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CONTAMINATION ASSESSMENT/ REMEDIAL ACTIVITIES INVESTIGATIONWORK PIAN - GROUP D NAVAL AIR STATION PENSACOLA PENSACOLA, FLORIDA

Pesticide Rinsate Disposal Area (Site 15) DDT Mixing Area (Site 24)

July, 1990

Prepared for:

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TABLE OF CONTENTS

Section		Page
1	INTRODUCTION	1-1
2	SITE DESCRIPTION	2-1
	2.1 Site 15 - Pesticide Rinsate Disposal Area	2-1
	2.2 Site 24 - DDT Mixing Area	2-4
3	SITE HISTORY	3-1
	3.1 Site 15 - Pesticide Rinsate Disposal Area	3-1
	3.2 Site 24 - DDT Mixing Area	3-4
4	CLIMATOLOGY	4-1
5	BIOLOGICAL RESOURCES	5-1
	5.1 Regional Biological Resources	5-1
	5.1.1 Terrestrial	5-1
	5.1.2 Aquatic	5-4
	5.2 Site-Specific Biological Resources	5-9
6	SURFACE WATER HYDROLOGY	6-1
	6.1 General Occurance and Significance of Surface Water	6-1
	6.2 Site-Specific Surface Water Hydrology	6-2
7	PHYSIOGRAPHY AND HYDROGEOLOGY	7-1
	7.1 Physiography and Regional Hydrogeology	7-1

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

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Table of Contents (Cont.)

Section		Page
7.1.1	Physiography	7-1
7.1.2	Regional Hydrogeology	7-1
7.1.2.1	Surficial Sand-and-Gravel Aquifer	7-1
7.1.2.2	Intermediate System	7-4
7.1.2.3	Floridan Aquifer System	7-5
7.2	Site Hydrogeology	7-5
7.2.1	Site 15 - Pesticide Rinsate Disposal Area	7-5
7.2.2	Site 24 - DDT Mixing Area	7-6
8	PROJECT MANAGEMENT PLAN	8-1
9	SITE MANAGEMENT PLAN	9-1
10	HEALTH AND SAFETY PLAN	10-1
11	QUALITY ASSURANCE PROJECT PLAN	11-1
12	AERIAL PHOTOGRAPH ANALYSIS	12-1
13	UTILITIES SURVEY	13-1
14	FIELDWORK METHODOLOGY	14-1
14.1	Phase I -- Field Screening	14-1
14.1.1	Physical Survey	14-1
14.1.1.1	Overall Physical Reconnaissance	14-1
14.1.1.2	HNu/OVA Surface Emissions Survey [and Particulate Air Sampling]	14-2

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

Table of Contents (Cont.)

Section | Page

14.1.1.3 Habitat/Biota Survey 14-2

14.1.2 Geophysical Survey 14-2

14.1.3 Analytical Screening 14-3

14.1.3.1 Laboratory Analyses 14-3

14.1.4 Eydrologic Assessment .....[14-8]

14.2 Phase II --Characterization .....[14-9]

[14.2.1 Biota Sampling ..... 14-9]

[14.2.2] Soil'Sampling ..... [14-12]

[14.2.3] Shallow Monitoring Well Installation and Development .....[14-15]

[14.2.4] Groundwater Sampling .....[14-15]

[14.2.5] Hydrologic Assessment .....[14-15]

[14.2.6] Air Sampling ..... 14-16]

14.3 Phase III --Extent Delineation .....[14-16]

14.3.1 Soil Sampling .....[14-16]

14.3.2 Shallow Monitoring Uell Installation and Development .....[14-16]

14.3.3 Intermediate and Deep Monitoring Well Installation and Development .....[14-17)

14.3.4 Groundwater Sampling .....[14-17)

14.3.5 Hydrologic Assessment .....[14-17]

14.3.6 Air Sampling .....[14-17]

14.4 Phase IV --Extent Delineation .....[14-17]

14.5 Topographic Survey and Base Hap .....[14-18]

14.6 Field Quality Assurance/Quality Control .....[14-18]

14.6.1 Documentation ..... [14-18]

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

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Table of Contents (Cont.)

Section Page

14.6.2 Field QA/QC Samples ..... [14-18]

14.7 Decontamination and Waste Management Procedures ..... [14-19]

14.7.1 Decontamination Procedures ..... [14-19]

14.7.2 Waste Management Procedures ..... [14-19]

15 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL 15-1

16 GROUNDWATER MODELING 16-1

17 TREATABILITY STUDY 17-1

18 BASELINE RISK ASSESSMENT 18-1

18.1 Contaminant Identification 18-1

18.2 Exposure Assessment 18-2

18.3 Toxicity Assessment 18-3

18.4 Risk Characterization 18-3

19 FEASIBILITY STUDY 19-1

19.1 Screening of Applicable Remedial Technologies 19-1

19.2 Assessment of Applicable Remedial Technologies 19-2

19.3 Risk Assessment 19-2

19.4 Development and Evaluation of Remedial Action Alternatives 19-2

19.5 Selection of Recommended Remedial Action Alternatives 19-2

19.6 FS Report 19-3

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

Table of Contents (Cont.)

Section		Page
20	REPORT	20-1
21	**DOCUMENT REVISION**	21-1
22	PROJECT MANAGEMENT	22-1
23	**PROJECT SCHEDULE**	23-1
24	**REFERENCES**	24-1

Appendix

A	SITE-SPECIFIC **SAFETY** PLAN	A-1
B	SITE-SPECIFIC QUALITY **ASSURANCE** PROJECT PLAN	B-1
C	THREATENED *AND* ENDANGERED **FLORA** *AND* **FAUNA** ASSOCIATED WITH NAS PENSACOLA	C-1

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LIST OF TABLES

Table		Page
3-1	Summary of Analytical Results [for] Pesticide Rinsate Disposal Area (Site 15)	3-3
3-2	General Pesticide Inventory [for] Golf Course Pesticide Shop, Building 3586	3-6
14-1	Phase I Sampling and Analytical Requirements--Group D	14-4
14-2	Phase II Sampling and Analytical Requirements--Group D	[14-10]

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

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LIST OF ILLUSTRATIONS

Figure		Page
2-1	Location Map NAS Pensacola Sites 15 and 24	2-2
2-2	Site Map NAS Pensacola Site 15	2-3
2-3	Site Map NAS Pensacola Site 24	2-5
14-1	Tentative Soil Boring and Temporary Monitoring Well Locations. Site 15--Phase I	[14-6]
14-2	Tentative Soil Boring and Temporary Monitoring Well Locations. Site 24--Phase I	[14-7]
14-3	Tentative Soil Boring and Shallow Monitoring Well Locations. Site 15 Phase II	[14-13]
14-4	Tentative Soil Boring and Shallow Monitoring Well Locations. Site 24 Phase II	[14-14]
23-1	Phase I Project Schedule — Sites 15 and 24	23-2
23-2	Phase II Project Schedule Sites 15 and 24	23-3
23-3	Phase III Project Schedule Sites 15 and 24	23-4
23-4	Phase IV Project Schedule Sites 15 and 24	23-51

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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 Pesticide Rinsate Disposal Area (Site **15) and** the DDT Mixing Area (Site 24) located at the Naval Air Station (NAS) in Pensacola, Escambia County, Florida. This work plan has been prepared by Ecology and Environment, Inc. (E & E) for the Southern Division, U.S. Navy, Naval Facilities Engineering Command, under Contract No. N62467-88-C-0200. The work plan has been developed based on information and file documents provided by the Navy and on information gathered by E & E during preliminary site inspections **conducted** during January of 1989.

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

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

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

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

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

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2. SITE DESCRIPTION

2.1 Site 15 - Pesticide Rinsate Disposal Area

The Pesticide Rinsate Disposal site is located within the golf course maintenance area of NAS Pensacola, approximately 600 feet south of Bayou Grande (Figure 2-1). The site area is unpaved except for an asphalt wash pad that covers approximately 36 square feet. There are four buildings in the immediate site vicinity (Buildings 2692, 2640, 747, and 1831) with access via an unpaved gravel road (see Figure 2-2). Potential contaminant source areas include two pesticide storage areas: Building 2692, including an unpaved area northeast of this building; and the equipment rinsate area to the southeast of Building 2692.

There are two existing monitoring wells on-site: well GM-60 (15 feet deep, 2.5 feet screened), located near the southeast corner of Building 2692; and well GM-59 (17 feet deep, 2.5 feet screened), located approximately 15 feet northwest of the former outdoor pesticide storage area (see Figure 2-2). Both monitoring wells were installed in 1986 by Geraghty and Hiller, Inc., (G & M) as part of a Characterization Study.

Building 3586, located approximately 375 feet east of Site 15 in the golf course maintenance area, has been, and may still be, used for the storage, mixing, and disposal of pesticides. A sink on the outside of Building 3586 and a drain in a concrete pad to the north of the building both discharge into a holding tank. This tank was periodically pumped out by a contracted agent.

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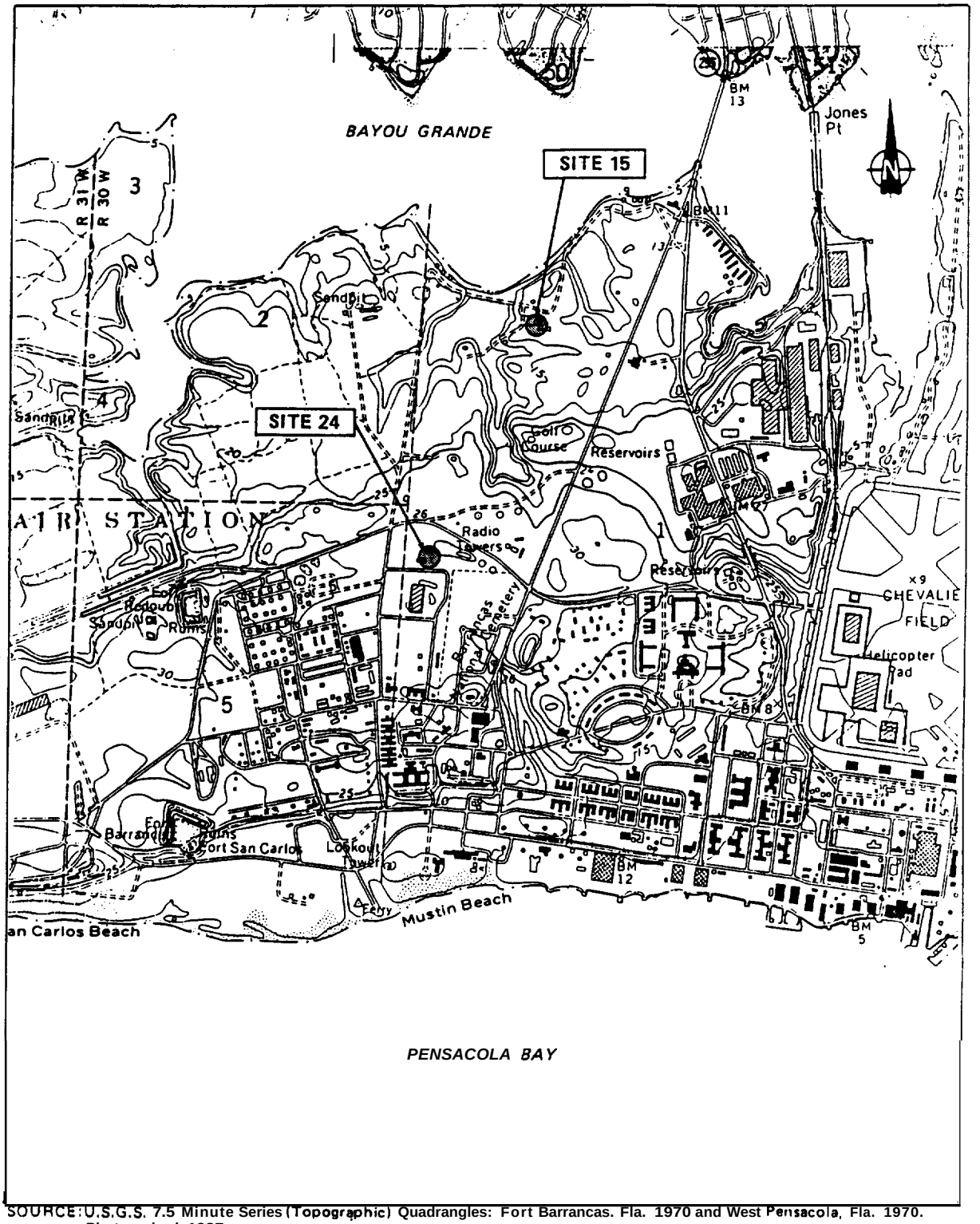

SOURCE: U.S.G.S. 7.5 Minute Series (Topographic) Quadrangles: Fort Barrancas. Fla. 1970 and West Pensacola, Fla. 1970. Photorevired 1987

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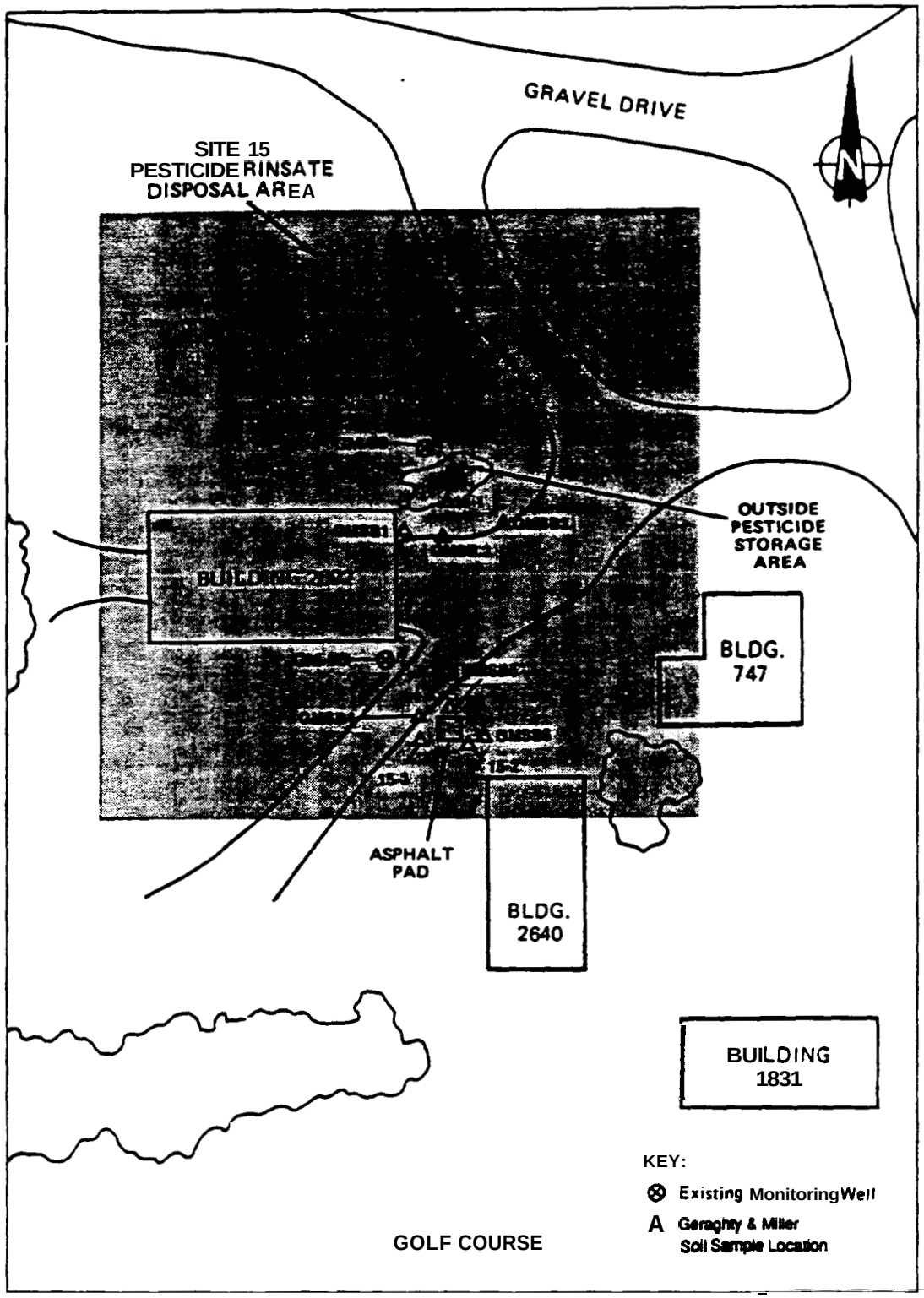
Figure 2–1 LOCATION MAP – NAS PENSACOLA – SITES 15 and 24



SOURCE: U.S. Naval Air Spoon. Pensacola, Florida, 1986; Geraghty and Miller 1986

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Figure 2–2 SITE MAP – NAS PENSACOLA SITE 15

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2.2 Site 24 - DDT Mixing Area

The DDT Mixing Area is located approximately 200 feet north of Building 3561 near the northwest corner of the Barrancas National Cemetery (see Figures 2-1 and 2-3). The site was used as a location for mixing DDT with fuel oil for mosquito control in the 1950's and early 1960's

A concrete pad, adjacent to Building 3561, was apparently used as a pesticide rinsate disposal area after the discontinued use of DDT. In addition, Building 3561 may have been previously used as a pesticide storage area. In March 1981, a tank washrack rinsing area was constructed near Building 3561. The rinsate was collected and diverted into the sanitary sewer system (NEESA 1983).

The area immediately surrounding Building 3651 is mostly paved; however, the former DDT mixing area is primarily unpaved and sparsely vegetated with native grasses. Surface soils are primarily sands and topographically, the area is generally flat. Land surface elevations average approximately 26 feet above mean sea level. Surface flows are most likely precluded by the high permeability of the surficial soils which allow direct infiltration of precipitation and spills.

There are no monitoring wells located on-site. A water supply well (NAS Pensacola Well No. 1) is located approximately 0.3 mile southeast of Site 24. This well is infrequently used as a secondary water supply to augment the primary well field located at Corry Station.

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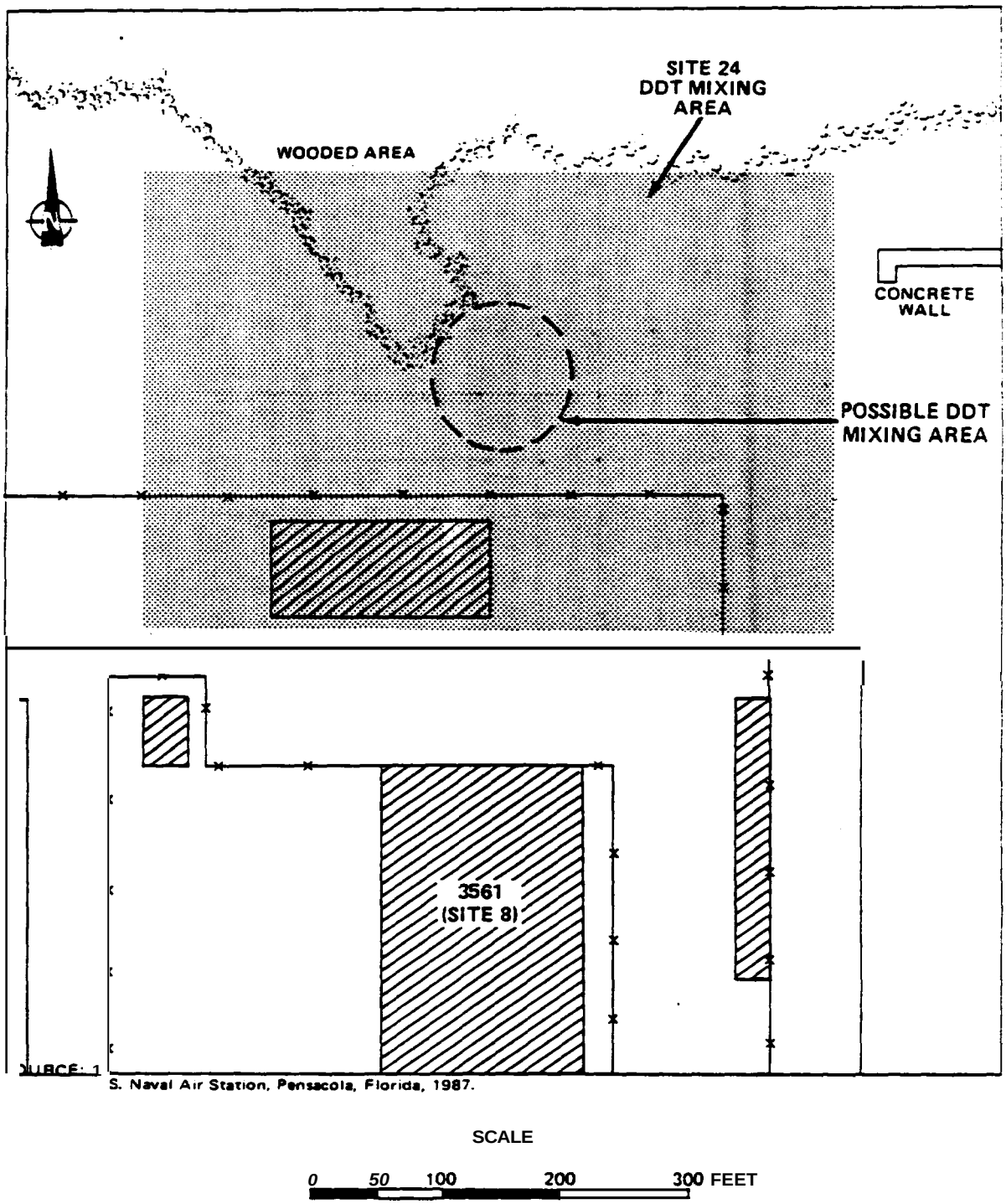

SOURCE: 1 S. Naval Air Station, Pensacola, Florida, 1987.

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Figure 2-3 SITE MAP – NAS PENSACOLA SITE 24

3. SITE HISTORY

3.1 Site 15 - Pesticide Rinsate Disposal Area

From 1963 until 1979, the Pesticide Rinsate Disposal site was used as an area for the storage of pesticides and the cleaning of pesticide mixing. and application equipment. Building 2692 and an outdoor area near the northeast corner of the building were used for the storage of pesticides (NEESA 1983). The floor of this building, and the outdoor area, are not cemented or paved; thereby creating the potential for direct infiltration of spilled or leaking pesticides. This building is currently used for the storage of fertilizers.

Equipment cleaning operations at the site's asphalt wash pad involved the disposal of dilute rinsate solutions directly onto the ground surface surrounding the pad (see Figure 2-2). These rinsates were allowed to infiltrate into the soil. The pesticide rinsate solutions are reported to have contained organic phosphates, chlorinated hydrocarbons, carbaryl, and carbamates (G & M 1986).

Previous environmental studies of the site were conducted under the Navy Assessment and Control of Installation Pollutants (NACIP) program. Former environmental investigations include an Initial Assessment Study (IAS) and a two-part Confirmation Study.

The IAS Report evaluated the Pesticide Rinsate Disposal site based on information taken from historical records, field inspections, and personnel interviews. The study concluded that discarded pesticide rinsates were not of sufficient concentration to constitute a threat to human health or the environment. It was recommended that no further

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study was necessary to further characterize the site. However, environmental sampling and laboratory analyses were not performed; therefore the data for a thorough assessment of the magnitude and extent of residual contamination were not available.

In 1984, G & M was retained by the Navy to perform a Confirmation Study at NAS Pensacola. The Confirmation Study consisted of a Verification Study and a subsequent Characterization Study.

As part of the Verification Study, G & M (1984) collected soil samples from 3 boring locations at depths of 1 inch, 12 inches, and 24 inches. Boring number 15-1 was located in the outdoor pesticide storage area, 15-2 and 15-3 were located on the perimeter of the asphalt wash pad [(see Figure 2-2)]. The samples were analyzed for arsenic, chlorinated pesticides, and PCBs. The analyses indicated moderate to low concentrations of several pesticides with a generally consistent decrease in concentration with depth (see Table 3-1). Chlordane and 4,4'-DDT appeared in the highest concentrations and over the widest distribution, with the elevated concentrations (21 ppm and 1.2 ppm, respectively) at the 1-inch depth in boring 15-1. Degradation products of 4,4'-DDT (4,4'-DDE and 4,4'-DDD) and of chlordane (heptachlor and heptachlor epoxide) were also detected in low concentrations, as were two other pesticides, Dieldrin and Beta-BHC. Concentrations of total arsenic ranged from 1.6 to 31 ppm. The highest concentrations were found at the 1-inch depth in boring 15-3 and throughout boring 15-2.

