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HEALTH AND SAFETY PLAN
FINAL DRAFT
FOR REMEDIAL INVESTIGATION/FEASIBILITY STUDY
AT
HADNOT POINT INDUSTRIAL AREA
AND
LIMITED SCOPE INVESTIGATIONS
AT
SITES 6, 48 AND 69

MARINE CORPS BASE CAMP LEJEUNE
NORTH CAROLINA

Prepared For:
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION

Prepared By:
ENVIRONMENTAL SCIENCE & ENGINEERING, INC.
RUTHERFORD, NEW JERSEY

ESE PROJECT NO. 49-02036
SEPTEMBER 1990

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TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 GENERAL

This HASP addresses all those activities associated with the field investigation to be performed during the Remedial Investigation Feasibility Study (RI/FS) at Hadnot Point Industrial Area (HPIA) (including Sites 21 and 22) and the limited scope investigations at Sites 6, 48 and 69, located at the Marine Corps Base (MCB) Camp Lejeune. This HASP will be implemented by the Health & Safety Officer (HSO). Compliance with this HASP is required of all persons and third parties. Assistance in implementing this Plan can be obtained from the ESE Company Health and Safety Supervisor (CHSS). The content of this HASP may change or undergo revision based upon additional information made available to health and safety (H&S) personnel, monitoring results, or changes in the technical scope of work. Any changes proposed must be reviewed by H&S staff and are subject to the approval of the ESE CHSS.

SITES: HPIA (including Sites 21 and 22), Sites 6, 48 and 69.

PLAN DATE: June, 1990

SCOPE OF WORK: Field investigation including:

1. Installation of monitoring wells (HPIA);
2. Sampling of monitoring wells, surface soils, and subsurface soils (HPIA, Sites 6, and 69);
3. Sampling of surface water and sediments (Sites 6, 48 and 69); and
4. Sampling of Fish (or shell fish) Tissue (Sites 48 and 69)*.
   *This activity will not be addressed in the HASP as exposure to hazardous chemicals during the sampling of fish tissue is not anticipated.

	SITE MANAGER	HEALTH AND SAFETY OFFICER
NAME	M. Sayres	K.L. Midder
WORK PHONE	201/896-0363	215/941-9700

EMERGENCY PHONE NUMBERS

Base	Police Dept.	451-4555
Base or Local	Fire Dept.	911
Jacksonville	Rescue Services	455-9119
Base Hospital	Building #NH100	451-4551
Onslow Memorial Hospital	Back-up Hospital	577-2240
National Response Center		800/424-8802
Poison Control Center	Duke University	800/672-1697
C.J. Campbell,CSP	CHSS	904/332-3318
T. Case	Field Ops. Leader	201/896-0363

2.0 HEALTH AND SAFETY PERSONNEL DESIGNATIONS

The health and safety designations and general responsibilities which may be employed for the MCB sites are presented below.

2.1 COMPANY HEALTH AND SAFETY SUPERVISOR (CHSS)

The CHSS has overall responsibility for development and implementation of this HASP. The CHSS shall approve any changes to this plan due to modification of procedures or newly proposed site activities.

The CHSS will be responsible for the development of new company safety protocols and procedures necessary for field operations and will also be responsible for the resolution of any outstanding safety issues which arise during site work. Health and safety related duties and responsibilities will be assigned only to qualified individuals by the ESE CHSS. Before personnel may work on site, currentness of acceptable medical examination and acceptability of health and safety training must be approved by the CHSS.

2.2 SITE HEALTH AND SAFETY OFFICER (HSO)

The HSO will be present on site during performance of all level A or B field operations (not anticipated) and will be responsible for all health and safety activities, as well as the delegation of duties to the H&S staff in the field. Where the site is identified as level C or level D, the HSO may direct the site health and safety efforts through an assistant health and safety officer approved by the CHSS. The HSO has stop-work authorization which can be executed upon a determination of an imminent safety hazard, emergency situation, or other potentially dangerous situations, such as detrimental weather conditions. Authorization to proceed with work will be issued by the CHSS after such action. The HSO will initiate and execute all contact with support facilities and personnel when this action is appropriate.

2.3 ASSISTANT HEALTH AND SAFETY OFFICER

An Assistant HSO will be designated by the HSO during level C or level D site conditions. During Level C and Level D field sampling activities, the Assistant HSO will have collateral duties to the HSO, and as such, must be qualified for health and safety responsibilities by the CHSS. At level A or B sites, the Assistant HSO will be the downrange person who accompanies field sampling teams and reports to the HSO. Additionally, the Assistant HSO may be required to support the HSO when multiple operations are conducted that require monitoring and HSO surveillance. The primary responsibility of the Assistant HSO is to provide the appropriate monitoring to ensure the safe performance of field operations. He/she will have access to continuous communications with the Command Post. The number of Assistant HSO's will be dependent upon the number of downrange operations occurring simultaneously, site level-of-protection designation, and the individual assignments made by the HSO. The Assistant HSO will also share responsibility with the Field Operations Leader and the HSO for ensuring that all safety practices are utilized by downrange teams and that, during emergency situations, appropriate procedures are immediately and effectively initiated. The Assistant HSO will

also be responsible for the control of specific field operations and all related activities such as personnel decontamination, monitoring of worker heat stress or cold stress, distribution of safety equipment, and conformance with all other procedures established by the HASP.

2.4 AIR MONITORING SPECIALIST

The Air Monitoring Specialist, if needed, will perform all supplemental air monitoring necessary to support specific activities as required by the HASP. He/she will provide consultation to the project team where such services are necessary to ensure that appropriate monitoring, calibration, and maintenance procedures are employed. This will include specification as to type of instrumentation and procedures to be employed to make sure of its proper use.

3.0 PHYSICAL DESCRIPTION AND SITE HISTORY

3.1 LOCATION

MCB Camp Lejeune is located in Onslow County, North Carolina (Figure 3-1). The facility, which covers approximately 170 square miles, is bounded to the southeast by the Atlantic Ocean, to the west by U.S. 17 and to the northwest by State Road 24. The base is bisected by the New River estuary, which occupies approximately 30 square miles. Sites 21 and 22 are located within HPIA. For the purposes of the RI/FS, HPIA is defined as that area bounded by Holcomb Boulevard to the west, Sneads Ferry to the North, Louis Street to the east, and Main Services Road to the south (Figure 3-3).

Site 6, located on the east side of the New River Estuary, just north of HPIA is comprised of Storage Lots 201 and 203. Lots 201 and 203 are situated on Holcomb Boulevard between Wallace and Bearhead creeks (Figure-2) and are approximately 25 and 46 acres in size, respectively.

Site 48, the MCAS Mercury Dump, is located on the west side of the New River Estuary, on Longstaff Road next to Building 804 (Photo Lab) (Figure 3-4).

Site 69, the Rifle Range Chemical Dump, is also west of the New River Estuary, approximately 9000 feet east of the intersection of Range and Sneads Ferry Roads, north of Everett Creek (Figure 3-5).

3.2 DESCRIPTION

HPIA is comprised of approximately 75 buildings/facilities. These include maintenance shops, gas stations, administrative offices, commissaries, snack bars, warehouses, storage yards, and a dry cleaning facility. A steam plant and training facility occupy the southwest portion of HPIA. In addition numerous underground storage tanks, stormwater drains, and oil water separators are present on site. A transformer storage yard Lot 140 (Site 21) and a fuel tank farm (Site 22) are located within the northern portion of the HPIA.

Site 6 (Storage Lots 201 and 203) has a history of various uses. The lot surfaces are relatively flat and unpaved. The information provided to ESE indicates that the surface soils have been moved about as a result of equipment movement and regrading (Water and Air Research, Inc. 1983).

Metallic mercury was periodically drained from the delay lines of radar units and disposed of at Site 48. The actual disposal area is approximately 20,000 square feet and covers a 100-200 foot wide corridor which extends from the rear of Building 804 (the Photo Lab) to the banks of the New River.

Site 69, the Rifle Range Chemical Dump, is an estimated six acres in size, containing approximately 93,000 cubic yards of bulk and containerized hazardous wastes.

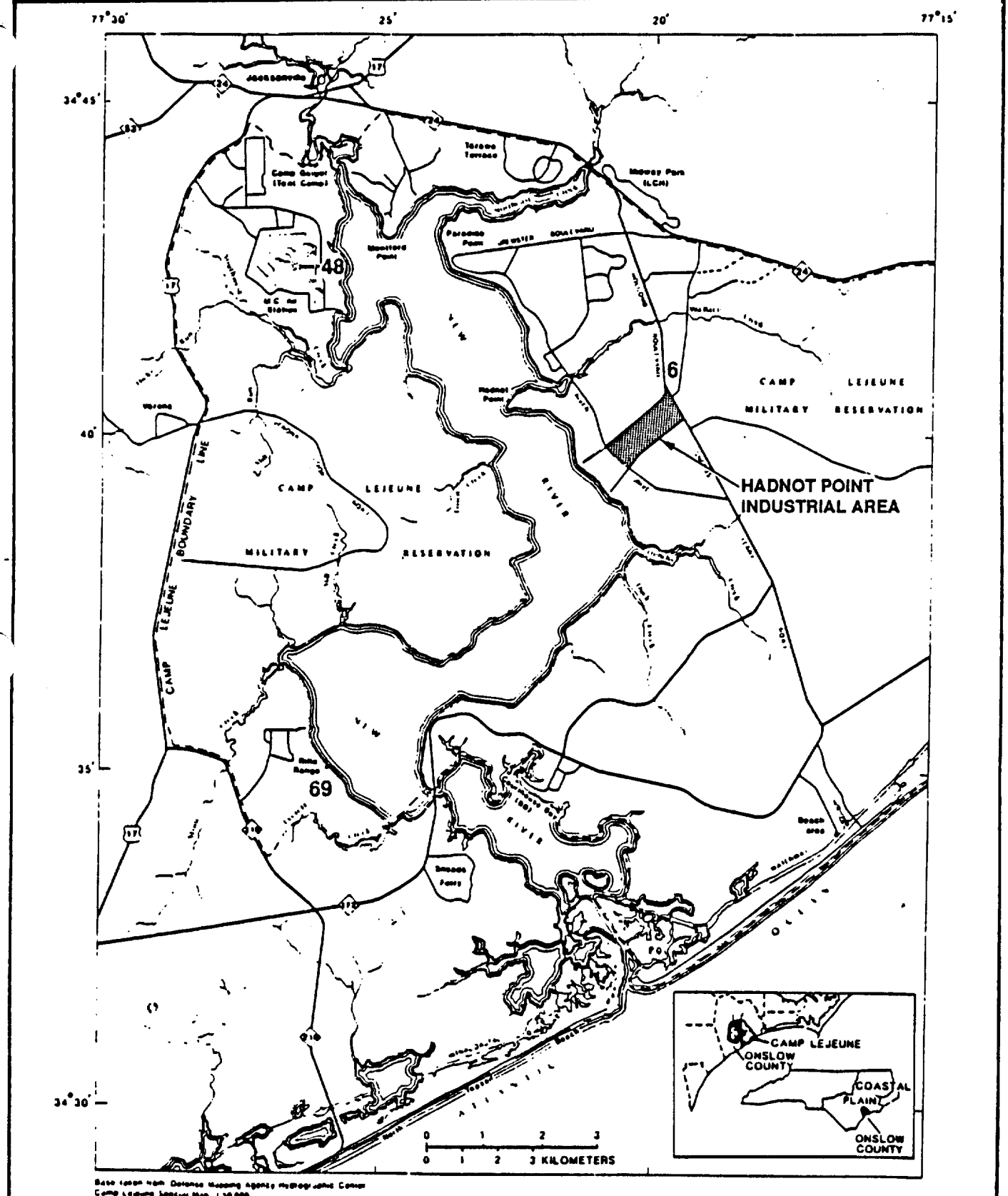


Figure 3–1
SITE LOCATIONS

SOURCE: HARNED *et al.*, 1989.

