N00639.AR.000853
NSA MID SOUTH
5090.3a

FINAL DRAFT PROJECT PLANS FOR REMEDIAL INVESTIGATION FEASIBILITY STUDY
MILLINGTON SUPPACT TN
11/15/1989
ERC ENVIRONMENTAL AND ENERGY

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FINAL DRAFT PROJECT PLANS FOR REMEDIAL INVESTIGATION FEASIBILITY STUDY SITES 1 THROUGH 9 NAS MILLINGTON SUPPACT TN

11/15/1989

ERC ENVIRONMENTAL AND ENERGY

2

FINAL DRAFT

PROJECT PLANS

(PMP, SMP, SAP, DMP, AND HSP)

FOR

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
NAS MEMPHIS SITES NO. 1-9
MILLINGTON, TENNESSEE

Prepared For:
Department of the Navy
Southern Division
Naval Facilities Engineering Command
Charleston, South Carolina
Contract No. N62467-88-C-0198

Prepared By:
ERC Environmental and Energy Services Co.
725 Pellissippi Parkway
P.O. Box 22879
Knoxville, Tennessee 37933-0879

15 November 1989

ERCE/EDGe Project No. B880

FINAL DRAFT

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FINAL DRAFT

OneStep™
Index System

Contents

1

2

3

4

5

Cardinal®
A Jostens Company

Reorder By Number
5 Tab OneStep

60513 Clear
60514 Blue
60515 Red

60516 Green
60517 Brown
60518 Multi-Color

OneStep™
Index System

Contents

1

2

3

4

5

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60517 Brown
60518 Multi-Color

725 Pellissippi Parkway
P.O. Box 22879
Knoxville, Tennessee 37933
Telephone: 615-966-9761
Fax: 615-966-4155

ERC/EDGe Environmental and Energy Services Co.

16 November 1989

Commanding Officer
Attn: (Code 11519)
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
P.O. Box 10068
Charleston, SC 29411-0068

RE: Project RI/FS Work Plans for NAS Memphis Sites 1 through 9; Contract N62467-88-C-0198

Dear Mr. Moser:

Enclosed are three sets of the RI/FS Work Plans for NAS Memphis Sites No. 1 through 9. Each set consists of the following:

- o RI/FS Work Plan for investigation of Sites No. 1-9.
- o Project Plans
  - Project Management Plan
  - Site Management Plan
  - Data Management Plan
  - Sampling and Analysis Plan
  - Health and Safety Plan

The site-specific health and safety plans were prepared by EnSafe, our subcontractor.

Please call me at (615) 966-9788 if you have any questions, corrections, or additions, or exceptions.

Sincerely,

ERC ENVIRONMENTAL AND ENERGY SERVICES CO.

Harry A. Bryson

Harry A. Bryson, CHMM
Senior Project Manager

HAB:ldl

Attachments/Enclosures

cc: Mr. George Robertson, Public Works Engineering, NAS Memphis (w/15 enclosures)
Mr. Nile Luedtke, NCR, Martin Marietta Energy System (w/2 enclosures)
Mr. Charles H. Higgins, ERCE/EDGe Group (w/1 enclosure)
Ms. Cindy Lin, ERCE/EDGe Group (w/1 enclosure)
Mr. Dwight C. Flynn, ERCE/EDGe Group (w/0 enclosure)
Mr. Wayne McCoy, ERCE/EDGe Group (w/0 enclosure)

FINAL DRAFT

PROJECT PLANS

(PMP, SMP, SAP, DMP, AND HSP)

FOR

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
NAS MEMPHIS SITES NO. 1-9
MILLINGTON, TENNESSEE

Prepared For:
Department of the Navy
Southern Division
Naval Facilities Engineering Command
Charleston, South Carolina
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Knoxville, Tennessee 37933-0879

15 November 1989

ERCE/EDGe Project No. B880

FINAL DRAFT

FOREWORD

This document consists of five project plans:

- Project Management Plan (PMP)
- Site Management Plan (SMP)
- Data Management Plan (DMP)
- Sampling and Analysis Plan (SAP)
- Health and Safety Plan (HSP)

These plans, completed per specific SOW requirements, are included as volumes I, II, III, IV, and V, respectively, of this document. Each plan is a "stand alone" plan. The SOW for this project is included as Appendix B to Volume I, the Project Management Plan. The SOW includes all amendments in effect at the time the PMP was issued. Amendments to the Contract will be posted as they are issued.

FINAL DRAFT

VOLUME I:

PROJECT MANAGEMENT PLAN
FOR
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
NAS MEMPHIS SITES NO. 1-9
MILLINGTON, TENNESSEE

Prepared For:
Department of the Navy
Southern Division
Naval Facilities Engineering Command
Charleston, South Carolina
Contract No. N62467-88-C-0198

Prepared By:
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725 Pellissippi Parkway
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15 November 1989

ERCE/EDGe Project No. B880

FINAL DRAFT

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1.0 INTRODUCTION

The purpose of this Project Management Plan (PMP) is to document the planned overall approach for RI/FS activities at nine (9) sites identified for investigation Naval Air Station (NAS) Memphis, Shelby County, Tennessee. This work is being conducted as part of the Navy's Installation Restoration Program (IRP) under Contract No. N62467-88-C-0198, Southern Division, Naval Facilities Engineering Command (SOUTHDIV NAVFACENGCOM). The work to be performed will consist of Remedial Investigations (RIs) and Feasibility Studys (FSs) as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. Remedial activities if any, will be determined on the basis of the RI/FS findings and conclusions.

1.1 PMP ORGANIZATION

This Project Management Plan includes a description of the management approach and schedule as well as the qualifications of personnel who will be directing and performing this work. Since project conditions may change during the course of this work, periodic updates of the Project Management Plan may be required. ERCE will update this document on an as-needed basis as directed by the SOUTHDIV NAVFACENGCOM Engineer-in-Charge (EIC).

Schedules presented in this document provide estimates of the time needed to complete the RI/FS project tasks. These estimates are based on ERCE's recommendations concerning SOUTHDIV's program at NAS Memphis, and incorporate procedural and budgetary constraints.

Section 2.0 of this Project Management Plan provides background information on the Navy IRP; on previous investigations completed at NAS Memphis under the Navy IRP; and on the further work that

ERCE may be performing at NAS Memphis under the Navy IRP. Section 3.0 presents and discusses ERCE's overall corporate organizational structure as well as the organizational structure that ERCE has developed for management of the NAS Memphis program. Section 4.0 discusses ERCE's general approach to project management. Section 5.0 details how this general approach will be implemented in managing at NAS Memphis RI/FS. Section 6.0 discusses the preliminary schedule for the planned nine site RI/FS activities.

1.2 BACKGROUND

1.2.1 Project Setting

NAS Memphis, a 3,490-acre federal military facility, is located in Millington, Tennessee, approximately twenty miles northeast of the City of Memphis and thirteen miles east of the Mississippi River. The facility if bordered on the west and south by the City of Millington and the north and east by agricultural and residential areas. The general location is shown on Figures 1-1 and 1-2. Figure 1-3 is a map of the major portion of the NAS.

1.2.2 Nas Memphis History

During World War I, the U.S. Army constructed Park Field, a military aviation training facility. Between the World Wars, the site was used for approximately eight years as a civilian airfield and, beginning in 1929, as a government-supported agricultural research facility.

Since it was commissioned in 1942, the mission of the NAS has been to provide services and material to support operations of aviation activities, units of the Naval Education and Training Command and other activities and units as designated by the Chief of Naval Operations. The Naval Regional Medical Center is located adjacent to the NAS and is part of the entire facility which is the subject of this study. In support of these activities, some hazardous wastes have been generated.