These initial results suggested the need for inclusion of the site in G & M's, 1986 Characterization Study. During this study, six more soil sample sets (1-inch, 12-inch, and 24-inch sampling depths) were collected and two shallow monitoring wells were installed on-site (GM-59 and GM-60). Water level measurements performed on five dates from June 11 to July 11, 1985 indicate an average depth to the water table of 13.11 feet in GM-59 and 13.66 feet in GM-60. Monitoring well GM-60 was installed at the southeastern corner of Building 2692, and well GM-59 was installed less than 5 feet from the northwest edge of the outdoor storage area. Well GM-60 was completed to a depth of 15 feet below land

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Table 3-1

SUMMARY OF ANALYTICAL RESULTS
PESTICIDE **RINSATE** DISPOSAL **AREA (SITE 15)**

Analytical Parameter	Sample Location								
	15-1 Depth (inches)			15-2 Depth (inches)			15-3 Depth (inches)		
	1	12	24	1	12	24	1	12	24
Pesticides and PCBs (ug/g or ppm)									
Chlordane	21.0	6.30	0.41	0.41	1.1	0.59	--	0.2	--
Chlordane	21.0	6.30	0.41	1.1	0.59	--	0.29	0.06	--
4,4'-DDT	1.2	0.79	0.01	0.69	0.40	0.01	--	--	--
4,4'-DDE	1.2	--	--	--	0.19	--	--	--	--
Heptachlor	*	*	*	*	*	--	*	*	--
Hetachlor Epoxide	--	0.16	0.03	--	--	--	--	--	--
Dieldrin	--	--	--	0.17	0.1	0.01	0.1	0.44	0.02
4,4'-DDD	--	--	--	--	0.03	--	--	--	--
4,4'-DDD	--	--	--	--	0.03	--	--	0.01	--
BHC-beta	--	--	--	--	0.03	--	--	--	--
Total Pesticides and PCBs	23.4	7.25	0.45	1.96	1.34	0.02	0.39	0.51	0.02
Total Arsenic	15.0	8.0	3.2	15.0	19.0	19.0	31.0	1.6	2.4

Note: * Heptachlor is a constituent of chlordane and is present below quantifiable limits.

Source: Geraghty and Miller, Inc. 1984

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surface, with a screen interval of 12.5 feet to 15 feet. Well GM-59 was completed to a depth of 17 feet below land surface, with 2.5 feet of screen from 14.5 to 17 feet. Groundwater samples were collected from the two wells and analyzed for chlorinated pesticides, PCBs, and arsenic. No pesticides or PCBs were detected in the water samples; however, low concentrations of arsenic (0.153 ppm) were detected in the sample from well GM-59.

Three soil sample sets (GMSB-1 through B-3) were collected from the southern perimeter of the storage area, and three were collected (GMSB-4 through B-6) from the northern perimeter of the asphalt wash pad. The soil samples were analyzed for EP-Toxicity arsenic. Arsenic concentrations ranged from not detectable to 12.7 ppm. These levels exceeded the EP-Toxicity maximum contaminant level (MCL) of 5 ppm in 2 of the 18 samples (12.7 ppm in GMSB-2-1 and 5.2 ppm in GMSB-2-12).

The exceedance of the EP-Toxicity MCL indicates that these soils may be characterized under RCRA (Resource Conservation and Recovery Act) as a hazardous waste. This implies that further horizontal and vertical delineation of contamination is necessary to provide the data required for determing appropriate remedial measures at the site.

3.2 Site 24 - DDT Mixing Area

From the early 1950s until the early 1960s, the DDT Mixing Area site was used as a location for mixing DDT with diesel fuel for mosquito control. Reportedly, spills occurred within the mixing area when DDT was transferred from drums to spray tanks. The unintentional spillage of DDT concentrate may have contaminated site soils and groundwater (NEESA 1983).

The aerial application of DDT was performed for at least 10 years to control mosquito outbreaks. In later years, a fogger machine was used for DDT application. On the average, two or three mosquito outbreaks occurred each year during the spring and summer. For each aerial

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application, 500 gallons of 20% DDT were mixed with 500 gallons of diesel oil. The fogger machine used 300 gallons of each product. Two applications during a one-week period were performed for each mosquito outbreak (NEESA 1983).

Previous environmental studies of NAS Pensacola were conducted under the NACIP program. Former environmental investigations at NAS Pensacola consisted of an IAS and a two-part Confirmation Study. The Navy's 1983 IAS report evaluated the DDT nixing Area site based on information taken from historical records, field inspections, and personnel interviews. This report included an estimate of approximately 20 gallons of pesticide mixture, containing about 3.3 pounds of DDT, vere inadvertently spilled during the entire period of operations. The Navy study concluded that this estimated level of DDT contamination posed no threat to human health or to the environment. The DDT mixing area site was not investigated during the subsequent Confirmation Study.

In addition, Building 3561 was used as a pesticide storage and equipment rinsing area, after the use of DDT was discontinued. A typical inventory of stored pesticides is included in Table 3-2. In March 1981, a tank washrack rinsing area was constructed near building 3561. The rinsate was collected and diverted into the sanitary sewer system (NEESA 1983).

The activities involved in the storage and disposal of pesticides in Building 3561 and the adjacent concrete pad were not detailed in any of the previous investigations. It is unknown whether the operations are still in progress or if any potentially harmful releases have occurred. To date, no environmental sampling has been performed on any portion of this site.

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Table 3-2

GENERAL PESTICIDE INVENTORY
GOLF COURSE PESTICIDE SHOP, BUILDING 3586
(Prom 1979 Pest Management Plan)

Pesticides	Inventory
Insecticides	
Carbaryl, *80%* WP	10 pounds
Diazinon, 47.5% EC	2 gallons
Dursban, 41% EC	10 gallons
Dursban, .5% Mole Cricket Bait	*900* pounds
Trichorfon, *80%* SP (Dylox)	2 pounds
Herbicides	
CAMA, 10.3% EC (Calar)	3 gallons
Copper, 7% SC	5 gallons
Dalapon, 46.7% SP	100 pounds
Glyphosate, 41% EC	5 gallons
Kerb, 50% WP	21 pounds
MSMA, *47.8%* WP	16 gallons
Simazine, *80%* WP	20 pounds
2, 4-D, *49.8%* Amine	4 gallons
Miscellaneous	
Dexon, 35% WP	57 pounds
Maneb, *80%* WP	110 pounds
Methyl bromide, *98%* LFU	30 pounds
Nemacur, 15% Granules	275 pounds

Source: NEESA, 1983

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4. CLIMATOLOGY

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

Precipitation rates in the NAS Pensacola vicinity are relatively high with an average annual rainfall of approximately **[60]** inches. Rainfall amounts are highest in July and August during almost daily thunderstorms (averaging [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 three to four inches of rainfall during a single hour. Evaporation rates are also highest in the summer months, which reduces the potential recharge resulting from heavy summer rains. Spring and fall rains are generally'less intense, but longer in duration, producing less surface runoff and higher rates of infiltration and net recharge.

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

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

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5. BIOLOGICAL RESOURCES

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

51 Regional Biological Resources

5.1.1 Terrestrial

Vegetation. The primary vegetated communities of the NAS Pensacola facility can be considered one of two types: north Florida coastal strand communities; and sand pine scrub communities. The north Florida coastal strand communities are stabilized coastal dunes with a sand substrate, vegetatively characterized by the plants Uniuola paniculata (sea oats), Bydrocotyle bonariensis (beach pennywort), Ipomea stolonifera (beach morning-glory), Coccoloba uvifera (sea grape), Quercus geminata (twin live *oak)*, and the stunted shrubs species Yucca aloifolia (yucca), Opuntia, and Cereus. This community type has been ranked by the Florida Natural Areas Inventory (FNAI) as locally restricted and vulnerable to extinction due to developmental activities. This community type can have 3 to 5 distinct habitat types (Uolfe et al. 1988).

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The sand pine scrub community is a more upland coastal community characterized by coastal dune formations from an older geologic age with deep, fine white sand substrate and the plants Pinus clausa (sand pine), Quercus spp. (scrub *oak* species, geminata, champanii, myrtifolia, and

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

Two other community types 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 of 1986 (Navy 1986).

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

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

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

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

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

150024 **Birds.** A literature search reveals 250 possible bird species associated with the area. Thirteen of these species are endangered and seven are species of concern (see Appendix C). In March 1986, the Navy conducted a survey and found 23 species of birds on the NAS Pensacola facility. The Navy recorded moderate size rookeries of the great blue heron, and

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found large numbers of nesting osprey in the southwestern portions of the NAS Pensacola facility. Because of the large number and diversity of habitats found around the facility and considering that the survey was conducted during a predominantly non-mating season, it is likely that there are more species of birds using the facility and surrounding waters as feeding and nesting sites than have been found.

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

5.1.2 Aquatic

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

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

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

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

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

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

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

Fish **and** Shellfish. Early studies of Pensacola Bay have identified **180** bony fish species and **7** cartilaginous fish species (Cooley **1978).** The **13** most abundant species were spot (Leiostomus xanthurus), pinfish (Lagodon rhomboides), atlantic croaker (Micropogonias undulatus), gulf menhaden (Brevoortia patronus), bay anchovy (Anchoa mitchilli), longspine porgy (Stenotus caprinus), silver perch (Bairdiella chrysoura), southern hake (Urophycis floridana), inshore lizardfish (Synodus foetens), gafftopsail catfish (Bagre marinus), sand seatrout (Cynoscion arenarius), and spotted hake (Urophycis regia) (Heil **1988).**

Fish diversity was highest in the more saline waters near the NAS Pensacola facility during spring and summer. In the less saline waters of East Bay, diversity was lowest in summer and highest during the winter months. Fish population density was the highest in the more saline waters, with peaks throughout the summer (Cooley **1978).**

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

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(Heil **1989).** Shrimp are caught in greater abundances near NAS because of the higher salinities. Blue crabs and oysters are more readily caught in the East Bay area. In fact, the only legal shellfishing areas recognized by FDNR are in the East Bay area. Scallops (Aequipecten irradians) are collected only within grassbed areas. No information is available at this time on where scallops are collected by the general public and how many are removed. The nearest seagrass beds to the NAS facility are located in the Big Lagoon along the southwest portion of the facility.

Sport and Commercial Fishing. A moderate amount of commercial fishing occurs in Escambia county, accounting for 2% of the total Florida landings for **1980-85** (Navy **1986).** The dominant finfish species in terms of total weight was the black mullet. The most economically important species of finfish was the red snapper. E & E examined the commercial landing data for Escambia county for **1987** and **1988** (Heil **1989)** and found that the most important commercial species by weight were: black mullet (24% of county landings), brown shrimp **(21%),** vermillion snapper **(19.5%),** red snapper **(7.6%),** porgies **(4.7%),** and amberjack *(4%).* Other less important commercial fish caught were spanish mackerel, sand seatrout, black grouper, spotted seatrout, bluecrabs, and squid. This data, as well as the **Navy's** data, also suggests that a significant tuna fishery may be developing in the Pensacola Bay area **(0** pounds landed in **1983, 1,582** pounds in **1987).**

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

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

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90 percent of all commercially valuable fish species are estuarine dependent during some phase of their life cycle. Shrimp, bluecrab and shellfish are known to release larvae that feed in and around estuaries until settlement. During early life history stages the juveniles reside within seagrass beds or other protected habitats until maturity. Any contamination of the water or sediments around NAS Pensacola could be detrimental to fish and shellfish population structure, or could be accumulated by the organisms residing near the facility.

Marine Mammals. Few mammals have been sighted within the area of the NAS Pensacola facility, most of the 13 species of mammals reported for the northeastern Gulf of Mexico stay predominantly in Gulf waters. The atlantic bottlenose dolphin (Tursiops truncatus), however, has been sighted regularly off the NAS Pensacola facility. Manatees have been sighted irregularly, with one recent sight'ing in the area recorded by the FNAI in October 1988. A goosebeaked whale (Ziphius cavirostris) was reported stranded on Santa Rosa Island, and a pilot whale (Globicephala macrorhynchus) was found stranded on a beach near Pensacola (Navy 1986).

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

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

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

5.2 Site-Specific Biological Resources

Site 15 is found in an area of sand pine scrub communities which are dominated by scrub oaks and shrub vegetation. The majority of the habitat within the immediate vicinity of Site 15 has been partially altered for the construction of several buildings. The understory consists mostly of grass species, instead of shrubs and herbaceous plants. The areas to the west and southwest of Site 15 consist of a cultiyated golf course to the east, and a relatively undisturbed sand pine scrub community to the north. Because of the abundance of relatively undisturbed vegetative communities in the vicinity of Site 15, it is expected that many species of birds, reptiles, amphibians, and mammals use the site for feeding, nesting, or as a migration corridor.

Site 24 has been cleared of most vegetation for the construction of buildings and storage areas; therefore, grasses are the only dominant vegetation. The site is surrounded on the north and west by sand scrub vegetative communities. A cemetery lies to the east-southeast. It is expected that few faunal species, primarily small mammals and some birds, use this habitat for feeding, but a moderate number of species may use this site habitat as a migration corridor to the wooded area north of the site.

There are no aquatic habitats located on either site; however, Bayou Grande is located approximately 1/4-mile northwest of Site 15.

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6. SURFACE WATER HYDROLOGY

6.1 General Occurrence and Significance of Surface Water

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

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

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

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

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

6.2 Site-Specific Surface Water Considerations

No significant surface water bodies are located on or in the immediate vicinity of Site 24. The nearest surface water body to Site 24 is a pond on the A.C. Read Golf Course, approximately 0.3 mile to the northeast.

No significant surface water bodies occur in the immediate vicinity of Site 15. The closest surface water body, the Golf Course Pond, is located approximately 500 feet west of the site, Bayou Grande is located approximately 600 feet to the north and an unnamed pond is located approximately 650 feet to the northeast. Given the permeable nature of the soils (which would limit surface runoff) and the distance from Site 15, it is not likely that these surface water bodies would be significantly impacted by site contamination. However, the potential for impact on these water bodies will be re-evaluated during the course of this investigation.

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7. PHYSIOGRAPHY AND EYDROGEOLOGY

7.1 Physiography and Regional Hydrogeology

7.1.1 Physiography

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

7.1.2 Regional Hydrogeology

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

7.1.2.1 Surficial/Sand-and-Gravel Aquifer

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

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of unconsolidated to poorly indurated clastic deposits (Wagner et al. 1984). In this portion of Florida the Surficial Aquifer constitutes an important source of water supply and is called the Sand-and-Gravel Aquifer (SEGS 1986). The sediments making up this aquifer belong to all or part of the Pliocene to Eolocene Series which, in this area, consist mainly of the Citronelle Formation overlain by a thin cover of marine terrace deposits. Given that the Sand-and-Gravel Aquifer is contiguous with land surface and recharge occurs principally by the direct infiltration of precipitation, the aquifer is particularly susceptible to contamination from surface sources. In the NAS Pensacola vicinity the Sand-and-Gravel Aquifer is made up of three zones based on contrasting permeabilities. These zones are referred to as the surficial zone, the low permeability zone, and the main producing zone (Wilkins et al. 1985).

Surficial Zone. The surficial zone is contiguous with land surface and contains groundwater under water table or perched water table conditions. The results of numerous borings conducted at NAS Pensacola (G & M 1984, 1986) indicate that the surficial zone ranges in thickness between 40 and 70 feet and [consists] of tan and brown fine to medium-grained quartz sand. Depth to the water table within the surficial zone is variable depending on location and ranges from less than one foot near surface water bodies to more than 20 feet in areas of higher elevation. In general, the direction of ground water flow is controlled by the topography and by discharge to surface water bodies. Consequently shallow groundwater in the surficial zone moves toward areas of lower elevation and/or the nearest surface water body. Overall, the surficial zone has a high permeability. Numerous aquifer (slug) tests and laboratory permeability tests conducted on wells in or sediments from the surficial zone at NAS Pensacola (G & M 1986) yielded hydraulic conductivity values ranging from 16 to 56 ft/day. Horizontal groundwater flow velocities in the surficial zone will depend on site-specific hydraulic conductivities and horizontal hydraulic gradients, however, velocities would generally be expected to be high.

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

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

Main Producing Zone. The bottom portion of the Sand-and-Gravel Aquifer is called the main producing zone and is [composed] mainly of sand and gravel interbedded with thin beds of silt and clay. The depth at which the main producing zone is encountered is somewhat variable, ranging from **60** to approximately **120** below land surface at NAS Pensacola. This zone generally has the highest permeability characteristics due to thicker, and more persistent sand and gravel beds, and is tapped by most of the major wells in the Pensacola area (Wilkins et al. 1985). NAS Pensacola has three supply wells which produce water from this zone, however, due to high iron content in the water the wells are infrequently used **(G & M 1986).** The principal sources of water for NAS Pensacola are wells located at Corry Field, approximately 3 miles to the north. The thickness of the main producing zone can be highly variable; however, it is estimated to be up to about 100 feet at NAS Pensacola. Insufficient data exist for wells open to the main producing zone at NAS

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

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

7.1.2.2 Intermediate System

The lower limit of the Sand-and-Gravel Aquifer coincides with the top of a regionally extensive and vertically persistent hydrogeologic unit of much lower permeability. This unit is referred to as the Intermediate System. In the vicinity of NAS Pensacola the top of the Intermediate System generally lies within the sediments termed Miocene Coarse Clastics or corresponds to the top of the Upper Member of the Pensacola Clay and occurs at a depth of approximately 300 feet (Wilkins et al. 1985). In general the Intermediate System consists of fine-grained sediments, and functions as an effective confining unit which retards the exchange of water between the overlying Sand-and-Gravel Aquifer and the underlying Floridan Aquifer System (SEGS 1986). For the most part the entire sequence is poor to non-water bearing. However, relatively thin beds of sand exist within the unit which may yield small quantities of water. In the NAS Pensacola area the Intermediate System is approximately 1,100 feet thick and is composed of the lower portion of the Miocene Coarse Clastics, the Upper Member of the Pensacola Clay, the Escambia Sand Member of the Pensacola Clay, and the Lower Member of the Pensacola Clay; all are of Miocene Age.

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7.1.2.3 Floridian Aquifer System

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

7.2 Site Hydrogeology

7.2.1 Site 15 - Pesticide Rinsate Disposal Area

Two monitoring wells (GM-59 and GM-60) were installed on-site by G & M in 1986 as part of a Characterization Study. Well GM-59 was completed to a depth of 17 feet below land surface, with 2.5 feet of screen from 14.5 to 17 feet. Well GM-60 was completed to a depth of 15 feet below land surface, with a screened interval from 12.5 feet to 15 feet. Lithologic drilling logs for the two wells indicate that the surficial zone of the Sand-and-Gravel Aquifer at both locations [consists] of fine to medium-grained tan sands to a depth of at least 15 feet. Lithologic information from nearby borings indicate that there are primarily fine to medium-grained quartz sands at depths of approximately 15 to 50 feet below land surace (G & M 1986).

Water level measurements performed on five dates from June 11 to July 11, 1985 indicate an average depth to the water table of 13.11 feet in GM-59 and 13.66 feet in GM-60. The direction of groundwater flow can not be determined from these two wells; however, the site's proximity to Bayou Grande indicates that goundwater flow should be to the west and northwest (G & M 1986).

In addition, there is a NAS Pensacola supply well (Well No. 1) located approximately 0.7 mile south of Site 15. This well is infrequently used as a secondary water supply to [augment] the primary well field located at Corry Station. The supply well was installed in 1942 to a depth of 174.5 feet with bronze screen from approximately 106 to 174

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feet. The well yield, when in use, is about 650 gallons per minute (gpm), and depth to the water table (in 1942) vas approximately *23* feet (G & M 1986).

7.2.2 Site *24* - DDT Mixing Area

The soils of Escambia County are primarily derived from marine and stream deposit parent material. The IAS soil association map (NEESA 1983) indicates that the soils at Site 24 are predominately a sandy fill material.

This material was most likely deposited as fill material for construction purposes. The location of the site indicates that it may overlie the poorly drained, gray sandy lowland soils of the Series. There are currently no monitoring wells on-site and there is no currently available site-specific hydrogeologic data. However, land surface elevations are approximately 26 feet above mean sea level and the depth to groundwater has been roughly estimated to be 10 feet. Lithologic information from nearby borings indicate that there are primarily fine to medium-grained quartz sands at depths of approximately 15 to 50 feet below land surface.

In addition, there is an NAS Pensacola supply well (Well No. 1) approximately *0.3* mile southeast of Site *24.* This well is infrequently used as a secondary water supply to augment the primary well field located at Corry Station. The supply well vas installed in 1942 to a depth of 174.5 feet with bronze screen from approximately 106 to 174 feet. The well yield, when in use, is about 650 gallons per minute (gpm) and the depth to the static water level (in 1942) was approximately *23* feet.

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8. PROJECT MANAGEMENT PLAN

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

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9. SITE MANAGEMENT PLAN

The Generic Site Management Plan (GSMP), submitted to the Navy for approval, defines the management procedures for field activities on both the site and program level. The management and implementation of all field activities conducted as part of the Contamination Assessment/ Remedial Activities Investigation of Sites 15 and 24 will follow the GSMP, and any updated versions. Data Quality Objectives (DQOs), and all applicable or relevant and appropriate requirements (ARARs) have been considered in developing the initial phases of fieldwork described here, and will be updated and revised for any subsequent phases of fieldwork.

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10. HEALTH AND SAFETY PLAN

A comprehensive General Health and Safety Plan (GHSP) and individual site-specific safety plans (SSP) have been developed to provide readily available emergency information and preventative safety measures. The GHSP, submitted to the Navy for approval, outlines health and safety procedures and protocols to be followed during all field investigations at each of the 37 sites on NAS Pensacola. The plan includes: standard operating procedures (site entry, decontamination, etc.); hazard communication and training (safety training, briefings, documentation, etc.); safety equipment and instrumentation (monitoring, personnel protective equipment, etc.); hazard evaluation by contaminant class (metals, organics, etc.); and hazard evaluation for each task (drilling, sampling, etc.). The GHSP will be periodically updated, as required, during the course of this program.

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

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11. QUALITY ASSURANCE PROJECT PLAN

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

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

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12. *AERIAL* PHOTOGRAPH ANALYSIS

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

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13. UTILITIES SURVEY

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

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14. FIELDWORK METHODOLOGY

14.1 Phase I -- Field Screening

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

14.1.1 Physical Survey

14.1.1.1 Overall Physical Reconnaissance

A field reconnaissance survey will be conducted on and around the Pesticide Rinsate Disposal and DDT Mixing areas. Available aerial photographs and maps will be used as guides in locating surface features. Visual inspections will be made regarding surface conditions, stressed vegetation, surface drainage patterns, and areas of exposed debris.

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

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

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

During the establishment of the geophysical survey grid network (discussed in Section 14.1.2), an emissions survey will be conducted using HNu and/or OVA air monitoring equipment. The survey will be conducted in accordance with Section 6.1.1 of the GQAPP. Measurements will be made at each established grid point, and readings will be recorded in the field logbook.

[In addition, preliminary air screening **will be** conducted with a particulate monitor, such as a **Mini-Ram**, to determine if the site represents a source of particulates in the air. The air sampling will be conducted in accordance vith Section 6.1.3 of the **GQAPP.]**

14.1.1.3 Habitat/Biota Survey

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

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14.1.2 Geophysical Survey

A magnetometry (Hag) survey will be conducted using a proton magnetometer or gradiometer. The magnetometer will be carried along transects at 50 foot intervals at both Sites 15 and *24* to identify

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potential buried metallic objects, such as pipes, drums, or storage tanks. The results of the survey may aid in the identification of potential contaminant sources [and] plumes and in the selection of drilling locations. The Mag survey will be performed in accordance with procedures detailed in Section 6.2.3 of the GQAPP.

14.1.3 Analytical Screening

14.1.3.1 Laboratory Analyses

Phase I sampling activities for Sites 15 and 24 will require soil sampling, the installation of shallow temporary monitoring wells, and groundwater sampling. All of the samples will be analyzed in the laboratory for analytical screening parameters. The analytical screening program has been developed for the Phase I effort as a measure to efficiently and cost-effectively provide focus for subsequent phases of site characterization and contamination extent delineation. Analytical screening is addressed in detail in Section 9.1 of the GQAPP. Analytical requirements for samples collected in Phase I are shown in Table 14-1.

Soil - Approximately 48 soil borings will be drilled using either a solid stem auger extraction method or a hand-operated bucket auger. Borings will be completed to an approximate depth of 12 feet at Site 15 and 10 feet at Site 24, or to the water table, whichever is greater. Soil samples will be collected over 5 foot intervals (0-5, 5-10 feet, etc.); soil lithologies will be characterized and recorded in the field notebook. All drilling and sampling equipment will be decontaminated in accordance with Sections 6.6 and 6.10 of the GQAPP.

Assuming the water table is at a depth of 12 feet at Site 15 and 10 feet at Site 24, a total of 87 samples will be collected at Site 15 and 38 samples will be collected at Site 24.

Tentative sample locations are shown in Figures 14-1 and 14-2. The approximate locations indicated were selected based on both site history information pertaining to potential source areas (see Section 2) and on

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Table 14-1

PHASE I SAMPLING AND ANALYTICAL REQUIREMENTS-GROUP D

SITE 15

Medium	No. of Samples	Duplicates	Total	Analytical Suite[a,b]
Soil	87	4	91	A
Groundwater[d]	10	1	11	A
TOTAL	61	4	65	

Medium	No. of Samples	Dupli-cates	Trip Blanks[f]	Field Blanks	Rinsate Blanks	Preservative Blanks[g]	Total	Analytical Suite[a,c]
Groundwater[e]	2	1	1	1	1	1	7	B

SITE 24

Medium	no. of Samples	Duplicates	Total	Analytical Suite[a,b]
Soil	36	2	40	A.
Groundwater[c]	5	1	6	A
TOTAL	43	3	46	

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Table 14-1 (Cont)

[a]Analytical suite dosignations are as follows:

A = Volatile organic compounds, polynuclear aromatic hydrocarbons, organophosphorous pesticides, carbamates, pesticides and total PCBs, total recoverable hydrocarbons, and metals (total, unfiltorod).