MARINE CORPS BASE
CAMP LEJEUNE

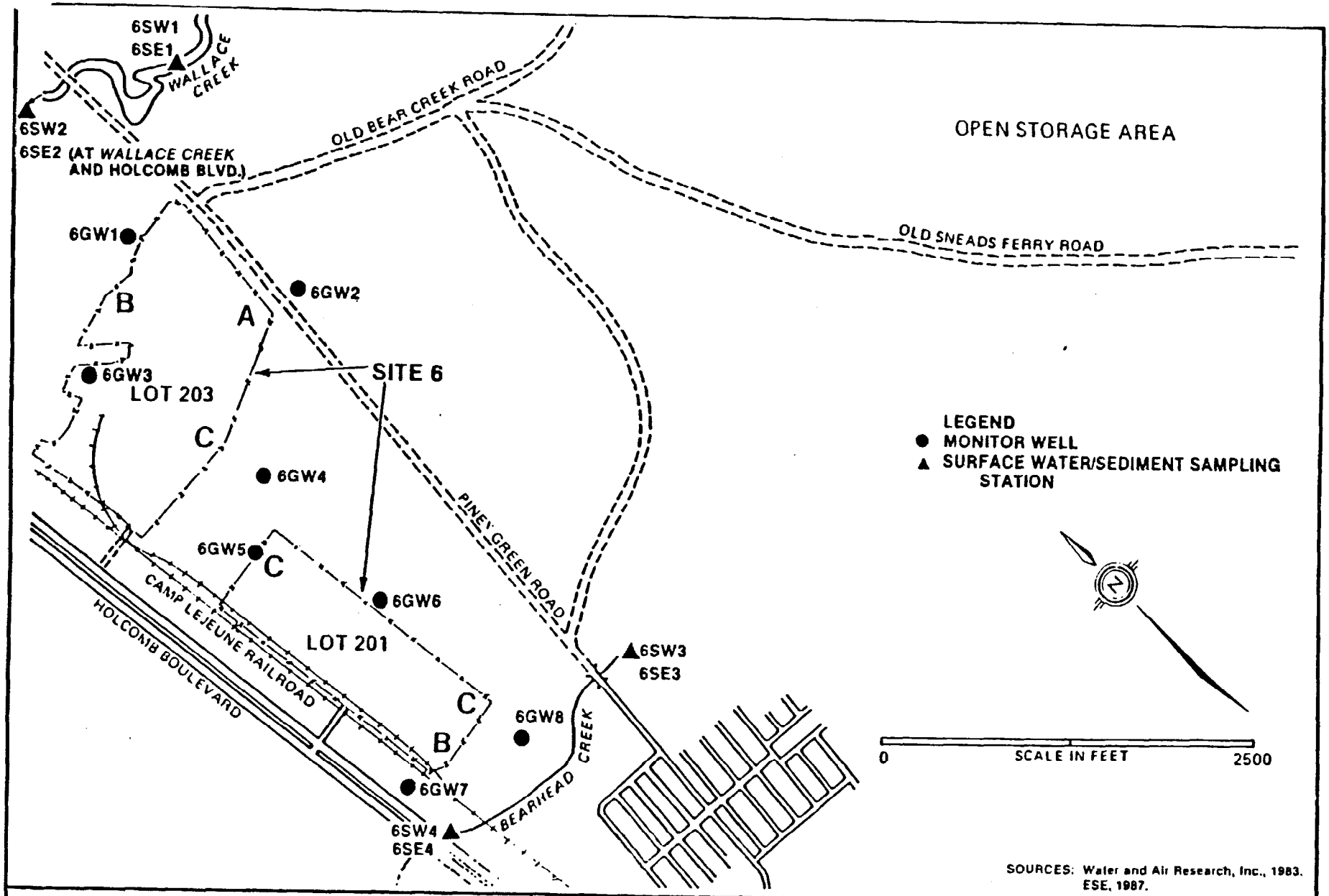


Figure 3-2
SITE 6
STORAGE LOTS 201 AND 203

MARINE CORPS BASE
CAMP LEJEUNE

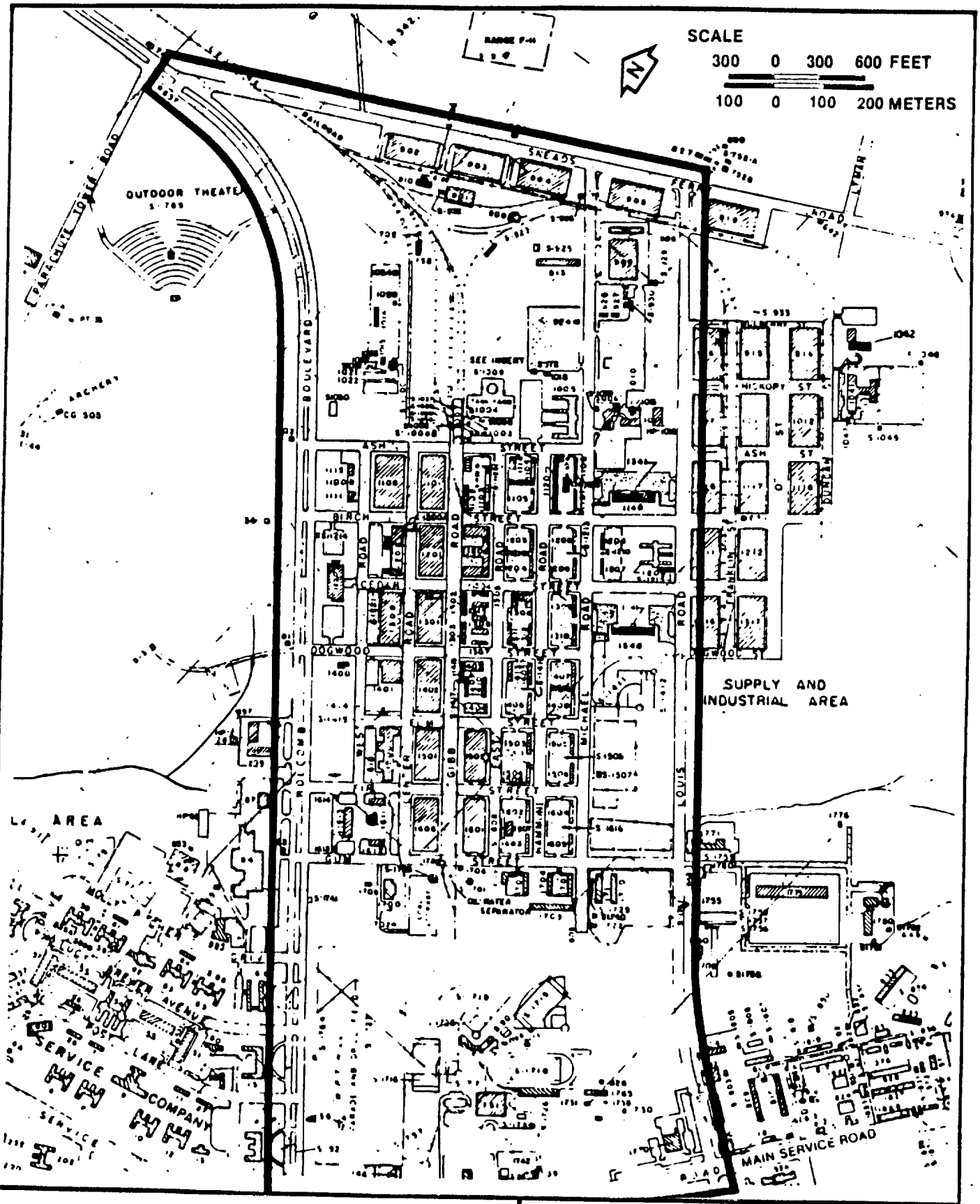


Figure 3-3
HADNOT POINT INDUSTRIAL AREA

SOURCE: CAMP LEJEUNE, 1987.

MARINE CORPS BASE
CAMP LEJEUNE

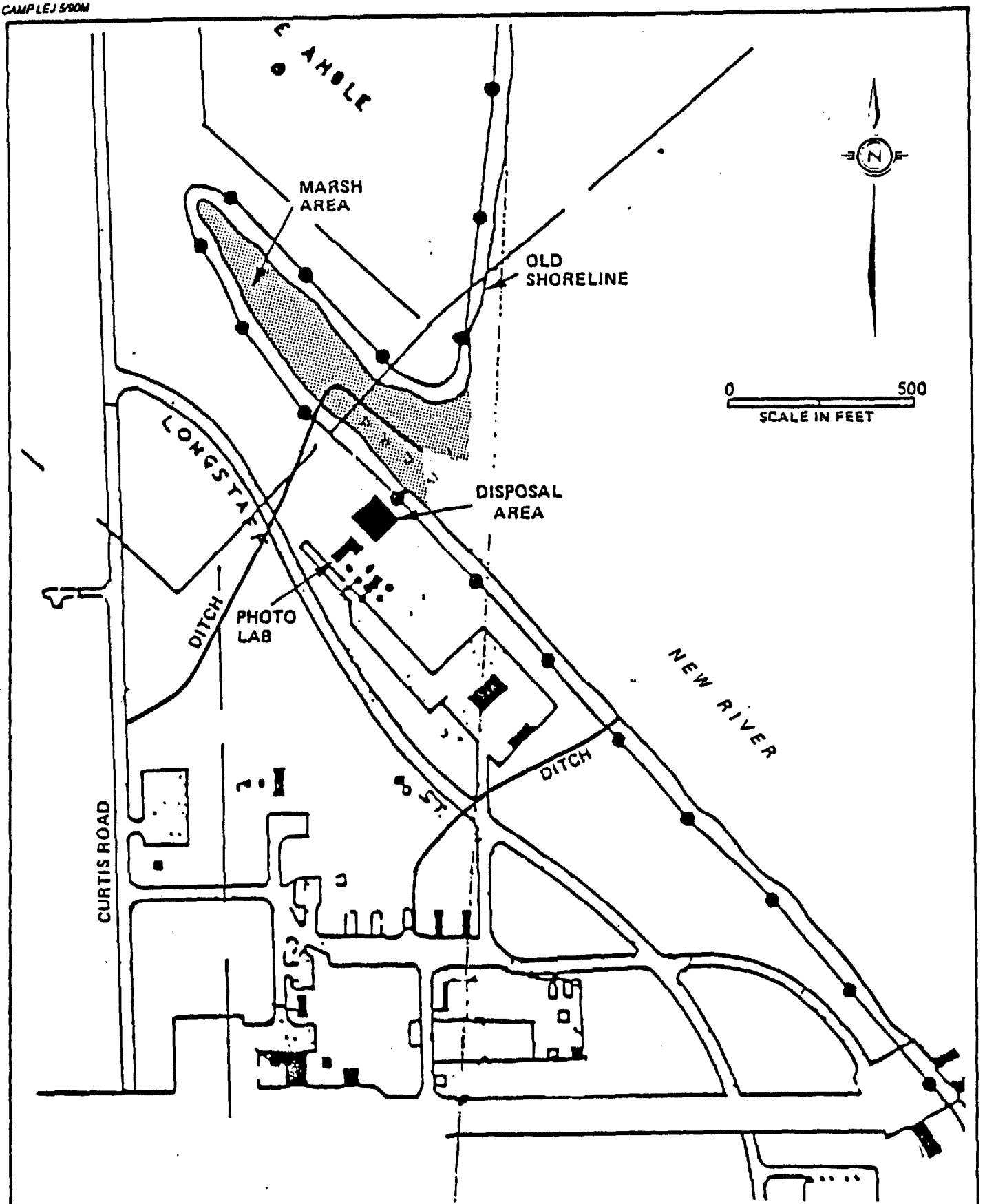
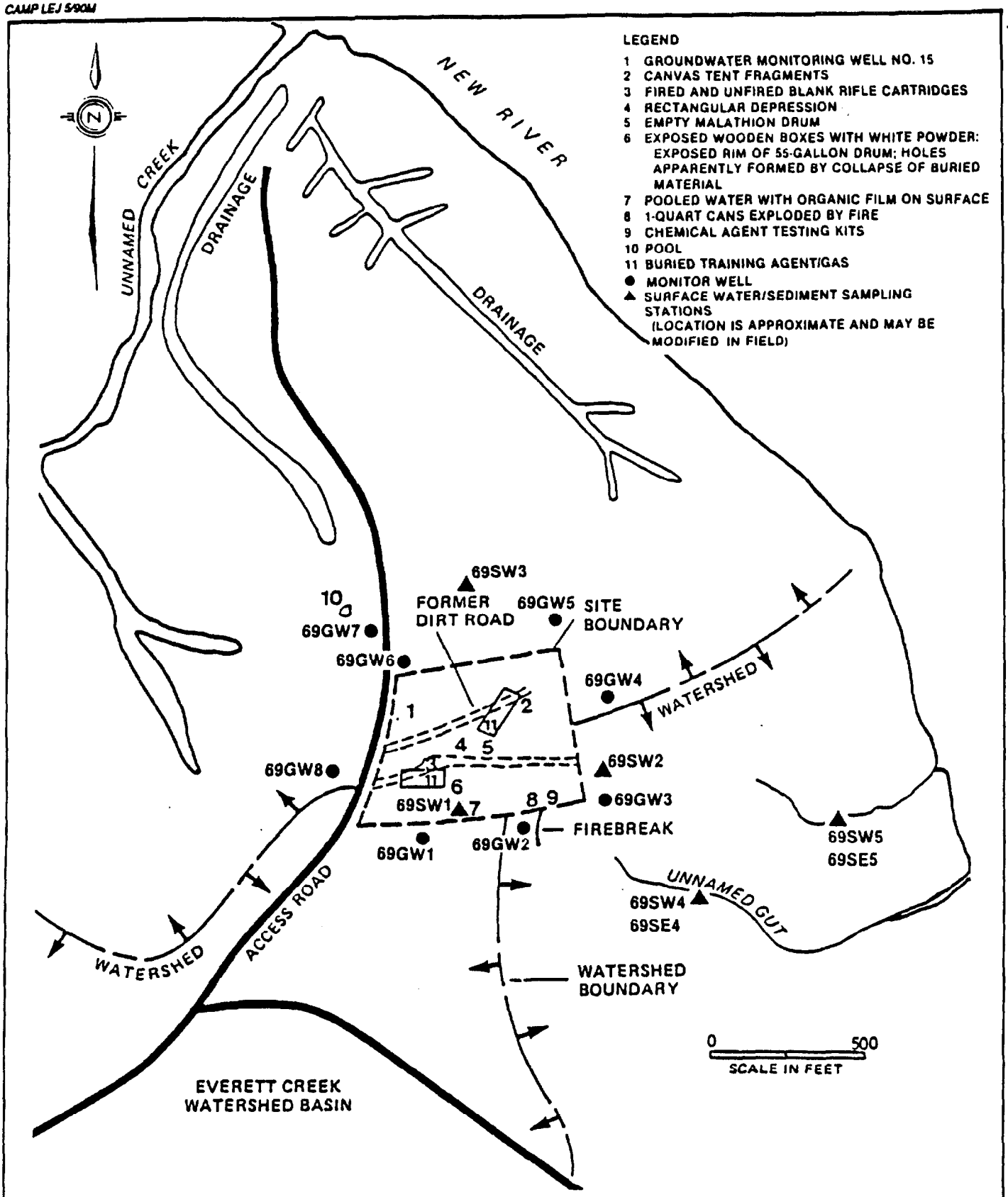


