assessment/ Remedial Activities Investigation, Chevalier Field Pipe Leak Area (Site 23), Naval Air Station Pensacola, Pensacola, Florida, April 1992;
- Final Draft Interim Data Report, Contamination, Assessment/ Remedial Activities Investigation, Soil South of Building 3460 (Site 29), Naval Air Station Pensacola; Pensacola, Florida, April 1992;
- Final Draft Interim Data Report, Contamination Assessment/ Remedial Activities Investigation, Solvent North of Building 3557 (Site 34), Naval Air Station Pensacola, Pensacola, Florida, April 1992; and
- Final Draft Interim Data Report, Contamination Assessment/ Remedial Activities Investigation, Industrial Waste Sewer (Site 36), Naval Air Station Pensacola, Pensacola, Florida, Volumes I through V, April 1992.

In general, the results of E & E's Phase I investigation of sites 9, 10, 23, 29, and 34, revieved in combination with those of previous investigations of the sites (NEESA 1983; G&M 1984, 1986), indicated the following:



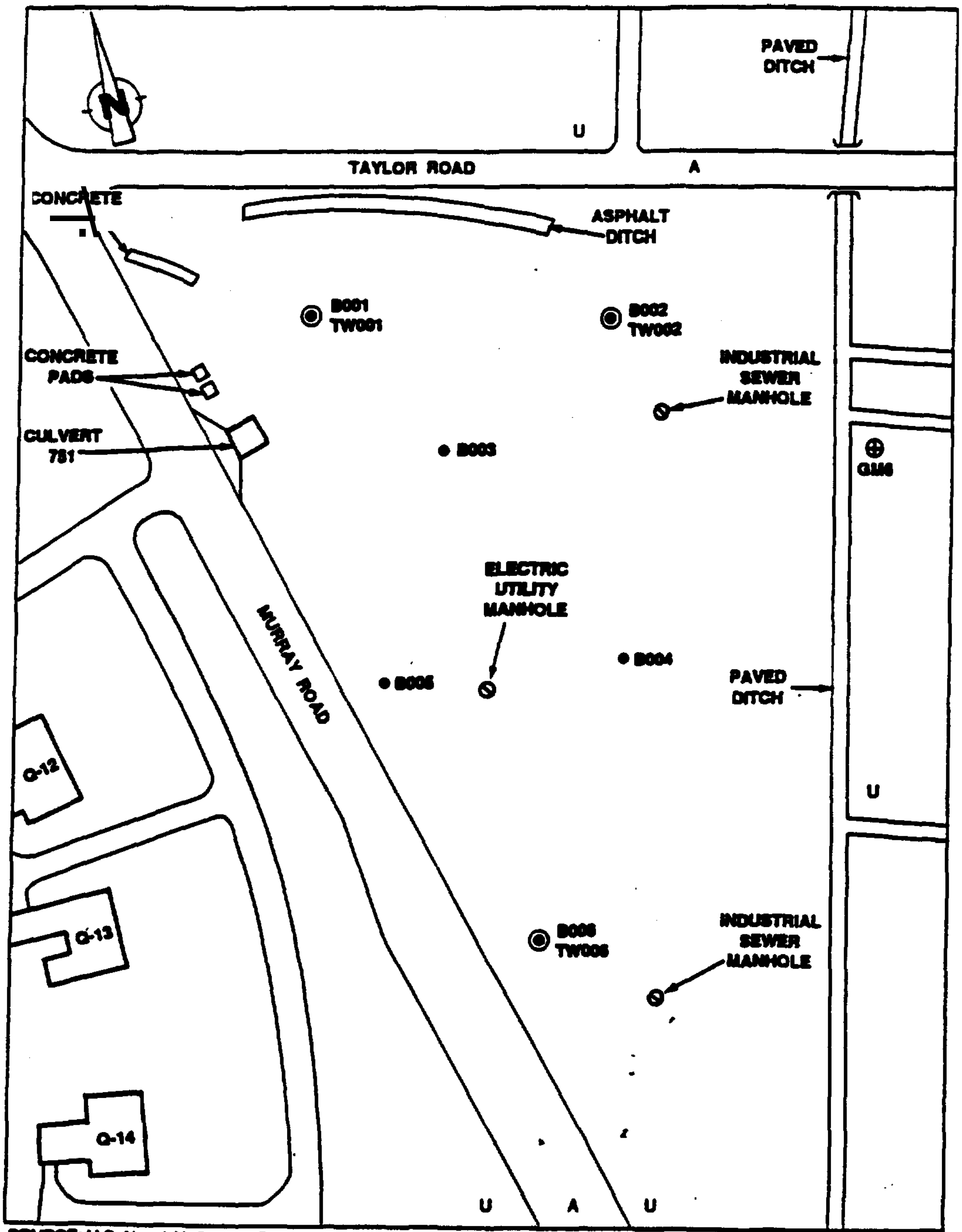
SOURCE: U.S. Naval Air Station, Pensacola, Florida 1991; Ecology and Environment, Inc. 1991

0 200 400 FEET
SCALE

KEY:

⊕	Existing Permanent Shallow Monitoring Well	U	Unpaved
[redacted]		•	Soil Boring
A		O	Temporary Monitoring Well
C	Concrete Paved		

Figure 14-2
SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS
NAS **PENSACOLA** SITE 9 — PHASE I



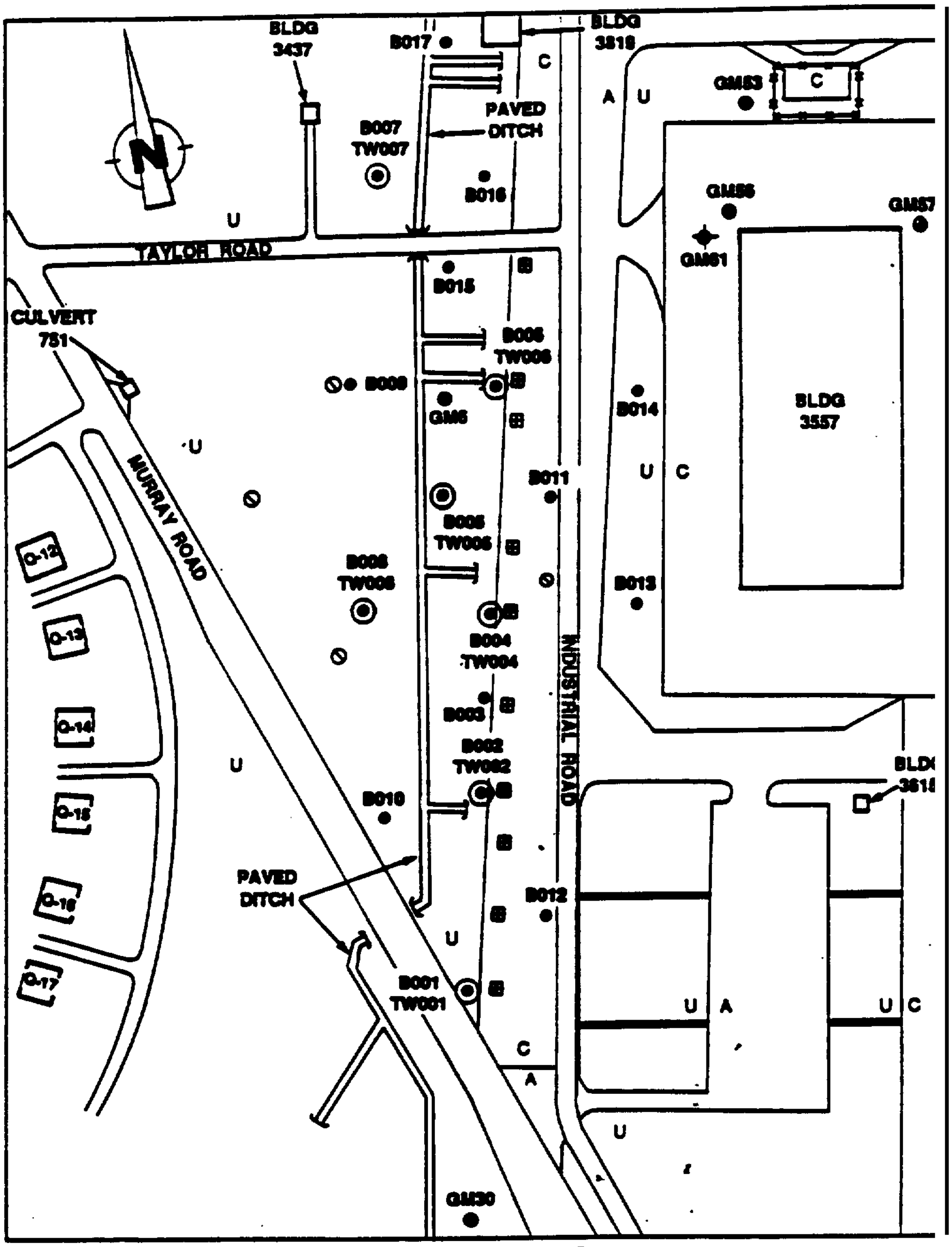
SOURCE: U.S. Naval Air Station, Pensacola, Florida 1991; Ecology and Environment, Inc. 1991

0 100 200 FEET
SCALE

KEY:

⊕	Existing Permanent Shallow Monitoring Well	TW001	Temporary Monitoring Well Number
Q-12	Residential Quarters	A	Asphalt Paved
•	Soil Boring	U	Unpaved
B001	Soil Boring Number		
O	Temporary Monitoring Well		

Figure 14-3
SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS
NAS PENSACOLA SITE 10 — PHASE I



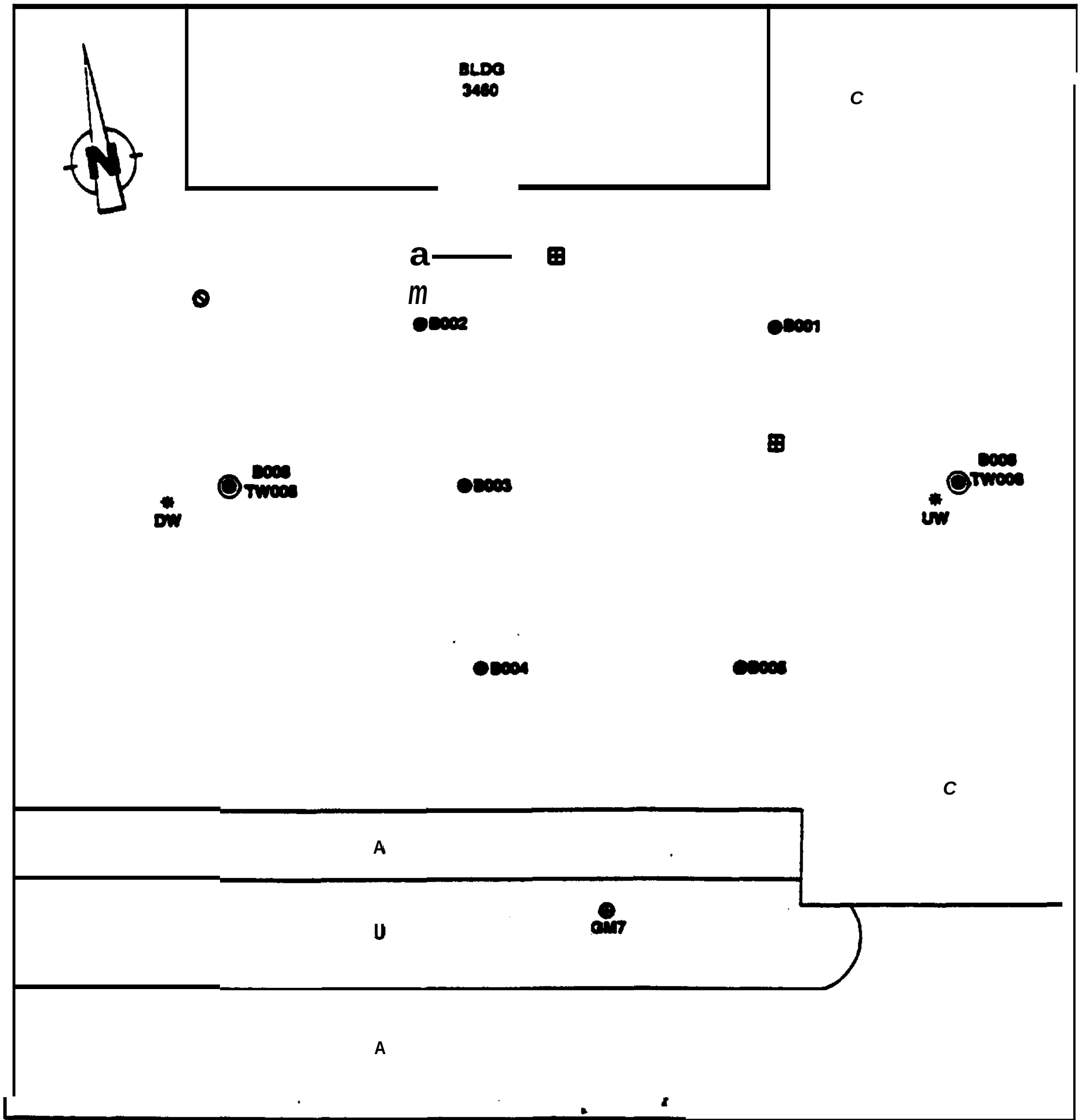
SOURCE: U.S. Naval Air Station, Pensacola, Florida 1991; Ecology and Environment, Inc. 1991

0 200 400 FEET
SCALE

KEY:

- Soil Boring
- Temporary Monitoring Well
- Existing Permanent Shallow Monitoring Well
- Existing Permanent Deep Monitoring Well
- Manhole
- Steel Grate
- BLDG 3557 Building
- Q-12 Residential Quarters
- Fence
- U Unpaved Area
- A Asphalt Paved Area
- C Concrete Paved Area

Figure 14-4
SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS
NAS PENSACOLA SITE 23 — PHASE I

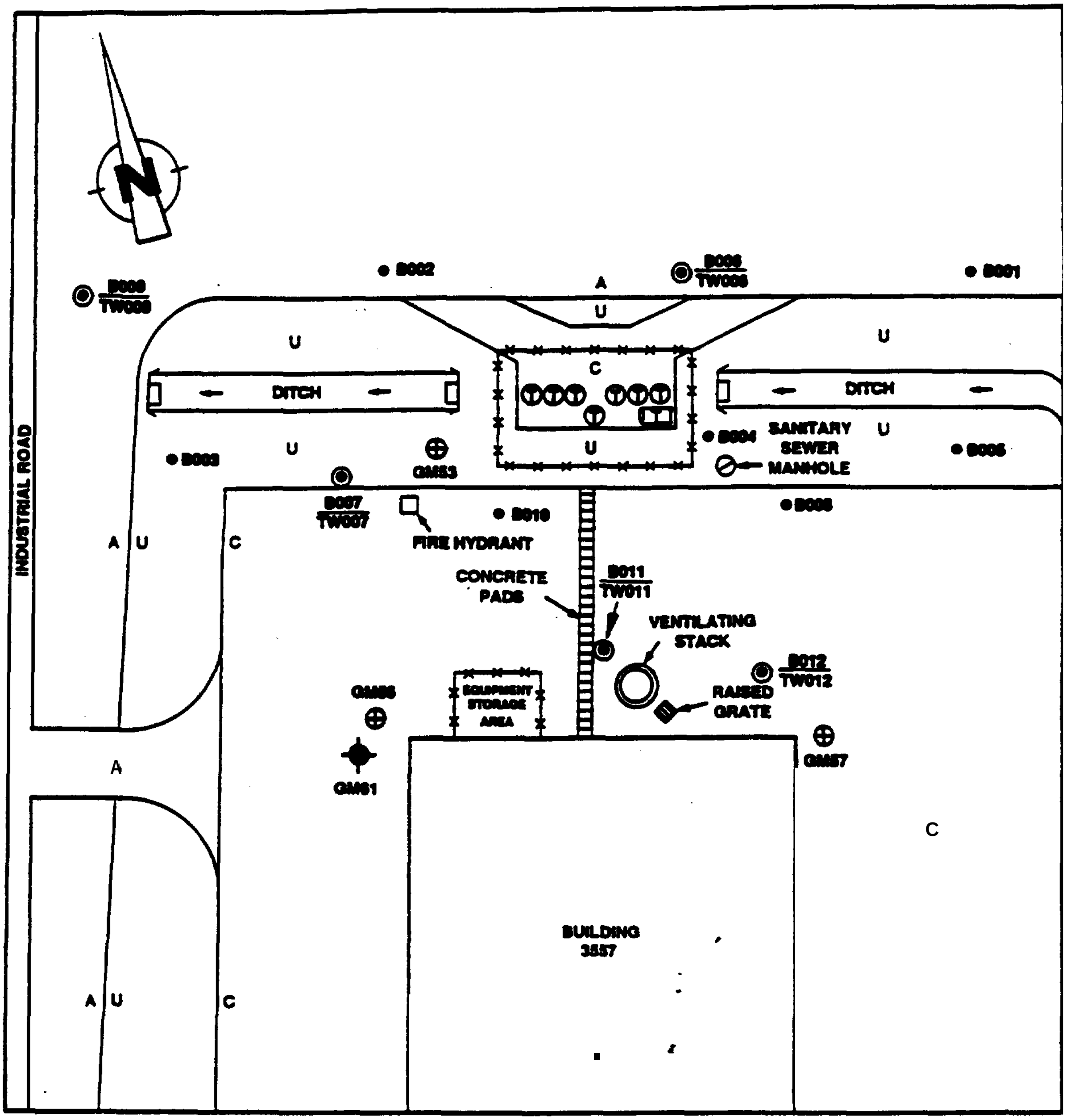


SOURCE: U.S. Naval Air Station, Pensacola, Florida 1991; Ecology and Environment, Inc. 1991

KEY:

●	Soil Boring	DW/UW	Downwind/Upwind
○	Temporary Monitoring Well	BLDG 3460	Building
⊕	Existing Permanent Shallow Monitoring Well	U	Unpaved Area
⊞	Stormwater Drain	A	Asphalt Paved Area
⊘	Industrial Sewer Manhole	C	Concrete Paved Area
✱	Particulate Air Screening Location		

Figure 14-5
PARTICULATE AIR SCREENING, SOIL BORING, AND TEMPORARY MONITORING W E U LOCATIONS — NAS PENSACOLA SITE 29 — PHASE I



SOURCE: U.S. Naval Air Station Pensacola, Pensacola, Florida, 1990; Ecology and Environment 1991

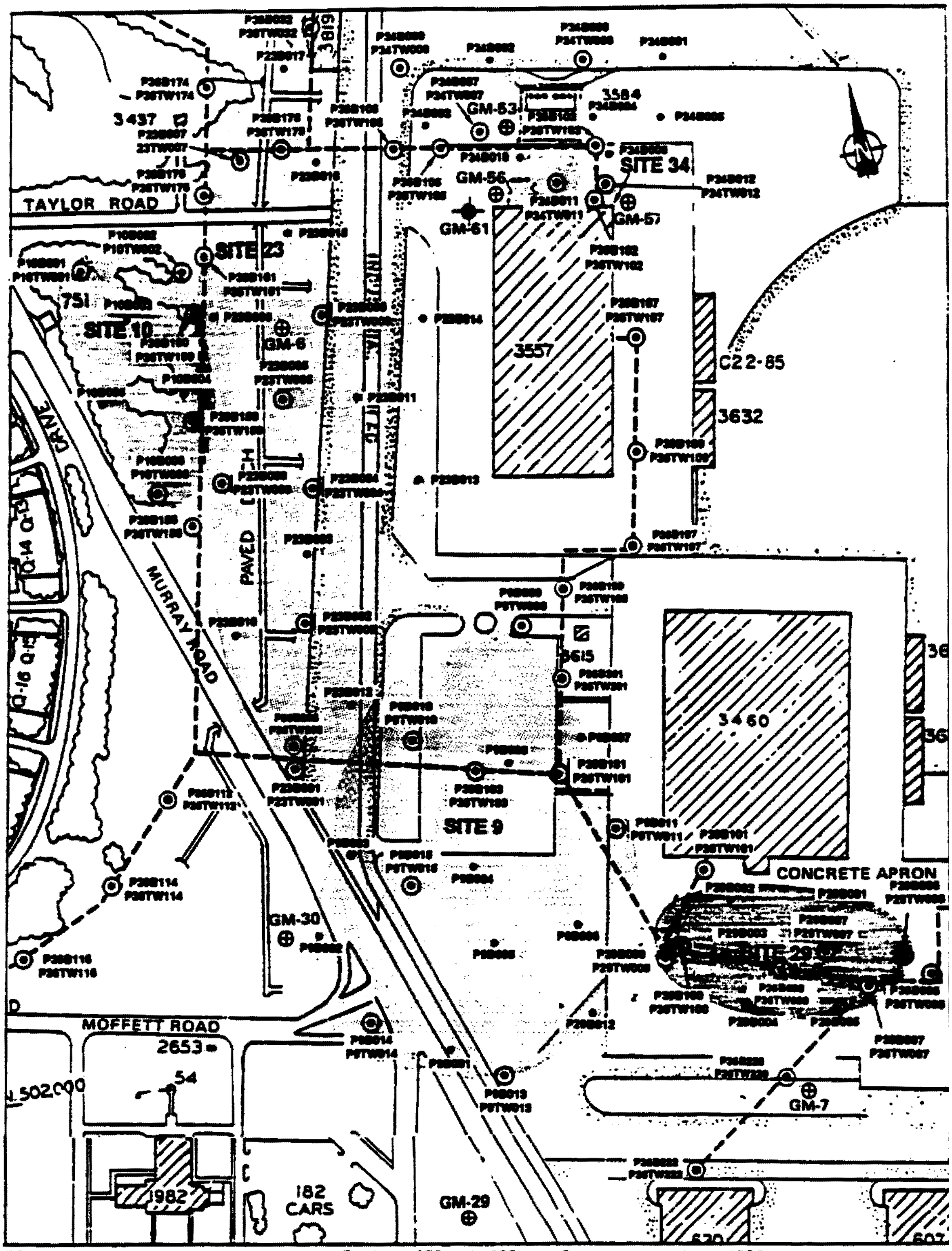
SCALE

0 100 200 FEET

KEY:

U	Unpaved Area		Existing Permanent Deep Monitoring Well
A	Asphalt-Paved Area	•	Soil Boring
C	Concrete-Paved Area	O	Temporary Monitoring Well
	Fence	B007	Soil Boring Number
BLDG. 3557	Building	TW007	Temporary Monitoring Well Number
	Existing Permanent Shallow Monitoring Well	GM53	Permanent Monitoring Well Number
	Storage Tank		

Figure 14-6 SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS NAS PENSACOLA SITE 34 — PHASE I



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

SCALE

0 200 400 600 800 FEET

KEY:

⊕ Permanent Shallow Monitoring Well	— — — Industrial Waste Sewer Line	P10B001 Soil Boring Number
Permanent Deep Monitoring Well	• Soil Boring	P10TW001 Temporary Monitoring Well Number
Building	○ Temporary Monitoring Well	

Figure 14-7 SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS NAS PENSACOLA SITES 9, 10, 23, 29, 34, AND 36 — PHASE I

Site 9

- o Low levels of radiation are present at Site 9. The nature of the source material(s) and the extent of potential contamination are currently unknown.

- o Low concentrations of metals are widespread in soils across Site 9. The widespread distribution of metals in the unsaturated zone is likely attributable to localized sources of contamination, extensive redistribution of Site 9 soils during frequent construction and associated earth moving activities, and/or endemic or ambient sources in the area.

- o Elevated total recoverable petroleum hydrocarbon (TRPH) contamination was detected in soils primarily along the perimeter of the site and also along the portion of the industrial waste sewer line (Site 36) that crosses Site 9.

- o Polynuclear aromatic hydrocarbons (PAHs) were detected only at Phase I soil boring B002 'at twice the detection limit. Stained soil and strong petroleum odors at this location indicate a local contaminant source.

- o Groundwater contamination at Site 9 primarily consists of metals. Elevated lead concentrations detected in many of the Site 9 Phase I groundwater samples exceed the Florida Primary Drinking Water Standard and may indicate localized contaminant sources in the saturated zone.

Site 10

- o TRPE contamination is apparently distributed throughout the soil column in most areas of Site 10 except in the northwest portion.

- o Elevated PAH and phenol concentrations are present in soil in the northeast portion of Site 10. High phenol concentrations are also sporadically distributed across the east and west-central site areas.

- o Lead, chromium, cadmium, and nickel concentrations exceeding the Florida drinking water and groundwater standards were detected in groundwater samples from wells in the northwest area of Site 10; these may be attributable to an undetermined source possibly impacting Site 10 from the west. Lead concentrations, which were elevated with respect to the Florida Primary Drinking Vater Standard and detected in groundwater from all three Site 10 temporary vells, suggest endemic or ambient sources in this area.

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

- o High phenol concentrations detected in well TW002 groundwater samples (in the northeast area of the site) may be associated with localized, on-site and/or off-site sources.

Site 23

- o The highest concentrations and greatest variety of metals were observed in boring B001 soil samples (in the southern area of Site 23). High PAH concentrations and stained soil were also observed at this location. Soil contamination in this area may be associated vith a localized on-site source and corresponds to the area vhere metallic debris vere encountered during drilling and prominent electromagnetic and magnetic anomalies were observed.

- o High TRPH, PAH, and phenol concentrations vere detected in boring B008 soil samples (in the western area of Site 23). Petroleum-saturated soils also vere observed at this location; therefore, a local source, possibly one of the reported historical fuel pipe leaks, is probably located in this area.

- o TRPHs were detected in soil samples from borings B011 and B012 (along the east perimeter of Site 23).

- o High Concentrations and a variety of metals were detected in groundvater samples from wells in the southern area of Site 23; sediments in this area may have been contaminated by a local source, probably associated vith metallic debris and wire buried in this area.

- o Arsenic and lead concentrations, detected in groundvater samples from wells across the site, vere elevated with respect to the Florida primary drinking vater standards, suggesting endemic or ambient sources in the site vicinity.

- o TRPHs, PAHs, and phenols, detected in groundwater samples from wells in the vest and central portions of the site, are apparently associated with a localized on-site source: however, a potential source of phenol contamination is also present west of Site 23.

Site 29

- o TRPHs appear to be limited to soils in the northern area of Site 29 and along the industrial vaste sever line (Site 36). TRPHs detected in the northern area of Site 29 may indicate a potential local source in this area.

- PAHs were detected in samples from one soil boring (B006) along the eastern site perimeter and may indicate a localized presence in this area.

- A potential source of groundwater metals contamination may exist on Site 29 along the industrial waste sewer line (Site 36)--groundwater samples collected from wells along the sewer line exhibited relatively higher levels of metals than other Site 29 groundwater samples. However, arsenic concentrations in GW007 (southern area of Site 29) exceeded the Florida Primary Drinking Water Standard.

- Methylene chloride was detected in a groundwater sample (GW008) from the western portion of Site 29. The source and extent of this contaminant are currently unknown.

Site 34

- Limited areas of soil TRPH contamination were detected in the southern portion of Site 34 near the pipeline from the tank farm to Building 3557 and also along the portion of the industrial sewer line (Site 36) located across Site 34. Very low levels of PAHs were also detected in Site 34 soils in two areas along the industrial sewer line.

- The highest metals concentrations detected in groundwater samples from wells on Site 34 occurred in samples obtained from Site 36 (industrial sewer line) wells during the corresponding Site 36 Phase I investigation. These occurrences indicate a potential source of metals contamination along the sewer line.

- TRPHs, PAHs, and phenols were detected in groundwater sample GW011 collected near the tank farm pipeline, indicating a potential source in this area.. Phenols were also detected in groundwater sample GW007 in the area west of the tank farm.

In light of the Phase I results summarized above, the objectives of the Phase II investigations of sites 9, 10, 23, 29, and 34 will be as follows:

Site 9

- Identify, to the greatest extent possible, the on-site sources of radiation, metals, and organic contamination as well as potential ambient sources of contamination in the site vicinity;

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

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

Site 10

- Identify, to the greatest extent possible, the on-site sources of metals and organic contamination, additional off-site sources of contamination, and any potential ambient sources of contamination in the site vicinity;

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

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

Site 23

- Identify, to the greatest extent possible, the on-site sources of metals and organic contamination, the impact of any off-site sources of Contamination, and any potential ambient sources of contamination in the site vicinity;

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

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

Site 29

- Identify, to the greatest extent possible, the on-site sources of metals and organic contamination as well as potential ambient sources of contamination in the site vicinity;

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

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

Site 34

- o Identify, to the greatest extent possible, the on-site sources of metals and organic contamination, additional off-site sources of contamination, and any potential ambient sources of contamination in the site vicinity;

- o Fully characterize the nature/magnitude and delineate the overall extent of on-site soil and groundwater contamination and potential on-site and off-site stormwater drainage ditch sediment contamination; and

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

In order to meet the above objectives, the Phase II investigation of sites 9, 10, 23, 29, and 34 will include the following elements:

- o Contaminant source survey;
- o Drainage ditch sediment sampling (Site 34 only);
- o Soil sampling;
- o Installation of shallow and intermediate (sites 10 and 34 only) monitoring wells;
- o Collection of groundwater samples from all existing and newly installed wells;
- o Eydrologic assessment: and
- o Engineering survey.

The specific scope of work associated with each of the above elements is described in sections 14.2.1 through 14.2.4. In developing the specific scopes of work, the Phase I and previous analytical results have been evaluated regarding all requirements of the CERCLA and Superfund Amendments and Reauthorization Act (SARA), as well as all other ARARs. For sites 9, 10, 23, 29, and 34, these ARARs include:

- o Resource Conservation and Recovery Act (RCRA);
- o Clean Water Act (CWA);
- o Safe Drinking Water Act (SDUA);

- o 40 CFR Parts 264, 265, 270, and 271 (Corrective Action for Solid Vaste Hanagement Units at Hazardous Vaste Hanagement Facilities; Proposed Rule);
- o Chapter 17-25, Florida Administrative Code (FAC; Regulation of Stormvater Discharge;
- o Chapter 17-3, FAC (Water Ouality Standards);
- o Chapter 17-550, PAC (Drinking Vater Standards, Monitoring, and Reporting); and
- o Chapter 17-770, FAC (State Underground Petroleum Environmental Response).

Formal, quantitative air sampling vill not be conducted during Phase II at sites 9, 10, 23, 29, and 34 because no evidence that these sites represent a potential source of airborne volatile or particulate contaminants vas revealed by the Phase I surface emissions survey, particulate air screening, or fieldvork air monitoring activities. Biota sampling also will not be conducted during Phase II because the potential contaminants of concern have not been sufficiently characterized. Hovever, base-wide biota sampling will be conducted in conjunction with the investigation of operable units (OUs) 15, 16, and 17 (Bayou Grande Area, NAS Pensacola Wetlands, and Pensacola Bay Area, respectively).

Based on the results of the activities identified above, during Phase II E & E will initiate the appropriate Risk Assessment and, as warranted, Feasibility Study activities. Risk Assessment activities will be directed tovard identification of contaminants of concern as well as identification of data gaps that must be eliminated to support the eventual completion'ofa Baseline Risk Assessment for the sites. If no data gaps are identified, the Baseline Risk Assessment will be completed during Phase 11.

Feasibility Study activities, which will be required for sites 10 and 23 and may be required for sites 9, 29, and 34, will be directed tovard identification of data gaps that must be eliminated to support the eventual completion of a comprehensive Feasibility Study for the site. If no data gaps are identified, the Feasibility Study vill be completed during Phase 11.

In addition, if warranted, E & E will evaluate the Phase II results to identify whether any interim remedial measures (IRHs) are required and develop recommendations for implementation of these IRHs (see Section 14.2.5). IRMs will only be implemented following receipt of EPA approval.

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

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

14.2.1 Contaminant Source Survey

A supplemental contaminant source survey will be performed at sites 9, 10, 23, 29, and 34 to obtain a comprehensive understanding of potential additional contaminant source(s) in the site vicinities. Specific tasks associated with the contaminant source survey at these sites will include:

Site 9--Identification of the source(s) and nature of material that have contributed to the area of radiation detected on site.

Site 10--Identification of any nearby activities/facilities that may be directly impacting the site, particularly activities in areas from which surface runoff flovs onto Site 10.

Site 2%-Determination of whether any normal, daily, facility-specific and/or base-wide activities, such as aircraft operations, may have created potential, low-level, ambient sources of TRPA or other contamination.

Site 29--Determination of whether any normal, daily, facility-specific and/or base-wide activities, such as aircraft operations, may have created potential, low-level, ambient sources of TRPB or other contamination.

Site 34

- o Identification of any current activities in Building 3557 that may be impacting the site: and
- o Delineation of the stormwater drainage ditch system on site and in the site vicinity and evaluation of the potential effects the system may have on the distribution of site contaminants and off-site contaminant migration.

The survey will utilize existing information in NAS Pensacola files, previous investigative reports, and interviews with current and former employees of the NAS Pensacola facility. All background source survey work will be conducted in close communication with the facility Installation Restoration (IR) coordinator as the survey may need to access repositories and/or individuals at several locations among the various tenant commands.

14.2.2 Sampling and Analysis

Figures 14-8 through 14-11 shows the proposed Phase II soil boring and monitoring well locations for sites 9, 10, 23, and 29, respectively. Figure 14-12 shows the proposed Phase II sediment sample, soil boring, and monitoring well locations for Site 34. Figures 14-8 through 14-12 include the relevant proposed Site 36 Phase II sampling locations.

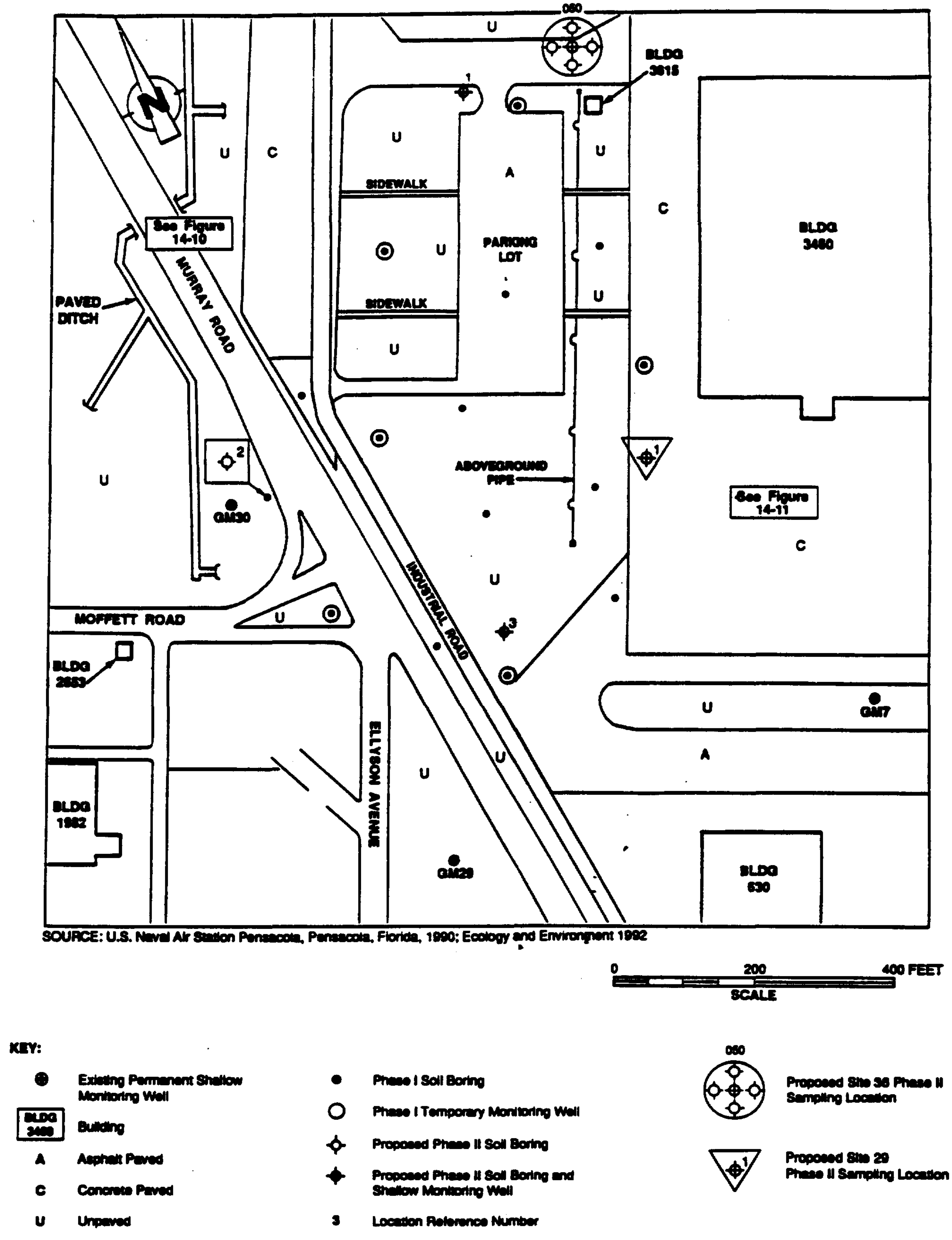


Figure 14-8
PROPOSED SOIL BORING AND MONITORING WELL LOCATIONS
NAS PENSACOLA SITE 9 — PHASE II

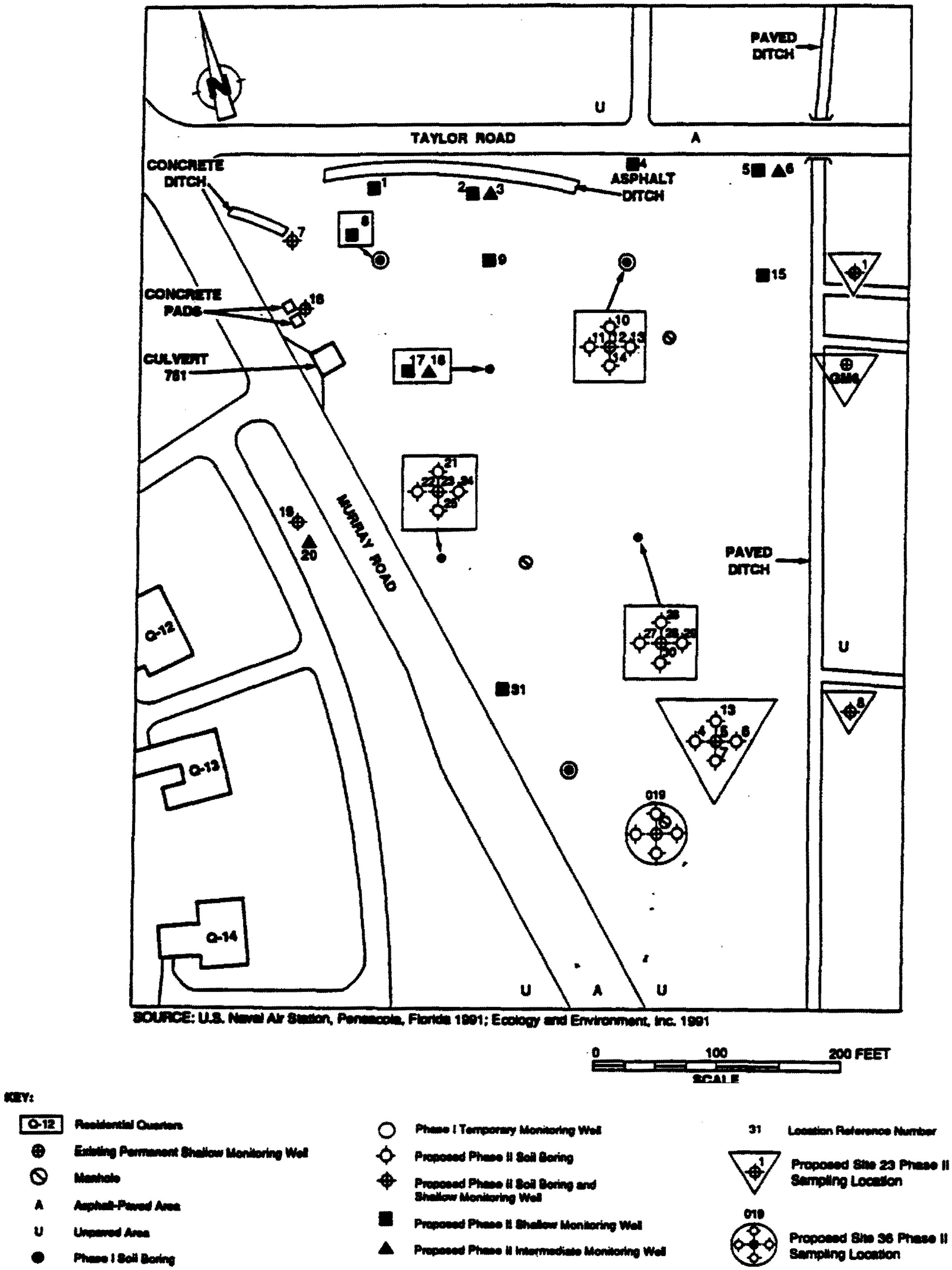
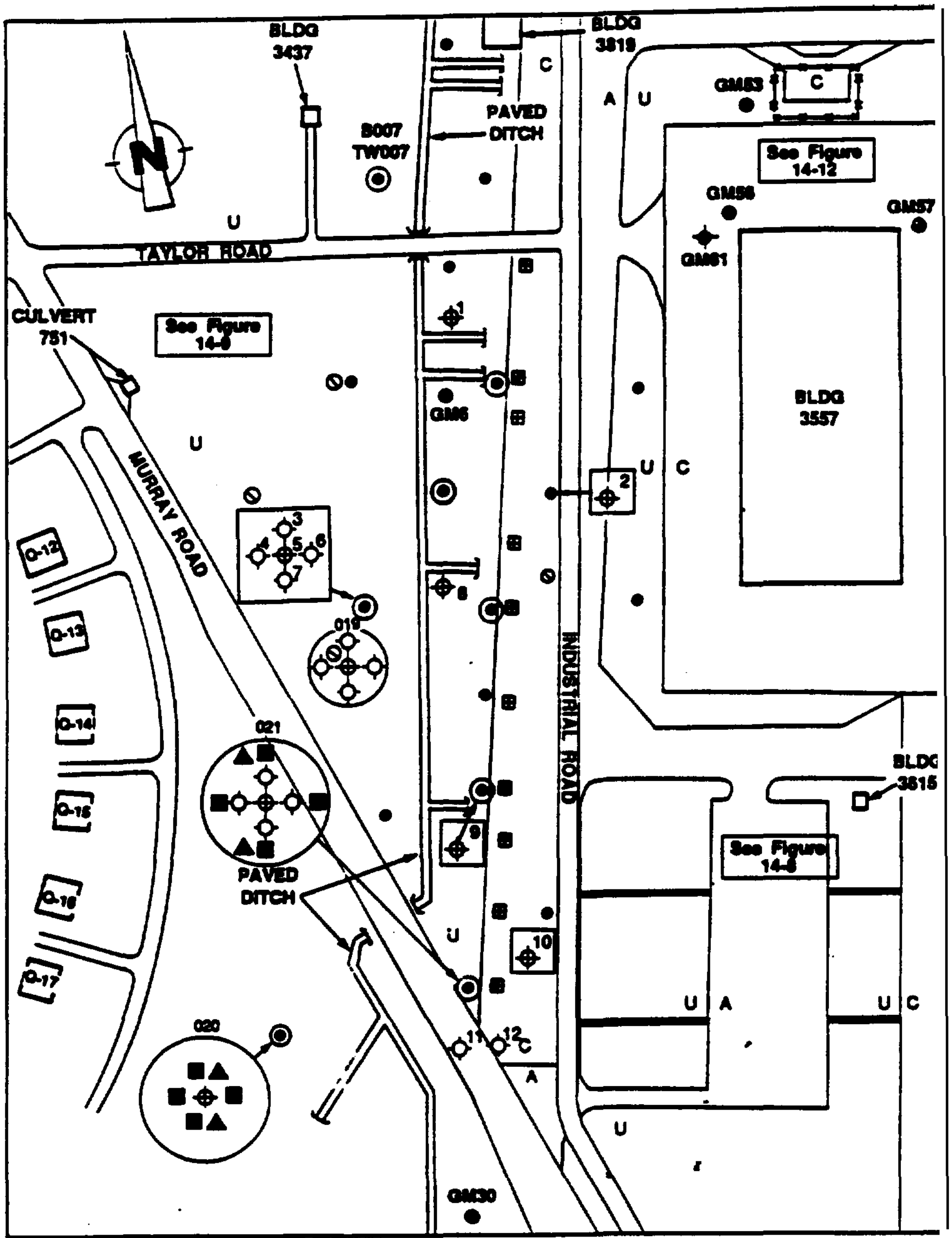