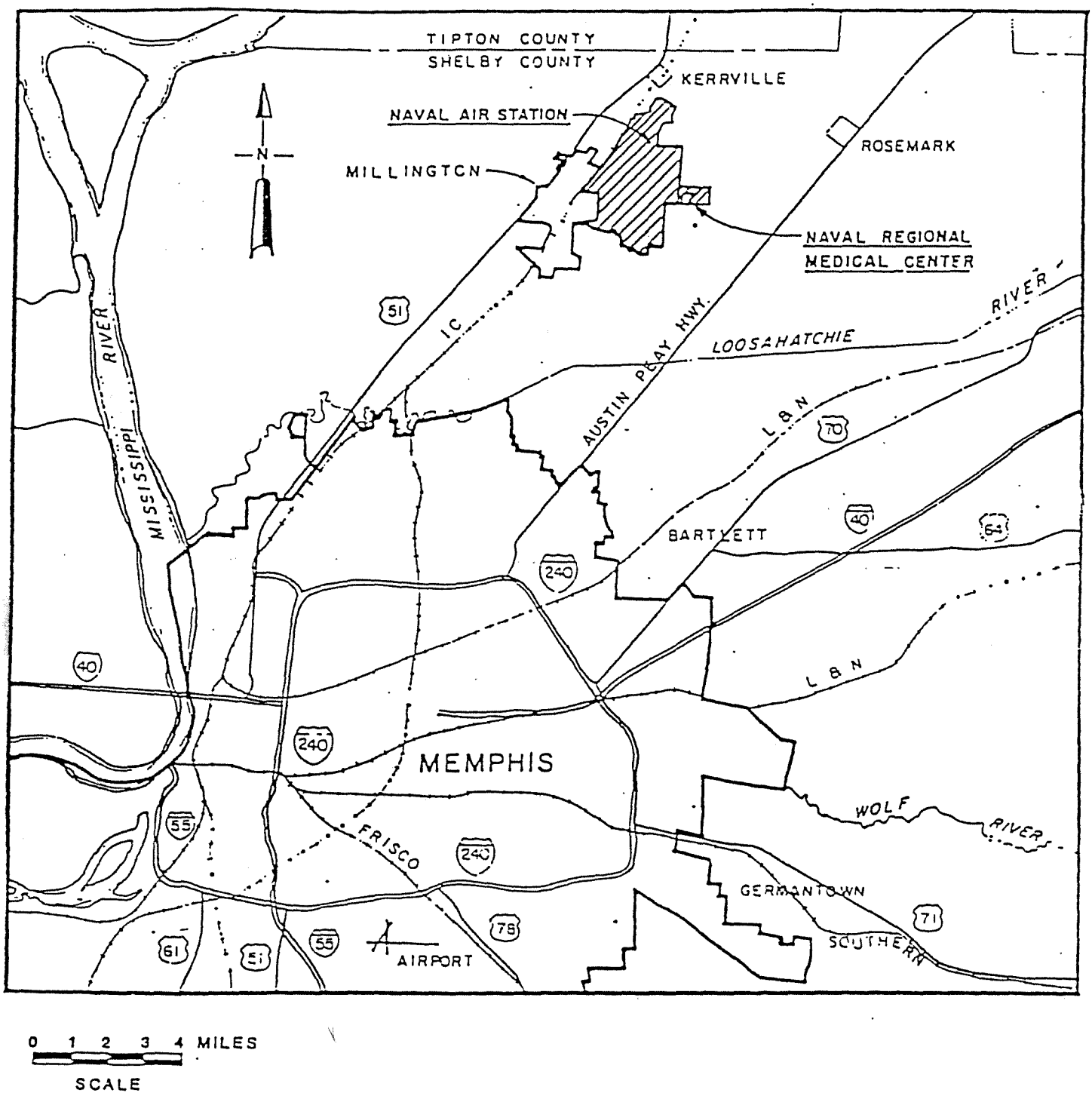


FIGURE 1-1. LOCATION MAP - NAS MEMPHIS

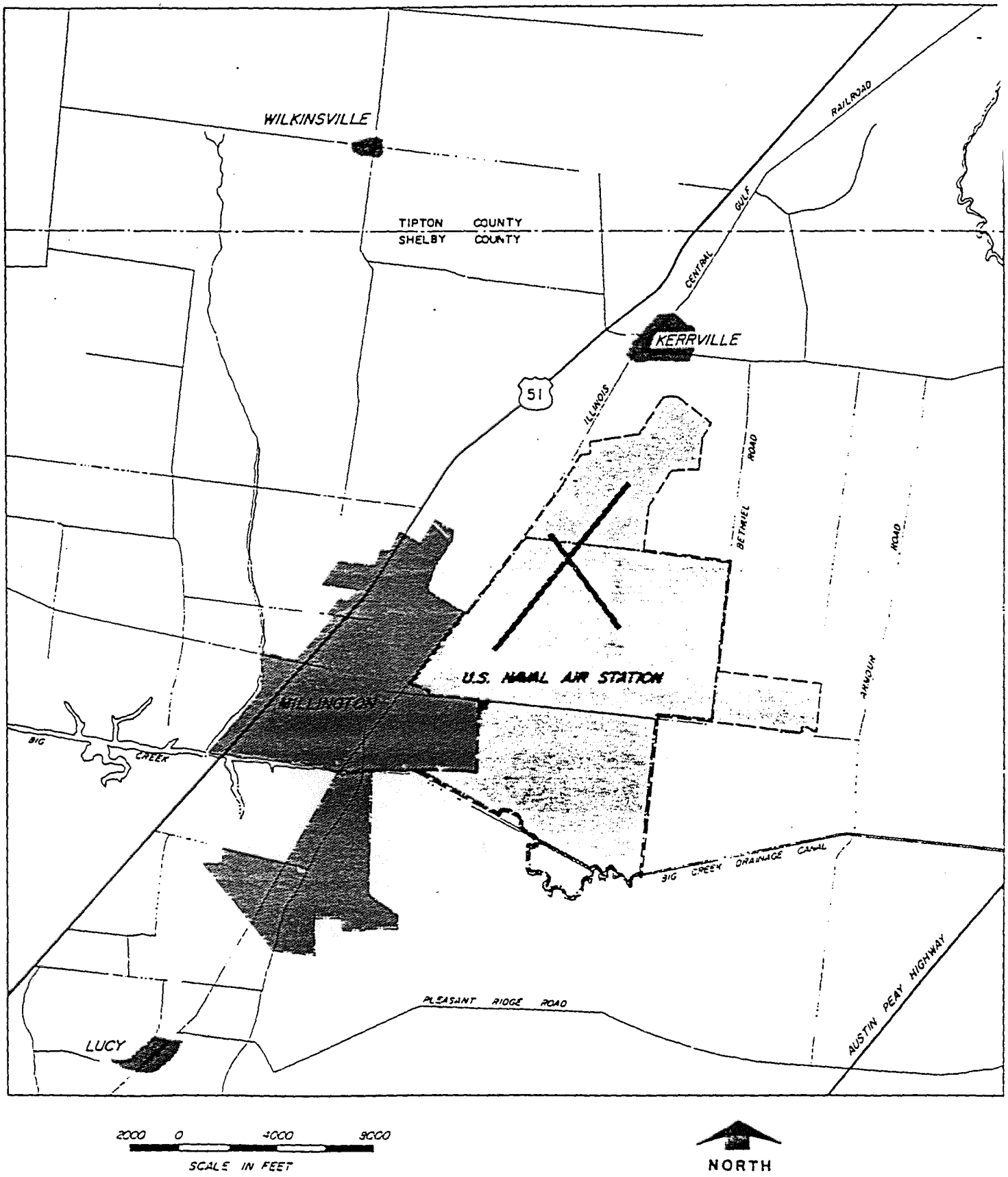


FIGURE 1-2. NAS MEMPHIS AND VICINITY

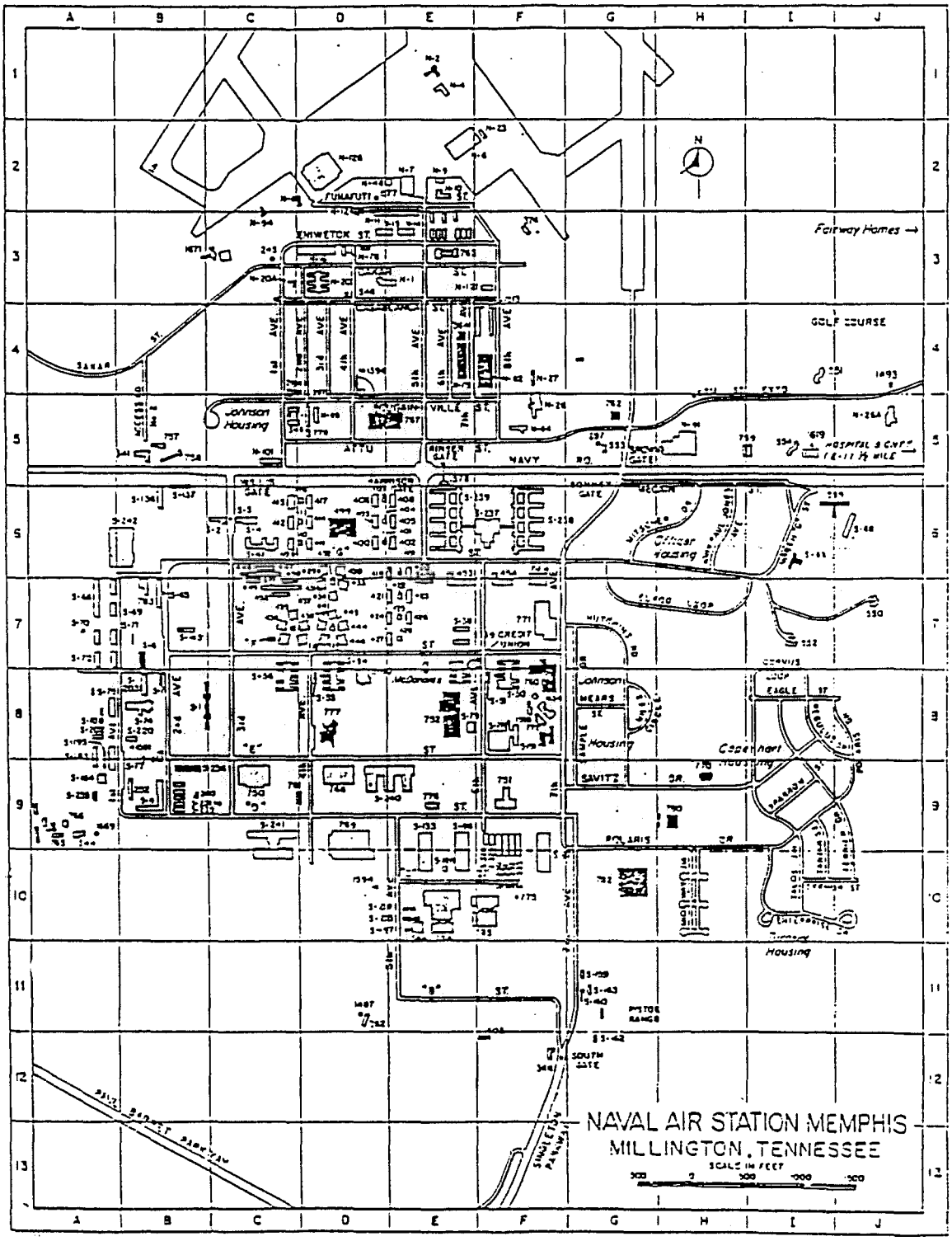


FIGURE 1-3. NAS MEMPHIS MAP

2.0 BACKGROUND

2.1 NAVY INSTALLATION RESTORATION PROGRAM (IRP)

The Navy IRP was established in 1986 to direct the investigation and remediation of uncontrolled hazardous waste disposal sites associated with naval operations. Prior to 1986, these investigation/remediation activities had been managed under the Navy Assessment and Control of Installation Pollutants (NACIP) program.

In accordance with EPA's 40 CFR 300, the National Oil and Hazardous Substance Contingency Plan (NCP), the Navy IRP is currently being implemented in full compliance with the statutory requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 and the Superfund Amendments and Reauthorization Act of 1986. Furthermore, since SARA Section 121 specifies the inclusion of all applicable or relevant and appropriate requirements (ARARs), the Navy IRP incorporates compliance with the Resource Conservation and Recovery Act (RCRA) of 1976 Hazardous and Solid Waste Amendments (HSWA), of 1984 where applicable.

The Navy IRP can be viewed as a five-step investigation and remediation process:

1. Site Discovery or Notification;
2. Preliminary Assessment and Site Inspection (PA/SI);
3. Establishment of Priorities for Remedial Action;
4. Remedial Investigation and Feasibility Study (RI/FS); and
5. Remedial Design and Remedial Action (RD/RA).

Each of the above steps includes substeps or subdivisions.

2.2 PREVIOUS INVESTIGATIONS

Two major investigation programs have been conducted at NAS Memphis under the NACIP/Navy IRP programs: (1) Initial Assessment Studies (IAS), and (2) Verification Studies (VS). The IAS (1982-1983) was conducted by the Naval Energy and Environmental Support Activity (NEESA) to identify and assess NAS Memphis sites that could pose a potential threat to human health or the environment as a result of contamination derived from past naval operations. The VS (1985) was conducted by Geraghty and Miller, Inc., to confirm/refute the presence of contamination at specific sites identified in the IAS, and if contamination was detected, evaluate its magnitude/extent to a degree that would allow the recommendation of remedial actions.

In addition to the above NACIP/Navy IRP programs, a RCRA Facility Assessment (RFA) has been completed at NAS Memphis, as a condition of RCRA/HSWA permit issued to the installation by EPA Region IV and the Tennessee Department of Health and Environment (TDHE) in 1986.

Table 2-1 lists 9 of the 60 known and potential sites of environmental contamination that have been identified for further investigation under CERCLA RI/FS activities.

2.3 SCOPE OF WORK

As stated in the previous section, IAS, VS, and RFA investigations for NAS Memphis have been completed.

The Navy IRP is directly governed by CERCLA/SARA. However, because SARA specifies that all applicable or relevant and appropriate requirements (ARARs) be included in CERCLA activities, some RCRA provisions may be applicable ARARs.

Provisions of other environmental statutes and their implementing regulations may become pertinent on a site-by-site basis.

TABLE 2-1

NAVY IRP SITES* AT NAS MEMPHIS

Site No.	Site Name/Description
1	Fire Department Drill Area
2	South-Side Landfill
3	N-121 Plating Shop Dry Well
4	N-121 Plating Shop Storm Sewer
5	Fire-Fighting Training Area
6	N-126 Battery Shop Storm Sewer
7	N-126 Plating Shop Dry Well
8	Cemetery Disposal Area
9	Sewage Lagoons

*Sites to be investigated under CERCLA/SARA

Consequently, ERCE's work at NAS Memphis will integrate CERCLA, RCRA, and any other "ARAR" requirements to the extent necessary. Although the administrative processes for CERCLA and RCRA statutes are somewhat different, their technical requirements are essentially the same. Hence, the CERCLA/RCRA overlap approach should not impede implementation of the RI/FS.

3.0 PROJECT ORGANIZATIONAL STRUCTURE

This section presents the management structure for ERCE's work at NAS Memphis and presents the relationships between levels of responsibility, roles and duties anticipated for assigned positions, and resources available to carry out various tasks.

3.1 CORPORATE ORGANIZATION

ERCE's project management lines of authority and communication are illustrated in Figure 3-1. ERCE's management philosophy is project-oriented and matrix management-structured. Multi-disciplinary technical project teams, who receive technical direction from different areas and levels within the corporate organization, according to the nature of project undertaken, are formed within this management structure. The ERCE Project Manager coordinates client direction with internal technical direction to achieve the client's goals in the most expeditions and efficient manner.

The NAS Memphis project staff will form a semi-autonomous group with ERCE's office structure, with the authority to commit company resources to the project. ERCE's Principal-in-Charge and Program Manager, Mr. Chuck Higgins, PE; and Project Manager, Mr. Harry Bryson, CHMM, will maintain formal as well as informal lines of communication between the Navy IRP Engineer-in-Charge (EIC), ERCE's QA officer, and ERCE's Health and Safety officer, ERCE's Principal Engineer and ERCE's subcontractor, Environmental Safety and Design (ENSAFE), of Memphis, Tennessee. Figure 3-2 shows ERCE's program organization for the NAS Memphis project and illustrates the relationships between ERCE's project groups and "external" groups, whose functions will be to assist with the direction and monitoring of project activities. Table 3-1 lists the principal project personnel.

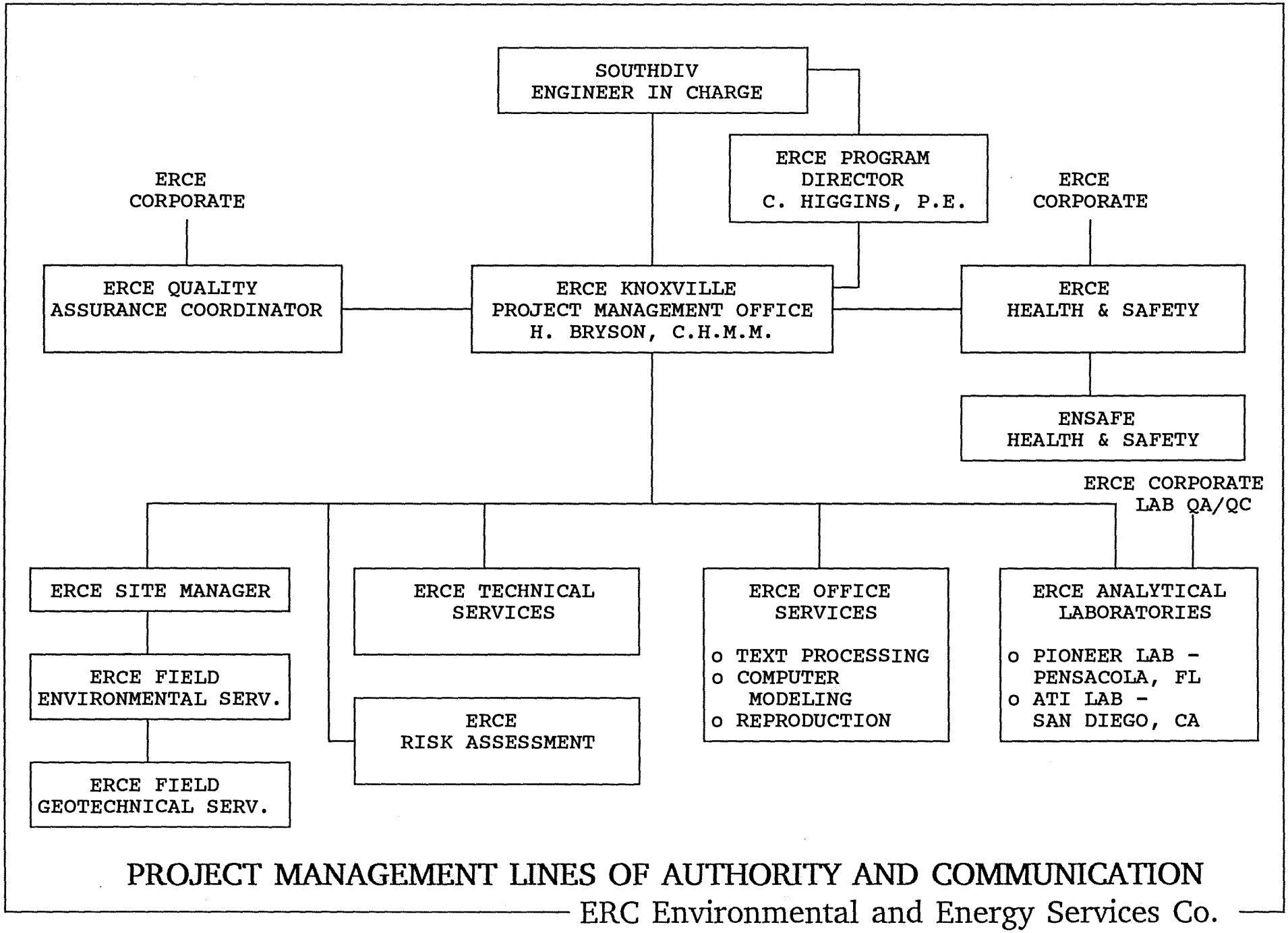


FIGURE 3-1. PROJECT ORGANIZATIONAL CHART

TABLE 3-1. LIST OF PROJECT PERSONNEL

I. U.S. Navy

Southern Division, Naval Facilities Engineering Command

Position/Title	Name	Phone No.
Head, Remedial Action Branch	Mr. G.C. Bradley, PE	(803) 743-0573
Engineer-in-Charge	Mr. Robert Moser, PE	(803) 743-0573

II. NAS Memphis

Public Works Div.	Mr. George Robertson	(901) 873-5209
Environment Affairs	CWO3 Ken Iverson	(901) 873-5462
Public Affairs Officer	Ms. Sue Hosmer-Millican	(901) 873-5761

III. ERCE/EDGe Group

Program Director and Principal-in-Charge	Mr. Chuck Higgins, PE Nashville, TN	(615) 333-0630
Project Manger/ Environmental Scientist	Mr. Harry Bryson, CHMM Knoxville, TN	(615) 966-9788
Project Engineer/ Deputy Project Manager	Ms. Cindy Lin, Ph.D, PE Nashville, TN	(615) 333-0630

IV. ERCE/EDGe Subcontractors - ENSAFE, Memphis, Tennessee

Subcontractor Project Manager	Mr. Phil Coop Memphis, TN	(901) 372-7962
Subcontractor Health & Safety Officer	Mr. Rick Barlow	(901) 873-5761

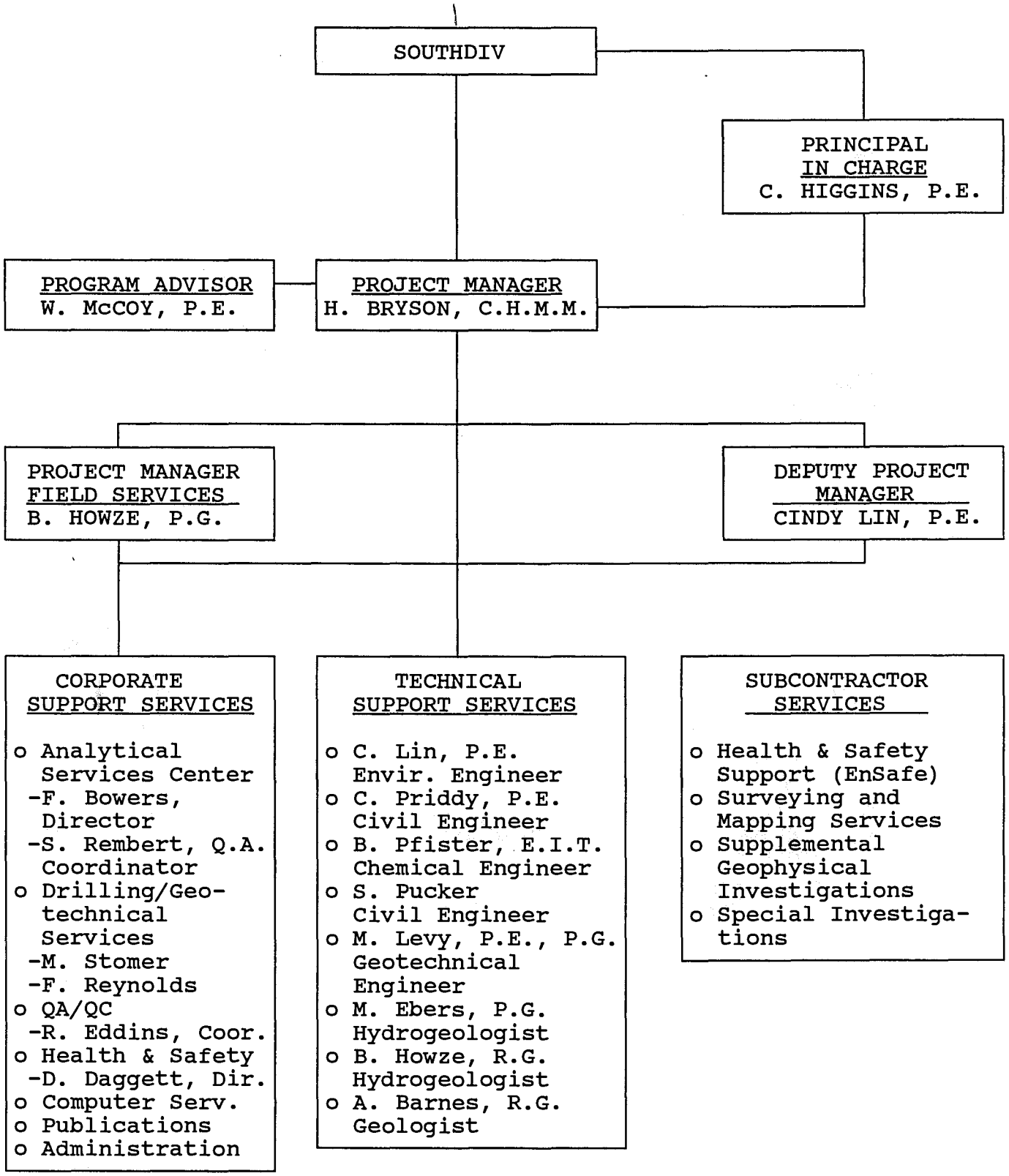


FIGURE 3-2. ERCE/EDGe GROUP PROJECT ORGANIZATION

3.2 PROGRAM ORGANIZATION

The organizational structure that ERCE has adapted for this program assures the cost-effective use of key personnel as well as maintenance of close communication and coordination with the EIC. Based on ERCE's experience with similar military programs, this organizational structure is designed to accommodate multiple task assignments and can be adjusted in response to changing program needs.