Figure 3–4
SITE 48
MCAS MERCURY DUMP

SOURCES: WATER AND AIR RESEARCH, INC., 1983; ESE, 1984.

MARINE CORPS BASE
CAMP LEJEUNE



SOURCES: Water and Air Research, Inc., 1983. ESE, 1987.

Figure 3-5
SITE 69
RIFLE RANGE CHEMICAL DUMP

MARINE CORPS BASE
CAMP LEJEUNE

3.3 SITE HISTORY

MCB Camp Lejeune is a training base for the Marine Corps. The establishment of MCB Camp Lejeune began in the late 1930s with the construction of the HPIA facility. Water supply for the base was furnished by wells which tapped a potable aquifer 50 to 300 feet below the land surface. In 1941 a water treatment system including 21 water supply wells was placed on-line at HPIA. This system serviced most of the base until the 1950's when additional wells and treatment facilities were installed because of the expanding needs of the base. Today, 8 water treatment facilities and over 160 water supply wells serve the MCB Camp Lejeune.

As a result of Marine operations and activities, substantial quantities of wastes that contain hazardous and toxic organic and inorganic compounds have been generated at the base. This has resulted in the storage, disposal, and/or spillage of these wastes within the base. Several of the base's water supply wells have been shut down as a result of the presence of organic compounds, thus suggesting that some of the wastes may have entered the groundwater. A full description of the status of groundwater contamination is available in the Characterization Step Report for Hadnot Point Industrial Area (ESE, 1988).

4.0 SITE-RELATED INCIDENTS, COMPLAINTS, AND ACTIONS

4.1 LOTS 201 AND 203 (SITE 6)

Lots 201 and 203 have been and are still currently being used to store hazardous materials. DDT is reported to have been disposed of at Lot 203 when it served as a waste disposal area in the 1940's. Transformers containing PCB's have also been stored at Lots 201 and 203, however, no spills or leaks have been reported at these sites (Water and Air Research, 1983).

4.2 MCAS MERCURY DUMP (SITE 48)

Site 48 was used for the disposal of metallic mercury. Approximately one gallon per year of mercury was disposed of over a ten year period, resulting in disposal of more than 1,000 pounds of mercury at Site 48. The information available to ESE indicates that the mercury was carried by hand and dumped or buried in small quantities at randomly selected spots (Water and Air Research, 1983).

4.3 RIFLE RANGE CHEMICAL DUMP (SITE 69)

Information provided to ESE suggests that Site 69 was used as an active chemical disposal area from the early 1950's until 1976. The list of materials disposed of at the site include pentachlorophenol, DDT, trichloroethylene (TCE), malathion, diazinon, lindane, gas cylinders, HTH, PCB's, drums that appeared to contain training agent consisting of chloroacetophenone (CN) gas, all other hazardous materials generated or used on the base, and chemical agent test kits for chemical warfare, which contained no agent substances. The material was disposed of in trenches or pits which were between 6 and 20 feet deep. At least 12 different disposal events have been documented at Site 69 (Water and Air Research Inc, 1983).

4.4 HPIA

Confirmation study (precursor to current RI/FS activities) investigations within HPIA have identified three separate zones of contamination of the shallow aquifer within HPIA. These contaminant zones appear to be related to vehicle maintenance activities and/or fuel storage. Waste materials detected to date include TCE, petroleum hydrocarbons, and lead.

4.4.1 TRANSFORMER STORAGE YARD LOT 140 (SITE 21)

The Transformer Storage Yard Lot 140 (Site 21 within HPIA) was used from 1958 to 1977 for pesticide/herbicide mixing and for the cleaning of pesticide/herbicide application equipment. The information available to ESE indicates that these activities were conducted in the southeast corner of the site. According to the initial records search conducted by Camp Lejeune personnel, pesticide contamination probably occurred as a result of small spills, washouts and excess disposal. Analysis of two rounds of water and soil samples indicate that pesticides and herbicides are present at the site. From 1950 to 1951, Site 21 was also used for drainage of transformer oil into a pit located at the northeastern end of the lot. The amount of oil drained is unknown (Water and Air Research Inc.,1983).

4.4.2 INDUSTRIAL AREA TANK FARM (SITE 22)

Site 22, an industrial area tank farm within HPIA, was installed in the 1940's. Since it's installation, several fuel leaks have been documented. In 1981, the most recently documented incident, approximately 100 gallons of diesel fuel was released. In 1979, a major fuel leak of 20,000 to 50,000 gallons of diesel and unleaded fuel occurred in an underground line near the tank truck loading facility (Water and Air Research Inc.,1983). Several of the compounds identified in environmental samples collected at Site 22 were fuel byproducts (e.g., benzene) and were present at high concentrations.

A field investigation was performed at Site 22 in 1988 by O'Brien & Gere Engineers, Inc.. This investigation identified 15 feet of free floating product in a monitoring well located on the western edge of the tank farm. The study also characterized a benzene contaminant plume in the vicinity of Site 22. The extent of the plume has not been fully defined beyond the maximum contamination level of 5 ppb (O'Brien & Gere Engineers, Inc.).

5.0 WASTE DESCRIPTION/CHARACTERIZATION

The following information is presented in order to identify the types of materials that may be encountered at the MCB work sites. The detailed information on these materials was obtained from the Fundamentals of Industrial Hygiene, 2nd Edition, Chicago, IL; Sax, N. Irving, 1984; Dangerous Properties of Industrial Materials, 6th Edition, Van Nostrand Reinhold Co., New York, NY; Hazardous Chemicals Desk Reference, Sax n. Irving / Lewis J. Richard Sr., 1987; and 40 CFR, Part 300, Appendix A.

5.1 CERCLA HAZARD RATING DEFINITIONS

Substance	Toxicity	Ignitability	Reactivity	Persistence
Lead	3	0	0	3
Benzene	3	3	0	1
Chloroform	3	3	0	0
Toluene	2	1	3	0
Xylene	2	1	3	0
Methylene Chloride	3	*	*	2
Trichlorofluoroethane	*	*	*	3
2,4-D	*	*	*	*
DDT	3	0	*	3
DDD	*	*	*	*
DDE	*	*	*	3
PCB'S	3	3	0	0
Mercury	3	0	0	3
Trichloroethane	2	2	1	0
Vinyl Chloride	3	3	3	*

5.2 WASTE TYPES: Liquid __X__ Solid ____X____ Gas _____
Sludge _____ Semi-solid __X__ Other _____

5.3 CHARACTERISTICS: Corrosive _____ Flammable __X__
Explosive _____ Volatile __X__
Radioactive_____ Inert _____
Other _____

5.4 CONTAINMENT: Pit __X__ Pond _____ Lagoon _____
Lake _____ Process Vessel _____
Tank __X__ Piping __X__ Drum ____X____
Tank Car _____ Lab Pack __X__
Other _____

6.0 HAZARD ASSESSMENT

6.1 SOURCES OF CONTAMINATION

6.1.1 LOTS 201 AND 203 (SITE 6)

Site 6 has a history of various uses, including disposal and storage of hazardous materials. Although no spills or leaks have been recorded at this location, contamination has been identified in groundwater and creek sediment (ESE, 1985, 1987). Contaminants identified at Site 6 include DDT, DDE, benzene, 1,1,2,2 tetrachloroethane, chloromethane, trichloroethane, vinyl chloride, and trans-1,2 dichloroethane.

6.1.2 MCAS MERCURY DUMP (SITE 48)

Site 48 was used as a mercury dump from 1956 to 1966. The actual disposal area is approximately 20,000 square feet and covers a 100-200 foot wide corridor which extends from the rear of Building 804 to the banks of the New River (Figure 3-4). It is estimated that 1000 pounds of mercury was disposed of in this time frame (Water and Air Research Inc., 1983). To date, mercury was the only contaminant identified in samples collected at Site 48.

6.1.3 RIFLE RANGE CHEMICAL DUMP (SITE 69)

Site 69 was an active chemical dump from the early 1950's until 1976 (Water and Air Research Inc., 1983). Prior sampling efforts have shown that the contamination at Site 69 is extensive. Pesticides and pentachlorophenol have been identified in surface water and sediment samples. Contamination at Site 69 appears to be concentrated in the southern portion of the fill area.

6.1.4 HPIA

Leaks and spills of degreasing solvents, fuels, and oil at vehicle maintenance facilities within HPIA. As a result contamination of the shallow aquifer by volatile organic compounds (VOCs) metals, and petroleum hydrocarbons has been identified.

6.1.4.1 Transformer Storage Yard Lot 140 (Site 21)

Site 21 was used as a transformer storage area as well as a pesticide mixing and application equipment cleaning area. Transformer oil was dumped in a pit which was located on the northeastern end of the lot. This activity was believed to have taken place from 1950 to 1951. The amount of oil dumped during this time period is unknown. Pesticide mixing and cleaning activities took place from 1958 to 1977 (Water and Air Research Inc., 1983). Contaminants identified at Site 21 include pesticides, herbicides and PCB's.

6.1.4.2 Industrial Area Tank Farm (Site 22)

Several fuel leaks have occurred at Site 22, the Industrial Area Tank Farm, over the years. One major fuel leak, recorded in 1979, was noted to contain 20,000 to 50,000 gallons of fuel (Water and Air Research Inc., 1983). Contaminants identified at Site 22 include benzene, VOC's, and solvents such

as chloroform, xylene, methylene chloride, toluene and trichlorofluorethane. Oil and grease were also found in close proximity to Site 22.

6.2 CHEMICAL CHARACTERIZATION OF SOIL AND SEDIMENT

6.2.1 SITE 6

In 1986, sediment sampling was performed at Site 6. These samples were analyzed for pesticides only. Analytical results showed elevated levels of DDT and DDE in the sediment collected from Bearhead Creek (south side of site). DDT and DDE concentrations were higher in the upstream sediment samples suggesting a potential source of contamination east of Piney Creek Road. Migration of contaminants from Lot 201 may also be the source of pesticides in the creek sediments.