Figure 14-9
PROPOSED SOIL BORING AND MONITORING WELL LOCATIONS
NAS PENSACOLA SITE 10 — PHASE II



SOURCE: U.S. Naval Air Station Pensacola, Pensacola, Florida, 1990; Ecology and Environment 1992

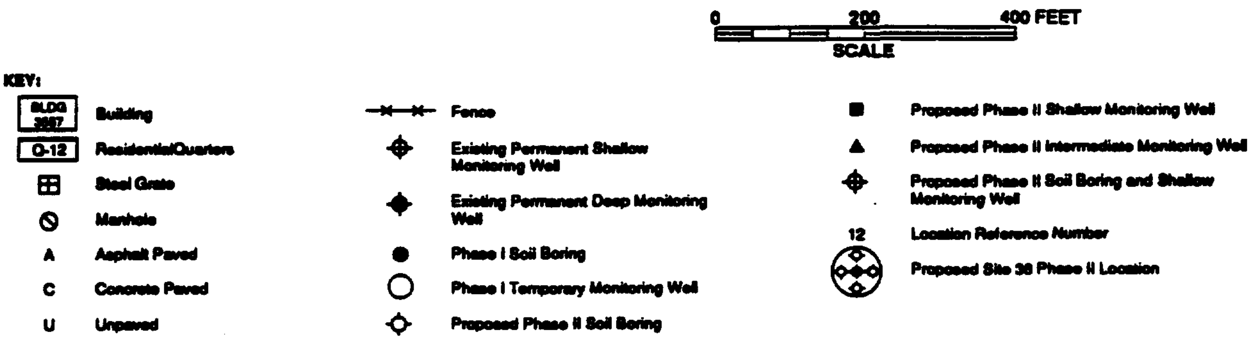
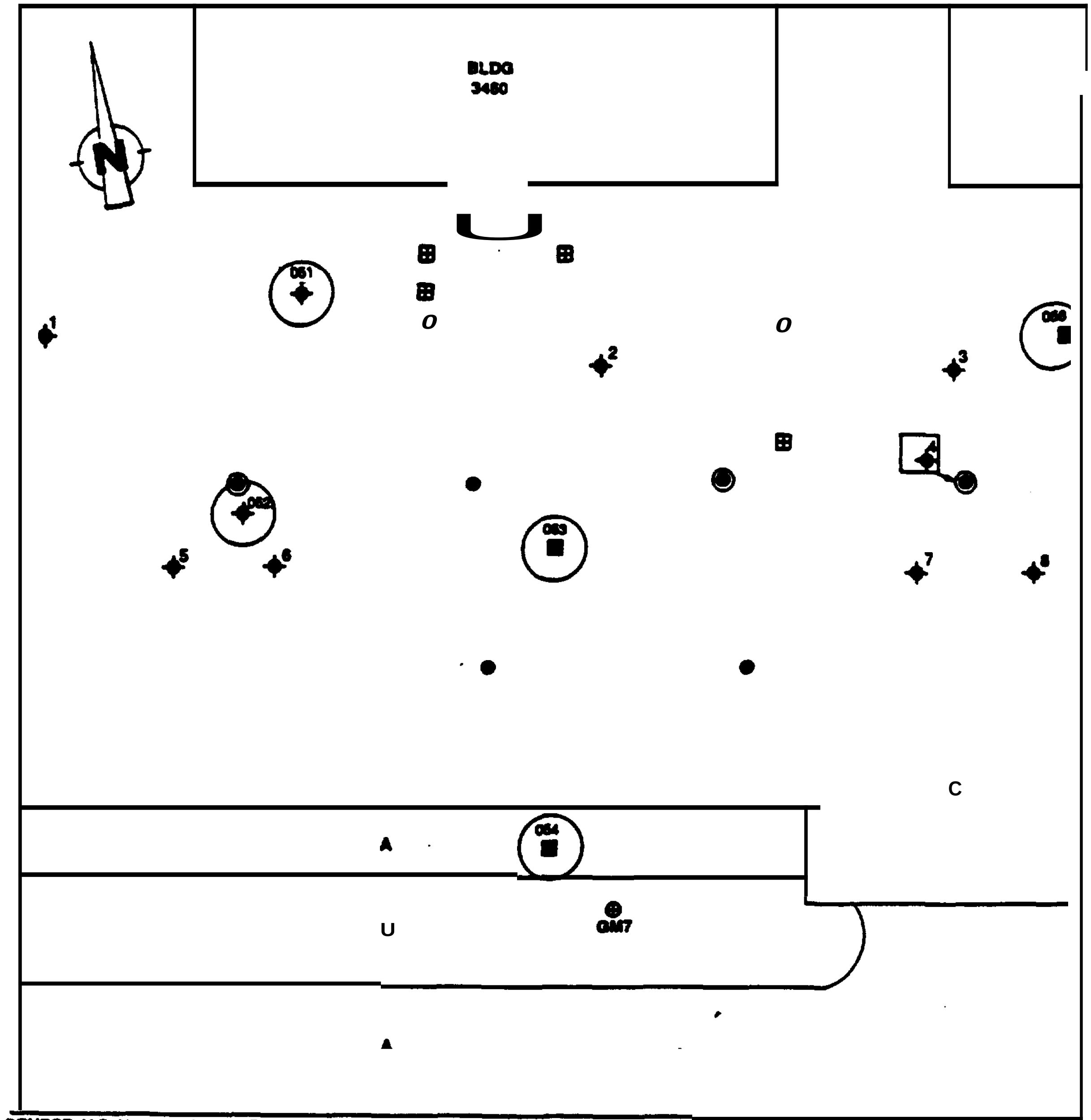


Figure 14-10
PROPOSED SOIL BORING AND MONITORING WELL LOCATIONS
NAS PENSACOLA SITE 23 — PHASE II



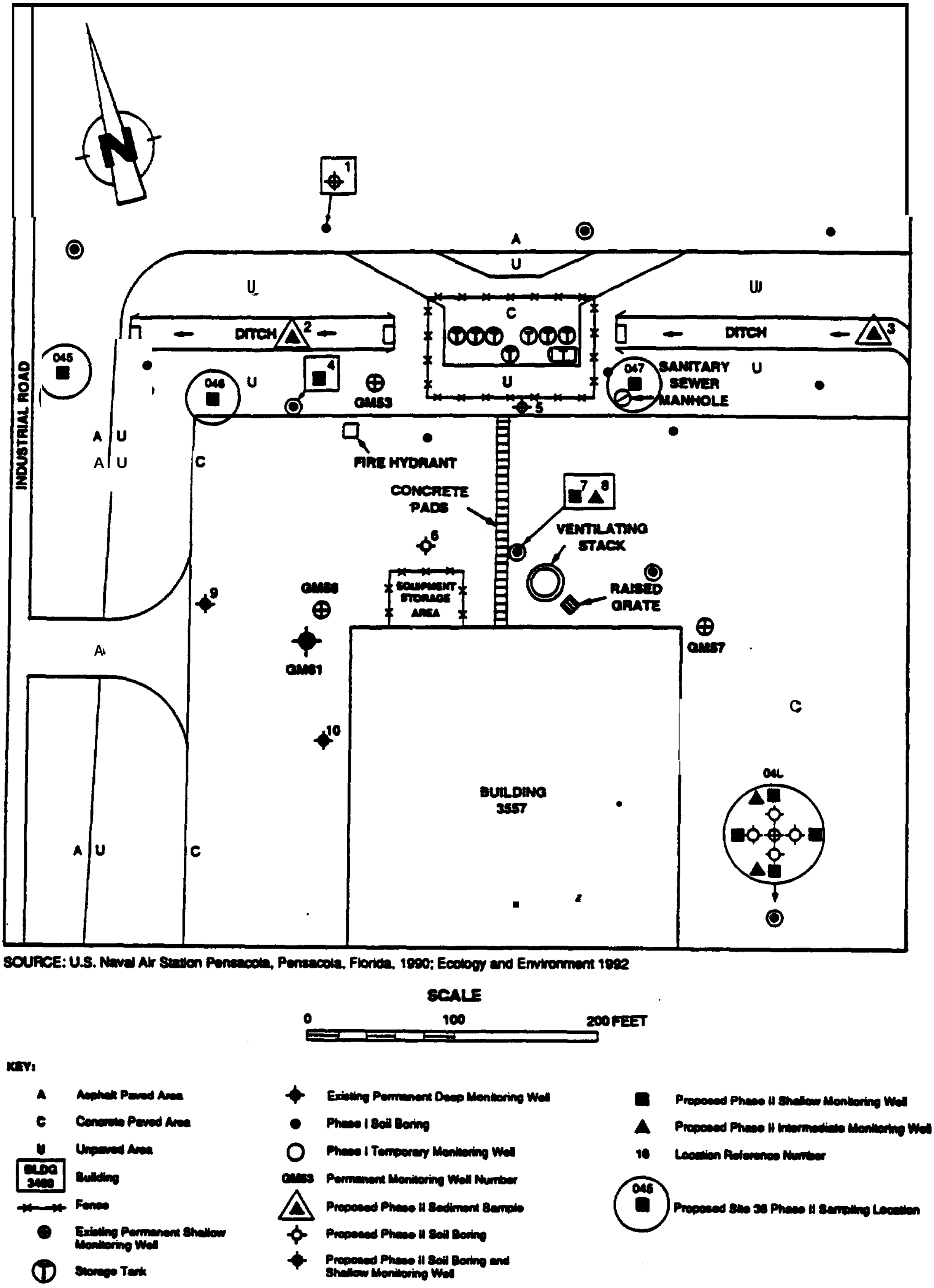
SOURCE: U.S. Naval Air Station, Pensacola, Florida 1991; Ecology and Environment, Inc. 1991

0 100 200 FEET
SCALE

KEY:

- Phase I Soil Boring
- Phase I Temporary Monitoring Well
- Existing Permanent Shallow Monitoring Well
- Stormwater Drain
- Industrial Sewer Manhole
- BLDG 3460 Building
- A Asphalt Paved Area
- C Concrete Paved Area
- U Unpaved Paved Area
- Proposed Phase II Soil Boring and Shallow Monitoring Well
- 3 Location Reference Number
- Proposed Phase II Shallow Monitoring Well
- 051 Proposed Site 36 Phase II Sampling Location

Figure 14-11
PROPOSED SOIL BORING AND MONITORING WELL LOCATIONS
NAS PENSACOLA SITE 29 — PHASE II



SOURCE: U.S. Naval Air Station Pensacola, Pensacola, Florida, 1990; Ecology and Environment 1992

ngun 14-12
PROPOSED SEDIMENT SAMPLE, SOIL BORING, AND MONITORING WELL LOCATIONS
NAS PENSACOLA SITE 34 — PHASE II

Tables 14-3 through 14-7 summarize the sampling and analytical requirements, including QA/QC samples, for the Phase 11 investigations of sites 9, 10, 23, 29, and 34, respectively. Tables 14-8 through 14-18 are as follows:

- o Tables 14-8 and 14-9 provide the specific rationale for each proposed Phase II Site 9 soil boring and monitoring well location, respectively, and for the analytical suite associated with each proposed Phase II sampling location. (Groundwater samples to be collected from the two existing on-site wells and analyzed for suite A, see below, are not included in Table 14-9.)

- o Tables 14-10 and 14-11 provide the specific rationale for each proposed Phase II Site 10 soil boring and monitoring well location, respectively, and for the analytical suite associated with each proposed Phase II sampling location.

- o Tables 14-12 and 14-13 provide the specific rationale for each proposed Phase II Site 23 soil boring and monitoring well location, respectively, and for the analytical suite associated vith each proposed Phase II sampling location. (Groundwater samples to be collected from the existing on-site well and analyzed for suite A, see below, are not included in Table 14-13.)

- o Tables 14-14 and 14-15 provide the specific rationale for each proposed Phase II Site 29 soil boring and monitoring well location, respectively, and for the analytical suite associated with each proposed Phase II sampling location. (Groundvater samples to be collected from the existing on-site well and analyzed for suite A, see below, are not included in Table 14-15.)

- o Tables 14-16, 14-17, and 14-18 provide the specific rationale for each proposed Phase II Site 34 sediment sample, soil boring, and monitoring well location, respectively, and for the analytical suite associated with each proposed Phase II sampling location. (Groundvater samples to be collected from the four existing on-site wells and analyzed for suite A, see below, are not included in Table 14-18.)

The sample location reference numbers listed in tables 14-8 and 14-9 correspond to the location numbers on Figure 14-8; the sample location reference numbers listed in tables 14-10 and 14-11 correspond to the location numbers on Figure 14-9; the sample location reference numbers listed in tables 14-12 and 14-13 correspond to the location numbers on

Table 14-3

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS
NAS PENSACOLA SITE 9

Medium	lo. of Samples[a]	Dupli-cates	Trip Blanks[b]	Preservative Blanks[b]	Field Blanks	Rinsate Blanks	Total[a]	Analytical suite[c]
Soil[e]	9	1	1	NR[f]	NR	1	12	A
	(1)	—	1	NR	NR	—	(1),1	B
	(9)	NR	NR	NR	NR	NR	(9)	C
Groundwater[g]	4	1	1	1	1	1	9	A
	(1)	—	1	NR	NR	—	(1),1	B
	(2)	NR	NR	NR	NR	NR	(2)	D
TOTAL	13	2	4	1	1	2	23	
	(13)	NR	NR	NR	NR	NR	(13)	

14(NASP)UH8000:T0479/1398/10

toy:

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

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

[c]Analytical suite designations are as follows:

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

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

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

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

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

[e]3 boring locations x 3 depth intervals = 9 samples.

[f]NR = lot required.

[g]2 existing wells + 2 new wells (shallow) = 4 samples.

Source: Ecology and Environment, Inc., 1992.

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

Table 14-4

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS
NAS PENSACOLA SITE 10

Medium	no. of Samples[a]	Dupli-cates	Trip Blanks[b]	Preservative Blanks[b]	Field Blanks	Rinsate Blanks	Total[a]	Analytical Suite[c,d]
Soil[e]	76	8	3	NR[f]	NR	3	90	A
	(28)	NR	NR	NR	NR	NR	(28)	B
Groundwater[g]	19	2	2	1	1	2	27	A
	(8)	NR	NR	NR	NR	NR	I 0	C
TOTAL	95	10	5	1	1	5	117	
	(36)	NR	NR	NR	am	NR	(36)	

14[NASP]UH8000:T0479/1399/10

Key:

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

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

[c]Analytical suite designations are as follows:

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

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

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

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

[e]10 boring locations x 3 dopth intervals = 30 samples, plus 2 boring locations x 5 dopth intervals = 10 samples, plus 6 boring locations x 6 dopth intervals = 36 samples (total samples = 76).

[f]NR = Not required.

[g]19 now wells (15 shallow and 4 intermediate) = 19 samples.

Source: Ecology and tnvironwnt, Inc., 1992.

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

Table 14-5

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS
NAS PENSACOLA SITE 23

Medium	No. of Samples[a]	Dupli-cates	Trip Blanks[b]	Preservative Blanks[b]	Field Blanks	Rinsate Blanks	Total[a]	Analytical Suite[c,d]
Soil[e]	36	4	2	NR[f]	NR	2	44	A
	(12)	NR	NR	NR	an	NR	(12)	B
Groundwater[g]	7	1	1	1	1	1	12	A
	(4)	NR	NR	NR	NR	NR	(4)	C
TOTAL	43	5	3	1	1	3	56	
	(16)	NR	NR	NR	NR	NR	(16)	

14[NASP]UH8000:T0479/1400/10

Key:

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

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

[c]Analytical suite designations are as follows:

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

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

C = Total suspended solids, total Kjeldahl nitrogen (TKN), ammonia nitrogen, orthophosphate phosphorus, dissolved oxygon (in field), 5-day biological oxygon demand (BOD_5), and chemical oxygon demand (COD).

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

[e]12 boring locations X 3 depth intervals = 36 samplos.

[f]NR = Not required.

[g]1 existing well + 6 now wells (shallow) = 7 samples.

Source: Ecology and Environment, Inc., 1992.

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

Table 14-6

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS
NAS PENSACOLA SITE 29

Medium	No. of Samples[a]	Dupli-cates	Trip Blanks[b]	Preservative Blanks[b]	Field Blanks	Rinsate Blanks	Total[a]	Analytical Suite[c,d]
Soil[e]	24	2	—	NR[f]	NR	1	27	A
	(1)	—	1	NR	NR	NR	(1),1	B
	(9)	NR	NR	NR	NR	NR	(9)	C
Groundwater[g]	9	1	—	1	1	1	13	A
	(1)	—	1	—	—	—	(1),1	B
	(4)	NR	NR	NR	NR	NR	(4)	D
TOTAL	33	3	2	1	1	2	42	
	(15)	NR	NR	All	NR	NR	(15)	

14[NASP]UH8000:T0479/1402/10

Key:

[a]The number of samples shown in parentheses will bo analysed tor thm additional parameters indicated.

[b]Trip blanks will bo analysed tor Appendix IX volatile organic compounds (VOCs) only. Preservative blanks will bo analysed tot Target compound List (TCL) VOCs, total recoverable petroleum hydrocarbons (TRPHs), dissolved Target Analyte List (TAL) rtals, and cyanide.

[c]Analytical suite designations are as follows:

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

B = Appendix IX VOCs, BAA., dioxins, pesticides, PCBs, organophosphorus pesticides, herbicides, total metals, cyanide, and sulfide.

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

D = Total suspended solid., total Kjeldahl nitrogon (TKN), ammonia nitrogon, orthophosphatm phosphorus, dissolved oxygmn (in field), 5-day biological oxygmn demand (BOD_5), and chemical oxygen demand (COD).

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

[e]8 boring locations X 3 depth intervals = 24 samples.

[f]NR = Aot required.

[g]1 existing well + 8 now wells (shallow) = 9 samples.

Source: Ecology and Environment, Inc., 1992.

Table 14-7

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS
NAS PENSACOLA SITE 34

Medium	No. of Samples[a]	Dupli-cates	Trip Blanks[b]	Preservative Blanks[b]	Field Blanks	Rinsate Blanks	Total[a]	Analytical Suite[c,d]
Sediment	2 (1)	1 All	1 All	NR[e] NR	NR NR	1 NR	5 (1)	A B
Soil[f]	15 (9)	2 All	1 NR	NR NR	NR NR	1 NR	19 (9)	A B
Groundwater[g]	11 (4)	1 All	1 NR	1 NR	1 NR	1 NR	16 (4)	A C
TOTAL	28 (14)	4 All	3 All	1 NR	1 NR	3 NR	40 (14)	

14(NASP)UH8000:T0479/1403/10

Key:

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

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

[c]Analytical suite designations are as follows:

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

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

C = Total suspended solids, total Kjeldahl nitrogen (TKN), ammonia nitrogon. ortbophosphato phosphorus, dissolved oxygen (in field), 5-day biological oxygen demand (BOD_5), and chemical oxygen demand (COD).

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

[e]NR = Not required.

[f]5 boring locations x 3 depth intervals = 15 samples.

[g]4 existing wells + 7 new wells (6 shallow, 1 intermediate) = 11 samples.

Source: Ecology and Environment, Inc., 1992.

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

Table 14-8

RATIONALE FOR PROPOSED PHASE II SOIL SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 9

Location Reference Number(s)	Sample Type(s)[a]	Location Rationale	Analytical Suite(s)[b]	Analytical Rationale
1, 3	AWT	Determine presence or absence ot contamination in this area. Radiation readings recorded above background during radiation survey.	A	Characterize **full** spectrum of potontial contaminants.
			C	Support potontial site remediation planning activities.
2	AWT	Elevated levels of PAHs detected in Phase I soil borinq B002.	A	Characterize cull spectrum of potontial contaminants.
			B (0.5 - 2.5 Coot)	Satisfy RCRA requirements.
			C	Support potontial site remediation planning activities.

14(NASP)UH8000:T0479/1404/7

Key:

[a]AWT = Soil samples collected above water table at following intervals (BLS): 0-0.5, 0.5-2.5, and 2.5-5 Coot.
[b]Specific parameters included within each analytical suite are given in Table 14-3.
PAHs = Polynuclear aromatic hydrocarbons.

RCRA = Resource Conservation and Recovery Act.

Source: Ecology and Environment, Inc., 1992.

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

Table 14-9

RATIONALE FOR PROPOSED PHASE II MONITORING WELL LOCATIONS AND GROUNDWATER SAMPLE ANALYSES NAS PENSACOLA SITE 9

Location Reference Number(s)[a]	Sample Type(s)[b]	Location Rationale	Analytical Suite(s)[c]	Analytical Rationale
1, 3	SGW	Confirm nature and magnitude of groundwater metals contamination detected in Phase I temporary monitoring wells TW008 and TW013.	A	Characterize full spectrum of potential contamination
			B (Location 1 only)	Satisfy RCRA requirements
			D	Support potontial site remediation planning activities

14[NASP]UH8000:T0479/1405/7

Key:

[a]The two existing wells GM29 and 6130 will also bo sampled during Phase II tor analytical suite A parameters.
[b]SGW = Groundwater sample from shallow monitoring well.
[c]Specific parameters included within each analytical suite are given in Table 14-3.

RCRA = Resource Conservation and Recovery Act.

Source: Ecology and Environment, Inc., 1992.

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

Table 14-10

RATIONALE FOR PROPOSED PHASE II SOIL SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 10

Location Reference Number(s)	Sample Type(s)[a]	Location Rationale	Analytical Suite(s)[b]	Analytical Rationale
7, 16, 19	A M	Determine tho presence of absence of contamination in this area	A	Characterize full spectrum of potontial contaminants
			B	Support potential site remediation planning activities
12, 23, 28	AWT	Confirm elevated levels of PAHs and phenols detected in Phase I boring 8002 and phenols in Phase I borings 8004 and BOOS	A	Characterize full spectrum of potontial contaminants
			B	Support potential site remediation planning activities
10, 11, 13, 14, 21, 22, 24, 25, 26, 27, 29, 30	AWT	Delineate lateral extent of PAH and phenol contamination detected during Phase I soil sampling	A	Phenol contamination is of definite concern here. PAH contamination is of potential concern (locations 10, 11, 13, 14)

14[NASP]UH8000:T0479/1407/7

toy:

[a]AWT = Soil samples collected above water table at following intervals (BLS): 0-0.5, 0.5-2.5, 2.5-5 foot (locations 10-14, 26-30): also 5-10 and 10-15 foot (locations 7, 16); and 15-20 foot (locations 19, 21-25).
[b]Specific parameters included within each analytical suite are given in Table 14-4.
PAHs = Polynuclear aromatic hydrocarbons.

Source: Ecology and Environaont, Inc., 1992.

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

Table 14-11

RATIONALE FOR PROPOSED PHASE II MONITORING WELL LOCATIONS AND GROUNDWATER SAMPLE ANALYSES NAS PENSACOLA SITE 10

Location Reference Number(s)[a]	Sample Type(s)[b]	Location Rationale	Analytical Suite(s)[c]	Analytical Rationale
8,12	SGW	Confirm nature and magnitude of groundvator contamination dotoctod in Phase I temporary wells **TW001** and TW002.	A	Characterize Cull spectrum of potontial contaminants
			C (Location 8 only)	Support potontial site remediation planning activities
1,7,16,17, 19,23,28, 31	SGW	Delineate extent and/or identify source of groundvator contamination dotoctod on Site 10 during Phase I. Wells are at tho same location or upgradient of Phase I Site 10 wells where contamination dotoctod.	A	Determine absence of contamination in these areas
			C (locations 17, 19, and 28 only)	Support potential site remediation planning activities

14[NASP]UH8000:T0479/1409/7

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

Table 14-11 (Cont.)

Location Reference Number(s)	Sample Type(s)[b]	Location Rationale	Analytical Suite(s)[c]	Analytical Rationale
2,4,5,9,15	SGW	Dotormino presence and nature of potontial shallow groundwater contamination. All wells are hydraulically downgradient of Site 10 contamination detected during Phase I.	A	Characterize full spectrum of potontial contaminant.
			C (Location 5 only)	Support potential site remediation planning activities
3,6,18,20	IGW	Determine presence and nature of intermediate groundwater contamination. Proposed wells are clustered with proposed ahallow wells.	A	Characterize full spectrum of potential contaminants
			C (locations 6, 18, and 20 only)	Support potential site remediation planning activities

14[NASP]UH8000:T0479/1409/7

Key:

[a]Downgradient control will bo provided by Site 23 existing ahallow woll GM6 and Site 23 proposed ahallow woll location 1 (see Table 14-13 and Figure 14-10).
[b]SGW = Groundwater sample from ahallow monitoring woll: IGW = groundwater sample from intermediate monitoring woll.
[c]Specific parameters included within each analytical suite are given in Table 14-4.

Source: Ecology and Environment, Inc., 1992.

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

Table 14-12

RATIONALE FOR PROPOSED PHASE II SOIL SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 23

Location Reference Number(s)	Sample Type(s)[a]	Location Rationale	Analytical Suite(s)[b]	Analytical Rationale
1,8	ANT	Determine presence or absence of contamination in this area.	A	Characterize full spoctrum of potontial contaminants.
			B (Location 8 only)	Support potontial site romodiation planning activitios.
9,11,12	AWT	Delineate lateral extent of dotoctod Phaso I contamination.	A	Characterize full spoctrum of potontial contaminants.
			B (locations 9 and 11 only)	Support potontial site romodiation planning activitios.
2,5,10	AWT	Confirm dotoctod Phaso I soil contamination: Location 5 (TRPHs, PAHs, and phenols); locations 2 and 10 (TRPHs only).	A	Characterize full spectrum of potential contaminants.
			B (tocation 5 only)	Support potontial site romodiation planning activitios.
3,4,6,7	AUT	Delineate lateral extent of dotoctod Phaso I contamination.	A	Characterize full spoctrum of potontial contaminants.

14[NASP]UH8000:T0479/1415/7

Note: Additional Phase II soil sampling locations on Site 23 have been included in tho proposed Phaso II sampling for Site 36 (Industrial Sewer Line--Group N; see E & E 1992a).

Key:

[a]AWT=Soil samples collected above water table at following intervals (BLS); 0-05, 0.5-2.5, and 2.5-5 foot.
[b]Specific parameters included within each analytical suite are given in Table 14-5.

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

Source: Ecology snd Snvironmont, Inc., 1992.

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

Table 14-13

RATIONALE FOR PROPOSED PHASE II MONITORING WELL
LOCATIONS AND GROUNDWATER SAMPLE ANALYSES
NAS PENSACOLA SITE 23

location Reference Number(s)[a]	Sample Type(s)[b]	Location Rationale	Analytical Suite(s)[c]	Analytical Rationale
5, 9	SGW	Confirm nature and magnitude of qrounduator contamination dotoctod in Phaso I temporary monitorinq wells TW002 and TW008.	A	Characterize full spectrum of potontial contaminants.
			C (Location 5 only)	Support potential site remediation planninq activities.
1, 8	SGW	Determine presence and nature of potontial shallow qroundwator contamination. Wells are located downgradient of contamination dotoctod in Site 23 Phaso I temporary monitorinq wells.	A	Characterize full spectrum of potential contaminants.
			C (Location 1 only)	Support potential site remediation planning activities.
2, 10	SGW	Delineate extent and/or identify source of shallow groundwater contamination dotoctod in Site 23 Phaso I temporary monitoring wells. Locations are either hydraulically cross- or upgradient.	A	Characterize full spectrum of potential contaminants.
			C	Support potential site remediation planning activities.

14[NASP]UH8000:T0479/1416/7

Note: An additional five shallow and two intermediate wells on Site 23 have boon included in tho proposed Phaso II investigation for Site 36 (Industrial Sewer Line--Group B; see E & E 1992a).

Key:

[a]Existing well 6116 will also bo sampled for analytical suite A parameters.
[b]SGW = Groundwater sample from shallow monitoring well.
[c]Specific paramotors included within each analytical suite are given in Table 14-5.

Source: Ecology and Cnvironmont, Inc., 1992.

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

Table 14-14

RATIONALE FOR PROPOSED PHASE II SOIL SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 29

Location Reference Number(s)	Sample Type(s)[a]	Location Rationale	Analytical Suite(s)[b]	Analytical Rationale
1,2,3	AWT	Determine presence or absence of contamination in this area.	A	Characterize full spectrum of potontial contaminants
			C (Location 2 only)	Support potential site remediation planning activitios
4	AWT	Confirm contamination detected in Phase I soil boring 1006.	A	Characterize Cull spectrum of potontial contaminants
			B (0.5 - 2.5 foot)	Satisfy RCRA requirements
			C	Support potential site remediation planning activitios
5-8	AWT	Delineate lateral extent of detected Phase I contamination.	A	Characterize full spectrum of potontial contaminants
			C (Location 6 only)	Support potential site remediation planning activitios

14[NASP]UH8000:T0479/1417/7

Note: Additional Phaso II soil sampling locations on Site 29 have boon included in tho proposed Phaso II sampling for Site 36 (Industrial Sewer Line--Group N; see E & E 1992a).

Key:

[a]AWT = Soil samples are collected above water table at following intervals (BLS): 0-0.5, 0.5-2.5, and 2.5-5 toot.
[b]Specific parameters included within each analytical suite are given in Table 14-6.

RCRA = Resource Conservation and Recovery Act.

Source: Ecology and Snvironmont, Inc., 1992.

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

Table 14-15

RATIONALE FOR PROPOSED PHASE II MONITORING WELL LOCATIONS AND GROUNDWATER SAMPLE ANALYSES NAS PENSACOLA SITE 29

Location Reference Number(s)[a]	Sample Type(s)[b]	Location Rationale	Analytical Suite(s)[c]	Analytical Rationale
1,2,3	SGW	Determine presence and nature of potential shallow groundwater contamination. Wells are located hydraulically downgradient of detected Phase I contamination.	A	Characterize full spectrum of potential contaminants.
			D (locations 1 and 2 only)	Support potential site remediation planning activities.
4-8	SGW	Delineate extent and/or identify source of shallow groundwater contamination detected in Phase I temporary monitoring wells. Proposed wells are located either hydraulically cross- or upgradient of detected Phase I contamination.	A	Characterize full spectrum of potential contaminants.
			B (Location 4 only)	Satisfy RCRA requirements.
			D (locations 4 and 6 only)	Support potential site remediation planning activities.

14[NASP]UH8000:T0479/1418/7

Note: An additional five shallow monitoring wells on Site 29 have been included in the proposed Phase II investigation for Site 3 (Industrial Sewer Line--Group N; see E & E 1992a).

Key:

[a]Existing well GM7 will also be sampled for analytical suite A parameters.
[b]SGW = Groundwater sample from shallow monitoring well.
[c]Specific parameters included within each analytical suite are given in Table 14-6.

RCRA = Resource Conservation and Recovery Act.

Source: Ecology and Environment, Inc., 1992.

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

Table 14-16

RATIONALE FOR PROPOSED PHASE II SEDIMENT SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 34

Location Reference Number(s)	Sample Type(s)[a]	Location Rationale	Analytical Suite(s)[b]	Analytical Rationale
2	SD	Dotormino presence or absence ot potontial downstream contamination in tho on-site stormwater drainage system.	A	Characterize full spectrum of potontial contaminants
			B	Support potontial site remediation planning activities
3	SD	Dotormino presence or absence of upstream contamination (dum to potential off-site contaminant contributions) in tho on-sit. stormwater drainage system.	A	Characterize full spectrum of potontial contaminants

14[NASP]UH8000:T0479/1419/7

Key:

[a]SD = Sediment.
[b]Specific parameters included within each analytical suite are given in Table 14-7.

Source: Ecology and Environment, Inc., 1992.

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

Table 14-17

RATIONALE FOR PROPOSED PHASE II SOIL SAMPLE LOCATIONS AND ANALYSES NAS PENSACOLA SITE 34

Location Reference Number(s)	Sample Type(s)[a]	Location Rationale	Analytical Suite(s)[b]	Analytical Rationale
1	AWT	Determine tho presence or absence of contamination in this area.	A	Characterize full spectrum of potential contaminants
			B	Support potential site remediation planning activities
5, 6, 9, 10	AWT	Determine tho presence of potential soil contamination in areas not sampled during Phase I.	A	Characterize Cull spectrum of potential contaminants
			B (locations 5 and 6 only)	Support potential site romodiation planning activities

14[NASP]UH8000:T0479/1420/7

Key:

[a]AWT = Soil samples collected above water table 4t following intervals (BLS): 0-0.5, 0.5-2.5, and 2.5-5 toot.
[b]Specific parameters included within each analytical suite are given in Table 14-7.

Source: Ecology and Environment, Inc., 1992.

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

Table 14-18

RATIONALE FOR PROPOSED PHASE II MONITORING WELL LOCATIONS AND GROUNDWATER SAMPLE ANALYSES NAS PENSACOLA SITE 34

Location Reference Number(s)[a]	Sample Type(s)[b]	Location Rationale	Analytical Suite(s)[c]	Analytical Rationale
4, 7	SGW	Confirm nature and magnitude of groundwater contamination detected in Phase I temporary monitoring wells TW007 and TW011.	A	Characterize full spectrum of potential contaminants.
			C (location 7 only)	Support potential site remediation planning activities.
1, 5	SGW	Delineate extent and/or identify source of detected Phase I shallow groundwater contamination. Well is located hydraulically cross- or upgradient.	A	Characterize full spectrum of potential contaminants.
			C	Support potential site remediation planning activities.
9, 10	SGW	Determine presence and nature of potential shallow groundwater contamination. Wells are located hydraulically downgradient of detected Phase I contamination.	A	Characterize full spectrum of potential contaminants.

14[NASP]UH8000:T0479/1421/7

Key at end of table.

Table 14-18 (Cont.)

Location Reference Number(s)[a]	Sample Type(s)[b]	Location Rationale	Analytical Suite(s)[c]	Analytical Rationale
0	IGW	Determine presence and nature of potential intermediate groundwater contamination. Proposed well is clustered with proposed shallow well.	A	Characterize full spectrum of potential contaminants.
			D	Support potential site remediation planning activities.

14[NASP]UH8000:T0479/1421/7

Note: In addition, three shallow monitoring wells on Site 34 have boon included in tho proposed Phase II investigation tor Site 36 (Industrial Sewer Line--Group H; see E & E 1992a).

Key:

[a]All tour existing wells (GM53, GM56, GM57, and GM61) will also bo sampled during Phase II tor analytical suite A parameters.
[b]SGW = Groundwater sample from shallow monitoring well; IGW = groundwater sample from intermediate monitoring well.
[c]Specific parameters included within each analytical suite are given in Table 14-7.

Source: Ecology and Environment, Inc., 1992.

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

Figure 14-10; the sample location reference numbers listed in tables 14-14 and 14-15 correspond to the location numbers on Figure 14-11; and the sample location reference numbers listed in tables 14-16, 14-17, and 14-18 correspond to the location numbers on Figure 14-12. The analytical suite designations used in tables 14-8 through 14-18 correspond to the designations used and defined in tables 14-3 through 14-7.

It is proposed to sample for analysis the eight existing wells located on the Group F sites and all newly installed wells (including proposed Phase II Site 36 wells located on Group F sites) for analytical suite A during Phase II to provide a uniform, time-synchronous perspective on sites 9, 10, 23, 29, and 34 groundwater conditions (see also the work plan for Group N--Site 36 [E & E 1992]). This perspective will be critical to properly evaluate the groundwater migration pathway. In addition, during Phase 11 field activities at NAS Pensacola site groups A through E, soil brings, shallow monitoring wells, and intermediate monitoring wells will be completed at three background locations across the base, and--together with the three existing on-base deep supply **wells--sampled** for analytical suite A. (Soil samples collected below the water table will be analyzed for Target Analyte List [TAL] metals.) These background locations will help provide a perspective regarding on-site occurrences of potential contaminants as well **as aid in** evaluating the impact of potential, base-wide ambient contaminant sources. The collection of these background soil and groundwater samples is discussed in the work plan for Group A--Site 1 (Sanitary Landfill; E & E 1991).

Tables 14-3 and 14-6 indicate that one sample from each medium at sites 9 and 29, respectively, will be additionally analyzed for Appendix IX parameters (analytical suite B). It should be noted that for these samples, analytical suite A analyses will only be performed for parameters not encompassed by Appendix IX (e.g., gross alpha, beta, and gamma radioactivity). Furthermore, it should be noted that trip blanks for all five sites will not be analyzed for full analytical suite A parameters, but only for VOCs (Appendix IX VOCs for sites 9 and 29 and

Target Compound List [TCL] VOCs for sites 10, 23, and 34). Finally, it should also be noted that the number of required trip blanks shown on tables 14-3 through 14-7 reflects the total number of trip blanks required for the entire sampling program for each site.

As noted above, tables 14-8 through 14-18 provide specific rationales for proposed Phase II sampling locations and analyses for each site. Sampling locations were selected based on the Phase I results in accordance with one of the following criteria:

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

Sampling locations selected according to the first criterion are required to allow identification of the full spectrum of potential on-site contaminants as well as the maximum levels of occurrence. Locations selected according to the second criterion are required to delineate the distribution of contamination on site and in the site vicinity. Locations selected according to the third criterion are required to confirm that the extent of contamination has been completely delineated. The specific, detailed rationales provided in tables 14-8 through 14-18 for each sampling location or group of locations meet one or more of the three general criteria defined above:

All three of the above criteria must be met to complete a Baseline Risk Assessment and, as warranted, Feasibility Study for the site. Furthermore+ in most instances, meeting the above criteria requires that the collected samples be analyzed for the full suite of parameters in analytical suite A.

Finally, to support potential remediation planning activities for these sites, selected samples from each medium also must be analyzed for those parameters which directly control the viability of various remedial alternatives (see analytical suites B and C [tables 14-4, 14-5, and 14-71 and suites C and D [tables 14-3 and 14-61.

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

14.2.2.1 Sediment Sampling

Site 34

During the Phase II sampling, two sediment samples (sample locations 2 and 3) will be collected at the Site 34 on-site downstream and upstream locations of the stormwater drainage ditch system (see Figure 14-12).

Sediment samples will be collected in accordance with Section 6.9.2 of the GOAPP. Where possible, sediment samples will be collected at depths of surface to 0.4 foot below the surface with one of the following: a stainless steel trowel, a bucket-type mud auger, an Eckman dredge, or other coring device. The composition of sediment materials retrieved will be recorded in the field notebook. Equipment decontamination activities will be conducted in accordance with Section 6.10 of the GOAPP.

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

The two sediment samples will be analyzed for the parameters indicated on Table 14-7 (see also Table 14-16).

14.2.2.2 Soil Sampling

All Phase II soil sampling, compositing, and lithologfc logging 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 GOAPP. The number and types of soil field QA/QC simples to be collected during Phase II were determined in accordance with Section 11.1 of the GOAPP.

At soil boring locations where a monitoring well will not be installed, soil borings will be completed using hollow-stem auger methods, and soil samples will be collected using split-spoon samplers in accordance with Section 6.6.2 of the GQAPP.

Site 9

During the soil boring and shallow monitoring well installation (Section 14.2.2.3), soil samples will be collected at three soil boring locations across Site 9 (see Figure 14-8). At each location, composite soil samples will be collected from each of the following depth intervals: 0 to 0.5 foot BLS, 0.5 foot to 2.5 feet BLS, 2.5 to 5 feet BLS, and then every 5-foot interval to the water table. For the purpose of estimating sample numbers, the depth to the water table is assumed to be 5 feet BLS across the site.

The nine soil samples will be analyzed for the parameters indicated on Table 14-3 (see also Table 14-8).

Site 10

During the Phase 11 soil boring and monitoring well installation (Section 14.2.2.3), soil samples will be collected at 18 locations across Site 10 (see Figure 14-9). At each location, composite soil samples will be collected from each of the following depth intervals: 0 to 0.5 foot BLS, 0.5 foot to 2.5 'feet BLS, 2.5 to 5 feet BLS, and then every 5-foot interval to the water table. For the purpose of estimating sample numbers, the depth to the water table is assumed to be from 5 to 20 feet BLS across the site, based on Phase I boring results.

The 76 soil samples will be analyzed for the parameters indicated on Table 14-4 (see also Table 14-10).

Site 23

During the Phase II soil boring and monitoring well installation (Section 14.2.2.3), soil samples will be collected at 12 locations across Site 23 (see Figure 14-10). At each location, composite soil samples will be collected from each of the following depth intervals: 0 to 0.5 foot BLS, 0.5 foot to 2.5 feet BLS, 2.5 to 5 feet BLS, and then every 5-foot interval to the water table. For the purpose of estimating sample numbers, the depth to the water table is assumed to be 5 feet BLS across the site.

The 36 soil samples will be analyzed for the parameters indicated on Table 14-5 (see also Table 14-12).

Site 29

During the Phase II soil boring and monitoring well installation (Section 14.2.2.3), soil samples will be collected at eight locations across Site 29 (see Figure 14-11). At each location, composite soil samples will be collected from each of the following depth intervals: 0 to 0.5 foot BLS, 0.5 foot to 2.5 feet BLS, 2.5 to 5 feet BLS, and then every 5-foot interval to the water table. For the purpose of estimating sample numbers, the depth to the water table is assumed to be 5 feet BLS across the site.

The 24 soil samples will be analyzed for the parameters indicated on Table 14-6 (see also Table 14-14).

Site 34

During the Phase II soil boring and monitoring well installation (Section 14.2.2.3), soil samples will be collected at five locations across Site 34 (see Figure 14-12). At each location, composite soil samples will be collected from each of the following depth intervals: 0 to 0.5 foot BLS, 0.5 foot to 2.5 feet BLS, 2.5 to 5 feet BLS, and then every 5-foot interval to the water table. For the purpose of estimating sample numbers, the depth to the water table is assumed to be 5 feet BLS across the site.

The 15 soil samples will be analyzed for the parameters indicated on Table 14-7 (see also Table 14-17).

14.2.2.3 Soil Boring Completion and Permanent Monitoring Well Installation and Development

Two permanent monitoring wells will be installed at Site 9, nineteen will be installed at Site 10, six will be installed at Site 23, eight will be installed at Site 29, and seven will be installed at Site 34. These wells will be located and designed to supplement the Phase I investigation results regarding the lateral and vertical extent of groundwater contamination. The number and target completion depths of these wells are as follows:

Site 9--Two shallow wells, each of which will be approximately 15 feet deep.

Site 10

- o Fifteen shallow wells, each of which will be approximately 20 feet deep; and
- o Four intermediate wells, each of which will be approximately 40 feet deep.

Site 23--Six shallow wells, each of which will be approximately 15 feet deep.

Site 29--Eight shallow wells, each of which will be approximately 15 feet deep.

Site 34

- o Six shallow wells, each of which will be approximately 15 feet deep; and
- o One intermediate well, which will be approximately 40 feet deep.

Figures 14-8 through 14-12 show the locations of the proposed monitoring wells at each site, and tables 14-9, 14-11, 14-13, 14-15, and 14-8 provide a detailed rationale for the selection of each of the monitoring well locations and target depths at each site.

In order to detect the presence of any floating product at sites 9, 10, 23, 29, and 34, the shallow vells will be completed into the upper portion of the surficial zone of the Sand-and-Gravel Aquifer so that the well screen brackets the water table. At sites 10 and 34, the intermediate vells will be installed to investigate the vertical extent of possible groundwater contaminants, particularly any dense nonaqueous phase liquids (DNAPLs). These five intermediate wells will be completed into the lower portion of the surficial zone immediately above the first confining/semi-confining unit. Each of the intermediate wells will be clustered with a shallow well to assist in delineating the vertical extent of any contamination at that location as well as determine the vertical hydraulic gradients between the monitored zones (see figures 14-9 and 14-12).