The key program personnel are the Principal-in-Charge/Program Manager, the Project Manager/Environmental Scientist and the Deputy Project Manager/Principal Engineer. Key Personnel and their responsibilities are described briefly below. Resumes are provided in Appendix A.

3.2.1 Principal-in-Charge/Program Director

Mr. Higgins in a registered Professional Engineer and Executive Vice President for ERCE. He is based in ERCE's Nashville, Tennessee office. He is the Principal-in-Charge and Program Manager. He has years of indepth experience as an environmental engineers and educator. He has served with the Tennessee Department of Health and Environment, and is presently an adjunct Professor of Environmental Engineering at Vanderbilt University in Nashville. He is also a Major in the Tennessee Army National Guard (TN ARNG), in charge of environmental affairs at TN ARNG facilities throughout the state. He has an active DOD Secret Clearance and a DOE "Q" Clearance.

3.2.2 Project Manager/Environmental Scientist

Mr. Bryson is a Certified Hazardous Materials Manager (CHMM) and Engineer-in-Training. He is a Senior Project Manager based in ERCE's Knoxville, Tennessee office. He is the Project Manager and Principal Environmental Scientist for the project. His educational background includes the physical and life sciences, in particular biology, environmental engineering, and health

physics (radiation protection). He is experienced in performing work under formal regulatory programs (RCRA, CERCLA, UMTRCA) dealing with wastewaters and hazardous, radioactive, and radioactive mixed wastes. He is also a part-time instructor pilot for the Tennessee Air National Guard (TN ANG) in Knoxville. He has the rank of Major and USAF Aeronautical rating of Command Pilot.

3.2.3 Deputy Project Manager/Project Engineer

Ms. Lin is a Registered Professional Engineer with a Ph.D. in Civil Engineering. She is based in ERCE's Nashville office is the Deputy Project Manager and Principal Engineer for the project. Ms. Lin has a wide range of experience in hazardous waste research, state environmental regulatory programs, and private industry.

3.2.4 Technical Staff

Work assignments will be staffed out of ERCE's Knoxville and Nashville, Tennessee offices, with supporting staff made available from other offices to meet any unexpected staffing needs. Several specialty components exist within the ERCE Central Region organization to provide support on an as-needed basis. ERCE's Geologic Associates division company may be used to support field work if it proves cost-effective or appropriate to use an ERCE owned drill rig rather than to provide such services through a subcontract. ERCE's Civil Engineering Design Group may be used for remedial action design work for selected units and systems to be constructed/employed. ERCE's Pioneer Laboratory in Pensacola, Florida will provide laboratory analytical services. ERCE's ATI laboratory, San Diego, California, will be utilized on an as-required basis.

In addition, ERCE will call upon EnSafe, ERCE's Principal Subcontractor, for assistance in tasks of a specific or general

nature. ERCE will be responsible for EnSafe's work, and will ensure all SOW requirements are met.

4.0 MANAGEMENT APPROACH

This section outlines the management approach ERCE will use to manage the Navy IRP program task assignments for NAS Memphis.

4.1 OVERVIEW OF MANAGEMENT CONTROL PROCESS

Each task assignment from SOUTHDIV will be managed by the ERCE Project Manager (PM). The Project Manager will identify the level of effort and technical expertise required for the task, and select a task implementation team. The Project Manager is a senior level technical professional and will define site-specific project tasks, prepare schedules and budgets, request personnel and material support from the appropriate administrative managers, coordinate with support services (i.e., geotechnical investigations and analytical laboratory services) and be responsible for quality control on the project. Resumes of key technical personnel are presented in Appendix A.

After personnel assignments have been made for a task assignment, the Project Manager (or a designated Site Manager for field work, as appropriate), will be responsible for the day-to-day technical direction of personnel assigned to the project.

4.2 MANAGEMENT CONTROL REQUIREMENTS

Task assignments will be managed within initial budgets and schedules agreed to by ERCE and SOUTHDIV by dividing the scope of work into standard tasks. ERCE may break these tasks down further into subtasks for internal project management purposes.

All expenditures for this project will be approved by the Project Manager or Program Manager. The Project Manager will also authorize modifications to tasks or subtasks, with (1) the concurrence of the Program Manager and the EIC or (2) specific direction by the EIC, if within the negotiated SOW. The project manager has direct responsibility for authorizing, monitoring,

and controlling all work and the expenditure of funds and hours, as well as for the successful completion of the work, including budget and schedule requirements. In short, the Project Manager will be responsible for performance of work. The Program Director (PD) will be responsible for ensuring that the Project Manager has access to resources necessary for the performance of work. This will be accomplished through the development and implementation of a Work Breakdown Structure (WBS) Management Plan for each site-specific project.

4.3 WORK BREAKDOWN STRUCTURE

This section describes the Work Breakdown Structure management technique that will be used by ERCE in organizing and performing work assignments. The WBS technique provides the technical and organizational foundation for subdividing project work, scheduling project tasks, and monitoring expenditures. The technique consists of a breakdown of the Navy-approved work plan by task. The major end products are identified, and successively subdivided until the total effort is defined by manageable tasks assignable to a project team or team member. The WBS is used to assign responsibilities for each work element, establish schedules and milestones, allocate resources, track costs against estimates, assess the status of the project effort, evaluate work performance, and determine the necessity for revision of the project effort in response to changed conditions.

Under the WBS as used by ERCE, work is identified by a seven-character letter/number code, called the Task Code. One letter identifies the managing ERCE office; the following 3 numbers identify the job (Project/Client); and the last three numbers the task as shown below:

B880-061	ERCE Office (B = Knoxville, Tennessee; A = Nashville, Tennessee)
B880-061	Project Number

One of the major objectives of the WBS system is to give the project manager a tool for cost control, with the flexibility to allow for expansion in both depth and scope as the need for greater work detail arises.

4.4 TASK BUDGETS

The WBS Management Plan will include a budget breakdown by task. Monthly costs will be calculated from the actual costs recorded for each week and printed out through the Deltek system, a computerized project management system. This will allow the Project Manager to track budgeted hours and dollars against actual expenditures to assess progress on a weekly basis and allow the site manager to make corrections to the schedule as needed.

4.5 PROJECT MANAGEMENT SYSTEM

ERCE operates an interactive computer software system to track projects. This Project Management System (PMS) is a tool for project managers, company administrators, senior management staff, and clients to track monthly costs and weekly hours against projections.

Monthly Work Progress and Laboratory Status reports will also be written for the Navy EIC. These are due the 15th of each month for the preceding month's activities.

5.0 MANAGEMENT OF WORK ASSIGNMENTS

5.1 PROJECT TASK START-UP ACTIVITIES

On receipt of a task assignment from the EIC, ERCE will initiate project start-up and WBS development and implementation. The Project Manager will be assign tasks based on current individual workloads and technical expertise, as necessary. The Project Manager will develop the PMS for each project and estimate required manpower for scheduling purposes. Support group requests are also made in the start-up phase. For major reports, the publications group will be notified as early as possible of the scheduled deadline for submission. Prior to project start-up, project documentation procedures will be implemented to maintain an accurate record of all activities, key decisions, etc., performed during project execution.

5.2 WORK PLANS

The work plan will identify project/site objectives and propose the methodologies to accomplish each work element. ERCE will present a 90% draft of each work plan to the Navy by mail for review. After receiving comments from the Navy, ERCE will incorporate the comments into a draft final, which will be submitted to the key Technical Review Committee (TRC) members. The TRC will provide formal comments on the draft final, and the Navy's response to those comments will be incorporated into the final work plan. The general submittal schedule is shown in Figure 5-1. The TRC membership list is contained in the Project Community Relations Plan (CRP).

TABLE 5-1. BASIC CONTRACT AWARD SUBMITTAL SCHEDULE FOR PROJECT DELIVERABLES
(Per SOW Revision in Effect as of 15 November 1989)

	SUBMITTAL DATE (days after event)	SUBMITTALS *A	*B	*C
PHASE IV - SMP, PMP, DMP, SAP AND HSP FOR SITES 1,2,3,4,5,6,7,8 AND 9				
90% Draft	18 September 1989 (90 days after award)	3	6	2
Draft Final	15 days after directed by EIC	3	15	2
Final	15 days after directed by EIC	3	15	0
LAB QA PLAN**	19 August 1989 (60 days after award)	1	1	1

* See addressees under Distribution. Numbers in column refer to number of copies to be sent to each addressee.

** With submittals as required to obtain approval by the Navy, EPA Region IV, and TDHE

PHASE IV - COMMUNITY RELATIONS PLAN (CRP) FOR SITES 1,2,3,4,5, 6,7,8,9,10,11 AND 12				
90% Draft	18 September 1989 (90 days after award)	3	6	0
Draft Final	15 days after directed by EIC	3	15	0
Final	15 days after directed by EIC	3	15	0

TABLE 5-1. (continued)

PHASE IV - RI/FS WORK PLAN FOR SITES 1,2,3,4,5,6,7,8 AND 9

RI/FS WORK PLAN

90% Draft	18 September 1989 (90 days after award)	3	6	2
Draft Final	15 days after directed by EIC	3	15	2
Final	15 days after directed by EIC	3	15	0

PHASE VIII - RCRA FACILITY ASSESSMENT REVISION

PRELIMINARY REVIEW DOCUMENT VISUAL SITE INSPECTION DOCUMENT DRAFT FINAL RFA 20 July 1989 (30 days after award)	4	3	0
PRELIMINARY REVIEW DOCUMENT VISUAL SITE INSPECTION DOCUMENT FINAL RFA 15 days after directed by EIC	3	6	0

PHASE IX - RCRA FACILITY INVESTIGATION WORK PLAN FOR SITE 59 (OLD PESTICIDE SHOP)

RFI WORK PLAN, SMP, PMP, DMP, SAP, AND HSP

Draft Plan	18 September 1989 (90 days after award)	3	3	0
Final Plan	15 days after direction by EIC	3	6	0

PHASE X - RCRA FACILITY INVESTIGATION FOR SITE 59 (OLD PESTICIDE SHOP)

RFI REPORT

Draft Final	90 days after direction by EIC	3	3	0
Final	20 days after direction by EIC	3	6	0

TABLE 5-1. (continued)

MONTHLY SUBMITTALS

1. WORK PROGRESS REPORT

   Due on the 15th of each month

2. LABORATORY PROGRESS REPORT

   Due on the 15th of each month

MINUTES OF MEETINGS

1. IRP MEETINGS

   Due 10 days after meetings

2. OTHER THAN IRP MEETINGS

   Due 10 days after meetings
   (NOTE: ONE COPY TO ALL WHO ATTEND)
   (NOTE: The EIC will direct the AE to proceed with the next submittal when the EIC is satisfied with the previous submittal.

DISTRIBUTION

Addresses

a.	SOUTHDIV	Commanding Officer Attn: (Code 11519) (Mr. Robert Moser) Southern Division Naval Facilities Engineering Command 2155 Eagle Drive P.O. Box 10068 Charleston, SC 29411-0068 (803) 743-0573
b.	ACTIVITY	Commanding Officer Attn: Public Works Engineering (Mr. George Robertson) Naval Air Station MEMPHIS Millington, Tennessee 38054-5000 (901) 873-5209

TABLE 5-1. (continued)

c. NCR

MARTIN MARIETTA ENERGY SYSTEMS, INC.
Attn: Nile A. Luedtke (Marilew H. Bartling) P.O. Box 2003
(Oak Ridge Gaseous Diffusion Plant)
Oak Ridge, Tennessee 37831-7740
(615) 574-5270

SPECIAL NOTES

NOTE 1: ERCE will comply with Section I of the SOW. Provide EIC a copy of all project related correspondence including submission letters to addressees. All Final reports shall be bound in three-ring binders and provided on five an one-quarter inch floppy disc in a format accessible to IBM PC-compatible machines using MS-DOS and Enable software (one copy per FINAL submittal).

NOTE 2: All submittals shall be bound unless otherwise directed by the EIC.

5.3 PROJECT OPERATIONS

Following approval of the initial stages of the project, actual technical work will be implemented. This will include all aspects associated with actually performing each phase of work.

5.3.1 Project Planning

The Project Manager will forecast manpower requirements and schedule appropriate technical personnel needed to complete the project on time. The Project Manager's request will be channeled through corporate management on an as-required basis.

Since most of the RI will involve laboratory analysis of environmental samples, ERCE's servicing analytical laboratory will be informed of projected sample analysis requirements by the Project Manager or a designated Site Manager. The need for special analyses and short turnaround times will be made known well in advance of delivery of samples to the laboratory.

Drilling and other subcontracting needs will also be coordinated by the Project Manager during the early stages of project start-up. Subcontracts (discussed below) will be developed for special services and scheduled by the project manager.

Staff meetings will be conducted with key project personnel. These meetings will primarily address critical issues, project status, problem areas, scheduling, and action items of the previous meeting. These meetings will be in person or by telephone, as appropriate for the meeting agenda.

5.3.2 Subcontracting Procedures

ERCE subcontracting program utilizes a comprehensive list of vendors, generic contracts, and standard policies and procedures developed for hazardous substance management and remediation programs. Subcontracting (drilling, surveying and mapping, geophysical and special investigations, etc.) will be coordinated

and directed by the Project Manager in accordance with ERCE's standard subcontracting procedures and will be subject to government approval.

Project work under this Contract will be on a firm fixed price (FFP) basis. ERCE will be responsible for all subcontractor work. ERCE subcontractors are subject to provisions of ERCE's contract that deal with QA/QC, health and safety, and compliance with applicable laws and regulations.

5.3.3 Quality Control and Quality Assurance

Three distinct approaches will be used to ensure product quality under this project. The Quality Assurance (QA) program, Quality Control (QC) program, and QA Project Plans (QAPPs) will be used to complement each other in implementing a comprehensive system for data generation, and product preparation, review and approval.

In-house QA is the responsibility of the Project Manager, the Principal-in-Charge, and the QA officer. The QA officer is responsible directly to higher company management.

QC responsibility lies primarily with the Project Manager. The Project Manager is the individual closest to the job, and as such is the person most capable of controlling the overall quality of the work product. The ERCE corporate QA officer will provide QA oversight for the project.

A QAPP is a detailed implementation plan prepared for individual projects which spells out techniques, procedures, data and analytical requirements, replicate requirements, peer review procedures, and other procedures that will assist the project team in obtaining information and data at the desired level of confidence. The QAPP is essentially the working document governing data collection, and field and laboratory principles of

sample collection and analysis. Project-specific QAPPs will be prepared and reviewed for individual work assignments, according to a standard format dependent upon the project type. In general, the QAPP will follow the guidelines and formats specified by EPA and TDHE publications and amendments. These will include "Interim Guidance and Specifications for Preparing Quality Assurance Plans," (USEPA, QAMS 005/80, EPA-600/4-83-004), and others as issued. The QAPP will incorporate by reference EPA Region IV Standard Operating Procedures.

5.3.4 Field Operations Support Functions

The project manager is responsible for specifying and requesting equipment necessary for field operations. The Project Manager and the, Site Manager, assisted by the Health and Safety Coordinator (SC) and the Equipment Coordinator, determines the types and amounts of equipment needed to execute the fieldwork, based on the work plan, site safety plan, and QAPP. The SSC must approve the proposed list of safety equipment before field operations at a site may begin.

The Site Manager will ensure the type and number of analyses necessary for execution of a project are performed, based on the Work Plan, SAP, and QAPP. Additional health monitoring analyses may also be required under the Health and Safety Plan.