6.2.2 SITE 21

In 1984, soil borings were completed within and adjacent to this site. Soil samples taken from these borings were analyzed for organochlorine pesticides/herbicides, and PCB's. Analytical results showed detectable amounts of DDD, DDE, and DDT in all of the samples collected. Organochlorine pesticides and herbicides were identified in soils collected from the 1 to 2 foot range. PCB's were not detected in any of the samples.

In 1986, 32 soil samples were collected from eight soil borings around the circumference of Site 21. The soil samples collected were analyzed for organochlorine pesticides, herbicides, PCB's and tetrachlorodioxin. Results of these analyses showed detectable amounts of 2,4-D, DDD, DDE, and DDT. In fact, 30 of the 32 samples collected contained the herbicide 2,4-D. This compound was evenly distributed at all depths. DDD was also found in the soils down to five feet. DDE and DDT were detected down to the 3 to 5 foot range. PCB's were detected in two soil samples from boring 21S09 which is located close to the transformer oil pit.

6.2.3 SITE 22

To date, the information available to ESE indicates that, no soil sampling has been conducted at this site.

6.2.4 SITE 48

Soil and sediment samples were collected at Site 48 in 1984. The soil samples were collected at the groundwater interface from four borings. Four sediment samples were also collected from the marsh area north of Building 804. All of the samples collected from this area were analyzed for mercury only. Results of the analyses found mercury to be present in all of the samples.

6.2.5 SITE 69

Sediment is the only medium sampled at this site to date. Analytical results identified VOCs, pesticides and pentachlorophenol present at this site. This contamination appears to be concentrated in the southern portion of the fill area.

6.2.6 HPIA

No soil sampling has been conducted within HPIA except at Site 21 to date.

6.3 CHEMICAL CHARACTERIZATION OF GROUNDWATER

6.3.1 SITE 6

Eight shallow monitoring wells (6GW1 - 6GW8) were installed at this site in 1986. Two sets of samples were collected from these wells, one in 1986 and the other in 1987. These samples were analyzed for VOCs and the o,p-and p,p-isomers of DDD, DDE, and DDT. Analytical results indicate that these samples contained DDT or its metabolites. Only three VOCs were detected in the samples. Benzene, and 1,1,2,2-tetrachloroethane were detected in well 6GW1 located in the northwest corner of Lot 203. Chloromethane was detected in the sample from well 6GW6 located just east of Lot 201.

6.3.2 SITE 48

No groundwater sampling has been conducted at Site 48 to date.

6.3.3 SITE 69

In 1984, eight groundwater monitoring wells (Figure 3-5) were installed at Site 69. Three rounds of samples were collected from these wells in 1984. During all three rounds, the samples were analyzed for organochlorine pesticides, PCB's, pentachlorophenol, VOCs, mercury and residual chloride during the first two rounds of sampling. Additional compounds were added during the third round of sampling. These include tetrachlorodioxin, xylene, methyl ethyl ketone, methyl isobutyl ketone and ethylene bromide. The results of this sampling shows that the groundwater beneath Site 69 contains high levels of VOCs.

6.3.4 HPIA

VOCs, metals, and oil and grease have been detected in three separate areas within the shallow aquifer at HPIA. Detected compounds include TCE, trans-1,2-dichloroethane, benzene, ethylbenzene, toluene, xylene, oil and grease, and lead. Details of the locations of wells and substances detected through sampling are provided in the Characterization Step Report for Hadnot Point Industrial Area (ESE, 1988).

6.3.4.1 Site 21

One shallow monitoring well was installed at Site 21 in 1984. Groundwater samples were collected in 1984 and again in 1986. These samples were analyzed for organochlorine pesticides, organochlorine herbicides and PCB's. Groundwater samples collected in 1986 were also analyzed for volatile organics, tetrachlorodioxin, xylene, methyl ethyl ketone, ethyl dibromide, and oil and grease. Results of the analyses performed in 1984 for organochlorine herbicides, pesticides and PCB's showed none of the contaminants present in the groundwater. Results of the analyses in 1986 for volatile organics, tetrachlorodioxin, xylene, MEK, and ethyl dibromide did not show any of these contaminants to be present. However 2,4-D, and oil and grease were found to be present in the 1986 samples.

6.3.4.2 Site 22

Two shallow and one deep monitoring well were sampled at Site 22 in 1984. The samples were analyzed for lead, volatile organics, and oil and grease.

Analytical results of the sample collected from the shallow well 22GW1 (Figure 6-1) showed benzene, chloroform, 1,2-dichloroethane, toluene, ethylbenzene, T-1,2-dichloroethane, 1,2-dichloropropane, trichlorofluoromethane, methylenechloride, oil and grease and lead. Several of the organic constituents identified are associated with fuel components. The other volatile organics reported in the water samples suggest other possible sources of contamination. The concentrations of benzene, chloroform, ethylbenzene, and toluene exceed the North Carolina groundwater standards. Benzene was present at concentrations up to 17,000 ug/1.

Analysis of the sample collected from 22GW2 identified oil and grease in significant amounts.

Analysis of the sample collected from 22GW3 indicated elevated levels of benzene, 1,2-dichloroethane, T-1,2-dichloroethane, ethylbenzene, trichlorofluoromethane, toluene, and lead. Benzene was detected at a concentration of 380 ug/1 which exceeds the North Carolina drinking water standard.

Groundwater sampling was again performed at wells 22GW1 and 22GW2 on three separate occasions in 1987. The groundwater samples were analyzed for benzene, chloroform, 1,2-dichloroethane, T-1,2-dichloroethane, 1,2-dichloropropane, ethylbenzene, trichlorofluoromethane, toluene, xylene, methylene chloride, lead, and oil and grease. Analytical results of the sample collected from monitoring well 22GW1 indicated elevated levels of benzene, toluene, lead and oil and grease. Ethylbenzene and xylene were also found during sampling performed on 1/9/87. The level of benzene at well 22GW1 was consistently above the 10,000 ppb range. The only contaminants found at well 22GW2 were lead, methylene chloride, oil and grease. These contaminants were found only during sampling performed on 1/9/87.

A field investigation was conducted Site 22 by O'Brien & Gere Engineers, Inc. in 1988. Their study concluded that a 15 foot layer of floating product was present in a monitoring well which was installed adjacent to well 22GW1. This study was able to characterize a benzene contaminant plume in the vicinity of the tank farm. The extent of the plume has not been fully defined beyond the Maximum Contamination Level (MCL) of 5 ppb.

6.4 LEVELS OF HAZARD

The following levels of hazard represent a qualitative judgment based on the types of substances expected to be encountered, the toxicity and health effects associated with these substances, the work setting associated with exposure to these substances, the routes of exposure associated with these substances, and the work operation or activities associated with these substances. No guidelines or standards, other than professional judgment based on information available at the time this Health and Safety Plan was written, are intended to be used, cited, or implied.

Two levels of hazard are anticipated to be encountered during the performance of field investigations at HPIA and Sites 6, 48 and 69.

CAMP LEJ 5/90M

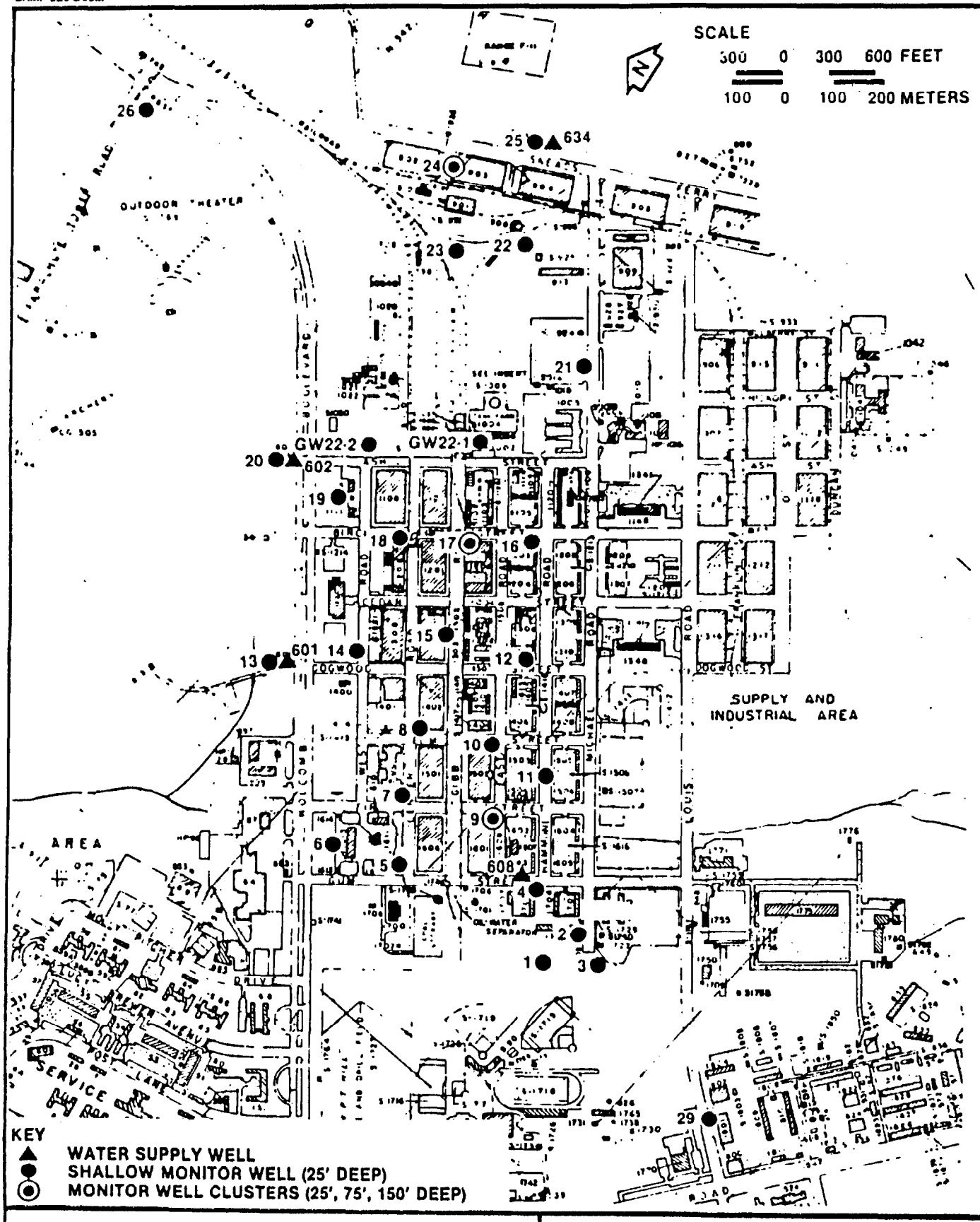


Figure 6–1
MONITORING WELLS AND WATER SUPPLY WELLS AT HADNOT POINT INDUSTRIAL AREA
SOURCE: ESE, 1987.

MARINE CORPS BASE CAMP LEJEUNE

The potential for encountering significant contamination during sampling of water supply wells and all groundwater monitoring wells, except 22GW1, is expected to be low. The installation, development and sampling of the intermediate and deep wells to be located in the vicinity of Buildings 902, 1202 and 1602 at HPIA (Figure 6-2); surface/subsurface soil sampling (soil borings) at 1202; and groundwater, surface water and sediment sampling at Sites 6, 48 and 69 is also expected to pose low levels of hazard.

The potential for encountering significant contamination during surface and subsurface soil sampling (soil boring) at Buildings 902 and 1602; groundwater sampling of monitoring well 22GW1; and the installation, development and sampling of the deep wells to be located in the vicinity of Site 22 is considered to be moderate.

The existing database (ESE, 1988; ESE, 1990; Water and Air Research, Inc., 1983) forms the basis for rating a low-hazard potential during water supply well sampling; groundwater sampling at all existing wells except 22GW1; monitoring well installation, development, and sampling in the vicinity of Buildings 902 and 1602, and soil boring at Buildings 902 and 1602. A low hazard potential also exists for sampling groundwater, surface water and sediment at Sites 6, 48 and 69. The low hazard ranking is based on the following:

- Dilution effects associated with surface water current is expected to minimize skin contact and inhalation exposures.
- The suspected contaminants associated with Site 21 are non-volatile (ie. herbicide,pesticides and PCB's), thus minimizing the potential for inhalation exposure during groundwater sampling at Site 21; and
- The low potential for skin contact with contaminated groundwater and surface water associated with water sampling procedures as described in this HASP.
- The limited field efforts around the perimeter of Site 69.