All the shallow wells on sites 9, 10, 23, 29, and 34 and the majority of the intermediate wells on sites 10 and 34 will be installed using hollow-stem auger methods, and constructed of 4-inch-diameter, flush-threaded polyvinyl chloride (PVC) casing terminating in 10 feet of 0.015-inch, factory-slotted screen.

At sites 10 and 34, to prevent the potential downward migration of any shallow contaminants during drilling, Site 10 intermediate wells (locations 3, 6, 18, and 20; see Figure 14-9) and Site 34 intermediate wells (location 8; see Figure 14-12) will be installed, using either hollow-stem auger or hydraulic rotary methods, through 8-inch-diameter PVC surface casings. The surface casings will be grouted in place and allowed to set 24 hours prior to drilling the well borehole to the target depth, in accordance with Section 6.7.4 of the GOAPP. The intermediate well surface casing will be set at approximately 30 feet BLS. The five intermediate wells installed through the surface casings will be constructed in the same manner as the shallow wells. All drilling and finished monitoring well construction will be conducted in accordance with sections 6.7.2 and 6.7.3 of the GQAPP. In addition, all newly installed wells will be protected above surface grade with a steel surface casing and locking wellhead cover. In paved or heavily traveled areas, the wells will be protected at surface grade with a flush-mount security cover and locking cap.

In conjunction with the drilling of the well boreholes, continuous split-spoon samples will be collected to the target completion depth of each well in accordance with Section 6.7.2.3 of the GQAPP. At sites 10 and 34, where wells are constructed in clusters, split-spoon samples will only be collected during drilling of the deeper well borehole.

After installation, each of the new monitoring wells will be developed using a submersible pump and/or bailer in accordance with Section 6.7.5 of the GQAPP. Development waste will be contained in 55-gallon drums, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy (see also Section 14.6.2).

All drilling equipment will be decontaminated prior to use and between the installation of each well in accordance with Section 6.10 of the GQAPP. All borehole cuttings and drilling fluids will be stored in 55-gallon drums, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy (see also Section 14.6.2)

14.2.2.4 Groundwater Sampling
Purging and sampling of each well will be performed in accordance with sections 6.8.2 and 6.8.3 of the GOAPP, respectively. Equipment decontamination activities will be performed in accordance with Section 6.10 of the GOAPP. The number and types of groundwater field QA/QC samples to be collected were determined in accordance with Section 11.1 of the GOAPP.

All shallow monitoring wells will be checked for floating and/or sinking immiscible hydrocarbons with an oil/water interface probe. All intermediate monitoring wells will be checked for sinking immiscible hydrocarbons with an oil/water interface probe.

Site 9
During Phase II, groundwater samples will be collected from the two existing on-site wells and two newly installed shallow on-site monitoring wells at Site 9 (see Figure 14-8). The four samples will be analyzed for the parameters indicated on Table 14-3 (see also Table 14-9).

Site 10

During Phase II, groundwater samples will be collected from the 19 newly installed on-site monitoring wells (15 shallow and four intermediate) at Site 10 (see Figure 14-9). All 19 samples will be analyzed for the parameters indicated on Table 14-4 (see also Table 14-11).

Site 23

During Phase 11, groundwater samples will be collected from the existing well and six newly installed on-site shallow monitoring wells at Site 23 (see Figure 14-10). All seven samples will be analyzed for the parameters indicated on Table 14-5 (see also Table 14-13).

Site 29

During Phase II, groundwater samples will be collected from the existing well and the eight newly installed on-site shallov monitoring wells at Site 29 (see Figure 14-11). All nine samples will be analyzed for the parameters indicated on Table 14-6 (see also Table 14-15).

Site 34

During Phase 11, groundwater samples will be collected from four existing wells and the seven newly installed on-site monitoring wells (six shallow and one intermediate) at Site 34 (see Figure 14-12). All 11 samples will be analyzed for the parameters indicated on Table 14-7 (see also Table 14-18).

14.2.3 Hydrologic Assessment

The main objective of the Phase II hydrologic assessment is to further delineate the hydrogeologic character of the underlying aquifer at sites 9, 10, 23, 29, and 34. Slug and short-term specific capacity tests, rather than a long-term pump test, have been proposed for Phase II because the location and distribution of contaminants in the various zones of the underlying aquifer have not yet been precisely identified. The hydrologic assessment at sites 9, 10, 23, 29, and 34 will include a wellhead elevation survey of all the newly installed permanent monitoring wells; static water level measurements in all the on-site wells and, at sites 23 and 34, the on-site surface drainage ditch system; and short-term specific capacity and/or slug tests on all the newly installed permanent wells.

All of the newly installed monitoring wells will be surveyed during the engineering survey (Section 14.2.4), and referenced to a USGS benchmark, in accordance with Section 6.7.6 of the GQAPP.

At sites 9, 10, 23, 29, and 34, static water levels will be measured in all the existing and proposed on-site vells and, at sites 23 and 34, in the on-site drainage ditch system on at least four occasions: once during the sampling of the newly installed wells; once approximately two to four weeks after sampling to obtain an estimate of the short-term temporal variability in water levels.; once during a low tidal phase; and once during a high tidal phase. The measurements taken during opposing tidal phases will be collected on the same day in order to accurately evaluate tidal influences on water level elevations at these sites.

Limited aquifer testing will be conducted on all newly installed monitoring wells. This testing will consist primarily of performing short-term specific capacity tests on wells that are capable of sustaining a measurable yield. The specific capacity testing at sites 9, 10, 23, 29, and 34 will be conducted during the development of the newly installed wells. The procedure for specific capacity testing involves measuring the initial static water level in the well and then vithdraving groundvater from the well at a constant rate for a designated period. The sustained water level during pumping is then noted, and the pump is turned off. The water level recovery in the well is then recorded continuously over time until the water level equilibrates to the initial static level. In addition to measuring dravdown in the developing well during the specific capacity testing, water levels will be measured in adjacent shallov, intermediate, and/or deep monitoring wells to determine the extent to which the respective, monitored zones may be hydraulically connected.

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

The purposes of the specific capacity and slug testing are to obtain site-specific, first estimate values for hydraulic conductivity (K), transmissivity (T), and groundwater flow velocity (V) for each of the monitored depth zones. During each of these tests, a calibrated tape and/'or electronic data logger will be used to monitor and record the water levels in the well(s) being tested or observed.

A rain gauge will be installed at or near the Group F sites and aonitored regularly during the fieldwork.

14.2.1.4 Engineering Survey

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

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

14.2.5 Interim Remedial Measures

During the field investigation, circumstances on site may require IRMs. IRMs will be initiated on a case-by-case basis and only following receipt of EPA approval. Rapid response will be emphasized. An IRM could involve the installation of security fences and warning signs; construction of berms, caps, and/or recovery and treatment systems; and removal of soil, sediment, and/or drums. If an IRM is conducted, a detailed, explanatory report of the IRM will be developed by E 6 E and provided to the Navy and EPA.

14.2.6 Report

Refer to Section 20 of this work plan (revised April 1992) for a description of the Phase II report.

14.3 Phase III--Extent Delineation

Phase III tasks will be conducted based on the results of phases I and II, [if deemed *necessary]*. Although the earlier phases are intended to identify and characterize areas and contaminants of primary concern as they extend laterally from these sites, 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 II, additional biota sampling may be conducted in Phase 111. [If required,] a separate biological sampling plan will be prepared. [However, base-wide biota sampling will be conducted as part of the investigation of OUs 15, 16, and 17.)

14.3.2 Soil Sampling

Soil sampling will be conducted in conjunction with any new shallow, intermediate, and/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 shallow groundwater contamination.

14.3.4 Intermediate and Deep Monitoring Well Installation and Development

The installation of additional monitoring wells into deeper zones of the aquifer may be required to assess horizontal and vertical hydraulic gradients, aquifer physical characteristics, and vertical extent of contamination. The number of wells and their locations and depths are dependent upon the findings of phases I and 11.

14.3.5 Groundvater Sampling

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

14.3.6 Hydrologic Assessment

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

[14.3.7 Engineering Survey

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

14.3.[8] Air sampling

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

14.4 Phase IV--Extent Delineation

The following tasks, if required, will be performed as a continuation of the effort to delineate the extent of contamination:

- o Soil sampling;
- o Surface water and sediment sampling;
- o Shallow monitoring well installation and development;
- o Intermediate and deep monitoring well installation and development;
- o Groundwater sampling;
- o Hydrologic assessment; [and
- o Engineering Survey.]

14.[5] Field Quality Assurance/Quality Control

14.[5].1 Documentation

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

14.[5].2 Field Quality Assurance/Quality Control 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 (11.11 of the GQAPP. The estimated numbers of required field QA/QC samples for phases I and II are shown in tables 14-1 [through 14-7.]

14.[6] Decontamination and Waste Management Procedures

14.[6].1 Decontamination Procedures

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

14.[6].2 Waste Management Procedures

[All **investigation-derived waste** handling **will** be performed in accordance vith Section 6.11 of the GQAPP and **EPA's** guidance for **investigation-derived waste.]** All vater generated during monitoring well purging and development activities on sites 9, 10, 23, 29, and 34 will be discharged onto the ground surface away from the well or containerized, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy.

Any excess soil auger cuttings generated by soil boring or monitoring well installation activities will be disposed of on the site or 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 GOAPP and GSHP. All phases of fieldwork will incorporate a different level of data quality and requisite laboratory QA/QC. These levels are discussed in detail in the GQAPP and GSHP.

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

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. The following two scenarios will be considered to assess the potential for off-site contamination:

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

E & E will use the tvo-dimensional analytical RANDOMWALK model (Prickett et at. 1981) to arrive at these estimates. E 6 E will calculate flow velocity field input data for the solute transport simulation from a simplified model based on Darcy's Law. E & E will utilize parameters including transmissivity, storativity, and hydraulic conductivity determined from the previous phases of fieldwork.

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

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

17. TREATABILITY STUDY

As indicated in tables 14-3 [through 14-7], a number of the analyses to be performed on the samples collected during phases II through IV are required in support of the treatability study. Characterization of samples in terms of parameters listed in tables 14-3 [through 14-7], together with treatability tests, will provide the basic data required for the evaluation of physical, chemical, and biological remedial technologies. Some of the treatability tests that may be examined are incineration tests, solubility tests, soil leaching tests, and coagulation-flocculation jar tests.

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

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 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 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 pathway 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, groundwater, or biota);
3) A point of potential contact with the medium of concern; and
4) An exposure route to the population from the contact point.

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

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

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18.3 Toxicity Assessment

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

18.4 Risk Characterization

In the final stages of the baseline risk assessment, a characterization of the potentially adverse effects to human health or environment of each scenario derived is developed and summarized. By integrating information developed during the exposure and toxicity assessments, estimates of risk can be developed to include carcinogenic risks, non-carcinogenic 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, and retirement homes);
- Activities (recreational and/or occupational) which take place near the sites and the estimated number of people involved;

- 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 (e.g., hydrogeologists, chemists, and risk assessors), the Navy, and the reviewing regulatory agencies (i.e., FDER and EPA) and that the goal of these tasks is to produce appropriate, sufficient, and high quality data to complete the baseline risk assessment.

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 work plan after the initial phases of the fieldwork have been completed. However, it is anticipated that if contamination of some degree is identified on site, the general approach described below will be followed.

As part of the initial scoping activities of the FS, E 6 E will prepare a summary of field data collected during the remedial investigation (RI) to compare and evaluate the concentration of the contaminants of concern with the cleanup criteria developed. E 6 E will prepare a qualitative and quantitative summary of contamination for the scenarios identified during the risk assessment evaluation. The results of this evaluation and summary will serve as a basis for screening applicable remedial technologies for the development and evaluation of remedial action alternatives.

19.1 Screening of Applicable Remedial Technologies

E & E will screen and develop applicable technologies for the remediation of any on-site contamination. In the process of screening applicable technologies, E & E will consider all ARARs, identify problems, and determine pathways of contamination using a receptor-oriented approach based on the threat to the public health, 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 6 E's engineering judgment.

19.2 Assessment of Applicable Remedial Technologies

During the assessment process, E & E will consider the relative applicability of each technology. In addition, criteria such as environmental, institutional, and public health impacts, and technical feasibility will be applied. A discussion of the applicable technologies will be provided for each general response action. The summary will include any appropriate comments concerning the reliability and inplementability 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 considering potential advantages or disadvantages of technologies applied in combination. In this task, individual technologies will be assembled into remedial action alternatives for the site. During the assembly and evaluation of the action alternatives, criteria including technical feasibility, environmental and public health, institutional impacts, and comparative costs will be considered.

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. 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 PS Report

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

20. REPORT

Following the Phase I investigation, E 6 E will prepare a Phase I Interim Data Report for each site. The purpose of this report is to summarize the findings of Phase I and provide recommendations for the Phase 11 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 required.) Following the Phase I interim report, the vork plans for the Phase II work will be updated accordingly. If the results of Phase II indicate that no further action is warranted, a formal **[RI]** report will be produced. However, if the Phase II results indicate that additional investigation is required, the Phase II report will be produced as the Phase II Interim Data Report and will only 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 vork plans for the Phase III work will be updated. (Once the Phase III vork is complete, all results will be synthesized and presented in an RI report.

In addition, following any treatability studies and PS vork, formal reports will be produced for these efforts. These reports will include detailed narratives associated with the respective tasks.

For all reports, B & B will prepare a 100% draft report for the Navy and Technical Review Committee (TRC) reviev. The TRC reviev comments will be incorporated into draft final reports which will be resubmitted to the TRC for final approval. The draft final report will then become final if no further comments are received from the TRC.]

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

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

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

21. DOCUMENT REVISION

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

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

22. PROJECT MANAGEMENT

Project management will be an ongoing process throughout this investigation. This process includes preparation of biweekly project status reports, coordination of schedules, mobilizations, and other project incidentals vith the Navy, management of project staff, coordination with the E & E support groups (e.g., publications and 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.

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

23. PROJECT SCHEDULE

Figures 23-1, 23-2, 23-3, and 23-4 show the project schedules €or phases I, 11, III, 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, III, 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.

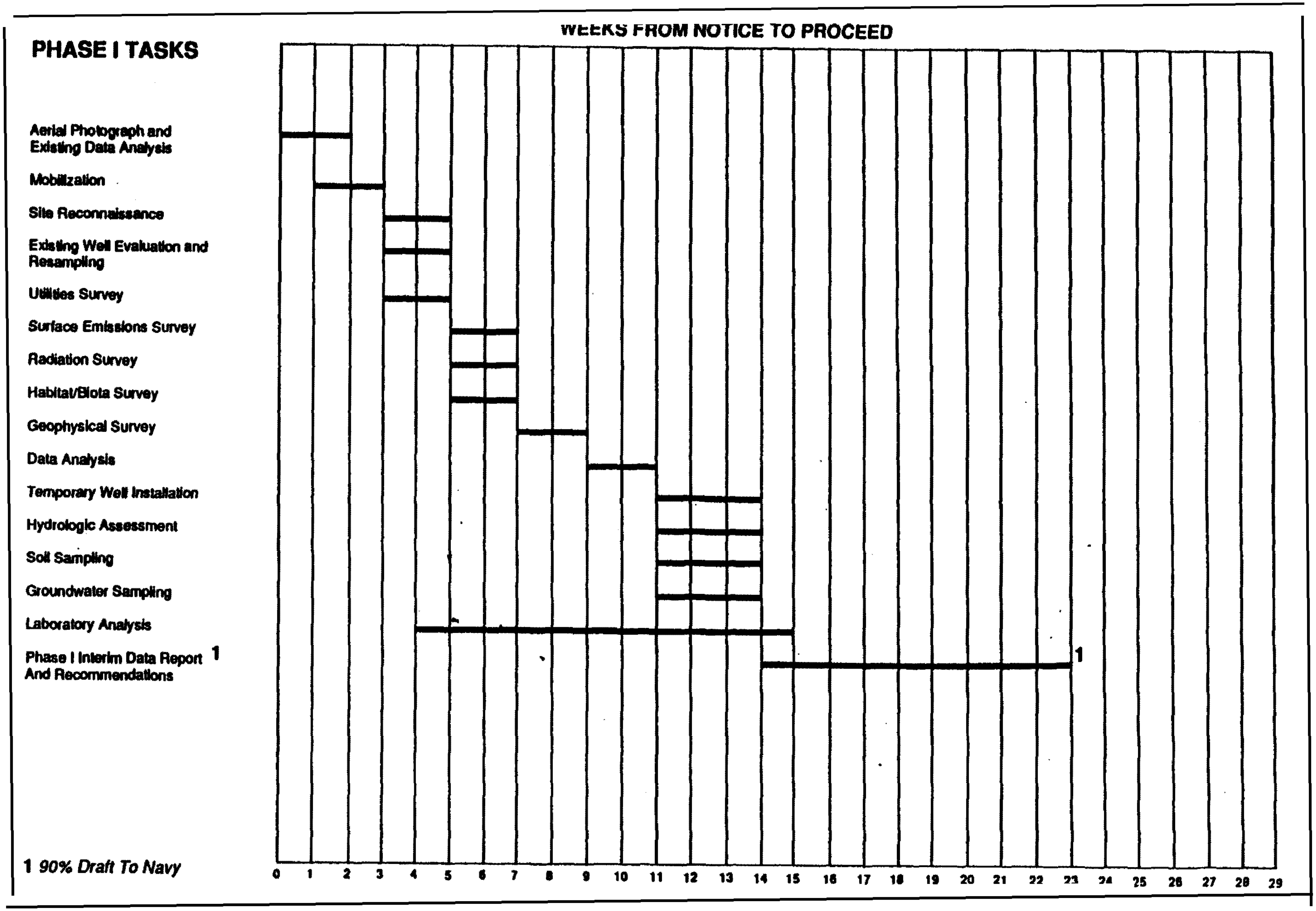

Figure 23-1 PHASE I PROJECT SCHEDULE– GROUP F

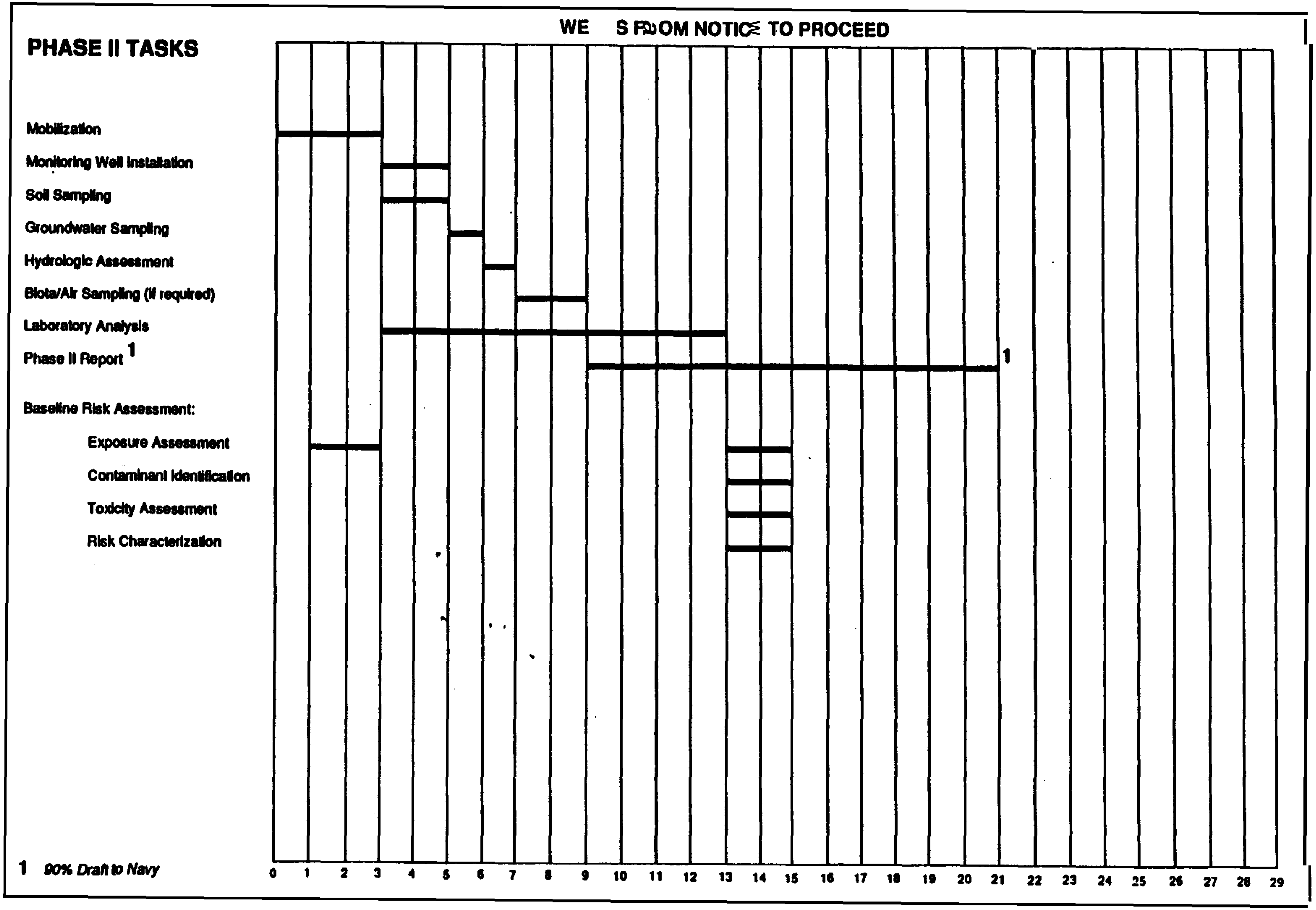

Figure 23-2 PHASE II PROJECT SCHEDULE – GROUP F

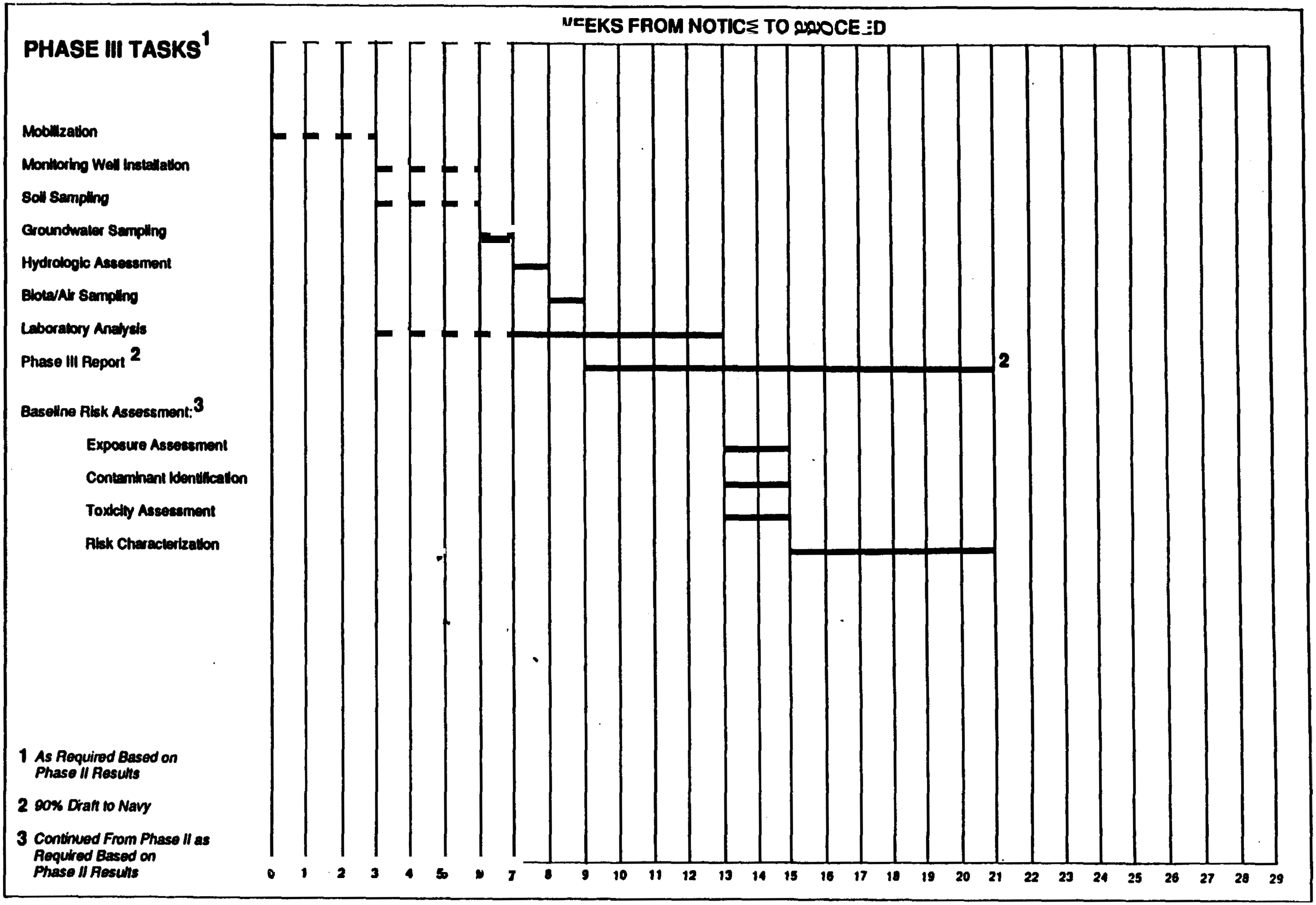

Figure 23-3 PHASE III PROJECT SCHEDULE -- GROUP F

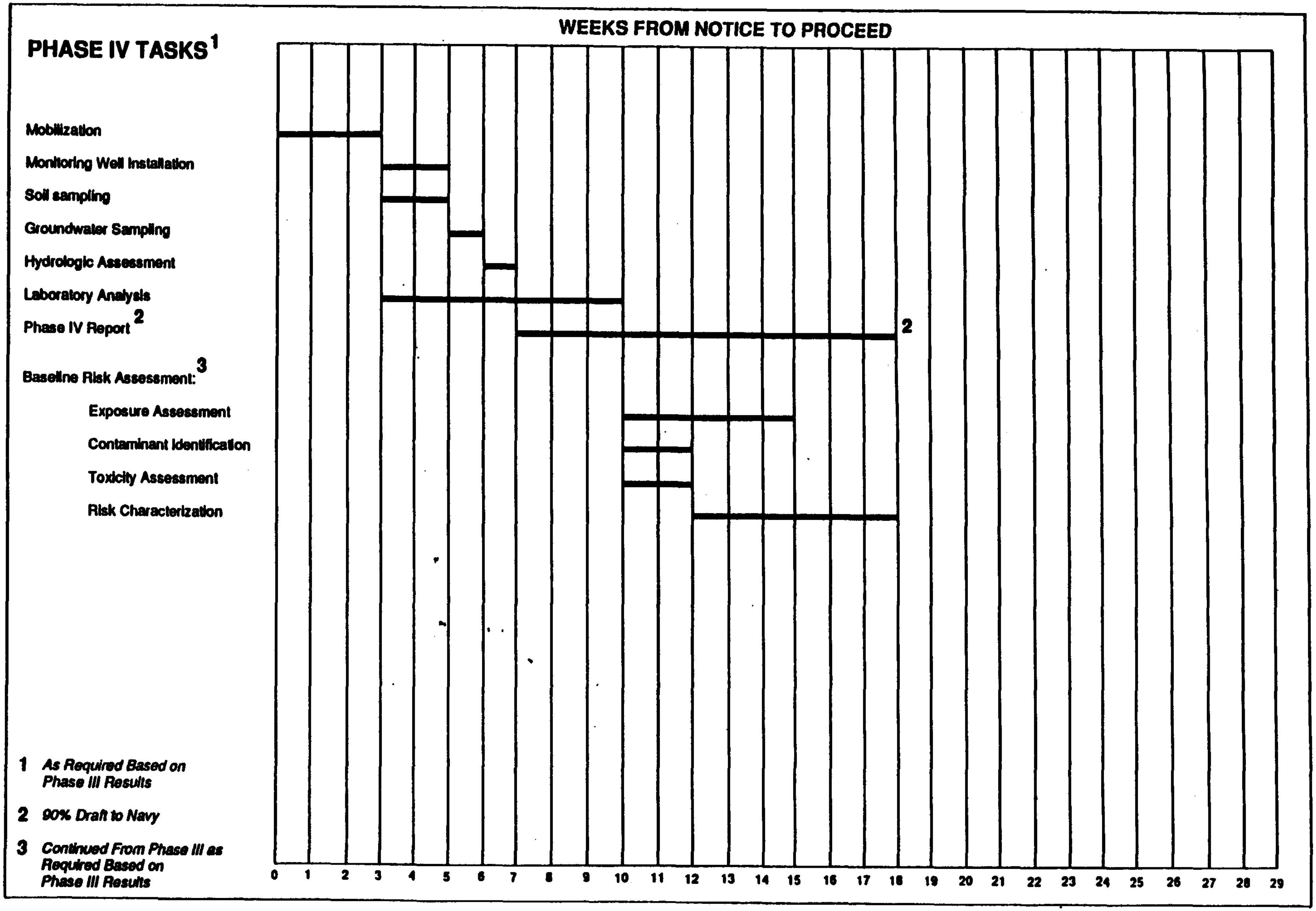

Figure 23-4 PHASE IV PROJECT SCHEDULE -- GROUP F

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APPENDIX a

SITE-SPECIFIC SAFETY PLAN

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

mcology and environment, inc.

S I T E   S A F E T Y   P L A N

Version 988

A. GENERAL INFORMATION

Projmct Title: Site 9 - Navy Yard Diapoaal Area | Projmct No.: UH8000

TDD/Pan No.:

Project Manager: John Barksdale | Projmct Dir.: Gerry Gallagher

Location(s): Navy Yard Disposal Area - southwestern corner of Chevalier Field

Prepared by: Joseph F. Fugitt | Datm Prepared: 04/01/92

Approval by: Sybil Newchurch | Date Approved: 04/03/92

Site Safety Officer Review: | Date Reviewed:

Scope/Objective of Work: Field activities will include soil sampling, permanent monitoring well installation, groundwater sampling, physical surveys, and hydrologic assessment.

Proposed Datm of Field Activities: December 1992

background Info: Complete: [X] Prmliminary (No analytical data available) [ ]

Documentation/Summary:

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

Overall Physical Hazard Serious [ ] LOU [ ] Moderate [X] Unknown [ ]

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

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

Characteristic(s):

Flammable/Ignitable [X] Volatile [X] Corrosive [ ] Acutely Toxic [ ]

Explosive [ ] Reactive [ ] Carcinogen [ ] Radioactive* [ ]

Other:

Physical Hazards:

Overhead [X] Confined* Space [ ] Below Grade [ ] Trip/Fall [X]

Puncture [ ] Burn [ ] Cut [ ] Splash [X]

Noise [X] Othmr: Aircraft and vehicular traffic using Chmvalimr Field. Heat/cold stress.

*Requires complmtion of additional form and special approval from the Corporatm Health/Safety group. Contact RSC or HQ.

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Site History/Description and Unusual Features (see Sampling Plan for detailed description): Between 1917 and 1930, Site 9 was uaod as a sanitary landfill. Currently, tho northern portion of tho site is paved with asphalt and uaod for parking. Tho results of tho Phase I investigation indicated a wide area of very low lovols of radiation: however, tho nature of tho source materials is unknown. Soil samples exhibited low lovols of metals, some TRPHs, and PAHs. Groundwater samples exhibited elevated lovols of metals, particularly load. Sampling teams should bo aware of tho site's proririty to Chevalier Field and take tho appropriate precautions.

Locations of Chemicals/Wastes: Solid, municipal waste, buried on site.

Estimated Volume of Chemicals/Wastes: Unknown

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

C. HAZARD EVALUATION

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

Physical Haxard Evaluation:

1) Soil sampling - Personal contamination. ovorhoad, noise, automobiles
2) Monitoring well installation - Overhead, noise, automobiles
3) Groundwater sampling - Splaah, personal contamination, automobiles
4) Decontamination procedures - Solvents, acid solutions
5) Physical surveys - Slips, trips, falls, automobiles
6) Hydrologic assessment - Splaah, personal contamination, automobiles

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Odor Description
Hydrochloric Acid	5 ppm	Inh, Ing, Con.	Corrosive	unknown	Acrid
Nitric Acid	2 ppm	Inh, Ing, Con.	Corrosive	0.3 - 1 ppm	Acrid
Sulfuric Acid	1 mg/m^3	Inh, Ing, Con.	Corrosive	N/A	Odorless
Sodium Hydroxide	2 mg/m^3	Inh, Ing, Con.	Corrosive	N/A	Odorless
Isopropyl Alcohol	440 ppm	Inh, Ing, Con.	Drowsiness, Head	7.5 - 200 ppm	Rubbing Alcohol
Lead	0.05 mg/m^3	Inh, Ing, Con.	Muscle Pain	N/A	Odorless

Note: Complete and attach a Hazard Evaluation Sheet 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 all field personnel):

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

	A	B	C	D
Task 1				X
Task 2				X
Task 3				X
Task 4				X
Task 5				X
Task 6				X

(Expand if necessary)

Modifications: Modified level D with tyvek, neoprene gloves and boots, safety glasses, APR available when upgrade to level C is necessary based on OVA readings.

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

- o Level D: O_2 <19.5% or >25%, explosive atmosphere >10% LEL, organic vapors above background levels, particulates > ____ mg/m^3, other ____________
- o Level C: O_2 <19.5% or >25%, explosive atmosphere >25% LEL_3 (California-20%), unknown organic vapor (in breathing zone) >1 ppm, particulates > ____ mg/m^3, other ____________
- o Level B: O2 <19.5% or >25%, explosive atmosphere >25% LEL (California-208); unknown organic vapors (in breathing zone) >5 ppm, particulates > ____ mg/m3, other ____________
- o Level A: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors >500 ppm, particulates > ____ mg/m^3, other ________

Air Monitoring (daily calibration unless otherwise noted):

Contaminant of Interest	Type of Sample (area, personal)	Monitoring Equipment	Frequency of Sampling
Volatile organics	Area	OVA	Continuous
Radiation	Area	Mini-rad	continuous
Explosive Gases	Area	O_2/Explosimeter	Continuous
(Expand if necessary)			

Decontamination Solutions and Procedures for Equipment, Sampling Gear, etc.:

Alconox + tap water wash, tap water rinse, two isopropanol rinses, organic-free water rinse, and air dry. Teflon implements used for the collection of samples for metals analyses will have a 10% nitric acid solution rinse after the tap water rinse followed by another tap water rinse, two isopropanol rinses, and air dry.

Personnel Decon Protocol: Boot and glove wash - Alconox + tap water wash with clean water rinse. Expendables will be double-bagged and drummed for disposal. Field personnel will take a hygienic shower off site, follouing completion of each day's fioldwork.

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

Special Site Equipment, Facilities, or Procoduroa (Sanitary Facilities and Lighting Must Meet 29 CFR 1910.1201:

Site Entry Procoduroa and Special Considerations: E & E's "buddy system" will bo employed at all times during fioldwork activitioa. Personnel will exercise caution in tho vicinity of nearby roadways. If above background radiation levels are encountered, team members will evacuate tho sampling area and contact tho corporate health physics group to reassess tho site.

Work Limitations (time of day, weather condition., etc.1 and Heat/Cold Stress Requirements: All fioldwork activities will be performed during daylight hours. Team members will break as needed to prevent heat stress and replace fluids. Cooling vests may bo used to prevent heat stress.

General Spill Control, if applicable: N/A

Investigation-Derived Material Disposal (i.e., expendables, decon waste, cuttingal: All fioldwork waste materials will bo double bagged, drummed, labeled, and transported to designated location for final disposal by tho Navy.

Sample Handling Procoduroa Including Protective Wear: During a11 handling of samples, a11 field team members will wear surgical gloves. Goggles will be worn during sample preservation with acids.

Team Member*	Responsibility
To bo determined.	Team Leader
	Site Safety Officer/Sampler
	Geologist/Sampler
	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 CIR 1910.120. Respiratory protection program meets requirements of 29 CFR 1910.134. and ANSI Z88.2 119801.

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E. EMERGENCY INFORMATION

(Use supplemental sheets, 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 Room: NAS Dispensary - Building 3600: (904) 452-2733; Baptist Hospital: (904) 434-4811 (Life Flight)

Poison Control Center:

Police (include local, county sheriff, state): 911

Fire Department: 911

Airport:

U.S. Coast Guard: Emergency: (904) 453-8178; General Information: (904) 453-8282

Laboratory: E & E ASC: (716) 631-0360

Fed. Express: (800) 230-5355

Client Contact: U.S. Navy Southern Division, Engineer-In-Charge, Susanne D. Sanborn: (803) 743-0574

Site Contact: NAS Pensacola Environmental Coordinator, Ron Joyner: (904) 452-4515

SITE RESOURCES

Site Emergency Evacuation Alarm Method: N/A

Water Supply Source: On sit.

Telephone Location, Number: To bo determined on site

Cellular Phone, if available: To bo dotorminod on site

Radio:

Other: On-site warehouse number to be determined

EMERGENCY CONTACTS

1. Dr. Raymond Harbison (Univ. of Florida) .... (501) 221-0465 or (904) 462-3277, 3281
   Alachua, Florida (501) 370-0263 (24 hours)

2. Ecology and Lnvironmnt, Inc., Safety Director
   Paul Jonmaire .... (716) 684-8060 (office)
   (716) 155-1260 (homo)

3. Regional Safety Coordinator - Sybil Iowchurch........... (904) 877-1971 (office)
   (904) 878-2336 (home)

4. **Regional** Office Manager - Rick Rudy .... (904) 877-1978 (office)
   (904) 893-7245 (homo)

[NASP]UH8000:T0479:1

MEDTOX HOTLINE

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

   What to rmport:

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

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

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

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

EMERGENCY ROUTES

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

Directions to hospital (include map) from Site 9.

NAS Dispensary - Follow Moffett Road west to Fisher Street. Turn lmft onto Fisher Street and continue south to ita intersection with Turner Street. Turn right onto Turnmr Street and proceed west. Thm NAS Dispensary is located on Turner Street in Building 3600.

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

Emergency Egress Routes to Got Off-Site Emergency egress routms will bo located if emergency mxit routms become blockmd by construction, mtc.