Chemical analyses will be performed at ERCE's Pioneer Laboratory located in Pensacola, Florida. The Pioneer Laboratory approved by the Navy to conduct analyses associated with the NACIP program. ERCE's ATI Laboratory in San Diego, California, will be utilized if necessary. The ATI laboratory is also Navy-approved.

ERCE's Pioneer Laboratory is chemically and biologically certified, staffed by full-time scientists and technicians, and equipped with state-of-the-art instrumentation for the full range of water, air, biota, and soil quality parameters. Laboratory

work will be performed in accordance with guidelines and protocol established by EPA and TDHE. If necessary, methods will be developed for other tests which may be required for site-specific conditions. The methods will undergo the same rigorous QA/QC checks as established procedures. QA and QC programs are conducted for instruments and analytical procedures.

5.3.5 Health and Safety Procedures

The Project Manager is assisted by the Corporate Health and Safety Officer and an assigned site Health and Safety Coordinator responsible for overseeing the health and safety program in conjunction with this project. For more information concerning the health and safety program for this contract, refer to the ERCE Corporate Health and Safety Plan and the site-specific project Health and Safety Plans (HSPs) for NAS Memphis Sites 1 through 9.

5.3.6 Additional Support Services

Additional technical and management support functions may be required in certain situations. These services are tasked on a case-by-case basis, and are most often assigned individually to support ongoing efforts for the various work phases at each site. Five basic task items fall into this category, as follows: remedial oversight support, community relations support, data management support, analytical support, and other technical support (e.g., publications).

Other support services include drafting/blueprint development, computer services/programming/software applications, computer-aided drafting and design (CADD), services and literature/information computer searches.

5.3.7 Report Approval Process

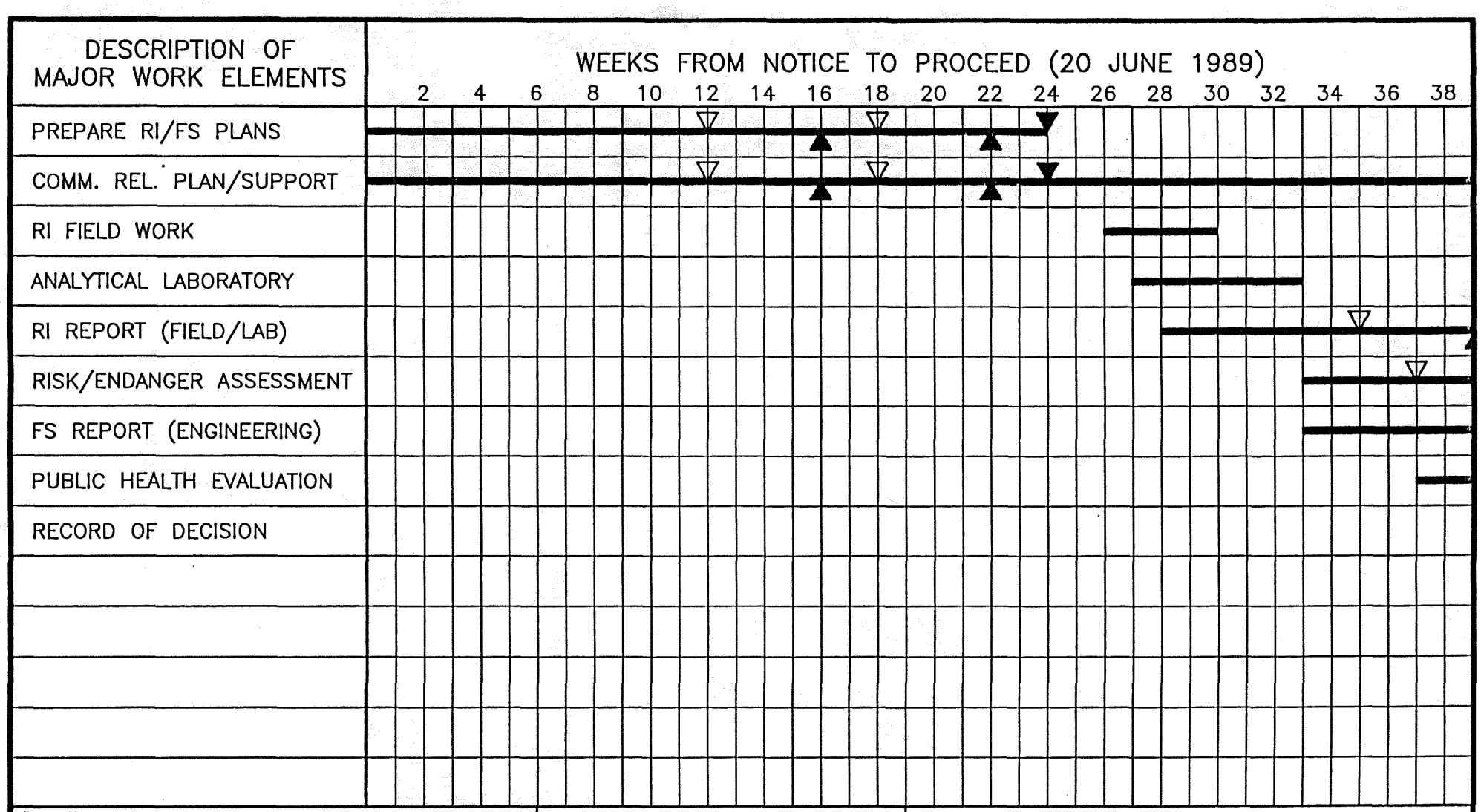
A 90% draft, draft final, and final of RI and FS reports will be submitted. These reports will include a copy of all data, and

will describe, discuss, evaluate, and interpret the data, and make recommendations. The 90% draft will be presented to the Navy for review. After receiving formal comments from the Navy, ERCE will incorporate the comments into a draft final for delivery to TRC members. At a meeting with the TRC, ERCE will discuss and review comments and the Navy's responses in the draft final. Following discussion of comments with the TRC on the draft final, appropriate comments will be incorporated into the final report.

6.0 SCHEDULE

An overall estimated schedule has been developed for the NAS Memphis project and is shown on Figure 6-1. The time scale along the top of the figure is in monthly increments for 1989 and then 6-month form 1990 on. The schedule is divided into several major items corresponding to the entire work scope for this facility. It should be understood that the given time lines are tentative and dependent upon available funding, Navy/TRC review and EPA and/or TDHE mandates.

Symbols on the schedule identify the planned time of various submittals and Navy/TRC reviews for each item. In addition, monthly field project status updates and generic plan adjustment points are shown.



REMARKS:

▽ DRAFT SUBMITTALS

▼ FINAL SUBMITTALS

▲ REVIEWER COMMENTS RECIEVED (ASSUMES 4 WEEK CLIENT REVIEW, 2 TO 4 WEEK TURNAROUND)

MADE BY: H.A. BRYSON

DATE: 14 SEPT 1989

LAST REV. DATE: NA

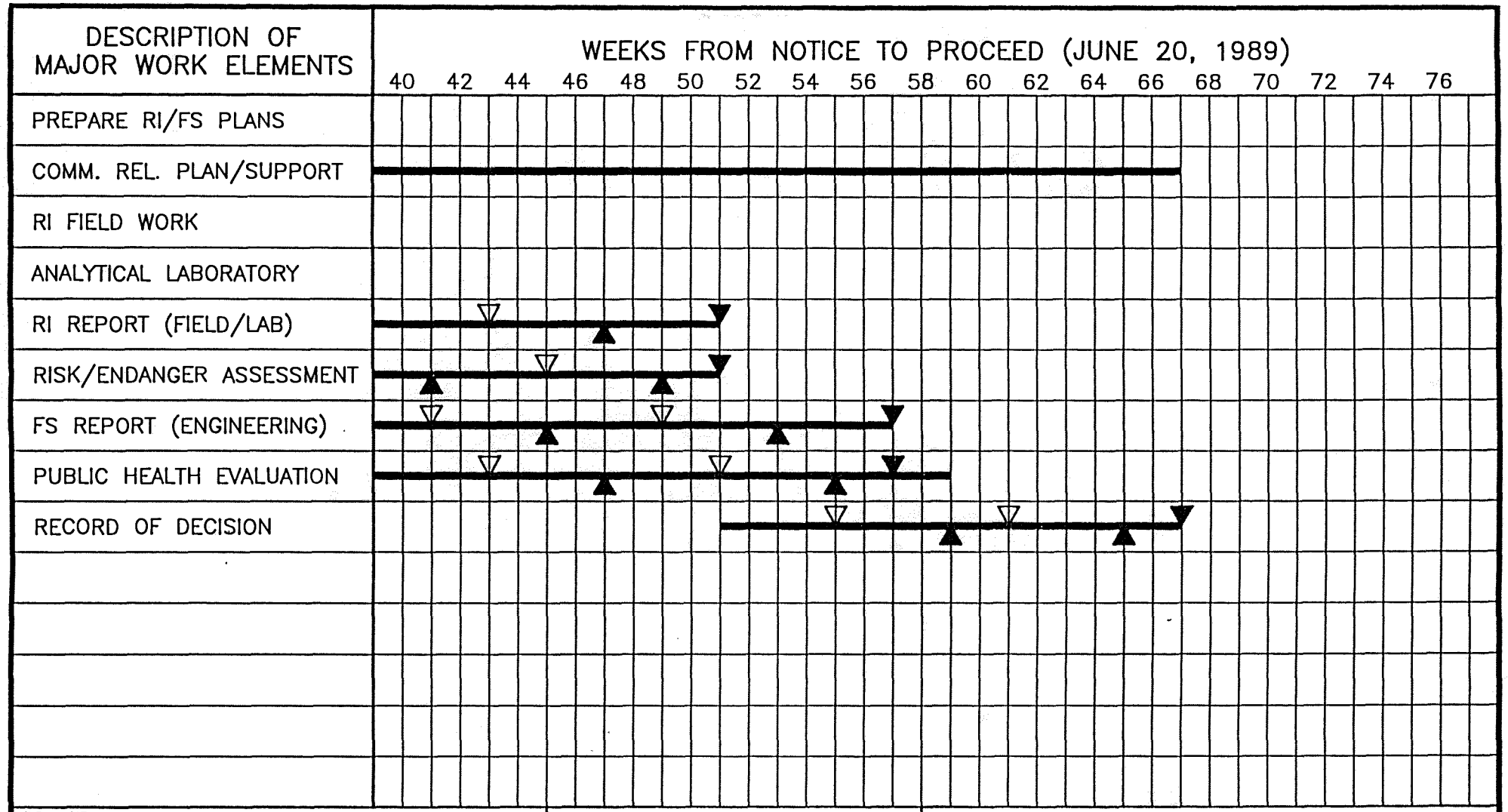
FIGURE 6–1

PROJECT SCHEDULE

FOR: NAS MEMPHIS RI/FS SITES 1 THROUGH 9

PROJECT NO. B880–062

SHEET 1 OF 2



REMARKS:

- ▽ DRAFT SUBMITTALS
- ▼ FINAL SUBMITTALS
- ▲ REVIEWER COMMENTS RECIEVED (ASSUMES 4 WEEK CLIENT REVIEW, 2 TO 4 WEEK TURNAROUND)

MADE BY: H.A. BRYSON

DATE: 14 SEPT 1989

LAST REV. DATE: NA

FIGURE 6-1

PROJECT SCHEDULE

FOR: NAS MEMPHIS RI/FS SITES 1 THROUGH 9

PROJECT NO. B880-062

SHEET 2 OF 2

APPENDIX A

BIOGRAPHICAL SUMMARIES

LIST OF RESUMES FOR KEY PROJECT PERSONNEL

Principal-in-Charge/ Program Director	Mr. Charles L. Higgins, PE Nashville, Tennessee
Project Manager/ Project Scientist	Mr. Harry A. Bryson, CHMM Knoxville, Tennessee
Deputy Project Manager/ Project Engineer	Dr. V. Cindy Lin, Ph.D, PE Nashville, Tennessee

EXPERIENCE AND QUALIFICATIONS
CHARLES S. HIGGINS, JR.

EMPLOYMENT HISTORY

1978 - Present	ERC Environmental and Energy Services Co. Nashville, Tennessee Executive Vice President
1973 - 1978	Division of Water Quality Control Tennessee Department of Public Health Nashville, Tennessee Assistant Director and Environmental Engineer
1988 - Present	Vanderbilt University Nashville, Tennessee Adjunct Instructor in Environmental Engineering

RELATED PROJECT EXPERIENCE

- Principal Engineer and QA/QC supervisor for POL and hazardous substances underground storage tank evaluations, testing and contamination assessment and QA/QC for related air, water, soil and hazardous waste sampling and analysis for the following clients:

  - Federal Chemical Company; Portland, TN
  - Wendell Bennett Mobil Station; Carthage, TN
  - Drapers Store; Lafayette, TN
  - Tenneco Oil Company; Smyrna, TN
  - Nashville Electric Service Transportation Center; Nashville, TN

Tank Management - U.S. Navy, SOUTHDIV
Principal Engineer for UST management, assessment, testing and contamination investigation and remediation in TN, LA, MS, AR, and AL

Emergency Spill and SPCC Plans - Nashville International Airport, Nashville, TN
Principal Engineer for (1) emergency response to and remediation of jet fuel spill; (2) preparation of SPCC plans for the airport, including design of containment structure to prevent release of contaminants.

Hazardous Waste Regulations Compliance - U.S. Army Corp - Huntsville Division
Principal Engineer for RCRA and CERCLA compliance at 42 military facilities throughout the U.S. Facilities contained abandoned and existing treatment, storage and disposal facilities containing hazardous, industrial and sanitary wastes and explosives.

Solid Waste Management - Nashville and Davidson County, TN
Principal Engineer for development of solid waste management plan to identify long-term disposal options (landfilling, incineration, recycling) and short-term disposal alternatives, including landfill site selection, investigation, design and permitting.

Mobil Chemical Company, Charleston, SC
Principal environmental engineer for contamination study of surface and ground water. Primary responsibilities included regulatory liaison with the State of South Carolina, Department of Health and Environment Control.

Tennessee Department of Health and Environment, Nashville, TN
Principal Engineer for investigation of contaminants from 13 abandoned hazardous waste sites around the state. Techniques included site investigations and sampling, file study, aerial photo reconnaissance and interviews of knowledgeable personnel. Management responsibilities included cost estimating and scheduling.

Volunteer Army Ammunition Plant, Chattanooga, TN
Principal Engineer for an investigation that included soil samples for physical and chemical analyses and installation, development, sampling and analyses of 32 wells to make a preliminary determination of pathways for contaminant migration.

Lasko Metal Products, Inc., Franklin, TN
Principal Engineer for review and preparation of RCRA Part A application of hazardous waste storage facility.

El Dorado Chemical Company, El Dorado, AK
Principal Engineer for preparation of hazardous waste RCRA Interim Status documents, ground water monitoring portion.

U.S. Corps of Engineers; Fort Campbell, KY
Supervised landfill site selection investigation, NEPA environmental assessment, design and preparation of operation and construction plans for permit of 60-acre sanitary landfill. The landfill is situated in karst terrain underlain by limestone and is the first facility permitted by the State of Tennessee incorporating a leachate collection system.

City of Paris Landfill; Paris, TN
Project Manager for hydrogeologic investigation, design and preparation of operation and construction plans for permit of 60-ac. sanitary landfill. Landfill underlain by limestone.

Holston Army Ammunition Plant; Kingsport, TN
Performed quality assurance for preparation of operation and construction plans for permit of 3 sanitary and demolition landfills and closure of 4 industrial landfills. Landfills underlain by limestone.

Corps of Engineers, Nashville District; Ft. Campbell, KY
Principal Engineer for investigation of JP-4 fuel leak from a 250,000 gallon underground storage tank farm and distribution system located at Ft. Campbell, KY. Investigation involved installation of monitoring wells (124 feet in depth), soil and ground water sampling and analytical analysis of samples to determine type and source of fuel in subsurface.

Martin Marietta Energy Systems, Inc.; Paducah Gaseous Diffusion Plant; Paducah, KY
Principal Engineer and Project Manager for preparation of a ground water monitoring plan for 3004(u) site characterization for the entire facility. Supervised the installation of wells and subsequent ground water monitoring activities. Interpreted subsurface data to determine the probable extent of contamination on site. The facility has about 60 Solid Waste Management Units (SWMU's). Developed the closure plan for an abandoned disposal facility containing a mixture of hazardous and radioactive wastes and provided regulatory liaison and negotiation of closure guidelines with the State of KY. Management responsibilities included cost estimating and scheduling.