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

[b]Specific constituents encompassed by the various chemical groups included within analytical suite A are idontifiod in Tables 9-1 through 9-4 of the GQAPP.

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

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

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

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

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

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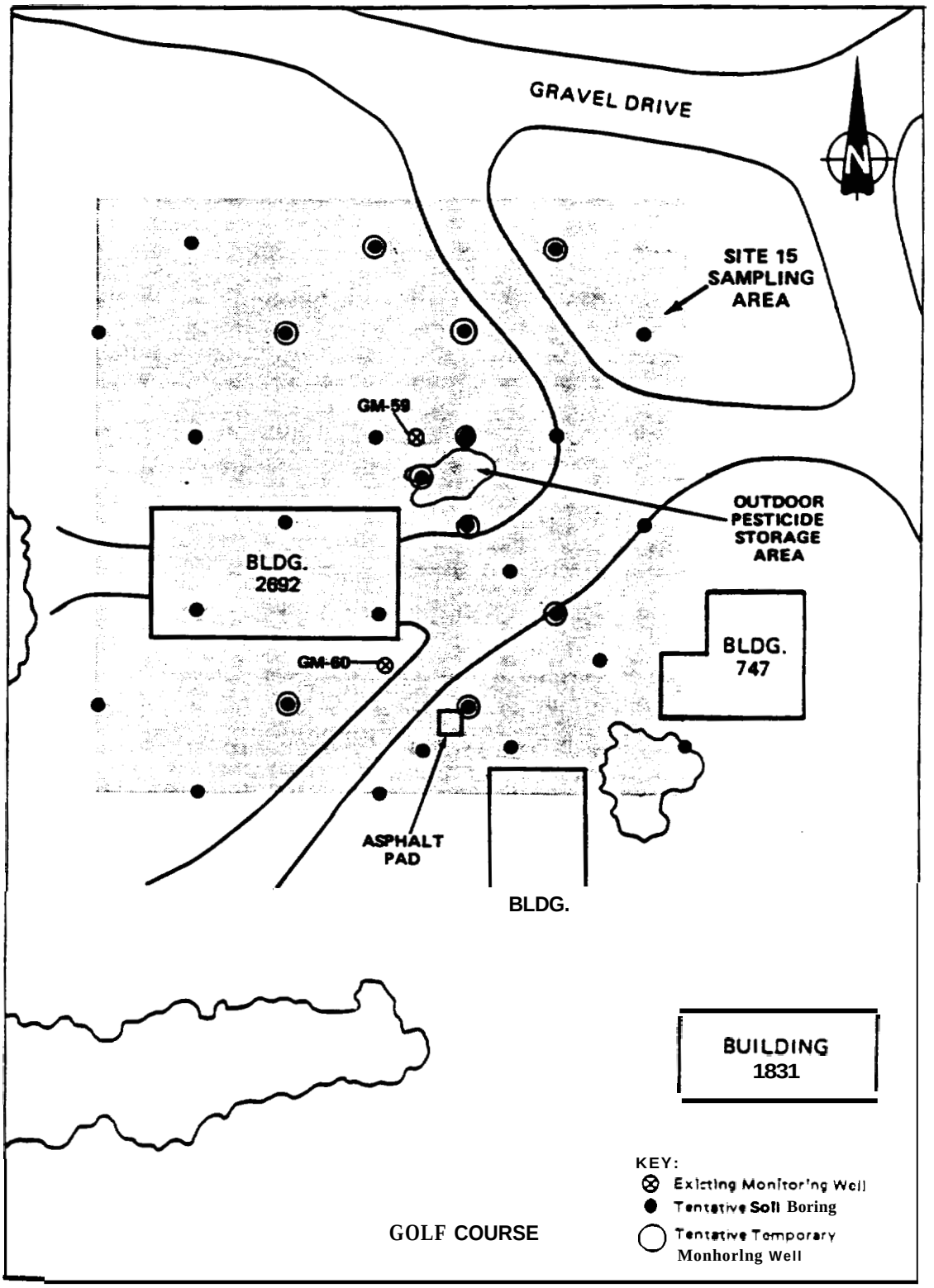

SOURCE: U.S. Naval Air Station. Pensacola, Florida, 1986

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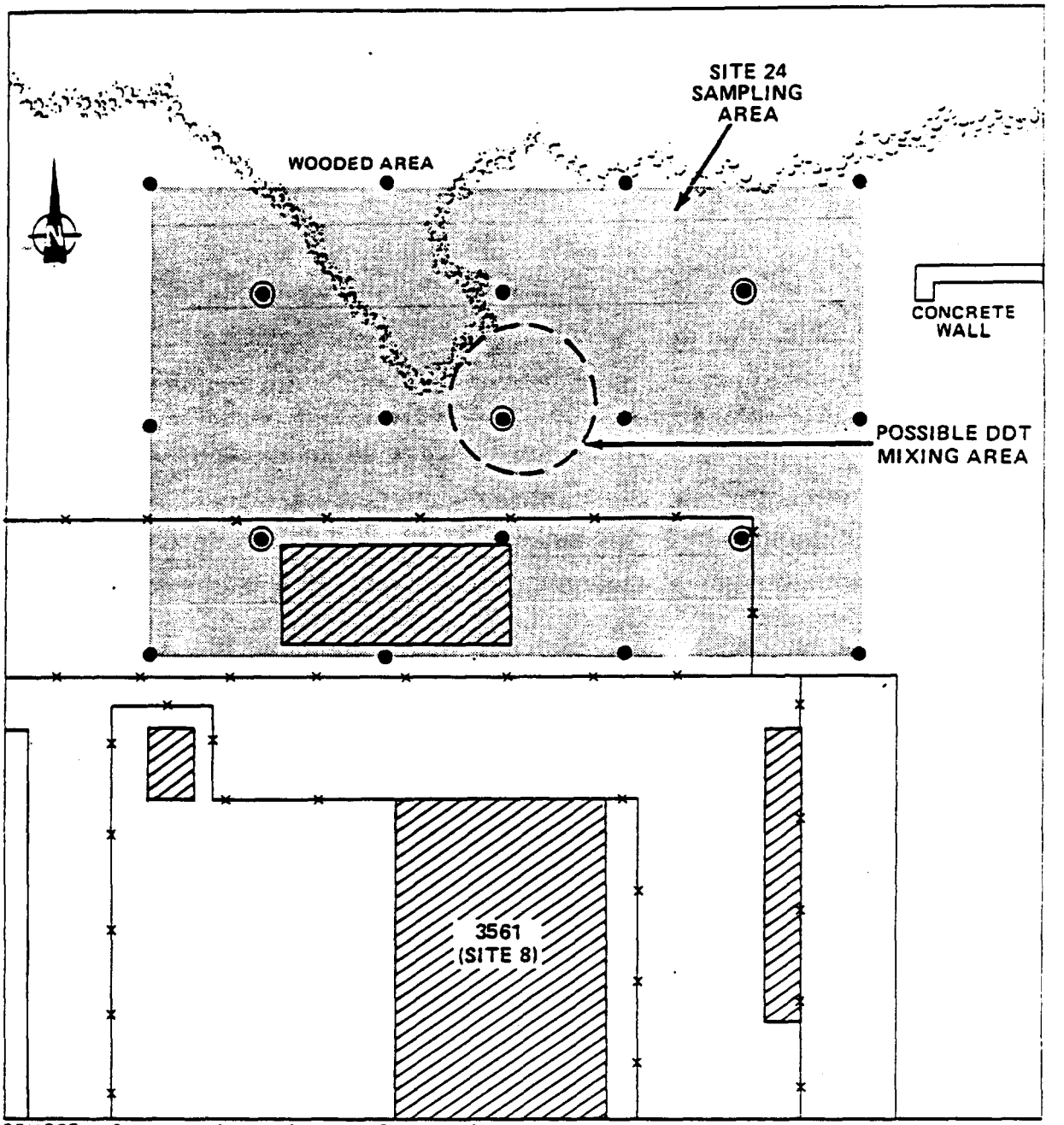
Figure 14–1 TENTATIVE SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS, SITE 15 – PHASE I



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

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KEY:

- ● Tentative Soil Boring
- ○ Tentative Temporary Monitoring Well
- ▨ Building

Figure 14–2 TENTATIVE SOIL BORING AND TEMPORARY MONITORING WELL LOCATIONS, SITE 24 – PHASE I

an approximation of the potential size of source areas. Sample numbers and locations are approximate and may be altered subject to the evaluation of more detailed site-specific data from the reconnaissance and geophysical surveys.

Groundwater - At Site 15, approximately 10 stainless steel temporary monitoring wells will be installed to an estimated depth of 16 feet with 5 feet of screen from 11 to 16 feet. At Site 24, approximately 5 temporary wells will be installed to an estimated depth of 14 feet with a screen interval from 9 to 14 feet. The screened interval will be installed to bracket the water table for the collection of immiscible, floating contaminants, if any. Soil samples will be as described above, during well installation, and observations regarding lithology will be recorded in the field notebook..

Tentative temporary monitoring well locations are shown in Figures 14-1 and 14-2. The approximate locations indicated were selected based on both site history information pertaining to potential source areas (see Section 2), and on an approximation of the potential transport size of source areas.

All wells will be installed, developed, and sampled in accordance with Sections 6.7 and 6.8 of the GQAPP. [In addition, the two existing monitoring wells at Site 15 (GM-59 and GM-60) will be sampled.] Decontamination of drilling and sampling equipment will be in accordance with Section 6.10 of the GQAPP.

14.1.4 Hydrologic Assessment

The temporary wells and existing well network will be surveyed to obtain top of casing elevations referenced to USGS datum or to a suitable established benchmark located within the vicinity of Sites 15 and 24. Static water levels will be measured in each well to determine shallov groundwater flow direction and horizontal hydraulic gradient. Geophysical and analytical screening data, hydrologic data collected during Phase I will be evaluated and evidence of lateral contaminant migration in shallow groundwater assessed. Conclusions drawn from these

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

evaluations will form the basis for permanent monitoring well installations during Phases II and 111.

14.2 Phase II -- Characterization

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

- o To characterize the nature and magnitude of the full spectrum of potential site contaminants;
- o To confirm and validate the contaminant distributions indicated by the Phase I analytical screening results by collecting and analyzing samples under full-scale CERCLA-type QA/QC requirements;
- o To support the preliminary identification, screening, and evaluation data requirements of potential remedial alternatives.

Phase II characterization will consist of limited soil sampling; the installation, development, and sampling of shallow monitoring wells, and the sampling of existing wells; a continuation of hydrologic assessment; and air sampling if necessary. Analytical requirements for Phase II are shown on Table 14-2.

[During the Phase II investigation of Site 15, which is covered by RCRA requirements, at least one sample per contaminated medium will also be analyzed for Appendix IX parameters (40 CFR, Part *264).* These samples will be collected from the area of highest contamination for each medium as determined during the Phase I investigation. Additional Appendix IX samples may be required depending on the extent of contamination detected.]

[14.2.1 Biota Sampling

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

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

Table 14-2

PHASE II SAMPLING AND ANALYTICAL REQUIREMENTS-GROUP D

SITE 15

Medium	lo. of Samples	Dupli-cates	Trip Blanks.	Field Blanks	Rinsate Blanks	[Preservative Blanks[b]]	Total*	Analytical Suite[c,d]
Soil	30	3	2	[1]	2	[1]	39 (10	A C
Groundvator	[3]	1	1	[NR]	1	[NR]	[6] (2)	A B
TOTAL	[33]	4	[3]	[1]	[3]	[1]	[45] (12)	

SITE 24

Medium	No. of Samples	Dupli-cates	Trip Blanks'	Field Blanks	Rinsate Blanks	[Preservative Blanks[b]]	Total*	Analytical Suite[c,d]
Soil	25	3	[1]	[1]	[1]	[1]	[32] (10)	A C
Groundwater	3	1	[1]	[NR]	[1]	[NR]	[6] (2)	A B
TOTAL	28	4	[2]	[1]	[2]	[1]	[38] (12)	

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

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

[c]Analytical suite designations are as follows:

A = TCL volatile organic compounds plus xylene and ketones, TCL base/neutral and acid oxtractable 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 14-2 (Cont.)

B = Total suspmnded so ids, to 11 Kjeldahl nitrogen, amm nia nitrogen, rthophospha phosphorus, dissolved oxygen (in field), 5-day biological oxygen demand (BOD_5), and chmmical oxygmn demand (COD).

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

[d]Specific constitumnts encompassed by the various chemical groups included within the abovm-lirtod analytical suites are identified in Tables 9-5 through 9-13 of the GQAPP.

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

[NR = Not required.]

[14.2.2] Soil Sampling

Soil samples will be collected as part of the shallov monitoring well installation (described below in Section 14.2.2) and from shallow soil borings at both Sites 15 and 24.

At Site 15, it is tentatively planned that soils will be sampled during the installation of three wells and during three shallov borings, for a total of six locations (shown on Figure 14-3). At Site 24, it is tentatively planned that soils will be sampled during the installation of three wells and during two shallow borings, for a total of five locations (see Figure 14-4).

The samples will be retrieved by split-spoon samplers during hollow-stem auger drilling or by hand-operated bucket augers. The soil samples will be collected from the boreholes at intervals of: surface to 0.5 feet, 0.5 to 2.5 feet, and every 2.5-foot interval thereafter to a maximum depth of 10 feet, or until water table conditions are encountered, whichever is less. Water table is estimated to occur at Site 15 at a depth of 12 feet, and therefore each boring will involve five samples from each location. The total number of soil samples for Phase II at Site 15 is estimated to be 30. At Site 24, water table conditions are estimated to occur at 10 feet, and will require that five samples be collected at each of the five locations, totaling 25 samples for Site 24 during Phase 11.

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

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It is not anticipated that the number of soil samples projected for Phase II at Sites 15 and 24 will change; however, the findings of Phase I will determine the information needs of Phase 11. The number of shallow wells and their locations and the number of soil samples may be altered.

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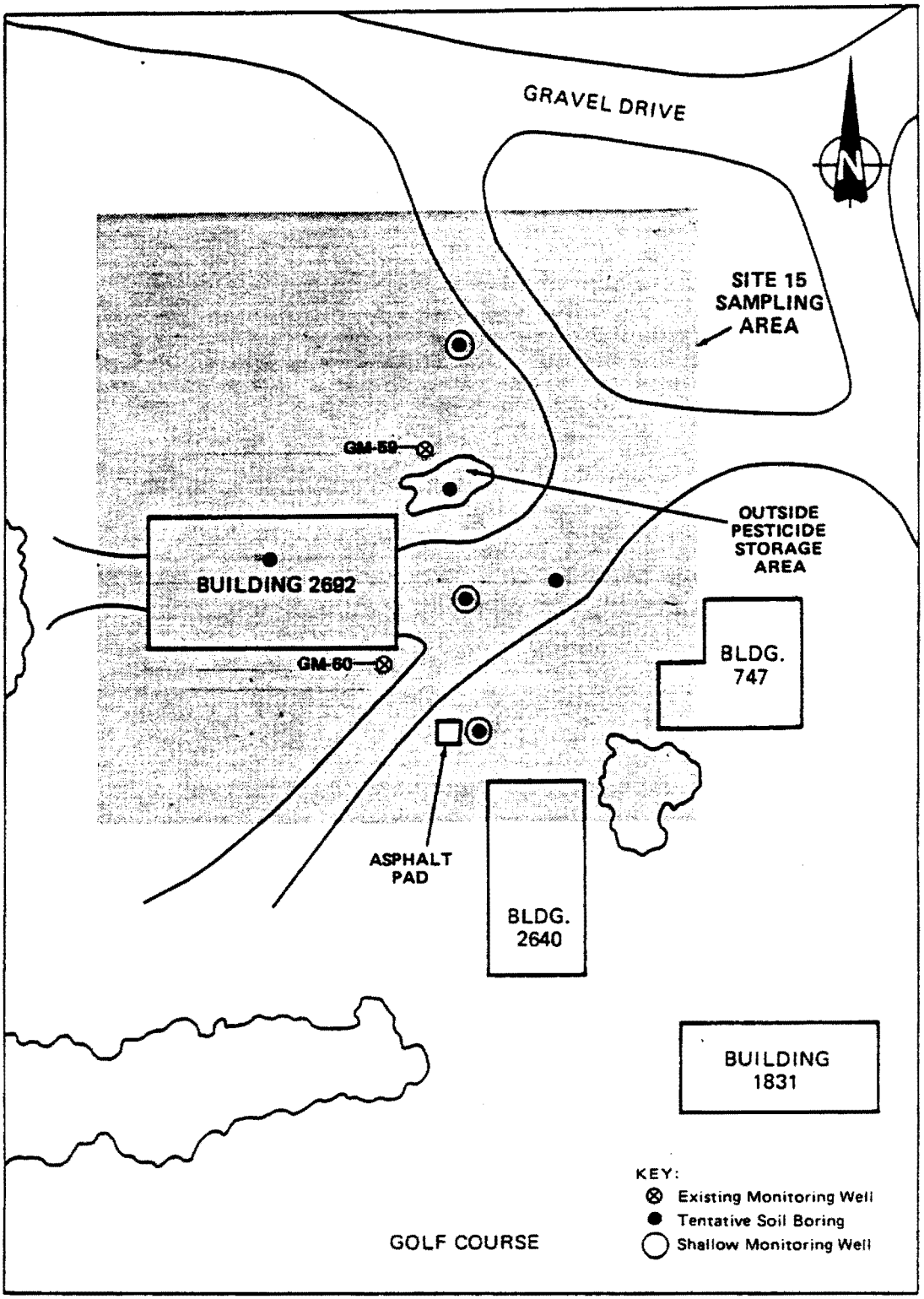

SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1986

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Figure 14-3 TENTATIVE SOIL BORING AND SHALLOW MONITORING WELL LOCATIONS, SITE 15 – PHASE II

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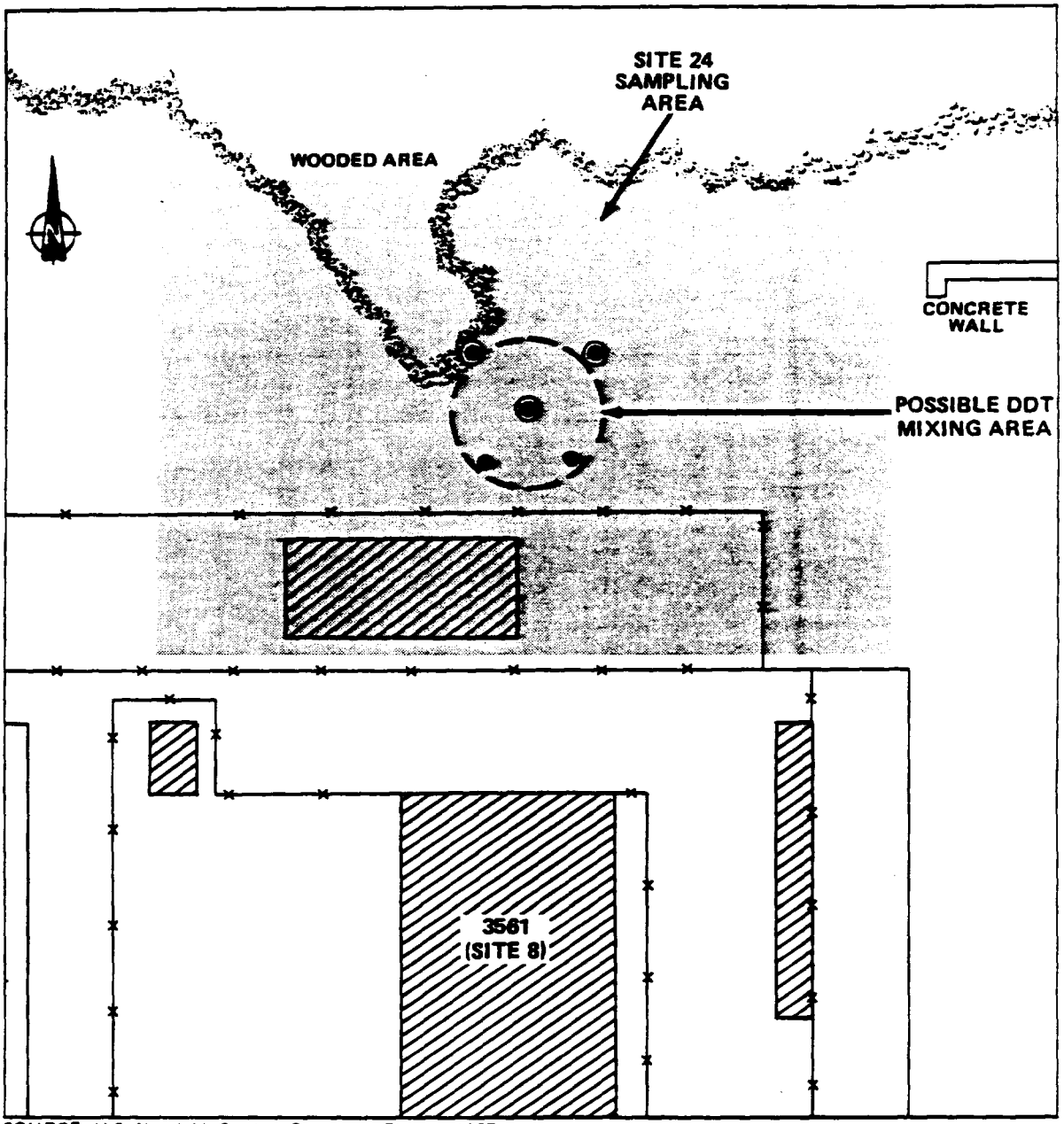

SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1987.

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KEY:

- Tentative Soil Boring
- Tentative Shallow Monitoring Well
- Building

Figure 14–4 TENTATIVE SOIL BORING AND SHALLOW MONITORING WELL LOCATIONS, SITE 24 – PHASE II

[14.2.3] Shallow Monitoring Well Installation and Development

The actual number and locations of monitoring wells to be installed in Phase II will be based on Phase I findings. For planning purposes, the number of permanent shallow monitoring wells to be installed at each site is three. All shallow wells will be of two-inch diameter PVC construction, and bracket the water table with 10 feet of screen. The anticipated well depths are 25 feet at Site 15 and 20 feet at Site 24. The wells will be installed utilizing hollow-stem auger techniques, constructed and developed in accordance with Section 6.7 of the GQAPP. Drilling equipment will be decontaminated in accordance with Section 6.10 of the GQAPP.

[Depending on the results obtained during Phase I, the delineation of the extent of shallow groundwater contamination may be possible during Phase II by the installation of a few monitoring wells in addition to the number proposed. When and where possible and/or practical, additional monitoring wells will be installed during Phase II in order to expedite the overall investigation schedule.]

[14.2.4] Groundwater Sampling

Groundwater samples will be collected from the two existing monitoring wells and the estimated three newly installed permanent wells at Site 15. The existing monitoring well network is shown on Figure 14-3. The three new monitoring wells at Site 24 will also be sampled. The purging and sampling of wells will be conducted in accordance with Sections 6.8 and 6.10 of the GQAPP.

[14.2.5] Hydrologic Assessment

Well head elevations will be surveyed for all newly installed monitoring wells and water levels will be measured in all wells.

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

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particularly useful for deriving first estimates of aquifer hydraulic properties (i.e., hydraulic conductivity, transmissivity). .

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

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

14.2.6 Air Sampling

Formal air sampling will be performed in Phase II as deemed appropriate based on Phase I surface emission surveys [and particulate air sampling, and the Phase I shallow soil sampling.)

14.3 Phase III - Extent Delineation

Phase III tasks will be conducted based on the results of Phases I and II. 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 Soil Sampling

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

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14.3.2 Shallov Monitoring Well Installation and Development

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

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

14.3.3 Intermediate and Deep Honitoring Well Installation and Development

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

14.3.4 Groundwater Sampling

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

14.3.5 Hydrologic Assessment

All wells installed during Phase III will require a well head survey to obtain top of casing elevations. Water level measurements will be made for all site monitoring wells and nearby surface water bodies. Horizontal and vertical hydraulic gradients will be determined. Aquifer testing will be performed, as required, to determine aquifer physical characteristics. [On sites where contamination is found in the surficial zone during Phases I and/or 11, the low permeability zone will be further characterized during Phase III and any subsequent phases. It is intended that soil sample results, lithologic logs, isopach maps, permeability testing, aquifer testing, 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.]

14.3.6 Air Sampling

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

14.4 Phase IV - Extent Delineation

The following tasks, if required, will be performed as a continuation in

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the effort of delineating the extent of contamination:

- o Shallow Monitoring Well Installation and Development;
- o Intermediate and Deep Monitoring Well Installation and Development;
- o Groundwater Sampling; and
- o Eydrologic Assessment

14.5 Topographic *Survey* and Base Hap

Following the completion of Phases III and IV, a topographic survey of the Sites 15 and 24 will be conducted and a base map will be developed. Base map coverage, contour intervals, scale, and requireaents for horizontal and vertical control will be established and approved by the Navy. The topographic base map will be developed for the requirements of remedial planning and will include the locations of surface features such as: roads, structures, nearby surface waters, monitoring wells, and above ground utilities. The location of subsurface utilities and drainage structures will be reflected on the base map as indicated on existing NAS Pensacola General Development and utilities maps, and/or as located during field investigations.