[NASP]UH8000:T0479:1

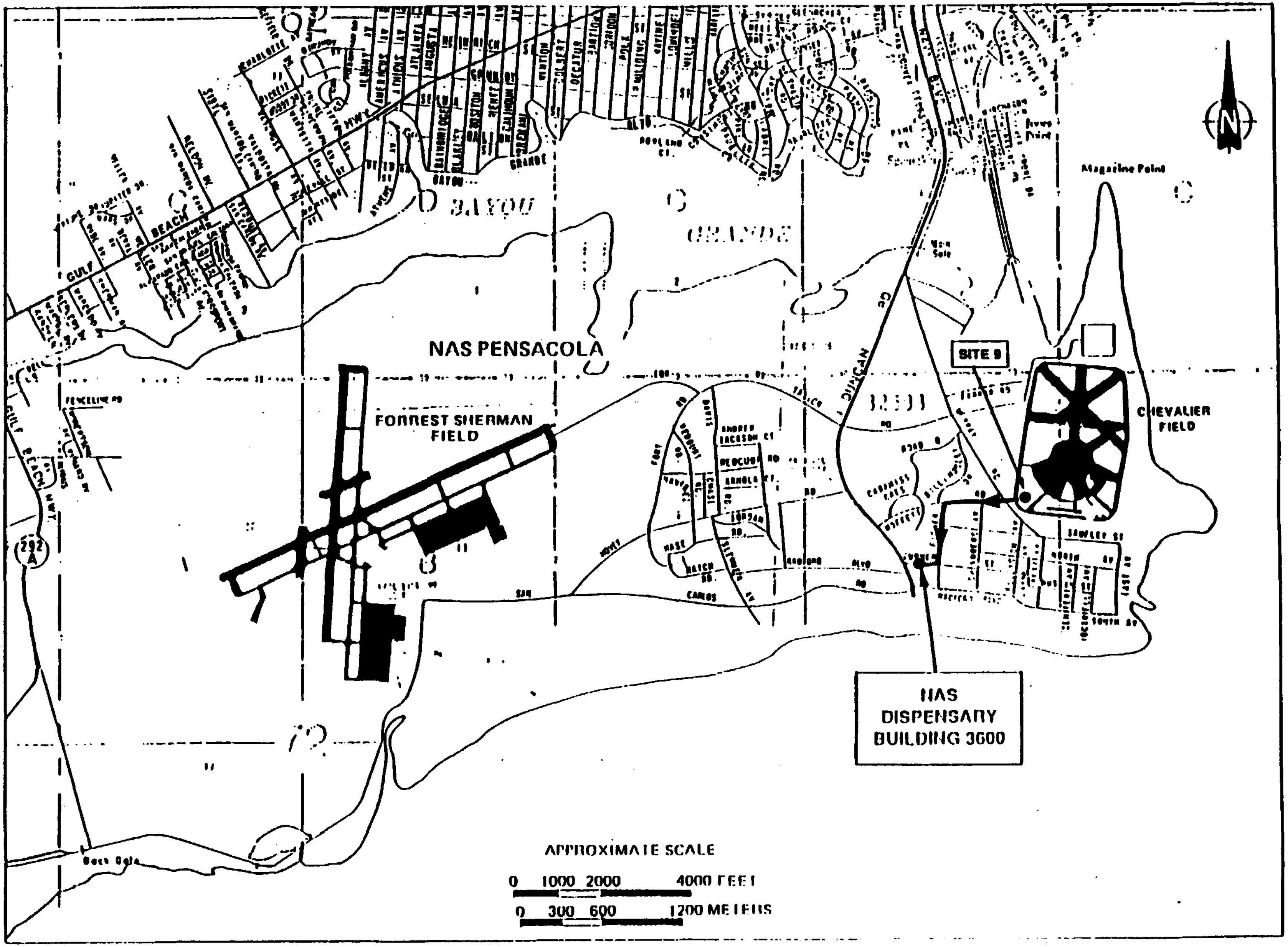
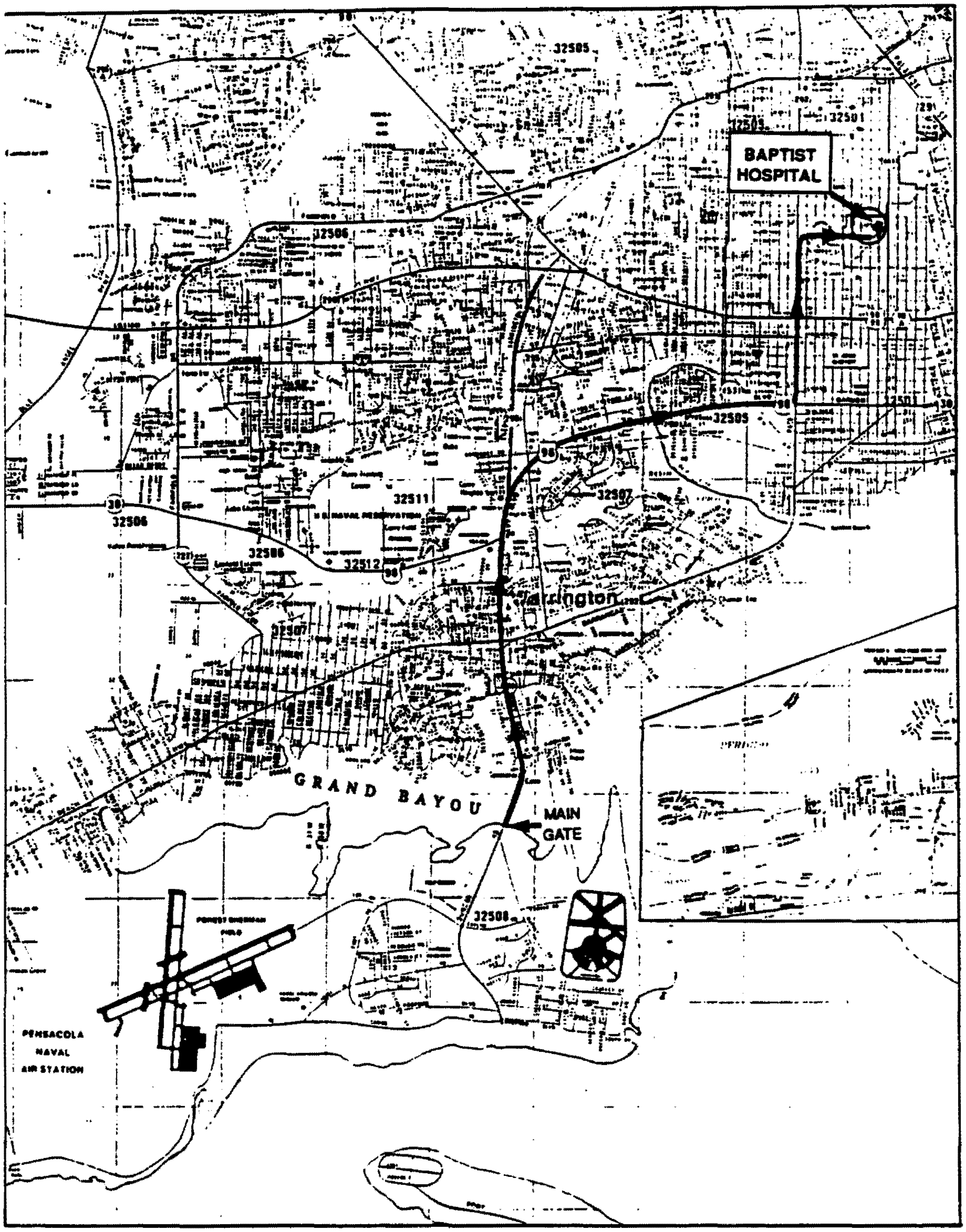


Figure 2-1 LOCATION OF NAS DISPENSARY



SOURCE: Ecology and Environment, Inc., 1992

APPROXIMATE SCALE IN FEET

0 2000 4000 6000 8000

Figure A-2 LOCATION OF BAPTIST HOSPITAL

F. EQUIPMENT CHECKLIST

PROTECTIVE GEAR

Level A	No.	Level B	NO.
SCBA		SCBA	
SPARE AIR TANKS		SPARE AIR TANKS	
ENCAPSULATING SUIT (Type ____________)		PROTECTIVE COVERALL (Type ____________)	
SURGICAL GLOVES		RAIN SUIT	
NEOPRENE SAFETY BOOTS		BUTYL APRON	
BOOTIES		SURGICAL GLOVES	
GLOVES (Type ____________)		GLOVES (Type ____________)	
OUTER WORK GLOVES		OUTER WORK GLOVES	
HARD HAT		NEOPRENE SAFETY BOOTS	
CASCADE SYSTEM		BOOTIES	
5-MINUTE ESCAPE COOLING VEST		HARD HAT WITH FACE SHIELD	
		CASCADE SYSTEM	
		MANIFOLD SYSTEM	
Level C		Level D	
ULTRA-TWIN RESPIRATOR		ULTRA-TWIN RESPIRATOR (Available)	X
POWER AIR PURIFYING RESPIRATOR		CARTRIDGES (Type GMC-H ____________)	
CARTRIDGES (Type ____________)		5-MINUTE ESCAPE MASK (Available)	
5-MINUTE ESCAPE MASK		PROTECTIVE COVERALL (Type Tyvek ____________)	X
PROTECTIVE COVERALL (Type ____________)		RAIN SUIT	
RAIN SUIT		NEOPRENE SAFETY BONDS	
BUTYL APRON		BOOTIES	X
SURGICAL GLOVES		WORK GLOVES	
GLOVES (Type ____________)		HARD HAT WITH FACE SHIELD	X
OUTER WORK GLOVES		SAFETY GLASSES	X
NEOPRENE SAFETY BOOTS			
HARD HAT WITH FACE SHIELD			
BOOTIES			
HARDHAT			

INSTRUMENTATION	No.	DECON EQUIPMENT	No.
OVA		WASH TUBS	X
THERMAL DESORBER		BUCKETS	X
O2/EXPLOSIMETER W/CAL. KIT	X	SCRUB BRUSHES	X
PHOTOVAC TIP		PRESSURIZED SPRAYER	X
HNu (Probe 10.2 eV)	X	DETERGENT (Type ______)	
MAGNETOMETER		SOLVENT (Type ______)	
PIPE LOCATOR		PLASTIC SHEETING	X
WEATHER STATION		TARPS AND POLES	
DRAEGER PUMP, TUBES ______		TRASH BAGS	X
BRUNTON COMPASS		TRASH CANS	
MONITOX CYANIDE		MASKING TAPE	X
HEAT STRESS MONITOR		DUCT TAPE	X
NOISE EQUIPMENT ______		PAPER TOWELS	X
PERSONAL SAMPLING PUMPS		FACE MASK	
		FACE MASK SANITIZER	
		FOLDING CHAIRS	
		STEP LADDERS	
RADIATION EQUIPMENT		DISTILLED WATER	X
DOCUMENTATION FORMS			
PORTABLE RATEMETER			
SCALER/RATEMETER		SAMPLING EQUIPMENT	
NaI Probe		8 OZ. BOTTLES	X
ZnS Probe		HALF-GALLON BOTTLES	X
GM Pancake Probe		VOA BOTTLES	X
GM Side Window Probe		BAILER CORD	X
MICRO R METER		HAND BAILERS	X
ION CHAMBER		THIEVING RODS WITH BULBS	
ALERT DOSIMETER		SPOONS	X
POCKET DOSIMETER		KNIVES	
MINI RAD	X	FILTER PAPER	
FIRST AID EQUIPMENT		PERSONAL SAMPLING PUMP SUPPLIES	
FIRST AID KIT	X		
OXYGEN ADMINISTRATOR			
STRETCHER			
PORTABLE EYE WASH	X		
BLOOD PRESSURE MONITOR			
FIRE EXTINGUISHER	X		

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VAN EQUIPMENT	No.	MISCELLANEOUS (Cont.)	No.
TOOL KIT	X		
HYDRAULIC JACK			
LUG WRENCH			
TOW CHAIN			
VAN CHECK OUT			
Gas			
Oil			
Antifreeze			
Battery			
Windshield Wash			
Tire Pressure			
		SHIPPING EQUIPMENT	
MISCELLANEOUS		COOLERS	X
PITCHER PUMP		PAINT CANS WITH LIDS, 7 CLIPS EACH	
SURVEYOR'S TAPE		VERMICULITE	X
100 FIBERGLASS TAPE		SHIPPING LABELS	X
300 NYLON ROPE		DOT LABELS: "DANGER"	
NYLON STRING		"UP"	
SURVEYING FLAGS			
FILM		"HAZARD GROUP"	
WHEEL BARROW		STRAPPING TAPE	X
BUNG WRENCH		BOTTLE LABELS	X
SOIL AUGER		BAGGIES	X
PICK		CUSTODY SEALS	X
SHOVEL		CHAIN-OF-CUSTODY FORMS	X
CATALYTIC HEATER		FEDERAL EXPRESS FORMS	X
PROPANE GAS		CLEAR PACKING TAPE	X
BANNER TAPE			
SURVEYING METER STICK			
CHAINING PINS & RING			
TABLES			
WEATHER RADIO			
BINOCULARS			
MAGAPHONE			

ecology and environment, inc.

ON-SITE SAFETY MEETING

Project ____________________ TDD/Pan ____________

Date ____________ **Time** ____________ Job No. ____________

Address ____________________

Specific Location ____________________

Type of Work ____________________

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment ____________________

Chemical Hazards ____________________

Radiation Hazards ____________________

Physical Hazards ____________________

Emergency Procedures ____________________

Name Printed	Signature

Meeting Conducted by: ____________________ ____________________

(Print) (Signature)

(Site Safety Coordinator) (Team Leader)

ecology and onvironront, inc.

SITE SAFETY PLAN

Project Title: Site 10 - Commodore's Pond

Project Io.: UH8000

TDD/Pan No.:

Project Manager: John Barksdale

Project Dir.: Gerry Gallagher

Location(s): Commodore's Pond - southeast of tho intersection of Hurray and Taylor roads

Proparod by: Joseph F. Fugitt

Date Proparod: 04/01/92

Approval by: Sybil Newchurch

Data Approved: 04/03/92

Site Safety Officer Review:

Date Reviewed:

Scope/Objective of Work: Field activities will include soil sampling, permanent monitoring well installation, groundwater sampling, physical surveys, and hydrologic. assessment.

Proposod Date of Field Activities: December 1992

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

Documentation/Summary:

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

B. SITE/WASTE CHARACTERISTICS

Walt. Type(s):

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

Characteristic(s):

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

Othor:

Physical Hazards:

Overhead	[X]	Confined* Space	[ ]	Below Grade	[ ]	Trip/Fall	[X]
Puncture	[ ]	Burn	[ ]	cut	[ ]	Splash	[X]
Noise	[X]						

Othor: Vehicular traffic on nearby roadways. Heat/cold stress.

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

Site History/Description and Unusual Features (see Sampling Plan for detailed description): Site 10 was formerly tho location of a small surface water body. In tho mid-ninotoonth century, tho pond was used for the underwater storage of shaped oak timbers. This underwater storago method preserved tho wood prior to its use for shipbuilding. The original pond is no longer in existence; therefore, its exact dimenstions are unknown. A subsequent excavation of tho site, during construction of tho IWTP sewer line, did not reveal any contamination. Soil samples collected during tho Phase I investigation exhibited elevated levels of TRPHs, PAHs, and phenols. Groundwater samples exhibited elevated levels of lead, chromium, cadmium, nickel, and phenols. The site is unpaved and is covered with grass and trees.

Locations of Chemicals/Wastes: If contamination is present, it is probably located below land surface.

Estimated Volume of Chemicals/Wastes: Unknown

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

C. HAZARD EVALUATION

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

Physical Hazard Evaluation:

1) Soil sampling - Personal contamination, overhead, noise, automobilos

2) Monitoring well installation - Overhead, noise, automobilos

4) Decontamination procedures - Solvents, acid solutions

5) Physical surveys - Slips. trips, falls, automobilos

6) Hydrologic assessment - Splash, personal contamination. automobilos

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Odor Description
Hydrochloric Acid	5 ppm	Inh, Ing, Con.	Corrosive	unknown	Acrid
Nitric Acid	2 ppm	Inh, Ing, Con.	Corrosive	0.3 - 1 ppm	Acrid
Sulfuric Acid	1 mg/m^3	Inh, Ing, Con.	Corrosive	N/A	Odorloss
Sodium Hydroxide	2 mg/m^3	Inh, Ing, Con.	Corrosive	N/A	Odorless
Isopropyl Alcohol	440 ppm	Inh, Ing, Con.	Drowsiness, Head	7.5 - 200 ppm	Rubbing Alcohol
Lead	0.05 mg/m^3	Inh, Ing, Con.	Muscle Pain	N/A	Odorless
Chromium	1 mg/m^3	Inh, Ing, Con.	Cough, Head	N/A	Odorless
Cadmium	0.05 mg/m^3	Inh, Ing, con.	Cough, Chest Pain	N/A	Odorless
Phenols	5 ppm	Inh, Ing. Con.	Blindness	---	Sweet, tarry
Diesel Fuel	--	Inh, Ing. Con.	Vomit, diarrhea	0.082 ppm	Petroleum

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

D. SITE SAFETY WORK PLAN

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

Perimeter identified? [No] Site secured? [No]

Work Areas Designated? [Yes] Zone(s) of Contamination Identified? [No]

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

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

	A	B	C	D
Task 1				X
Task 2				X
Task 3				X
Task 4				X
Task 5				X
Task 6				X

(Expand if necessary)

Modifications: Modified level D with tyvmk, neoprene gloves and boots, safety glasses, APR available when upgrade to level C is necessary based on OVA readings.

Action Levels for Evacuation of work Zone Pending Reassessment of Condition.:

- o Level D: O_2 <19.5% or >25%, explosive atmosphere >10% LEL, organic vapors above background levels, particulates >_____ mg/m^3, othmr ______________
- o Level C: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapor (in breathing zone) >1 ppm, particulates >_____ mg/m^3, othor __________
- o Level B: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors (in breathing zone) >5 ppm, particulates >_____ mg/m^3, other ____________
- o Level A: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors >500 ppm, particulates >_____ mg/m^3, othmr ________

Contaminant of Interest	Type of Sample (area, personal)	Monitoring Equipment	Frequency of Sampling
Volatile Organics	Area	OVA	Continuoua
Radiation	Area	Mini-rad	Continuous
Explosive Gases	Area	O_2/Explosimeter	Continuous

Decontamination Solutions and Procedures for Equipment, Sampling Gear, etc.:

Alconox + tap water wash, tap water rinao, two isopropanol rinses, organic-free water rinse, and air dry. Toflon implements used for tho collection of samples for metals analyses will have a 10% nitric acid solution rinao after tho tap watmr rinse followed by another tap water rinse, two isopropanol rinses, and air dry.

Personnel Decon protocol: Boot and glovo wash - Alconox + tap water wash with clean water rinse. Expendables will bo double-bagged and drummed for disposal. Field personnel will take a hygienic shower off site, following completion of each day's fieldwork.

Docon Solution Monitoring Procoduroa, if Applicable: Docontamination activitios will bo performed in a well-ventilated area upwind of tho sampling zone.

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

Site Entry Procoduroa and Special Considerations: C & E's "buddy system" will bo employed at a11 times during fieldwork activitios. Personnel will exercise caution in tho vicinity of nearby roadway.. If above background radiation levels are oncowtorod, team members will evacuate tho sampling area and contact tho corporato health physics group to reassess tho site.

Work Limitations (time of day, weather condition., etc.) and Heat/Cold Stress Requirements: All fieldwork activitios will be porforrd during daylight hours. Team members will break as needed to provont heat stress and replace fluids. Cooling vests may bo used to provont heat stress.

General Spill Control, if applicable: N/A

Investigation-Derived Material Disposal (i.e., expendables, decon waste, cuttings): All fieldwork vasto materials will bo double bagged, drummed, labeled, and transported to designated location for final disposal by tho Navy.

Sample Handling Procedures Including Protective Wear: During a11 handling of samples, all field team members will wear surgical gloves. Goggles will bo worn during sample preservation with acids.

Team Member*	Responsibility
To bo determined.	Team Leader
	Site Safety Officer/Sampler
	Sampler
	Sampler

*All entries into exclusion zone require Buddy System use. All C & E field staff participate in medical monitoring program and have completed applicable training per 29 CFR 1910.120. Respiratory protection program meets requirements of 29 CFR 1910.134. and MSI 166.2 (1980).

- -

[NASP]UH8000:T0479:2

E. EMERGENCY INFORMATION

(Use supplemental sheets, if necessary)

LOCAL RESOURCES

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

Ambulance: On base: (904) 452-4138; Off base: 911

Hospital Emergency Room: NAS Dispensary - Building 3600: (904) 452-2733: Baptist Hospital: (904) 434-4811 (Life Flight)

Poison Control Center:

Police (include local. county sheriff, state): 911

Fire Department: 911

Airport:

U.S. Coast Guard: Emergency: (904) 453-8178: General Information: (904) 453-8282

Laboratory: E & E ASC: (716) 631-0360

Fed. Express: (800) 238-5355

Client Contact: U.S. Navy Southern Division, Engineer-In-Charge, Susanne D. Sanborn: (803) 743-0574

Site Contact: NAS Pensacola Environmental Coordinator, Ron Joyner: (904) 452-4515

SITE RESOURCES

Site Emergency Evacuation Alarm Method: N/A

Water Supply Source: On aito

Telephone Location, Number: To be dotorminod on aito

Cellular Phone, if available: To bo dotorminod on aito

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) 604-D060 (office)
   (716) 655-1260 (home)

3. Regional Safety Coordinator - Sybil Howchurch............ (904) 077-1971 (office)
   (904) 878-2336 (home)

4. Regional Office Manager - Rick Rudy .... (904) 877-1978 (office)
   (904) 893-7245 (home)

[NASP]UH8000:T0479:2

MEDTOX HOTLINE

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

   What to report:

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

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

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

   a. 24 hour hotline - (716) 684-0940
   b. Corporate Safety Director - Paul Jonmaire - home # (716) 655-1260
   c. Assistant Corp. Safety Officer - Steven Sherman - hor # (716) 680-0084

—— mer ——

(— Field must Know Route(s) Prior to Start of Work)

Directions to hospital (include map) from Site 10

NAS Dispensary - Follow Murray Road south to Moffett Road. Turn right onto Moffett Road and continuo to its intersection with Fisher Stroot. Turn left onto Fisher Stroot and proceed south to Turnor Stroot. Turn right onto Turnor Stroot. Tho NAS Dispensary is located on Turnor Stroot in Building 3600.

Baptist Hospital - Take Duncan Road (Navy Blvd.) north to exit the base. 'Navy Blvd. becomes HWY 98 and curves to tho east. Follow Navy Blvd./Hwy. 98 east approx. 3 mi to Pace Blvd. Turn left (north) on Pace Blvd. and proceed approx. 1 mi to Cervantes St. (Hwy. 90). Turn right on Cervantes/Hwy. 90 and follow this road for about 0 blocks and turn loft (north) onto E street. The hospital is about 6 blocks north on tho loft.

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

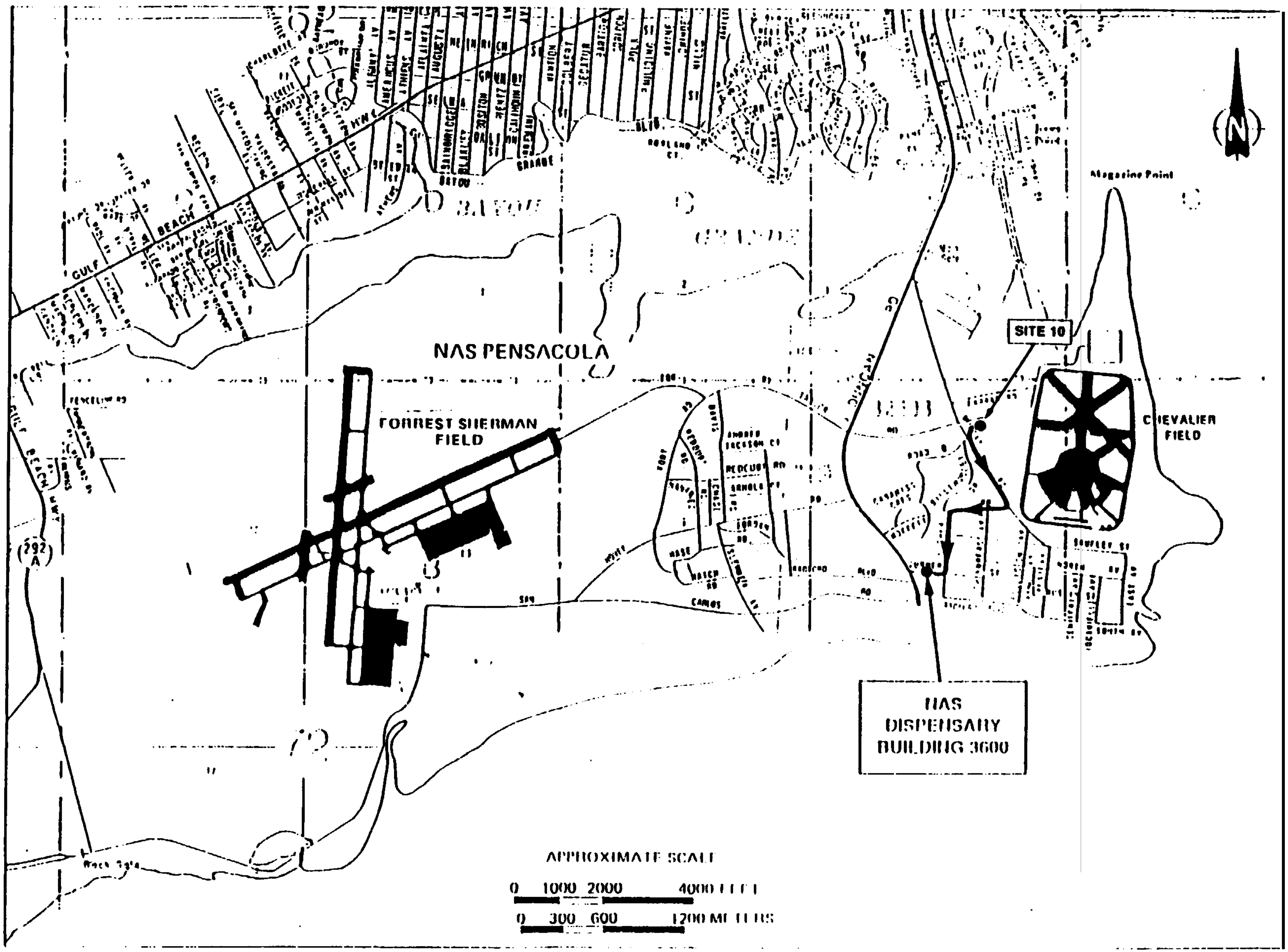

Figure 2-6 LOCATION OF NAS DISPENSARY

F. EQUIPMENT CHECKLIST

PROTECTIVE GEAR

Level A	No.	Level B	No.
SCBA		SCBA	
SPARE AIR TANKS		SPARE AIR TANKS	
ENCAPSULATING SUIT (Type ____________)		PROTECTIVE COVERALL (Type ____________)	
SURGICAL GLOVES		RAIN SUIT	
NEOPRENE SAFETY BOOTS		BUTYL APRON	
BOOTIES		SURGICAL GLOVES	
GLOVES (Type ____________)		GLOVES (Type ____________)	
OUTER WORK GLOVES		OUTER WORK GLOVES	
HARD HAT		NEOPRENE SAFETY BOOTS	
CASCADE SYSTEM		BOOTIES	
5-MINUTE ESCAPE COOLING VEST		HARD HAT WITH FACE SHIELD	
		CASCADE SYSTEM	
		MANIFOLD SYSTEM	

Level C	No.	Level D	No.
ULTRA-TWIN RESPIRATOR		ULTRA-TWIN RESPIRATOR (Available)	X
POWER AIR PURIFYING RESPIRATOR		CARTRIDGES (Type GMC-H ____________)	
CARTRIDGES (Type ____________)		5-MINUTE ESCAPE MASK (Available)	
5-MINUTE ESCAPE MASK		PROTECTIVE COVERALL (Type Tyvek ____________)	X
PROTECTIVE COVERALL (Type ____________)		RAIN SUIT	
RAIN SUIT		NEOPRENE SAFETY BONDS	
BUTYL APRON		BOOTIES	X
SURGICAL GLOVES		WORK GLOVES	
GLOVES (Type ____________)		HARD HAT WITH FACE SHIELD	X
OUTER WORK GLOVES		SAFETY GLASSES	X
NEOPRENE SAFETY BOOTS			
HARD HAT WITH FACE SHIELD			
BOOTIES			
HARDHAT			

INSTRUMENTATION	No.	DECON EQUIPMENT	No.
OVA		WASH TUBS	X
THERMAL DESORBER		BUCKETS	X
O2/EXPLOSIMETER W/CAL. KIT	X	SCRUB BRUSHES	X
PHOTOVAC TIP		PRESSURIZED SPRAYER	X
HNu (Probo 10.2 eV ______)	X	DETERGENT (Type ______)	
MAGNETOMETER		SOLVENT (Type ______)	
PIPE LOCATOR		PLASTIC SHEETING	X
WEATHER STATION		TARPS AND POLES	
DRAEGER PUMP, TUBES ______		TRASH BAGS	X
BRUNTON COMPASS		TRASH CANS	
MONITOX CYANIDE		MASKING TAPE	X
HEAT STRESS MONITOR		DUCT TAPE	X
NOISE EQUIPMENT ______		PAPER TOWELS	X
PERSONAL SAMPLING PUMPS		FACE MASK	
		FACE MASK SANITIZER	
		FOLDING CHAIRS	
		STEP LADDERS	
RADIATION EQUIPMENT		DISTILLED WATER	X
DOCUMENTATION FORMS			
PORTABLE RATEMETER			
SCALER/RATEMETER		SAMPLING EQUIPMENT	
NaI Probo		8 OZ. BOTTLES	X
ZnS Probo		HALF-GALLON BOTTLES	X
OM Pancake Probo		VOA BOTTLES	X
GM Side Window Probo		BAILER CORD	X
MICRO R METER		HAND BAILERS	X
ION CHAMBER		THIEVING RODS WITH BULBS	
ALERT DOSIMETER		SPOONS	X
POCKET DOSIMETER		KNIVES	
MINI RAD	X	TILTER PAPER	
FIRST AID EQUIPMENT		PERSONAL SAMPLING PUMP SUPPLIES	
FIRST AID KIT	X		
OXYGEN ADMINISTRATOR			
STRETCHER			
PORTABLE EYE WASH	X		
BLOOD PRESSURE MONITOR			
FIRE EXTINGUISHER	X		

VAN EQUIPMENT	No.	MISCELLANEOUS (Cont.)	No.
TOOL KIT	X		
HYDRAULIC JACK			
LUG WRENCH			
TOW CHAIN			
VAN CHECK OUT	/		
Gas			
Oil			
Antifreeze			
Battery			
Windshield Wash			
Tire Pressure			
		SHIPPING EQUIPMENT	
MISCELLANEOUS		COOLERS	X
PITCHER PUMP		PAINT CANS WITH LIDS, 7 CLIPS EACH	
SURVEYOR'S TAPE		VERMICULITE	X
100 FIBERGLASS TAPE		SHIPPING LABELS	X
300 NYLON ROPE		DOT LABELS: "DANGER"	
NYLON STRING		"UP"	
SURVEYING FLAGS		"INSIDE CONTAINER COMPLIES ...."	
FILM		"HAZARD GROUP"	
WHEEL BARROW		STRAPPING TAPE	X
BUNG WRENCH		BOTTLE LABELS	X
SOIL AUGER		BAGGIES	X
PICK		CUSTODY SEALS	X
SHOVEL		CHAIN-OF-CUSTODY FORMS	X
CATALYTIC HEATER		FEDERAL EXPRESS FORMS	X
PROPANE GAS		CLEAR PACKING TAPE	X
BANNER TAPE			
SURVEYING METER STICK			
CHAINING PINS & RING			
TABLES			
WEATHER RADIO			
BINOCULARS			
MAGAPHONE			

ecology and environment. inc.

ON-SITE SAFETY MEETING

Project ______________________ TDD/Pan ______________

Date ______________ Time ______________ Job No. ______________

Address ______________________

Specific Location ______________________

Type of Work ______________________

____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment ______________________

____

Chemical Hazards ______________________

____

Radiation Hazards ______________________

____

Physical Hazards ______________________

____

Emergency Procedures ______________________

____

Hospital/Clinic ______________________ Telephone ______________

Hospital Address ______________________

Special Equipment ______________________

Other ______________________

Checklist

1. Emergency information reviewed? ______ and made familiar to all team members? ______
2. Route to nearest hospital driven? ______ and its location known to all tea8 members? ______
3. Site safety plan readily available and ita location known to a11 tea8 members? ______

Meeting shall k attended by a11 **personnel who rill be working within the exclusion area. Daily informal** update meetings will be bold when site tasks and/or conditions change.

ATTENDEES

Name Printed	Signature

Meeting Conducted by: ______________________ ______________________

(Print) (Signature)

______________________ ______________________

(Site Safety Coordinator) (Tea8 Loader)

ecology and environment, inc.

SITE SAFETY PLAN

Version 988

A. GENERAL INFORMATION

Project Title: Site 23 - Chevalier Field Pipe Leak Area

Project No.: UH8000

TDD/Pan No.:

Project Manager: John Barksdale

Project Dir.: Gerry Gallagher

Location(s): Chevalier Field Pipe Leak Area - near tho southwestern corner of Chevalier Field between Murray and Industrial roads

Prepared by: Joseph C. Fugitt

Date Proparod: 04/01/92

Approval by: Sybil Newchurch

Date Approved: 04/03/92

Site Safety Officer Review:

Date Reviewed:

Scope/Objective of Work: Field activities will include soil sampling, permanent monitoring well installation, groundwater sampling, physical surveys, hydrologic assessment.

Proposed Date of Field Activities: December 1992

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

Documentation/Summary:

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

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

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

Characteristic(s):

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

Other:

Physical Hazards:

Overhead [X]	Confined* Space [ ]	Below Grade [ ]	Trip/Fall [X]
Puncture [ ]	Burn [ ]	Cut [ ]	Splash [X]
Noise [X]			

Other: Aircraft and vehicular traffic using Chovalior Field. Heat/cold stress.

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

Site History/Description and Unusual Features (see Sampling Plan for detailed description): Site 23 is tho location of two separate undorground fuel leaks. One loak, in 1965, consisted of the loss of an unknown volume of Navy Special Fuel Oil (NSFO). Reportedly, tho fuml was pumped from tho groundwater table, and tho contaminated soils were removed. In 1970, another leak of unknovn volume was discovered in tho same area in a pipeline carrying Diesel Fuel Marine (DFM). A layer of fuml is suspected to bo present on the water table surface, and soil in the area is suspected to bo contaminated with oil. Groundvator samples collected at tho site did not exhibit any VOC contamination; however, strong odors were noted (G&M 1984). Soil samples collected during tho Phase I investigation exhibited elevated levels of metals, PAHs, phenols, and TRPHs. Groundwater samples exhibited elevated metals, PAHs, phonola, and TRPHs.

Locations of Chemicals/Wastes: If present, contamination is probably located bmlov land surface.

Estimated Volume of Chemicals/Wastes: Unknovn

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

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

Physical Hazard Evaluation:

1) Soil sampling - Personal contarination, ovmrhmad, noise, automobiles
2) Monitoring well installation - Overhead, noise, automobiles
3) Groundwater sampling - Splash, personal contamination, automobiles
4) Decontamination procedures - Solvents, acid solutions
5) Physical surveys - Slips, trips, falls, automobiles
6) Hydrologic assessment - Splash, personal contarination, automobiles

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Odor Description
Hydrochloric Acid	5 ppm	Inh, Ing, Con.	Corrosive	Unknown	Acrid
Nitric Acid	2 ppm	Inh, Ing, Con.	Corrosive	0.3 - 1 ppm	Acrid
Sulfuric Acid	1 mg/m^3	Inh, Ing, Con.	Corrosive	N/A	Odorless
Sodium Hydroxide	2 mg/m^3	Inh, Ing, Con.	Corrosive	N/A	Odorless
Isopropyl Alcohol	440 ppm	Inh, Ing, Con.	Drowsiness, Head	7.5 - 200 ppm	Rubbing Alcohol
Arsenic	0.010 mg/m^3	Inh, Ing, Con.	Head, Dizziness	N/A	Odorless
Lead	0.050 mg/m^3	Inh, Ing, Con.	Vomit, Diarrhea	N/A	Odorless
Phenols	5 ppm	Inh, Inq, Con.	Vorit, Diarrhea	0.05 ppm	Sweet, pungent
Diesel Fuel	---	Inh, Inq, Con.	Vorit, Diarrhea	0.082 ppm	Potroleum

Note: Complete and attach a Hazard Evaluation Sheet for major known contarinant.

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? [No] Site secured? [No]

Work Areas Designated? [Yes) Zone(s) of Contamination Identified? [No]

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

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

	A	B	C	D
Task 1				X
Task 2				X
Task 3				X
Task 4				X
Task 5				X
Task 6				X

(Expand if necessary)

Modifications: Modified level D with tyvek. neoprene gloves and boots, safety glasses, APR available when upgrade to level C is necessary based on WA readings.

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

- o Lovel D: O2 <19.5% or >25%, explosive atmosphere >10% LEL, organic vapors above background levels, particulates > ____ mg/m3, other ________
- o Level C: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapor (in breathing zone) >1 ppm, particulates > ____ mg/m^3, other ________
- o Level B: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors (in breathing zone) >5 ppm, particulates > ____ mg/m^3, other ________
- o Level A: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors >500 ppm, particulates > ____ mg/m^3, other ________.

Air Monitoring (daily calibration unless otherwise noted):

Contaminant of Interest	Type of Sample (area, personal)	Monitoring Equipment	Frequency of Sampling
Volatile Organics	Area	OVA	Continuous
Radiation	Area	Mini-rad	Continuoua
Explosive Gases	Area	O2/Explosimeter	Continuous

Decontamination Solutions and Procedures for Equipment, Sampling Gear. etc.:

Alconox + tap water wash, tap water rinse, two isopropanol rinses, organic-free water rinae, and air dry. Teflon implements used for the collection of samples for metals analyses will have a 10% nitric acid solution rinse after the tap water rinae followed by another tap water rinse, two isopropanol rinses, and air dry.

Personnel Decon Protocol: Boot and glove wash - Alconor + tap water wash with clean water rinse. Expendables will be double-bagged and drummed for diapoaal. Field personnel will take a hygienic shower off site, followrnq completion of each day's fioldwork.

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

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

Site Entry Procoduroa and Special Considerations: E L E's "buddy system" will bo employed at a11 tins during fieldwork activities. Personnel will exercise caution in the vicinity of nearby roadways. If above background radiation levels are encountered, team members will evacuate tho sampling area and contact tho corporate health physics group to reassess tho site.

Work Limitations (time of day, weather condition., etc.) and Heat/Cold Stress Requirements: All fioldwork activities will bo performed during daylight boura. Team members will break as needed to prevent heat stress and replace fluid.. Cooling vests may bo used to provont heat stress.

General Spill Control, if applicable: N/A

Investigation-Derived Material Disposal (i.e., expendables, decon waste, cuttings): All fioldwork waste materials will bo double bagged, drummed, labeled, and transported to designated location for final disposal by tho Wavy.

Sample Handling Procoduroa Including Protective Wear: During a11 handling of samples, all field team members will wear surgical gloves. Goggles will bo.worn during sample preservation with acids.

Team Member*	Responsibility
To be determined.	Team Leader
	Site Safety Officer/Sampler
	Geologist/Sampler
	Sampler

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

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E. EMERGENCY INFORMATION

(Uno supplemental sheets, if necessary)

LOCAL RESOURCES

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

Ambulance: On bono: (904) 452-4138; Off base: 911

Hospital Emergency Room: NAS Dispensary - building 3600: (904) 452-2733: baptist Hospital: (904) 434-4811 (Life Flight)

Poison Control Center:

Police (include local, county sheriff, state): 911

Fire Department: 911

Airport:

U.S. Coast Guard: Emergency: (904) 453-8178; General Intorration: (904) 453-8282

Laboratory: E L E ASC: (716) 631-0360

Fed. Express: (800) 238-5355

Client Contact: U.S. Wavy Southern Division, Engineer-In-Charge, Suzanne D. Sanborn: (803) 743-0574

Site Contact: NAS Pensacola Environmental Coordinator, Ron Joyner: (904) 452-4515

SITE RESOURCES

Site Emergency Evacuation Alarm Method: N/A

Water Supply Source: On site

Telephone Location, Number: To bo dotorminod on site

Cellular Phone, if available: To bo dotorminod on site

Radio:

Other: On-site warehouse number to be determined

EMERGENCY CONTACTS

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

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

3. Regional Safety Coordinator - Sybil Iovchurch........... (904) 877-1978 (office)
   (904) 878-2336 (home)

4. Regional Office Manager - Rick Rudy .... (904) 871-1978 (office)
   (904) 893-7245 (home)

MEDTOX HOTLINE

1. **Twenty-four hour answering service:** (501) 370-1263

   What to report:

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

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

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

   a. 24 **hour** hotline ‾ (716) 604-1940
   b. Corporate Safety Director ‾ Paul Jonmaire ‾ home # (716) 655-1260
   c. Assistant Corp. Safety Officer ‾ Steven Sherman ‾ homo # (716) 688-0084

EMERGENCY ROUTES

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

Directions to hospital (include map) from Site 23

Dispensary ‾ Follow **Murray** Road south to Moffett Road. Turn right onto Moffett Road and continuo to its intersection with Fisher Stroot. Turn loft onto Fisher Stroot and proceed south to Turner Stroot. Turn right onto Turnor Stroot. Tho NAS Dispensary is located on Turnor Stroot in 'Building 3600.

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

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

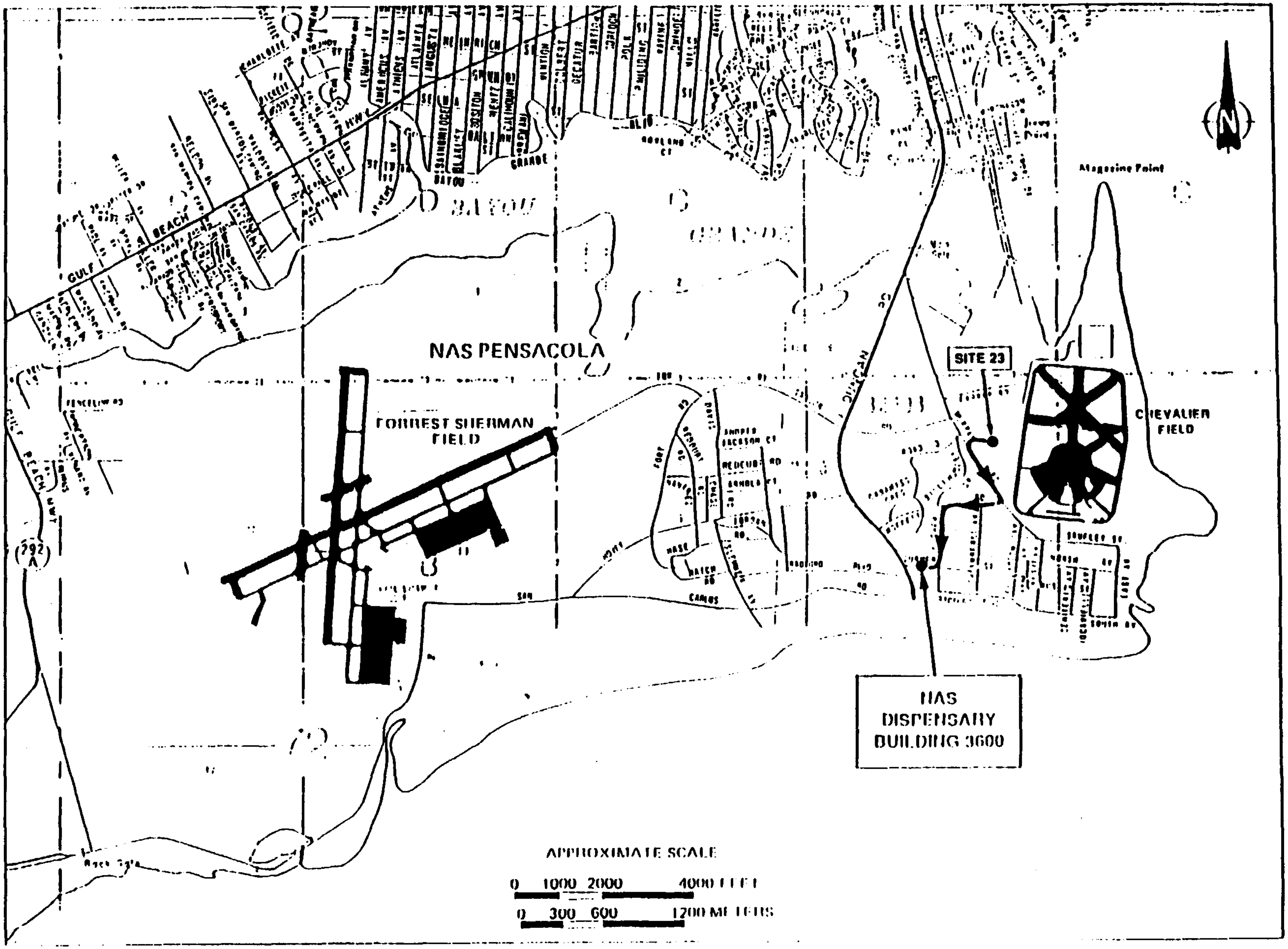

Figure A-4 LOCATION OF NAS DISPENSARY

F. EQUIPMENT CHECKLIST

PROTECTIVE GEAR

Level A	No.	Level B	No.
SCBA		SCBA	
SPARE AIR TANKS		SPARE AIR TANKS	
ENCAPSULATING SUIT (Type ____________)		PROTECTIVE COVERALL (Type ____________)	
SURGICAL GLOVES		RAIN SUIT	
NEOPRENE SAFETY BOOTS		BUTYL APRON	
BOOTIES		SURGICAL GLOVES	
GLOVES (Type ____________)		GLOVES (Type ____________)	
OUTER WORK GLOVES		OUTER WORK GLOVES	
HARD HAT		NEOPRENE SAFETY BOOTS	
CASCADE SYSTEM		BOOTIES	
5-MINUTE ESCAPE COOLING VEST		HARD HAT WITH FACE SHIELD	
		CASCADE SYSTEM	
		MANIFOLD SYSTEM	

Level C	No.	Level D	No.
ULTRA-TWIN RESPIRATOR		ULTRA-TWIN RESPIRATOR (Available)	X
POWER AIR PURIFYING RESPIRATOR		CARTRIDGES (Type GMC-H ____________)	
CARTRIDGES (Type ____________)			
5-MINUTE ESCAPE MASK		PROTECTIVE COVERALL (Type Tyvek ____________)	X
PROTECTIVE COVERALL (Type ____________)		RAIN SUIT	
M I A SUIT		NEOPRENE SAFETY BONDS	
BUTYL APRON		BOOTIES	X
SURGICAL GLOVES		WORK GLOVES	
GLOVES (Type ____________)		HARD HAT WITH FACE SHIELD	X
OUTER WORK GLOVES		SAFETY GLASSES	X
NEOPRENE SAFETY BOOTS			
HARD HAT WITH FACE SHIELD			
HARDHAT			

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INSTRUMENTATION	NO.	DECON EQUIPMENT	NO.
WA		WASH TUBS	X
THERMAL DESORBER		BUCKETS	X
O2/EXPLOSIMETER W/CAL. KIT	X	SCRUB BRUSHES	X
PHOTOVAC TIP		PRESSURIZED SPRAYER	X
[redacted]		DETERGENT (Type ____________)	
		SOLVENT (Type ____________)	
PIPE LOCATOR		PLASTIC SHEETING	X
WEATHER STATION		TARPS AND POLES	
DRAEGER PUMP, TUBES ____________		TRASH BAGS	X
BRUNTON COMPASS		TRASH CANS	
MONITOX CYANIDE		MASKING TAPE	X
HEAT STRESS MONITOR		DUCT TAPE	X
NOISE EQUIPMENT ____________			
PERSONAL SAMPLING PUMPS		FACE MASK	
		FACE MASK SANITIZER	
		FOLDING CHAIRS	
		STEP LADDERS	
RADIATION EQUIPMENT		DISTILLED WATER	X
DOCUMENTATION FORMS			
PORTABLE RATEMETER			
SCALER/RATEMETER		SAMPLING EQUIPMENT	
NaI Probe		8 OZ. BOTTLES	X
ZnS Probe		HALF-GALLON BOTTLES	X
GM Pancake Probe		VOA BOTTLES	X
GM Side Window Probe		BAILER CORD	X
MICRO R METER		HAND BAILERS	X
ION CHAMBER		THIEVING RODS WITH BULBS	
ALERT DOSIMETER		SPOONS	X
POCKET DOSIMETER		KNIVES	
MINI RAD	X	FILTER PAPER	
FIRST AID EQUIPMENT		PERSONAL SAMPLING PUMP SUPPLIES	
FIRST AID KIT	X		
OXYGEN ADMINISTRATOR			
STRETCHER			
PORTABLE EYE WASH	X		
BLOOD PRESSURE MONITOR			
FIRE EXTINGUISHER	X		

VAN EQUIPMENT	NO.	MISCELLANEOUS (Cont.)	no.
TOOL KIT	X		
HYDRAULIC JACK			
LUG WRENCH			
TOW CHAIN			
VAN CHECK OUT			
Gas			
Oil			
Antifreeze			
Battery			
Windshield Wash			
Tire Pressure			
		SHIPPING EQUIPMENT	
MISCELLANEOUS		COOLERS	X
PITCHER PUMP		PAINT CANS WITH LIDS, 7 CLIPS EACH	
SURVEYOR'S TAPE		VERMICULITE	X
100 FIBERGLASS TAPE		SHIPPING LABELS	X
300 NYLON ROPE		DOT LABELS: "DANGER"	
NYLON STRING		"UP"	
SURVEYING FLAGS		"INSIDE CONTAINER COMPLIES ..."	
FILM		"HAZARD GROUP"	
WHEEL BARROW		STRAPPING TAPE	X
BUNG WRENCH		BOTTLE LABELS ,	X
SOIL AUGER		BAGGIES	X
PICK		CUSTODY SEALS	X
SHOVEL		CHAIN-OF-CUSTODY FORMS .	X
CATALYTIC HEATER		FEDERAL EXPRESS TORUS	X
PROPANE GAS		CLEAR PACKING TAPE	X
BANNER TAPE			
SURVEYING METER STICK			
CHAINING PINS & RING			
TABLES			
WEATHER RADIO			
BINOCULARS			
MAGAPHONE			

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ON-SITE SAFETY MEETING

Projmct ______________________ TDD/Pan ______________

Date ______________ Time ______________ Job No. ______________

Address ______________________________

Specific Location ______________________________

Type of Work ______________________________

____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment ______________________________

____

Chemical Hazards ______________________________

____

Radiation Hazards ______________________________

____

Physical Hazards ______________________________

____

Emergency Procedures ______________________________

____

Hospital/Clinic ______________________ Telephone ______________

Hospital Address ______________________________

Special Equipment ______________________________

Other ______________________________

Chmcklist

1. Emergency information reviewed? ______ and made familiar to a11 team members? ______
2. Route to nearest hospital driven? ______ and its location known to all team members? ______
3. Site safety plan readily available and its location known to all team members? ______

Meeting shall be attended by all personnel who rill be working within the exclusion area. Daily informal update meetings will be held when site tasks **and/or** conditions **change.**

Name Printed	Signature

Meeting Conductmd by: ______________________ ______________________

(Print) (Signature)

______________________ ______________________

(Site Safety Coordinator) (Team Leader)

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ecology and environment, inc.