The primary risk to personnel conducting the well installation, development, and sampling in the vicinity of Buildings 902 and 1602; surface and subsurface soil sampling at Buildings 902 and 1202; water supply well sampling; and groundwater, surface water and sediment sampling at all locations except monitoring well 22GW1 is by way of inhalation and skin contact with potentially contaminated water and soils.

The potential for exposure to hazardous substances is considered to be moderate during on-site installation, development, and monitoring of deep wells in the vicinity of Site 22 and Building 1202 (Figure 6-2), groundwater sampling of well 22GW1, and surface soil/subsurface soil sampling (soil

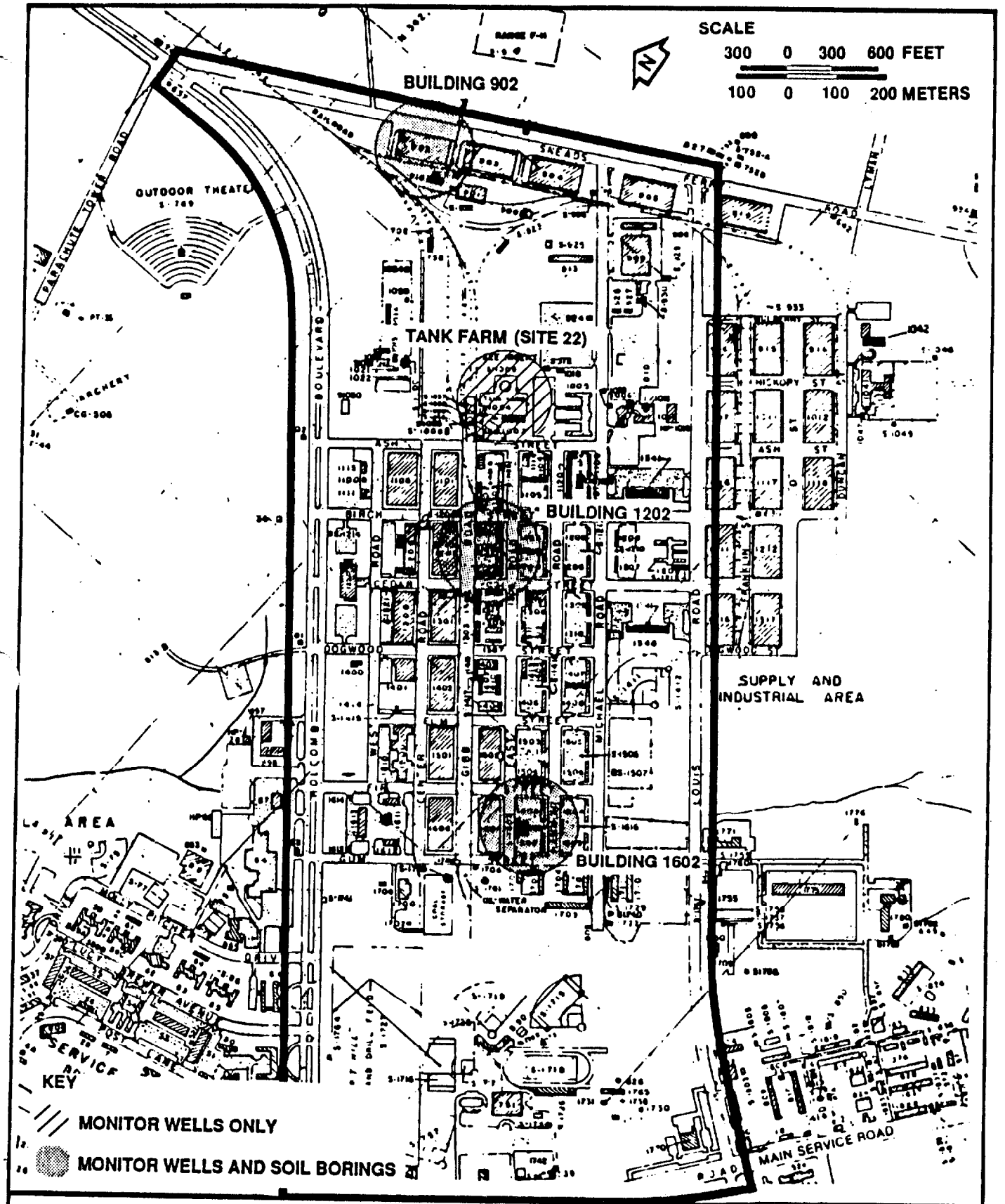


Figure 6-2
AREAS FOR INTERMEDIATE AND DEEP MONITORING WELLS AND SOIL BORINGS
SOURCE: CAMP LEJEUNE, 1987.

MARINE CORPS BASE CAMP LEJEUNE

boring) at Buildings 902 and 1602. The basis for giving these activities a moderate exposure potential are as follows:

- Surface and subsurface soil sampling (soil borings) and deep well installation procedures are likely to carry contaminated materials to the surface;
- Analysis of groundwater samples taken from the groundwater monitoring well at Site 22 (well 22GW1) consistently shows high levels of benzene; and
- Well development will result in pumping contaminated liquids to the surface;

The primary risk to personnel while conducting activities described as having a moderate hazard potential is by way of inhalation and skin contact with potentially contaminated soil and groundwater. There is a moderate potential for producing atmospheric contamination in the range of any recognized occupational exposure limit during these activities. Level C protection should be adequate to protect against these inhalation and skin contact hazards. However, Level C protection is recommended under the contingency that protection may be upgraded to Level B or downgraded to Level D, if appropriate. Selection of the level of protection will be made in the field based on monitoring instrument results.

7.0 BASIC TRAINING REQUIRED

Completion of the Basic Fundamental Health and Safety Training is required for all employees who will perform work covered by this HASP. Training or the combination of training and site experience must also conform to the requirements of 29 CFR 1910.120.

7.1 ADVANCED TRAINING

Advanced training as necessary will be provided to any personnel who will be expected to perform site work utilizing Level A protection or other specialized operation to be undertaken at a site. However, no Level A work is planned for activities covered by this HASP.

7.2 SITE-SPECIFIC TRAINING

Training will be provided prior to any on-site activities that will specifically address the activities, procedures, monitoring, and equipment for the site operations. It will include site and facility layout, hazards, and emergency services at the site, and will detail all provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand, and to reinforce their responsibilities regarding safety and operations for their particular activity.

7.3 SAFETY BRIEFINGS

Project personnel will be given briefings by the HSO or Assistant HSO on a daily or as-needed basis to further assist site personnel in conducting their activities safely. Safety briefings will be provided when new operations are to be conducted, changes in work practices must be implemented due to new information made available, or if site or environmental conditions change. Briefings will also be given to facilitate conformance with prescribed safety practices when performance deficiencies are identified during routine daily activities or as a result of safety audits.

7.4 FIRST AID AND CPR

The CHSS will identify those individuals requiring this training in order to ensure emergency treatment is available at field activities. It is expected that at least one of the field team members will have First Aid and CPR training. These courses will be consistent with the requirements of the American Red Cross Association.

7.5 OTHER TRAINING

No additional training has been identified for personnel performing work falling within the scope of this HASP.

8.0 ZONES, PROTECTION, AND COMMUNICATION

8.1 SITE ZONES

Level C Work Zones: Surface and subsurface soil sampling (soil borings), at Buildings 902 and 1602; groundwater sampling at well 22GW1; and deep groundwater monitor well installation, development and sampling in the vicinity of Site 22 will be designated as Level C work zones. These same locations may be upgraded to Level B if monitoring instruments show concentrations steadily elevated at levels which justify upgrading protection with government approval (taking into account the inherent variability of the monitoring instrument). If justified by the results of monitoring instrument measurements, Level C work zones may be downgraded to Level D. A Level C work zone approximately 25 ft by 25 ft will be established at the aforementioned installations. At each location, a contamination reduction zone (CRZ) will be established containing a contamination reduction corridor (CRC). The CRZ and CRC will be established in accordance with EPA recommendations and will be equipped for the appropriate level of protection.

Level D Work Zones: Water supply well sampling locations; all groundwater sampling locations except well 22GW1; all surface water and sediment sampling locations; surface and subsurface soil sampling (soil borings) at Building 1202; and deep well installation, development, and sampling in the vicinity of Buildings 902 and 1602 will be designated as Level D work zones. Level D work zones will remain in effect unless they conflict with level C and/or level B work zones, in which case the higher level of protection will take precedence. Additionally, level D work zones will remain in effect until monitoring instrument measurements show concentrations steadily elevated at levels which justify upgrading protection (taking into account the inherent variability of the monitoring instrument).

8.2 PERSONAL PROTECTION

8.2.1 GENERAL

The level of protection to be worn by field personnel is defined below and is controlled by the HSO with approval of the CHSS. Basic levels of protection for general operations are outlined in Appendix A of this Health and Safety Plan. Protection may be upgraded or downgraded, as appropriate, only after the HSO receives authorization from the ESE CHSS.

Groundwater sampling at all existing monitoring wells except 22 GW1 and all water supply wells, sediment sampling at Sites 6, 48, and 69, deep groundwater monitoring well installation, development and sampling in the vicinity of Buildings 902 and 1602, and soil sampling at Building 1202 will be considered as having a low risk potential and as such personal protection for Level D work zones will be used. Groundwater sampling at well 22 GW1, deep well installation, development and sampling in the vicinity of Site 22, and surface and subsurface soil sampling (soil borings) at Buildings 902 and 1602 will be

considered as having a moderate risk potential, and as such personal protection for Level C work zones will be used.

A summary of the field sampling activities (i.e., tasks) falling within the scope of this Health and Safety Plan and corresponding levels of work zone personal protection is provided below.

Task	Level of Protection
Groundwater sampling at all existing monitoring wells except 22GW1 and all water supply wells; and surface water and sediment sampling at Sites 6, 48 and 69.	Level D personnel protection equipment augmented by one-piece polycoated Tyvek® coveralls and latex boot covers and gloves covered by a pair of chemical-resistant gloves with a contingency to upgrade to Level C equipment. Level C personnel protection equipment to include half mask (or full face) respirators approved by NIOSH for protection against organic vapors, dust and mist.
Deep groundwater monitoring well installation, development and sampling in the vicinity of Buildings 902 and 1602; and soil sampling at Building 1202.	Same as listed above.
Groundwater sampling at well 22GW1; deep well installation, development and sampling in the vicinity of Site 22.	Level C personal protection to include: cotton work clothes, chemical resistant boots or latex boot covers, one-piece Tyvek coveralls and half mask (or full-face) respirators approved by NIOSH for protection against organic vapors, dust and mist. Based on monitoring instrument data instrument data, full Level B personal protection equipment may be required. If warranted by monitoring instrument data, Level C personal protection equipment may be downgraded to Level D.
Surface and subsurface soil sampling (soil borings) at Buildings 902 and 1602.	Same as listed above.

8.2.2 INITIAL LEVELS OF PROTECTION

Sampling of Water Supply Wells All Existing Wells, Except 22GW1; Well Sampling and Development at Buildings 902 and 1602--Level D personal protection is planned for this activity. Cotton work clothes, latex inner gloves covered by a pair of chemical-resistant gloves, chemical-resistant boots or latex boot covers and one-piece polycoated Tyvek® coveralls should adequately protect workers from skin contact with contaminated groundwater. A PID meter (i.e. Photovac TIP with a 10.6 eV lamp or an HNU with a 10.2 eV lamp) will be used to monitor the breathing zone, and well headspace. Additionally, the well headspace will be monitored using a Combustible Gas Meter (CGM). If PID meter readings in the breathing zone are steadily elevated at concentrations greater than 2 ppm above background (taking into account the instrument's inherent variability) or if PID readings in the well headspace are steadily elevated at concentrations greater than 50 ppm above background, or if the CGM readings at the well headspace exceed 20 percent L.E.L., the team will reassess the situation with regard to the identity of the contaminants and protective equipment. Breathing zone PID meter readings greater than 2 ppm above background will serve as a basis for upgrading to Level C protection.