14.6 Field Quality Assurance/Quality Control

14.6.1 Documentation

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

14.6.2 Field QA/QC Samples

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

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14.7 Decontamination and Waste Management Procedures

14.7.1 Decontamination Procedures

All equipment decontamination procedures for Sites 15 and 24 will be performed in accordance with Section 6.10 of the GOAPP.

14.7.2 Waste Management Procedures

All water generated during monitoring well purging and development activities on Sites 15 and 24 will be discharged onto the ground surface away from the well, or will be containerized, labeled, and moved to a storage area on NAS Pensacola, as directed by the Navy.

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

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

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15. LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

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

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16. GROUNDWATER MODELING

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

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

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

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

17. TREATABILITY STUDY

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

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18. BASELINE RISK ASSESSMENT

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

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

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

18.1 Contaminant Identification

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

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

18.2 Exposure Assessment

In this subtask, actual or potential pathways are identified, populations potentially exposed are characterized, and the extent of exposure is determined. Identification of potential exposure pathways helps to conceptualize the migration of contaminants from an existing source to an existing or potential point of contact. An exposure 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, ground water, biota);

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

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

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

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

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18.3 Toxicity Assessment

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

18.4 Risk Characterization

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

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

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

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

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

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

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19. FEASIBILITY STUDY

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

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

19.1 Screening of Applicable Remedial Technologies

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

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19.2 Assessment of Applicable Remedial Technologies

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

19.3 Risk Assessment

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

19.4 Development and Evaluation of Remedial Action Alternatives

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

19.5 Selection of Recommended Remedial Action Alternatives

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

1500272

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

19.6 PS Report

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

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20. REPORT

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

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

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

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

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21. DOCUMENT REVISION

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

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22. PROJECT MANAGEMENT

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

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23. PROJECT SCHEDULE

[Figures *23-1*, *23-2*, 23-3, and *23-4* show the project schedules for phases I, II, 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, 111, and IV are tentative. In addition, the length of time between phases is subject to the schedule in the Federal Facilities Agreement Site Management Plan (FFASMP). The schedule in the FFASHP will be updated yearly.]

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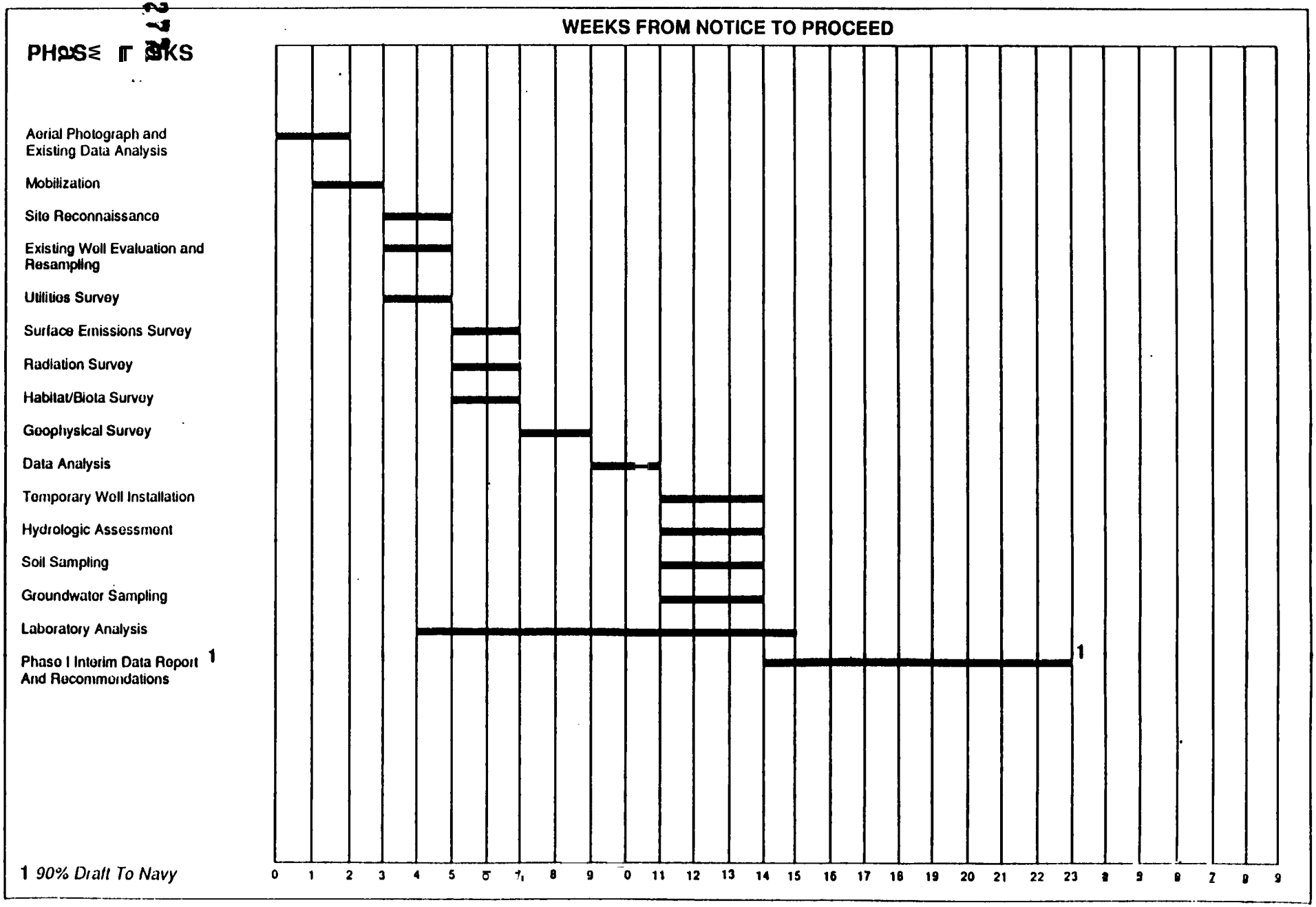

Figure 23-1 PHASE I PROJECT SCHEDULE -- GROUP D

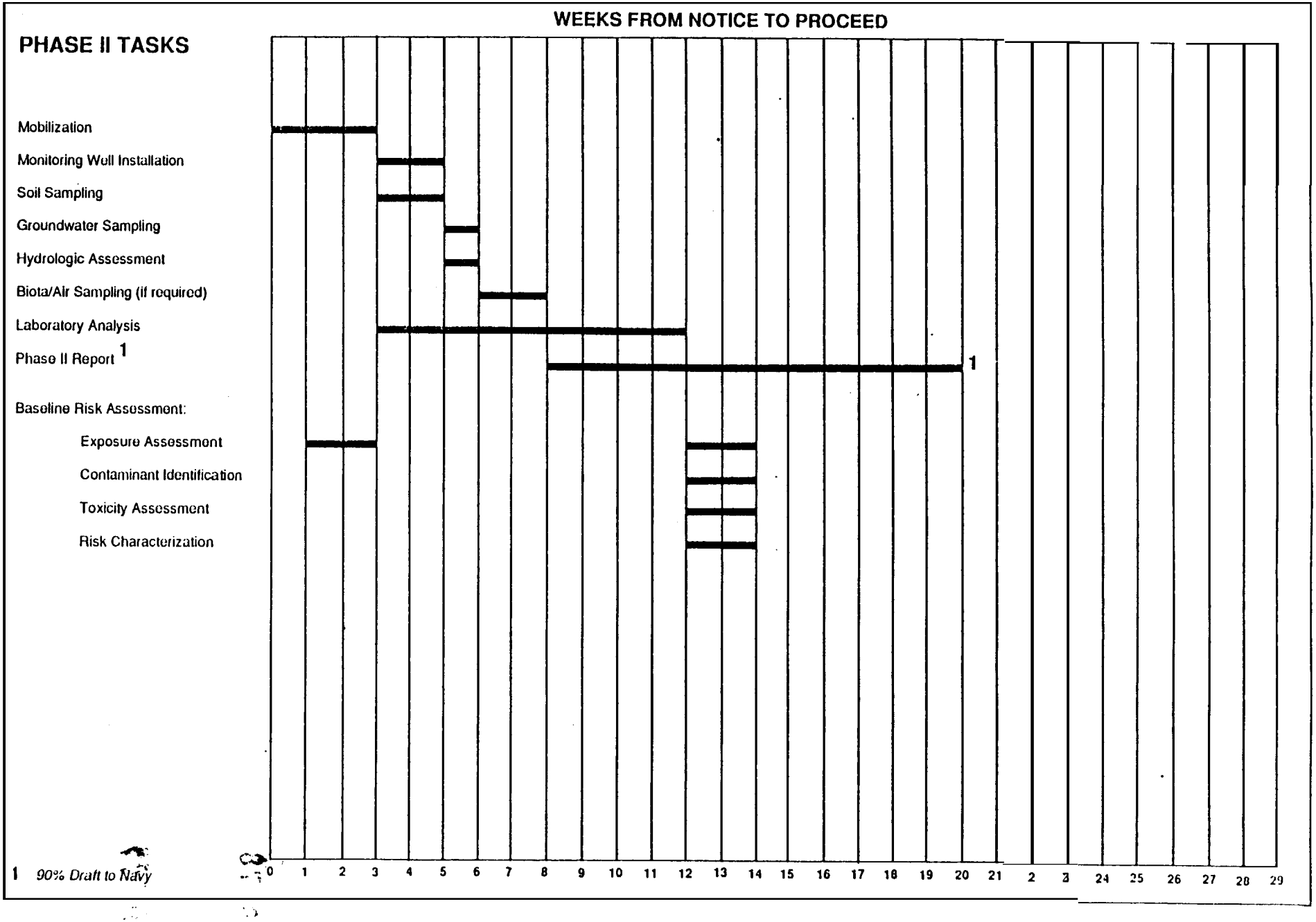

Figure 23-2 PHASE II PROJECT SCHEDULE -- GROUP D

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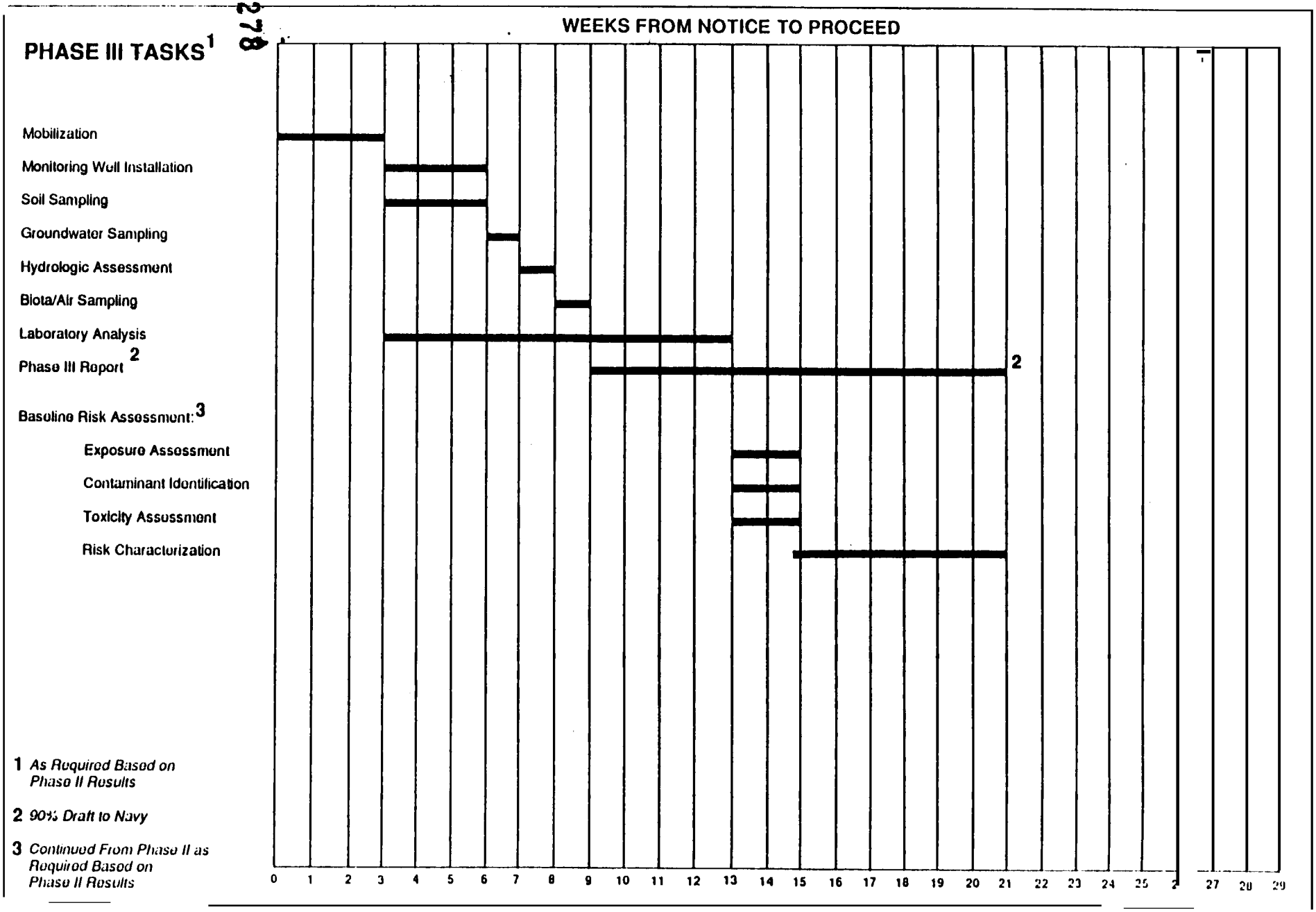

Figure 23-3 PHASE III PROJECT SCHEDULE -- GROUP D

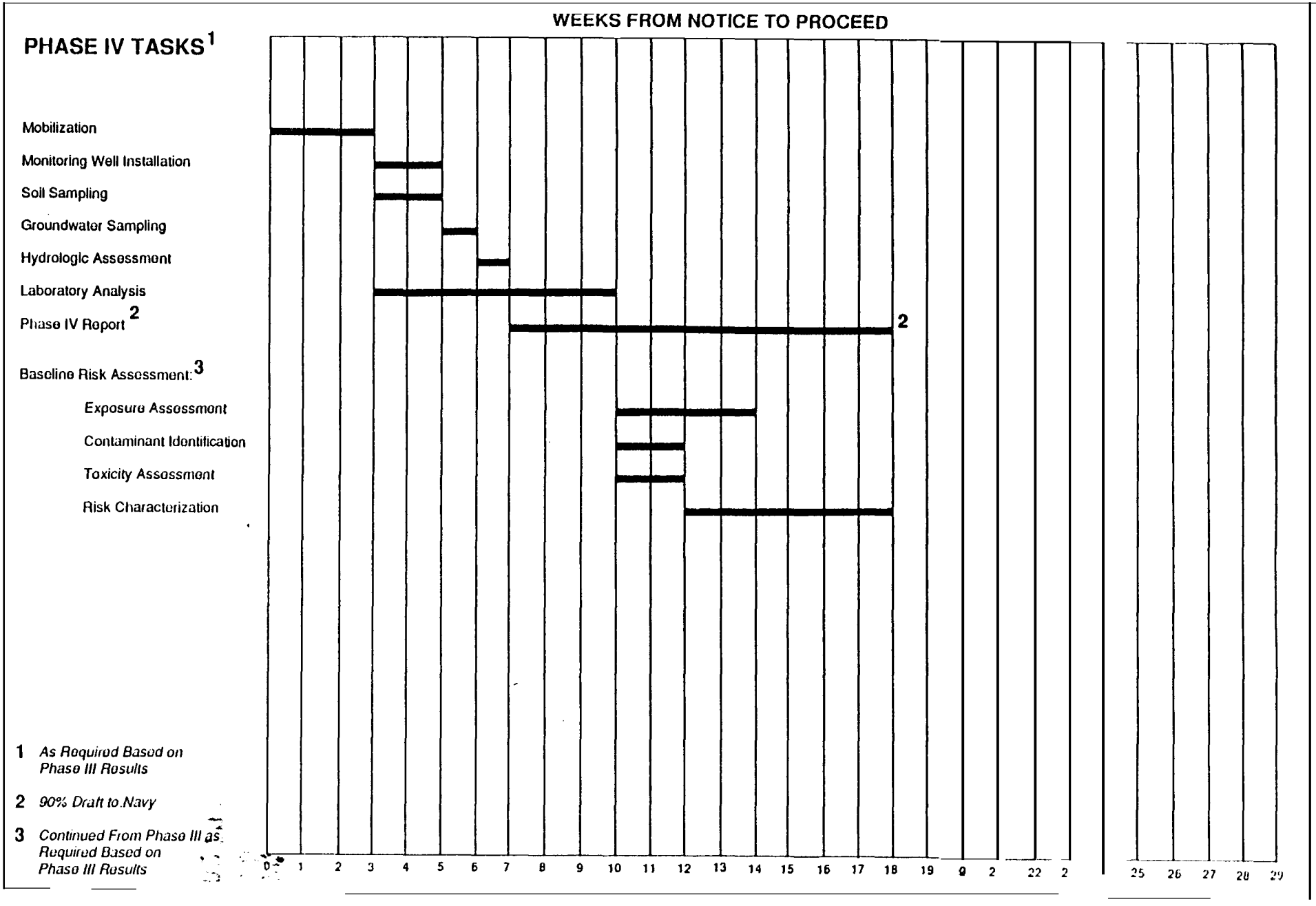

Figure 23-4 PHASE IV PROJECT SCHEDULE - GROUP D

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APPENDIX A

SITE-SPECIFIC SAFETY PLAN

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SITS SAFETY PLAN

Version 988

A. GENERAL INFORMATION

Project Title: Site 15 - Posticido Disposal Aroa

Project No.: UH1104

TDD/Pan No.:

Project Manager: John Barksdale

Project Dir.: Rick Rudy

Location(s): Pesticide Disposal Area - Located within tho golf corse maintenance aroa

Proparod by: Hal Davis

Date Proparod: 4-27-89

Approval by: Mary Miller MM

Date Approved: 5-5-89

Site Safety Officer Review:

Date Reviewed:

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

Proposed Date of Field Activities: August 1989

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

Documentation/Summary:

Overall Chemical Hazard:	Serious [ ]	Moderato [X]
	LOW [ ]	Unknown [ ]
Overall Phyrical Hazard	Serious [ ]	Moderate [ ]
	LOW [X]	Unknown [ ]

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

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

Characteristic(s):

Flammable/ Ignitable [X]	Volatile [X]	Corrosive [ ]	Acutely Toxic [X]
Explosive [ ]	Roactivo [ ]	Carcinogen [X]	Radioactive' [ ]

Other:

Physical Hazards:

Ovorhoad [X]	Confined' Space [ ]	Below Grade [ ]	Trip/Fa11 [X]
Puncture [ ]	Burn [ ]	Cut [ ]	Splash [X]
Noise [X]	Other: Vehicular traffic in site area		

*Requires completion of additional form and special approval from the Corporate Health/Safety qroup. Contact 'SC or HQ.

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Site History/Description and Unusual Features (see Sampling Plan for detailed description): From 1963 until 1979, tho Pesticide Rinsate Disposal Area was used as an area for tho storage of pesticides and tho cleaning of pesticide mixing and application equipment. Building 2692 and an outdoor area near tho northeast corner of tho building were used for tho storage of pesticides. The floor of tho building and tho outdoor area are not paved. Ddilute rinsate solutions were discarded onto tho ground surface at tho site. Soil analyses have indicated moderate to low concentrations of several pesticides. Chlordane and 4,4-DDT appeared in tho highest concentrations (21 ppm and 1.2 ppm, respectively).

Locations of Chemicals/Wastes: Contaminants have been found in surface and subsurface soils.

Estimated Volume of Chemicals/Wastes: Unknown

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) Physical Surveys - Automobile hazards;

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

3) Soil Sampling - Using portable drill rig;

4) Decontamination Procedures - Using solvents.

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Odor Description
Chlordane	0.5 mg/m3	Inh, Abs	Convulsions	odorless	odorless
4,4-DDT	1.0 mg/m^3	Inh,Ing,Derm,Eye	tremors, convulso	slight	slight/odorless
Isopropyl Alcohol	400 ppm	" "	drowsiness,head.	7.5-200 ppm	rubbing alcohol
Nitric Acid	2 ppm	" "	corrosive	0.3-1 ppm	acrid
hoptachlor	0.5 mg/m^3	Inhale, absorb	tremors, convulso	0.2 ppm	camphor odor
epoxide	--	Ing/Abs	Skin Irritant	--	--
dieldrin	0.25 mg/m3	Inh, Ing, Con	nausea, convulso	0.6 mg/m3	
PCB's	0.5 mg/m^3	Inh, Ing, Con	nausea,vomit,head	N/A	hydrocarbon odor
arsonic	0.5 mg/m^3	fnh, Ing, Con	naus,vomit,diarrhe	N/A	garlic-like

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D. SITE SAFETY WORK PLAN

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

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

Work Areas Designated? [yes] Zen.(~) of Contamination Idontifiod? [no]

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

Anticipated Lovol of Protection (Cross-roferonce task numbers to Section C):

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

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

- Lovol D: O_2 <19.5% or >25%, oxplo ive atmosphoro >10% LEL, organic vapors above background levels, particulatos >_____ mg/m^3, othor _____
- Lovol C: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapor (in breathing zone) >5 ppn, particulatos >_____ mg/m^3, other _____
- Lovol B: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors (in breathing zone) >500 ppm, particulatos >_____ mg/m^3, othor _____
- Lovol A: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors >500 ppm, particulatos >_____ mg/m^3, othor _____

Air Monitoring (daily calibration unless otherwise noted):

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

Docontanination Solutions and Procedures for Equipment, Sampling Gear, etc.:
Trisodium phosphate wash, tap water rinso, isopropanol rinso, distilled water rinse, isopropanol rinse, and final distilled water rinso.

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

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

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

All drilling safety procedures will bo strictly adhered to as outlined in Attachment A.

Site Entry Procedures and Special Considerations: 6 & E's "Buddy System" will bo employed at all times during fieldwork activities. Personnel will exercise caution in tho vicinity of Chevalier Field and along nearby roadways. If above background radiation levels are encountered team members will evacuate tho sampling area, and contact tho corporato health physics group to reassess tho site.

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

All fieldwork activities will bo performed during daylight hours. Team members will take breaks as necessary to avoid heat stress and replace fluids. Cooling vests may bo used to prevent heat stress.

General Spill Control, if applicable: N/A

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

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

Sample Handling Procoduros Including Protective Wear:

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

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

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

1500285

E. EMERGENCY INFORMATION

(Use supplemental sheets, if necessary)

LOCAL RESOURCES

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

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

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

Poison Control Center

Police (include local, county sheriff, state) 911

Fire Department 911

Airport

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

Laboratory E • E ASC 1-716-631-0360

red. Express 1-800-238-5355

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

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

SITE RESOURCES

Site Eaergency Evacuation Alarm Method N/A

Water Supply Source On-site

Telephone Location, Number To be determined on-site

Cellular Phone, if available N/A

Radio

Other On-site warehouse number to be determined

EMERGENCY CONTACTS

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

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

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

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

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MEDTOX HOTLINE

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

   What to report:

   - State: "this is an emergency."
   - Your name, region, and site.
   - Telephone number to reach YOU·
   - Pour location.
   - Wan of person injured or exposed.
   - Nature of emergency.
   - Action taken.