S I T E   S A F E T Y   P L A N

Version 988

A. GENERAL INFORMATION

Project Title: Site 29 - Soil South of Building 3460

Project no.: UH8000

TDD/Pan No.:

Project Manager: John Barksdale

Project Dir.: Gerry Gallagher

Location(s): Soil South of Building 3460 - approximately 100 feet south of tho southeast corner of Building 3460

Prepared by: Joseph F. Fugitt

Date Proparod: 04/01/92

Approval by: Sybil Newchurch

Date Approved: 04/03/92

Site Safety Officer Review:

Date Reviewed:

Scope/Objective of Work: Field activities will include soil sampling, permanent monitoring well installation. groundwater sampling, physical surveys, and hydroloqic assessment.

Proposed Date of Field Activities: December 1992

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

Documentation/Summary:

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

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

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

Characteristic(s):

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

Other:

Physical Hazards:

Overhead [X]	Confined* Space [ ]	Below Grade [ ]	Trip/Fall [X]
Puncture [ ]	Burn [ ]	Cut [ ]	Splash [X]

Noise [X] Other: Aircraft And vehicular traffic using Chevalier Field. Heat/cold stress.

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

[NASP]UH8000:T0479:4

Site History/Description and Unusual Features (see Sampling Plan for detailed description): In tho spring of 1981, several workers sustained chemical burns while working in an oxcavation south of Building 3460. Reportedly, a slimy black substance in tho soil oxcavation was responsible for tho injuries. In addition, station personnel reported a noticeable odor of "paint stripper" in tho oxcavation. A portion of tho IWTP sewer line lies beneath tho concrete apron in tho vicinity of Site 29. Industrial wastes disposed of in tho sewer include: paint strippers, thinners, chromic acid, phenolic compounds, cyanides, sulfuric acid, and other hazardous wastes. It is suspected that a leak in tho industrial waste sewer line ray have caused tho contamination at tho site. The site is currently covered by a concrete apron of Chevalier Field. Soil samples collected during tho Phase I investigation oxhibitod levels of TRPHs and PAHs. The groundwater samples from tho west portion of tho site exhibited some metals and also methylene chloride.

Locations of Chemicals/Wastes: A sludge-like material is located below land surface.

Estimated Volume of Chemicals/Wastes: Unknown

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

C. HAZARD EVALUATION

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

Physical Hazard Evaluation:

1) Soil sampling - Personal contarination, overhead, noise, autorobiloa
2) Monitoring well installation - Overhead, noise, automobiles
3) Groundwater sampling - Splash, personal contamination, automobiloa
4) Docontamination procedures - Solvents, acid solutions
5) Physical surveys - Slips, trips, falls, automobiloa
6) Hydrologic assessment - Splash, personal contarination, autorobiloa

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Odor Description
Hydrochloric Acid	5 ppm	Inh, Ing, Con.	Corrosive	Unknown	Acrid
Nitric Acid	2 ppm	Inh, Ing, Con.	Corrosive	0.3 - 1 ppm	Acrid
Sulfuric Acid	1 mg/m^3	Inh, Ing, Con.	Corrosive	N/A	Odorless
Sodium Hydroxide	2 mg/m^3	Inh, Ing, Con.	Corrosive	N/A	Odorless
Isopropyl Alcohol	440 ppm	Inh, Ing, Con.	Drowsiness, Head	7.5 - 200 ppm	Rubbing Alcohol
Methylene Chloride	500 ppm	Inh, Ing, Con.	Nausea, Vomit	160 ppm	Sweet, Pleasant
Lead	0.050 mg/m^3	Inh, Ing, Con.	Vomit, Diarrhea	N/A	Odorless
Mercury	0.05 mg/m^3	Inh, Ing, Con.	Cough, Chest Pain	N/A	Odorless
Hydrogen Cyanide	4.7 ppm	Inh, Ing, Con.	Vomit, Diarrhea	---	Bitter, Almond-like
Toluene	100 ppm	Inh, Ing, Con.	Dizziness, Fatigue	0.2 ppm	Benzene-like
Benzene	1 ppm	Inh, Ing, Con.	Head, Dizziness	61 ppm	Aromatic
1,1,2-Trichloroethane	10 ppm	Inh, Ing, Con.	Drowsiness, Head	---	Chloroform-like

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

D. SITE SAFETY WORK PLAN

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

Perimeter identified? [No]   Site secured? [No]

Work Areas Designated? [Yes]   Zone(s) of Contamination Identified? [lo I

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

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

	A	B	C	D
Task 1				X
Task 2				X
Task 3				X
Task 4				X
Task 5				X
Task 6				X

(Expand if necessary)

Modifications: Modified level D with tyvek, neoprene gloves and boots, safety glasses, APR available when upgrade to level C is necessary based on OVA readings.

Action Levels for evacuation of Work Zone Pending Reassessment of Condition.:

- o Level D: O_2 <19.5% or >25%, explosive atmosphere >10% U L, organic vapors above background levels, particulates >_____ mg/m^3, othor _____________
- o Level C: O_2 <19.5% or 258, explosive atmosphere >25% LEL (California-20%), unknown organic vapor (in breathing zone) >1 ppm, particulatoa >_____ mg/m3, othar ___________
- o Level B: O_2 <19.5% or >25%, oxploaiva atmosphere >25% LEL (California-20%), unknown organic vapors (in breathing zone) >5 ppm, particulatoa >_____ mg/m^3, othor ___________
- o Level A: O_2 <19.5% or >25%, explosive atmosphere >25% U L (California-20%), unknown organic vapors >500 ppm, particulatoa >_____ mg/m^3, othar ________

Air Monitoring (daily calibration unless otherwise noted):

Contaminant of Interest	Type of Sample (area, personal)	Monitoring Equipment	Frequency of Sampling
Volatile organics	Area	OVA	Continuoua
Radiation	Area	Mini-rad	Continuoua
Explosive Gases	Area	O_2/Explosimeter	Continuous

Alconox + tap water wash, tap water rinso. two isopropanol rinses, organic-free water rinso. and air dry. Teflon implements used for tho collection of samples for metals analyses will have a 10% nitric acid solution rinse after the tap water rinse followed by another tap water rinso, two isopropanol rinses, and air dry.

Personnel Decon Protocol: Boot and glove wash - Alconox + tap water wash with clean water rinse. Expendables will bo double-bagged and drummed for disposal. Field personnel will take a hygienic shower off site, following completion of each day's fieldwork.

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

Special Site Equipment, Facilities, or Procedures (Sanitary Facilities and Lighting Must Meet 29 CFR 1910.1201:

Site Entry Procedures and Spacial Considerations: E L E's "buddy system" will bo employed at a11 times during fieldwork activities. Personnel will exercise caution in tha vicinity of nearby roadways. If above background radiation levels are oncountarod, team members will evacuate tho sampling area and contact tho corporate health physics group to reassess tho site.

Work Limitations (time of day, weather conditions, etc.) and Heat/Cold Stress Requirements: All fieldwork activities will bo performed during daylight hours. Team members will break as needed to prevent heat stress and replace fluids. Cooling vests may bo used to prevent heat stress.

General Spill Control, if applicable: N/A

Investigation-Derived Material Disposal (i.e., expendables, decon waste, cuttings): All fieldwork waste materials will be double bagged, drummed, labeled, and transportad to designated location for final disposal by tho Navy.

Sample Handling Procedures Including Protective Wear: During a11 handling of samples, all field team members will wear surgical gloves. Goggles will be worn during sample preservation vith acids.

Team Member*	Responsibility
To bo determined.	Team Leader
	Site Safety Officer/Sampler
	Sampler
	Sampler

*All entries into exclusion rono require Buddy System use. All E L E field staff participate in medical monitoring program and have completed applicable training per 29 CFR 1910.120. Respiratory protection program moats requirements of 29 CFR 1910.134, and ANSI 288.2 (1980).

[NASP]UH8000:T0479:4

E. EMERGENCY INFORMATION

(Use supplemental shoots, if necessary)

LOCAL RESOURCES

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

Ambulance: On base: (904) 452-4138; Off base: 911

Hospital Emergency Room: NAS Dispensary - Building 3600: (904) 452-2733; Baptist Hospital: (904) 434-4811 (Life Flight)

Poison Control Center:

Police (include local, county sheriff, state): 911

Fire Department: 911

Airport:

U.S. Coast Guard: Emergency: (904) 453-8170: General Information: (904) 453-8282

Laboratory: E & E ASC: (716) 631-0360

Fed. Express: (800) 230-5311

Client Contact: U.S. Navy Southern Division, Engineer-In-Charge, Suzanne D. Sanborn: (003) 743-0574

Site Contact: NAS Pensacola Environmental Coordinator, Ron Joyner: (904) 452-4515

SITE RESOURCES

Site Emergency Evacuation Alarm Method: N/A

Water Supply Source: On sit.

Telephone Location, Number: To bo dotorminod on site

Cellular Phone, if available: To bo dotorminod on site

Radio:

Othor: On-sit. warehouse number to bo dotorminod

EMERGENCY CONTACTS

1. Dr. Raymond Harbison (Univ. of Florida) .... (501) 221-0465 or (904) 462-3277, 3281
   Alachua, Florida (501) 370-0263 (24 hours)

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

3. Regional Safety Coordinator - Sybil Newchurch............ (904) 877-1970 (office)
   (904) 878-2336 (homo)

4. Regional Office Manager - Rick Rudy .... (904) 877-1978 (office)
   (904) 893-7245 (homo)

MEDTOX HOTLINE

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

   What to report:

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

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

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

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

EMERGENCY ROUTES

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

Directions to hospital (include map) from Site 29.

NAS Dispensary – Go mouth to Saufley Stroot. Follow Saufley Stroot west to Fisher Stroot. Turn loft onto Fisher Stroot and follow it mouth to Turner Street. Turn right onto Turner Stroot. Tho NAS Dispensary is located on Turnor Stroot in Building 3600.

Baptist Hospital – Take Duncan Road (Navy Blvd.) north to exit tho base. Navy Blvd. becomes HWY 98 and curves to tho east. Follow Navy Blvd./Hwy. 98 east approx. 3 mi to Pace Blvd. Turn loft (north) on Pace Blvd. and procood approx. 1 mi 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. Tho hospital is about 6 blocks north on the loft.

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

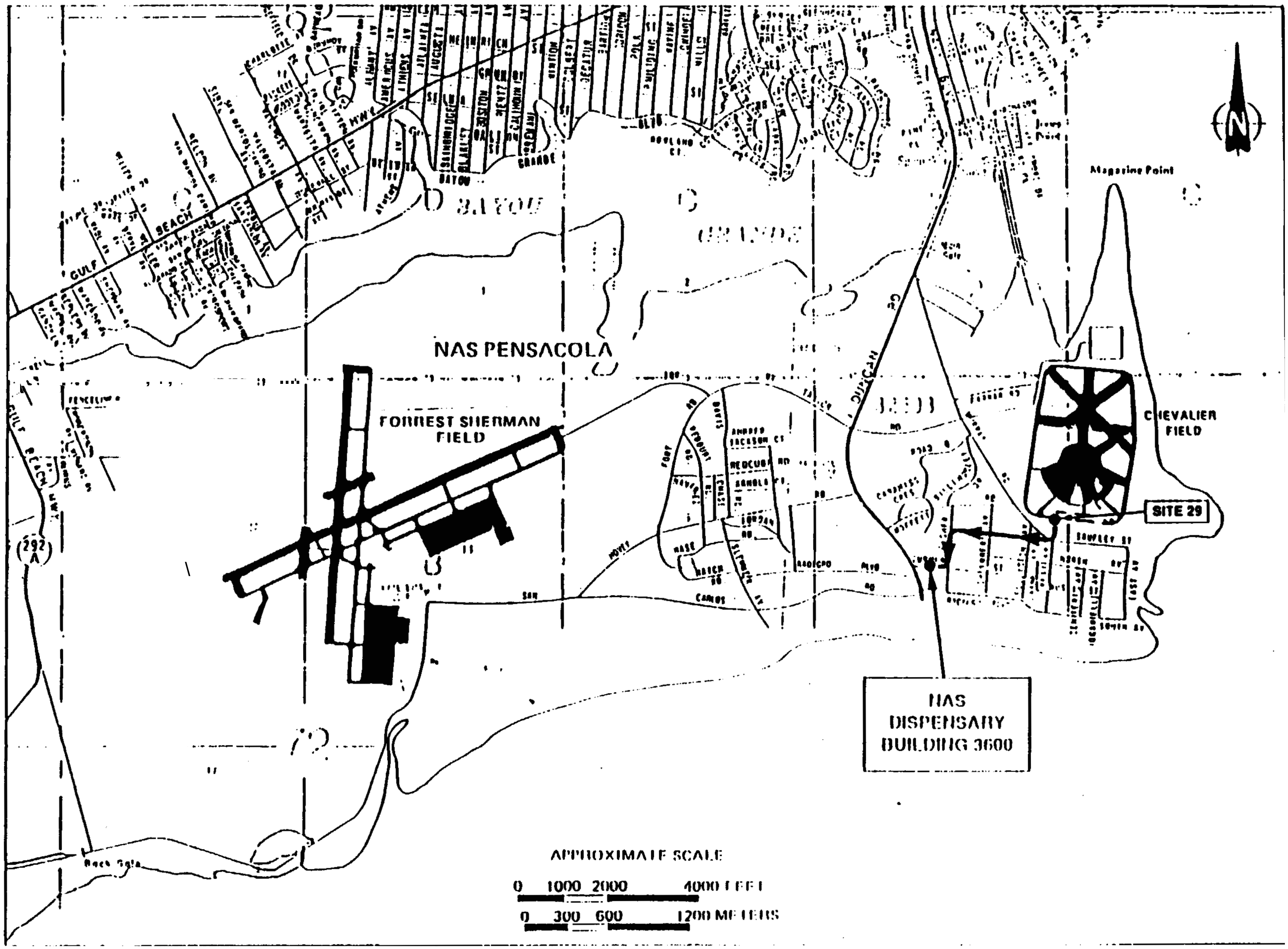

Figure **A-5** **LOCATION OF NAS DISPENSARY**

F. EQUIPMENT CHECKLIST

PROTECTIVE GEAR

Level A	NO.	Level B	NO.
SCBA			
SPARE AIR TANKS		SPARE AIR TANKS	
ENCAPSULATING SUIT (Type ______)		PROTECTIVE COVERALL (Type ______)	
SURGICAL GLOVES		MIN SUIT	
NEOPRENE SAFETY BOOTS		BUTYL APRON	
BOOTIES		SURGICAL GLOVES	
GLOVES (Type ______)		GLOVES (Type ______)	
OUTER WORK GLOVES		OUTER WORK GLOVES	
HARD HAT		NEOPRENE SAFETY BOOTS	
CASCADE SYSTEM		BOOTIES	
5-MINUTE ESCAPE COOLING VEST		HARD HAT WITH FACE SHIELD	
		CASCADE SYSTEM	
		MANIFOLD SYSTEM	

Level C	NO.	Level D	NO.
ULTRA-TWIN RESPIRATOR		ULTRA-TWIN RESPIRATOR (Available)	X
POWER AIR PURIFYING RESPIRATOR		CARTRIDGES (Type GMC-H ______)	
CARTRIDGES (Type ______)		5-MINUTE ESCAPE MASK (Available)	
5-MINUTE ESCAPE MASK		PROTECTIVE COVERALL (Type Tyvek ______)	X
PROTECTIVE COVERALL (Type ______)		MIN SUIT	
RAIN SUIT		NEOPRENE SAFETY BONDS	
BUTYL APRON		BOOTIES	X
SURGICAL GLOVES		WORK GLOVES	
GLOVES (Type ______)		HARD HAT WITH FACE SHIELD	X
OUTER WORK GLOVES		SAFETY GLASSES	X
NEOPRENE SAFETY BOOTS			
HARD HAT WITH FACE SHIELD			
BOOTIES			
HARDHAT			

INSTRUMENTATION	NO.	DECON EQUIPMENT	NO.
OVA		WASH TUBS	X
THERMAL DESORBER		BUCKETS	X
O2/EXPLOSIMETER W/CAL. KIT	X	SCRUB BRUSHES	X
PHOTOVAC TIP		PRESSURIZED SPRAYER	X
HNu (Probe 10.2 eV)	X	DETERGENT (Type)	
MAGNETOMETER		SOLVENT (Type)	
		PLASTIC SHEETING	X
WEATHER STATION		TARPS AND POLES	
DRAEGER PUMP, TUBES			X
BRUNTON COMPASS		TRASH CANS	
MONITOX CYANIDE		MASKING TAPE	X
HEAT STRESS MONITOR		DUCT TAPE	X
NOISE EQUIPMENT		PAPER TOWELS	X
PERSONAL SAMPLING PUMPS		FACE MASK	
		FACE MASK SANITIZER	
		FOLDING CHAIRS	
		STEP LADDERS	
RADIATION EQUIPMENT		DISTILLED WATER	X
DOCUMENTATION FORMS			
PORTABLE RATEMETER			
SCALER/RATEMETER		SAMPLING EQUIPMENT	
NaI Probe		8 OZ. BOTTLES	X
ZnS Probe		HALF-GALLON BOTTLES	X
GM Pancake Probe		VOA BOTTLES	X
GM Side Window Probe		BAILER CORD	X
MICRO R METER		HAND BAILERS	X
ION CHAMBER		THIEVING RODS WITH BULBS	
ALERT DOSIMETER		SPOONS	X
POCKET DOSIMETER		KNIVES	
MINI RAD	X	FILTER PAPER	
FIRST AID EQUIPMENT		PERSONAL SAMPLING PUMP SUPPLIES	
FIRST AID KIT	X		
OXYGEN ADMINISTRATOR			
STRETCHER			
PORTABLE EYE WASH	X		
BLOOD PRESSURE MONITOR			
FIRE EXTINGUISHER	X		

VAN EQUIPMENT	no.
TOOL KIT	X
HYDRAULIC JACK	
LUG WRENCH	
TOW CHAIN	
VAN CHECK OUT	
Gas	
Oil	
Antifreeze	
Battery	
Windshield Wash	
Tire Pressure	
MISCELLANEOUS	
PITCHER PUMP	
SURVEYOR'S TAPE	
100 FIBERGLASS TAPE	
300 NYLON ROPE	
NYLON STRING	
SURVEYING FLAGS	
FILM	
WHEEL BARROW	
BUNG WRENCH	
SOIL AUGER	
PICK	
SHOVEL	
CATALYTIC HEATER	
PROPANE GAS	
BANNER TAPE	
SURVEYING METER STICK	
CHAINING PINS & RING	
TABLES	
WEATHER RADIO	
BINOCULARS	
MAGAPHONE	

MISCELLANEOUS (Cont.)	no.
SHIPPING EQUIPMENT	
COOLERS	X
PAINT CANS WITH LIDS, 7 CLIPS EACH	
VERMICULITE	X
SHIPPING LABELS	X
DOT LABELS: "DANGER"	
"UP"	
"INSIDE CONTAINER COMPLIES ..."	
"HAZARD GROUP"	
STRAPPING TAPE	X
BOTTLE LABELS	X
BAGGIES	X
CUSTODY SEALS	X
CHAIN-OF-CUSTODY FORMS	X
FEDERAL EXPRESS FORMS	X
CLEAR PACKING TAPE	X

[NASP]UH8000:T0479:4

ecology and environment, inc.

ON-SITE SAFETY MEETING

Project ____________________ TDD/Pan ____________

Date ____________ **Time** ____________ Job No. ____________

Address ____________________

Specific Location ____________________

Type **of** work ____________________

____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment ____________________

____

Chemical Hazards ____________________

____

Radiation **Hazards** ____________________

____

Physical Hazards ____________________

____

Emergency Procedures ____________________

____

Hospital/Clinic ____________________ Telephone ____________

Hospital Address ____________________

Special Equipment ____________________

Other ____________________

Checklist

by

Name Printed	**Signature**

(**Site** Safety Coordinator) (Team Leader)

[NASP]UH8000:T0479:4

ecology and environment, inc.

SITE SAFETY PLAN

Version 988

A. GENERAL INFORMATION

Project Title: Site 34 - Solvent North of Building 3557

Project No.: UH8000

TDD/Pan No.:

Project Manager: John Barksdale

Project Dir.: Gerry Gallagher

Location(s): Solvent North of Building 3557-area underneath concrete apron immediately north of Building 3557.

Prepared by: Joseph F. Fugitt

Dato Proparod: 4/01/92

Approval by: Sybil Newchurch

Dato Approved: 4/03/92

Sit. Safety Officer Review:

Dato Reviewed:

Scope/Objective of Work: Field activities will include soil sampling, permanent monitoring well installation, groundwater sampling, physical surveys, and hydrologic assessment.

Proposed Dato of Field Activities: December 1992

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

Documentation/Summary:

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

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

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

Characteristic(s):

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

Other:

Physical Hazards:

Overhead	[X]	Confined* Space	[ ]	Below Grade	[ ]	Trip/Fall	[X]
Puncture	[ ]	Burn	[ ]	Cut	[ ]	Splash	[X]

Noise [X] Other: Aircraft and vehicular traffic using Chevalier Field. Heat/cold stress.

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

Site History/Description and Unusual Features (see Sampling Plan for detailed description): A tank farm with pipes connecting to Building 3557 is located along tho northern edge of tho site. In May 1984, one of these pipes leaked 45,000 gallons of a solvent/detergent solution into tho surrounding area. Tho solution was composed of 1.7% chlorinated aromatic hydrocarbon solvent. It is believed that contamination ray have penetrated tho concrete apron, via expansion joints, and contaminated on-aito soils and groundvator. Moderate concentrations of some organics have boon found in groundvator collected from wells in tho immediate vicinity of tho aito (G&M 1986). Tho results of tho Phase I investigation indicated that low levels of TRPHs and PAHs were detected in soil samples in tho area along tho industrial sewer line located on aito. Groundwater samples from two areas of tho site exhibited TRPHs, PAHs, and/or phenols.

Locations of Chemicals/Wastes: Contaminants from tho pipe leak are likely contained in on-site soils below tho concrete apron.

Estimated Volume of Chemicals/Wastes: unknown

Site Currently in Operation Yes: [X] No: [1

C. HAZARD EVALUATION

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

Physical Hazard Evaluation:

1) soil sampling - Personal contamination, overhead, noise, automobiles
2) Monitoring well installation - Overhoad. noise, automobiles
3) Groundwater sampling - Splash, personal contamination, automobiles
4) Decontamination procedures - Solvents, acid solutions
5) Physical surveys - Slips, trips, falls, automobiloa
6) Hydrologic assessment - Splash, personal contamination, automobiles

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Odor Description
Hydrochloric Acid	5 ppm	Inh, Ing, Con.	Corrosive	Unknown	Acrid
Nitric Acid	2 ppm	Inh, Ing, Con.	Corrosive	0.3 - 1 ppm	Acrid
Sulfuric Acid	1 mg/m^3	Inh, Ing, Con.	Corrosive	N/A	Odorless
Sodium Hydroxide	2 mg/m^3	Inh, Ing, Con.	Corrosive	N/A	Odorless
Isopropyl Alcohol	440 ppm	Inh, Ing, Con.	Drowsiness, Head	7.5 - 200 ppm	Rubbing Alcohol
Benzene	1 ppm	Inh, Ing, Con.	Head, Dizziness	61 ppm	Aromatic
Toluene	100 ppm	Inh. Ing, Con.	Dizziness, Fatigue	0.2 ppm	Benzene-like
Phonola	5 ppm	Inh, Inq, Con.	Vomit, Diarrhea	0.05 ppm	Sweet, Pungent

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

D. SITE SAFETY WORK PLAN

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

Perimeter identified? [ ] Site secured? [ ]

work Areas Designated? [ ] Zone(s) of Contamination Identified? [ ]

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

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

	A	B	C	D
Task 1				X
Task 2				X
Task 3				X
Task 4				X
Task 5				X
Task 6				X

(Expand if necessary)

Modifications: Modified level D with tyvek, neoprene gloves and boots, safety glasses, APR available when upgrade to level C is necessary based on OVA readings.

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

- Level D: O_2 <19.5% or >25%, explosive atmosphere >10% LEL, organic vapors above background levels, particulates >____ mg/m3, othor ________
- Level C: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapor (in breathing zone) >1 ppm, particulates >____ mg/m^3, othor ________
- Level B: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors (in breathing zone) >5 ppm, particulates >____ mg/m^3, othor ________
- Level A: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors >500 ppm, particulates >____ mg/m^3, othor ________

Contaminant of Interest	Type of Sample (area, personal)	Monitoring Equipment	Frequency of Sampling
Volatile Organics	Area	OVA	Continuoua
Radiation	Area	Mini-rad	Continuoua
Explosive Oases	Area	O_2/Explosimeter	Continuous

Personnel Decon protocol: Boot and glove wash - Alconox + tap water wash with clean water rinse. Expendables will be double-bagged and drummed for disposal. Field personnel will take a hygienic shower off site, following completion of each day's fieldwork.

Decon Solution Monitoring Procmdurma, if Applicable: Decontamination activitima will be performed in a well-vantilatad area upwind of the sampling zone.

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

Site Entry Procmdurma and Special Considerations: E & E's "buddy system" will be employed at a11 times during fieldwork activitima. Personnel will exercise caution in the vicinity of nearby roadway.. If above background radiation levels arm encountered, team members will evacuate the sampling area and contact the corporatm health physics group to reassess the site.

Work Limitations (time of day, weather conditions, etc.) and Heat/Cold Stress Requirements: All fimldwork activitima will be performed during daylight hours. Team members will break as needed to prmvmnt heat stress and replace fluids. Cooling vests may be used to prmvmnt heat stress.

General Spill Control, if applicable: N/A

Investigation-Derived Material Disposal (i.e., expendables, decon waste, cuttings): All fimldwork waste materials will be double bagged, drummed, labeled, and tranaportmd to designated location for final disposal by the Navy.

Sample Handling Procmdurma Including Protective Wear: During all handling of samples, all field team members will wear surgical gloves. Goggles will be worn during sample preservation with acids.

Team Member*	Responsibility
To be determined.	Team Leader
	Site Safety Officer/Sampler
	Geologist/Sampler
	Sampler

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

E. EMERGENCY INFORMATION

(Use supplemental sheets, if necessary)

LOCAL RESOURCES

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

Ambulance: On base: (904) 452-4138; Off base: 911

Hospital Emergency Room: NAS Dispensary - Building 3600: (904) 452-2733: Baptist Hospital: (904) 434-4811 (Life Flight)

Poison Control Center:

Police (include local, county sheriff, state): 911

Fire Department: 911

Airport:

U.S. Coast Guard: Emergency: (904) 453-0178: General Information: (904) 453-8282

Laboratory: E & E ASC: (716) 631-0360

Fed. Express: (000)238-5355

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

Site Contact: NAS Pensacola Environmental Coordinator, Ron Joyner: (904) 452-4515

SITE RESOURCES

Site Emergency Evacuation Alarm Method: N/A

Water Supply Source: On site

Telephone Location, Number: To bo determined on site

Cellular Phone, if available: To be determined on site

Radio:

Other: On-site warehouse number to be dmtmrrinmd

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-B060 (office
   (716) 655-1260 (home)

3. Regional Safety Coordinator - Sybil Newchurch............ (904) 877-1978 (office
   (904) 878-2336 (home)

4. Regional Office Manager - Rick Rudy .... (904) 877-1978 (office
   (904) 893-7245 (home)

MEDTOX HOTLINE

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

   What to rmport:

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

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

3. If a toxicologist does not return your call within 15 minutes, call thm following persons in ordmr until contact is udm:

   a. 24 hour hotline - (716) 604-8940
   b. Corporate Safety Director - Paul Jonmaire - home # (716) 655-1260
   e. Assistant Corp. Safety Officer - Steven Sherman - home # (716) 688-0084

EMERGENCY ROUTES

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

Directions to hospital (include u p) from Site 34.

BAS Dispensary - Follow Murray Road south to Moffett Road. Turn right onto Moffett Road and continue to its intersection with Fisher Strmmt. Turn left onto Fisher Strmmt and proceed south to Turnmr Strmmt. Turn right onto Turnmr Strmmt. Thm NAS Dispensary is locatmd on Turnmr Street in Building 3600.

Baptist Hospital - Take Duncan Road (Navy Blvd.) north to exit thè base. Navy Blvd. becomes HWY 98 and curves to thm mast. Follow Navy Blvd./Hwy. 98 mast approx. 3 ni to Pace Blvd. Turn lmft (north) on Pace Blvd. and procmod approx. 1 mi to Cervantes St. (Hwy. 90). Turn right on Cervantes/Hwy. 90 and follow this toad for about 8 blocks and turn left (north) onto E street. Thm hospital is about 6 blocks north on thm loft.

Emergency Egress Routes to Get Off-Sit0 Emergency egress routes will be locatmd if emergency exit routes become blocked by construction, mtc.

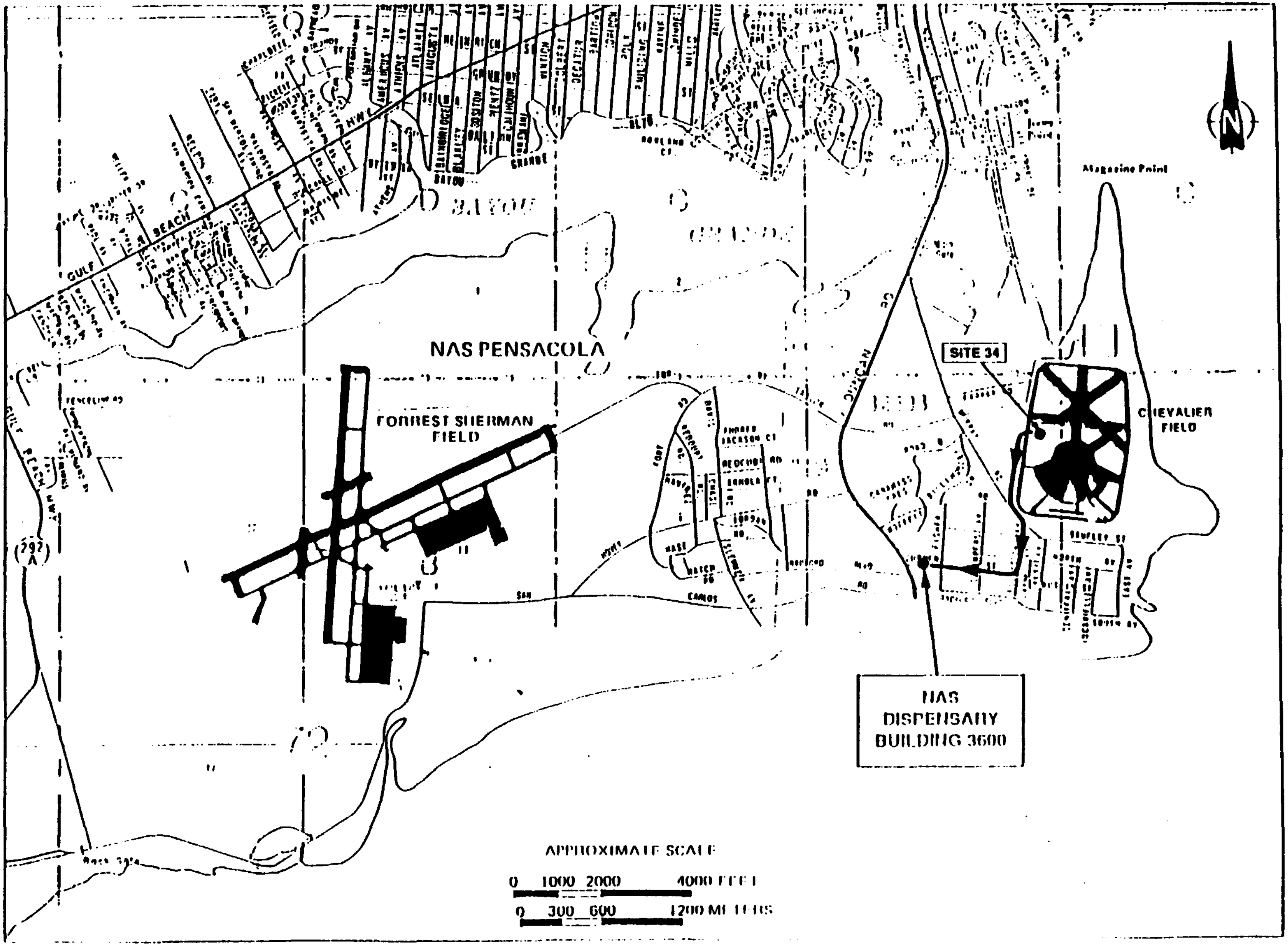

Figure A-6 LOCATION OF NAS DISPENSARY

F. EQUIPMENT CHECKLIST

PROTECTIVE GEAR

Level A	No.	Level B	No.
SCBA		SCM	
SPARE AIR TANKS		SPARE AIR TANKS	
ENCAPSULATING SUIT (Type ________)		PROTECTIVE COVERALL (Type ________)	
SURGICAL GLOVES		RAIN SUIT	
NEOPRENE SAFETY BOOTS		BUTYL APRON	
BOOTIES		SURGICAL GLOVES	
GLOVES (Type ________)		GLOVES (Type ________)	
OUTER WORK GLOVES		OUTER WORK GLOVES	
HARD HAT		NEOPRENE SAFETY BOOTS	
CASCADE SYSTEM		BOOTIES	
5-MINUTE ESCAPE COOLING VEST		HARD RAT WITH FACE SHIELD	
		CASCADE SYSTEM	
		MANIFOLD SYSTEM	
Level C		**Level D**	
ULTRA-TWIN RESPIRATOR		ULTRA-TWIN RESPIRATOR (Available)	X
POWER AIR PURIFYING RESPIRATOR		CARTRIDGES (Type GMC-H ________)	
CARTRIDGES (Type ________)		5-MINUTE ESCAPE MASK (Available)	
5-MINUTE ESCAPE MASK		PROTECTIVE COVERALL (Type Tyvek ________)	X
PROTECTIVE COVERALL (Type ________)		RAIN SUIT	
RAIN SUIT		NEOPRENE SAFETY BONDS	
BUTYL APRON		BOOTIES •	X
SURGICAL GLOVES		WORK GLOVES	
GLOVES (Type ________)		HARD RAT WITH FACE SHIELD	X
OUTER WORK GLOVES		SAFETY GLASSES	X
NEOPRENE SAFETY BOOTS			
UARD RAT WITH FACE SHIELD			
BOOTIES			
HARDHAT			

INSTRUMENTATION	No.	DECON EQUIPMENT	No.
OVA		WASH TUBS	X
THERMAL DESORBER		BUCKETS	X
O2/EXPLOSIMETER W/CAL. KIT	X	SCRUB BRUSHES	X
PHOTOVAC TIP		PRESSURIZED SPRAYER	X
HNu (Probe 10.2 eV)	X	DETERGENT (Type .)	
MAGNETOMETER		SOLVENT (Type)	
PIPE LOCATOR		PLASTIC SHEETING	X
WEATHER STATION		TARPS AND POLES	
DRAEGER PUMP, TUBES		TRASH BAGS	X
BRUNTON COMPASS		TRASH CANS	
MONITOX CYANIDE		MASKING TAPE	X
HEAT STRESS MONITOR		DUCT TAPE	X
NOISE EQUIPMENT		PAPER TOWELS	X
PERSONAL SAMPLING PUMPS		FACE MASK	
		FACE MASK SANITIZER	
		FOLDING CHAIRS	
		STEP LADDERS	
RADIATION EQUIPMENT		DISTILLED WATER	X
DOCUMENTATION FORMS			
PORTABLE RATEMETER			
SCALER/RATEMETER		SAMPLING EQUIPMENT	
NaI Probe		8 OZ. BOTTLES	X
ZnS Probe		HALF-GALLON BOTTLES	X
GM Pancake Probe		VOA BOTTLES	X
GM Side Window Probe		BAILER CORD	X
MICRO R METER		HAND BAILERS	X
ION CHAMBER		THIEVING RODS WITH BULBS	
ALERT DOSIMETER		SPOONS	X
POCKET DOSIMETER		KNIVES	
MINI RAD	X	FILTER PAPER	
FIRST AID EQUIPMENT		PERSONAL SAMPLING PUMP SUPPLIES	
FIRST AID KIT	X		
OXYGEN ADMINISTRATOR			
STRETCHER			
PORTABLE EYE WASH	X		
BLOOD PRESSURE MONITOR			
FIRE EXTINGUISHER	X		

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VAN EQUIPMENT	NO.	MISCELLANEOUS (Cont.)	No.
TOOL KIT	X		
HYDRAULIC JACK			
LUG WRENCH			
TOW CHAIN			
VAN CHECK OUT			
Gas			
Oil.			
Antifreeze			
Battery			
Windshield Wash			
Tire Pressure			
		SHIPPING EQUIPMENT	
MISCELLANEOUS		COOLERS	X
PITCHER PUMP		PAINT CANS WITH LIDS, 7 CLIPS EACH	
SURVEYOR'S TAPE		VERMICULITE	X
100 FIBERGLASS TAPE		SHIPPING LABELS	X
300 NYLON ROPE		DOT LABELS: "DANGER"	
NYLON STRING		"UP"	
SURVEYING FLAGS		"INSIDE CONTAINER COMPLIES ..."	
FILM		"HAZARD GROUP"	
WHEEL BARROW		STRAPPING TAPE	X
BUNG WRENCH		BOTTLE LABELS	X
SOIL AUGER		BAGGIES	X
PICK		CUSTODY SEALS	X
SHOVEL		CHAIN-OF-CUSTODY FORMS	X
CATALYTIC HEATER		FEDERAL EXPRESS FORMS	X
PROPANE GAS		CLEAR PACKING TAPE	X
BANNER TAPE			
SURVEYING METER STICK			
CHAINING PINS & RING			
TABLES			
WEATHER RADIO			
BINOCULARS			
MAGAPHONE			

ecology and environment, inc.

on-SITS SAFETY MEETING

Project ______________________ TDD/Pan ______________

Date ______________ Time ______________ Job lo. ______________

Address ______________________

Specific Location ______________________

Type of Work ______________________

____

SAFETY TOPICS PRESENTED

Protective Clothing/Equipment ______________________

____

Chemical Hazards ______________________

____

Radiation Hazards ______________________

____

Physical Hazards ______________________

____

Emergency Procedures ______________________

____

Hospital/Clinic ______________________ Telephone ______________

Hospital Address ______________________

Special Equipment ______________________

Other ______________________

Checklist

1. Emergency information reviewed? ______ and made familiar to all team members? ______
2. Route to nearest hospital driven? ______ and its location known to all team members? ______
3. Site safety plan readily available and its location known to all team members? ______

Meeting shall be attended by all personnel rho rill bo **working within** tho exclusion area. **Daily informal update meetings** rill bo bold **when site** tasks **and/or** conditions **change.**

Name Printed	Signature

Meeting Conducted by: ______________ ______________

(Print) (Signature)

______________ ______________

(Site Safety Coordinator) (Team Leader)

[NASP]UH8000:T0479:5

STANDARD OPERATING PROCEDURES FOR HEALTH AND SAFETY ON DRILLING RIG OPERATIONS

REVISED: JANUARY 1990

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CONTENTS

1 INTRODUCTION

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

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

2 OPERATION OF DRILLING EQUIPMENT BY E & E

2.1 RESPONSIBILITIES AND AUTHORITY OF SITE SAFETY OFFICER

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

E & E personnel are restricted from the borehole area during active drilling. When E 6 E personnel are doing drilling; they will be restricted from the borehole area by means of a "super exclusion zone" delineated by placing a 4- by 8-foot sheet of plywood over the borehole.

2.2 RESPONSIBILITIES AND AUTHORITY OF E & E DRILLER

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

- o Rill switches tripped and operation verified;
- o Chain guards in place:
- o Belt guards in place;
- o Belts set to proper tension (visual);
- o Loose belts;
- o Presence of any fluid leaks:
- o Any damaged hoses, cables, ropes, chains:
- o Control panel is clean;
- o Control lever functions labeled;
- o Pressure relief valves function;
- o Cathead free of rust and grease:
- o Cathead grooves less than 1/8 inch in depth:
- o All tools in proper working order;
- o Rig leveled and stabilized:
- o Check for weld cracks in mast; and
- o Safety hooks operational.

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

During the drilling operations, the following safety practices vill be in effect:

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

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

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

2.3 RESPONSIBILITY AND AUTHORITY OF OTHER E 6 E PERSONNEL

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

It is the responsibility of all E 6 E personnel to carry their issued nondisposable gear, including hard hat, face shield, respirator, steel-toed boots, eyepiece inserts, safety glasses, and appropriate outerwear for the expected climate.

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

3 TRAINING REQUIREMENTS FOR SITE PERSONNEL

3.1 E 6 E SITE SAFETY OFFICER

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

3.2 E & E DRILLER AND HELPER

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

3.3 OTHER E & E DRILLING PERSONNEL

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

3.4 SUBCONTRACT DRILLER AND OTHER SUBCONTRACT DRILLING PERSONNEL

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

4 SUPERVISION OF SUBCONTRACT DRILLERS

4.1 RESPONSIBILITIES AND AUTHORITY OF SITE SAFETY OFFICER

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

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

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

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

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

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

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

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

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

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

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

- o Location and operation of kill switches, fire extinguisher, and first aid kit:
- o Heat and cold stress hazards:
- o "Super exclusion zone" around borehole: and
- o Warnings to Subcontractors about hazards of climbing the mast vithout safety belt and other equipment.

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

The SSO vill be responsible €or shutdovn of the drilling operation if electrical storms are in the site area.

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

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

4.2 RESPONSIBILITIES AND AUTHORITY OF OTHER E & E PERSONNEL

All E 6 E personnel on site are required to follow the terms of the SSP and the direction of the SSO. Because'the SSO cannot be in all places at all times, the crev should observe the subcontractors and condition of their equipment at all times, and report immediately to the Team Leader and SSO any safety-related issues that are unresolved. Included are such details as dressout, site functions, and decontamination. It is important that the SSO be involved so that proper log entries can be made.

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

B 6 E personnel are forbidden from approaching augers during drilling. Activities at the borehole, such as sampling, require that equipment be stopped.

5 GENERAL DRILLING SITE SAFETY CHECKLISTS

5.1 SAFETY CHECKLISTS FOR SPECIFIC TYPES OF DRILLING ACTIVITIES

5.1.1 General Drilling Site Safety Checklist

- o All E 6 E drilling personnel will have read and understood the terms of the E 6 E drilling SOP.