Jackson Pit Site; Memphis, TN
Principal Engineer for hydrogeologic investigation and methane gas study for this 97-acre State Superfund Site. The investigative effort included geophysical investigation, soil and water analysis, subsurface exploration, well installation, community relations and remediation evaluation.

Tennessee Department of Health and Environment, Nashville, TN
Principal Engineer for Remedial Investigation (RI) studies to assess the potential of contamination (including soil, ground water and volatile organics) from 13 state Superfund sites. Techniques included site reconnaissance, surface and subsurface investigations, monitoring and sampling, file study, aerial photo reconnaissance and interviews of knowledgeable personnel. Managed multi-disciplinary teams with up to 9 site investigations active at one time.

Naval Air Station; Memphis, TN
Principal Engineer and Project Manager for the preparation of Remedial Facilities Assessment (RFA) under EPA and State of Tennessee oversight. Identified 58 potential SWMU's. Prepared Remedial Facilities Investigation (RFI) plan for the site to be studied. Performed field surveys to identify all past and present solid waste management units, including landfills, storage piles, subsurface impoundments, incineration pits and underground storage tanks that have been or are presently being used to store wastes and petroleum products.

Chickasaw Ordnance Works
Principal Engineer for the investigation of environmental hazards at this abandoned WW II munitions production facility. This study was conducted for the TN "Superfund" Division. Work included record and title searches, surveys, ground water assessment and civil engineering analysis. This project was one of thirteen similar studies for which Mr. Higgins was overall Project Director.

Scovill Chemical Company; Loudon, TN
Principal Engineer for RFI planning at an industrial plant.

Blue Grass Army Depot; Lexington, KY
Principal Engineer and Project Manager for the preparation of RFI plans for six potential SWMU's.

Genesco Superfund Site; Williamson County, TN
Quality Assurance Manager for site investigation of solvent burial site. Evaluated the extent of ground water contamination and developed remedial action plans.

Martin Marietta Energy Systems, Inc.; Oak Ridge, TN

- Quality Assurance manager for the preparation of RCRA Part B Permits for hazardous waste storage facilities.
- Quality Assurance Manager for the preparation of a closure plan for 37 underground storage tanks that contained a mixture of hazardous and radioactive wastes.
- Quality Assurance Manager for the design of new facilities and closure of old facilities for the disposal of hazardous wastes (radioactive and non-radioactive) at the Y-12 plant.

State of Tennessee
Served as Assistant Director and Environmental Engineer, TN Division of Water Quality Control for 5 years. During this period, was directly responsible for regulation of stream quality control throughout the state resulting from non-point discharges occurring from surface and underground mine operations. Developed interim status and final regulations for the control of water quality in streams affected by non-point discharges.

State of Tennessee
Developed numerous water quality regulations to implement the TN Water Quality Control Act.

Numerous Communities throughout Tennessee
Assisted numerous rural and urban communities throughout TN for compliance with the TN Water Quality Control Act by regulating and controlling POTW's and sources of non-point discharges.

Office of Surface Mining; Washington, DC
Developed a course of instruction entitled "Hydrology and Sedimentation" and taught the 2-day course to approximately 200 professional engineers, geologists and inspectors in cities in both the eastern and western United States. The course included principals of hydrology, precipitation and runoff modeling, flood analysis, sediment transport mechanisms, design of drainage structures (ditches, retention and detention basins, levees) and erosion control.

State of Michigan - Department of Conservation
Developed regulations for urban runoff and water quality control resulting from non-point discharges occurring from mining operations.

State of Tennessee
Industrial representative to State of TN area-wide committee for 208 Planning which emphasized control of non-point discharges.

Comprehensive Environmental Impact Statement for Office of Surface Mining regarding permitting of coal mining operations in TN
Principal Engineer for the assessment of geological, hydrological and hydrogeological impacts and development of model permit for coal mine operations. Project included the assessment of non-point discharges affecting stream water quality, review and editing of EIS report and response to public comment.

Residential Community; Clarksville, TN
Design of subsurface drainage system to accommodate control of urban storm water runoff in a karstic environment from a residential planned unit development.

Volunteer Army Ammunition Plant
Project Director for a Phase II contamination study of the entire facility under the IRP. Sampling and analysis of toxics and explosives in soil, surface water and ground water were conducted under procedures established by USATHAMA. Thirty-three ground water monitoring wells were installed and quantity and quality assessments were made.

Matheson Gas Products
Project Director for the evaluation of 7 toxic waste disposal sites in 5 states and Canada to assess potential for gas cylinder degradation and resultant release of contaminant at old disposal sites, including lagoons. The wastes were buried in high pressure cylinders containing acutely toxic gases including hydrogen cyanide, chlorine and phosgene. Two sites were WW II weapons plants.

Bordeaux Landfill Design and Methane Gas Study, Nashville, TN
Principal Environmental Engineer for design of 1200-ton/day sanitary landfill facility, including preparation of feasibility study to assess recovery of methane gas from 110-acre, 10-year old adjacent sanitary landfill facility. The landfill is located on the flood plain of the Cumberland River and required extensive ground water evaluation for design and permitting.

Matlock Bend Industrial Park, Tredon, TN
Principal Engineer for the preparation of a Master Plan for a 3,000-acre industrial park.

Cummings Research Park, Huntsville, Alabama

- Principal Engineer for the preparation of a Master Plan and preliminary engineering for a 2,200-acre research park development.

- Principal Engineer for the hydrologic analysis of the development in an urbanized area. Work included analysis by the application of runoff models for three watersheds, two of which were subject to frequent flooding to design a storm water management system to control erosion, sediment transport and flooding.

Heathrow, Williamson County, TN
Principal Engineer for civil site design of a residential development.

Tennessee Department of Corrections; Nashville, TN
Principal Engineer for a comprehensive review of solid waste management practices at four correction facilities. Prepared recommendations relating to recycling, waste minimization, collection, transportation and disposal.

North Hollywood Dump Site, Memphis, TN
Principal Environmental Engineer and QA/QC Consultant for a soil pesticide and heavy metals contamination sampling and testing program at this Superfund NPL site. The program is being conducted under the auspices of the CDC, Atlanta.

Memphis Area Transit Authority; Memphis, TN

- Project Manager for evaluation of an existing active methane gas system (designed by others) which had been installed to protect four buildings constructed on top of a landfill and subsequently failed.

- Principal-in-Charge for a project which included inspection of lines and manholes with television observation for leaks and breaks. The project included both storm sewers and sanitary sewers.

Chestnut Ridge Municipal Landfill; Knoxville, TN
Project Manager for hydrogeologic investigation and design for expansion of a 120-acre sanitary landfill.

Highlands Municipal Landfill; Springfield, TN
Principal Engineer for preliminary geologic and geotechnical assessment of site for landfill development in karst geology. After obtaining site approval, Principal Engineer and Project Manager for design and permitting of 28 million cubic yard sanitary landfill. Landfill design included leachate collection system and constructed soil liner.

Rutledge Pike Municipal Landfill; Knoxville, TN
Principal Engineer for landfill gas migration and remediation study in a trailer park adjacent to a municipal sanitary landfill. Principal Engineer for the design of an extension to the existing facility.

Metropolitan Government of Nashville and Davidson County Ash Disposal Feasibility Study
Project Manager for site location and design of operational plans to accommodate the disposal of ash residue from the Nashville Thermal Transfer Plant. The design includes a 100 mil HDPE liner and leachate collection system.

Hospital Humana del Pedregal; Mexico City, Mexico
Project Manager and Principal Design Engineer for a sanitary sewerage collection and treatment system using locally purchased materials and labor. The STP is a recirculating sand filter producing an effluent which is used to irrigate the hospital grounds. The project required coordination with a local (Mexico City) architect, selection of local materials, construction inspection and the preparation of the O&M Manual.

Great Lakes Chemical Company; El Dorado, AR
Principal Engineer for development of ground water section and construction and operational report for RCRA Part B application to operate two new hazardous waste landfill facilities and one interim hazardous waste landfill facility. Also supervised installation of ground water monitoring system to identify extent of contamination from existing landfill site. Conducted aquifer testing, ground water sampling and analyses to assess extent of contamination in uppermost aquifer. Coordinated permit and monitoring activities with EPA Region VI and the AR Department of Environmental Management.

Heidel Bottoms Mine; Wartburg, TN
Principal Engineer for environmental engineering analysis and design for a 200-acre surface mine located on a flood plain. Work included design of drainage systems and levees to protect mine from the 200-year flood. Analysis and modeling of 23-square mile watershed was required. The storm water model was used to predict environmental impacts.

Governor's Square; Clarksville, TN
Principal Engineer for the analysis of a 450-acre watershed which discharges into a sinkhole. These evaluations required the application and extensive use of U.S. Corp of Engineers' HEC-1 model. The project included design of a drainage well to control runoff from a $60 million commercial development.

Highsplint Dam; Brookside, KY
Principal Engineer and Engineer of Record for the design of an approximately 300 feet high, Class "C" dam. Design included hydrologic analysis of PMP floods and hydraulic analyses of various structures.

Bavaria Apartment Complex; Nashville, TN
Principal Engineer and Expert Witness for the evaluation of stormwater flows in a sub-basin of Mill Creek. Work included evaluation of peak flows and volumes for a variety of precipitation events and the relationship between development practices within the watershed and the hydrologic regime.

F.S. Route 42 Bridge; Fort Stewart, GA
Senior Engineer for the design of a tank trail bridge. Work included the hydrologic analysis of a 100-square mile watershed.

Spencer Artillery Range
Principal Engineer for environmental studies at a proposed 118,000-acre Training Center. A major task included the investigation and environmental assessment of a WW II and Korean War Bombing and Artillery range.

Camp Forest Cantonment Area
Conducted studies for the removal of structures, foundations and a STP at this abandoned WW II post.

Fordyce Wood Treaters; Fordyce, AR
Principal Engineer for hydrogeologic studies and reports to exempt wood treating industry from monitoring of ground water. Waiver obtained for ground water monitoring for hazardous waste surface impoundment facility containing pentachlorophenol.

True Temper Sports, Inc.; Amory, MS
Principal Engineer for preparation of complete RCRA Part B application documents for five hazardous waste surface impoundments.

Knoxville Wastewater Control System; Knoxville, TN
Developed land application system for disposal of 120 tons/day of municipal sludge generated from a 60 MGD wastewater treatment facility. Prepared guidelines and permit documents for application of sludge on farm and strip-mined lands.

Rutherford County Landfill; Murfreesboro, TN
Project Manager for the geologic/hydrogeologic investigation and preliminary engineering design of a 250-acre (privately owned) landfill site.

Loudon Wastewater Treatment System; Loudon, TN
Evaluated alternatives for disposal of sludge generated from a 4 MGD municipal wastewater treatment facility. Conducted costs analyses for disposal options considered.

Knox County Water and Wastewater Department; Knoxville, TN
Upgraded the operation of an 80,000 GPD secondary treatment plant to tertiary standards. Designed a sand filter to further treat the secondary effluent. System permitted by State of Tennessee for discharge to nearby sinkhole.

Huntsville Division, Corps of Engineers
Project Director for open end, task order contract for RCRA facility assessments at Bluegrass Army Depot, site of the former Nansemond Ordnance Works, PA/SI's, Pueblo Army Depot and 14 Defense Fuel Supply Plants. Contract required managing work of multi-disciplines and multi-tasks often within a short time frame.

Metro Landfill Siting Study; Nashville, TN
Project Manager for the siting of potential sanitary, ash, brush and demolition landfills to serve Metropolitan Nashville and Davidson County.

Monsanto Landfill; Columbia, TN
Environmental Engineer and Quality Assurance Manager for design of industrial landfill incorporating double-liner with leachate collection and leak detection system.

Colorado Landfill Design; Denver, CO
Design Engineer for the development of an industrial landfill at the site of an abandoned sand and gravel quarry.

Landfill Remedial Design Evaluation; Snohomish County, WA
Senior Environmental Engineer for remedial design evaluation of a large sanitary landfill involving review of existing design and construction plans. Work encompassed independent evaluations of technical merits of claims in the Cathcart lawsuit.

Speed Limestone Quarry; Columbia, TN
Environmental Engineer for siting, NPDES permitting, operational planning and monitoring of limestone quarry.

Rodgers Construction Group; Nashville, TN
Principal Environmental Engineer for NPDES evaluations, including runoff treatment, storm water management, discharge monitoring and quarry reclamation at five limestone aggregate production facilities, including open-pit quarries and underground mine.

Remedial Investigation/Feasibility Study; Oak Ridge, TN
Principal Engineer for RI/FS investigations at 2,000-acre DOE Oak Ridge National Laboratory complex involving over 150 hazardous and radioactive contaminated sites.

Huntsville Division, Corps of Engineers
Project Manager for formulation, revision and update of RCRA Part A and B permit applications for open burning/open detonation facilities under 40 CFR 264 Subpart X for 18 DESCOM, TECOM and FORSCOM installations nationwide.

EDUCATION

Master of Science, Environmental and Water Resources Engineering	Vanderbilt University Nashville, Tennessee 1978
Bachelor of Engineering, Civil Engineering	Vanderbilt University Nashville, Tennessee 1971

REGISTRATIONS

Professional Engineer	Tennessee, Florida, Georgia, Virginia, Mississippi, Ohio, Michigan, Colorado, Alabama, Washington

MEMBERSHIPS

American Society of Civil Engineers, Member of Residuals Management Committee (1980 - 1986); Solid and Hazardous Waste Management Committee (1986 - Present, Chairman 1989)
Society of American Military Engineers
National Society of Professional Engineers
Tennessee Environmental Health Association
Tennessee Society of Professional Engineers
Water Pollution Control Association
Tennessee Statewide 208 Technical Advisory Committee and Mining Subcommittee (1978 - 1979)
Advisory Committee for the Tennessee 208 Water Quality Management Continuing Planning Program. Industrial representative and member. (1979 - 1986)

PUBLICATION AND PRESENTATIONS

"Multi-Disciplinary Analysis and Design of Class V Drainage Wells for a Large Commercial Development," February, 1987 (with Phillip R. Kemmerly and Lawrence C. Weber).

"Acid Mine Drainage and a Field Method for the Treatment of Infrequently Occurring Acid Water Bodies," *Proceedings, Symposium on Environment and Mining Research and Demonstration Activities in Southern Appalachia*. Environment Center, University of Tennessee. Knoxville, Tennessee, 1978.

OTHER

- Current clearances: DOD, Secret, DOE and Q
- Currently assigned as an Environmental Officer (Major, CE, ARNG). Has over 16 years of experience with munitions, demolitions, range operations and DOD environmental programs.

EXPERIENCE AND QUALIFICATIONS
HARRY BRYSON

EMPLOYMENT HISTORY

1989 -Present ERC Environmental and Energy Services Co.
Knoxville, TN
Senior Scientist

RELATED PROJECT EXPERIENCE

- Senior Project Manager and Deputy Manager of Knoxville office. Duties include environmental investigations; engineering conceptual design and regulatory compliance interpretation and compliance; engineering group management; project management for a number of specific projects; and program management for complex, multi-project contracts involving a number of ERCE regional offices and subcontractors.

- Graduate environmental engineer and Certified Hazardous Materials Manager and Engineer-in-Training with over seven years of full-time experience in waste management and environmental assessment and remediation fields, principally with site problems involving chemical, radioactive and mixed (chemical and radioactive) wastes. He is experienced in environmental regulation compliance with respect to hazardous and industrial solid wastes, radioactive wastes and radioactive mixed wastes. He is experienced in the preparation and evaluation of environmental assessments and environmental impact statements and is familiar with risk assessment methodologies. Associated permit/compliance activity has included site assessment and monitoring of air, surface water and ground water for environmental assessment and risk analysis.