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

3. IFA 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

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

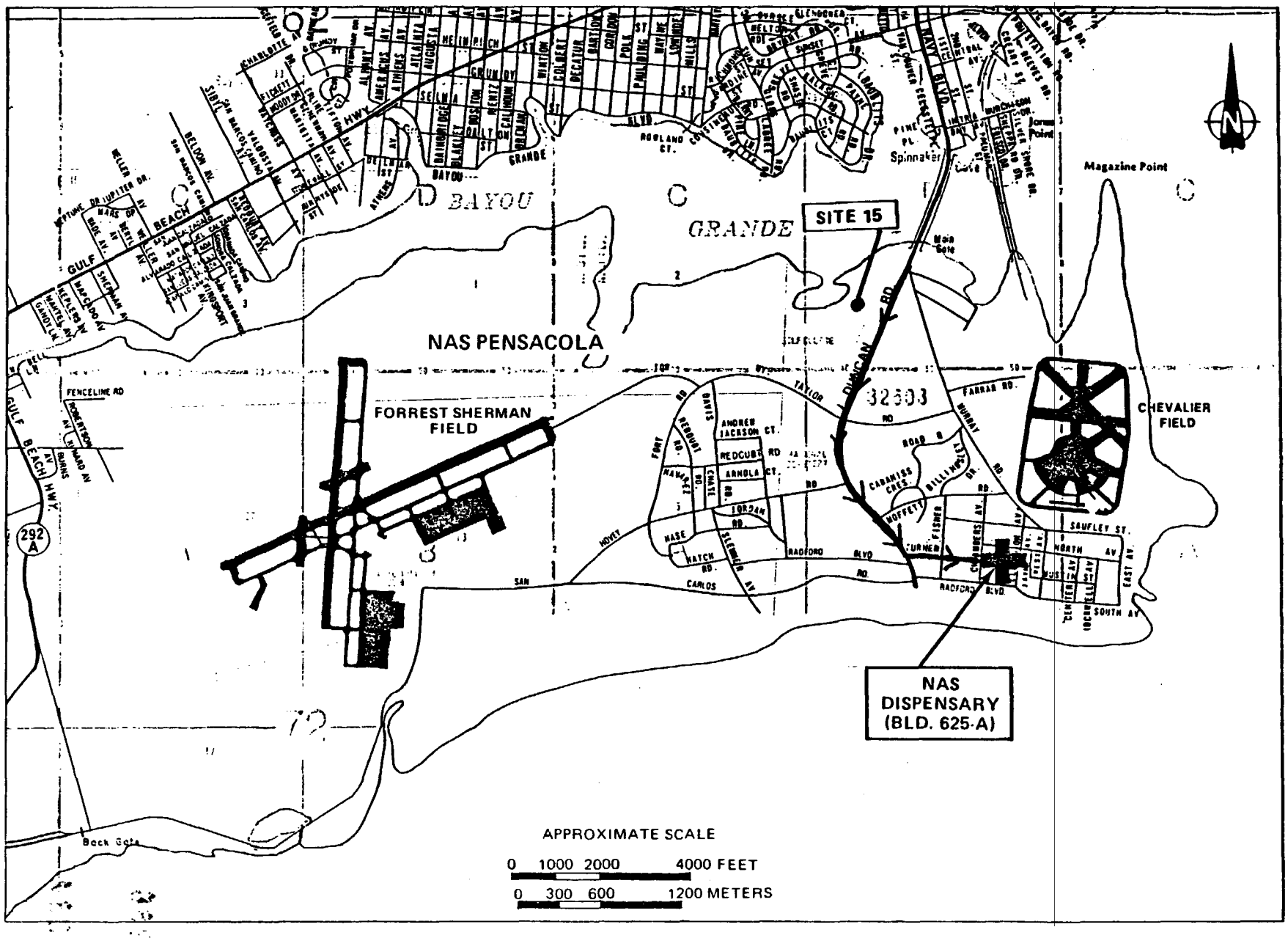
Directions to hospital (include map)

NAS Dispensary - Take Andrew Jackson Court west to Davis. Turn right (north) onto Davis and continuo until intersects Taylor Road. Turn right (east) onto Taylor Road and continuo to it's intersection with Duncan Road. Turn right on Duncan Road and continuo to it's intersection with Turner Road. Turn loft (east) on Turner Road and continuo to it's intersection with Ellyson Avenue. The NAS Dispensary is located on tho northwest corner of tho intersection of Ellyson Avenue and Turner street, in Building 625-A.

Baptist Hospital - Take Duncan Road (Wavy Blvd.) north to exit tho base. Wavy Blvd. becomes HWY 98 and curves to tho east. At HWY 90 (10A or Cervantes Rd.) turn right (east), follow this road for about 8 blocks and turn loft (north) onto E street. Tho hospital is about 6 blocks north on tho loft.

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

1500286



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DRILL RIG SAFETY

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

1500287

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

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

THE EFFECTS OF HEAT

As the result of normal oxidatlon processes within the body, a predictable amount of heat is generated. If the heat Is liberated as It Is formed, there is no change In body temperature. If the heat Is liberated more rapidly, the body cools to a point at which the production of heat Is accelerated and the excess is available to bring the body temperature back to normal.

Interference with the elimination of heat leads to its accumulation and thus to the elevation of body temperature. As a result, the person is said to have a fever. When such a condition exists, it produces a vicious cycle in which certain body processes speed up and generate additional heat. Then the body must eliminate not only the normal but also the additional quantities of heat.

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

HEAT CRAMPS

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

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

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

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

HEAT EXHAUSTION

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

Heat Exhaustion Symptoms. The symptoms of heat exhaustion are:

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

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

HEAT STROKE

1500288

Heat stroke is a profound disturbance of the heat-regulating mechanism, associated with high fever and collapse. Sometimes this condition results in convulsions, unconsciousness, and even death. Direct

exposure to sun, poor air circulation, poor physical condition, and advanced age (over 40) bear directly on the tendency to heat stroke. It is a serious threat to life and carries a 20% mortality rate. Alcoholics are extremely susceptible.

Heat Stroke Symptoms. The symptoms of heat stroke are:

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

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

AVOIDANCE OF HEAT-RELATED EMERGENCIES

Please note that, in the case of heat cramps or heat exhaustion, "Gatorade" or its equivalent is suggested as part of the treatment regime. The reason for this type of liquid refreshment is that such beverages will return much-needed electrolytes to the system. Without these electrolytes, body systems cannot function properly, thereby increasing the represented health hazard. Therefore, when personnel are working in situations where the ambient temperatures and humidity are high--and especially in situations where protection Levels A B, and C are required--the site safety officer must:

- Assure that all employees drink plenty of fluids ("Gatorade" or its equivalent);
- Assure that frequent breaks are scheduled so overheating does not occur: and
- Revise work schedules, when necessary, to take advantage of the cooler parts of the day (i.e., 5:00 a.m. to 1:00 p.m., and 6:00 p.m. to nightfall].

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If protective clothing must be worn, especially Levels A and 8, the suggested guidelines for ambient temperature and maximum wearing time per excursion are:

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

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

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

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

1500289

Mallinckrodt
Material Safety Data

Emergency Phone Number: **314-982-SO00**

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

ISOPROPYL ALCOHOL

PRODUCT IDENTIFICATION:

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

Formula **CAS No.:** 67-63-0

Molecular Weight: **60.10**

Chemical Formula: $(CH_3)_2$ CHOH

Hazardous Ingredients: Not applicable.

PRECAUTIONARY MEASURES

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

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

EMERGENCY/FIRST AID

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

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

SECTION 3 Reactivity Data

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

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

Hazardous Polymerization:
Will not occur.

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

SECTION 4 Leak/Spill Disposal Information

Remove all sources of ignition. Ventilate area of leak **or** spill. Clean-up personnel require protective clothing and respiratory protection from vapors. Small spills may be absorbed **on** paper towels and evaporated in **a** fume hood. Allow enough time for fumes to clear **hood,** then ignite paper in a suitable location **away** from combustible materials. Contain and recover liquid for reclamation **when** possible. Larger spills. and **lot** sizes **an 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 apprwcd facility.

Ensure compliance with local, state and federal regulations.

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

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:
May cause irritation of the nose and throat. Exposure to high concentrations has narcotic effect, producing symptoms of drowsiness, headache, staggering, unconsciousness and possibly death.

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

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

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

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

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

B. FIRST AID

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

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

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

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

C. TOXICITY DATA (RTECS, 1982)

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

SECTION 6 Occupational Control Measures

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

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work 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 the maximum use concentration specified by the respirator supplier. Alternatively, a supplied air full facepiece respirator or airlined hood may be worn.

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

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

SECTION 7 Storage and Special Information

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

Mallinckrodt
Material Safety Data

Emergency Phone Number: 314-982-5000

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Mallinckrodt, Inc. Science Products Division, P O Box 4 Mt. Paris, KY 43061

NITRIC ACID, 70%

PRODUCT IDENTIFICATION:

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

Formula CAS No.: 7697-37-2

Molecular Weight: 63.00

Chemical Formula: HNO_3

Hazardous Ingredients: Not Applicable

PRECAUTIONARY MEASURES

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

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

/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 condition, of use and storage. Containers may burst when heated.

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

Hazardous Polymerization:
Will not occur.

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

SECTION 4 Leak/Spill Disposal Information

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

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

Ensure compliance with local, state and federal regulations.

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

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SECTION 5 Health Hazard Information

A* EXPOSURE / HEALTH EFFECTS

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

Ingestion:
Corrosive! Swallowing nitric acid can c a w immediate pein 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 a n irritating and may cause damage to the eyes. Splashes nay cause severe bums and permanent eye damage.

Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth. Long rem 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 Io 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 milt if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

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

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

C. TOXICITY DATA (RTECS, 1982)

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

SECTION 6 Occupational Control Measures

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

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it 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 Manuel 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 wid is an oxidizer a d should not come in contact with cartridges a d cannisters that contain oxidizable materials, such as activated charcoal.

Skim 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 a d direct sunlight. Mate from incompatible substances. Protect from moisture.

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Mallinckrodt
Material Safety Data

Mallinckrodt provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. Individuals receiving this information must exercise their independent judgment in determining its appropriateness for a particular purpose.

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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 (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 many metals releasing flammable, potentially explosive hydrogen gas.

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

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

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

SECTION 3 Reactivity Data

Stability:
Stable under ordinary conditions of use and storage.

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

Hazardous Polymerization:
Will not occur.

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

SECTION 4 Leak/Spill Disposal Information

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

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

Ensure compliance with local, state and federal regulations.

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

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SECTION S Hen**lth 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 Conlncl:
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 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 mwth lo an unconscious person.

Skin Exposure:
In case of contact, immediately flush skin with pknty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician.

Eye Exposure:
Wash eyes with pknty 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: 16 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 lo 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 tlk TLV is exceeded a full faceplece chemical cartridge respirator nay 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 faceplece respirator or airlined hood may be worn.

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

Eye Prolcctlon:
Use chemical safety goggles and/or a lull face shield where splashing *b* 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 scool, dry, ventilated storage area with acid resistant floors and podd drainage. Protect from physical damage. Keep out of direct sunlight and a n y from heal, water, and incompatible materials. Do not wash out container and use it for other purposes. W k n diluting, always add the wid to water; never add water to the acid.

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Chemical Fact Sheet*

Version 2

2,4-D

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

Chemical Names: 2,4-Dichlorophenoxyacetic acid; CAS 94-75-7.

Trade Names: 2,4-D Acid, Esteron, Verton, Visko, Weedone, Brush-Rhap, Brush Killer, Chloroxone, Ded-Weed, and others.

Uses: As a fungicide, herbicide and defoliant; as a plant growth regulator.

PHYSICAL INFORMATION

Appearance: White or tan powder or crystals.

Odor: None.

Behavior in Water: Slightly soluble, crystals sinks.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 10 mg/m^3.

NIOSH Recommended Limit: Average 8 hour exposure -- 10 mg/m^3.

ACGIH Recommended Limit: Average 8 hour exposure -- 10 mg/m^3.

Short Term Exposure:

Inhalation: May cause irritation of the mouth, nose and throat, headache, nausea, vomiting, and drarrhea at levels above 10 mg/m^3. Nerve damage, which may be delayed, may include swelling of legs and feet, muscle twitch and stupor. Severe exposures may result in death.

Skin: Dust or liquid left in contact with the skin for several hours may be absorbed. This may result in severe delayed symptoms as listed above. These symptoms may last for months or years.

Eyes: Irritation may occur.

Ingestion: The oral dose required to produce symptoms is about 1/12 ounce (1/2 teaspoon). Increasing amounts may result in increasingly severe symptoms as listed above. Death has resulted from as little as 1/5 ounce. Survival for more than 48 hours is usually followed by complete recovery althouqh symptoms may last for several months.

Long Term Exposure:

Workers exposed to 2,4-D in the manufacturing process over a five to ten year period at levels above 10 mg/m^3 complained of weakness, rapid fatigue, headache and vertigo. Liver damage, low blood pressure and slowed heartbeat were also found.

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

EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Get to fresh air. Give artificial respiration or oxygen as required. Seek medical attention, if necessary.

Skin: Remove soiled clothing promptly. Wash affected area with soap and water for at least five minutes.

Eyes: Wash eyes with plenty of water for at least 15 minutes. Seek medical attention.

Ingestion: Get immediate medical attention.

FIRE AND EXPLOSION INFORMATION

General: Non-flammable.

REACTIVITY

Materials to Avoid: None specified.

Conditions to Avoid: Beat and strong light cause breakdown to poisonous compounds such as chlorinated phenols and phosgene.

PROTECTIVE MEASURES

Storage and Handling: Store away from light and heat.

Engineering Controls: Use in closed systems if possible. Sinks, shower and eyewash stations should be available. Emergency water should be available if used out-of4oors.

Protective Clothing (Should not be substituted for proper handling and engineering controls): Safety glasses, dust mask and impervious gloves an clothing should be worn if contact is likely.

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

1500293

PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of spill area. Wearing protective clothing and equipment sweep up carefully and place in suitable container. Liquid solution may be absorbed on clay or vermiculite and placed in a suitable container. Scrub spill area with soap and water. For final disposal contact your regional office of the New York State Department of Environmental Conservation.

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

ARSENIC (metallic and inorganic compounds)

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

Chemical Names: Arsenic solid, colloidal arsenic, metallic arsenic, arsenic black, CAS 7440-38-2; disodium arsenate, CAS 7778-43-0; sodium arsenate, CAS 7631-89-2; arsenic chloride, CAS 7784-34-1; arsenic sulfide, CAS 1303-33-9; arsenic trioxide, CAS 1327-53-3; and others. A separate fact sheet is available on Arsine.

Trade Names: Ruby Arsenic, Realgar, Butter of Arsenic, White Arsenic and others.

Uses: Used to harden copper-lead alloys: in the manufacture of ctrtain types of glass; as a radioactive tracer in toxicology: in pesticides, insecticides and rodenticides; taxidermy and others.

PHYSICAL INFORMATION

Appearance: Grey, shiny metal. The inorganic compounds are various colors.

Odor: None, except for arsenic trioxide which has a garlic-like odor.

Behavior in Water: The metal is insoluble but some inorganic compounds are soluble.

HEALTH HAZARD

OSHA Standard: Average 8 hour exposure -- 0.01 mg/m^3 (as arsenic).

NIOSH Recommended Limit: 0.002 mg/m^3 (as arsenic).

ACGIH Recommended Limit: Average 8 hour exposure -- 0.2 mg/m^3 (as arsenic; does not apply to arsenic trioxide production).

Short Term Exposure:

Inhalation: May cause coughing, chest pains, difficult breathing, giddiness, headache, nausea, vomiting, diarrhea and breakdown of nasal tissues,

Skin: Prolonged contact may cause irritating redness and blisters. Arsenic trioxide is readily absorbed cauainq those symptoms listed under inhalation.

Eyes: May cause irritation-

Ingestion: nay cause stomach pains, vomiting (possibly with blood), diarrnea (possibly with blood), inflammation of the throat, cramps in the legs, restlessness, paralysis, shock and death. Animal studies indicate that the lethal dose of arsenic trioxide is about one teaspoon.

Long Term Exposure:

Levels of 0.56 mg/m^3 may cause weakness, loss of appetite, nausea, vomiting, diarrhea, stomach pain, irritation and inflammation of the eyes, nose and throat, breakdown of nasal tissue, excess itching, development of thickened skin and warts on the hands and feet, skin discoloration, and paralysis of the hands and feet. Studies have linked long term occupational exposure to arsenic and inorganic arsenic compounds with skin and lung cancer in humans. Sodium arsenate has caused birth defects in animals. Whether it does so in humans is not known.

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

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EMERGENCY AND FIRST AID INSTRUCTIONS

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

Skin: Remove contaminated clothing. Wash affected area with water for at least 5 minutes. Seek medical attention.

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

Ingestion: If conscious, give large amounts of milk or water. Seek medical attention.

Note to Physician: Urine analysis may be helpful in monitoring exposure.

FIRE AND EXPLOSION INFORMATION

General: The dust will burn.

REACTIVITY

Conditions to Avoid: High temperature will cause a breakdown to highly toxic fumes.

Materials to Avoid: Can react vigorously with strong oxidizers (chlorine, dichromate, permanganate). Forms highly toric fumes on contact with acids or active metals (iron, aluminum, zinc).

PROTECTIVE MEASURES

Storage and Handling: Store in a cool, well-ventilated area away from combustible materials and those materials listed above. Protect from physical damage.

Engineering Controls: Enclosed processes preferred. Otherwise, use in a well-ventilated area. Sinks, showers and eyewash stations should be readily available. Arsenic trioxide should be used in an enclosed process.

Protective Clothing (Should not be substituted for proper handling and engineering controls): Wear gloves, goggles, apron or coveralls and head and neck covering. Work clothing should be changed at the end of the workshift. Employer shall provide laundering services.

Protective Equipment For any detectable levels use a self-contained breathing apparatus with a full facepiece and operated in a positive pressure mode or a combination Type C supplied-air respirator uith an auxiliary self-contarned breathing apparatus, both with a full facepiece and operated in a positive pressure mode. For escape from a contaminated area use a gas mask vith acid gas canister and high-efficiency particulate filter or an escape self-contained breathing apparatus,

Note: workers should be permitted to leave the work area every two hours to wash tnerr faces and obtain clean respirators.

Miscellaneous: Wash hands and face before eating or smoking. No eating, drinking or smoking in areas where arsenic is handled, processed or stored. Employees should shower before putting on street clothes.

1500294

PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of the spill area. Put on a respirator and other protective clothing. If the spill is a solid, place in suitable container without raising dust (wet mopping or vacuuming preferred). If the spill is a liquid, cover vith an absorbent and sweep into a suitable container. ?or final disposal contact your regional office of the New York State Department of Environmental Conservation.

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

Chemical Pact Sheet* Version 2

DDT

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

Chemical Names: 1,1,1-Trichloro-2,2-bis(p-chlorophenyl) ethane: bis(p-chlorophenyl-trichloroethane; p,p'-dichlorodiphenyltrichloroethane; diphenyltrichloroethane; 1,1,1-trichloro-2,2-di(4-chlorophenyl) ethane; and others; CAS 50-29-3.

Trade Names: Anofex, Dicophane, Didiqam, Chlorophenothane, ENT 1506, Estonate, Genitox, Gesarol, Gyron, Ixodex, Pentachlorin, Pentaech, Santobane, Zerdane and many others.

Uses: Insecticide** (Use has been restricted by EPA and NYS Department of Environmental Conservation).

PHYSICAL INFORMATION

Appearance: Pure DDT is a colorless, white or slightly off-white powder. Technical grade DDT is a white or cream colored waxy solid. Available as powders, granules, aerosols, smoke candles, emulsifiable concentrates and vaporizer charges. Hay be dissolved in solvents that produce additional toxic effects.

Odor: None or slightly aromatic.

Behavior in Water: Insoluble, sinks.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- I mg/m^3.

NIOSH Recommended Limit: Average 10 hour day/40 hour week -- 0.5 mg/m^3.

ACGIH Recommended Limit: Average 8 hour exposure -- 1 mg/m^3.

Short Term Exposure:

Inhalation: 500-4200 mg/m^3 has produced dizziness.

Skin: Can cause irritation in very high concentrations. DDT can be absorbed through the skin if dissolved in vegetable oils or other solvents.

Eyes: Can cause irritation.

Ingestion: 1/30 - 1/4 ounce has caused nausea, vomiting, headache and convulsions. Other symptoms include weakness, restlessness, dizziness, incoordination, numbness of face and extremities, abdominal pain, diarrhea, tremors, and death. Symptoms may be delayed from 1/2 - 3 hours. Estimated lethal dose is between 1 teaspoon and 1 ounce.

Long Term Exposure:

Contact with dust can cause skin and eye irritation. Occupational exposure to DDT has been associated with changes in genetic material. DDT levels build up and remain in the body for long periods of time. DDT causes cancer in mice. Whether it causes cancer in humans is unknown.

**May require a permit for this use. Contact the Department of Environmental Conservation, Bureau of Pesticides Management.'

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

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EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Move person to fresh air. Seek medical attention, if necessary.

Skin: Remove contaminated clothing. Wash affected atea with soap and water. Seek radical attention, if necessary,

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

Ingestion: If person is conscious, give water or milk to drink. Seek medical attention.

Note to Physician: Gastric lavage and saline cathartics may be used. Avoid fats, oils and stimulants, especially epinephrine.

FIRE AND EXPLOSION INFORMATION

General: Non-flammable; poisonous gases can be produced in fires, Solvent may be flammable.

REACTIVITY

Materials to Avoid: Will degrade to DDE at very higb temperatures.

Conditions to Avoid: Strong oxidizers (permangantes and chlorates), alkaline substances, and iron and aluminum salts.

PROTECTIVE MEASURES

Storage and Handling: Store in a cool, dry, well-ventilated area, Should not be stored in iron containers.

Engineering Controls: Adequate ventilation: sinks, showers, eyewash stations and outdoor emergency water sources should be available,

Protective Clothing (Should not be substituted for proper handling and engineering controls): Neoprene gloves, safcty goggles and protective overclothing should be worn when exposure is likely,

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

1500295

PROCEDURES FOR SPILLS AND LEAKS

Warn all workers of spill. Wear proper protective clothing. Sweep up and place in a suitable contaiier. Absorb liquids with vermiculite or other inert material and scoop into suitable container. For final disposal contact your regional office of the New Yotk State Department of Environmental Conservation.

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

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Chemical Fact Sheet* Version 2

DIELDRIN

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

Chemical Names: Hexachloroepoxyoctahydro-endo, exo-dimethanonaphthalene; endo, exo-1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4,5,8-dimethanonaphthalene; 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-exo-1,4-endo-5,8-dimethanonaphthalene; CAS 60-57-1.

Trade Names: HEOD, Alvit, Compound 497, Dieldrex, Dieldrite, ENT 16225, Illoxol, Octalox, Panoram D-31, Quintox and others.

Uses: Insecticide **.

PHYSICAL INFORMATION

Appearance: White crystals or light brown flakes. Hay be dissolved in petroleum based solvent.

Mild chemical-like, **Minimum Detectable by Odor:** 0.6 mg/m^3.

Behavior in Water: Insoluble, sinks.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 0.25 mg/m^3.

NIOSH Recommended Limit: Average 10 bour day/40 hour week exposure -- 0.15 mg/m^3.

ACGIH Recommended Limit: Average 8 hour exposure -- 0.25 mg/m^3.

Short Term Exposure:

Inhalation: nay cause nausea', drowsiness, loss of appetite, visual disturbances and insomnia. Sprays of 1 to 2 1/2% have caused giddiness, headache, muscle twitching, Convulsions and loss of consciousness.

Skin: Can be absorbed to cause or increase the severity of symptoms as listed under ingestion.

Eyes: Can cause irritation and redness.

Ingestion: May cause headache, nausea, insomnia. high blood pressure. vision problems, loss of coordination, profuse sweating, dizziness, frothing at the mouth, convulsions and loss of consciousness. Death may occur from as little as 1/20 ounce (1.4 gram). Some symptoms may be delayed up to 12 hours.

Long Term Exposure:

Workplace related exposure has caused dizziness, nausea, muscle twitch, convulsions, enlarged liver and skin irritation. Dieldrin has caused cancer in laboratory animals. It is consider& a suspect occupational carcinogen.

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

**Use not permitted in New York State. For more information contact the Bureau of Pesticides Management, Department of Environment Conservation.

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EMERGENCY AND FIRST AID INSTRUCTIONS

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

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

Eyes: Wash with water for at least 15 minutes. Seek medical attention, if necessary.

Ingestion: Seek immediate medical attention.

Note to Physician: Gastric lavage or catharsis may be useful. Administer barbiturates as anticonvulsant therapy. Observe patient carefully because repeated treatment may be necessary.

FIRE AND EXPLOSION INFORMATION

General: Considered non-flammable but will burn at high temperatures. Often dissolved in a flammable solvent for use.

Extinguisher: Dry chemical, water spray, foam or carbon dioxide.

REACTIVITY

Conditions to Avoid: High temperatures may cause breakdown to toxic hydrochloric acid and chlorinated hydrocarbon fumes.

Materials to Avoid: may react vigorously with strong oxidizers such as chlorine and permanganates, strong acids such as sulfuric or nitric, and active metals such as sodium or potassium.

PROTECTIVE MEASURES

Storage and Handling: Keep in tightly sealed containers, preferably outdoors..

Engineering Controls: Ventilate as necessary. Sinks, showers and eyewash stations should be easily available. When used outdoors, emergency water should be available.

Protective Clothing (Should not be substituted for proper handling and engineering control): Neoprene rubber gloves and apron, and eye protection should be worn if contact with Dieldrin is possible.

Protective Equipment: For any detectable levels use a self-contained breathing apparatus with full facepiece operated in a positive pressure mode or a combination Type C supplied-air respirator with an auxiliary self-contained breathing apparatus, both with full facepiece and operated in a positive pressure mode. For escape from a contaminated area wear a gas mask with an organic vapor canister and a high-efficiency particulate filter (including pesticide respirators meeting these requirements) or an escape self-contained breathing apparatus.

PROCEDURES FOR SPILLS AND LEAKS

Warn other workers of spill. Put on proper protective clothing and equipment. Sweep up solid material. Absorb liquids on inert material such as sand or vermiculite. Liquid material may be flammable. Put in suitable container. Establish good ventilation. Pot find disposal contact the regional office of the New York State Department of Environmental Conservation.

For more information:

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

1500296

Chemical Pace Sheet* Version 2

PCBs

The information in this sheet applies to workplace exposure resulting from processinq, manufacturing, storinq or handlinq and is not designed for the population at large. Any generalization beyond occupational exposures should not be made. The best industrral hygiene practice is to maintain concentrations of all chemicals at levels as low as is practical.

Chemical Names: Polychlorinated biphenyls.