- o Obvious or questionable safety conditions that arise during daily inspection of the rig and its components will be cause for vork interruption.

- o Only approved Drillers will remain in proximity to the borehole during drilling, and an approximate 4- by 8-foot "super exclusion area" will be established around the moving auger at all times. No personnel, except the Driller and the Driller's Helper, will enter this zone during drilling. The SSO will issue varnings to those personnel vho breach this zone.

- o Continuous O_2/explosimeter monitoring at borehole using remote sampling hose will exist at all times.

- o All field team members will be briefed on planned drilling operations and possible problems before vork begins on day 1. All will be shown the location and operation of "kill switches," which will be operationally checked each morning.

- o Fire extinguisher(s) will be staged next to the rig before drilling and refueling operations.

- o Velding and cutting activities will only. be performed avay from ignition sources at a distance approved by the SSO or Team Leader.

- o Appropriate personnel protective equipment (based on hazards associated vith assumed well contaminants) will be vorn as directed by the SSO and the SSP. At a minimum, steel-toed boots, hard hats, and face shields will be vorn during any active drilling.

- o Outrigger stabilizers must be in place before drilling commences, and the rig must also be leveled.

- o The drill rig mast must be horizontal during movement of rig and should not be erected vithin 25 feet of overhead lines.

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

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

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

- Only properly licensed staff will drive the drill rig. A daily safety check of the vehicle, following E 6 E protocol, will be carried out by the driver.

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

5.1.2 Rotary and Core Drilling

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

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

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

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

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

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

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

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

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

- Drill rods should not be braked while being lowered into the hole vith chuck jaws.

- Drill rods should not be held or lowered into the hole vith pipe wrenches.

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

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

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

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

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

5.1.3 Cathead Usage

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

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

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

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

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

- Never vrap the rope from the cathead (or any other rope, vire rope, or cable on the drill rig) around a hand, vrist, arm, foot, ankle, leg, or any other part of the body.

- Alvays maintain a minimum of 18 inches of clearance betveen the operating hand and the cathead drum vhen driving samplers, casing, or other tools vith the cathead and rope method. Be avare that the rope advances tovard the'cathead with each hammer blov as the sampler or other drilling tool advances into the ground.

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

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

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

- Vhen using the cathead and rope for driving or back-driving, make sure that all threaded connections are tight, vhile staying as far avay as possible from the hammer impact point.

- The cathead Operator must be able to operate the cathead standing on a level surface with sound, firm-footing conditions, without distraction or disturbance.

5.1.4 Continuous-Flight or Hollov-Stem Augers

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

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

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

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

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

5.1.5 Use of Virc Line Hoists, Vire Rope, and Hoisting Equipment

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

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

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

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

- Host sheaves on exploration drill rigs are stationary vith a single part line. The number of parts of line should never be increased vithout first consulting with the manufacturer of the drill rig.

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

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

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

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

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

- Avoid sudden loading in cold veather.

- Never use frozen ropes.

- Protect wire rope from sharp corners or edges.

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

- Clutches and brakes on hoists should be periodically tested.

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

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

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

6 REFERENCES

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

Dicdrich D-50 Safety Manual.

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

Vire Rope Users Hanual, American Iron and Steel Institute.

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

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

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CONTENTS

1 INTRODUCTION

Field operations present a variety of hazards to the employee. During hot days or when wearing protective clothing, heat stress can be experienced and, if not remedied, can threaten the health or life of field personnel. Therefore, it is important that all employees are able to recognize the symptoms of heat stress as well as perform first aid without delay.

2 SCOPE

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

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

3 OBJECTIVES

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

4 EFFECTS OF HEAT

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

Interference with the elimination of heat leads to its accumulation and thus to the elevation of body temperature. As a result, the person is said to have a fever. Such a condition produces a 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 vithin the body is brought to the surface largely by the bloodstream and escapes to the cooler surroundings by conduction and radiation. If air movement such as a breeze strikes the body, additional heat is lost by convection. However, vhen the temperature of the surrounding air becomes equal to or rises above that of the body, all of the heat must be lost by vaporization of the moisture (sweat) from the skin surface. As the air becomes mare humid (contains more moisture), vaporization from the skin slows down. Thus, on a day vhen the temperature is 95°F to 100°F, vith high humidity and little or no breeze, heat is retained vithin the body. It is on such a day or, more commonly, after a succession of such days (a heat vavc) that medical emergencies due to heat are likely to occur. Such emergencies are classified in three categories: heat cramps, heat exhaustion, and heat stroke.

4.1 HEAT CRAMPS

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

4.1.1 Symptoms

The symptoms of heat cramps include the folloving:

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

4.1.2 Emergency Care

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

4.2 HEAT EXHAUSTION

Heat exhaustion occurs in individuals working in hot environments and may be associated vith 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 blood. The blood vessels in the skin become dilated and a large amount of blood is pooled in the skin. This condition, plus the blood pooled in the lover extremities vhen an individual is in an upright position, may lead to an inadequate return of blood to the heart and eventually to physical collapse.

4.2.1 Symptoms

The symptoms of heat exhaustion are as follows:

- o Pale clammy skin,
- o Profuse perspiration,
- o Generalized veakness,
- o Dizziness,
- o Veak pulse,
- o Rapid and usually shallov breathing,
- o Unconsciousness, and
- o Appearance of having fainted (the patient vill respond to the sue treatment that is administered in cases of fainting).

4.2.2 Emergency Care

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

4.3 HEAT STROKE

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

4.3.1 Symptoms

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

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

4.3.2 Emergency Care

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

5 PREVENTION OF HEAT STRESS

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

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

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

5.1 GUIDELINES FOR USE OF PROTECTIVE CLOTHING

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

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

5.2 HEARTRATE MONITORING

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

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

If the recovery pulse rate during the last 30 seconds of the first minute is at 110 beats/minute or less and the deceleration between the first, second, and third minutes is at least 10 beats/minute, the vork-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.

5.3 HONITORING PERSONNEL BODY TEMPERATURE AND BLOOD PRESSURE

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

5.4 MONITORING THE WORK AREA FOR HEAT STRESS CONDITIONS

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

6 DECONTAMINATION

As in other medical emergencies, decontamination should proceed as normally as possible vithout contributing unduly to the victim's stress or injury. At a minimum, the protective clothing should be removed as he or she is taken from the hazardous zone. The "buddy system" is always in effect and backup personnel should be available at the decontamination station to either suit up and assist in extraction or to help decontaminate and undress the victim. If other serious injuries or more life-threatening conditions exist, and the victim cannot be disrobed or decontaminated completely, the victim (or contaminated portions) should be vrapped in plastic (or other protective material) for his or her ovn safety as well as the safety of apbulance and hospital personnel. Carefully avoid action that vould result in the victim's being further overheated.

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

Emergency Telephone Number: 314-982-5000

HYDROCHLORIC ACID, 37%

PRODUCT IDENTIFICATION:

Synonyms: Muriatic acid

Formula CAS No.: 7647-01-0

Molecular Weight: 36.46 (HCl)

Chemical Formula: HCl

Hazardous Ingredients: Hydrogen chloride

PRECAUTIONARY MEASURES

DANGER! CORROSIVE. LIQUID AND MI— CAUSE SEVERE BURNS TO ALL M D Y TISSUE. MAY BE FATAL IC SWALLOWED. HARMFUL I CINHALED. INHALATION MAY CAUSE LUNG DAMAGE.

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

EMERGENCY/FIRST AID

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

DOT Hazard Class: Corrosive Material

SECTION 1 Physical Data

Appearance: Clear, colorless fuming liquid.

Odor: Pungent odor of hydrogen chloride.

Solubility: Infinite in water with slight evolution of heat.

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

Melting Point: -74% (-101°F)

Specific Gravity: 1.18

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

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

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

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

Explosion:
Not considered to be an explosion hazard.

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

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

SECTION 3 Reactivity Data

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

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

Hazardous Polymerization:
Will not occur.

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

SECTION 4 Leak/Spill Disposal Information

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

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

Ensure compliance with local, state and federal regulations

AD

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

SECTION 5 Health Hazard Information

4. EXPOSURE / HEALTH EFFECTS

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

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

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

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

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

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

4

B. FIRST AID

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

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

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

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

C. TOXICITY DATA (RTECS,1986)

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

SECTION 6 Occupational Control Measures

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

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

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

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

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

SECTION 7 Storage and Special Information

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

....

HYD[ROCHLORIC]

Mallinckrodt
Material Safety Data
Emergency Phone Number: 314-982-5000

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

ISOPROPYL ALCOHOL

PRODUCT IDENTIFICATION;

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

Formula CAS No.: 67-63-0

Molecular Weight: 60.10

Chemical Formula: $(CH_3)_2CHOH$

Hazardous Ingredients: Not applicable.

PRECAUTIONARY MEASURES

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

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

EMERGENCY/FIRST AID

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

DOT Hazard Class: Flammable Liquid

SECTION 1 Physical Data

Appearance: Clear, colorless liquid.

Odor. Rubbing alcohol.

Solubility. Infinite in water.

Boiling Point: 82°C (180°F).

Melting Point: -89°C (-128°F).

Specific gravity: 0.79

Vapor Density (Air = 1): 2.1

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

Evaporation Rate: (n-BUAC = 1) 2.83

SECTION 2 Fire and Explosion Information

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

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

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

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

SECTION 3 Reactivity Data

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

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

Hazardous Polymerization:
Will not occur.

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

SECTION 4 Leak/Spill Disposal Information

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

Ensure compliance with local, state and federal regulations.

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

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Material Safety Data

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

ISOPROPYL ALCOHOL

PRODUCT IDENTIFICATION:

Synonyms: 2-propanol; sec-propylalcohol; isopropanol

Formula **CAS No.:** 67-63-0

Molecular Weight: 60.10

Chemical Formula: $(CH_3)_2CHOH$

Hazardous Ingredients: **Not** applicable.

PRECAUTIONARY MEASURES

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

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

EMERGENCY/FIRST AID

If swallowed, **give** water to drink. Induce vomiting if medical help is not immediately available. Never **give anything** by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush skin or eyes with plenty of water for at least 15 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: 2.6, **uel:** 12.0.

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

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

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

SECTION 3 Reactivity Data

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

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

Hazardous Polymerization:
Will not occur.

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

SECTION 4 Leak/Spill Disposal Information

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

Ensure compliance with local, state and federal regulations.

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

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

NITRIC ACID, 70%

PRODUCT IDENTIFICATION:

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

Formula CAS No.: 7697-37-2

Molecular Weight: 63.00

Chemical Formula: HNO_3

Hazardous Ingredients: Not Applicable

PRECAUTIONARY MEASURES

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

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

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 its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.

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

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

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

SECTION 3 Reactivity Data

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

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

Hazardous Polymerization:
Will not occur.

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

SECTION 4 Leak/Spill Disposal Information

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

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

Ensure compliance with local, state and federal regulations.

AD

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

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

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

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

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

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

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

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

B. FIRST AID

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

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

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

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

C. TOXICITY DATA (RTECS, 1982)

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

SECTION 6 Occupational Control Measures

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

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

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

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

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

SECTION 7 Storage and Special Information

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

NITR

recycled paper

Mallinckrodt
Material Safety Data

Emergency Phone Number: 314-982-5000

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

SODIUM HYDROXIDE

PRODUCT IDENTIFICATION:

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

Formula CAS No.: 1310-73-2

Molecular Weight: 40.00

Chemical Formula: NaOH

Hazardous Ingredients: None.

PRECAUTIONARY MEASURES

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

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

EMERGENCY/FIRST AID

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

DOT Hazard Class: **Corrosive Material**

SECTION 1 Physical Data

Appearance: White, deliquescent pellets.

Odor: Odorless.

Solubility: 111 g/100 g of water.

Boiling Point: 1390°C (2534°F)

Melting Point: 318°C (604°F)

Specific Gravity (water = 1): 2.13

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

Vapor Pressure (mm Hg): **Negligible.**

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

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

Explosion:
Not considered to be an **explosion** hazard.

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

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

SECTION 3 Reactivity Data

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

Hazardous Decomposition Products:
Sodium oxide.

Hazardous Polymerization:
This substance does not polymerize.

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

SECTION 4 Leak/Spill Disposal Information

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

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

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

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

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

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

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

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

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

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

B. FIRST AID

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

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

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

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

C. TOXICITY DATA (RTECS, 1982)

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

SECTION 6 Occupational Control Measures

Airborne Exposure Limits:

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

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

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

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

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with 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. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Always add the caustic to water while stirring; never the reverse.

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MC

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Mallinckrodt
Material Safety Data

Emergency Phone Number: 314-982-5000

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

SULFURIC ACID 96%

PRODUCT IDENTIFICATION;

Synonyms: Oil of Vitriol

Formula CAS No: 7664-93-9

Molecular Weight: 98.07

Chemical Formula: H_2SO_4

Hazardous Ingredients: Not applicable.

PRECAUTIONARY MEASURES

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

Do **not** get in eyes, on skin, or on clothing.
Do not breathe mist.

Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
This substance is classified as a POISON under the Federal Caustic Poison Act.

EMERGENCY/FIRST AID

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

DOT Hazard Class: Corrosive Material

SECTION 1 Physical Data

Appearance: Colorless, oily liquid.

Odor: **Odorless.**

Solubility: Infinite @ 20°C.

Boiling Point: ca. 310°C **(590°F)**

Melting **Point:** ca. **-14°C (6°F).**

Specific Gravity: 1.84

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

Vapor Pressure (mm Hg): 1 **@ 146°C (295°F).**

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

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

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

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

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

SECTION 3 Reactivity Data

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

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

Hazardous Polymerization:
Will **not** occur.

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

SECTION 4 Leak/Spill Disposal Information

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

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

Ensure compliance with local, state and federal regulations.

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

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

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

Ingestion:
Corrosive. Swallowing can cruse 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 bum can occur.

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

Chronic Exposurr:
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 respirator). function may be mom 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 waler 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/m³.

SECTION 6 Occupational Control Measures

Airborne Exposure Limits:

- OSHA Permissible Explosure Limit (PEL): 1 mg/m³ (TWA).
- ACGIH Threshold Limit Value (TLV): 1 mg/m³ (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 ran 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 faccpiccc 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 faccpicce 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 arid to water; never odd water to the acid.

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Arsonic

Date 3/26/92

DOT Name/U.N. No. 1558

Job NO. UH8000

CAS Number 7784-42-1

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACQIH Other:

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Arsenia)

Chemical Formula As Molecular Weight 74.9

Physical State Solid Solubility (H2O) Insoluble Boiling Point Sublimes

Flash Point N/A vapor Pressure/Density 0 n Freezing Point N/A

Specific Gravity 5.73 Odor Characteristic N/A Flammable Limits Non

Incompatabilities STRONG OXIDIZERS, BROMINE AZIDE, HYDROGEN GAS

Biological Proportios:

TLV-TWA 0.002 mg/m^3 PEL 0.010 mg/m^3 Odorpdor Threshold Odorless

IDLH 100 mg/m^3 Human Aquatic Rat/Mouse

Route of Exposure Inh, Abs, Ing, Con

Carcinogen Yes Teratogen Mutagen

Handling Recommendations: (Personal protective measures)

Tyvek and safety glasses with full-face respirator available for upgrade.

Monitoring Recommendations:

Continuous Mini-Ram

Disposal/Waste Troataont:

Health Hazards and First Aid:

Eye: wash immediately; skin: wash immediately; Swallow: immediate medical attontion - irritation from exposure requires immediate medical attontion.

Symptoms: Acute: Headache, dizziness, nausea, vomiting, convulsions

Chronic: Coma

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HAZARD EVALUATION OF CHEMICALS

Chemical Nan Benzene

Date 3/23/92

DOT Name/U.N. No. 1114

Job No. UH8000

CAS Number 71-43-2

References Consulted (circle):

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

Toxic and Hazardous Safety Manual   ACGIH   Other:

Rad Health Handbook   NCRP 65   10 CFR 20   Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Benzol, Benzole, Cyclohexatriene)

Chemical Formula C_6H

Molecular Weight 78

Physical State Liquid

solubility (H2O) Slightly

Boiling Point 176°F

Flash Point 12°F

Vapor Pressure/Density 75 mm

Freezing Point 42°F

Specific Gravity 0.879

Odor Characteristic 4.68 ppm

Flammable Limits 1.3-7.1%

Incompatabilities Strong oxidizers, chlorine, bromine

Biological Properties:

TLV-TWA 10 ppm

PEL 1 ppm

Odor/Odor Threshold Aromatic

IDLH 100/CNS

Human

Aquatic

Rat/Mouse 50/24H

Route of Exposure Inhalation, ingestion, eye (ocular), dermal absorption

Carcinogen Human - suspected

Teratogen

Mutagen Experimental

Radiological Proportioa:

Handling Recommendations: (Personal protective measures)

10 ppm use SCBA. Use protective clothing: excel-viton; good-neoprene, saranax; poor-butyl, natural rubber for gloves. Avoid skin/eye contact .

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

Do not induce vomiting or give water or milk; got medical attontion immediately, remove to fresh air, givo artificial respiration if needed, medical attontion, flush with water, rinse/wash akin with soap and water thoroughly

Symptoms:

Acute: Skin irritant, CNS depressant, mostly IHL, initial excitation followed by headache, dizziness, vomiting, delirium, severe exposure may see tremors, blurred vision, shallow respiration, convulsions

Chronic: Anorexia, drowsiness, anemia, bleeding under skin, reduced blood clotting; liver, kidney, bone marrow damage, leukemia

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Cadmium

Date 3/23/92

DOT Name/U.N. No. 2570

Job No. UH8000

CAS Number 7440-43-9

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH . Other :

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics .

Chemical Proportioa: (Synonyms:)

Chemical Formula Cd Molecular Weight 112.4

Physical State solid solubility (H2O) Insoluble Boiling Point 1409° F

Flash Point N/A Vapor Pressure/Density 0 n Freezing Point 610° F

Specific Gravity 8.65 odor Characteristic --- Flammable Limits

Incompatabilities Strong oxidizers

Biological Properties:

TLV-TWA — PEL 0.2 mg/m^3 Odor/Odor Threshold Odorless

IDLH 50 mg/m^3 Human --- Aquatic --- Rat/Mouse —

Route of Exposure Inhalation, Ingestion

Carcinogen X Toratogon nutagen

Radiological Proportioa:

Handling Recommendations: (Personal protective measures)

Monitoring Recommendations:

Mini-Ram

Disposal/Waste Treatment:

Health Hazards and First Aid:

Large quantities of water, induce vomiting, medical attention: remove to fresh air, medical attontion immediately

Symptoms: Acute: irritation of nose and throat, coughing, chest pain, nausea, vomiting, dizziness, chills, stomach distress, diarrhea

Chronic: loss of smell, liver damage, kidnoy damage, cancer ecology and onvironwnt, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Name: Chromium (hexavalent)

Date: 3/23/92

DOT Name/U.N. No.:

Job No.: UH8000

CAS Number: 1440-41-3

References Consulted (circle):

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

Toxic and Hazardous Safety Manual | ACGIH | Other: SAX, Aldrich

Rad Xoalth Handbook | NCRP 65 | 10 CFR 20 | Handbook of Chemistry and Physics

Chemical Properties: (Synonym: Chromic Oxide, soluble chromic salts)

Chemical Formula: Cr

Molecular Weight: 52

Physical state: solid

solubility (H2O): insoluble

boiling Point: 4788°F

Flash Point: N/A

Vapor Pressure/Density: 0 mm

Freezing Point: 3452°F

Specific Gravity: 7.14

Odor Characteristic:

Flammable Limits:

Incompatabilitios: Strong oxidizers

Biological Proportios:

TLV - m: 0.5 mg/m^3

PEL: 1 mg/m^3

Odor/Odor Threshold:

IDLH: N/A

Human:

Aquatic:

Rat/Mouse:

Route of Exposure: Inhalation, Ingostion

Carcinogen:

Teratogen:

Mutagen:

Radiological Proportios:

Handling Recommendations: (Personal protective measures)

APR: any detectable limit- SCBA. Wear gloves and booties. Prevent skin/eye contact.

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

ING: give large amounts of water, induce vomiting, immediate medical attontion. INH: move to fresh air, CPR if necessary, immediate medical attontion. DER: Rinse with largo amounts of water.

Symptoms:

Acute: Contact dermatitis; irritation of mucous membranes and upper respiratory tract, coughing, wheezing, headache, fever, nausea, vomiting.

Chronic: Carcinogen, liver and kidney damage, bronchitis, ulceration of skin, lung cancer.

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Diesel Fuel Date 3/23/92

DOT Name/U.N. lo. 1993 Job No.

CAS Number

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: JP5, Jet Fuel, Diesel Oil, Fuel Oil #2)

Chemical Formula CHx (mixture of hydrocarbons) Molecular Weight varies

Physical State liquid Solubility (H2O) unsoluble Boiling Point 340°F- 675°F

Flash Point 100 F- 136 F Vapor Pressure/Density N/A Freezing Point N/A

Specific Gravity 0.879 odor Characteristic 0.082 ppm Flammable Limits

Incompatabilities Strong oxidizers

Biological Proportioa:

TLV-TWA --- PDL — Odor/Odor Threshold petroleum odor

IDLH --- Human Aquatic Rat/Mouse

Route of Exposure Inhalation, Ingestion, Dermal

Carcinogen possible Toratogen nutagen

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Impervious clothing, neoprene gloves and boots, APR at high concentrations

Monitoring Recommendations:

OVA or HNu with 10.2 eV probe.

Disposal/Waste Treatment:

Health Hazards and First Aid:

Wash skin upon contact; do not induce vomiting if ingested. Seek medical attontion.

Symptoms: Acute: vomitinq, diarrhea, pulmonary edema

Chronic: pneumonia, respiratory paralysis, CNS depressant

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HAZARD EVALUATION OF CHEMICALS

Chemical Name: Hydrogen Cyanide

Date: 3/23/92

DOT Name/U.N. No.: 1051

Job No.: UH8000

CAS Number: 74-90-8

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Formonitrile, Hydrocyanic acid, Prussic acid)

Chemical Formula: HCN Molecular Weight: 27.0

Physical State: liquid/ gas Solubility (H2O): miscible Boiling Point: 78° F

Flash Point: 0 °F Vapor Pressure/Density: 630 mm Freezing Point: 8 °F

Specific Gravity: 0.69 Odor Characteristic: Flammable Limits: Class 1A

Incompatabilities: Acids, oxidizers, amines, sodium hydroxide, calcium hydroxide, sodium carbonate, water

Biological Properties:

TLV-TWA: 4.7 ppm PEL: 4.7 ppm Odor/Odor Threshold: bitter, almond-like

IDLH: 50 ppm Human: Aquatic: Rat/Mouse:

Route of Exposure: Inhalation, Ingestion, Dermal

Carcinogen: --- Teratogen: --- Mutagen: ---

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Monitoring Recommendations:

OVA only. The Ionizing potential for HCN is 13.60 eV, so an HNu would be ineffective.

Disposal/Waste Treatment:

Health Hazards and First Aid:

ING: Give water, induce vomiting, medical attention immediately; INH: move to fresh air, medical attention: DER: wash with soap and water promptly.

Symptoms: Acute: stomach distress, vomiting, diarrhea, black stool, headache, dizziness, metallic taste

Chronic: muscle weakness, joint/muscle pain, insomnia, coma, death

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HAZARD EVALUATION OF CHEMICALS

Chomical Name: Lead

Date: 3/23/92

DOT Name/U.N. no.: 2291

Job no.: UH8000

CAS Number: 7439-92-1

References Consulted (circle):

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

Toxic and Hazardous Safety Manual | ACGIH | Other:

Rad Health Handbook | NCRP 65 | 10 CFR 20 | Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Plumbum)

Chomical Formula: Pb

Molecular Weight: 207.2

Physical State: solid

solubility (H_2O): insoluble

Boiling Point: 3164 F

Flash Point: N/A

Vapor Pressure/Density: 0 mm

Freezing Point: N/A

Specific Gravity: 11.34

Odor Characteristic: N/A

Flammable Limits: N/A

Incompatabilities: Strong oxidizers, hydrogen peroxide, acids

Biological Properties:

TLV-TWA: .100 mg/m^3

PEL: .050 mg/m^3

Odor/Odor Threshold: N/A

IDLH: 700 mg/m^3

Human:

Aquatic:

Rat/Mouse:

Route of Exposure: Inhalation, Ingestion, Dermal

Carcinogen: ---

Teratogen: ---

Mutagen: ---

Radiological Properties:

Handling Recommendations: (Personal protective measures)

5 mg/m^3 high efficiency particulate respirator; other concentrations- SCM: avoid skin contact or ingestion.

Uonitorinq Recommendations:

Disposal/Waste Treatment:

Health Hazards and first Aid:

ING: Give water, induce vomiting, medical attention immediately; INH: move to fresh air, medical attontion: DER: wash with soap and water promptly.

Symptoms:

Acute: stomach distress, vomiting, diarrhea, black stool, headache, dizziness, metallic taste

Chronic: muscle weakness, joint/muscle pain, insomnia, coma. death

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HAZARD EVALUATION OF CHEMICALS

Chemical Nam Methylene Chloride — Date 3/23/92

DOT Name/U.N. No. 1593 — Job No. UH8000

CAS Number 75-09-2

References Consulted (circle):

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

Toxic and Hazardous Safety Manual — ACGIH — Other:

Rad Health Handbook — NCRP 65 — 10 CFR 20 — Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Dichloromethane, Methylene Dichloride)

Chemical Formula CH_2Cl_2 — Molecular Weight

Physical State Liquid — Solubility (H2O) Slightly — Boiling Point 104°F

Flash Point — Vapor Pressure/Density 350 mm Hg — Freezing Point -142°F

Specific Gravity 1.33 — Odor Characteristic Like chloroform — Flammable Limits

Incompatabilities

Biological Proportioa:

TLV-TWA 50 ppm — PEL 500 ppm — Odor/Odor Threshold Sweet, pleasant/160 ppm

IDLH 5,000 ppm — Human — Aquatic — Rat/Mouse

Route of Exposure Oral, inh, ing, derm

Carcinogen Human/animal — Teratogen — Mutagen Experimental

Radiological Proportioa:

N/A

Handling Recommendations: (Personal protective measures)

Tyvek, gloves (PVA, Viton); any detectable concentrations-SCBA: no APR cartridge available

Monitoring Recommendations:

OVA continuously

Disposal/Waste Treatment:

Health Hazards and First Aid:

Inh: move to fresh air, APR if necessary; Eye/skin: flush with water for 15 minutes, wash akin with soap/water; Ing: seek medical attontion

Symptoms: Acute: Mental coafuaion, light-headedness, nausea/vomiting, headache, staggering, unconsciousness, irritation of eyes/resp/skin, akin burns

Chronic: Heart palpitations, malaise, death

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Mercury Date 3/13/92

DOT Name/U.N. No. 2809 Job No. UH8000

CAS Number 7439-97-6

References Consulted (circle):

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

Toric and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Colloidal mercury, Metallic mercury, Quicksilver)

Chemical Formula Hg Molecular night 200

Physical State liquid solubility (H2O) Insoluble Boiling Point 674° F

Flash Point N/A Vapor Pressure/Density 0.0012 mm Freezing Point -38° F

Specific Gravity 13.6 Odor Characteristic N/A Flammable Limits Non

Incompatabilities Acetylene, ammonina, chlorine dioxide, asides, calcium, sodium carbide, lithium, rubidium, and copper

Biological Properties:

TLV-TWA 0.05 mg/m³ PEL 0.05 mg/m³ Odor/Odor Threshold odorless

IDLH 28 mg/m³ Human Aquatic Rat/Mouse

Route of Exposure Ingestion, Inhalation, Dermal

Carcinogen Teratogen Mutagen

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

INH & ING: seek medical attontion promptly: DER: wash with soap and water.

symptoms: Acute: couqh: chest pain: temor; indocision: headache; weak; irrition of eyes and skin

Chronic: GI tract depression

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HAZARD EVALUATION OF CHEMICALS

Chemical Name: Phenol

Date: 3/23/92

DOT Name/U.N. No.: 1671

Job No.: UH8000

CAS Number: 108-95-2

References Consulted (circle):

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

Toxic and Hazardous Safety Manual   ACGIH   Other: ____

Chemical Properties: (Synonyms: Carbolic Acid, Phonic Acid, Phenyl Hydroxide)

Chemical Formula: C_6H_5OH Molecular Weight: 94.11

Physical State: Solid/Liquid   Solubility (H2O): 9%   Boiling Point: 359°F

Flash Point: 175°F   Vapor Pressure/Density: 40 mm   Freezing Point: ____

Specific Gravity: 1.06   Odor Characteristic: .05 ppm   Flammable Limits: ____

Incompatabilities: Strong oxidisors, calcium hypochloritm, aluminum chloride acid

Biological Properties:

TLV-TWA: 5 ppm   PEL: 5 ppm   Odor/Odor Threshold: Sweet, pungmnt. aromatic

IDLH: 250 ppm   Human: ____   Aquatic: ____   Rat/Mouse: ____

Route of Exposure: Inh, eye, dorm, ing,

Carcinogen: Suspect   Teratogen: Experimental   Mutagen: Experimental

Handling Recommendations: (Personal protective measures)

Apr: Dusty/windy condition or known high conentration of >1 but <5 ppo: SCBA >5 ppa Tyvek and gloves (Neoprene ‾ 10 hours, Butyl ‾ 8 hours)

Uonitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

Inh: move to fresh air, APR if necessary; Eye/skin: flush with water for 15 minutes/wash skin with soap and water; Ing: do not induce vomiting; instead, give milk, egg white, or water, and seek medical attention.

Symptoms:

Acute: Vomiting, difficulty swallowing, diarrhea, loss of appetite, headache, fainting, dizziness, dark urine, skin rash/whitening of color

Chronic: Liver or kidney damage, eye damage/blindness, circulatory collapse, paralysis, convulsions, coma

[FS]FO5000:60

ecology and onvironmont, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Name Toluene

Date 3/23/92

DOT Name/U.N. No. 1294

Job No. UH8000

CAS Number 108-88-3

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other :

Rad Health Handbook NCRP 65 io CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (synonym: Methyl benzene, Toluol, Phenyl methane)

Chemical Formula C_7H_8 nolocular Weight 92

Physical State Colorless Liquid Solubility (H2O) 0.05g/100 H_2O Boiling Point 231°F

Flash Point 40°F Vapor Pressure/Density 22mm Freezing Point -139°F

Specific Gravity 0.8669 Odor Characteristic 0.2ppm Flammable Limits 1.38 - 7.18

Incompatabilities Strong Oxidisers, HNO_3, H_2SO_4, O_2, Peroxides, Heat

Biological Properties:

TLV-TWA 100 ppm PEL 200 ppm Odor/Odor Threshold Benzene-Like

IDLH 2,000 ppm Human IHL TCLD - 200 ppm Aquatic 96:100-10 ppm Rat/Mouse 4000 ppm

Route ot Exposure Inhalation, Ingestion, Dermal Contact. Eye (Ocular)

Carcinogen Experimental Teratogen Experimental Mutagen Experimental

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Impervious clothing, Viton gloves, faceshield respirator w/organic vapor cartridge up to 1000 ppm,

>1000 ppm use APR with chemical cartridgo: 2000 ppm-SCBA

Monitoring Recommendations:

Disposal/Waste Treatment:

Concentrated: incineration; dilute discharge to municipal sewer after primary treatment, incineration for dilute organic mixture

Health Hazards and First Aid:

Flush area with water and wash with soap; move to fresh air if inhaled; if swallowed, do not induce vomiting. Contact physician immediately.

Symptoms: Acute: Dizziness, fatigue, nausea, headache, vomiting, irritates eyes, dries skin

Chronic: Bone marrow, depression, defatting of akin. dermatitis, kidney and/or liver damage if ingested

La>

ecology and onvironmnt, inc.

HAZARD EVALUATION OF CHEMICALS

Chemical Name 1,1,2-Trichloroethane

Date 3/23/92

DOT Name/U.N. No. 2831

Job No. UH8000

CAS Number 79-00-5

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonym: beta-Trichloroethane, Vinyl trichloride)

Chemical Formula $CHCl_2CH_2Cl$ Molecular Weight 133.4

Physical State liquid Solubility (H2O) 0.4% Boiling Point 237° F

Flash Point N/A Vapor Pressure/Density 19 mm Freezing Point -34° F

Specific Gravity 1.44 Odor Characteristic Flammable Limits

Incompatabilities Strong caustics or oxidizers, chemically-active metals

Biological Properties:

TLV-TWA 10 ppm PEL 10 ppm Odor/Odor Threshold chloroform like

IDLH 500 ppm Human Aquatic Rat/Mouse

Route of Exposure Ingestion, Inhalation, Dermal

Carcinogen X Teratogen Mutagen

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Monitoring Recommendations:

OVA or HNu with tho 11.7 eV probe.

Disposal/Waste Treatment:

Health Hazards and First Aid:

INH L ING: seek medical attention promptly: DER: wash with soap and water.

Symptoms: Acute: light headed, drowsiness, headache, irritation of eyes and akin

Chronic: CNS depression, liver or kidney damage

APPENDIX B

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN

Section 1.0 -- Title Page

Vork Plan Group: F
Site No.: 9
Site Name: Navy Yard Disposal Area

prepared by: Joseph F. Pugitt
Ecology and Environment, Inc.
1203 Governor's Square Blvd., 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 6 E Project Manager: ____________
J. Barksdale

E 6 E Regional QA/QC Coordinator: ____________
K. Walker

E 6 E ASC Director: ____________
A. Clifton

E 6 E QA/QC Project Officer: ____________
M. Meredith

Section 2.0 _Table of Contents

ecology and environment, inc.

Title: SOP-Heat Stress Monitoring

Category: E 6 S, TRAINING 2.8

Revised: JANUARY 1990

Approved: H. Van Cleave

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

REVISED JANUARY 1990

Prepared by

Ecology and Environment, Inc.
368 Pleasantview Drive
Lancaster, New York 14086

CONTENTS

1 INTRODUCTION

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

2 SCOPE

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

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

3 OBJECTIVES

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

4 EFFECTS OF HEAT

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

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

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

4.1 BEAT CRAMPS

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

4.1.1 Symptoms

The symptoms of heat cramps include the folloving:

o Muscle cramps in legs, arms, or abdomen;

o Pain accompanying the cramps;

o Profuse perspiration: and

o Faintness.

4.1.2 Emergency Care

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

4.2 BEAT EXHAUSTION

Beat exhaustion occurs in individuals vorking in hot environments and may be associated vith heat cramps. Beat 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 blood. The blood vessels in the skin become dilated and a large amount of blood is pooled in the skin. This condition, plus the blood pooled in the lover extremities when an individual is in an upright position, may lead to an inadequate return of blood to the heart and eventually to physical collapse.

4.2.1 Symptoms

The symptoms of heat exhaustion are as follovs:

- o Pale clammy skin,
- o Profuse perspiration,
- o Generalized veakness,
- o Dizziness,
- o Veak pulse,
- o Rapid and usually shallow breathing,
- o Unconsciousness, and
- o Appearance of having fainted (the patient vill respond to the same treatment that is administered in cases of fainting).

4.2.2 Emergency Care

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

4.3 HEAT STROKE

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

4.3.1 Symptoms

Folloving are the symptoms of heat stroke (note the absence of irati

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

4.3.2 Emergency Care

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

5 PREVENTION OF HEAT STRESS

Please note that in the case of heat cramps or heat exhaustion, Gatorade or its equivalent is suggested as part of the treatment regime. The reason for this type of liquid refreshment is that such beverages vill return much-needed electrolytes to the body's system. Vithout these electrolytes, body systems cannot function properly, and the represented health hazard vill be increased. Therefore, vhen personnel are vorking in situations vhere the ambient temperatures and humidity are high, and especially in situations vhere levels A, B, and C of protective apparel are required, the SSO must follov the procedures listed belov:

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

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

5.1 GUIDELINES FOR USE OF PROTECTIVE CLOTHING

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

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

5.2 HEARTRATE MONITORING

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

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

If the recovery pulse rate during the last 30 seconds of the first minute is at 110 beats/minute or less and the deceleration between the first, second, and third minutes is at least 10 beats/minute, the vork-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.

5.3 HONITORING PERSONNEL BODY TEMPERATURE AND BLOOD PRESSURE

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

s.4 MONITORING THE WORK AREA FOR HEAT STRESS CONDITIONS

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

6 DECONTAMINATION

As in other medical emergencies, decontamination should proceed as normally as possible vithout contributing unduly to the victim's stress or injury. At a minimum, the protective clothing should be removed as he or she is *taken* from the hazardous zone. The "buddy system" is always in effect and backup personnel should be available at the decontamination station to either suit up and assist in extraction or to help decontaminate and undress the victim. If other serious injuries or more life-threatening conditions exist, and the victim cannot be disrobed or decontaminated completely, the victim (or contaminated portions) should be vrapped in plastic (or other protective material) for his or her ovn safety as vell as the safety of ambulance and hospital personnel. Carefully avoid action that vould result in the victim's being further overheated.

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Material Safety Data Sheet

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

Emergency Telephone Number: 314-982-5000

HYDROCHLORIC ACID, 37%

PRODUCT IDENTIFICATION:

Synonyms: Muriatic acid

Formula CAS No.: 7647010

Molecular Weight: 36.46 (HCl)

Chemical Formula: HCl

Hazardous Ingredients: Hydrogen chloride

PRECAUTIONARY MEASI

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

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

EMERGENCY/FIRST AID

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

DOT Hazard Class: Corrosive Material

SECTION 1 Physical Data

Appearance: Clear, colorless fuming liquid.

Odor: Pungent odor of hydrogen chloride.

Solubility: Infinite in water with slight evolution of heat.

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

Melting Point: -74°C (-101°F)

Specific Gravity: 1.18

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

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

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

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

Explosion:
Not considered to be an explosion hazard.

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

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

SECTION 3 Reactivity Data

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

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

Hazardous Polymerization:
Will not occur.

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

SECTION 4 Leak/Spill Disposal Information

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

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

Ensure compliance with local, state and federal regulations

AD

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

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

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

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

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

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

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

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

4

B. FIRST AID

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

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

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

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

C. TOXICITY DATA (RTECS, 1986)

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

SECTION 6 Occupational Control Measures

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

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of 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:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.

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

...ial Information

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

HYDC

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Emergency Phone Number: 314-982-5000

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

recycled paper

ISOPROPYL ALCOHOL

PRODUCT IDENTIFICATION:

i) ol; sec ol; iso anol

Formula CAS No.: 67-63-0

Molecular Weight: 60.10

i al Fo () H

I : Not bl

PRECAUTIONARY MEASURES

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

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

EMERGENCY/FIRST AID

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

DOT Hazard Class: Flammable Liquid

SECTION 1 Physical Data

Appearance: Clear, colorless liquid.

Odor: Rubbing alcohol.

Solubility: Infinite in water.

Boiling Point: 82°C (180°F).

Melting Point: -89°C (-128°F).

Specific gravity: 0.79

Vapor Density (Air = 1): 2.1

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

Evaporation Rate: (n-BUAC = 1) 2.83

SECTION 2 Fire and Explosion Information

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

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

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

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

SECTION 3 Reactivity Data

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

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

Hazardous Polymerization:
Will not occur.

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

SECTION 4 Leak/Spill Disposal Information

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

Ensure compliance with local, state and federal regulations.

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

Mallinckrodt
Material Safety Data

Emergency Phone Number: 314-982-5000

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

ISOPROPYL ALCOHOL

PRODUCT IDENTIFICATION;

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

Formula CAS No.: 67-63-0

Molecular Weight: **60.10**

Chemical Formula: $(CH_3)_2$ CHOH

Hazardous Ingredients: **Not** applicable.

PRECAUTIONARY MEASURES

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

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

EMERGENC' /FI T AID

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

SEE SECTION 5.

DOT Hazard Class: Flammable **Liquid**

SECTION 1 Physical Data

Appearance: Clear, colorless liquid.

Odor: Rubbing alcohol.

Solubility: Infinite in water.

Boiling Point: **82°C (180°F).**

Melting Point: -89°C (-128°F).

Specific gravity: 0.79

Vapor Density **(Air = 1): 2.1**

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

Evaporation Rate: (n-BUAC = 1) 2.83

SECTION 2 Fire and Explosion Information

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

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

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

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

SECTION 3 Reactivity Data

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

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

Hazardous Polymerization:
Will not occur.

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

SECTION 4 Leak/Spill Disposal Information

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

Ensure compliance with local, state and federal regulations.

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

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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.

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 HAY **CAUSE FIRE. CORROSIVE. LIQUID** *AND* **MIST CAUSE SEVERE** BURNS **TO ALL BODY TISSUE.** HAY **BE FATAL IF SWALLOWED. HARMFUL IC 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

Inc w *d* **contact,** immediately flush skin or eyes with plenty of **water** for at least IS minutes. **If swallowed,** DO NOT INDUCE VOMITING! **Give** large quantities *d* 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 cares call a physician.
SEE SECTION 5.

DOT Hazard Class: Oxidizer

SECTION 1 Physical Data

Appearance: Clear, colorless to slightly yellow liquid.

Odor. Suffocating acrid.

Solubility: Infinite in water.

Boiling Point: 122°C **(252°F)**

Melting Point: -34°C (-29°F)

Specific **Gravity: 1.41**

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

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

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

Fire:
Not combustible, but substance is a strong oxidizer and its heat *d* 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 *d* 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 *d* **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 *M* **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 quipmcnt 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.

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

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

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

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

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

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

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

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

B. FIRST AID

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

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

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

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

C. TOXICITY DATA (RTECS, 1982)

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

SECTION 6 Occupational Control Measures

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

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

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

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

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

SECTION 7 Storage and Special Information

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

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Material Safety Data

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

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

SODIUM HYDROXIDE

PRODUCT IDENTIFICATION:

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

Formula CAS No.: **1310-73-2**

Molecular Weight: 40.00

Chemical Formula: NaOH

Hazardous Ingredients: None.

PRECAUTIONARY MEASURES

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

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

EMERGENCY/FIRST AID

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

DOT Hazard Class: Corrosive Material

SECTION 1 Physical Data

Appearance: While, deliquescent pellets.

Odor: Odorless.

Solubility: **111 g/100 g of water.**

Boiling Point: **1390°C (2534°F)**

Melting Point: 318°C **(604°F)**

Specific Gravity (water = 1): 2.13

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

Vapor Pressure (mm Hg): Negligible.

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

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

Explosion:
Not considered to be an explosion hwrd.

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

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

SECTION 3 Reactivity Data

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

Hazardous Decomposition Products:
Sodium oaidc.

Hazardous Polymerization:
This substance does not polymerize.

Incompatibilities:
Contact 4 t h **water, acids,** flammable liquids, and organic halogen compounds, **especially** trichloroethylene, may **cause fire** or explosion. **Contact** with nitromethane and other similar nitro **compounds** causes formation of shock-sensitive salts. Contact with **metals** such as aluminum. tin, and **zinc** causes **formation of flammable hydrogen gas.**

SECTION 4 Leak/Spill Disposal Information

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

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

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

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

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

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

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

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

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

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

B. FIRST AID

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

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

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

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

C. TOXICITY DATA (RTECS, 1982)

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

SECTION 6 Occupational Control Measures

Airborne Exposure Limits:

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

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

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

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

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with 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. Protect from physical damage. Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities. Always add the caustic to water while stirring; never the reverse.

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Mallinckrodt
Material Safety Data

Emergency Phone Number: 314-982-5000

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

SULFURIC ACID *96%*

PROD ATION

Synonyms: Oil of Vitriol

Formula CAS No.: 7664-93-9

Molecular Weight: 1 0 7

Chemical Formula: H_2SO_4

Hazardous Ingredients: Not applicable.

BRECAUTIONARY MEASURES

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

Do not gel in eyes, on skin, or on hi
or breathe mist.
Keep ntai closed.
Use only with adequate ventilation.
Wash after
This substance is classified as a POISON under the al Caustic **Poison Act.**

EMERGENCY/FIRS 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, loom or carbon dioxide. Water spray may be used to keep fire exposed containers cool.