Deep Groundwater Monitoring Well Installation and Surface and Subsurface Soil Sampling at Building 1202--Level D personal protection is planned for this activity. Cotton work clothes, latex inner gloves covered by a pair of chemical-resistant gloves, chemical-resistant boots or latex boot covers and one-piece polycoated Tyvek® coveralls should adequately protect workers from skin contact with contaminated soil. A PID meter (i.e. Photovac TIP with a 10.6 eV lamp or an HNU with a 10.2 eV lamp) will be used to monitor the breathing zone, borehole, soil sample (e.g. split spoon) and drill cuttings from each boring. Additionally, the borehole will be monitored using a CGM. If PID meter readings in the breathing zone area are steadily elevated at concentrations greater than 2 ppm above background (taking into account the instrument's inherent variability) or if the PID readings in the borehole, soil sample or at the drill cuttings are steadily elevated at concentrations greater than 50 ppm above background, or if the CGM readings at the borehole exceed 20% L.E.L, the team will reassess the situation with regard to the contaminants and protective equipment. The field team will discontinue on-site subsurface soil sampling (soil boring) activities during those periods of time when borehole CGM readings exceed 20% L.E.L. Breathing zone PID meter readings greater than 2 ppm above background will serve as a basis for upgrading to Level C protection.

Surface Water and Sediment Sampling at Sites 6, 48 and 69--Level D personal protection is planned for this activity. Cotton work clothes, latex gloves, hip waders and one-piece polycoated Tyvek® coveralls should adequately protect workers from skin contact with contaminated surface water and sediments. A PID meter (i.e. Photovac TIP with a 10.6 eV lamp or an HNU with a 10.2 eV lamp) will be used to monitor the breathing zone. If PID meter readings in the breathing zone are steadily elevated at concentrations greater than 2 ppm above background (taking into account the instrument's inherent variability) the team will reassess the situation with regard to the identity of the contaminants and protective equipment. Breathing zone PID meter readings

greater than 2 ppm above background will serve as a basis for upgrading to Level C protection. In addition to PID readings mercury vapors will also be monitored at Site 48 using a direct reading instrument. If the instrumentation reads concentrations steadily above 0.025 milligrams per cubic meter (mg/m3) one-half the OSHA PEL, the level of protection will be upgraded to Level C. The procedures outlined in NIOSH's "Criteria for a Recommended Standard, Occupational Exposure To Inorganic Mercury", #73-11024 will be followed to determine if any additional worker protection measures should be taken. Integrated personal monitoring will also be accomplished in conjunction with the instantaneous readings if the levels exceed 0.025 mg/m3.

Sampling of Monitoring Well 22GW1 and Deep Monitoring Well Development and Sampling in the Vicinity of Site 22--Level C personal protection is required for this activity. Cotton work clothes, latex inner gloves covered by a pair of chemical-resistant gloves, chemical-resistant boots or latex boot covers, one-piece Tyvek® coveralls and half mask or full-face respirators approved by NIOSH for protection against organic vapors, dusts and mists should adequately protect workers from inhalation hazards and skin contact with contaminated groundwater. A PID meter (i.e. Photovac TIP with a 10.6 eV lamp or an HNU with a 10.2 eV lamp) will be used to monitor the breathing zone, and well headspace for each well sampled. Additionally, the well headspace will be monitored using a CGM. If PID meter readings in the breathing zone are steadily elevated at concentrations greater than 5 ppm above background (taking into account the instrument's inherent variability), or if the PID readings in the well headspace are steadily elevated at concentrations greater than 50 ppm above background, or if the CGM readings at the well headspace exceed 20 percent L.E.L., the team will reassess the situation with regard to the contaminants and protective equipment. Breathing zone PID meter readings greater than 5 ppm above background will serve as a basis for upgrading to Level B protection. Level D protection will be considered when PID meter readings in the breathing zone are consistently less than 2 ppm above background and well headspace CGM readings are consistently less than 20% L.E.L. and there is no indication that conditions will change during the remaining activity.

Surface and Subsurface Soil Sampling (Soil Borings) at Buildings 902 and 1602; Installation of Deep Wells in the Vicinity of Site 22--Level C personal protection is required for this activity. Cotton work clothes, latex inner gloves covered by a pair of chemical-resistant gloves, chemical resistant boots or latex boot covers, one-piece Tyvek® coveralls and half mask or full-face respirators approved by NIOSH for protection against organic vapors, dusts and mists should adequately protect workers from inhalation hazards and skin contact with contaminated soil. A PID meter (i.e. Photovac TIP with a 10.6 eV lamp or an HNU with a 10.2 eV lamp) will be used to monitor the breathing zone, borehole, soil sample (e.g. split spoon) and drill cuttings from each boring. Additionally, the borehole will be monitored using a CGM. If PID meter readings in the breathing zone area are steadily elevated at concentrations greater than 5 ppm above background (taking into account the instrument's inherent variability), or if the PID readings in the borehole, soil sample or at the drill cuttings are steadily elevated at concentrations

greater than 50 ppm above background, or if the CGM readings at the borehole exceed 20% L.E.L, the team will reassess the situation with regard to the contaminants and protective equipment. The field team will discontinue on-site subsurface soil sampling (soil boring) activities during those periods of time when borehole CGM readings exceed 20% L.E.L. Breathing zone PID meter readings greater than 5 ppm above background will serve as a basis for upgrading to Level B protection. Level D protection will be considered when PID meter readings in the breathing zone are consistently less than 2 ppm above background and borehole CGM meter readings are consistently less than 20% L.E.L. and there is no indication that conditions will change during the remaining sampling activity.

8.2.3 SAFETY EQUIPMENT

Basic emergency and first aid equipment will be available at the Support Zone and/or the CRC, as appropriate. Equipment may include HASP-specified communications, first aid kit, emergency eyewash or emergency shower or drench system, fire extinguisher, and other safety-related equipment. A backup field team may also be located in the Support Zone or the CRZ if required to support downrange field teams. The Command Post will be manned during all times when teams are downrange. Communications will be maintained, and personnel will be available to assist in decontamination procedures for personnel and equipment. Other safety equipment will be located at the site of specific operations.

Equipment to be provided may include:

- PID meter (Photovac TIP with a 10.6 eV lamp or an HNU with a 10.2 eV lamp),
- Personal protective equipment,
- Fire extinguisher,
- First-aid kit,
- Portable eyewash station,
- Air horns, and
- Combustible Gas Meter (CGM), and
- Mercury Vapor Analyzer.

8.3 COMMUNICATIONS

Walkie-Talkies - Hand held units shall be utilized as much as possible by field teams for communication between downrange operations and the Command Post base-station where applicable.

Telephones - A telephone may be located at the Command Post in the Support Zone for communication with emergency support services/facilities.

Air Horns - These will be carried by downrange field teams and also will be maintained at the Support Zone for announcing emergency evacuation procedures and backup for other forms of communications.

Hand signals - To be employed by downrange field teams along with utilizing the buddy system. These signals are also very important when working with heavy equipment. They shall be known by the entire field team before operations commence and covered during site-specific training.

9.0 MONITORING PROCEDURES

9.1 MONITORING DURING SITE OPERATIONS

All site environmental monitoring should be accompanied by monitoring of appropriate climatic conditions. Monitoring will be performed by the HSO or the Assistant HSO during the conduct of work covered by this HASP.

9.1.1 SAMPLING OF WATER SUPPLY WELLS AND ALL EXISTING WELLS EXCEPT 22GW1 AND MONITORING WELL DEVELOPMENT AND SAMPLING AT BUILDINGS 902 AND 1602

A PID meter (i.e Photovac TIP with a 10.6 eV lamp or an HNU with a 10.2 ev lamp) will be used to monitor the "breathing zone" at the well headspace. Additionally, a CGM will be used to monitor the well headspace. One PID headspace measurement and one CGM headspace measurement will be taken prior to extracting the first bailer. As a minimum, three PID breathing zone measurements should be taken upon extracting the first, last and at least one additional bailer, as determined by the on-site HSO.

9.1.2 DEEP GROUNDWATER MONITORING WELL INSTALLATION AND DEVELOPMENT IN THE VICINITY OF BUILDINGS 902 AND 1602

A PID meter (i.e. Photovac TIP with a 10.6 eV lamp or an HNU with a 10.2 eV lamp) will be used to monitor the "breathing zone", the borehole, and the drill cuttings. One PID "breathing zone" measurement, one PID borehole measurement, one PID drill cutting measurement and one borehole CGM measurement will be taken for the first auger flight, the last auger flight and at least one additional auger flight to be determined by the on-site HSO for each monitoring well installation.

9.1.3 SURFACE WATER AND SEDIMENT SAMPLING AT SITES 6, 48 AND 69

A PID meter (i.e. Photovac TIP with a 10.6 eV lamp or an HNU with a 10.2 eV lamp) will be used to monitor the "breathing zone". One PID measurement will be taken at the beginning of sample collection, another at the end of sample collection and one additional sample as determined by the HSO. In addition to PID readings, mercury vapor readings will be taken in the breathing zone at Site 48 during the collection of surface water and sediment samples. At least three mercury vapor measurements will be taken during the field efforts at this site. If the sample readings are greater than 50% of the OSHA PEL (0.025 mg/m3), integrated personal sampling will also be accomplished in conjunction with instantaneous monitoring. Integrated sampling will be performed in accordance with the OSHA sample protocol.

9.1.4 SURFACE AND SUBSURFACE SOIL SAMPLING AT BUILDINGS 902 AND 1602

A PID meter (i.e. Photovac TIP with a 10.6 eV lamp or an HNU with a 10.2 eV lamp) will be used to monitor the "breathing zone", the borehole, the soil sample (e.g. split spoon) and the drill cuttings. Additionally, a CGM will be used to monitor the borehole. At a minimum, one PID "breathing zone" measurement, one PID borehole measurement, one PID soil sample measurement, one PID drill cutting measurement and one borehole CGM measurement will be taken for the first soil sample and each additional soil sample extracted at each soil boring location.

9.1.5 SAMPLING OF MONITORING WELL 22GW1, DEEP MONITORING WELL INSTALLATION, DEVELOPMENT AND SAMPLING IN THE VICINITY OF SITE 22

A PID meter (i.e Photovac TIP with a 10.6 eV lamp or an HNU with a 10.2 ev lamp) will be used to monitor the "breathing zone" at the well headspace. Additionally, a CGM will be used to monitor the well headspace. One PID headspace measurement and one CGM headspace measurement will be taken prior to extracting the first bailer. As a minimum, three PID breathing zone measurements should be taken upon extracting the first, last and at least one additional bailer, as determined by the on-site HSO. Additional measurements may be taken if considered to be necessary by the on-site HSO or Assistant HSO.

9.1.6 SURFACE AND SUBSURFACE SOIL SAMPLING (SOIL BORINGS) AT BUILDINGS 902 AND 1602, INSTALLATION OF DEEP WELLS IN THE VICINITY OF SITE 22

A PID meter (i.e. Photovac TIP with a 10.6 eV lamp or an HNU with an 10.2 eV lamp) will be used to monitor the "breathing zone", the borehole, the soil sample (e.g. split spoon) and the drill cuttings. Additionally, a CGM will be used to monitor the borehole. At a minimum, one PID "breathing zone" measurement, one PID borehole measurement, one PID soil sample measurement, one PID drill cutting measurement and one borehole CGM measurement will be taken for the first soil sample and each additional soil sample extracted at each soil boring location. Additional measurements may be taken if considered to be necessary by the on-site Assistant HSO.

9.2 PERSONNEL (INTEGRATED) MONITORING PROCEDURES

Personnel (integrated) monitoring may be conducted by the HSO or Assistant HSO to verify compliance with the Occupational Safety and Health Administration (OSHA) regulations and to document compliance with acceptable exposure criteria. If personnel monitoring indicates exposures exceeding occupational exposure limits established by either the Occupational Safety and Health Administration, the American Conference of Governmental Industrial Hygienists or exposure limits recommended by the National Institute for Occupational Safety and Health, personal protection equipment set forth by this Health and Safety Plan will be modified appropriately. Appropriate and more protective levels of protection will remain in effect until subsequent personnel monitoring indicates that exposures are within these exposure criteria.

9.3 MEDICAL SURVEILLANCE PROCEDURES FOR EVIDENCE OF PERSONAL EXPOSURE

All personnel and subcontractors who will be performing field work covered by this HASP will be required to have passed a medical surveillance examination outlined in Table 9-3. The exam will be taken annually at a minimum and upon termination of work. Additional medical testing may be required by the ESE CHSS in consultation with the company physician and the HSO if an overt exposure or accident occurs, or if other site conditions warrant further medical surveillance.