Trade Names: Aroclor, Arochlor, Kaneclor, Clophen, Phenoclor, Pyralene, Askarel, Asbestol, Inerteen, Pyranol, Santotherm, Clorextol, Saf-Ti-Kuhl, No-Plan101, Chemko and others.

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

PHYSICAL INFORMATION

Appearance: May be a Clear, colorless oily liquid, light to dark yellow resin or war, or white to yellow powder.

Odor: Aromatic, acrid.

Evaporation: Very slow.

Behavior In Water: Does not mix; sinks.

HEALTH HAZARD INFORMATION

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

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

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

Short Term Exposure:

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

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

Eyes: May produce irritation. Levels at 10 mg/m^3 are severely irtitatinq.

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

Long Term Exposure:

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

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

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

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

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

EMERGENCY AND FIRST AID INSTRUCTIONS

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

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

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

Ingestion: Get immediate medical attention.

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

FIRE AND EXPLOSION INFORMATION

General: Non-flammable.

REACTIVITY

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

PROTECTIVE MEASURES

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

Engineering Controls: Provide local exhaust ventilation system. Sinks8 showers and eyewash stations should be readily available.

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

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

1500297

PROCEDURES FOR SPILLS AND LEAKS

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

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

ecology and environnont, inc.

SITE SAFETY PLAU

Version 900

A. GENERAL INFORMATION

Project Title: Site 24 - DDT Mixing Area

Project No.: UH1104

TDD/Pan No.:

Project Manager: John Barksdale

Project Dir.: Rick Rudy

Location(s): DDT Mixing Area - Near tho northwest corner of tho Barrancas National Cemetary

Prepared by: Hal Davis

Date Proparod: 4-27-09

Approval by: Mary Miller MM

Date Approved: 5-5-89

Site Safety Officer Review:

Date Reviewed:

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

Proposed Date of Field Activities: August 1989

Background Info: Complote: [X]

Preliminary (No analytical data available) [ ]

Documentation/Summary:

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

B. SITE CHARACTERISTICS

Waste Type(s):

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

Characteristic(s):

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

Other:

Physical Hazards:

Overhead [X]	Confined* space [ ]	Below Grade [ ]	Trip/Fa11 [X]
Puncture [ ]	Burn [ ]	Cut [ ]	Splash [X]
Noise [X]	Other: Vehicular traffic in site area.		

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

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Site History/Description and Unusual Features (see Sampling Plan for detailed description): From thm early 1950's until the early 1960's the DDT mixing area site was used as a location for mixing DDT with diesel fuel for mosquito control. Reportedly, spills occured within the mixing area when DDT was transferred from drums to spray tanks. An estimated 20 gallons of pesticide mixture, containing about 3.3 pounds of DDT, were inadvertently spilled during tho entire period of operations. Building 3561 was used as a pesticide storage and equipment rinsing area after the use of DDT was discontinued.

Locations of Chemicals/Wastes: Contaminants are likely contained in subsurface media.

Estimated Volume of Chemicals/Wastes: 20 gallons Of pesticide

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

C. a

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

Physical Hazard Evaluation:

1) Physical Surveys - Automobile hazards;

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

3) Soil Sampling - Using portable drill rig:

4) Decontamination Procedures - Using solvents.

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Odor Description
Chlordane	0.5 mg/m3	Inh, Abs	Convulsions	odorless	odorless
4,4-DDT	1.0 mg/m^3	Inh,Ing,Derm,Eye	tremors, convulse	slight	slight/odorless
Isopropyl Alcohol	400 ppm		drowsiness,head.	7.5-200 ppm	rubbing alcohol
Nitric Acid	2 ppm	" "	cocrosive	0.3-1 ppm	acrid
hoptachlor	0.5 mg/m^3	Inhale, absorb	tremors, convulse	0.2 ppm	camphor odor
epoxide	--	Inh. Abs	Skin Irritant	--	--
dieldrin	0.25 mg/m3	Inh, Ing, Con	nausea, convulse	0.6 mg/m3	
PCB's	0.5 mg/m^3	Inh, Ing, con	nausea,vomit,head	N/A	hydrocarbon odor
arsenic	0.5 mg/m^3	Inh, Ing, Con	naus,vomit,diarrhe	N/A	garlic-liks

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

1500298

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SITE SAFETY PLAN

Version 988

A. GENERAL INFORMATION

Project Title: Site 24 - DDT Mixing Area

Project No.: UH1104

TDD/Pan lo.:

Project Manager: John Barksdale

Project Dir.: Rick Rudy

Location(s): DDT Mixing Area - Near tho northwost corner of tho Barrancas National Cemetary

Prepared by: Hal Davis

Dato Proparod: 4-27-89

Approval by: Mary Miller MM

Dato Approvod: 5-5-89

Site Safety Officer Review:

Dato Reviewed:

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

Proposed Dato of Field Activities: August 1989

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

Documentation/Summary:

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

B. SITE/WASTE CHARACTERISTICS

Waste Type(s):

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

Characteristic(s):

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

Other:

Physical Hazards:

Overhead [X]	Confined* Space [ ]	Below Grade [ ]	Trip/Fa11 [X]
Puncture [ ]	Burn I 1	Cut [ ]	Splash [X]
Noise [X]	Other: Vehicular traffic in site area.		

*Requires completion of additional form and special approval from tho Corporato Health/Safety group. Contact 3SC or HQ.

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Site History/Description and Unusual Features (see Sampling Plan for detailed description): From the early 1950's until the early 1960's the DDT mixing area site was used as a location for mixing DDT with diesel fuel for mosquito control. Reportedly, spills occured within the mixing area when DDT was transferred from drums to spray tanks. An estimated 20 gallons of pesticide mixture, containing about 3.3 pounds of DDT, were inadvertently spilled during the entire period of operations. building 3561 was used as a pesticide storage and equipment rinsing area after the use of DDT was discontinued.

Locations of Chemicals/Wastes: Contaminants are likely contained in subsurface media.

Estimated Volume of Chemicals/Wastes: 20 gallons of pesticide

Site Currently in operation Pes: [ ] 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)

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1) Physical Surveys - Automobile hazards;

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

3) soil Sampling - Using portable drill rig;

4) Decontamination Procedures - Using solvents.

Chemical Hazard Evaluation:

Compound	PEL/TWA	Route of Exposure	Acute Symptoms	Odor Threshold	Description
Chlordane	0.5 mg/m3	Inh, Abs	Convulsions	odorless	odorless
4,4-DDT	1.0 mg/m^3	Inh,Ing,Derm,Eye	tremors, convulse	slight	slight/odorless
Isopropyl Alcohol	400 ppm	" "	drowsiness,head.	7.5-200 ppm	rubbing alcohol
Nitric Acid	2 ppm	" "	corrosive	0.3-1 ppm	acrid
heptachlor	0.5 mg/m^3	Inhale, absorb	tremors, convulse	0.2 ppm	camphor odor
epoxide	--	Inh, Abs	Skin Irritant	--	--
dieldrin	0.25 mg/m3	Inh, Ing, Con	nausea, convulse	0.6 mg/m3	
PCB's	0.5 mg/m^3	Inh, Ing, Con	nausea,vomit,head	N/A	hydrocarbon odor
arsenic	0.5 mg/m^3	Inh, Ing, Con	naus,vomit,diarrhe	N/A	garlic-like

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

1500299

D. SITE SAFETY WORK PLAN

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

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

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

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

Anticipated Level of Protmction (Cross-reference task numbers to Smction C):

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

(Expand if necessary)

Modifications: Modified level D with tyveck, neoprene gloves and books, safety glasses, APR available when level C upgrade is necessary

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, particulatms >_____ 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) >5 ppm, particulatms >_____ 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) >500 ppm, particulatms >_____ mg/m^3, othor _____
- o Level A: O_2 <19.5% or >25%, explosive atmosphere >25% LEL (California-20%), unknown organic vapors >500 ppn, particulatms >_____ mg/m^3, othor _____

Air Monitoring (daily calibration unless otherwise noted):

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

(Expand if necessary)

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

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

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

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

All drilling safety procedures will be strictly adhered to as outlined in Attachment A.

site Entry Procedures and Special Considerations: E & E's "Buddy System" will be employed at a11 times during fielduork activities. Personnel uill exercise caution in the vicinity of Chevalier Field and along nearby roadways. If above background radiation levels are encountered team members will evacuate the sampling area, and contact the corporate health physics group to reassess the site.

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

All fieldwork activities will be performed during daylight bours. Team members will take breaks as necessary to avoid heat stress and replace fluids. Cooling vests may be used to prevent heat stress.

General Spill Control, if applicable: N/A

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

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

Sample Handling Procedures 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
Team members to be determined	Team Leader
	Site Safety Officer/Sampler
	Geologist/Sampler

*All entries into exclusion zone require Buddy System use. All E & E field staff participate in medical wnitoring 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).

1500300

E. EMERGENCY INFORMATION

(Use supplemental shoots. if necessary)

LOCAL RESOURCES

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

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

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

Poison Control Center

Police (include local, county sheriff, state) 911

Fire Department 911

Airport

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

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

Fed. Express 1-800-238-5355

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

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

SITE RESOURCES

Site Emergency Evacuation Alarm Method N/A

Water Supply Source On-site

Telephone Location, lumber To bo dotorminod on-site

Cellular Phone, if available N/A

Radio

Other On-site warehouse number to bo dotorminod

EMERGENCY CONTACTS

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

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

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

4. Office Manager..... R.Rudy..... 093-7245 (homo)

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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 tho information givmn to the 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)

NAS Dispensary - Take Andrew Jackson Court west to Davis. Turn right (north) onto Davis and continue until intersects Taylor Road. Turn right (east) onto Taylor Road and continue to it's intersection with Duncan Road. Turn right on Duncan Road and continuo to it's intersection with Turner Road. Turn loft (east) on Turner Road 8nd continuo to it's intersection with Ellyson Avenue. The NAS Dispensary is located on the northwest corner of the intersection of Ellyson Avenue and Turner street, in Building 625-A.

Baptist Hospital - Take Duncan Road (Navy Blvd.) north to exit tho base. Navy Blvd. becomes HWY 98 and curves to tho east. Follow Navy Blvd./Hwy. 98 mast approx. 3ri to Pace Blvd. Turn loft (north) on Pace Blvd. and proceed approx. 1mi to Cervantes St. (Hwy. 90). Turn right on Cervantes/Hwy. 90 and follow this road for about 8 block8 and turn left (north) onto E street. Tho 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 construction, etc.

150030

D. SITE SAFETY WORK PLAN

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

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

Work Areas Designated? [yes] Zone(s) of Contamination Identified? [no 1

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

Anticipated Lovol of Protection (cross-referonco task numbers to Section C):

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

Modifications: Modified level D with tyveck, neoprene gloves and boots, safety glasses, APR available when level C upgrade is necessary

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

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

Air Monitoring (daily calibration unless otherwise noted):

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

(Expand if necessary)

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

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

Decon solution Monitoring Procoduros. if Applicable: Decontamination will bo performed in a well-ventilated area upwind of tho sampling zone.

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

All drilling safety procedures will bo strictly adhered to as outlined in Attachment A.

Site Entry Procoduros and Special Considerations: E & E's "buddy System" will be employed at all times during fieldwork activities. Personnel will exercise caution in tho vicinity of Chevalier Field and along nearby roadways. If above background radiation levels are encountered team members will evacuate tho sampling area, and contact the corporato health physics group to reassess tho site.

Work Limitations (time of day, weather condition., etc.) and Heat/Cold Stress Requirements:

All fieldwork activities will be performed during daylight hours. Team members will take breaks as necessary to avoid heat stress and replace fluids. Cooling vests may bo used to prevent heat stress.

General Spill Control, if applicable: N/A

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

All fieldwork vasto materials will bo double baggod, drummed, labeled and transported to a designated location for final disposal by the Navy.

Sample Handling Procoduros Including Protective Wear:

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

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

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

1500302

Appendix C (Cont.)

Base * = Status of species on tho NAS Pensacola facility.
R = Resident.
M = Migrant.
SR = Suspected resident.
P = Possible resident duo to available habitat; survey required.
U = Unknown, survey required.
N/A = lot expected to OCCUr on tho NAS Pensacola facility.

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E. EMERGENCY INFORMATION

(Use supplemental shmets, if necessary)

LOCAL RESOURCES

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

Ambulance On Base — 904-4524138, Off Base -- 911

Hospital Emergency Room NAS Dispensary - 904-452-2733, Baptist Hospital 904-434-4611 (Life Plight)

Poison Control Center

Police (include local, county sheriff, state) 911

Fire Department 911

Airport

U.S. Coast Guard Emergency - 904-453-8176, General Information 904-453-8287

Laboratory E • E ASC 1-716-631-0360

Fed. Express 1-600-736-5355

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

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

SITE RESOURCES

Site Emergency Evacuation Alarm Method N/A

'ater Supply Sourcm On-site

lephone Location, lumber To be determined on-site

Cellular Phone, if available N/A

Radio

Other On-site warehouse number to be determinod

EMERGENCY CONTACTS

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

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

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

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

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MEDTOX HOTLINE

1. Twenty-tour 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 the 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 - how # (716) 655-1260
   c. Assistant Corp. Safety Officer - Steven Sherman - how # (716) 611-0014

EMERGENCY ROUTES

(NOTE: Field Team must Know Rout.(~) ?=for to Start of Work)

Directions to hospital (include up)

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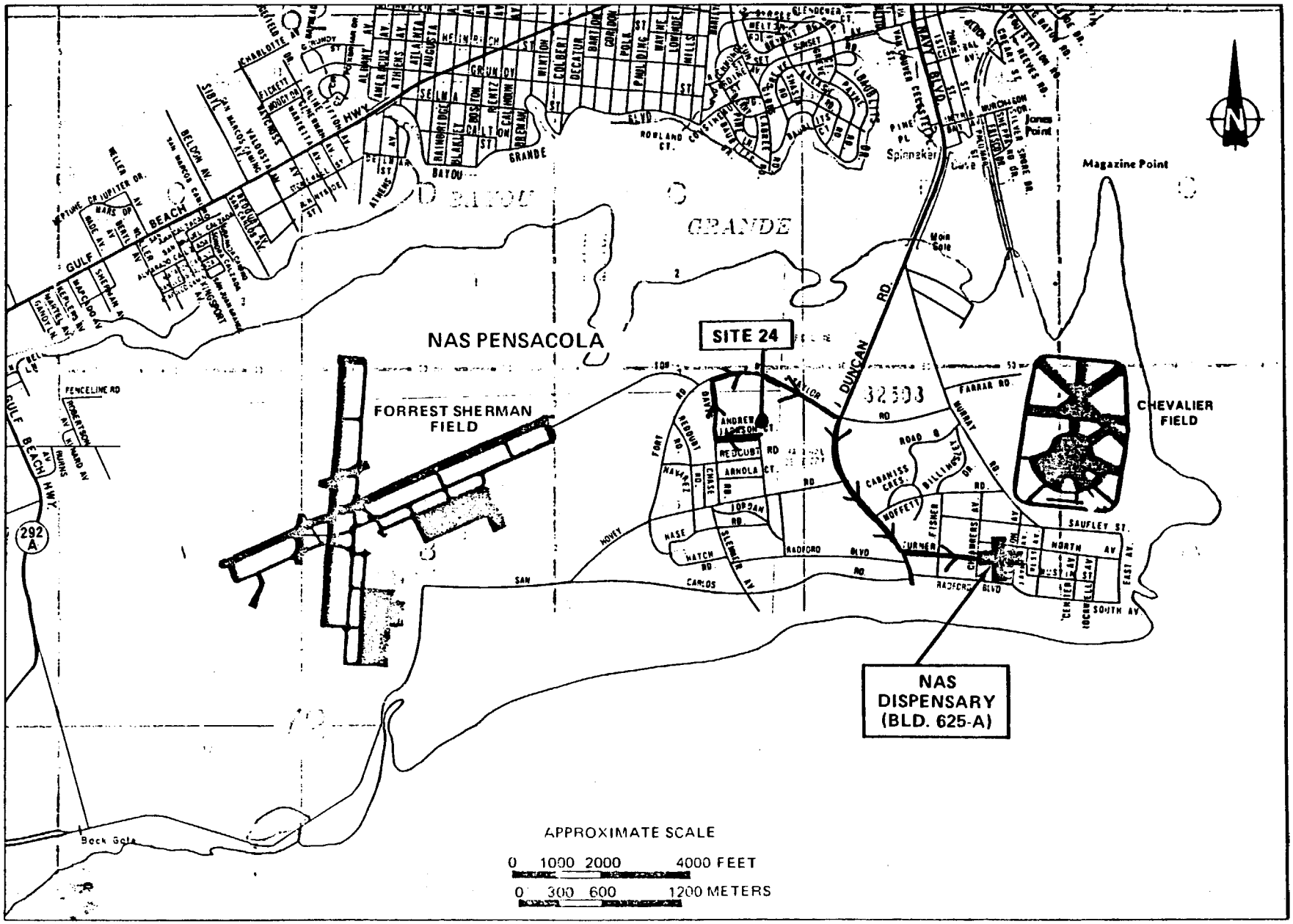
Emergency Egress Routes to Got Off-Site Emergency egress routes will bo located if emergency exit routes become blocked by construction, etc.



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DRILL RIG SAFETY

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

1500305

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

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

THE EFFECTS OF HEAT

As the result of normal oxidation processes within the body, a predictable amount of heat is generated. If the heat is liberated as It is formed, there Is no change In body temperature. If the heat is liberated more rapidly, the body cools to a point at which the production of heat is accelerated and the excess is available to bring the body temperature back to normal.

Interference with the elimination of heat leads to its accumulation and thus to the elevation of body temperature. As a result, the person Is said to have a fever. When such a condition exists, it produces a vicious cycle In which certain body processes speed up and generate addltlonal heat. Then the body must eliminate not only the normal but also the additional quantities of heat.

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

HEAT CRAMPS

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

Heat Cramp Symptoms. The symptoms of heat cramp are:

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

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

HEAT EXHAUSTION

Heat exhaustion occurs in individuals working In hot environments. and may be associated with heat cramps. Heat exhaustion is caused by the pooling of blood in the vessels of the rkln. The heat is transported from the interior of the body to the surface by me blood. The blood vessels in the skin become dilated and a large amount of blood is pooled in the rkln. This condition, plus the blood pooled in the lower extremities when an individual is in an upright position, may lead to an inadequate return of blood to the heart and eventually to physical collapse.

Heat Exhaustion Symptoms. The symptoms of heat exhaustion are:

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

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

HEAT STROKE

1500306 Heat stroke is a profound disturbance of the heat-regulating mechanism, associated with high fever and collapse. Sometimes this condition results in convulsions. unconsciousness, and even death. Direct

exposure to sun, poor air circulation, poor physical condition, and advanced age (over 40) bear directly on the tendency to heat stroke. It is a serious threat to life and carries a 20% mortality rate. Alcoholics are extremely susceptible.

Heat Stroke Symptoms. The symptoms of heat stroke are:

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

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

AVOIDANCE OF HEAT-RELATED EMERGENCIES

Please note that, in the case of heat cramps or heat exhausiion, "Gatorade" or its equivalent is suggested as part of the treatment regime. The reason for this type of liquid refreshment is that such beverages will return much-needed electrolytes to the system. Without these electrolytes, body systems cannot function properly, thereby increasing the represented health hazard. Therefore, when personnel are working in situations where the ambient temperatures and humidity are high--and especially in situations where protection Levels A, E, and C are required--the site safety officer must:

- Assure that all employees drink plenty of fluids ("Gatorade" or its equivalent);
- Assure that frequent breaks are scheduled so overheating does not occur; and
- Revise work schedules, when necessary, to take advantage of the cooler parts of the day (i.e., 5:00 a.m. to 1:00 p.m., and 6:00 p.m. to nightfall).

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

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

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

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

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

1500397

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ISOPROPYL ALCOHOL

PRODUCT IDENTIFICATION:

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

Formula **CAS No.:** 67-63-0

Molecular Weight: **60.10**

Chemical Formula: $(CH_3)_2$ CHOH

Hazardous Ingredients: **Not** applicable.

PRECAUTIONARY MEASURES

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

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

EMERGENCY/FIRST AID

If swallowed, give water to drink. Induce vomiting if medical help 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 SECTION5.

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: 3 W C (750°F).
Flammable limits in air, % by volume:
lel: 2.9 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 lire, 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.

NFPA Ratings: Health: 1 flammability 3 Reactivity 0

SECTION 3 Reactivity Data

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

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

Hazardous Polymerization:
Will not occur.

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

SECTION 4 Leak/Spill Disposal Information

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

Ensure compliance with local, state and federal regulations.

1500308

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

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

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

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

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

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

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

B. FIRST AID

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

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

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

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

C. TOXICITY DATA (RTECS, 1982)

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

SECTION 6 Occupational Control Measures

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

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

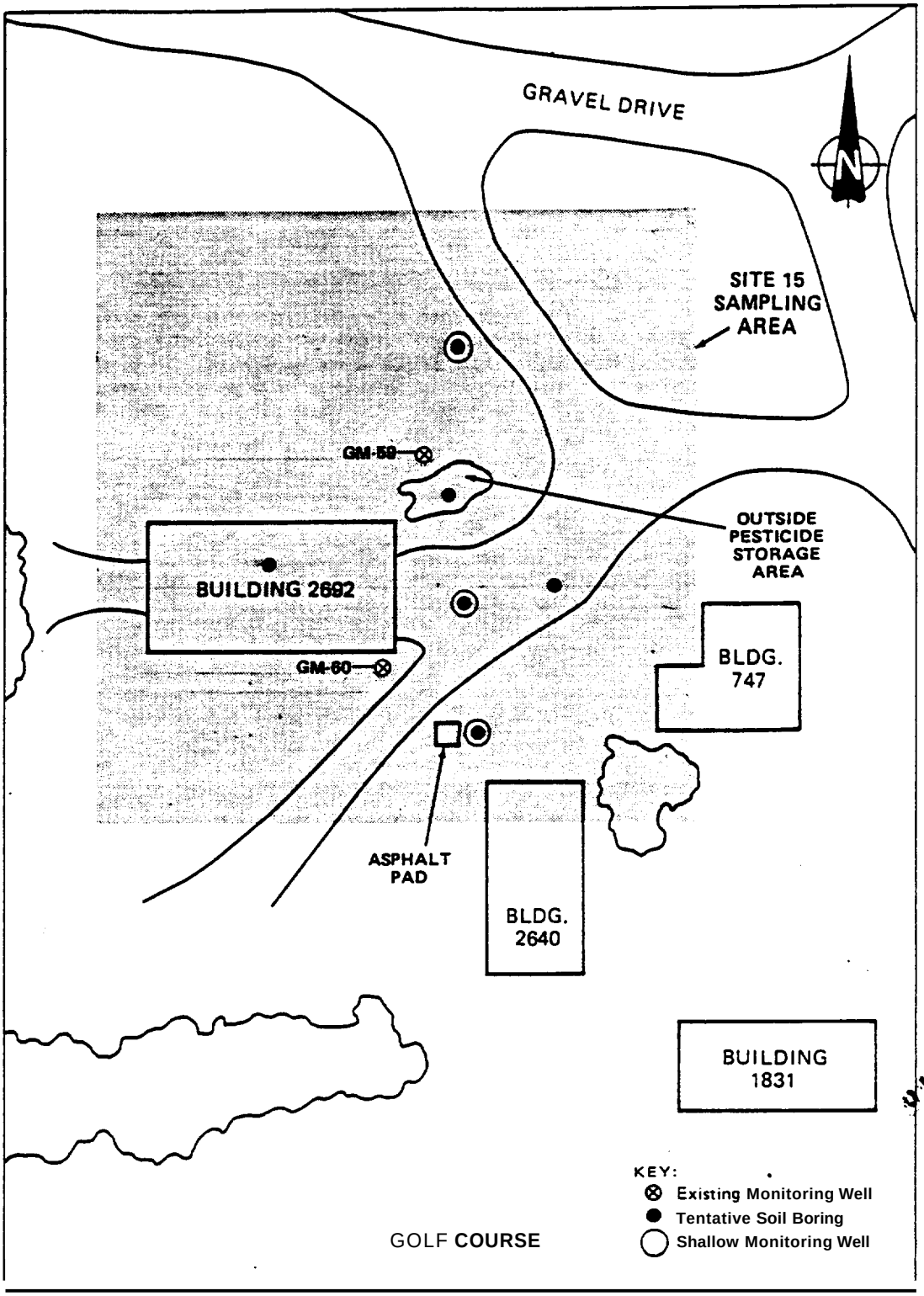
Personal Respirators: (NIOSH Approved)
If the TLV is exceeded a full facepiece chemical cartridge respirator may be worn, in general, up to the maximum use concentration specified by the respirator supplier. Alternatively, a supplied air full facepiece respirator or airlined hood may be worn.