- Twenty-one years of military experience, including 4,000 flying hours as a military aircraft pilot for the USAF and the Tennessee Air National Guard; and 16 years and experience in Strategic Air Command (SAC) Command Control and Communications C^3; Operational Security (OPSEC); Communications Security (COMSEC); and USAF/ANG Disaster Preparedness programs with emphasis on survivability under conditions limited and total nuclear weapons exchanges. He has an active DoD Top Security Clearance with a current Special Background Investigations (SBI). He is a KC-135E Instructor Pilot and Battle Staff Coordinator (part-time) in the 134th Air Refueling Group, Tennessee Air National Guard, and has the USAF aeronautical rating of Command Pilot. He is also an Admissions Liaison Officer for the USAF Academy and USAF ROTC programs. Rank: Major

RCRA EXPERIENCE

- RFI plan for investigation of portions of the Clinch River watershed affected by surface water and seepage from disposal on the Oak Ridge Reservation (contaminants: heavy metals and radionuclides).
- RFA and hydrogeological investigations plan for leading underground storage tank at a manufacturing plant in Lenoir, NC.
- PEA for an inactive light manufacturing plant near Jena, LA.
- Numerous Environmental Audits for operating and idle commercial facilities.
- RCRA Corrective Measures Studies, Corrective Measures Plans and Corrective Actions (CMS/CAP/CA) included
  - Design and permit application for temporary waste piles for management of low level, radioactively-contaminated soils at 3 DOE sites in NJ.
  - Design of a subsurface (soil) drainage system for ground water level depression at a former lead-acid battery reprocessing site in Jacksonville, FL.
  - Post closure plan for an analytical chemistry laboratory waste disposal area in Knoxville, TN.
  - Leachate Management study for 3 temporary low-level radioactively-contaminated soil waste piles in NJ.
  - Revision of 6 RCRA Part B permit applications for DOE, K-25 Plant Oak Ridge, TN.
  - OB/OD unit RCRA Part B permit applications per 40 CFR 264-Subpart X at Milan and Volunteer Army Ammunition Plants in Tennessee.

REMEDIAL INVESTIGATION/FEASIBILITY STUDIES (RI/FS)

- Engineering feasibility study and geologic report review for the remediation of DOE's Weldon Spring, MO, site (low level radioactive contamination uranium, thorium). Preparation of responses to local interest groups.

- Remedial investigations plan for NPL site near Columbia, SC (former waste solvent storage area).

- Remedial investigation report for Cabot Carbon/Koppers NPL site in Gainesville, FL (former wood distillation products production and current wood preserving activities).

- Remedial investigation work plan, RI report feasibility study, Record of Decision document and remedial design documents for a portion of Williams AFB, AZ (leaded gasoline, metal plating waste discharge area).

- RI report for an inactive municipal landfill in Middlesex, NJ, contaminated with uranium or processing waters from a nearby DOE facility.

- Peer Review (for EPA Region IV) of RI report of NPL site near Asheville, NC.

REMEDIAL DESIGN/REMEDIAL ACTION (RD/RA) EXPERIENCE

- Remedial design documents for remediation of a contaminated (lead) drainage ditch at Williams, AFB, AZ (soil cementation and concrete ditch liner).

- Remedial design documents for interim ground water treatment system at Picatinny Arsenal, NJ (ground water pretreatment, air stripping and carbon filtration for removal of volatile organic contaminants).

- Remedial design document for construction of all low level radioactive waste landfill at DOE's Niagara Falls, NY, facility (uranium and radium wastes).

- Preliminary remedial design document for conversion of wastewater lagoons at DOE's Weldon Spring, MO site into above-ground, solidified-waste, low level radioactive waste landfills.

EDUCATION

Master of Science Environmental Engineering	University of Tennessee Knoxville, Tennessee 1984
Bachelor of Science Engineering Physics	University of Tennessee Knoxville, Tennessee 1981
Master of Science, Biology	Butler University Indianapolis, IN 1979
Bachelor of Science, Life Sciences	USAF Colorado Springs, CO 1971

REGISTRATION

Certified Hazardous Materials Manager - Masters Level 1986

OTHER

DoD Top Secret Clearance (Active), with current special Background Investigation (SBI)

29 CFR 1910.120 Health and Safety Trained and Medically Monitored

EXPERIENCE AND QUALIFICATIONS OF
Y. CINDY LIN

EMPLOYMENT HISTORY

1988 - Present	ERC Environmental and Energy Services Co. Nashville, TN Environmental Engineer
1985 - 1988	Kansas Department of Health & Environment Municipal Programs Section, Bureau of Water Protection Topeka, KS Environmental Engineer
1985	IMS Engineers, P.C. Rochester, NY Civil Engineer
1983 - 1985	Oklahoma State University Stillwater, OK Project Researcher
1980 - 1982	Georgia Institute of Technology Atlanta, GA Research Assistant

RELATED PROJECT EXPERIENCE

Sanders Lead Company; Troy, AL
Environmental Engineer responsible for the preparation of RCRA Part A and Part B permit applications, ground water assessment and ground water corrective action plan (remediation). Project involved in-plant surface water and ground water study, investigation of secondary lead smelting facilities, feasibility study and assessment of remedial alternatives.

Kansas State-wide Toxics Inventory Control; KS
Environmental Engineer responsible for the development of a toxics control methodology for municipalities and industries in Kansas to trace, control and report both point and non-point toxics sources.

Kansas Ground water Cleanup Target; KS
Environmental Engineer responsible for the requirements and criteria development for ground water quality control. The responsibilities included evaluation of toxic Health Advisory (HA) published by EPA, conducting risk assessment, establishment of state action/notification levels of specific chemicals and maintaining a computerized tracking system of drinking water standards. Also served as state coordinator of EPA "How Clean is Clean?" program.

Kansas State-Wide Sludge Management Plan; KS
Environmental Engineer responsible for the development of Kansas Sludge Management Plan. The responsibilities included the technical review and assessment of proposed EPA regulations governing the NPDES sludge permitting and management practice and establishment of a computerized state-wide sludge inventory. Oversaw the construction projects of municipal sludge handling, treatment and disposal facilities. Also served as technical advisor for all sludge-related issues.

Kansas Combined Sewer Overflow Inventory; KS
Environmental Engineer responsible for the development of a state-wide inventory of combined sewer overflow sources for the assessment of stream impact by combined storm and sanitary sewer overflows.

EPA Construction Grant Projects; KS
Environmental Engineer responsible for the technical and regulatory review of engineer reports, facilities plans and construction plans and specifications for the construction of wastewater and water treatment facilities. Reviewed engineering contracts, construction change orders, plan of operations, operation and maintenance manuals, financial capability, project performance and cost estimates. Responsibilities also included the inspection of construction sites and monitoring of the construction activities. Also provided technical assistance for the establishment of state policies, standards and regulations governing the design and operation of water and wastewater treatment works.

Reich Farm Site (EPA Superfund NPL Site); NJ
Civil Engineer responsible for the establishment of the site QA/QC plan, site operation plan, safety plan and sampling and analytical plan for the remedial investigation/feasibility study (RI/FS).

New York State Superfund Sites; NY
Civil Engineer responsible for the preparation of RI/FS reports for Williamson Landfill Site, Clifton Park Landfill Site and German Flatts Landfill Site.

Wastewater Treatment O & M Manuals, NY
Civil Engineer responsible for the preparation of O & M manuals for the Chatauqua Sewage Plant, Silver Lake Sewer System and Erie County Sewage work.

Highway Drainage Design; NY
Civil Engineer responsible for the drainage design for the Transit Road Project in Buffalo, NY.

Hazardous Waste Treatment; OK
Project Researcher involved in research activities of two major EPA projects: "Land Treatment of Industrial Hazardous Wastes" and "Biokinetic Study of Organic Priority Pollutants by Activated Sludge." The types of waste subject to the land treatment study included oil refinery waste, slop oil and wood preserving waste.

Horton River; TN
Research Assistant responsible for the stream modeling and kinetic study project funded by Tennessee Valley Authority. The project involved the photokinetic study of residual chlorine compounds in the power plant cooling system blow-down and two-dimensional stream modeling in the Horton River, a tributary of the Tennessee River.

EDUCATION

Doctor of Philosophy, Civil Engineering	Oklahoma State University 1986
Master of Science, Sanitary Engineering	Georgia Institute of Technology 1982
Bachelor of Science, Civil Engineering	Tamkang University, Taiwan 1979

REGISTRATION

Professional Engineer	Kansas, Oklahoma, Tennessee (pending), Alabama (pending)

MEMBERSHIPS

American Society of Civil Engineers
Society of Women Engineers
American Water Works Association
Association of Water Pollution Control, Kansas

PUBLICATIONS

Lin, et al., "Decomposition and Transport of Monochloramine in Fresh Water." Water Science Technology, v. 15, pp. 215, 1983.

Kincannon, D.F., Y. Lin, E. L. Stover and V. A. Mast, "Kinetics of Microbial Degradation of Hazardous Wastes by Land Treatment," Final Project Report to EPA, Ada, OK, 1984.

Lin, Y., "The Application of Mass Transport Theory for RBC Performance." Presentation, Oklahoma State University, Stillwater, OK, 1984.

Kincannon, D. F. and Y. Lin, "Land Treatment of Industrial Hazardous Wastes," Procd. of the 40th Purdue Industrial Waste Conference, 1985.

OTHER

Technical Advisor of EPA National Task Force for CAPDET (Computer Aided Process Development and Evaluation Train).

Engineering Malpractice Screening Panel, Kansas State Board of Technical Profession.

APPENDIX B

SCOPE OF WORK

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CONTRACT NO. N62467-88-C-0198
(w/Amendment 1)

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
2155 EAGLE DR., P. O. BOX 10068
CHARLESTON, S. C. 29411-0068

PLEASE ADDRESS REPLY TO THE COMMANDING OFFICER, NOT TO THE SIGNER OF THIS LETTER.
REFER TO:
5090
11519/OC

20 JUN 1989

ERC
Environmental and Energy Service Co.
Attn: Mr. Charles Higgins
3325 Perimeter Hill Drive
Nashville, TN 37211

Subj: CONTRACT N62467-88-C-0198, SOIL AND/OR GROUNDWATER CONTAMINATION INVESTIGATIONS, NAVAL AIR STATION, MEMPHIS, MILLINGTON, TN AMENDMENT NO. 1

Dear Mr. Higgins:

In accordance with the terms of the subject contract, the Government wishes to amend the statement of work. The required services for this amendment are stated in the attached Amendment No. 1 of June 12, 1989 to the statement of work.

It is requested that you submit a fee proposal on enclosure (2) (original and four copies) including sufficient detail to permit an adequate review to: Commanding Officer, Southern Division, Naval Facilities Engineering Command, P. O. Box 10068, Charleston, S. C., 29411-0068, Attn: (Code 0231, JM) on or before June 22, 1989. Upon completion of a review of your proposal, you will be contacted to schedule a date for starting negotiations.

You are reminded that this letter does not constitute authority to proceed with any work specified in this request. A contract change is dependent upon the successful completion of negotiations. In the unlikely event that these negotiations are unsuccessful, the Government cannot be held liable for any expenses incurred in the preparation of your proposal.

Sincerely,

Doris K. Ott

DORIS K. OTT
MAJ, CEC, USAF
CONTRACTING OFFICER
CONTRACTS SUPPORT CONTRACTS BRANCH

Encl:
(1) Scope of Work
(2) A&E Fee Proposal Form

Copy to:
NAS Memphis (Ms. Lancaster)

DATE: 12 JUNE 89
CODE 11519

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
P. O. BOX 10068
CHARLESTON, SOUTH CAROLINA 29411

STATEMENT OF WORK
N62467-88-C-0198
Amendment #1

I. INTRODUCTION

A. PROJECT TITLE: CONTRACT N62467-88-C-0198, A/E SERVICES TO CONDUCT SOIL AND/OR GROUNDWATER CONTAMINATION INVESTIGATION FOR NAVAL AIR STATION MEMPHIS, MILLINGTON, TN

B. LOCATION: Naval Air Station (NAS) MEMPHIS, MILLINGTON, TN and all associated Navy property owned or formerly owned.

C. GENERAL DESCRIPTION:

C.1. The objective of the Naval Installation Restoration (IR) Program is to investigate and remediate uncontrolled hazardous waste disposal sites located on naval activities and related sites. This work shall amend the basic scope of work dated 21 May 1989 to include a Pre-Technical Review Meeting and a Technical Review Meeting.

C.2. Pre-Technical Review Meeting: The A&E shall meet with the EIC and Activity personnel at the activity on 29 June 1989 at 2:00 p.m.. The A&E shall be allowed three members to attend. The A&E shall be prepared to discuss his actions to prepare the project as stated in the basic scope of work dated 21 May 1989. This meeting will be used to inform the Commanding Officer of the work to be done and to receive comments and questions from him. The A&E is reminded that he works for SOUTHERN DIVISION NAVAL FACLILTIES ENGINEERING COMMAND, Charleston, S.C.. The A&E shall record all minutes of the meeting and submit and distribute in accordance with Section III, L.1 and L.2 of the basic scope.

C.3. Technical Review Meeting: The A&E shall meet with the EIC, Activity personnel and the other members of the TRC at the activity, on 30 June 1989 at 2:00 p.m., attachment (1) is the agenda. The A&E shall be allowed three members to attend and one court reporter. The A&E shall be prepared to discuss his actions to prepare the project as stated in the basic scope of work. The A&E is reminded that he works for SOUTHERN DIVISION NAVAL FACLILTIES ENGINEERING COMMAND, Charleston, S.C.. The A&E shall record all minutes of the meeting by the use of an court reporter and submit and distribute in accordance with Section III, L.1 and L.2 of the Basic Scope as follows:

" L. Submittal Schedule and Distribution

L.1. SUBMITTAL SCHEDULE

SUBMITTAL DATE (days after/event)	SUBMITTALS *A	*B	*C
MINUTES OF MEETINGS			
IRP MEETINGS			
Due 10 days after meetings.	3	15	0
OTHER THAN IRP MEETINGS			
Due 10 days after meetings. (NOTE : ONE COPY TO ALL WHO ATTEND)	3	6	0

L.2. DISTRIBUTION

Addressees

a. **SOUTHDIV**

Commanding Officer
Attn.: (Code 11519)
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
PO Box 10068
Charleston, SC 29411-0068

b. **ACTIVITY**

Commanding Officer
Attn.: Public Works Engineering
Naval Air Station MEMPHIS
Millington, TN 38054-5000"

C.4. Section I of the basic scope applies.

AGENDA FOR TECHNICAL REVIEW COMMITTEE MEETING

JUNE 30, 1989 AT 2:00 PM IN BUILDING S-1

NAVAL AIR STATION MEMPHIS

1. Welcome (CAPT Richard Grant, Commanding Officer, Naval Air Station Memphis)

2. Update on status of RCRA Facility Investigation Work Plan for NAS Memphis. (Mr. Robert Moser, SOUTHNAVFACENGCOMM)

3. Tour of Installation/Restoration Program Sites (12).

4. Return from tour. Questions and discussion session.

5. Discuss TRC Charter and sign document.
(Member Representatives)

6. Schedule next meeting.

DATE: 05 DEC 88
CODE 11439
REVISED 06-01-89

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
P. O. BOX 10068
CHARLESTON, SOUTH CAROLINA 29411

STATEMENT OF WORK
N62467-88-C-0198
BASIC AWARD

I. INTRODUCTION

A. PROJECT TITLE: CONTRACT N62467-88-C-0198, A/E SERVICES TO CONDUCT SOIL AND/OR GROUNDWATER CONTAMINATION INVESTIGATION FOR NAVAL AIR STATION MEMPHIS, MILLINGTON, TN

B. LOCATION: Naval Air Station (NAS) MEMPHIS, MILLINGTON, TN and all associated Navy property owned or formerly owned.

C. GENERAL DESCRIPTION:

C.1. The objective of the Naval Installation Restoration (IR) Program is to investigate and remediate uncontrolled hazardous waste disposal sites located on naval activities and related sites. The work may include identification and quantification of contaminant concentrations, the extent of migration and the effects on human health and the environment. The studies may consist of field investigations, including but not limited to: monitoring well installation, collection of air, water, soil, sediment, and biological samples, geophysical investigations, site survey, contaminate fate and transport modeling, and analysis of chemical contaminants. Studies to determine remedial alternatives or corrective actions, including bench tests or pilot studies, may also be required. Site remediation may subsequently be initiated based on findings of the IR Program investigation reports. The establishment for a public relations program required concurrently with this work by regulatory status may also be provided.

C.2. The IR Program investigation might be designed to identify contamination resulting from past Navy operations and to institute remedial action as needed. The IR program follows the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and 40 CFR 300, The National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The NCP is a five step response process: 1) Site Discovery or Notification 2) Preliminary Assessment and Site Inspection (PA/SI) 3) establishment of priorities for remedial action 4) Remedial Investigation and Feasibility Study (RI/FS) and 5) Remedial Design and Remedial Action (RD/RA).