TABLE 9-3

MEDICAL EXAMINATION--MONITORING PROGRAM

Basic physical exam
Heart status and functions (EKG)
Chest X-ray (Roentgenogram posterior-anterior)
Pulmonary function--forced vital capacity, forced expiratory volume at 1 second and reserve volume
Blood--full SMAC Series
Hemoglobin--cell counts, protein levels
Acetylcholinesterase activity
Heavy metals
PCB in serum
Liver function--full enzyme profile
Renal function--BUN, Creatinine, Creatine/Creatinine ratio, lipoprotein count and differential, uric acid
Urinalysis
Audiometry--audio spectrum response of ear
Eye--physical condition, visual acuity

Source: ESE, 1990.

10.0 PERSONNEL DECONTAMINATION PROCEDURE

Under no circumstances (except emergency evacuation) will personnel be allowed to leave the site prior to decontamination. Decontamination will take place at the drill rig during drilling activities. A generalized procedure for removal of protective clothing is as follows:

- Drop tools, monitors, samples, and trash at designated drop stations. These stations will be plastic containers or drop sheets.
- Step into designated shuffle pit area and scuff feet to remove gross amounts of dirt from outer boots. If necessary, wash boots down with soap and water in designated wash pit area.
- Remove tape from boots and remove boots. Discard tape in disposal container.
- Remove hard hat and place or hang in the designated area.
- Remove Tyvek® coveralls, if used, and discard in container.
- Remove gloves and place in container. Remove respirator and place in the designated area.

Note: Disposable items (Tyvek® coveralls and latex over boots) will be changed on a daily basis unless there is a reason for changing sooner. Dual respirator canisters may be changed after 8 hours of use or more frequently if considered to be appropriate.

Pressurized sprayers with water and soap and water, or other designated equipment will be available in the decontamination area for washdown and cleaning of personnel, samples, and equipment.

10.1 EQUIPMENT DECONTAMINATION

Equipment to be decontaminated during the project may include tools, monitoring equipment, respirators, sample containers, and laboratory equipment.

All decontamination will be done by personnel in protective gear appropriate for the level of decontamination to be determined by the HSO. The decontamination work tasks will be split or rotated among support and work crews.

Miscellaneous tools and samplers will be dropped into a plastic pail, tub, or other container. They will be brushed off and rinsed (outside, if possible) and transferred into a second pail to be carried to further decontamination

stations. Decontamination of sampling equipment includes soap, tap water rinse, deionized water rinse, air dry, and wrapped in aluminum foil.

10.2 SAMPLE CONTAINERS

Exterior surfaces of sample bottles will be decontaminated prior to packing for transportation to the analytical laboratory. Gross levels of contaminants will be wiped from the sample containers at the sample site. The samples will then be taken to the decontamination area for further cleaning, if necessary, transferred to a clean carrier, and the sample identities noted and checked off against the chain-of-custody record. The samples, now in a clean carrier, will be stored in a secure area prior to shipment.

10.3 MONITORING EQUIPMENT

Monitoring equipment will be protected as much as possible from contamination by draping, masking, or otherwise covering as much of the instruments as possible with plastic without hindering the operation of the unit. The PID meter, for example, can be placed in a clear plastic bag which allows reading of the scale and operation of knobs. The PID sensor can be partially wrapped, keeping the sensor tip and discharge port clear.

The contaminated equipment will be taken from the drop area and the protective coverings removed and disposed in the appropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe. The units can then be taken inside in a clean plastic tub, wiped off with damp disposable wipes, and dried. The units will be checked, standardized, and recharged as necessary for the next day's operation. They will then be prepared with new protective coverings.

10.4 RESPIRATORS

Respirators will be decontaminated daily. Taken from the drop area, the masks will be disassembled, the cartridges set aside and the rest placed in a cleansing solution. (Parts will be numbered, e.g., Number 1 on all parts of mask Number 1). After an appropriate time within the solution, the parts will be removed, hand scrubbed, rinsed with tap water, air dried and placed in a clean dry area for reuse. The old cartridges will be marked so as to indicate length of usage (if means to evaluate the cartridges remaining utility are available) or will be discarded into the contaminated-trash container for disposal. In the morning, the masks will be re-assembled and new cartridges installed, if appropriate. Personnel will inspect their own masks to ensure all parts are present and in good working condition to provide maximum protection possible.

10.5 LABORATORY EQUIPMENT

Sample handling areas and equipment will be cleaned/wiped down daily. Disposable wipes will be used and discarded into a plastic bag. These will subsequently be taken and placed in the disposal drum for final disposition. For final cleanup, all equipment will be disassembled and decontaminated. Any equipment which cannot be satisfactorily decontaminated will be disposed (e.g., glassware, covers for surfaces), as previously indicated.

The contamination reduction corridor will be set up in the following manner for Level C activities. If Level B activities are warranted, this HASP will be amended accordingly.

Equipment and monitoring instruments will be dropped off at Station 1. The sampler will then proceed to the boot and glove wash (Station 2) and then to the boot and glove rinse (Station 3). The next station is the tape removal (Station 4), then he or she will move to the head cover removal (Station 5), and then the outer glove removal (Station 6). All of the above decontamination stations are located inside the exclusion zone. The sampler then steps across the "hot line" to the safety boot removal and then the sampler moves to splash suit removal (Stations 7 and 8, respectively). These are the last two stations in the decontamination reduction zone; the sampler crosses the contamination control line to exit the zone.

11.0 ADDITIONAL WORK PRACTICES

Workers will be expected to adhere to the established safety practices for their respective specialties (e.g., drilling, laboratory analysis, etc.). The need to exercise caution in the performance of specific work tasks is made more acute due to weather conditions, restricted mobility and reduced peripheral vision caused by the protective gear itself, the need to maintain the integrity of the protective gear, and the increased difficulty in communicating caused by respirators. Work at the site will be conducted according to established protocol and guidelines for the safety and health of all involved. The following are important principles for working at the MCB:

- o In any unknown situation, always assume the worst conditions and plan responses accordingly.

- o Employ the buddy system. Establish and maintain communication. In addition to radio communications, it is advisable to develop a set of hand signals as conditions may greatly impair verbal communication.

- o Minimize contact with contaminated materials. Plan work areas, decontamination areas, and procedures to accomplish this. Do not place equipment on drums or on the ground. Do not sit on drums or other materials.

- o Employ disposable items when possible to minimize risks during decontamination and possible cross-contamination during sample handling. This will require a common-sense approach to potential risks and costs.

- o Smoking, eating, or drinking after entering the work zone and before decontamination will not be allowed.

- o Avoid heat and other work stresses related to wearing the protective gear. Work breaks should be planned to prevent stress-related accidents or fatigue.

- o Maintain monitoring systems. Conditions can change quickly if subsurface areas of contamination are penetrated.

- o Conflicting situations which may arise concerning safety requirements and working conditions must be addressed and resolved rapidly by the Site Safety Officer.

- o Unauthorized breaches of specified safety protocol will not be allowed. Personnel unwilling or unable to comply with the established procedures will be replaced. Any changes in established procedure should be documented on the form provided and must be approved by the HSO.

- Be observant of not only one's own immediate surroundings but also that of others. Extra precautions are necessary when working near heavy equipment while utilizing personal protective gear. (Vision, hearing, and communication are restricted by the protective gear.)

- Use of contact lenses will not be allowed onsite. These prevent proper flushing should substances enter the eyes.

- Sites potentially requiring the use of respiratory protection equipment will require the removal of facial hair (except moustaches) to allow a proper facepiece fit.

- Contingency planning and dissemination of plans to all personnel minimize the impact of rapidly changing safety protocols in response to changing site conditions.

- Withdrawal from a situation of unknown hazard.

- Chemical contaminants may mimic or enhance symptoms of other illnesses or intoxication. Use of alcohol is prohibited.

- The site leader, HSO, and sampling personnel shall maintain records in a bound notebook recording daily activities, meetings, facts, incidents, data, etc., relating to the project. These record books will remain on-site during the full duration of the project so that replacement personnel may add information in the same record book, maintaining continuity. These notebooks and daily records will become part of the permanent project file.

12.0 DISPOSAL PROCEDURES

All discarded materials, waste materials, or other objects shall be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left onsite. All potentially contaminated materials (e.g., clothing, gloves, etc.) will be bagged or drummed as necessary and segregated for disposal. All contaminated waste materials will be left onsite. All non-contaminated materials shall be collected and bagged for appropriate disposal as normal domestic waste. Water and decontamination fluids generated during drilling and sampling will be discharged to the ground surface.

During monitoring well installation, development and sampling, drilling fluids, cuttings, development water and purge water will be discharged to the ground surface in the immediate vicinity of the well.

13.0 EMERGENCY PLAN

As a result of the hazards on site, and the conditions under which operations are conducted, the possibility of an emergency situation developing is very remote. However, an emergency plan is required to be available for use at all Sites.

Various individual site characteristics will determine preliminary action to be taken to assure that this emergency plan may be successfully implemented in the event of a site emergency. Careful consideration must be given to the proximity of places of employment and to the relative possibility of site fire, explosion or release of vapors, gases, or dusts which will impinge on these neighbors. If there is even a remote possibility of any of these occurrences, the Site Manager must coordinate the interface with MCB officials, the CHSS and the HSO.

Careful evaluation of the above factors must be made by the Site Manager. Based on this analysis, every attempt will be made to coordinate the procedures set forth in the Emergency Plan with MCB police, fire, and hospital officials.

13.1 SITE EMERGENCY COORDINATOR

The Site Emergency Coordinator is:

Field Operations Leader	Timothy Case
HSO (Alternate)	Kevin Midder (John Cashman)

The emergency coordinator shall make contact with MCB fire, police and other emergency units prior to beginning work on site. In these contacts the emergency coordinator will inform the emergency units about the nature and duration of work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants. Also at this time, the emergency coordinator and the emergency response units shall make arrangements to handle any emergencies that might be anticipated.

Contacts will be made with the following individuals:

Name	Telephone	Title/Jurisdiction
Col. Crawley	451-2555	Provost Marshall/Camp Lejeune
R.N. Piner	911	Fire Chief/Camp Lejeune
Commander Margolis	451-4551	Hospital Commander

The emergency coordinator shall implement the contingency plan whenever conditions at the site warrant such action. The coordinator will be responsible for assuring the evacuation, emergency treatment, emergency transport of site personnel as necessary, and notification of emergency response units and the appropriate Management staff.

13.2 Evacuation

In the event of an emergency situation, such as fire, explosion, significant release of toxic gases, etc., an air horn or other appropriate device will be sounded for approximately 10 seconds indicating the initiation of evacuation procedures. All personnel in both the restricted and nonrestricted areas will evacuate and assemble near the Support Zone. The location shall be upwind of the site as determined by a wind direction indicator. For efficient and safe site evacuation and assessment of the emergency situation, the Emergency Coordinator will have authority to initiate proper action if outside services are required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been given. The HSO or Assistant HSO must see that access for emergency equipment is provided and that all combustion apparatus has been shut down once the alarm has been sounded. Once the safety of all personnel is established, MCB Fire department and other emergency response groups will be notified of the emergency by telephone. The site evacuation plan shall be rehearsed regularly as part of the overall training program for site operations.

13.3 POTENTIAL FOR ACTUAL FIRE OR EXPLOSION

If L.E.L values are above 25 percent in the work zone or if an actual fire or explosion has taken place, immediately evacuate the site (air horn will sound for 10 second intervals), notify local fire and police departments, and other appropriate emergency response groups.

Fire Dept. - 911
Police Dept. - 451-2555

13.4 ENVIRONMENTAL INCIDENT (RELEASE OR SPREAD OF CONTAMINATION)

Control or stop the spread of contamination if possible. The emergency coordinator should instruct a person on site to immediately contact local authorities to inform them of the possible or immediate need for neighborhood evacuation. If a significant release has occurred, the National Response Center should then be contacted. This group will alert National or Regional Response Teams as necessary. Following these emergency calls, the reporting individual should then notify the CHSS and the site manager (SM).

		PHONE
MCB	Fire Department	911
MCB	Police Department	451-2555
National Response Center		(800) 424-8802
M. Sayres	SM	(201) 896-0363
C.J. CAMPBELL	CHSS	(904) 332-3318

13.5 PERSONNEL INJURY

Emergency first aid shall be applied on-site as deemed necessary. Then, decontaminate and transport the individual to the nearest medical facility if needed. The HSO will supply medical data sheets to appropriate medical personnel and complete the incident report.