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

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

SECTION 7 Storage and Special Information

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



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

SCALE

0 50 100 200 300 FEET

Figure 14–3 TENTATIVE SOIL BORING AND SHALLOW MONITORING WELL LOCATIONS, SITE 15 – PHASE II

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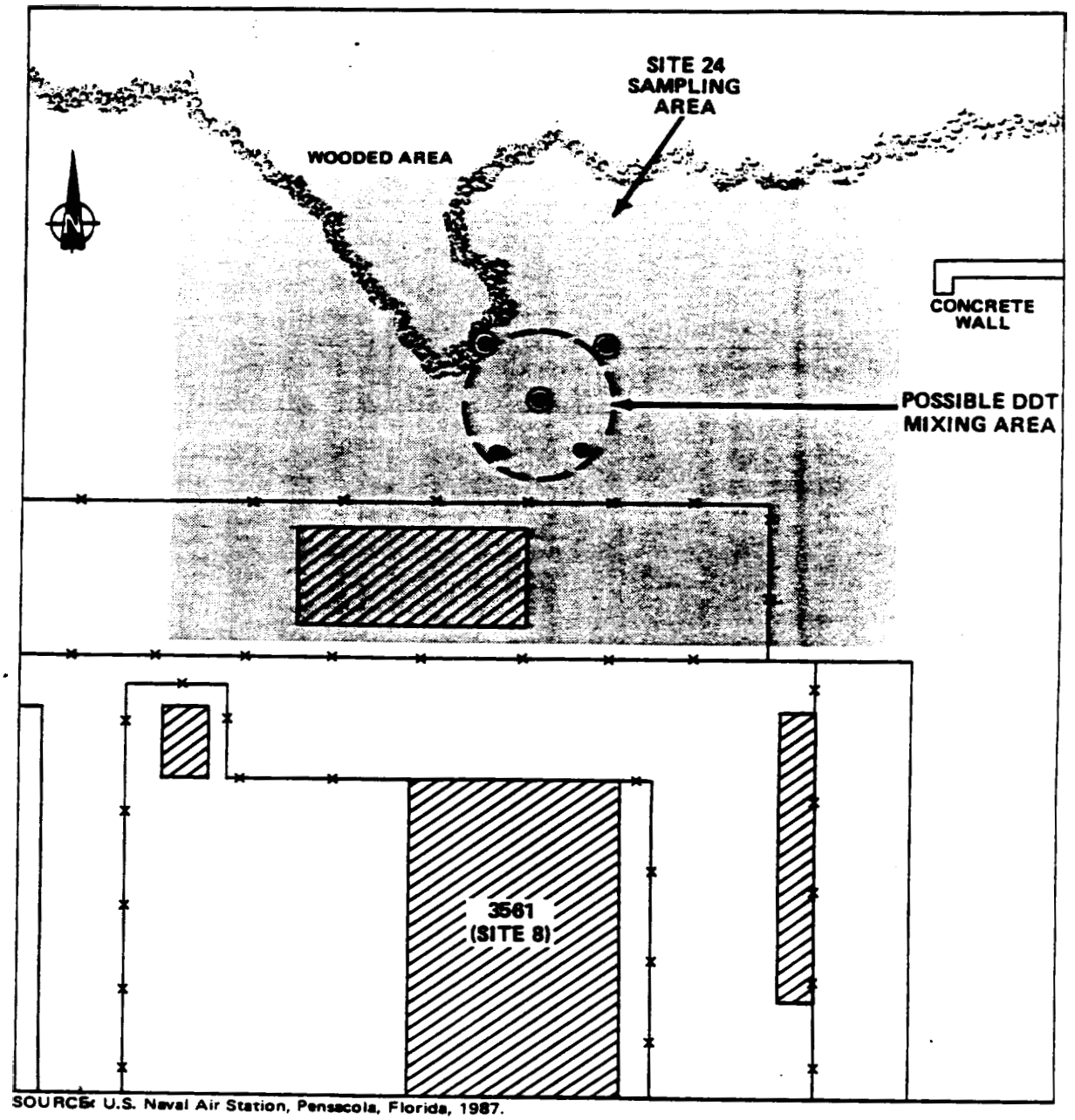

SOURCE: U.S. Naval Air Station, Pensacola, Florida, 1987.

SCALE

0 50 100 20 300 FEET

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KEY:

- Tentative Soil Boring
- Tentative Shallow Monitoring Well
- Building

Figure 14—4 TENTATIVE SOIL BORING AND SHALLOW MONITORING WELL LOCATIONS, SITE 24 – PHASE II

[14.2.3] Shallow Honitoring Well Installation and Development

The actual number and locations of monitoring wells to be installed in Phase II will be based on Phase I findings. For planning purposes, the number of permanent shallow monitoring wells to be installed at each site is three. All shallow wells will be of two-inch diameter PVC construction, and bracket the water table with 10 feet of screen. The anticipated well depths are 25 feet at Site 15 and 20 feet at Site 24. The wells will be installed utilizing hollow-stem auger techniques, constructed and developed in accordance with Section 6.7 of the GQAPP. Drilling equipment will be decontaminated in accordance with Section 6.10 of the GQAPP.

[Depending on the results obtained during Phase I, the delineation of the extent of shallow groundwater contamination may be possible during Phase II by the installation of a few monitoring wells in addition to the number proposed. When and where possible and/or practical, additional monitoring wells will be installed during Phase II in order to expedite the overall investigation schedule.]

[14.2.4] Groundwater Sampling

Groundwater samples will be collected from the two existing monitoring wells and the estimated three newly installed permanent wells at Site 15. The existing monitoring well network is shown on Figure 14-3. The three new monitoring wells at Site 24 will also be sampled. The purging and sampling of wells will be conducted in accordance with Sections 6.8 and 6.10 of the GQAPP.

[14.2.5] Hydrologic Assessment

Well head elevations will be surveyed for all newly installed monitoring wells and water levels will be measured in all wells.

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

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

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particularly useful for deriving first estimates of aquifer hydraulic properties (i.e., hydraulic conductivity, transmissivity).

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

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

14.2.6 Air Sampling

Formal air sampling will be performed in Phase II as deemed appropriate based on Phase I surface emission surveys [and particulate air sampling, and the Phase I shallov soil sampling.]

14.3 Phase III - Extent Delineation

Phase III tasks will be conducted based on the results of Phases I and 11. Although the earlier phases are intended to identify and characterize areas and contaminants of primary concern as they extend laterally from these sites, Phase III activities will be geared toward further delineating the horizontal and vertical extents of contamination.

14.3.1 Soil Sampling

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

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14.3.2 Shallov Monitoring Well Installation and Development

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

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

14.3.3 Intermediate and Deep Monitoring Well Installation and Development

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

14.3.4 Groundwater Sampling

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

14.3.5 Hydrologic Assessment

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

14.3.6 Air Sampling

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

14.4 Phase IV - Extent Delineation

The following tasks, if required, will be performed as a continuation in

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the effort of delineating the extent of contamination:

- o Shallow Honitoring Well Installation and Development;
- o Intermediate and Deep Honitoring Well Installation and Development;
- o Groundwater Sampling; and
- o Hydrologic Assessment

14.5 Topographic *Survey* and Base Map

Following the completion of Phases III and IV, a topographic survey of the Sites 15 and 24 will be conducted and a base map will be developed. Base map coverage, contour intervals, scale, and requirements for horizontal and vertical control will be established and approved by the Navy. The topographic base map will be developed for the requirements of remedial planning and will include the locations of surface features such as: roads, structures, nearby surface waters, monitoring wells, and above ground utilities. The location of subsurface utilities and drainage structures will be reflected on the base map as indicated on existing NAS Pensacola General Development and utilities maps, and/or as located during field investigations.

14.6 Field Quality Assurance/Quality Control

14.6.1 Documentation

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

14.6.2 Field QA/QC Samples

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

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NITRIC **ACID,** 70%

PRODUCT IDENTIFICATION:

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

Formula **CAS No.:** 7697-37-2

Molecular Weight: ***63.00***

Chemical Formula: HNO_3

Hazardous Ingredients: **Not** Applicable

PRECAUTIONARY **MEASURES**

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

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

EMERGENCY/FIRST AID

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

DOT Hazard Class: ***Oxidizer***

SECTION 1 Physical Data

Appearance: Clear, colorless to slightly yellow liquid.

Odor: Suffocating acrid.

Solubility: Infinite in water.

Boiling Point: 122°C (252°F)

Melting Point: -34°C ***(-29°F)***

Specific Gravity: 1.41

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

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

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

Fire:
Not combustible, but substance **is a strong oxidizer** and 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 sues:** Neutralize with **alkaline** material. pick up with absorbent **material** (sand, earth, vermiculite) and dispose **in a** RCRA-approved **waste** facility **or** sewer the neutralized slurry with excess **water** if **local** ordinances allow. **Provide forced** ventilation **to dissipate** fumes.

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

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

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

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SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:
Corrosive! Inhalation of vapors a n 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 d 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 a d permanent eye damage.

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

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

B. FIRST AID

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

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

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

Eye Exposure:
Wash eyes with plenty of n t e r lor at least 15 minutes, lifting lower a d 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 b recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation b 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", m a t recent edition, for details.

Personal Respirators: (NIOSH Approved)
If the TLV is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or self-contained breathing apparatus. Nitric acid is an oxidizer a d 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 b possible. Contact lenses should not be worn when working with this material. Maintain eye wash fountain a d quick-drench facilities in work a m .

SECTION 7 Storage and Special Information

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

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Emergency Phone Number: 311-982-5000

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

SULFURIC ACID 96%

PRODUCT IDENTIFICATION:

Synonyms: Oil of Vitriol

Formula CAS No.: 7664-93-9

Molecular Weight: 98.07

Chemical Formula: H_2SO_4

Hazardous Ingredients: Not applicable.

PRECA [

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 get in eyes, on skin, or on clothing.
Do not breathe t
Keep container closed.
Use only with adequate
Wash hc ft
This substance is a POISON under the Federal Caustic **Poison Act.**

ST 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 mart 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 maybe used to keep fire exposed containers cool.

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

SECTION 3 Reactivity Data

Stability:
Stable under ordinary conditions of use and storage.

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

Hazardous Polymerization:
Will not occur.

Incompatibilities:
Water, bases, organic material, halogens, metal acetylides, oxides and hydrides, strong oxidizers 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. Rush 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

1500313

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

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

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

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

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

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

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

B. FIRST AID

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

Ingestion:
If swallowed, DO NOT induce vomiting. Give large quantities of water or milk if available. Call a physician immediately. Never give anything by mouth to an unconscious person.

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

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

C. TOXICITY DATA (RTECS, 1982)

Oral rat LD50: 2140 mg/kg. Inhalation Guinea Pig LC50: 18 mg/m^3.

SECTION 6 Occupational Control Measures

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

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

Personal Respirators: (NIOSH Approved)
If the TLV is exceeded a full faceplece 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 faceplece 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 proper drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, always add the acid to water; never add water to the acid.

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Chemical Pact Sheet* Version 2

2,4-D

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

Chemical Names: 2,4-Dichlorophenoxyacetic acid: CAS 94-75-7.

Trade Names: 2,4-D Acid, Esteron, Verton, Visko, Weedone, Brush-Rhap, Brush Killer, Chloroxone, Ded-Weed, and others.

Uses: As a fungicide, herbicide and defoliant; as a plant growth regulator.

PHYSICAL INFORMATION

Appearance: White or tan powder or crystals.

Odor: None.

Behavior in Water: Slightly soluble, crystals sinks.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 10 mg/m^3.

NIOSH Recommended Limit: Average 8 hour exposure -- 10 mg/m^3.

ACGIH Recommended Limit: Average 8 hour exposure -- 10 mg/m^3.

Short Term Exposure:

Inhalation: May cause irritation of the mouth, nose and throat, headache, nausea, vomiting, and diarrhea at levels above 10 mg/m^3. Nerve damage, which may be delayed, may include swelling of legs and feet, muscle twitch and stupor. Severe exposures may result in death.

Skin: Dust or liquid left in contact with the skin for several hours may be absorbed. This may result in severe delayed symptoms as listed above. These symptoms may last for months or years.

Eyes: Irritation may occur.

Ingestion: The oral dose required to produce symptoms is about 1/12 ounce (1/2 teaspoon). Increasing amounts may result in increasingly severe symptoms as listed above. Death has resulted from as little as 1/5 ounce. Survival for more than 48 hours is usually followed by complete recovery although symptoms may last for several months.

Long Term Exposure:

Workers exposed to 2,4-D in the manufacturing process over a five to ten year period at levels above 10 mg/m^3 complained of weakness, rapid fatigue, headache and vertigo. Liver damage, low blood pressure and slowed heartbeat were also found.

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

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EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Get to fresh air. Give artificial respiration or oxygen as required, Seek medical attention, if necessary.

Skin: Remove soiled clothing promptly. Wash affected area with soap and water for at least five minutes.

Eyes: Wash eyes with plenty of water for at least 15 minutes. Seek medical attention.

Ingestion: Get immediate medical attention,

FIRE AND EXPLOSION INFORMATION

General: Non-flammable.

REACTIVITY

Materials to Avoid: None specified.

Conditions to Avoid: Heat and strong light cause breakdown to poisonous compounds such as chlorinated phenols and phosgene.

PROTECTIVE MEASURES

Storage and Handling: Store away from light and heat,

Engineering Controls: Use in closed systems if possible. Sinks, shower and eyewash stations should be available. Emergency water should be available if used out-of-doors.

Protective Clothing (Should not be substituted for proper handling and engineering controls): Safety glasses, dust mask and impervious gloves an clothing should be worn if contact is likely.

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

1500314

PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of spill area. Wearing protective clothing and equipment sweep up carefully and place in suitable container. Liquid solution may be absorbed on clay or vermiculite and placed in a suitable container. Scrub spill area with soap and water. For final disposal contact your regional office of the New York State Department of Environmental Conservation.

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

ARSENIC (metallic and inorganic compounds)

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

Chemical Names: Arsenic solid, colloidal arsenic, metallic arsenic, arsenic black, CAS 7440-38-2; disodium arsenate, CAS 7778-43-0; sodium arsenate, CAS 7631-89-2; arsenic chloride, CAS 7784-34-1; arsenic sulfide, CAS 1303-33-9; arsenic trioxide, CAS 1327-53-3; and others. A separate fact sheet is available on Arsine.

Trade Names: Ruby Arsenic, Realgar, Butter of Arsenic, White Arsenic and others.

Uses: Used to harden copper-lead alloys: in the manufacture of certain types of glass: as a radioactive tracer in toxicology; in pesticides, insecticides and rodenticides; taxidermy and others.

PHYSICAL INFORMATION

Appearance: Grey, shiny metal. The inorganic compounds are various colors.

Odor: None, except for arsenic trioxide which has a garlic-like odor.

Behavior in Water: The metal is insoluble but some inorganic compounds are soluble.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 0.01 mg/m^3 (as arsenic).

NIOSH Recommended Limit: 0.002 mg/m^3 (as arsenic).

ACGIH Recommended Limit: Average 8 hour exposure -- 0.2 mg/m^3 (as arsenic: does not apply to arsenic trioxide production).

Short Term Exposure:

Inhalation: May cause coughing, chest pains, difficult breathing, giddiness, headache, nausea, vomiting, diarrhea and breakdown of nasal tissues.

Skin: Prolonged contact may cause irritating redness and blisters. Arsenic trioxide is readily absorbed causing those symptoms listed under inhalation.

Eyes: May cause irritation.

Ingestion: May cause stomach pains, vomiting (possibly with blood), diarrhea (possibly with blood), inflammation of the throat, cramps in the legs, restlessness, paralysis, shock and death. Animal studies indicate that the lethal dose of arsenic trioxide is about one teaspoon.

Long Term Exposure:

Levels of 0.56 mg/m^3 may cause weakness, loss of appetite, nausea, vomiting, diarrhea, stomach pain, irritation and inflammation of the eyes, nose and throat, breakdown of nasal tissue, excess itching, development of thickened skin and warts on the hands and feet, skin discoloration, and paralysis of the hands and feet. Studies have linked long term occupational exposure to arsenic and inorganic arsenic compounds with skin and lung cancer in humans. Sodium arsenate has caused birth defects in animals. Whether it does so in humans is not known.

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

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EMERGENCY AND FIRST AID INSTRUCTIONS

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

Skin: Remove contaminated clothing. Wash affected are8 uith water for at least 5 minutes. Seek medical attention.

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

Ingestion: If conscious, give large amounts of milk or water. Seek medical attention.

Note to Physician: Urine analysis may be helpful in monitoring exposure.

FIRE AND EXPLOSION INFORMATION

General: The dust will burn.'

REACTIVITY

Conditions to Avoid: High temperature will cause 8 break-down to highly toxic fumes.

Materials to Avoid: Can react vigorously with strong oxidizers (chlorine, dichromate, permanganate). Forms highly toxic fumes on contact with acids or active metals (iron, aluminum, zinc).

PROTECTIVE MEASURES

Storage and Handling: Store in a cool, well-ventilated area away from combustible materials and those materials listed above. Protect from physical damage.

Engineering Controls: Enclosed processes preferred. Otherwise, use in a well-ventilated area. Sinks, showers and eyewash stations should be readily available. Arsenic trioxide should be used in an enclosed process.

Protective Clothing (Should not be substituted for proper handling and engineering conr Wear gloves, goggles, apron or coveralls and head and neck covering. Work clothing should be changed at the end of the workshift. Employer shall provide laundering services.

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

Note: Workers should be permitted to leave the work area every two hours to wash therr faces and obtain clean respirators.

Miscellaneous: Wash hands and face before eating or smoking. No eating, drinking or smoking in areas where arsenic is handled, processed or stored. Employees should shower before putting on street clothes.

1500315

PROCEDURES FOR SPILLS AND LEAKS

Get all workers out of the spill area. Put on a respirator and other protective clothing. I the spill is a solid, place in suitable container without raising dust (wet mopping or vacuuming preferred). If the spill is a liquid, cover with an absorbent and sweep into a suitable container. For final disposal contact your regional office of the New York State Department of Environmental Conservation.

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

Chemical Fact Sheet* Version 2

DDT

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

Chemical Names: 1,1,1-Trichloro-2,2-bis(p-chlorophenyl) ethane: bis(p-chlorophenyl-trichloroethane; p,p'-dichlorodiphenyltrichloroethane; diphenyltrichloroethane; 1,1,1-trichloro-2,2-di(4-chlorophenyl) ethane: and others; CAS 50-29-3,

Trade Names: Anofex, Dicophane, Didigam, Chlorophenothane, ENT 1506, Estonate, Genitox, Gesarol, Gyron, Ixodex, Pentachlorin, Pentaech, Santobane, Zerdane and many others.

Uses: Insecticide** (Use has been restricted by EPA and NYS Department of Environmental Conservation).

PHYSICAL INFORMATION

Appearance: Pure DDT is a colorless, white or sliqhtly off-white powder. Technical grade DDT is a white or cream colored waxy solid. Available as powders, granules, aerosols, smoke! candles, emulsifiable concentrates and vaporizer charges. May be dissolved in solvents that produce additional toxic effects.

Odor: None or slightly aromatic.

in Water: Insoluble, sinks.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 1 mg/m^3.

NIOSH Recommended Limit: Average 10 hour day/40 hour week -- 0.5 mg/m^3.

ACGIH Recommended Limit: Average 8 hour exposure -- 1 mg/m^3.

Short Term Exposure:

Inhalation: 500-4200 mg/m^3 has produced dizziness.

Skin: Can cause irritation in very high concentrations. DDT can be absorbed through the skin if dissolved in vegetable oils or other solvents.

Eyes: Can cause irritation.

Ingestion: 1/30 - 1/4 ounce has caused nausea, vomiting, headache and convulsions.. Other symptoms include weakness, restlessness, dizziness, incoordination, numbness of face and extremities, abdominal pain, diarrhea, tremors, and death. Symptoms may be delayed from 1/2 - 3 hours. Estimated lethal dose is between 1 teaspoon and 1 ounce.

Long Term Exposure:

Contact with dust can cause skin and eye irritation. Occupational exposure to DDT has been associated with changes in genetic material. DDT levels build up and remain in the body for long periods of time. DDT causes cancer in mice. Whether it causes cancer in humans is unknown.

**May require a permit for this use. Contact the Department of Environmental Conservation, Bureau of Pesticides Manaqement.'

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

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EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Hove person to fresh air. Seek medical attention, if necessary.

Skin: Remove contaminated clothing. Wash affected area with soap and water. Seek medical attention, if necessary.

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

Ingestion: If person is conscious, give water or milk to drink. Seek medical attention.

Note to Physician: Gastric lavage and saline cathartics may be used. Avoid fats, oils and stimulants, especially epinephrine.

FIRE AND EXPLOSION INFORMATION

General: Non-flammable; poisonous gases can be produced in fires. Solvent may be flammable.

REACTIVITY

Materials to Avoid: Will degrade to DDE at very high temperatures.

Conditions to Avoid: Strong oxidizers (permangantes and chlorates), alkaline substances, and iron and aluminum salts,

PROTECTIVE MEASURES

Storage and Handling: Store in a cool, dry, well-ventilated area. Should not be stored in iron containers.

Engineering Controls: Adequate ventilation; sinks, shovers, eyewash stations and outdoor emergency water sources should be available.

Protective Clothing (Should not be substituted for proper handling and engineering controls): Neoprene gloves, safety goggles and protective overclothing should be worn when exposure is likely.

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

1500316

PROCEDURES FOR SPILLS AND LEAKS

Warn all workers of spill. Wear proper protective clothing. Sweep up and place in a suitable contaier. Absorb liquids with vermiculite or other inert material and scoop into suitable container, For final disposal contact your regional office of the New York State Department of Environmental Conservation.

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

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Chemical Fact Sheet* Version 2

DDT

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

Chemical Names: 1,1,1-Trichloro-2,2-bis(p-chlorophenyl) ethane; bis(p-chlorophenyl-trichloroethane; p,p'-dichlorodiphenyltrichloroethane; diphenyltrichloroethane; 1,1,1-trichloro-2,2-di(4-chlorophenyl) ethane; and others; CAS 50-29-3.

Trade Names: Anofex, Dicophane, Didiqam, Chlorophenothane, ENT 1506, Estonate, Genitox, Gesarol, Gyron, Ixodex, Pentachlorin, Pentaech, Santobane, Zerdane and many others.

Uses: Insecticide** (Use has been restricted by EPA and NYS Department of Environmental Conservation).

PHYSICAL INFORMATION

Appearance: Pure DDT is a colorless, white or slightly off-white powder. Technical grade DDT is a white or cream colored wary solid. Available as powders, granules, aerosols, smoke candles, emulsifiable concentrates and vaporizer charges, May be dissolved in solvents that produce additional toxic effects.

Odor: None or slightly aromatic.

Behavior in Water: Insoluble, sinks.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 1 mg/m^3.

NIOSH Recommended Limit: Average 10 hour day/40 hour week -- 0.5 mg/m^3.

ACGIH Recommended Limit: Average 8 hour exposure -- 1 mg/m^3.

Short Term Exposure:

Inhalation: 500-4200 mg/m^3 has produced dizziness.

Skin: Can cause irritation in very high concentrations. DDT can be absorbed through the skin if dissolved in vegetable oils or other solvents.

Eyes: Can cause irritation.

Ingestion: 1/30 - 1/4 ounce has caused nausea, vomiting, headache and convulsions. Other symptoms include weakness, restlessness, dizziness, incoordination, numbness of face and extremities, abdominal pain, diarrhea, tremors, and death. Symptoms may be delayed from 1/2 - 3 hours. Estimated lethal dose is between 1 teaspoon and 1 ounce.

Long Term Exposure:

Contact with dust can cause skin and eye irritation. Occupational exposure to DDT has been associated with changes in genetic material. DDT levels build up and remain in the body for long periods of time. DDT causes cancer in mice. Whether it causes cancer in humans is unknown,

++May require a permit for this use. Contact the Department of Environmental Conservation, Bureau of Pesticides Management.'

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

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EMERGENCY AND FIRST AID INSTRUCTIONS

Inhalation: Move person to fresh air. Seek medical attention, if necessary.

Skin: Remove contaminated clothing. Wash affected area with soap and water, Seek medical attention, if necessary.

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

Ingestion: If person is conscious, give water or milk to drink. Seek medical attention.

Note to Physician: Gastric lavage and saline cathartics may be used. Avoid fats, oils and stimulants, especially epinephrine.

FIRE AND EXPLOSION INFORMATION

General: Non-flammable; poisonous gases can be produced in fires. Solvent may be flammable.

REACTIVITY

Materials to Avoid: Will degrade to DDE at very high temperatures.

Conditions to Avoid: Strong oxidizers (permangantes and chlorates), alkaline substances, and iron and aluminum salts.

PROTECTIVE MEASURES

Storage and Handling: Store in a cool, dry, well-ventilated area. Should not be stored in iron containers,

Engineering Controls: Adequate ventilation: sinks, showers, eyewash stations and outdoor emergency water sources should be available.

Protective Clothing (Should not be substituted for proper handling and engineering controls): Neoprene gloves, safety goggles and protective overclothing should be worn when exposure is likely.

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

1500317

PROCEDURES FOR SPILLS AND LEAKS

Warn all workers of spill. Wear proper protective clothing. Sweep up and place in a suitable container. Absorb liquids with vermiculite or other inert material and scoop into suitable container. For final disposal contact your regional office of the New York State Department of Environmental Conservation,

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

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EMERGENCY AND FIRST AID INSTRUCTIONS

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

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

Eyes: Wash with water for at least 15 minutes. Seek medical attention, if necessary.

Ingestion: Seek immediate medical attention.

Note to Physician: Gastric lavage or catharsis may be useful. Administer barbiturates as anticonvulsant therapy. Observe patient carefully because repeated treatment may be necessary.