C.3. A Resource Conservation and Recovery Act (RCRA) Facilities Assessment/Investigation might be completed at sites identified here in. The Hazardous Solid Waste Amendment (HSWA) permit

has been issued, and will be addressed further under this contract. The RCRA work at NAS under this contract may be to verify prior or continuing releases of hazardous waste or constituents from the solid waste management units (SWMU's) identified by the EIC. If releases of contaminants are found, corrective action plans and specifications may be required.

C.4. The following sites at NAS Memphis are included for work under this contract:

Site 1 Fire Department Drill Area
Site 2 South-Side Landfill
Site 3 N-121 Plating Shop Dry Well
Site 4 N-121 Plating Shop Storm Sewer
Site 5 Fire-Fighting Training Area
Site 6 N-126 Battery Shop Storm Sewer Ditch
Site 7 N-126 Plating Shop Dry Well
Site 8 Cemetery Disposal Area
Site 9 Sewage Lagoons
Site 10 North-Side Landfill
Site 11 Oiled, Dirt Roads
Site 12 Galley Disposal
Site 13 Bldg 499 Grease Pit
Site 14 S-140 Site & 7th Ave Ditch
Site 15 N-94 Tank Farm
Site 16 N-94 Above Ground Waste Tanks
Site 17 S-9 Underground Waste Tank
Site 18 N-112 Underground Waste Tank
Site 19 341 Underground Waste Tank
Site 20 1594 Underground Waste Tank
Site 21 N-10 Underground Waste Tank
Site 22 S-75 Underground Fuel Tanks
Site 23 S-8 Underground Fuel Tank
Site 24 Auto Shop Waste Oil Tank
Site 25 Big Creek Landfill
Site 26 N-102 Battery Acid Treatment
Site 27 Northside STP
Site 28 Southside STP
Site 29 Lakehouse STP
Site 30 Parkfield Waste Treatment Tank
Site 31 Aircraft Wash Rack @ 4th ST.
Site 32 N-7 Aircraft Wash Rack
Site 33 H-10 Incinerator
Site 34 H-109 Incinerator
Site 35 1579 Incinerator
Site 36 North STP Incinerator
Site 37 South STP Incinerator
Site 38 Industrial Drainage Ditch
Site 39 S-75 PCB Storage Area
Site 40 Salvage Yard #1
Site 41 Salvage Yard #2
Site 42 N-12 Hazardous Waste Storage
Site 43 H W Accum. Pt. @ S-176
Site 44 H W Accum. Pt. @ N-102
Site 45 H W Accum. Pt. @ S-142
Site 46 H W Accum. Pt. @ S-140
Site 47 H W Accum. Pt. @ 344
Site 48 H W Accum. Pt. @ S-9

Site 49 H W Accum. Pt. @ 757
Site 50 H W Accum. Pt. @ N-126, MAG-42
Site 51 H W Accum. Pt. @ N-126, VR-60
Site 52 H W Accum. Pt. @ N-126, VP-67
Site 53 H W Accum. Pt. @ N-126, AIMD
Site 54 H W Accum. Pt. @ Dental Clinic
Site 55 H W Accum. Pt. @ Medical Clinic
Site 56 H W Accum. Pt. @ 352
Site 57 H W Accum. Pt. @ S-183
Site 58 H W Accum. Pt. @ S-360
Site 59 Pesticide Storage Facility

An additional 15 sites may be added by the EIC.

C.5 Special Instructions

C.5.1. The Government reserves the right to hold in abeyance any phase of option and may cancel the contract at the completion of any phase or option.

C.5.2. The A&E will be responsible for obtaining all necessary permits and authorizations required to perform work under this contract. The A&E will be responsible for all damages to persons or property that occur as a result his fault or negligence.

C.5.3. A schedule for all on-base work will be coordinated with the activity representative (George Robertson 901-873-5209).

C.5.4. The A&E is responsible for recording minutes of all meetings attended and providing a copy of the minutes to all attendees. SOUTHNAVFACENGCOM (Attn.: Code 11519) shall be included for copies of minutes regardless of attendance.

C.5.5. The A&E is responsible for obtaining permission and clearance from the appropriate station security personnel to enter and perform any necessary work.

C.5.6. The A&E shall forward submissions directly to those concerned as directed in Section III of this scope.

C.5.7. The A&E shall be responsible for returning drilling and sampling sites back to their original condition after site work is complete.

C.5.8. The A&E shall not release or publicize in any manner information or data regarding work performed under this contract or subsequent modifications. Any outside inquiries concerning the project shall be directed to the Engineer-In-Charge (EIC).

C.5.9. The A&E shall set quality control limits on all phases of work. These limits shall be set in the work plans. In the event quality standards are not met, the A&E will repeat the work at no cost to the government on a mutually agreed upon schedule.

C.5.10. The A/E's original files shall be the property of the Government as stated in the contract clauses and shall be

submitted to the Government upon the completion or cancel of this contract or upon the request of the Government.

C.5.11. The schedule and timing of this work will vary depending on site status Technical Review Committee (TRC) review and funding.

C.5.12. All drilling material and other materials/waste generated by the A/E or his subcontractor in the course of their performance of this contract on NAS Memphis property shall be the responsibility of the A/E to properly package, identify, label and furnish the activity with all appropriate information for the activity to properly disposed of the waste, if the material/waste contains hazardous constituents, otherwise it will be the responsibility of the A/E to dispose of the materials/wastes.

C.5.13. The A&E shall provide and maintain the Administrative Record requirements for each phase of the work performed. This includes the documentation of objectives, achievements and amendments to these documents for the development of the Record of Decision (ROD). The Administrative Record shall be transferred to the EIC at the completion of each phase of work.

C.6 Applicable Documents (Updated editions of the following documents shall be used as they become available)

1. "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" draft dated March 1987
2. Initial Assessment Study of NAS Memphis, TN November 1983 *
3. "Superfund Public Health Evaluation Manual" Contact : US EPA October 1986
4. "Draft Guidance for Conducting RCRA Facility Investigations" OSWER Directive 95002.00-6C
5. "Methods of Chemical Analysis for Water and Wastes",EPA/600/4-79-020.
6. "Procedures for Handling and Chemical Analysis of Sediment and Water Samples", Technical Report EPA/CE-81-1.
7. Standard Methods for the Examination of Water and Wastewater American Public Health Association, Latest Edition.
8. "Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program", NEESA 202.2-047B. *
9. Practical Guide for Groundwater Sampling, Illinois State Water Survey, Champaign Illinois, 1985, ISWS Contract Report 374.
10. Specifications for Monitoring Well Installation and Sampling, Southern Division, Naval Facilities Engineering Command. *
11. Superfund Remedial Design and Remedial Action Guidance Documents US EPA.
12. US EPA Additional Interim Guidance for FY87 Record of Decision OSWER 9355.0-21
13. National Contingency Plan (NCP) 40 CFR 300
14. Confirmation Study, Verification Phase At The NAS Memphis, TN, G&M, Nov. 1985 *
15. "Community Relations in Superfund: A Handbook" USEPA

OSWER Directive 9230.0-3A

16. "Data Quality Objectives for Remedial Response Activities" OSWER Directive 9335.0-7B

17. "Guidance on CERCLA Compliance with other Statutes" USEPA July 1987

18. "Compendium of Superfund Field Operations Methods" USEPA 540/P-87/001a September 1987

19. "Superfund Exposure Assessment Manual" USEPA

20. "Guidance on Remedial Action for Contaminated Groundwater at Superfund Sites" USEPA October 1986.

21. "Guidance for Coordinating ATSDR Health Assessment Activities with the Superfund Remedial Process" OSWER 9285.4-02

22. "Technology Screening Guide for Treatment of Contaminated Soils and Sludges" USEPA

23. "Remedial Action Costing Procedures Manual" USEPA

24. Inventory Report RCRA Facility Assessment (RCRA), NAS Memphis, TN, EDGe, April 1987 *

25. Site Investigation Plan RCRA Facility Investigation (RFI) NAS Memphis, TN, EDGe, April 1987 *

26. Sampling Report - NAS Memphis, TN, EnSafe, August 1988 *

27. GUIDE FOR ARCHITECT-ENGINEER FIRMS PERFORMING SERVICES FOR THE SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND, SOUTHNAVFACENGCOM P-141, latest edition *

28. SECNAVINST 5720.44A (Department of the Navy Public Affairs Policy and Regulations)

29. NAVFACINST 5720.4C, NAVFACENGCOM Public Affairs Instruction (26 November 1986)

30. NAVFAC P-1024, Public Affairs Guide (January 1987)

31. INSTALLATION RESTORATION PUBLIC AFFAIRS PLAN (8 MARCH 1988)

32. REPORT FORMAT GUIDANCE MANUAL - SOUTHERN DIVISION NAVAL FACILITIES ENGINERRING COMMAND, 14 March 1989 Rev. 2 *

33. EPA DRAFT GUIDANCE ON PREPARING SUPERFUND DECISION DOCUMENTS: THE PROPOSED PLAN AND RECORD OF DECISION, MARCH 1988

* — These documents will be made available upon request on a loan basis for copying purposes.

C.7 <u>ABBREVIATIONS:</u>

ARC - AFTER RECEIPT OF FORMAL COMMENTS FROM EIC
CA - CORRECTIVE ACTION
CRP - COMMUNITY RELATIONS PLAN
DMP - DATA MANAGEMENT PLAN EIC - ENGINEER-IN-CHARGE (at Southern Division Code 11439)
DQO - DATA QUALITY OBJECTIVES
FS - FEASIBILITY STUDY
HRS - HAZARD RANKING SCORE
HSP - HEALTH AND SAFETY PLAN
NCR - NAVY CONTRACT REPRESENTATIVE
PA - PRELIMINARY ASSESSMENT
PDR - PRE-DESIGN REPORT
PMP - PROJECT MANAGEMENT PLAN
RA - RISK ASSESSMENT
RD/RA- REMEDIAL DESIGN/REMEDIAL ACTION
RFA - RCRA FACILITY ASSESSMENT

RFI - RCRA FACILITY INVESTIGATION
RI - REMEDIAL INVESTIGATION
RM - REMEDIAL MEASURES
ROD - RECORD OF DECISION
SAP - SAMPLE ANALYSIS PLAN
SI - SITE INVESTIGATION
SMP - SITE MANAGEMENT PLAN
TRC - TECHNICAL REVIEW COMMITTEE
TS/PS- TREATABILITY STUDY/PILOT STUDY

II. GENERAL SCOPE OF WORK

A. This work will be accomplished in the following phases:

Phase I - Preliminary Assessment (PA)
Phase II - Site Investigation (SI) Work Plan
Phase III - Site Investigation (SI)
Phase IV - Remedial Investigation / Feasibility Study (RI/FS) Work Plan
Phase V - Remedial Investigation (RI)
Phase VI - Feasibility Study (FS)
Phase VII - Remedial Design and Remedial Action (RD/RA)
Phase VIII - RCRA Facility Assessment (RFA)
Phase IX - RCRA Facility Investigation (RFI) Work Plan
Phase X - RCRA Facility Investigation (RFI)
Phase XI - Corrective Action Plans (CA)
Phase XII - Treatability Studies (TS)
Phase XIII - Pre-design Reports (PDR)

Each phase shall be a separate option of the government, to be negotiated and awarded separately or in any order or combination, as deemed appropriate by the government, as conditions at all sites are unknown. Additional work in any phase may be ordered at the option of the Government

B. OPTIONS:

As required the work as stated in the following phases may be added to this contract by written modification.

B.1. PHASE I - PRELIMINARY ASSESSMENT (PA)

At the option of the government, this scope of work may be amended to include a Preliminary Assessment (PA) and/or EPA 103c Notice and/or EPA PA form and/or Preliminary Hazard Ranking System (HRS) Score. Meetings and/or conferences may be required. Progress reports may be required.

B.1.1. A PA is to collect and review all available information about the history of generation, handling, storage, treatment and disposal of all solid and liquid waste of a potentially hazardous nature at the site. This may involve a site visit, reviewing activity records, and a general site familiarization. An Assessment Report will be provided which provides the sources of

information, site identification/location, investigation findings and a recommendation for site inspection. The recommendation should provide an outline of work which will develop sufficient input for determining a Hazard Ranking System site specific score. The outline of work shall define the extent of chemical, hydrogeologic and atmospheric sampling of each site.

B.1.2. Detailed requirements which also includes but not limited to the type of submittial, the number of submittals as well as the number of copies for this phase of work shall be defined and negotiated separately.

B.2. PHASE II – SITE INVESTIGATION (SI) WORK PLAN

At the option of the government, this scope of work may be amended to include a Site Investigation Work Plan and may consist of a plan defining the objectives of site sampling for surface water, soil, sediment, and any other proposed sampling media. The purpose of an SI will be to gather the data necessary to perform the Hazard Ranking System (HRS) for the site being investigated. The A&E may have to prepare or revise a SMP, and/or PMP, and/or CRP, and/or DMP, and/or SAP, and/or HSP, as described below, for this phase. Meetings and/or conferences may be required. Progress reports may be required. The A&E may be required to prepare permit applications/revisions.

B.2.1. Investigation Work Plan : (at the government's option) This plan will be submitted prior to beginning any site investigation and will address all appropriate tasks.

B.2.2. Site Management Plan (SMP) : (at the government's option) The A&E might have to submit a SMP for all field work. This plan provides a record of the Investigation objectives and identifies the ARAR'S Requirements. It also identifies the Data Quality Objectives (DQO) and analytical detection levels to be used throughout the investigation.

B.2.3. Project Management Plan (PMP) : (at the government's option) The A&E might have to submit a PMP. This plan documents the overall management approach. The PMP includes a description of qualifications of personnel performing or directing the investigations as well as a discussion of technical approaches and schedules.

B.2.4. Community Relations Plan (CRP) : (at the government's option) The purpose of the CRP will be to involve the public in activities and decisions made about the sites under investigation at the facility. The plan might include (but is not limited to) provision & management of: for a site specific mailing list, a conveniently located place for access to all public information about the site, stenographic services or court reporter for (TRC and other CERCLA meetings), and/or a public meeting when reports and proposed plan(s) are published. It may also include a summary of public comments on the investigation report(s) and proposed plan(s) and the Navy's response to those comments. The CRP will follow current EPA and Navy guidance for the community relations plans.

B.2.5. Data Management Plan (DMP): (at the government's option) The DMP addresses the data and report processing procedures, project file requirements, and project-related progress reporting procedures and documents. This plan provides the formats to be used to present the data, including data reduction. All data and reports will be provided on five and one-quarter inch floppy disc in a format accessible to IBM PC-compatible machines using MS-DOS and Enable software.

B.2.6. Sampling and Analysis Plan (SAP): (at the government's option) The A&E might have to submit a SAP which consist of two parts: (1) a quality assurance project plan (QAPP) that describes how the DQO's will be achieved; and, (2) a field sampling plan that provides guidance for all field work. The SAP might be written in accordance with current EPA, TDHE and Navy guidance. The SAP may have to be approved by the regulatory agencies. The Laboratory may have to meet Navy certification.

B.2.7. Health and Safety Plan (HSP): (at the government's option) The A&E might have to submit a HSP which includes all personnel expected to conduct site work and includes any needed site-specific safety requirements. The plan may have to conform to current EPA guidance documents. The plan shall also follow the requirements of 29 CFR 1910.120 (1)(1) and (1)(2), and any subsequent amendments. Subcontract personnel may be included or covered by a separate submittal meeting equivalent standards.

B.2.8. Detailed requirements which also includes but not limited to the type of submittal, the number of submittals as well as the number of copies for this phase of work shall be defined and negotiated separately.

B.3. PHASE III - SITE INVESTIGATION (SI)

At the option of the government, this scope of work may be amended to include a Site Investigation (SI) and/or EPA SI forms and/or Hazard Ranking System (HRS) Score. The A&E may have to prepare or revise a SMP, and/or PMP, and/or CRP, and/or DMP, and/or SAP, and/or HSP as part of this phase. Meetings and/or conferences may be required. Progress reports may be required. Progress reports may be required. The A&E may be required to prepare permit applications/revisions.