S w i r l **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 Lea

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 n r t e 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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HAZARD EVALUATION OF CHEMICALS

Chemical Name Arsenic

Date 3/26/92

DOT Name/U.N. no. 1558

Job No. UH8000

CAS Number 7784-42-1

References Consulted (circle):

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

Toxic and Hazardous Safety Manual   ACGIH   Other:

Rad Health Handbook   NCRP 65   10 CFR 20   Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Arsenia

Chemical Formula As   Molecular Weight 74.9

Physical State Solid   solubility (H2O) Insoluble   Boiling Point Sublimes

Flash Point N/A   vapor Pressure/Density 0 mm   Freezing Point N/A

Specific Gravity S.73   Odor Characteristic N/A   Flammable Limits Uon

Incompatabilities STRONG OXIDIZERS, BROMINE AZIDE, HYDROGEN GAS

Biological Properties:

TLV-TWA 0.002 mg/m3   PEL 0.010 mg/m^3 Odor/Odor Threshold Odorless

IDLH 100 mg/m^3 Human   Aquatic   Rat/Mouse

Route of Exposure Inh, Abs, Ing, Con

Carcinogen Yes   Teratogen   Mutagen

Handling Recommendations: (Personal protective measures)

Tyvek and safety glasses with full-taco respirator available for upgrade.

Monitoring Recommendations:

Continuous Mini-Ram

Disposal/Waste Treatment:

Health Hazards and First Aid:

Eye: wash immediately; skin: wash immediately; Swallow: immediate medical attontion - irritation from exposure requires immediate medical attention.

Symptoms: Acute: Headache, dizziness, nausea, voritinq, convulsions

Chronic: Coma

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HAZARD EVALUATION OF CHEMICALS

Chemical Nan Benzene

Date 3/23/92

DOT Name/U.N. No. 1114

Job lo. UH8000

CAS Number 71-43-2

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Benzol, Benzole, Cyclohexatriene)

Chemical Formula C_6H_6 Molecular Weight 78

Physical State Liquid Solubility (H2O) Slightly Boiling Point 176°F

Flash Point 12°F Vapor Pressure/Density 75 mm Freezing Point 42°F

Specific Gravity 0.879 Odor Characteristic 4.68 ppm Flammable Limits 1.3-7.1%

Incompatabilities Strong oxidizers, chlorine, bromine

Biological Properties:

TLV-TWA 10 ppm PEL 1 ppm Odor/Odor Threshold Aromatic

IDLX 100/CNS Human Aquatic Rat/Mouse 50/24H

Route of Exposure Inhalation, ingestion, eye (ocular), dermal absorption

Carcinogen Human - suspected Toratogon Mutagen Experimental

Radiological Proportios:

Handling Recommendations: (Personal protective measures)

10 ppm use SCBA. Use protoctivo clothing: excel-viton; good-neoprene, saranax; poor-butyl, natural rubber tor gloves. Avoid skin/eye contact .

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

Do not induce vomiting or give water or milk: got medical attontion immediately, remove to fresh air, give artificial respiration it needed, medical attontion, flush with water, rinse/wash skin with soap and water thoroughly

symptoms: Acute: Skin irritant, CNS depressant, mostly IHL, initial excitation followed by headache, dizziness, vomiting, delirium, severe exposure may see tremors, blurred vision, shallow respiration, convulsions

onic Anorexia drowsiness, anomia, blooding under mkin, educed blood clotting: liver, bono marrow damage, leukemia

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HAZARD EVALUATION OF CHEMICALS

Chemical Name: Cadmium Date: 3/23/92

DOT Name/U.N. No.: 2570 Job No.: UH8000

CAS Number: 7440-43-9

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH . Other:

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics .

Chemical Properties: (Synonyms:)

Chemical Formula: Cd Molecular Weight: 112.4

Physical State: solid Solubility (H2O): Insoluble Boiling Point: 1409° F

Flash Point: N/A Vapor Pressure/Density: 0 n Freezing Point: 610° F

Specific Gravity: 8.65 Odor Characteristic: --- Flammable Limits:

Incompatabilities: Strong oxidizers

Biological Properties:

TLV-TWA: — PEL: 0.2 mg/m3 Odor/Odor Threshold: Odorless

IDLH: 50 mg/m3 Human: --- Aquatic: --- Rat/Mouse: —

Route of Exposure: Inhalation, Ingestion

Carcinogen: X Teratogen: nutagen:

Radiological Properties:

Handling Recommendations: (Personal protective measures)

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nonitoring Recommendations:

Mini-Ram

Disposal/Waste Treatment:

Health Hazards and First Aid:

Largo quantities of water, induce vomiting, medical attontion: remove to fresh air, medical attantion immediately

Symptoms: Acute: irritation of nose and throat, coughing, chest pain, nausea, vomiting, dissiness, chills, stomach distress, diarrhea

Chronic: loss of smell, liver damage, kidney damage, cancer

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HAZARD EVALUATION OF CHEMICALS

Chemical Name: Chromium (hexavalent) Date: 3/23/92

DOT Name/U.N. no. Job No. UH8000

CAS Number: 7440-47-3

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other: SAX, Aldrich

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Proportiom: (Synonyms: Chromic oxide, soluble chromic malts)

Chemical Formula: Cr Molecular Weight: 52

Physical State: solid solubility (H2O): insoluble Boiling Point: 4788°F

Flash Point: N/A Vapor Pressure/Density: 0 mm Freezing Point: 3452°F

Specific Gravity: 7.14 Odor Charactorimtic: Flammable Limits:

Incompatabilities: Strong oxidizers

Biological Proportiom:

TLV-TWA: 0.5 mg/m^3 PEL: 1 mg/m^3 Odor/Odor Threshold:

IDLH: N/A Human: Aquatic: Rat/Mouse:

Route of Exposure: Inhalation, Ingestion

Carcinogen: Teratogen: Mutagen:

Radiological Proportiom:

Handling Recommendations: (Personal protective measures)

APR: any detectable limit- SCBA. Wear gloves and booties. Prevent skin/eye contact.

4

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

ING: give largo amounts of water, induce vomiting, immediate medical attontion. INH: move to fresh air, CPR it necessary, immediate medical attontion. DER: Rinse with largo amounts of water.

Symptoms:

Acute: Contact dermatitis; irritation of mucous membranes and upper respiratory tract, coughing, wheezing, headache, fever, nausea, vomiting.

Chronic: Carcinogen, liver and kidney damage, bronchitis, ulceration of skin, lung cancer.

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Diesel Fuel
Date 3/23/92

DOT Name/U.N. lo. 1993
Job lo.

CAS Number

References Consulted (circle):

NIOSH/OSHA Pocket Guide   Verschueren   Merck Index   Hazardline   Chris (Vol. 111

Toxic and Hazardous Safety Manual   ACGIH   Other:

Rad Health Handbook   NCRP 65   io CFR 20   Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: JP5, Jet Fuel, Diesel Oil, Fuel Oil #2)

Chemical Formula CHx (mixture of hydrocarbons)   Molecular Weight varies

Physical State liquid   Solubility (H2O) unsoluble   Boiling Point 340°F- 675°F

Flash Point 100 I- 136 I   Vapor Pressure/Density N/A   Freezing Point N/A

Specific Gravity 0.879   odor Characteristic 0.082 ppm   Flammable Limits

Incompatabilities Strong oxidizers

Biological Properties:

TLV-TWA ---   PEL —   Odor/Odor Threshold petroleum odor

IDLH ---   Human   Aquatic   Rat/Mouse

Route of Exposure Inhalation, Ingestion, Dermal

Carcinogen possible   Toratogen   Mutagen

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Impervious clothing, neoprene gloves and boots, APR at high concentrations

Monitoring Recommendations:

OVA or HNu with 10.2 eV probe.

Disposal/Waste Treatment:

Health Hazards and First Aid:

Wash akin upon contact: do not induce vomiting if ingested. Seek medical attontion.

Symptoms: Acute: vomiting, diarrhea, pulmonary edema

Chronic: pneumonia, respiratory paralysis, CNS depressant ecology and onvironront, inc.

HAZARD EVALUATION OF CHEMICALS

Chomical Name: Hydrogen Cyanide — Date: 3/23/92

DOT Name/U.N. No.: 1051 — Job No.: UH8000

CAS Number: 74-90-8

References Consulted (circle):

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

Toxic and Hazardous Safety Manual — ACGIH — Other:

Rad Health Handbook — NCRP 65 — 10 CFR 20 — Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Cormonitrilo, Hydrocyanic acid, Prussic acid)

Chemical Formula: HCN — Molecular Weight: 27.0

Physical State: liquid/ gas — Solubility (H2O): miscible — Boiling Point: 78° F

Flash Point: 0 °F — Vapor Pressure/Density: 630 mm — Freezing Point: 8 °F

Specific Gravity: 0.69 — Odor Characteristic: — Flammable Limits: Class 1A

Incompatabilities: Acids, oxidizers, amines, sodium hydroxide, calcium hydroxido, sodium carbonate, water

Biological Properties:

TLV-TWA: 4.7 ppm — PEL: 4.1 ppm — Odor/Odor Threshold: bitter, almond-like

IDLH: 50 ppm — Human: — Aquatic: — Rat/Mouse:

Route of Exposure: Inhalation, Ingestion, Dermal

Carcinogen: --- — Teratogen: --- — Mutagen: ---

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Monitoring Recommendations:

OVA only. Tho Ionizing potential for HCN is 13.60 eV, so an HNu would bo ineffective.

Disposal/Waste Treatment:

Health Hazards and First Aid:

ING: Give water, induce vomiting, medical attontion immediately; INH: move to fresh air, medical attention: DEI: wash with soap and water promptly.

Symptoms:

Acute: stomach distress, vomiting, diarrhea, black stool, headache, dizziness, metallic taste

Chronic: muscle weakness, joint/muscle pain, insomnia, coma, death

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Load

Date 3/23/92

DOT Name/U.N. No. 2291

Job No. UH8000

CAS Number 7439-92-1

References Consulted (circle):

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

Toxic and Hazardous Safety Manual   ACGIH   Other:

Rad Health Handbook   NCRP 65   10 CFR 20   Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Plumbum)

Chemical Formula Pb   Molecular Weight 207.2

Physical State solid   solubility (H2O) insoluble   Boiling Point 3164 F

Flash Point N/A   Vapor Pressure/Density 0 mm   Freezing Point N/A

Specific Gravity 11.34   Odor Characteristic N/A   Flammable Limits N/A

Incompatabilities Strong oxidizers, hydrogen peroxide, acids

Biological Properties:

TLV-TWA .100 mg/m^3 PEL .050 mg/m^3 Odor/Odor Threshold N/A

IDLH 700 mg/m^3 Human   Aquatic   Rat/Mouse

Route of Exposure Inhalation, Ingestion, Dermal

Carcinogen ---   Teratogen ---   Mutagen ---

Radiological Properties:

Handling Recommendations: (Personal protective measures)

5 mg/m^3 high efficiency particulate respirator; other concentrations- SCM: avoid skin contact or ingestion.

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

ING: Give water, induce vomiting, medical attention immediately; INH: move to fresh air, medical attention; DER: wash with soap and water promptly.

Symptoms: Acute: stomach distress, vomiting, diarrhea, black stool, headache, dizziness, metallic taste

Chronic: muscle weakness, joint/muscle pain, insomnia, coma, death

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Methylene Chloride

Date 3/23/92

DOT Name/U.N. No. 1593

Job No. UH8000

CAS Number 75-09-2

References Consulted (circle):

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

Toxic and Hazardous Safety Manual   ACGIH   Other:

Rad Health Handbook   NCRP 65   10 CFR 20   Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Dichloromethane, Methylene Dichloride)

Chemical Formula CH_2Cl_2 Molecular Weight

Physical State Liquid   Solubility (H2O) Slightly   Boiling Point 104°F

Flash Point   Vapor Pressure/Density 350 mm Hg   Freezing Point -142°F

Specific Gravity 1.33   Odor Characteristic Like chloroform   Flammable Limits

Incompatabilities

Biological Properties:

TLV-TWA 50 ppm   PEL 500 ppm   Odor/Odor Threshold Sweet, pleasant/160 ppm

IDLH 5,000 ppm   Human   Aquatic   Rat/Mouse

Route of Exposure Oral, inh, ing, derm

Carcinogen Human/animal   Teratogen   Mutagen Experimental

Radiological Properties:

N/A

Handling Recommendations: (Personal protective measures)

Tyvek, gloves (PVA, Viton); any detectable concentrations-SCBA: no APR cartridge available

Monitoring Recommendations:

OVA continuously

Disposal/Waste Treatment:

Health Hazards and First Aid:

Inh: move to fresh air, APR if necessary; Eye/skin: flush with water for 15 minutes, wash skin with soap/water; Ing: seek medical attention

Symptom: Acute: Mental confusion, light-headedness, nausea/vomiting, headache, staggering, unconsciousness, irritation of eyes/resp/skin, skin burns

Chronic: Heart palpitations, malaise, death

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HAZARD EVALUATION OF CHEMICALS

Chemical Name Mercury

Date 3/23/92

DOT Name/U.N. No. 2809

Job No. UH8000

CAS Number 7439-97-6

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other :

Rad Health Handbook NCRP 65 10 CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Colloidal mercury, Metallic mercury, Quicksilver)

Chemical Formula Hg

Molecular Weight 200

Physical State liquid

Solubility (H2O) Insoluble

Boiling Point 674° F

Flash Point N/A

Vapor Pressure/Density 0.0012 mm

Freezing Point -38° F

Specific Gravity 13.6

Odor Characteristic N/A

Flammable Limits Non

Incompatibilities Acetylene, ammonina, chlorine dioxide, azides, calcium, sodium carbide, lithium, rubidium, and copper

Biological Properties:

TLV-TWA 0.05 mg/m^3

PEL 0.05 mg/m^3

Odor/Odor Threshold odorless

IDLH 28 mg/m^3

Human

Aquatic

Rat/Mouse

Route of Exposure Ingestion, Inhalation, Dermal

Carcinogen

Teratogen

Mutagen

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

INH & ING: seek medical attontion promptly: DER: wash with soap and water.

Symptoms: Acute: cough: chest pain: temor; indecision; headache; weak; irrition of eyes and skin

Chronic: GI tract depression

HAZARD EVALUATION OF CHEMICALS

Chemical Name Phenol | Date 3/13/92

DOT Name/U.N. No. 1671 | Job No. UH8000

CAS Number 108-95-2

References Consulted (circle):

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

toxic and Hazardous Safety Manual | ACGIH | Other:

Chemical Properties: (Synonyms: Carbolic Acid. Phonic Acid, Phenyl Hydroxide)

Chemical Formula C_6H_5OH | Molecular Weight 94.11

Physical State Solid/Liquid | Solubility (H2O) 9% | Boiling Point 359°F

Flash Point 175°F | Vapor Pressure/Density 40 mm | Freezing Point

Specific Gravity 1.06 | Odor Characteristic .05 ppm | Flammable Limits

Incompatabilities Strong oxidizers, calcium hypochlorite, aluminum chloride acid

Biological Properties:

TLV-TWA 5 ppm | PEL 5 ppm | Odor/Odor Threshold Sweet, pungent, aromatic

IDLH 250 ppm | Human | Aquatic | Rat/Mouse

Route of Exposure Inh. eye, derm, ing,

Carcinogen Suspect | Teratogen Experimental | Mutagen Experimental

Handling Recommendations: (Personal protective measures)

Apr: Dusty/windy condition or known high conentration of >1 but <5 ppa: SCBA >5 ppa Tyvek and gloves (Neoprene ‾ 10 hours, Butyl ‾ 8 hours)

Monitoring Recommendations:

Disposal/Waste Treatment:

Health Hazards and First Aid:

Inh: move to fresh air, APR if necessary; Eye/skin: flush with water tor 15 minutes/wash skin with soap and water: Ing: do not induce vomiting; instead, give milk, egg white. or water. and seek medical attention.

Symptoms: Acute: Vomiting, difficulty swallowing, diarrhea, loss of appetite, headache, fainting, dizziness, dark urine, akin rash/whitening of color

Chronic: Liver or kidney damage, eye damage/blindness, circulatory collapse, paralysis. convulaiona, coma

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HAZARD EVALUATION OF CHEMICALS

Chemical Haw Toluene   Date 3/23/92

DOT Name/U.N. Ho. 1294   Job No. UH8000

CAS Number 108-88-3

References Consulted (circle):

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

Toxic and Hazardous Safety Manual ACGIH Other:

Rad Health Handbook NCRP 65 io CFR 20 Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: Methyl benzene, Toluol, Phenyl methane)

Chemical Formula C_7H_8 Molecular Weight 92

Physical State Colorless Liquid   Solubility (H2O) 0.05g/100 H_2O Boiling Point 231°F

Flash Point 40°F   Vapor Pressure/Density 22mm   Freezing Point -139°F

Specific Gravity 0.8669   Odor Characteristic 0.2ppm   Flammable Limits 1.3% - 7.12

Incompatabilities Strong Oxidizers, HNO_3, H_2SO_4, O_2, Peroxides, Heat

Biological Properties:

TLV-TWA 100 ppm   PEL 200 ppm   Odor/Odor Threshold Benzene-Like

IDLH 2,000 ppm   Human IHL TCLD - 200 ppm   Aquatic 96:100-10 ppm   Rat/Mouse 4000 ppm

Route of Exposure Inhalation, Ingestion, Dermal Contact, Eye (Ocular)

Carcinogen Experimental   Teratogen Experimental   Mutagen Experimental

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Impervious clothing, Piton gloves, faceshield respirator w/organic vapor cartridgo up to 1000 ppm, >1000 ppm use APR with chemical cartridgo: 2000 ppm-SCBA

Monitoring Recommendations:

Disposal/Waste Treatment:

Concentrated: incineration; dilute discharge to municipal sewer after primary treatment, incineration for dilute organic mixture

Health Hazards and First hid:

Flush area with water and wash vith soap: move to fresh air if inhaled; if swallowed, do not induce vomiting. Contact physician immediately.

Symptoms: Acute: Dizziness, fatigue, nausea, headache, vomiting, irritates eyes, dries skin

Chronic: Bone marrow, depression, dotatting of skin, dermatitis, kidney and/or liver damage if ingested

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HAZARD EVALUATION OF CHEMICALS

Chemical Name 1,1,2-Trichloroethane

Date 3/23/92

DOT Name/U.N. No. 2831

Job No. UH8000

CAS Number 79-00-5

References Consulted (circle):

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

Toxic and Hazardous Safety Manual   ACGIH   Other:

Rad Health Handbook   NCRP 65   io CFR 20   Handbook of Chemistry and Physics

Chemical Properties: (Synonyms: beta-Trichloroethane, Vinyl trichloride)

Chemical Formula $CHCl_2CH_2Cl$ Molecular Weight 133.4

Physical State liquid   Solubility (H2O) 0.48   Boiling Point 237° F

Flash Point N/A   Vapor Pressure/Density 19 mm   Freezing Point -34° F

Specific Gravity 1.44   Odor Characteristic   Flammable Limits

Incompatabilities Strong caustics or oxidizers, chemically-active metals

Biological Properties:

TLV-TWA 10 ppm   PEL 10 ppm   Odor/Odor Threshold chloroform like

IDLH 500 ppm   Human   Aquatic   Rat/Mouse

Route of Exposure Ingestion, Inhalation, Dermal

Carcinogen X   Teratogen   Mutagen

Radiological Properties:

Handling Recommendations: (Personal protective measures)

Monitoring Recommendations:

OVA or HNu with tho 11.7 eV probe.

Disposal/Waste Treatment:

Health Hazards and first Aid:

INH & ING: seek medical attention promptly: DER: wash with soap and water.

Symptoms: Acute: light headed, drowsiness, headache, irritation of eyes and skin

Chronic: CNS depression, liver or kidney damage

APPENDIX B

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN

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

Section 10 — Title Page

Work Plan Group: F
Site No.: 9
Site Name: Navy Yard Disposal Area

Prepared by: Joseph F. Fugitt
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Prepared for: Department of the Navy
Southern Division
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Contract Number N62467-88-C-0200

Signature Approvals:

E & E Project Manager: ____________________
J. Barksdale

B 6 E Regional QA/QC Coordinator: ____________________
K. Walker

E 6 E ASC Director: ____________________
A. Clifton

E 6 E QA/QC Project Officer: ____________________
M. Meredith

Section 2.0 -- Table of Contents

Section 3.0 — Project Summary

Work Plan Group: F

Site No.: 9

Site Name: Navy Yard Disposal Area

Site Description: A complete site description and history are presented in sections 2.0 and 3.0 of the attached work plan.

Phase I — Field Screening

Physical Survey (check all that apply):

X Overall Physical Reconnaissance
X Habitat/Biota Survey
X OVA Surface Emission Survey
X Radiation Survey
X Hydrologic Assessment

Geophysical Survey (check all that apply):

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

Analytical Screening (check all that apply):

___ Field Analyses
___ Soil Headspace Analyses: Planned number of samples ___
___ Soil Gas Analyses
X Laboratory Analyses:

PLANNED NUMBER OF SAMPLES

Surface Water	___	Duplicates	2
Sediment	___	Soil Gas Duplicates	___
Soil	15	Trip Blanks	___
Soil Gas	___	Field Blanks	___
Groundwater	6	Preservative Blanks	___
		Rinsate Blanks	___

CATEGORIES OF ANALYSES

- ___ Purgeable Aromatics
- ___ Purgeable Halocarbons
- ___ Base/Neutral Extractables
- ___ Acid Extractables
- X Volatile Organic Compounds
- X Polynuclear Aromatic Hydrocarbons
- X Phenols
- ___ Dioxins
- ___ Organophosphorus Pesticides
- ___ Herbicides
- X Pesticides
- X Polychlorinated Biphenyls
- X Total Recoverable Petroleum Hydrocarbons
- X Metals
- ___ Cyanide

Phase II--Characterization

PLANNED NUMBER OF SAMPLES

Surface Water	___
Sediment	___
Soil	9
Soil Gas	___
Groundwater	4
Duplicates	2
Soil Gas Duplicates	___
Trip Blanks	2
Field Blanks	1
Preservative Blanks	1
Rinsate Blanks	2

CATEGORIES OF ANALYSES

___ Purgeable Aromatics
___ Purgeable Ialocarbons
_X_ Base/Neutral Extractables
_X_ Acid Extractables
_X_ Volatile Organic Compounds
___ Polynuclear Aromatic Hydrocarbons
___ Phenols
_X_ Dioxins
_X_ Organophosphorus Pesticides
_X_ Herbicides
_X_ Pesticides
_X_ Polychlorinated Biphenyls
_X_ Total Recoverable Petroleum Hydrocarbons
_X_ Metals
_X_ Cyanide

Additional analytical categories are identified belov:

_X_ Gross Alpha
_X_ Gross Beta
_X_ Gamma Scan
_X_ Total Organic Carbon
_X_ Grain Size
_X_ Alkalinity
_X_ Total Suspended Solids (vater only)
_X_ Total Kjeldahl Nitrogen
_X_ Ammonia Nitrogen
_X_ Orthophosphate Phosphorus
_X_ Dissolved Oxygen (in field)
_X_ 5-day Biological Oxygen Demand
_X_ Chemical Oxygen Demand
_X_ pH
_X_ Percent Moisture
_X_ Hardness (water only)
_X_ BTU Content
_X_ Ash Content
_X_ Total Organic Halogens
_X_ Sulfur
_X_ Ignitability
_X_ Cation Exchange Capacity
_X_ Sulfide

Section 4.0 — Project Organization and Responsibility

The overall organizational structure for this site is discussed in Section 4.0 of the GQAPP. Site-specific designated personnel and their responsibilities are listed below:

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

Biographies for those personnel listed above which are not included in the GQAPP are included in Appendix A of this document.

Section 5.0 — QA/QC Objectives for Measurement Data

Criteria for reporting the accuracy, precision, and completeness of data are presented in Section 5.0 of the GQAPP. Detection limits for screening and quantitative analyses are presented in Section 9.0 of the 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.

Section 6.0 -- Fieldvork and Sampling Procedures

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

No Modifications

Analyte	Media	Method No.	A	P	C	DL
Laboratory Screening Analyses*						
Volatile Organic Compounds	S/W	--	N/M	N/M	N/M	N/M
Polynuclear Aromatic Eydrocarbons	S/W	--	N/M	N/M	N/M	N/M
Pesticides	S/W	--	N/M	N/M	N/M	N/M
Polychlorinated Biphenyls	S/W	--	N/M	N/M	N/M	N/M
Total Recoverable Petroleum Eydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	TBD
Phenols	S/W	--	N/M	N/M	N/M	N/M
Arsenic	S/W	--	N/M	N/M	N/M	N/M
Cadmium	S/W	--	N/M	N/M	N/M	N/M
Chromium	S/W	--	N/M	N/M	N/M	N/M
Copper	S/W	--	N/M	N/M	N/M	N/M
Lead	S/W	--	N/M	N/M	N/M	N/M
Nickel	S/W	--	N/M	N/M	N/M	N/M
Silver	S/W	--	N/M	N/M	N/M	N/M
Zinc	S/W	--	N/H	N/H	N/M	N/M
Laboratory Analyses						
Gross Alpha	S/W	EPA 900	N/M	N/M	N/M	N/M
Gross Beta	S/W	EPA 900	TBD	TBD	TBD	TBD
Gamma Scan	S/W	EPA 901.1	TBD	TBD	TBD	TBD
TCL Purgeables + xylene	S/W	EPA 8240/624	N/M	N/H	N/M	N/M
TCL BNAs	S/W	EPA 8270/625	N/M	N/M	N/M	N/M
TCL Pesticides 6 PCBs	S/W	EPA 8080/608	N/H	N/M	N/M	N/M
Dioxins	S/W	EPA 8280	TBD	TBD	TBD	TBD
Organophosphorus Pesticides	S/W	EPA 8140	N/M	N/M	N/M	N/M
Eerbicides	S/W	EPA 8150 (modified)/509B	N/M	N/H	N/M	N/M
Total Recoverable Petroleum Eydrocarbons	S/W	EPA 418.1	N/H	N/H	N/M	N/M
TAL Metals:						
Aluminum	S/W	EPA 6010	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010	N/M	N/M	N/M	N/M
Arsenic	S/W	EPA 7060	N/M	N/M	N/M	N/M
Barium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Beryllium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Boron	S/W	EPA 6010	N/H	N/M	N/M	N/H
Cadmium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Calcium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Chromium	S/W	EPA 6010	N/M	N/M	N/M	N/M

Analyte	Media	Method No.	A	P	C	DL
Cobalt	S/W	EPA 6010	N/M	N/M	N/M	N/M
Copper	S/W	EPA 6010	N/M	N/M	N/M	N/M
Iron	S/W	EPA 6010	N/M	N/M	N/M	N/H
Lead	S/W	EPA 7421	N/M	N/M	N/M	N/M
Magnesium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Hanganese	S/W	EPA 6010	N/H	N/M	N/M	N/M
Hercury	S/W	EPA 7471/7470	N/M	N/M	N/M	N/M
Nickel	S/W	EPA 6010	N/M	N/M	N/M	N/M
Selenium	S/W	EPA 7740	N/H	N/M	N/M	N/M
Silver	S/W	€PA 6010	N/M	N/M	N/M	N/M
Sodium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Thallium	S/W	EPA 7841	N/M	N/M	N/M	N/M
Tin	S/W	EPA 282.2	N/M	N/M	N/M	N/M
Vanadium	S/W	€PA 6010	N/M	N/M	N/M	N/M
zinc	S/W	EPA 6010	N/M	N/M	N/M	N/H
Cyanide	S/W	EPA 9010/335.2	N/M	N/H	N/M	N/M
Sulfide	S/W	EPA 376.1	N/M	N/M	N/M	N/M
TOC	S/W	EPA 415.1	N/M	N/M	N/M	N/M
Hardness	W	EPA 130.2	N/M	N/M	N/M	N/M
Alkalinity	W	EPA 310.1	N/M	N/M	N/M	N/M
Total Suspended Solids	W	€PA 160.2	N/M	N/M	N/M	N/M
Total Kjeldahl Nitrogen	S/W	€PA 351.3	N/M	N/M	N/M	N/M
Nitrogen-Ammonia	S/W	€PA 350.2	N/H	N/M	N/M	N/M
Orthophosphate Phosphorus	S/W	EPA 365.2	N/M	N/M	N/M	N/M
5-day Biological Oxygen Demand	W	SM 507	N/M	N/M	N/M	N/M
Chemical Oxygen Demand	W	EPA 410.4	N/M	N/M	N/M	N/M
pH	W	EPA 150.1	N/H	N/M	N/H	N/M
Percent Moisture	S	ASTH D-2216-80	N/M	N/H	N/M	N/M
Grain Size	S	ASTM D-422-63	N/H	N/M	N/M	N/M
BTU Content	S	ASTM D-2015-77	N/M	N/M	N/M	N/M
Ash Content	S	ASTH D-482	N/M	N/M	N/M	N/M
Total Organic Halogens	S	ASTH D-808-81	TBD	TBD	TBD	TBD
		EPA 325.3	TBD	TBD	TBD	TBD
Sulfur	S	ASTM D-129-64	N/M	N/M	N/M	N/M
Ignitability	S/W	EPA 1010	N/H	N/M	N/M	N/M
Cation Exchange Capacity	S	EPA 9081	75-125	35	95%	100mg/kg

Analyte	Media	Method No.	A	P	C	DL
Field Parameters						
pH	W	150.1	N/M	N/M	N/H	N/M
Specific Conductance	W	120.1	N/H	N/M	N/M	N/M
Temperature	W	170.1	N/M	N/H	N/M	N/M
Dissolved Oxygen	W	EPA 360.1	N/M	N/H	N/M	N/H

Notes: S = Soil and/or sediment
W = Groundwater and/or surface water
N/M = No modifications from GQAPP
TBD = To be determined.

*With the exception of total recoverable petroleum hydrocarbons, the laboratory screening analyses do not have EPA method numbers.

Section 7.0 -- Sample Custody

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

No Hodifications

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 Hodifications

Section 10.0 -- Data Reduction, Validation, and Reporting

Data reduction, validation, and reporting procedures are presented in Section 10.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 11.0 -- Internal Quality Control Checks

Internal quality control check procedures are presented in Section 11.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 12.0 — Performance and System Audits

Performance and system audit procedures are presented in Section 12.0 of the GQAPP. Specific audits planned for this site investigation are listed below:

Audit Type	Frequency/Date	Description
	To Be Determined	

Section 13.0 -- Preventive Maintenance

Preventive maintenance procedures are presented in Section 13.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 14.0 — Procedures Used to Assess Accuracy, Precision, and Completeness of Data

Procedures used to assess the accuracy, precision, and completeness of data are presented in Section 14.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 15.0 -- Corrective Action

Corrective action procedures are presented in Section 15.0 of the GQAPP. Modifications to these procedures are described below;

No Modifications

Section 16.0 — Quality Assurance Reports to Management

Quality assurance report procedures are presented in Section 16.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Appendix A -- Additional Personnel Biographies

Personnel assigned to this site investigation whose biographies do not appear in the GQAPP are listed below; biographies for these site personnel are presented on the following pages.

To Be Determined

Section 1.0 -- Title Page

Work Plan Group: F
Site No.: 10
Site Name: Commodore's Pond

Prepared by: Joseph P. Pugitt
Ecology and Environment, Inc.
1203 Governor's Square Blvd., 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:

B 6 E Project Manager: ____________________
J. Barksdale

E 6 B Regional QA Coordinator: ____________________
K. Walker

E & E ASC Director: ____________________
A. Clifton

B 6 E QA/QC Project Officer: ____________________
M. Meredith

Section 2.0 — Table of Contents

Section 3.0 -- Project Summary

Vork Plan Group: F

Site No.: 10

Site Nan: Commodore's Pond

Site Description: A complete site description and history are presented in sections 2.0 and 3.0 of the attached work plan.

Phase I--Field Screening

Physical Survey (check all that apply):

X Overall Physical Reconnaissance

X Habitat/Biota Survey

X OVA Surface Emission Survey

X Radiation Survey

X Hydrologic Assessment

Geophysical Survey (check all that apply):

X Electromagnetic Conductivity: X EM-31 X EM-34

___ Ground Penetrating Radar

___ Seismic Refraction

X Magnetometry

___ Seismic Reflection

___ Very Low Frequency

Analytical Screening (check all that apply):

___ Field Analyses

___ Soil Headspace Analyses: Planned number of samples ____

___ Soil Gas Analyses

X Laboratory Analyses:

PLANNED NUMBER OF SAMPLES

Surface Water	___
Sediment	___
Soil	6
Soil Gas	___
Groundwater	3
Duplicates	2
Soil Gas Duplicates	___
Trip Blanks	___
Field Blanks	___

Preservative Blanks	___
Rinsate Blanks	___

CATEGORIES OF ANALYSES

___ Purgeable Aromatics
___ Purgeable Halocarbons
___ Base/Neutral Extractables
___ Acid Extractables
X Volatile Organic Compounds
X Polynuclear Aromatic Hydrocarbons
X Phenols
___ Dioxins
___ Organophosphorus Pesticides
___ Herbicides
X Pesticides
X Polychlorinated Biphenyls
X Total Recoverable Petroleum Hydrocarbons
X Metals
___ Cyanide

Phase 11--Characterization

PLANNED NUMBER OF SAMPLES	
Surface Water	___
Sediment	___
Soil	76
Soil Gas	___
Groundwater	19
Duplicates	10
Soil Gas Duplicates	___
Trip Blanks	5
Field Blanks	1
Preservative Blanks	1
Rinsate Blanks	5

CATEGORIES OF ANALYSES

___ Purgeable Aromatics
___ Purgeable Halocarbons
_X_ Base/Neutral Extractables
_X_ Acid Extractables
_X_ Volatile Organic Compounds
___ Polynuclear Aromatic Hydrocarbons
___ Phenols
___ Dioxins
___ Organophosphorus Pesticides
___ Eerbicides
_X_ Pesticides
_X_ Polychlorinated Biphenyls
_X_ Total Recoverable Petroleum Hydrocarbons
_X_ Metals
_X_ Cyanide

Additional analytical categories are identified below:

_X_ Gross Alpha
_X_ Gross Beta
_X_ Gamma Scan
_X_ Total Organic Carbon
_X_ Grain Size
_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_ Eardness (water only)
_X_ BTU Content
_X_ Ash Content
_X_ Total Organic Ealogens
_X_ Sulfur
_X_ Ignitability
_X_ Cation Exchange Capacity
___ Sulfide

Section 4.0 -- Project Organization and Responsibility

The overall organizational structure for this site is discussed in Section 4.0 of the GQAPP. Site-specific designated personnel and their responsibilities are listed below:

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

Biographies for those personnel listed above which are not included in the GQAPP are included in Appendix A of this document.

Section 5.0 — QA/QC Objectives for Measurement Data

Criteria for reporting the accuracy, precision, and completeness of data are presented in Section 5.0 of the GQAPP. Detection limits for screening and quantitative analyses are presented in Section 9.0 of the 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.

Section 6.0 -- Pieldvork 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

Analyte	Media	Method No.	A	P	C	DL
Laboratory Screening Analyses*						
Volatile Organic Compounds	S/W	--	N/M	N/M	N/M	N/M
Polynuclear Aromatic Eydrocarbons	S/W	--	N/M	N/M	N/M	N/M
Pesticides	S/W	--	N/M	N/M	N/M	N/M
Polychlorinated Biphenyls	S/W	--	N/M	N/M	N/M	N/M
Total Recoverable Petroleum Eydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	TBD
Phenols	S/W	--	N/M	N/M	N/M	N/M
Arsenic	S/W	--	N/M	N/M	N/M	N/M
Cadmium	S/W	--	N/M	N/M	N/M	N/M
Chromium	S/W	--	N/M	N/H	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/H	N/M	N/M
Silver	S/W	--	N/H	N/M	N/M	N/M
Zinc	S/W	--	N/M	N/M	N/H	N/M
Laboratory Analyses						
Gross Alpha	S/W	EPA 900	N/M	N/H	N/M	N/M
Gross Beta	S/W	€PA 900	TBD	TBD	TBD	TBD
Gamma Scan	S/W	€PA 901.1	TBD	TBD	TBD	TBD
TCL Purgeables + xylene	S/W	€PA 8240/624	N/M	N/M	N/H	N/M
TCL BNAs	S/W	€PA 8270/625	N/M	N/H	N/M	N/M
TCL Pesticides & PCBs	S/W	€PA 8080/608	N/M	N/M	N/M	N/M
Total Recoverable Petroleum Eydrocarbons	S/W	EPA 418.1	N/M	N/H	N/M	N/M
TAL Metals:						
Aluminum	S/W	EPA 6010	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010	N/M	N/M	N/M	N/M
Arsenic	S/W	EPA 7060	N/M	N/M	N/M	N/M
Barium	S/W	EPA 6010	N/M	N/M	N/H	N/H
Beryllium	S/W	EPA 6010	N/M	N/M	N/M	N/H
Boron	S/W	EPA 6010	N/M	N/M	N/M	N/H
Cadmium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Calcium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Chromium	S/W	EPA 6010	N/M	N/M	N/M	N/M

Analyte	Hedia	Method No.	A	P	C	DL
Cobalt	S/W	EPA 6010	N/M	N/M	N/M	N/M
Copper	S/W	€PA 6010	N/M	N/M	N/M	N/M
Iron	S/W	EPA 6010	N/M	N/M	N/M	N/M
Lead	S/W	EPA 7421	N/M	N/M	N/M	N/H
Magnesium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Manganese	S/W	EPA 6010	N/M	N/M	N/M	N/M
Mercury	S/W	EPA 7471/7470	N/M	N/M	N/M	N/M
Nickel	S/W	EPA 6010	N/M	N/M	N/M	N/M
Selenium	S/W	EPA 7740	N/M	N/M	N/M	N/H
Silver	S/W	€PA 6010	N/M	N/M	N/M	N/N
Sodium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Thallium	S/W	EPA 7841	N/M	N/M	N/M	N/M
Tin	S/W	EPA 282.2	N/M	N/M	N/M	N/M
Vanadium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Zinc	S/W	€PA 6010	N/M	N/M	N/M	N/M
Cyanide	S/W	EPA 9010/335.2	N/M	N/M	N/M	N/M
TOC	S/W	EPA 415.1	N/M	N/M	N/M	N/M
Hardness	V	EPA 130.2	N/M	N/M	N/M	N/M
Alkalinity	V	EPA 310.1	N/M	N/M	N/M	N/M
Total Suspended Solids	W	EPA 160.2	N/M	N/M	N/M	N/M
Total Kjeldahl Nitrogen	S/W	EPA 351.3	N/M	N/M	N/M	N/M
Nitrogen-Ammonia	S/W	€PA 350.2	N/M	N/M	N/M	N/M
Orthophosphate Phosphorus	S/W	€PA 365.2	N/M	N/M	N/M	N/M
5-day Biological Oxygen Demand	W	SM 507	N/M	N/H	N/M	N/M
Chemical Oxygen Demand	V	EPA 410.4	N/M	N/M	N/M	N/M
pH	W	EPA 150.1	N/M	N/M	N/M	N/M
Percent Moisture	S	ASTH D-2216-80	N/M	N/M	N/M	N/M
Grain Size	S	ASTM D-422-63	N/M	N/M	N/M	N/M
BTU Content	S	ASTM D-2015-77	N/M	N/M	N/M	N/M
Ash Content	S	ASTU D-482	N/M	N/M	N/M	N/M
Total Organic Halogens	S	ASTH D-808-81	TBD	TBD	TBD	TBD
		EPA 325.3	TBD	TBD	TBD	TBD
Sulfur	S	ASTH D-129-64	N/M	N/M	N/M	N/M
Ignitability	S/W	EPA 1010	N/M	N/M	N/M	N/M
Cation Exchange Capacity	S	EPA 9081	75-125	35	95%	100mg/kg

Analyte	Media	Method No.	A	P	C	DL
Field Parameters						
pH	W	150.1	N/H	N/H	N/M	N/H
Specific Conductance	W	120.1	N/M	N/H	N/M	N/M
Temperature	W	170.1	N/M	N/H	N/M	N/M
Dissolved Oxygen	W	EPA 360.1	N/M	N/M	N/M	N/M

Notes: S = Soil and/or sediment
W = Groundwater and/or surface water
N/M = No modifications from GQAPP
TBD = To be determined.

*With the exception of total recoverable petroleum hydrocarbons, the laboratory screening analyses do not have EPA method numbers.

Section 7.0 — Sample Custody

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

No Hodifications

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 Hodifications

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. Hodifications 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. Hodifications to these procedures are described below:

No Modifications

Section 11.0 -- Internal Quality Control Checks

Internal quality control check procedures are presented in Section 11.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 12.0 — Performance and System Audits

Performance and system audit procedures are presented in Section 12.0 of the GQAPP. Specific audits planned for this site investigation are listed below:

Audit Type	Frequency/Date	Description
	To Be Determined	

Section 13.0 — Preventive Maintenance

Preventive maintenance procedures are presented in Section 13.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 14.0 — Procedures Used to Assess Accuracy, Precision, and Completeness of Data

Procedures used to assess the accuracy, precision, and completeness of data are presented in Section 14.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 15.0 — Corrective Action

Corrective action procedures are presented in Section 15.0 of the GOAPP. Modifications to these procedures are described belov:

No Modifications

Section 16.0 — Quality Assurance Reports to Management

Quality assurance report procedures are presented in Section 16.0 of the GQAPP. Modifications to these procedures are described belov:

No Modifications

Appendix A — Additional Personnel Biographies

Personnel assigned to this site investigation whose biographies do not appear in the GOAPP are listed below; biographies for these site personnel are presented on the following pages.

To Be Determined

Section 1.0 — Title Page

Work Plan Group: F
Site No.: 23
Site Name: Chevalier Field Pipe Leak Area

Prepared by: Joseph F. Fugitt
Ecology and Environment, Inc.
1203 Governor's Square Blvd., 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

E & E Regional QA Coordinator: ____________________
K. Walker

E 6 E ASC Director: ____________________
A. Clifton

E & E QA/QC Project Officer:. ____________________
M. Heredith

Section 2.0 — Table of Contents

4

Section 3.0 — Project Summary

Work Plan Group: F

Site No.: 23

Site Name: Chevalier Field Pipe Leak'Area

Site Description: A complete site description and 'history are presented in sections 2.0 and 3.0 of the attached work plan.

Phase I — Field Screening

Physical Survey (check all that apply):

_X_ Overall Physical Reconnaissance

_X_ OVA Surface Emission Survey

_X_ Radiation Survey

_X_ Habitat/Biota Survey

_X_ Asbestos Survey (in Rubble)

___ Hydrologic Assessment

Geophysical Survey (check all that apply):

_X_ Electromagnetic Conductivity:

_X_ En-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 Headspace Analyses: Planned number of samples ___

___ Soil Gas Analyses

_X_ Laboratory Analyses:

PLANNED NUMBER OF SAMPLES

Surface Water	___
Sediment	___
Soil	17
Soil Gas	___
Groundwater	7
Duplicates	2
Soil Gas Duplicates	___
Trip Blanks	___
Field Blanks	___
Preservative Blanks	___

Rinsate Blanks ___

CATEGORIES OF ANALYSBS

___ Purgeable Aromatics
___ Purgeable Halocarbons
___ Base/Neutral Extractables
___ Acid Extractables
_X_ Volatile Organic Compounds
_X_ Polynuclear Aromatic Hydrocarbons
_X_ Phenols
___ Dioxins
___ Organophosphorus Pesticides
___ Herbicides
_X_ Pesticides
_X_ Polychlorinated Biphenyls
_X_ Total Recoverable Petroleum Hydrocarbons
_X_ Metals
___ Cyanide

Phase II--Characterization

PLANNED NUMBER OF SAMPLES

Surface Water	___
Sediment	___
Soil	36
Soil Gas	___
Groundwater	7
Duplicates	5
Soil Gas Duplicates	___
Trip Blanks	3
Field Blanks	1
Preservative Blanks	1
Rinsate Blanks	3

CATEGORIES OF ANALYSES

- ___ Purgeable Aromatics
- ___ Purgeable Halocarbons
- X Base/Neutral Extractables
- X Acid Extractables
- X Volatile Organic Compounds
- ___ Polynuclear Aromatic Hydrocarbons
- ___ Phenols
- ___ Dioxins
- ___ Organophosphorus Pesticides
- ___ Herbicides
- X Pesticides
- X Polychlorinated Biphenyls
- X Total Recoverable Petroleum Hydrocarbons
- X Metals
- X Cyanide

Additional analytical categories are identified belov:

- X Gross Alpha
- X Gross Beta
- X Gamma Scan
- X Total Organic Carbon
- X Grain Size
- 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 Hardness (water only)
- X BTU Content
- X Ash Content
- X Total Organic Halogens
- X Sulfur
- X Ignitability
- X Cation Exchange Capacity
- ___ Sulfide

Section 4.0 — Project Organization and Responsibility

The overall organizational structure for this site is discussed in Section 4.0 of the GQAPP. Site-specific designated personnel and their responsibilities are listed below:

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

Biographies for those personnel listed above which are not included in the GQAPP are included in Appendix A of this document.