Hospital	- MCB Hospital	451-4551
Rescue	- Jacksonville Rescue Services	455-9119

The MCB Hospital shall be contacted for transport as necessary in an emergency. However, since some situations may require transport of an injured party by other means, a hospital route must be firmly identified. During the initial reconnaissance, the route to and from the primary hospital and back-up facility shall be located. The primary hospital route is as follows: From the Hadnot Point Industrial Area get on Holcomb Boulevard heading north, stay on Holcomb Boulevard until you reach Brewster Avenue (first traffic light). Make a left turn onto Brewster Avenue and go up 1 mile. The hospital will be located on your right hand side, building number NH100 (see Figure 13-1).

The back-up hospital is Onslow Memorial Hospital located in Jacksonville. The directions to this location are as follows: Take Holcomb Boulevard north out the main gate, go straight until you come to route 24 heading west. Take route 24 west to Western Boulevard. Make a right hand turn onto Western Boulevard and continue straight for approximately 2 miles. The hospital will be located on your left hand side directly across from the Jacksonville Mall.

These routes will be conspicuously posted on-site at all times.

13.6 OVERT PERSONNEL EXPOSURE

SKIN CONTACT: Use copious amounts of soap and water. Wash/rinse affected area thoroughly, then provide appropriate medical attention. Eyewash and emergency shower or drench system will be provided on-site at the CRZ and/or Support Zone, as appropriate. Eyes should be rinsed for 15 minutes upon chemical contamination.

INHALATION:	Move to fresh air and/or, if necessary, decon/transport to hospital.
INGESTION:	Decontaminate and transport to emergency medical facility
PUNCTURE WOUND OR LACERATION:	Decontaminate and transport to emergency medical facility. HSO will provide medical data sheets to medical personnel as requested (see Section 4-16).

Hospital -	MCB Hospital	451-4551
Rescue -	Jacksonville	455-9119

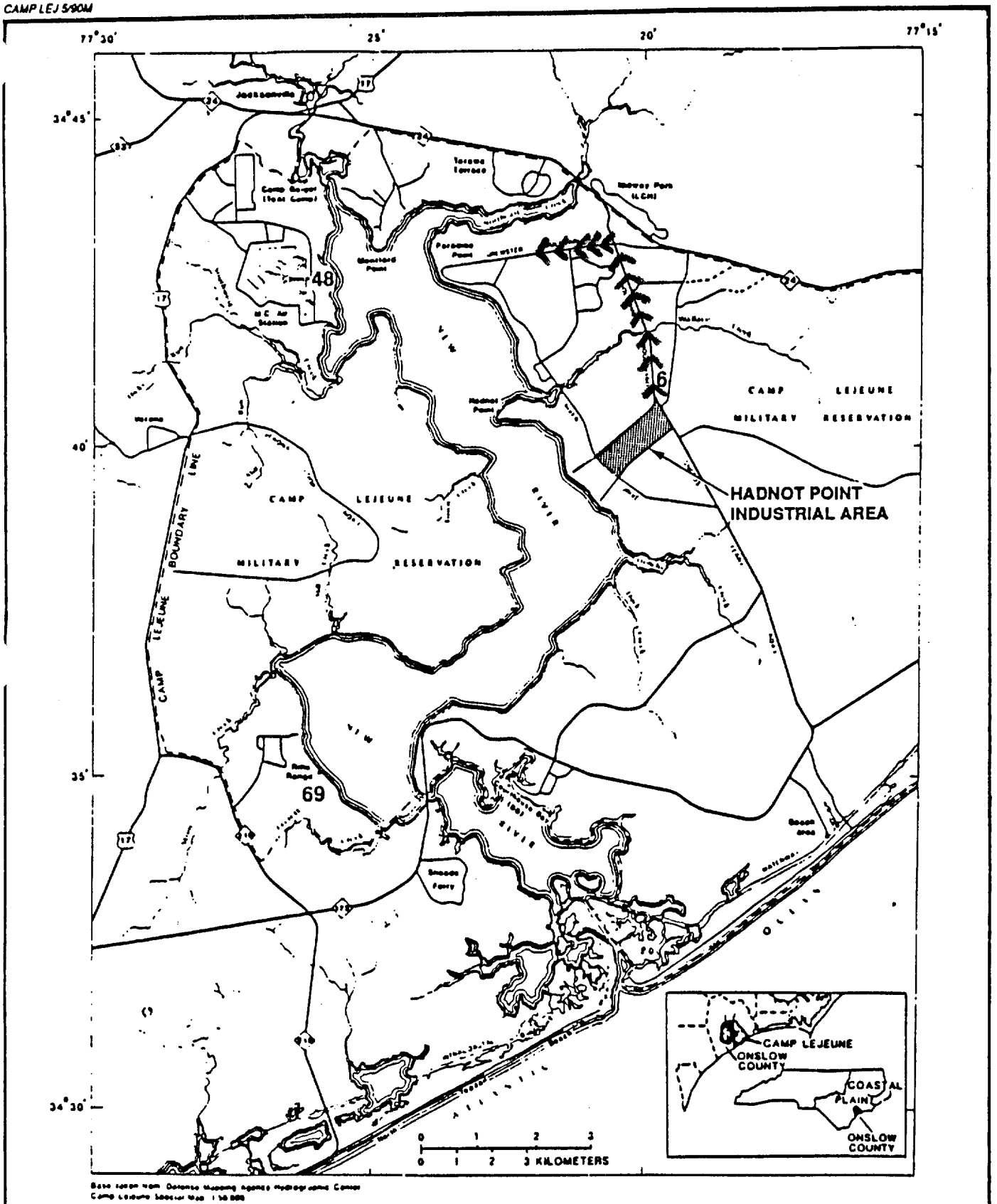


Figure 13–1
HOSPITAL ROUTE MAP

SOURCE: HARNED *et al.*, 1989.

MARINE CORPS BASE CAMP LEJEUNE

13.7 ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the HSO will determine if work can continue without sacrificing the health and safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries
- Potential for cold stress and cold-related injuries
- Treacherous weather-related working conditions
- Limited visibility
- Potential for electrical storms
- Rain and its effect on the operation of PI meters and other personal monitoring equipment.

14.0 AUTHORIZATIONS

Personnel authorized to enter the MCB sites while operations are being conducted must be certified by the ESE CHSS. Authorization will involve completion of appropriate training courses and medical examination requirements as required by OSHA 29 CFR 1910.10 and review and sign-off of this HASP. All personnel must utilize the buddy system or trained escort, and check in with the Field Team Leader at the Command Post.

1. ESE Personnel Authorized to Perform Work Onsite:

1.	R.G. Gregory	11.	(Others may be added)
2.	M. Sayres	12.	
3.	R.J. Pomeroy	13.	
4.	J.F. Bannon	14.	
5.	C.J. Snyder	15.	
6.	K.L. Midder	16.	
7.	S.A. Aharonian	17.	
8.	J.A. Cashman	18.	
9.	Tim Case	19.	
10.	Paul Feinberg	20.	

2. Other Personnel Authorized to Enter Site:

1. Authorized Subcontractors
2. MCB Officials
3. State Environmental Personnel
4. Police, Fire, Emergency Personnel

15.0 MEDICAL DATA SHEET

This brief Medical Data Sheet will be completed by all on-site personnel and will be kept in the Command Post during the conduct of site operations. Completion is required in addition to compliance with the Medical Surveillance Program requirements described in the Health and Safety Plan. This data sheet will accompany any personnel when medical assistance is needed or if transport to hospital facilities is required.

Project _____

Name _____ Home Telephone (____) _____

Address _____

Age _____ Height _____ Weight _____ Do You Wear Contacts _____

Name of Next of Kin _____

Drug or Other Allergies _____

Particular Sensitivities _____

_____

Provide a Checklist of Previous Illnesses or Exposures to Hazardous Chemicals

_____

_____

What medications are you presently using? _____

_____

Do you have any medical restrictions? _____

_____

Name, Address, and phone number of personal physician: _____

_____

_____

_____

_____

I am the individual described above. I have read and understand this HASP.

_____ _____

Signature Date

16.0 FIELD TEAM REVIEW

Each field team member shall sign this section after site-specific training is completed and before being permitted to work on site.

I have read and understand this Site-Specific Health and Safety Plan. I will comply with the provisions contained therein.

Site/Project: MCB Camp Lejeune, HPIA (including Sites 21 and 22), Sites 6, 48, and 69.

Name Printed	Signature	Date

17.0 APPROVALS

By their signature the undersigned certify that this HASP is approved and will be utilized at the MCB Camp Lejeune .

Health and Safety Officer	Date
Site Manager	Date
Company Health and Safety Supervisor	Date

REFERENCES

Environmental Science & Engineering, Inc. (ESE). 1988. Characterization Step Report for Hadnot Point Industrial Area. Confirmation Study to Determine Existence and Possible Migration of Specific Chemicals In Situ. Marine Corps Base Camp Lejeune, NOrth Carolina. Gainesville, Florida.

Environmental Science & Engineering, Inc. (ESE). 1990. Final Draft, Site Summary Report. Marine Corps Base Camp Lejeune, North Carolina. Plymouth Meeting, Pennsylvania.

Water and Air Research, Inc. 1983. Initial Assessment Study of Marine Corps Base Camp Lejeune, North Carolina. Gainesville, Florida.

PERSONAL PROTECTION EQUIPMENT LEVELS

PERSONAL PROTECTIVE EQUIPMENT--LEVEL A

1. Open-circuit, pressure-demand, self-contained breathing apparatus (SCBA);
2. Totally encapsulated suit;
3. Gloves, inner (surgical type);
4. Gloves, outer, chemical protective;
5. Boots, chemical protective, steel toe and shank; and
6. Booties, chemical protective.

CRITERIA

1. Sites known to contain hazards which:
   a. Require the highest level of respiratory protection (as previously stated),
   b. Will cause illness as a result of personal exposure,
   c. Permit a reasonable determination that personal exposure could occur to any part of the body; or
2. Sites for which the Project Manager and/or Site Safety Officer make a reasonable determination that, based on the lack of information to the contrary, the site may be described as previously stated.

PERSONAL PROTECTIVE EQUIPMENT--LEVEL B

1. Open-circuit, pressure-demand SCBA;
2. Chemical protective
   a. Overalls and long-sleeved jacket, or
   b. Coveralls;
3. Gloves, inner (surgical type);
4. Gloves, outer, chemical protective;
5. Boots, chemical protective, steel toe and shank; and
6. Booties, chemical protective.

PERSONAL PROTECTIVE EQUIPMENT--LEVEL C

1. Full face-piece, air-purifying respirator (high-efficiency particulate/organic vapor cartridges);
2. Emergency escape oxygen pack (carried);
3. Chemical protective (Tyvek® is the minimum protection)
   a. Overalls and long-sleeved jacket, or
   b. Coveralls, or
   c. Apron;
4. Gloves, inner (surgical type) (Latex);
5. Gloves, outer, chemical protective (Nitrile);

6. Boots, chemical protective (neoprene or NBR), steel toe and shank; and
7. Booties, chemical protective (Latex).

CRITERIA

1. Sites known to contain hazards which:
   a. Do not require a level of respiratory protection greater than the level afforded by air-purifying respirators (nominal protection of 10), as previously stated;
   b. Will cause illness as a result of personal exposure; or
   c. Permit a reasonable determination that personal exposure to areas of the body not covered by Level C protective clothing is unlikely; and

2. Sites for which the Project Manager and/or Site Safety Officer make a reasonable determination that, based on the lack of information to the contrary, the site may be described as previously stated.

PERSONAL PROTECTIVE EQUIPMENT--LEVEL D

1. Coveralls, cotton;
2. Boots/shoes, safety;
3. Safety glasses;
4. Hardhat with optional face shield (where overhead hazards exist); and
5. Air-purifying respirator (readily available).

CRITERIA

Sites where the Project Manager and/or Site Safety Officer make a reasonable determination that hazards due to exposure to hazardous materials are unlikely.

ADDITIONAL PERSONAL PROTECTION

In addition to personal protective equipment, field personnel having duties on or near the hazard site should have ready access to:

1. A fully stocked industrial-size first-aid kit;
2. An eyewash kit; and
3. At least 6 gallons of potable water and a pressurized container to permit decontamination in event of accidental skin or eye contact with chemicals.