FIRE AND EXPLOSION INFORMATION

General: Considered non-flammable but will burn at high temperatures, Often dissolved in a flammable solvent for use.

Extinguisher: Dry chemical, water spray, foam or carbon dioxide.

REACTIVITY

Conditions to Avoid: High temperatures may cause breakdown to toxic hydrochloric acid and chlorinated hydrocarbon fumes.

Materials to Avoid: May react vigorously with strong oxidizers such as chlorine and permanganates, strong acids such as sulfuric or nitric, and active metals such as sodium or potassium.

PROTECTIVE MEASURES

Storage and Handling: Keep in tightly sealed containers, preferably outdoors..

Engineering Controls: Ventilate as necessary. Sinks, showers and eyewash stations should be easily available. When used outdoors, emergency water *should* be available.

Protective Clothing (Should not be substituted for proper handling and engineering control): Neoprene rubber gloves and apron, and eye protection should be worn if contact with Dieldrin is possible.

Protective Equipment: par any detectable levels use a self-contained breathing apparatus with full facepiece operated in a positive pressure mode or a combination Type C supplied-air respirator with an auxiliary self-contained breathing apparatus, both with full facepiece and operated in a positive pressure mode. For escape from a contaminated area wear a gas mask with an organic vapor canister and a high-efficiency particulate filter (including pesticide respirators meeting these- requirements) or an escape self-containad breathing apparatus.

PROCEDURES FOR SPILLS AND LEAKS

Warn other workers of spill. Put on proper protective clothing and equipment. Sweep up solid material. Absorb liquid8 on inert material such as sand or vermiculite. Liquid material may be flammable. Put in suitable container, Establish good ventilation. For final disposal contact the regional office of the New York State Department of Environmental Conservation.

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

Chemical Fact Sheet* Version 2

DIELDRIN

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

Chemical Names: Hexachloroepoxyoctahydro-endo, exo-dimethanonaphthalene; endo, exo-1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4,5,8-dimethanonaphthalene; 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-exo-1,4-endo-5,8-dimethanonaphthalene; CAS 60-57-1.

Trade Names: HEOD, Alvit, Compound 497, Dieldrex, Dieldrite, ENT 16225, Illoxol, Octalox, Panoram D-31, Quintox and others.

Uses: Insecticide **.

PHYSICAL INFORMATION

Appearance: White crystals or light brown flakes. May be dissolved la petroleum based solvent.

Odor: Mild chemical-like. Minimum Detectable by Odor: 0.6 mg/m^3.

Behavior in Water: Insoluble. sinks.

HEALTH HAZARD INFORMATION

OSHA Standard: Average 8 hour exposure -- 0.25 mg/m^3.

NIOSH Recommended Limit: Average 10 hour day/40 hour week exposure -- 0.15

ACGIH Recommended Limit: Average 8 hour exposure -- 0.25 mg/m^3.

Short Term Exposure:

Inhalation: May cause nausea, drowsiness, loss of appetite, visual disturbances and insom a Sprays of 1 to 2 1/2% have caused giddiness, headache, muscle twitching, convulsions and . of consciousness.

gin: Can be absorbed to cause or increase the severity of symptoms as listed under ingestion.

Eyes: Can cause irritation and redness.

Ingestion: May cause headache, nausea, insomnia, high blood pressure, vision problems, loss of coordination, profuse sweating, dizziness, frothing at the mouth, convulsions and loss of consciousness. Death u y occur fr a as little a8 1/20 ounce (1.4 gram). Some symptoms may be delayed up to 12 hours.

Long Term Exposure:

Workplace related exposure has caused dizziness, nausea, muscle twitch, convulsions, enlarged liver and skin irritation. Dieldrin has caused cancer in laboratory animals. It is considered a suspect occupational carcinogen.

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

**Use not permitted in New York State. For more information contact the Bureau of Pesticides Management, Department of Environment Conservation.

1500318

Chemical Fact Sheet* Version 2

PCBs

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

Chemical Names: Polychlorinated biphenyls.

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

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

PHYSICAL INFORMATION

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

Odor: Aromatic, acrid.

Evaporation: very slow.

Behavior In Water: Does not mix; rinks.

HEALTH HAZARD INFORMATION

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

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

ACGIH Recommended Limit: Average 8 hour exposure -- 1.0 mg/m^3 (428 chlorine).
Average 8 hour exposure -- 0.5 mg/m^3 (54% chlorine).

Short Term Exposure:

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

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

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

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

Long Term Exposure:

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

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

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

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

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

EMERGENCY AND FIRST AID INSTRUCTIONS

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

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

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

Ingestion: Get immediate medical attention.

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

FIRE AND EXPLOSION INFORMATION

General: Non-flammable.

REACTIVITY

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

PROTECTIVE MEASURES

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

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

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

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

1500315

PROCEDURES FOR SPILLS AND LEAKS

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

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

APPENDIX B

SITE-SPECIFIC QUALITY ASSURANCE PROJECT PLAN

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

recycled paper
ecology and environment

Section 1.0 — Title Page

Work Plan Group: D
Site No.: 15
Site Name: Pesticide Rinsate Disposal Area

Prepared by: Mary L. Miller
Ecology and Environment, Inc.
1203 Governor's Square Boulevard, Suite 401
Tallahassee, Florida 32301

Prepared for: Departaent 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 QA/QC Director or
Assistant QA/QC Director: T. Yeates/R. Short

E & B ASC Director: A. Clifton

1500320

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

Section 2.0 -- Table of Contents

		Page	Date
Section 1.0	-- Title Page	1	4-24-89
Section 2.0	-- Table of Contents	2	4-24-89
Section 3.0	-- Project Summary	3	4-24-89
Section 4.0	-- Project Organization and Responsibility	5	4-24-89
Section 5.0	-- QA/QC Objectives for Measurement Data	5	4-24-89
Section 6.0	-- Fieldwork and Sampling Procedures	8	4-24-89
Section 7.0	-- Sample Custody	8	4-24-89
Section 8.0	-- Calibration Procedures and Frequency	8	4-24-89
Section 9.0	-- Analytical Procedures	8	4-24-89
Section 10.0	-- Data Reduction, Validation, and Reporting	9	4-24-89
Section 11.0	-- Internal Quality Control Checks	9	4-24-89
Section 12.0	-- Performance and Systems Audits	9	4-24-89
Section 13.0	-- Preventive Maintenance	10	4-24-89
Section 14.0	-- Procedures Used to Assess Accuracy, Precision, and Completeness of Data	10	4-24-89
Section 15.0	-- Corrective Action	10	4-24-89
Section 16.0	-- Quality Assurance Reports to Management	10	4-24-89
Appendix A	-- Additional Personnel Biographies	11	4-24-89

Section 3.0 -- Project Summary

Work Plan Group: D

Site No.: 15

Site Name: Pesticide Rinsate Disposal Area

Site Description: A complete site description and history are presented in Sections 2.0 and 3.0 of the attached work plan.

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

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

Geophysical Survey (check all that apply):

- ___ Electromagnetic Conductivity:
  - ___ EM-31 ___ EM-34
- 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 : Planned Number'of Samples ___
- X Laboratory Analyses:

PLANNED NUMBER OF SAMPLES		CATEGORIES OF ANALYSES
Surface Water	___	X Volatile Organic Compounds
Sediment	___	X Polynuclear Aromatic Hydrocarbons
Soil	a7	___ Phenols
Groundwater	10	X Organophosphorus Pesticides
Duplicates	5	___ Chlorinated Herbicides
Trip Blanks	___	X Carbamates
Field Blanks	___	X Pesticides/Polychlorinated Biphenyls
Rinsate Blanks	___	X Total Recoverable Hydrocarbons
Other	___	X Metals
		___ Gross Alpha

1500321

Section 3.0 -- Project *Summary* (Continued)

Phase II -- Characterization

PLANNED NUMBER OF SAMPLES

Surface Water	___	Air	___	Duplicates	4
Sediment	___	Biota:		Trip Blanks	3
Soi1	30	Flora	___	Field Blanks	3
Groundwater	5	Fauna	___	Rinsate Blanks	3

CATEGORIES OF ANALYSES

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

Additional analytical categories are identified below:

- ___ Gross Alpha
- X Total Organic Carbon
- X Hardness (water only)
- X Alkalinity
- X Total Suspended Solids (water only)
- X Total Kjeldahl Nitrogen
- X Ammonia Nitrogen
- X Orthophosphate Phosphorus
- X Dissolved Oxygen (in field)
- X 5-day Biological Oxygen Demand
- X Chemical Oxygen Demand
- X pH
- X Percent Moisture
- X Grain Size
- X BTU Content
- X Ash Content
- X Total Halogens
- X Sulfur
- X Ignitability
- X Cation Exchange Capacity

Section 4.0 -- Project Organization and Responsibility

The overall organizational structure for this site is discussed in Section 4.0 of the GQAPP. Site-specific designated personnel and their responsibilities are listed below:

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

Biographies for those personnel listed above which are not included in the GQAPP are included in Appendix A of this document.

Section 5.0 -- QA/QC Objectives for Measurement Data

Criteria for reporting the accuracy, precision, and completeness of data are presented in Section 5.0 of the GQAPP. Detection limits for screening and quantitative analyses are presented in Section 9.0 of the GQAPP. Procedures used to assess data accuracy, precision, and completeness are presented in Section 14.0 of the GQAPP. All analytes (including field parameters), sample media, and method numbers relevant to the investigation of this site are listed in the following table, which also identifies any modifications to the accuracy (A), precision (P), completeness (C), and detection limit (DL) criteria specified in the above-referenced GQAPP sections.

Analyte	Media	Method No.	A	P	C	DL
*						
Laboratory Screening Analyses						
Volatile Organic Compounds	S/W	--	N/M	N/M	N/M	N/M
Polynuclear Aromatic Hydrocarbons	S/W	--	N/M	N/M	N/M	N/M
Pesticides	S/W	--	N/M	N/M	N/M	N/M
Polychlorinated Biphenyls	S/W	--	N/M	N/M	N/M	N/M
Total Recoverable Hydrocarbons	S/W	EPA 418.1				
Arsenic	S/W	--	N/M	N/M	N/M	N/M
Cadmium	S/W	--	N/M	N/M	N/M	N/M
Chromium	S/W	--	N/M	N/M	N/M	N/M
Copper	S/W	--	N/M	N/M	N/M	N/M
Lead	S/W	--	N/M	N/M	N/M	N/M
Nickel	S/W	--	N/M	N/M	N/M	N/M
Silver	S/W	--	N/M	N/M	N/M	N/M
Zinc	S/W	--	N/M	N/M	N/M	N/M
Laboratory Analyses						
Volatile Halogenated Hydrocarbons	S/W	EPA 8010/601	N/M	N/M	N/M	N/M
Volatile Aromatic Hydrocarbons	S/W	EPA 8020/602	N/M	N/M	N/M	N/M
TCL Purgeables + xylene	S/W	EPA 8240/624	N/M	N/M	N/M	N/M
TCL BNAs	S/W	EPA 8270/625	N/M	N/M	N/M	N/M
TCL Pesticides & PCBs	S/W	EPA 8080/608	N/M	N/M	N/M	N/M
Total Recoverable Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/M
TCL Metals:						
Aluminum	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Arsenic	S/W	EPA 7060/206.2	N/M	N/M	N/M	N/M
Barium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Beryllium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Boron	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cadmium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Calcium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Chromium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cobalt	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Copper	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Iron	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Lead	S/W	EPA 7421/239.2	N/M	N/M	N/M	N/M
Magnesium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Manganese	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Mercury	S/W	EPA 7471/245.1	N/M	N/M	N/M	N/M

Analyte	Hedia	Method No.	A	P	C	DL
Nickel	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Selenium	S/W	EPA 7740/270.2	N/H	N/M	N/M	N/M
Silver	S/W	EPA 6010/200.7	N/H	N/H	N/M	N/M
Sodium	S/W	EPA 6010/200.7	N/M	N/H	N/M	N/M
Thallium	S/W	EPA 7841/279.2	N/H	N/M	N/M	N/H
Vanadium	S/W	EPA 6010/200.7	N/H	N/M	N/M	N/M
Zinc	S/W	EPA 6010/200.7	N/M	N/H	N/M	N/M
Cyanide	S/W	EPA 9010/335.2	N/M	N/M	N/M	N/M
TOC	S/W	EPA 9060/415.1	N/H	N/M	N/M	N/M
Eardness	W	EPA 130.2	N/M	N/H	N/M	N/M
Alkalinity	W	EPA 310.1	N/H	N/M	N/H	N/M
Total Suspended Solids	W	EPA 160.2	N/H	N/M	N/H	N/M
Total Kjeldahl Nitrogen	S/W	EPA 351.3	N/M	N/M	N/M	N/H
Nitrogen-Ammonia	S/W	EPA 350.2	N/M	N/M	N/H	N/M
Orthophosphate Phosphorus	S/W	EPA 365.2	N/M	N/M	N/M	N/M
5-day Biological Oxygen Demand	W	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/M	N/M	N/M	N/M
Percent Moisture	S	ASTM D-2216-80	N/M	N/H	N/M	N/:
Grain Size	S	ASTH D-422-63	N/H	N/H	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/H	N/H	N/M
Total Halogens	S	ASTH D-808-81	N/M	N/M	N/H	N/M
		EPA 325.3	N/H	N/M	N/M	N/M
Sulfur	S	ASTH D-129-64	N/M	N/M	N/M	N/H
Ignitability	S/W	EPA 1010	N/M	N/M	N/M	N/H
Cation Exchange Capacity	S	EPA 9081	N/H	N/H	N/M	N/H
Field Parameters						
pH	W	Field	N/M	N/H	N/M	N/H
Specific Conductance	W	Field	N/M	N/M	N/M	N/M
Temperature	W	Field	N/M	N/M	N/H	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 Hodifications from GQAPP

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

1500323

Section 6.0 -- Fieldwork and Sampling Procedures

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

No Modifications

Section 7.0 -- Sample Custody

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

No Modifications

Section 8.0 -- Calibration Procedures and Frequency

Calibration procedures and frequency are presented in Section 8.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 9.0 -- Analytical Procedures

Screening and quantitative analytical procedures are presented in Section 9.0 of the GQAPP. Site-specific accuracy, precision, completeness, and detection limit criteria are presented in Section 5.0 of this SQAPP. Modifications to any other of the analytical procedures are described below:

No Modifications

Section 10.0 -- Data Reduction, Validation, and Reporting

Data reduction, validation, and reporting procedures are presented in Section 10.0 of the GQAPP. Hodifications to these procedures are described below:

No Hodifications

Section 11.0 — Internal Quality Control Checks

Internal quality control check procedures are presented in Section 11.0 of the GQAPP. Hodifications to these procedures are described belov:

No Hodifications

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	

1500324

Section 13.0 -- Preventive Haintenance

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 Hanagement

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 3.0 -- Project Summary

Vork Plan Group: D

Site No.: 24

Site Name: DDT Mixing Area

Site Description: A complete site description and history are presented in Sections 2.0 and 3.0 of the attached work plan.

Phase I -- Field Screening

Physical Survey (check all that apply):

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

Geophysical Survey (check all that apply):

- ___ Electromagnetic Conductivity:
  - ___ EM-31 ___ EM-34
- 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 : Planned Number of Samples ___
- X Laboratory Analyses:

PLANNED NUMBER OF SAMPLES		CATEGORIES OF ANALYSES
Surface Water	___	X Volatile Organic Compounds
Sediment	___	X Polynuclear Aromatic Hydrocarbons
Soil	38	___ Phenols
Groundwater	5	X Organophosphorus Pesticides
Duplicates	3	X Carbamates
Trip Blanks	___	X Pesticides/Polychlorinated Biphenyls
Field Blanks	___	X Total Recoverable Hydrocarbons
Rinsate Blanks	___	X Metals
Other	___	___ Gross Alpha

Section 3.0 -- Project Summary (Continued)

Phase II — Characterization

PLANNED NUMBER OF SAMPLES

Surface Water	___	Air	___	Duplicates	4
Sediment	___	Biota:		Trip Blanks	4
Soil	25	Flora	___	Field Blanks	4
Groundwater	3	Fauna	___	Rinsate Blanks	4

CATEGORIES OF ANALYSES

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

Additional analytical categories are identified below:

___ Gross Alpha	X pH
X Total Organic Carbon	X Percent Moisture
X Eardness (water only)	X Grain Size
X Alkalinity	X BTU Content
X Total Suspended Solids (water only)	X Ash Content
	X Total Halogens
X Total Kjeldahl Nitrogen	X Sulfur
X Ammonia Nitrogen	X Ignitability
X Orthophosphate Phosphorus	X Cation Exchange Capacity
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.

Analyte	Media	Method No.	A	P	C	DL
Laboratory Screening Analyses*						
Volatile Organic Compounds	S/W	--	N/M	N/M	N/H	N/M
Polynuclear Aromatic Hydrocarbons	S/W	--	N/M	N/M	N/H	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 Eydrocarbons	S/W	EPA 418.1				
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/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/M	N/M	N/M	N/H
Silver	S/W	--	N/M	N/M	N/M	N/H
Zinc	S/W	--	N/M	N/H	N/M	N/M
Laboratory Analyses						
Volatile Halogenated Eydrocarbons	S/W	EPA 8010/601	N/H	N/M	N/M	N/
Volatile Aromatic Hydrocarbons	S/W	EPA 8020/602	N/H	N/M	N/M	N/M
TCL Purgeables + xylene	S/W	EPA 8240/624	N/H	N/M	N/M	N/H
TCL BNAs	S/W	EPA 8270/625	N/H	N/M	N/H	N/M
TCL Pesticides & PCBs	S/W	EPA 8080/608	N/M	N/M	N/H	N/M
Total Recoverable Hydrocarbons	S/W	EPA 418.1	N/M	N/M	N/M	N/M
TCL Metals:						
Aluminum	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Antimony	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/H
Arsenic	S/W	EPA 7060/206.2	N/M	N/M	N/M	N/M
Barium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/H
Beryllium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Boron	S/W	EPA 6010/200.7	N/H	N/M	N/H	N/M
Cadmium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/H
Calcium	S/W	EPA 6010/200.7	N/H	N/M	N/M	N/M
Chromium	S/W	EPA 6010/200.7	N/H	N/M	N/H	N/M
Cobalt	S/W	EPA 6010/200.7	N/H	N/M	N/M	N/H
Copper	S/W	EPA 6010/200.7	N/H	N/M	N/M	N/M
Iron	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/H
Lead	S/W	EPA 7421/239.2	N/H	N/H	N/M	N/M
Hagnesium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Manganese	S/W	EPA 6010/200.7	N/H	N/M	N/M	N/H
Hercury	S/W	EPA 7471/245.1	N/H	N/M	N/H	N/

Analyte	Media	Method No.	A	P	C	DL
Nickel	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Selenium	S/W	EPA 7740/270.2	N/M	N/M	N/M	N/M
Silver	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Sodium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Thallium	S/W	EPA 7841/279.2	N/M	N/M	N/M	N/M
Vanadium	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Zinc	S/W	EPA 6010/200.7	N/M	N/M	N/M	N/M
Cyanide	S/W	EPA 9010/335.2	N/M	N/M	N/M	N/M
TOC*	S/W	EPA 9060/415.1	N/M	N/M	N/M	N/M
Hardness	W	EPA 130.2	N/M	N/M	N/M	N/M
Alkalinity	W	EPA 310.1	N/M	N/M	N/M	N/M
Total Suspended Solids	W	EPA 160.2	N/M	N/M	N/M	N/M
Total Kjeldahl Nitrogen	S/W	EPA 351.3	N/M	N/M	N/M	N/M
Nitrogen-Ammonia	S/W	EPA 350.2	N/M	N/M	N/M	N/M
Orthophosphate Phosphorus	S/W	EPA 365.2	N/M	N/M	N/M	N/M
5-day Biological Oxygen Demand	W	SM 507	N/M	N/M	N/M	N/M
Chemical Oxygen Demand	W	EPA 410.4	N/M	N/M	N/M	N/M
pH	W	EPA 150.1	N/M	N/M	N/M	N/M
Percent Moisture	S	ASTM D-2216-80	N/M	N/M	N/M	N/M
Grain Size	S	ASTM D-422-63	N/M	N/M	N/M	N/M
BTU Content	S	ASTM D-2015-77	N/M	N/M	N/M	N/M
Ash Content	S	ASTM D-482	N/M	N/M	N/M	N/M
Total Halogens	S	ASTM D-808-81	N/M	N/M	N/M	N/M
		EPA 325.3	N/M	N/M	N/M	N/M
Sulfur	S	ASTM D-129-64	N/M	N/M	N/M	N/M
Ignitability	S/W	EPA 1010	N/M	N/M	N/M	N/M
Cation Exchange Capacity	S	EPA 9081	N/M	N/M	N/M	N/M
Field Parameters						
pH	W	Field	N/M	N/M	N/M	N/M
Specific Conductance	W	Field	N/M	N/M	N/M	N/M
Temperature	W	Field	N/M	N/M	N/M	N/M
Dissolved Oxygen	W	EPA 360.1	N/M	N/M	N/M	N/M

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

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

Section 6.0 -- Fieldwork and Sampling Procedures

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

No Modifications

Section 7.0 — Sample Custody

Sample custody procedures are presented in Section 7.0 of he GQ PP. Modifications to these procedures are described below:

No Modifications

Section 8.0 -- Calibration Procedures and Frequency

Calibration procedures and frequency are presented in Section 8.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 9.0 — Analytical Procedures

Screening and quantitative analytical procedures are presented in Section 9.0 of the GQAPP. Site-specific accuracy, precision, completeness, and detection limit criteria are presented in Section 5.0 of this SQAPP. Modifications to any other of the analytical procedures are described below:

No Modifications

Section 10.0 -- Data Reduction, Validation, and Reporting

Data reduction, validation, and reporting procedures are presented in Section 10.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 11.0 -- Internal Quality Control Checks

Internal quality control check procedures are presented in Section 11.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 12.0 -- Performance and System Audits

Performance and system audit procedures are presented in Section 12.0 of the GQAPP. Specific audits planned for this site investigation are listed below:

Audit Type	Frequency/Date	Description
	To Be Determined	

Section 13.0 -- Preventive Maintenance

Preventive maintenance procedures are presented in Section 13.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 14.0 — Procedures Used to Assess Accuracy, Precision, and Completeness of Data

Procedures used to assess the accuracy, precision, and completeness of data are presented in Section 14.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 15.0 — Corrective Action

Corrective action procedures are presented in Section 15.0 of the GQAPP. Modifications to these procedures are described below:

No Modifications

Section 16.0 — Quality Assurance Reports to Management

Quality assurance report procedures are presented in Section 16.0 of the 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

APPENDIX C

THREATENED AND ENDANGERED FLORA AND FAUNA ASSOCIATED WITH NAS PENSACOLA

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

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APPENDIX C

THREATENED /V/ 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 oxyrhynchus	Atlantic sturgeon	M	SSC	UR 2	Gulf coast, estuarine
Ammocrypta asprella	Crystal darter	U	T	UR 2	Fresh water
Etheostoma histrio	Harelquin darter	U	SSC		Fresh wator
Fundulus jenkinsi	Salt marsh topminnow	P	SSC		Salt, fresh, brackish waters
Lopisostour 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, rarshos, ponds
~~Carotta~~ carotta ~~carotta~~	Loggerhead turtlo	M ?	T	T	Marina, coastal
Chelonia mydas mydas	Green turtlo	M ?	E	E	Marine, coastal
Dermochelys coriacea	Leatherback turtlo	M	E	E	Marine, coastal
Drymarchon corais coupori	Eastern indigo snake	P	T	T	Open areas near water
Eretmochelys imbricata	Hawksbill turtlo	M ?	E	C	Marine, coastal
Gopherus polyphemus	Gopher tortoise	P	SSC	UR 1	Sandy coastal plains
Graptemys pulchra	Alabama rap turtlo	U	SSC		Swamps, streams, rarshos, ponds
Lepidochelys kempi	Atlantic ridley	M ?	E	E	Marine, coastal
Rana areolata aesopus	Clorida gophor frog	P	SSC	UR 2	Sand hill communities
Macroclemys temmincki	Alligator snapping turtlo	SR	SSC	UR 2	Swamps, marshes, ponds
MAMMALS					
Mustela vison lutensis	Florida rink	U		UR 2	Terrestrial habitats
Peromyscus polionotus trissyllepsis	Perdido Key beach mouse	N/A	T	E	Beach dunes
Trichechus manatus latirostris	West Indian manatee	M	E	E	Atlantic and Gulf coasts
Ursus americanus floridanus	Florida black boar	N/A	T	UR 2	Titi swamps

Appendix C (Cont).

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

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Appendix C (Cont.)

Scientific Name	C o w n 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	Panhandle lily	U	E	UR 2	Black, mucky soils
Pinguicula planifolia	Chapman's butterwort	U	RE	UR 2	
Polygonella macrophylla	Large-leaved jointwood	R	T	UR 1	Sand pino-oak scrub
Rhododendron austrinum	Orange azalea	U	E	UR 5	Moist, woody habitats
Sarracenia leucophylla	White-top pitchorplant	R	E		Open acid bops
Sarracenia rubra	Sweet pitchorplant	U	E	UR 2	Acid bogs/slash pine woods
Stewartia malacodnedron	Silky camellia	U	E		Slopes of wooded ravines

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

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