Section 5.0 -- QA/QC Objectives for Measurement Data

Criteria for reporting the accuracy, precision, and completeness of data are presented in Section 5.0 of the GQAPP. Detection limits for screening and quantitative analyses are presented in Section 9.0 of the GQAPP. Procedures used to assess data accuracy, precision, and completeness are presented in Section 14.0 of the GQAPP. All analytes (including field parameters), sample media, and method numbers relevant to the investigation of this site are listed in the following table, which also identifies any modifications to the accuracy (A), precision (P), completeness (C), and detection limit (DL) criteria specified in the above-referenced GOAPP sections.

Section 6.0 -- Fieldwork and Sampling Procedures

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

No Modifications

Analyte	Hedia	Method No.	A	P	C	DL
Lab tory screening Analyses*						
Volatile 'Organic Compounds	S/W	--	N/M	N/M	N/M	N/M
Polynuclear Aromatic Hydrocarbons	S/W	--	N/M	N/H	N/M	N/M
Pesticides	S/W	--	N/M	N/M	N/M	N/M
Polychlorinated Biphenyls	S/W	--	N/M	N/H	N/M	N/M
Total Recoverable Petroleum Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	TBD
Phenols	S/W	--	N/M	N/M	N/M	N/M
Arsenic	S/W	--	N/M	N/M	N/M	N/M
Cadmium	S/W	--	N/H	N/M	N/M	N/M
Chromium	S/W	--	N/M	N/H	N/M	N/H
Copper	S/W	--	N/M	N/M	N/M	N/H
Lead	S/W	--	N/M	N/M	N/M	N/M
Nickel	S/W	--	N/H	N/M	N/M	N/M
Silver	S/W	--	N/M	N/M	N/H	N/M
Zinc	S/W	--	N/M	N/M	N/M	N/M
Laboratory Analyses						
Gross Alpha	S/W	EPA 900	N/M	N/M	N/M	N/M
Gross Beta	S/W	EPA 900	TBD	TBD	TBD	TBD
Gamma Scan	S/W	EPA 901.1	TBD	TBD	TBD	TBD
TCL Purgeables + xylene	S/W	EPA 8240/624	N/H	N/H	N/M	N/M
TCL BNAs	S/W	EPA 8270/625	N/M	N/M	N/M	N/M
TCL Pesticides & PCBs	S/W	EPA 8080/608	N/M	N/M	N/M	N/M
Total Recoverable Petroleum Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/H
TAL Hetals:						
Aluminum	S/W	EPA 6010	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010	N/M	N/M	N/M	N/M
Arsenic	S/W	EPA 7060	N/M	N/M	N/M	N/M
Barium	S/W	EPA 6010	N/M	N/M	N/M	N/H
Beryllium	S/W	EPA 6010	N/H	N/M	N/M	N/M
Boron	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cadmium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Calcium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Chromium	S/W	EPA 6010	N/M	N/M	N/M	N/M

Analyte	Media	Method No.	A	P	C	DL
Cobalt	S/W	EPA 6010	N/M	N/M	N/M	N/M
Copper	S/W	EPA 6010	N/M	N/H	N/M	N/M
Iron	S/W	EPA 6010	N/M	N/M	N/M	N/M
Lead	S/W	EPA 7421	N/M	N/M	N/M	N/M
Magnesium	S/W	EPA 6010	N/W	N/H	N/M	N/M
Manganese	S/W	EPA 6010	N/H	N/M	N/M	N/M
Mercury	S/W	EPA 7471/7470	N/M	N/M	N/M	N/M
Nickel	S/W	EPA 6010	N/M	N/M	N/M	N/M
Selenium	S/W	EPA 7740	N/H	N/M	N/M	N/M
Silver	S/W	EPA 6010	N/H	N/M	N/M	N/M
Sodium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Thallium	S/W	EPA 7841	N/M	N/M	N/M	N/M
Tin	S/W	EPA 282.2	N/M	N/M	N/M	N/M
Vanadium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Zinc	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cyanide	S/W	EPA 90101335.2	N/H	N/M	N/M	N/M
TOC	S/W	EPA 415.1	N/H	N/H	N/M	N/M
Hardness	W	EPA 130.2	N/M	N/M	N/M	N/M
Alkalinity	W	EPA 310.1	N/M	N/M	N/M	N/M
Total Suspended Solids	W	EPA 160.2	N/M	N/M	N/M	N/M
Total Kjeldahl Nitrogen	S/W	EPA 351.3	N/M	N/M	N/M	N/M
Nitrogen-Ammonia	S/W	EPA 350.2	N/M	N/H	N/M	N/M
Orthophosphate Phosphorus	S/W	EPA 365.2	N/H	N/M	N/M	N/M
5-day Biological Oxygen Demand	W	SM 507	N/M	N/M	N/H	N/M
Chemical Oxygen Demand	W	EPA 410.4	N/M	N/M	N/H	N/M
pH	W	EPA 150.1	N/M	N/M	N/M	N/M
Percent Moisture	S	ASTH D-2216-80	N/M	N/M	N/M	N/M
Grain Size	S	ASTH D-422-63	N/M	N/M	N/H	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/M	N/M	N/M
Total Organic Halogens	S	ASTM D-808-81	TBD	TBD	TBD	TBD
		EPA 325.3	TBD	TBD	TBD	TBD
Sulfur	S	ASTH D-129-64	N/M	N/M	N/M	N/M
Ignitability	S/W	EPA 1010	N/M	N/M	N/H	N/M
Cation Exchange Capacity	S	EPA 9081	75-125	35	95%	100mg/kg

Analyte	Hedia	Method No.	A	P	C	DL
d Parameters						
pH	W	150.1	N/M	N/M	N/M	N/H
Specific Conductance	W	120.1	N/M	N/M	N/M	N/H
Temperature	W	170.1	N/M	N/M	N/M	N/M
Dissolved Oxygen	W	EPA 360.1	N/M	N/M	N/M	N/M

Notes: S = Soil and/or sediment
W = Groundwater and/or surface water
N/M = No modifications from GQAPP
TBD = To be determined.

*With the exception of total recoverable petroleum hydrocarbons, the laboratory screening analyses do not have EPA method numbers.

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 belov:

No Modifications

Section 10.0 -- Rata Reduction, Validation, and Reporting

Data reduction, validation, and reporting procedures are presented in Section 10.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 11.0 — Internal Quality Control Checks

Internal quality control check procedures are presented in Section 11.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 12.0 -- Performance and System Audits

Performance and system audit procedures are presented in Section 12.0 of'the GQAPP. Specific audits planned for this site investigation are listed below:

Audit Type	Frequency/Date	Description
	To Be Determined	

Section 13.0 — Preventive Maintenance

Preventive maintenance procedures are presented in Section 13.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 14.0 -- Procedures Used to Assess Accuracy, Precision, and Completeness of Data

Procedures used to assess the accuracy, precision, and completeness of data are presented in Section 14.0 of the GOAPP. Modifications to these procedures are described below:

No Modifications

Section 15.0 -- Corrective Action

Corrective action procedures are presented in Section 15.0 of the GOAPP. Modifications to these procedures are described below:

No Modifications

Section 16.0 — Quality Assurance Reports to Management

Quality assurance report procedures are presented in Section 16.0 of the GOAPP. Modifications to these procedures are described below:

No Modifications

Appendix A — Additional Personnel Biographies

Personnel assigned to this site investigation whose biographies do not appear in the GQAPP are listed below; biographies for these site .personnel are presented on the following pages.

To Be Determined

Section 10 — Title Page

Work Plan Group: F
Site No.: 29
Site Name: Soil South of Building 3460

Prepared by: Joseph Fugitt
Ecology and Environment, Inc.
1203 Governor's Square Blvd., 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 6 E Project Manager: ____________________
J. Barksdale

E & E Regional QA Coordinator: ____________________
K. Walker

E 6 E ASC Director: ____________________
A. Clifton

E & E QA/QC Project Officer: ____________________
M. Meredith

Section 2.0 -- Table of Contents

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Section 3.0 — Project Summary

Work Plan Group: F

Site No.: 29

Site Name: Soil South of Building 3460

Site Description: A complete site description and history are presented in sections 2.0 and 3.0 of the attached work plan.

Phase I — Field Screening

Physical Survey (check all that apply):

- X Overall Physical Reconnaissance
- X Habitat/Biota Survey
- X OVA Surface Emission Survey
- __ Radiation Survey
- X Eydrologic Assessment

Geophysical Survey (check all that apply):

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

Analytical Screening (check all that apply):

- __ Field Analyses
- __ Soil Headspace Analyses: Planned number of samples __
- __ Soil Gas Analyses
- X Laboratory Analyses:

PLANNED NUMBER OF SAMPLES

Surface Water	
Sediment	
Soil	8
Soil Gas	
Groundwater	3
Duplicates	2
Soil Gas Duplicates	
Trip Blanks	
Field Blanks	
Preservative Blanks	

Rinsate Blanks ___

CATEGORIES OF ANALYSES

___ Purgeable Aromatics
___ Purgeable Ialocarbons
___ Base/Neutral Extractables
___ Acid Extractables
_X_ Volatile Organic Compounds
_X_ Polynuclear Aromatic Hydrocarbons
_X_ Phenols
___ Dioxins
___ Organophosphorus Pesticides
___ Herbicides
_X_ Pesticides
_X_ Polychlorinated Biphenyls
_X_ Total Recoverable Petroleum Hydrocarbons
_X_ Metals
___ Cyanide

Phase II--Characterization

PLANNED NUMBER OF SAMPLES

Surface Water	___
Sediment	___
Soil	24
Soil Gas	___
Groundwater	9
Duplicates	3
Soil Gas Duplicates	___
Trip Blanks	2
Field Blanks	1
Preservative Blanks	1
Rlnsate Blanks	2

CATEGORIES OF ANALYSES

__ Purgeable Aromatics
__ Purgeable Halocarbons
X Base/Neutral Extractables
X Acid Extractables
X Volatile Organic Compounds
__ Polynuclear Aromatic Hydrocarbons
__ Phenols
X Dioxins
X Organophosphorus Pesticides
X Herbicides

X Pesticides
X Polychlorinated Biphenyls
X Total Recoverable Petroleum Bydrocarbons
X Metals
X Cyanide

Additional analytical categories are identified belov:

X Gross Alpha
X Gross Beta
X Gamma Scan
X Total Organic Carbon
X Grain Size
X Alkalinity
X Total Suspended Solids (vater only)
X Total Kjeldahl Nitrogen
X Ammonia Nitrogen
X Orthophosphate Phosphorus
X Dissolved Oxygen (in field)
X 5-day Biological Oxygen Demand
X Chemical Oxygen Demand

X pH
X Percent Moisture
X Hardness (water only)
X BTU Content
X Ash Content
X Total Organic Halogens
X Sulfur
X Ignitability
X Cation Exchange Capacity
X Sulfide

Section 4.0 — Project Organization and Responsibility

The overall organizational structure for this site is discussed in Section 4.0 of the GOAPP. 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 GOAPP 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 GOAPP. Detection limits for screening and quantitative analyses are presented in Section 9.0 of the GOAPP. Procedures used to assess data accuracy, precision, and completeness are presented in Section 14.0 of the GQAPP. All analytes (including field parameters), sample media, and method numbers relevant to the investigation of this site are listed in the following table, which also identifies any modifications to the accuracy (A), precision (P), completeness (C), and detection limit (DL) criteria specified in the above-referenced GOAPP sections.

Section 6.0 -- Fieldvork 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

Analyte	Media	Method No.	A	P	C	DL
Laboratory Screening Analyses	*					
Volatile Organic Compounds	S/W	--	N/M	N/M	N/M	N/M
Polynuclear Aromatic Hydrocarbons	S/W	--	N/M	N/H	N/M	N/M
Pesticides	S/W	--	N/M	N/M	N/M	N/H
Polychlorinated Biphenyls	S/W	--	N/M	N/M	N/M	N/M
Total Recoverable Petroleum Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/H	TBD
Phenols	S/W	--	N/M	N/H	N/M	N/M
Arsenic	S/W	--	N/M	N/H	N/M	N/M
Cadmium	S/W	--	N/M	N/M	N/H	N/M
Chromium	S/W	--	N/M	N/M	N/M	N/H
Copper	S/W	--	N/M	N/M	N/M	N/M
Lead	S/W	--	N/M	N/M	N/M	N/M
Nickel	S/W	--	N/M		N/M	N/M
Silver	S/W	--	N/M	N/M	N/M	N/H
Zinc	S/W	--	N/M	N/M	N/H	N/H
Laboratory Analyses						
Gross Alpha	S/W	EPA 900	N/M	N/M	N/M	N/M
Gross Beta	S/W	EPA 900	TBD	TBD	TBD	TBD
Gamma Scan	S/W	EPA 901.1	TBD	TBD	TBD	TBD
TCL Purgeables + xylene	S/W	EPA 8240/624	N/M	N/M	N/M	N/M
TCL BNAs	S/W	EPA 8270/625	N/M	N/M	N/M	N/M
TCL Pesticides & PCBs	S/W	€PA 8080/608	N/M	N/M	N/H	N/M
Dioxins	S/W	EPA 8280	TBD	TBD	TBD	TBD
Organophosphorus Pesticides	S/W	EPA 8140	N/M	N/H	N/M	N/M
Herbicides	S/W	EPA 8150 (modified)/509B	N/M	N/H	N/M	N/M
Total Recoverable Petroleum Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/M
TAL Metals:						
Aluminum	S/W	EPA 6010	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010	N/M	N/H	N/M	N/M
Arsenic	S/W	EPA 7060	N/M	N/M	N/H	N/M
Barium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Beryllium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Boron	S/W	EPA 6010	N/M	N/M	N/M	N/M
Cadmium	S/W	EPA 6010	N/H	N/H	N/M	N/M
Calcium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Chromium	S/W	EPA 6010	N/M	N/H	N/H	N/H

Analyte	Media	Method No.	A	P	C	DL
Cobalt	S/W	EPA 6010	N/H	N/M	N/M	N/M
Copper	S/W	EPA 6010	N/M	N/M	N/M	N/M
Iron	S/W	EPA 6010	N/M	N/M	N/M	N/M
Lead	S/W	EPA 7421	N/M	N/M	N/M	N/M
Hagnesium	S/W	EPA 6010	N/M	N/M	N/M	N/H
Manganese	S/W	EPA 6010	N/M	N/M	N/M	N/H
Hercury	S/W	EPA 747117470	N/M	N/M	N/M	N/H
Nickel	S/W	EPA 6010	N/H	N/M	N/M	N/M
Selenium	S/W	EPA 7740	N/M	N/M	N/M	N/M
Silver	S/W	EPA 6010	N/H	N/M	N/M	N/M
Sodium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Thallium	S/W	EPA 7841	N/H	N/M	N/M	N/M
Tin	S/W	EPA 202.2	N/M	N/M	N/M	N/M
Vanadium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Zinc	S/W	EPA 6010	N/H	N/M	N/M	N/M
Cyanide	S/W	EPA 9010/335.2	N/M	N/M	N/M	N/M
Sulfide	S/W	EPA 376.1	N/M	N/M	N/M	N/M
TOC	S/W	EPA 415.1	N/M	N/M	N/M	N/M
Hardness	W	EPA 130.2	N/M	N/M	N/M	N/H
Alkalinity	W	EPA 310.1	N/M	N/M	N/M	N/M
Total Suspended Solids	W	EPA 160.2	N/H	N/M	N/M	N/M
Total Kjeldahl Nitrogen	S/W	EPA 351.3	N/M	N/H	N/M	N/M
Nitrogen-Ammonia	S/W	EPA 350.2	N/M	N/M	N/M	N/M
Orthophosphate Phosphorus	S/W	EPA 365.2	N/M	N/M	N/M	N/M
5-day Biological Oxygen Demand	W	SM 507	N/M	N/M	N/M	N/M
Chemical Oxygen Demand	W	EPA 410.4	N/H	N/M	N/M	N/M
pH	W	EPA 150.1	N/H	N/M	N/M	N/M
Percent Moisture	S	ASTH D-2216-80	N/M	N/M	N/M	N/M
Grain Size	S	ASTH D-422-63	N/H	N/M	N/M	N/M
BTU Content	S	ASTH D-2015-77	N/M	N/M	N/H	N/M
Ash Content	S	ASTH D-482	N/M	N/M	N/M	N/M
Total Organic Ealogens	S	ASTH D-808-81	TBD	TBD	TBD	TBD
		EPA 325.3	TBD	TBD	TBD	TBD
Sulfur	S	ASTH D-129-64	N/M	N/M	N/M	N/M
Ignitability	S/W	EPA 1010	N/M	N/M	N/M	N/M
Cation Exchange Capacity	S	EPA 9081	75-125	35	95%	100mg/kg

Analyte	Media	Method No.	A	P	C	DL
Field Parameters						
pH	W	150.1	N/M	N/M	N/M	N/M
Specific Conductance	W	120.1	N/M	N/H	N/M	N/M
Temperature	W	170.1	N/M	N/M	N/M	N/M
Dissolved Oxygen	W	€PA 360.1	N/M	N/H	N/M	N/H

Notes: S = Soil and/or sediment
W = Groundwater and/or surface water
N/M = No modifications from GQAPP
TBD = To be determined.

*With the exception of total recoverable petroleum hydrocarbons, the laboratory screening analyses do not have €PA method numbers.

Section 7.0 — Sample Custody

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

No Hodifications

Section 8.0 -- Calibration Procedures and Frequency

Calibration procedures and frequency are presented in Section 8.0 of the GQAPP. nodifications 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. Hodifications 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. Hodifications to these procedures are described belov:

No Modifications

Section 11.0 — Internal Quality Control Checks

Internal quality control check procedures are presented in Section 11.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 12.0 — Performance and System Audits

Performance and system audit procedures are presented in Section 12.0 of the GQAPP. Specific audits planned for this site investigation are listed below:

Audit Type	Frequency/Date	Description
	To Be Determined	

Section 13.0 — Preventive Maintenance

Preventive maintenance procedures are presented in Section 13.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 14.0 -- Procedures Used to Assess Accuracy, Precision, and Completeness of Data

Procedures used to assess the accuracy, precision, and completeness of data are presented in Section 14.0 of the GOAPP. Modifications to these procedures are described below:

No Modifications

Section 15.0 -- Corrective Action

Corrective action procedures are presented in Section 15.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 16.0 — Quality Assurance Reports to Management

Quality assurance report procedures are presented in Section 16.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Appendix A — Additional Personnel Biographies

Personnel assigned to this site investigation whose biographies do not appear in the GQAPP are listed below; biographies for these site personnel are presented on the following pages.

To Be Determined

Section 1.0 — Title Page

Vork Plan Group: F
Site No.: 34
Site Name: Solvent North of Building 3557

Prepared by: Joseph F. Fugitt
Ecology and Environment, Inc.
1203 Governor's Square Blvd., 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

E & E Regional QA/QC Coordinator: ____________________
K. Walker

E & E ASC Director: ____________________
A. Clifton

E & E QA/QC Project Officer: ____________________
M. Meredith

Section 2.0 -- Table of Contents

Section 3.0 -- Project Summary

Work Plan Group: F

Site No: 34

Site Name: Solvent North of Building 3557

Site Description: A complete site description and history are presented in sections 2.0 and 3.0 of the attached work plan.

Phase I — Field Screening

Physical Survey (check all that apply):

_X_ Overall Physical Reconnaissance
_X_ Habitat/Biota Survey
_X_ OVA Surface Emission Survey
___ Radiation Survey
_X_ Hydrologic Assessment

Geophysical Survey (check all that apply):

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

Analytical Screening (check all that apply):

___ Field Analyses
___ Soil Headspace Analyses: Planned number of samples _____
___ Soil Gas Analyses
_X_ Laboratory Analyses:

PLANNED NUMBER OF SAMPLES

Surface Water	___	Duplicates	2
Sediment	___	Soil Gas Duplicates	___
Soil	12	Trip Blanks	___
Soil Gas	___	Field Blanks	___
Groundwater	5	Preservative Blanks	___
		Rinsate Blanks	___

CATEGORIES OF ANALYSES

___	Purgeable Aromatics	X	Pesticides
___	Purgeable Halocarbons	X	Polychlorinated Biphenyls
___	Base/Neutral Extractables	X	Total Recoverable Petroleum Eydrocarbons
___	Acid Extractables		
X	Volatile Organic Compounds		
X	Polynuclear Aromatic Hydrocarbons	X	Metals
X	Phenols	___	Cyanide
___	Dioxins		
___	Organophosphorus Pesticides		
___	Herbicides		

Phase **II—Characterization**

PLANNED NUMBER OF SAMPLES

Surface Water	___
Sediment	2
Soil -	15
Soil Gas	___
Groundwater	11
Duplicates	4
Soil Gas Duplicates	___
Trip Blanks	3
Field Blanks	1
Preservative Blanks	1
Rinsate Blanks	3

CATEGORIES OF ANALYSES

___	Purgeable Aromatics	X	Pesticides
___	Purgeable Halocarbons	X	Polychlorinated Biphenyls
X	Base/Neutral Extractables	X	Total Recoverable Petroleum Eydrocarbons
X	Acid Extractables		
X	Volatile Organic Compounds		
___	Polynuclear Aromatic Hydrocarbons	X	Hetals
___	Phenols	X	Cyanide
___	Dioxins		
___	Organophosphorus Pesticides		
___	Herbicides		

Additional analytical categories are identified below:

X	Gross Alpha	X	pH
X	Gross Beta	X	Percent Hoisture
X	Gamma Scan	X	Hardness (water only)
X	Total Organic Carbon	X	BTU Content
X	Grain Size	X	Ash Content
X	Alkalinity	X	Total Organic Halogens
X	Total Suspended Solids (water only)	X	Sulfur
X	Total Kjeldahl Nitrogen	X	Ignitability
X	Ammonia Nitrogen	X	Cation Exchange Capacity
X	Orthophosphate Phosphorus	___	Sulfide
X	Dissolved Oxygen (in field)		
X	5-day Biological Oxygen Demand		
X	Chemical Oxygen Demand		

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.

Section 6.0 -- Fieldwork and Sampling Procedures

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

No Uodifications

Analyte	Wedia	Method No.	A	P	C	DL
	*					
Laboratory Screening Ana						
lati Organic Compounds	S/V	--	N/M	N/M	N/M	N/H
Polynuclear Aromatic Hydrocarbons	S/V	--	N/H	N/M	N/M	N/H
]	S/V	--	N/M	N/M	N/M	N/M
Bipheny	S/V	--	N/M	N/M	N/M	N/H
Total Recoverable P Eydrocarbons	S/V	EPA 418.	N/M	N/H	N/H	TBD
Phenols	S/V	--	N/M	N/M	N/M	N/H
Arsenic	S/V	--	N/M	N/M	N/H	N/M
ni	S/V	--	N/H	N/M	N/M	N/M
u	S/V	--	N/M	N/H	N/M	N/H
Copper	S/V	--	N/M	N/M	N/H	N/M
Lead	S/V	--	N/M	N/M	N/M	N/M
Nickel	S/V	--	N/M	N/M	N/M	N/H
ver	S/V	--	N/M	N/H	N/M	N/H
Zinc	S/V	--	N/H	N/M	N/M	N/M
laboratory Analyses						
Gross Alpha	S/V	EPA 900	N/M	N/M	N/H	N/H
Gross Beta	S/V	EPA 900	TBD	TBD	TBD	TBD
Gamma Scan	S/V	EPA 901.1	TBD	TBD	TBD	TBD
TCL Purgeables + xylene	S/V	EPA 8240/624	N/M	N/M	N/H	N/H
TCL BNAs	S/V	EPA 8270/625	N/H	N/H	N/M	N/M
TCL Pesticides 6 PCBs	S/V	EPA 8080/608	N/H	N/M	N/M	N/M
Total Recoverable Petroleum Hydrocarbons	S/V	EPA 418.1	N/H	N/M	N/M	N/H
TAL Hetals:						
Aluminum	S/V	EPA 6010	N/M	N/M	N/M	N/H
Antimony	S/V	EPA 6010	N/H	N/H	N/M	N/H
Arsenic	S/V	EPA 7060	N/H	N/M	N/M	N/M
Barium	S/V	EPA 6010	N/H	N/M	N/H	N/M
Beryllium	S/V	EPA 6010	N/M	N/M	N/M	N/H
Boron	S/V	EPA 6010	N/M	N/M	N/M	N/M
Cadmium	S/V	EPA 6010	N/M	N/M	N/M	N/M
Calcium	S/V	EPA 6010	N/M	N/M	N/M	N/M
Chromium	S/V	EPA 6010	N/H	N/M	N/M	N/H

Analyte	Media	Method No.	A	P	C	DL
Cobalt	S/W	EPA 6010	N/M	N/M	N/M	N/M
Copper	S/W	EPA 6010	N/M	N/M	N/M	N/M
Iron	S/W	EPA 6010	N/M	N/H	N/M	N/M
Lead	S/W	EPA 7421	N/M	N/H	N/M	N/M
Hagnesium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Manganese	S/W	EPA 6010	N/M	N/H	N/M	N/M
Hercury	S/W	EPA 7471/7470	N/M	N/M	N/M	N/M
Nickel	S/W	EPA 6010	N/H	N/M	N/M	N/M
Selenium	S/W	EPA 7740	N/M	N/H	N/M	N/M
Silver	S/W	EPA 6010	N/M	N/M	N/M	N/M
Sodium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Thallium	S/W	EPA 7841	N/M	N/M	N/M	N/M
Tin	S/W	EPA 282.2	N/H	N/M	N/M	N/M
Vanadium	S/W	EPA 6010	N/M	N/M	N/M	N/M
Zinc	S/W	EPA 6010	N/H	N/M	N/M	N/M
Cyanide	S/W	EPA 9010/335.2	N/H	N/M	N/M	N/M
TOC	S/W	EPA 415.1	N/M	N/M	N/M	N/M
Hardness	W	EPA 130.2	N/M	N/M	N/M	N/M
Alkalinity	W	EPA 310.1	N/M	N/M	N/M	N/M
Total Suspended Solids	W	EPA 160.2	N/M	N/M	N/M	N/M
Total Kjeldahl Nitrogen	S/W	EPA 351.3	N/M	N/M	N/M	N/M
Nitrogen-Ammonia	S/W	EPA 350.2	N/M	N/M	N/M	N/M
Orthophosphate Phosphorus	S/W	EPA 365.2	N/H	N/M	N/M	N/M
5-day Biological Oxygen Demand	W	SM 507	N/H	N/M	N/M	N/M
Chemical Oxygen Demand	W	EPA 410.4	N/H	N/M	N/M	N/M
pH	W	EPA 150.1	N/M	N/M	N/M	N/M
Percent Moisture	S	ASTH D-2216-80	N/H	N/M	N/M	N/M
Grain Size	S	ASTH D-422-63	N/H	N/M	N/M	N/M
BTU Content	S	ASTH D-2015-77	N/M	N/M	N/M	N/M
Ash Content	S	ASTH D-482	N/M	N/M	N/M	N/M
Total Organic Halogens	S	ASTH D-808-81	TBD	TBD	TBD	TBD
		EPA 325.3	TBD	TBD	TBD	TBD
Sulfur	S	ASTH D-129-64	N/M	N/M	N/M	N/M
Ignitability	S/W	EPA 1010	N/M	N/M	N/M	N/M
Cation Exchange Capacity	S	EPA 9081	75-125	35	95%	100mg/kg

Analyte	Media	Method No.	A	P	C	DL
Field Parameters						
pH	W	150.1	N/M	N/M	N/M	N/H
Specific Conductance	V	120.1	N/M	N/M	N/H	N/M
Temperature	W	170.1	N/M	N/M	N/M	N/M
Dissolved Oxygen	W	EPA 360.1	N/M	N/H	N/H	N/M

Notes: S = Soil and/or sediment
V = Groundwater and/or surface water
N/M = No modifications from GQAPP
TBD = To be determined.

*With the exception of total recoverable petroleum hydrocarbons, the laboratory screening analyses do not have EPA method numbers.

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. Hodifications to these procedures are described below:

No Modifications

Section 9.0 -- Analytical Procedures

Screening and quantitative analytical procedures are presented in Section 9.0 of the GOAPP. Site-specific accuracy, precision, completeness, and detection limit criteria are presented in Section 5.0 of this SQAPP. Modifications to any other of the analytical procedures are described below:

No Modifications

Section 10.0 -- Data Reduction, Validation, and Reporting

Data reduction, validation, and reporting procedures are presented in Section 10.0 of the GOAPP. Modifications to these procedures are described below:

No Modifications

Section 11.0 -- Internal Quality Control Checks

Internal quality control check procedures are presented in Section 11.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 12.0 -- Performance and System Audits

Performance and system audit procedures are presented in Section 12.0 of the GQAPP. Specific audits planned for this site investigation are listed below:

Audit Type	Frequency/Date	Description
	To Be Determined	

Section 13.0 -- Preventive Maintenance

Preventive maintenance procedures are presented in Section 13.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 14.0 — Procedures Used to Assess Accuracy, Precision, and Completeness of Data

Procedures used to assess the accuracy, precision, and completeness of data are presented in Section 14.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 15.0 — Corrective Action

Corrective action procedures are presented in Section 15.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 16.0 — Quality Assurance Reports to Management

Quality assurance report procedures are presented in Section 16.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Appendix A — Additional Personnel Biographies

Personnel assigned to this site investigation whose biographies do not appear in the GQAPP are listed below: biographies for these site .personnel are presented on the following pages.

To Be Determined

APPENDIX C

THREATENED AND ENDANGERED FLORA AND FAUNA ASSOCIATED WITH NAS PENSACOLA

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

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

Scientific Name	Common Name	Base * status	Status. FGFWFC(or FDA)	USFWS	Habitat
FISHES					
Acipenser oxyrhynchur	Atlantic sturgeon	M	SSC	UR 2	Gulf coast, estuarine
Ammocrypta asprella	Crystal darter	U	T	UR 2	Fresh water
Etheostoma hirttio	Harelquin darter	U	SSC		Fresh water
Fundulus jenkinsi	Salt marsh topainnow	P	SSC		Salt, fresh, brackish waters
Lepisosteus spatula	Alligator gar	U	SSC		Brackish, fresh, salt wator
Moxostoma carinatum	River redhorse	U	SSC		Fresh water
AMPHIBIANS AND REPTILES					
Alligator mississippiensis	American Alligator	R	SSC	T(S/A)	Swamps, marshes, ponds
Caretta caretta caretta	Loggerhead turtle	M ?	T	T	Uarino, coastal
Chelonia mydas mydas	Green turtlo	M ?	E	E	Marine, coastal
Dermochelys coriacea	Leatherback turtlo	M	E	E	Marine, coastal
Dryaarchon corais couperi	Eastern indigo snake	P	T	T	Open areas near wator
Eretmochelys imbricata	Hawksbill turtlo	M ?	E	E	Marine, coastal
Gopherus polyphemus	Gopher tortoise	P	SSC	UR 1	Sandy coastal plains
Graptemys pulchra	Alabama map turtlo	U	SSC		Swamps, streams, marshes, ponds
Lepidochelys kempi	Atlantic ridley	M ?	E	E	Uarino, coastal
Rana areolata aesopus	Florida gopher frog	P	SSC	UR 2	Sand hill communities
Macroclemys temmincki	Alligator snapping turtle	SR	SSC	UR 2	Swamps, marshes, ponds
MAMMALS					
Mustela viron lutensis	Florida mink	U		UR 2	Terrestrial habitats
Peromyscus polionotus trissyllepsis	Perdido Key beach mouse	N/A	T	E	Beach dunes
Trichechus manatus latirostris	West Indian manatee	M	E	E	Atlantic and Gulf coast.
Ursus americanus floridanus	Florida black boar	N/A	T	UR 2	Titi swamps

Appendix C (Cont).

Scientific Name	Common Name	Base * Statu.	statu. FGFWFC(or FDA)	USFWS	Habitat
BIRDS					
Charadrius melodus	Piping Plover	P	T	T	Opon dry, sandy beaches
Charadrius alexandrinus	Snowy plover	P	T	UR 2	Opon dry, sandy beaches
Dendroida dominica stoddardi	Stoddard's yellow-throated warbler	P-u		UR 2	Uoodod habitats
Dondroica kirtlandii	Kirtland's warbler	U	E	L	Wooded habitats
Haematopus palliatus	American oystorcatchor	U	SSC		Coastal habitats
Egrotta rufescens	Reddish egret	P-u	SSC	UR 2	Freshwater/coastal wotlands
Egrotta caerulea	Little blue heron	P-u	SSC		Freshwater/coastal wotlands
Egrotta thula	Snowy egret	P-u	SSC		Freshwater/coastal wotlands
Grus canadensis pratensis	Florida sandhill crane	U	T		Freshwater wotlands
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 oystorcatchor	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	Nangrovo trees, coasts
Picoides borealis	Red-cockaded woodpockor	P-u	T	E	Cavity nests/old pine stands
Vermivora bachmanii	Bachmann's warbler	U	E	E	Uoodod habitats
Campephilus principalis	Ivory-billed woodpockor	U	E	E	Uoodod habitats
Sterna antillarum	Least torn	U	T		Coastal habitats
Nyctoria americana	Wood stork	U	E	E	Freshwater/coastal wotlands
Rostrhamus sociabilis	Snail kite	U	E	E	Freshwater/coastal wetlands
INVERTEBRATES					
Copris gophori	Scarab beetle	P		UR 2	Associated w/Gopher Tortoise

Appendix C (Cont.)

Scientific Name	Common Name	Base * Status	status FGFWFC(or FDA)	USFWS	Habitat
PLANTS					
Chrysopsis gossypina cruiseana	Cruise's goldon-astor	P	E	UR 1	Coastal dunes
Drosera intermedia	Spoon-leaved sundew	R	T		Aquatic habitats
Epigaea repens	Trailing arbutus	U	E		Dry, acid, sandy soil
Kalmia latifolia	Mountain laurel	U	T		Rich, moist, shady woods
Lilaeopsis carolinensis	Carolina lilaeopsis	R		UR 2	
Lilium iridollae	Panhandlo lily	U	E	UR 2	Black, mucky soils
Pinguicula planifolia	Chapman's buttorwort	U	RE	UR 2	
Polygonella macrophylla	Large-leaved jointweed	R	T	UR 1	Sand pino-oak scrub
Rhododondron austrinum	Orange azalea	U	E	UR 5	Moist, woody habitats
Sarracenia leucophylla	White-top pitchorplant	R	E		Open acid bogs
Sarracenia rubra	Sweet pitchorplant	U	E	UR 2	Acid bogs/slash pine woods
Stewartia malacodnedron	Silky camellia	U	E		Slopes of wooded ravines

C = Endangered
T = Threatened
UR 1 = Under roviow, for Federal listing with substantial evidence in existence indicating at least some degree of biological vulnerability and/or throat.
UR 2 = Under roviow, insufficient biological data available.
UR 5 = Candidate spocios, but taxa ha5 provon to bo more widespread than was previously believed and/or those species that are not subject to any identifiable throat.
FDA = Florida Department of Agriculture.
FGFWFC = Florida Game and Freshwater Fish Commission.
USFWS = U.S. fish and Wildlife Service.

Appendix C (Cont.)

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

[APPENDIX D

JUNE 1990 SECTION 14.2--CHARACTERIZATION]

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

14.2 Phase II — Characterization

The primary objectives of the Phase II field investigation are as follow

- o To characterize the nature and magnitude of the full spectrum of potential site contaminants;
- o To confirm and validate the contaminant distributions indicated by the Phase I analytical screening results by collecting and analyzing samples under full-scale CERCLA-type QA/QC requirements;
- o To support the preliminary identification, screening, and evaluation data requirements of potential remedial alternatives;

Phase 11 investigation of each Site will involve the collection of soil and groundwater 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 *14-3.*

During the Phase 11 investigation of sites 29 and *34,* which are 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 kontamination €or each medium as determined during the Phase I investigation. Additional Appendix IX samples may be required depending on the extent of contamination detected.

14.2.1 Biota Sampling

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

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

Table [14-3] (Cont.)

SITE 29

Medium	No. of Samples	Dupli-cates	Trip blanks'	Field Blanks	Rinsate Blanks	Preservative Blanks[b]	Total.	Analytical suite[c,d]
Soil	15	2	2	1	2	1	23 (6)	A C
Groundwater	3	1	1	NR	1	NR	6 (1)	A B
TOTAL	18	3	3	1	3	1	29(7)	

SITE 34

Medium	No. of Samples	Dupli-cates	Trip Blanks'	Field Blanks	Rinsate Blanks	Preservative Blanks[b]	Total[e]	Analytical Suite[c,d]
Soil	18	2	2	1	2	1	26 (6)	A C
Groundwator	2	1	1	NR	1	NR	5 (1)	A B
TOTAL	20	3	3	1	3	1	31(7)	

[a]Trip blanks will bo analysed for Target Compound Lirt (TCL) volatile organic coapoundr only.

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

'Analytical suite designations are as follows:

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

Table 14-3 (Cont.)

B = total suspended solids, total Kjeldahl nitrogen, 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 tho various chemical groups included within tho above-listed analytical suites are identified in Tables 9-5 through 9-13 of the Generic Quality Assurance Projoet Plan.

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

NR = not required.

14.2.2 Soil Sampling

Soil samples will be collected from the 27 tentative locations shown in Figure 14-2. At each location, samples will be collected by compositing soils from the following intervals; surface to 0.5 feet, 0.5 to 2.5 feet, and every 2.5 feet there to the water table.

The soil samples will be collected using a split-spoon sampling device during soil boring or 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.

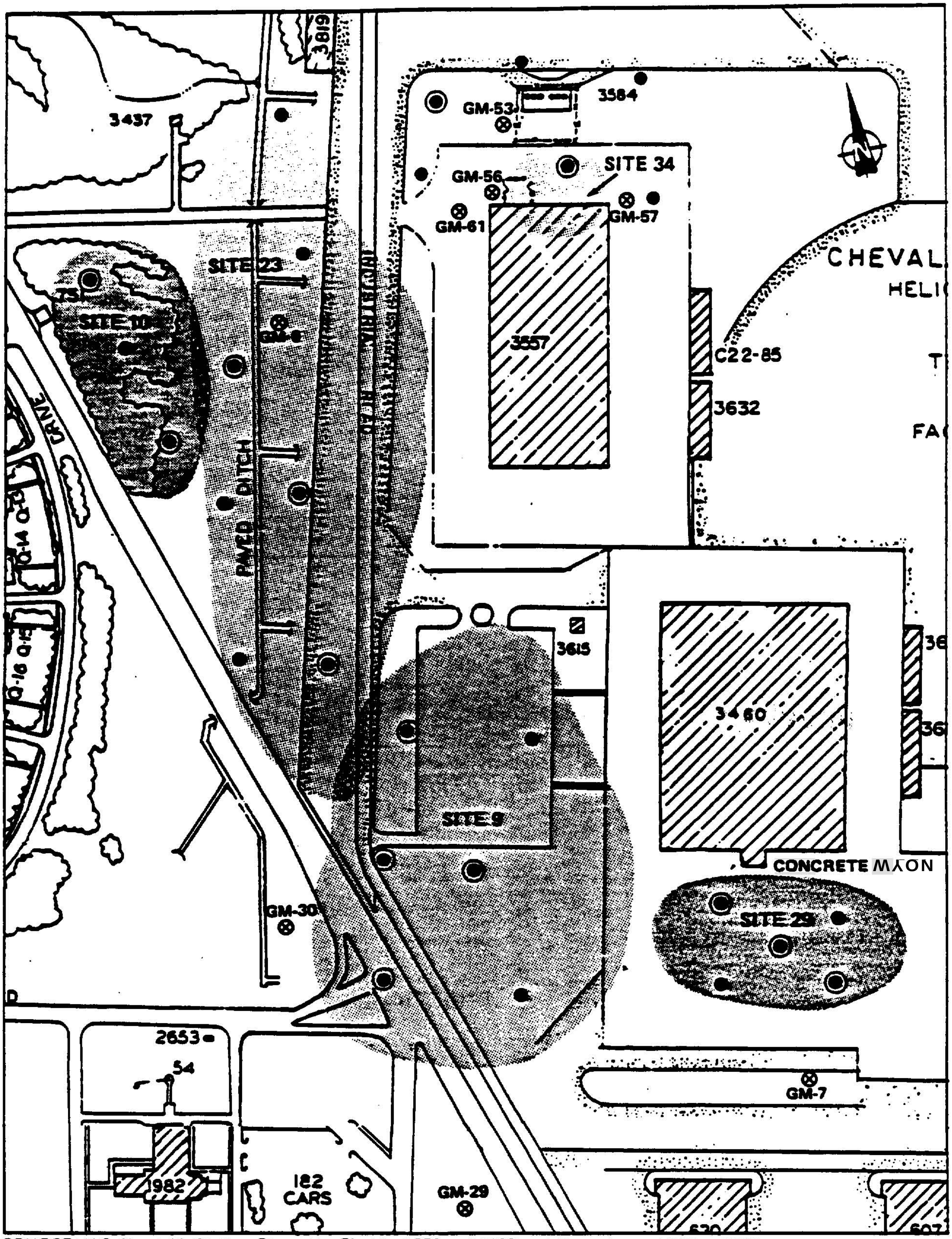
For planning purposes, three soil samples are assumed at each soil boring or well location. The following Section 14.2.2 assumes 27 soil boring locations in Phase II, thus a total of 81 soil samples is tentatively projected.

14.2.3 **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 14. All shallow wells will be installed to a depth of 15 feet and will be constructed of two-inch PVC, and bracket the water table with 10 **feet** of screen. The wells will be **installed** utilizing hollow-stem auger techniques and in accordance with sections 6.7 and 6.10 of the GQAPP.

Temporary or permanent covers for monitoring wells installed on aircraft ramps and tow-ways must be able to withstand the weight of aircraft and tow vehicles in order to prevent damage either to the aircraft or to the monitoring wells. These covers will conform to Federal Specification RR-F-621E (February 23, 1989), will be constructed of ductile iron or structural steel, and will withstand a minimum proof loading of 100,000 pounds, which will be identified on the cover. In addition, well covers must be secured so they cannot be dislodged by propellor or jet blast.

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



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

SCALE

0 200 400 600 800 FEET

KEY:

⊗ Existing Monitoring Well

● Tentative Soil Boring

○ Tentative Shallow Monitoring Well

▨ Building

Figure 14—2 TENTATIVE SOIL BORING AND SHALLOW MONITORING WELL LOCATIONS, SITES 9, 10, 23, 29, AND 34 — PHASE II

Depending on the results obtained during Phase I, the delineation of the extent of shallow groundwater contamination may be possible during Phase II by the installation of a fev monitoring wells in addition to the number proposed. When and where possible and/or practical, additional monitoring wells will be installed during Phase II in order to expedite the overall investigation schedule.

14.2.4 Groundvater Sampling

Groundwater samples will be collected from the estimated 14 newly installed permanent monitoring wells, at the locations shown on Figure 14-2. The purging and sampling of wells will be conducted in accordance with sections 6.8 and 6.20 of the GOAPP.

14.2.5 Hydrologic Assessment

Well head elevations will be surveyed for all newly installed monitoring wells and water levels will be measured in all wells.

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 advantage 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 finding of phases I and 11.

[Bold items enclosed in brackets denote *changes* to last version of document)

14.2.6 Air Sampling

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