B.3.1. The Site Investigation (SI) might determine whether specific toxic and hazardous materials identified in the PA are present in concentrations considered to be hazardous. Efforts might include sampling of existing monitoring wells, sediment, soil and surface water. Installation of additional wells, if required to determine the presence of contaminants must be approved by the EIC. The result of this phase might be a general evaluation of contamination found, including hydro-geological, health, safety and regulatory aspects and a proposal for further site characterization. The A&E may have to develop a Hazard Ranking System (HRS) score for each site at the activity. The A&E may have to complete "EPA Checklist of Data Requirements" for each site. The A&E may have to calculate a HRS score for each site in accordance with the procedures

specified in the National Contingency Plan (NCP), "Appendix A" (User's Manual), or the most current official EPA guidance for conducting an HRS evaluation. The A&E may have to submit all worksheets, forms, etc. completed under this phase in a brief report that summarizes the results of the evaluation. Within this report, the A&E may have to identify and discuss any assumptions made during the assessment and make recommendations where appropriate.

B.3.2. Detailed requirements which also includes but not limited to the type of submittial, the number of submittals as well as the number of copies for this phase of work shall be defined and negotiated separately.

B.4. PHASE IV – REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS) WORK PLAN

At the option of the government, this scope of work may be amended to include either a Remedial Investigation/Feasibility Study (RI/FS) Work Plan or (RI) Work Plan or (FS) Work Plan. The A&E may have to prepare or revised a SMP, and/or PMP, and/or CRP, and/or DMP, and/or SAP, and/or HSP as part of this phase. Meetings and/or conferences may be required. Progress reports may be required. The A&E may be required to prepare permit applications/revisions.

B.4.1. The (RI/FS) Work Plan may consist of the review of existing data and define new objectives. The plan may also consist of proposing methodology and procedures to determine concentration, migration potential, pathways and receptors of any contamination. The work plan might delineate methodology(s) to gather data which may be required for the evaluation of remedial action alternatives, risk assessments, and treatability studies.

B.4.2. Detailed requirements which also includes but not limited to the type of submittial, the number of submittals as well as the number of copies for this phase of work shall be defined and negotiated separately.

B.5. PHASE V – REMEDIAL INVESTIGATION (RI)

At the option of the government, this scope of work may be amended to include a Remedial Investigation (RI) and/or Remedial Investigation (RI) Report and/or Baseline Risk Assessment (RA) and/or Treatability Study/Pilot Study (TS/PS). Written monthly progress reports might have to be provided. The A&E might be required to provide or revise a SMP, and/or PMP, and/or CRP, and/or DMP, and/or SAP, and/or HSP as part of this phase. Project review meetings may be held at the activity to present preliminary findings to the TRC. At the request of the EIC, conferences may be held at the A&E's office to review the progress of the A/E investigation. Other meetings and/or conferences may be required. The A&E may be required to prepare permit applications/revisions.

B.5.1. Remedial Investigation (RI) : (at the government's option) The Remedial Investigation (RI) will gather data necessary to determine the extent and type of contamination and to provide an evaluation of the risk potential and treatability of the sites as approved by the TRC and the EIC. This evaluation will

include a selection of general remedial alternatives and baseline risk assessment considerations. Criteria will also be established for cleaning up the site or identifying the need for a treatability study program. Efforts may include sampling of existing monitoring wells, sediment, soil, air, biota, and surface water. Installation of additional wells or soil borings to determine the site parameters might be required. The result of this effort will be an evaluation of contaminants found, including (but not limited to) hydro-geological, health, safety, and regulatory aspects.

B.5.2. Remedial Investigation (RI) report : (at the government's option) The report will be a summary, compilation, and interpretation of all information collected and will provide a means to evaluate the sites. Copies of all data collected for the sites are to included. The results of this study will determine the necessity of any remedial actions at the site and delineate the implications of potential (or actual) off site migration to the public health and the environment.

B.5.3. Baseline Risk Assessment (RA) : (at the government's option) The A&E might have to prepare a Baseline RA which identifies the contaminants of concern, assesses toxicity, identifies the exposure pathways and receptors.

B.5.4. Treatability Study/Pilot Testing (TS/PT) : (at the government's option) The A&E might be required to perform a treatability study or pilot testing to aid in the selection of a remedial action. The A&E may be required to identify the need for any additional study or testing, and present a general program concept of his RI Study recommendation.

B.5.5. Detailed requirements which also includes but not limited to the type of submittial, the number of submittals as well as the number of copies for this phase of work shall be defined and negotiated separately.

B.6. <u>PHASE VI - Feasibility Study (FS)</u>

At the option of the government, this scope of work may be amended to include a Feasibility Study (FS) and/or Feasibility Study (FS) Report and/or Risk Assessment (RA) and/or Record of Decision (ROD). The A&E might be required to provide or revise a SMP, and/or PMP, and/or CRP, and/or DMP, and/or SAP, and/or HSP as part of this phase. Progress reports may be required. At the request of the EIC, conferences may held at the A&E's office to review progress of the study. Other meetings and/or conferences may be required. The A&E may be required to prepare permit applications/revisions.

B.6.1. Feasibility Study (FS) : (at the government's option) The Feasibility Study (FS) may determine and make recommendations for the most cost-effective remedial action that can be taken to protect the public health and environment. The FS involves a sequential process of identification, screening and evaluation of remedial technologies and alternatives. Current EPA guidance documents will be followed in conducting the FS.

B.6.2. Feasibility Study (FS) Report : (at the government's option) The FS report will be to evaluate technologies which may reduce the toxicity, mobility, or volume of any contamination found at the sites rather than protection achieved through reduction of exposure. Permanent solutions, alternative treatment technologies and resource recovery technologies will be used to the maximum extent possible. The A&E should describe the evaluation process and the most effective alternative for site closure. The remedial action selected should be capable of attaining the applicable, relevant and appropriate requirements (ARAR's) of environmental statutes and regulations, or will fully document the rationale for waiving any ARAR not fully attained.

B.6.3. Risk Assessment (RA) : (at the government's option) The A&E might be required to prepare a RA in which site data will be reviewed and compared to toxicological standards to assess the risk posed by site contamination. This process should include (1) selection of contaminant(s) of concern, (2) identification of exposure pathways, (3) estimation of chemical concentrations at exposure points, (4) comparison of the estimated concentrations to the appropriate standards, and (5) Characterization of risk. The RA will be completed in accordance with the current EPA guidance documents.

B.6.4. Record of Decision (ROD): (at the government's option) The A&E might be required to assist in the preparation of a ROD which will be based on information and technical analysis generated during the RI/FS and consideration of public comments and community concerns. The ROD will be prepared according to current EPA guidance documents.

B.6.5. Detailed requirements which also includes but not limited to the type of submittial, the number of submittals as well as the number of copies for this phase of work shall be defined and negotiated separately.

B.7. PHASE VII – REMEDIAL DESIGN AND REMEDIAL ACTION (RD/RA)

At the option of the government, this scope of work may be amended to include but not limited to the development, preparation and submission of formal construction contract plans, specifications, and cost estimates for the recommended remedial actions. The A/E might also be requested to provide construction oversight functions and/or certification of remedial procedures, where appropriate. The A&E might be required to provide or revise a SMP, and/or PMP, and/or CRP, and/or DMP, and/or SAP, and/or HSP, as part of this phase. Progress reports may be required. At the request of the EIC, conferences may held at the A&E's office to review progress of the study. Other meetings and/or conferences may be required. The A&E may be required to prepare permit applications/revisions.

B.7.1 Detailed requirements which also includes but not limited to the type of submittial, the number of submittals as well as the number of copies for this phase of work shall be defined and negotiated separately. Meetings may be required.

B.8. PHASE VIII – RCRA FACILITY ASSESSMENT (RFA)

At the option of the government, this scope of work may be amended to include a RCRA Facility Assessment. The RCRA Facility Assessment (RFA) may be to identify all areas of potential releases of hazardous substances at the activity. Media of concern are: air, soil, groundwater, surface water, and sediments. Current EPA guidance documents will be followed to conduct the RFA. (at the government's option) The A&E might be required to prepare a preliminary review of identified sites and/or visual site inspection and/or field sampling. The A&E might be required to provide or revise a SMP, and/or PMP, and/or CRP, and/or DMP, and/or SAP, and/or HSP as part of this phase. Progress reports may be required. At the request of the EIC, conferences may held at the A&E's office to review progress of the study. Other meetings and/or conferences may be required. The A&E may be required to prepare permit applications/revisions.

B.8.1. Detailed requirements which also includes but not limited to the type of submittial, the number of submittals as well as the number of copies for this phase of work shall be defined and negotiated separately.

B.9. PHASE IX – RCRA FACILITY INVESTIGATION (RFI) WORK PLAN

At the option of the government, this scope of work may be amended to include a RCRA Facility Investigation Work Plan and/or Mini Feasibility Study Work Plan and/or Risk Assessment Work Plan. The A&E might be required to provide or revise a SMP, and/or PMP, and/or CRP, and/or DMP, and/or SAP, and/or HSP as part of this phase. Progress reports may be required. At the request of the EIC, conferences may held at the A&E's office to review progress of the study. Other meetings and/or conferences may be required. The A&E may be required to prepare permit applications/revisions.

B.9.1. The RCRA Facility Investigation (RFI) Work Plan (at the government's option) will meet the pertinent requirements of the HSWA permit for the installation. The RCRA Hazardous and Solid Waste Amendments (HSWA) Permit for the installation will define the type of work required under this phase. This permit will be made available to the A&E prior to a request for a fee proposal.

B.9.2. Detailed requirements which also includes but not limited to the type of submittial, the number of submittals as well as the number of copies for this phase of work shall be defined and negotiated separately.

B.10. PHASE X – RCRA FACILITY INVESTIGATION (RFI)

At the option of the government, this scope of work may be amended to include but not limited to the preparation of a RFI which may investigate, as necessary, to characterize the facility setting, define the source, degree and extent of release of hazardous constituents, and identify actual or potential receptors. Mini feasibility studies and/or risk assessments may, at the option of the Government, be required. Data collected will be adequate to develop a corrective action plan. The A&E might be required to provide or revise a SMP, and/or PMP, and/or CRP, and/or DMP, and/or SAP, and/or HSP as part of this phase. Progress reports may be required. At the request of the EIC, conferences may held at the A&E's office to review

progress of the study. Other meetings and/or conferences may be required. The A&E may be required to prepare permit applications/revisions.

B.10.1 Detailed requirements which also includes but not limited to the type of submittial, the number of submittals as well as the number of copies for this phase of work shall be defined and negotiated separately.

B.11. PHASE XI – CORRECTIVE ACTION (CA) PLANS

At the option of the government, this scope of work may be amended to include but not limited to the development, preparation, and submission of formal construction contract plans, specifications, and cost estimates for the recommended corrective actions and prepare permit applications. The A/E may also be requested to provide construction oversight functions and/or certification of RCRA closure procedures, where appropriate. The A&E might be required to provide or revise a SMP, and/or PMP, and/or CRP, and/or DMP, and/or SAP, and/or HSP as part of this phase. Progress reports may be required. At the request of the EIC, conferences may held at the A&E's office to review progress of the study. Other meetings and/or conferences may be required. The A&E may be required to prepare permit applications/revisions.

B.11.1. Detailed requirements which also includes but not limited to the type of submittial, the number of submittals as well as the number of copies for this phase of work shall be defined and negotiated separately.

B.12. PHASE XII – TREATABILITY STUDIES (TS)

At the option of the government, this scope of work may be amended to include a Treatability Study and/or Pilot Study. The A&E might be required to provide or revise a SMP, and/or PMP, and/or CRP, and/or DMP, and/or SAP, and/or HSP as part of this phase. Progress reports may be required. At the request of the EIC, conferences may held at the A&E's office to review progress of the study. Other meetings and/or conferences may be required. The A&E may be required to prepare permit applications/revisions.

B.12.1 Detailed requirements which also includes but not limited to the type of submittial, the number of submittals as well as the number of copies for this phase of work shall be defined and negotiated separately.

B.13. PHASE XIII – PRE-DESIGN REPORT (PDR)

At the option of the government, this scope of work may be amended to include Pre-design Report. The details of the design will be at the conceptual level. The report will be a narrative description with supporting diagrams and figures and will follow current EPA guidance documents and Navy design manuals/criteria where appropriate. The A&E might be required to provide or revise a SMP, and/or PMP, and/or CRP, and/or DMP, and/or SAP, and/or HSP as part of this phase. Progress reports may be required. At the request of the EIC, conferences may held at the A&E's office to review progress of

the study. Other meetings and/or conferences may be required. The A&E may be required to prepare permit applications/revisions.

B.13.1 Detailed requirements which also includes but not limited to the type of submittial, the number of submittals as well as the number of copies for this phase of work shall be defined and negotiated separately.

III. DESCRIPTION OF SERVICES FOR THIS CONTRACT ACTION

A. A&E ORIENTATION

The A&E will meet with NAS and EIC in Millington, TN for an orientation, within the first 30 days after award of contract. The A&E will arrange a date to meet with the EIC. The A&E will be limited to one day and three people. The A&E shall record all minutes of the meeting and submit and distribute in accordance with Section III, L.1 and L.2 of this scope.

B. PRELIMINARY CONFERENCE

Preliminary Conference: The A&E will meet the EIC and Activity personnel at the activity, within 21 days after providing the Government with review actions to the Government's comments on the A&E's submitted 90% draft (Section III of this scope, Phase III - SI and Phase IV SMP, PMP, DMP, SAP, HSP, CRP, and RI/FS Plans). The A&E shall be prepared to discuss his review actions and the project. The A&E shall record all minutes of the meeting and submit and distribute in accordance with Section III, L.1 and L.2 of this scope.

C. TECHNICAL REVIEW MEETING

Technical Review Meeting: The A&E will meet the EIC and Activity personnel at the activity, as directed by the EIC after providing the Government with review actions to the Government's comments on the A&E's submitted Draft Final (Section III of this scope, Phase I - PA and Phase IV SMP, PMP, DMP, SAP, HSP, CRP, and RI/FS Plans). The A&E shall be prepared to discuss his review actions and the project. The A&E shall record all minutes of the meeting by the use of an stenographic services or court reporter and submit and distribute in accordance with Section III, L.1 and L.2 of this scope.

D. PHASE I - PRELIMINARY ASSESSMENT (PA) FOR SITES 10,11, AND 12

The A&E shall prepare PA documents. The Preliminary Assessment (PA) shall pull all existing documentation together (eg. Initial Assessment Study and NACIP Program Confirmation Study, Verification Phase). The A&E shall prepare the EPA's PA form, a Preliminary Hazard Ranking System (HRS) score and a report defining why no further action is required for sites 10, 11 and 12.

D.1. PA Form: The A&E shall complete the current EPA PA form for site 10, 11 and 12.

D.2. Preliminary Hazard Ranking System (HRS) Score: The A&E shall complete the "EPA Checklist of Data Requirements" form for sites 10, 11 and 12. Calculate a HRS score for each site in accordance with the procedures specified in the National Contingency Plan (NCP), "Appendix A" (User's Manual), or the current official EPA guidance for conducting an HRS evaluation. Submit all worksheets, forms, etc. completed under this phase in a brief report that summarizes the results of the evaluation. Within this report, the contractor will identify and discuss any assumptions made during the assessment and make recommendations where appropriate.

D.3 PA Report: The A&E shall prepare a PA report based on existing documentation, EPA PA completed form and Preliminary HRS score. The purpose of this report will be to document that toxic and hazardous materials are not present at these sites and/or they poses any significant threat or potential threat to human health or the environment; therefore no further action is required for sites 10, 11 and 12. No further action will be based on previous and current best professional judgement and HRS score.

D.4. The A&E shall prepare a 90% Draft and submit and distribute in accordance with Section III, L.1 and L.2 of this scope of work. As directed by the EIC, the A&E shall incorporate formal Government comments on the 90% Draft and prepare a Draft Final and submit and distribute in accordance with Section III, L.1 and L.2 of this scope of work. As directed by the EIC, the A&E shall incorporate formal government comments on the Draft Final and prepare a Final and submit and distribute in accordance with Section III, L.1 and L.2 of this scope of work.

E. PHASE IV - SMP,PMP,DMP,SAP, and HSP FOR SITES 1,2,3,4,5,6,7,8 and 9

The A&E shall prepare SMP, PMP, DMP, SAP AND HSP for sites 1,2,3,4,5,6,7,8 and 9 and bind them into one document.

E.1 The A&E shall provide the following documents:

E.1.1. Site Management Plan (SMP) : The A&E shall submit a SMP for all field work. This plan provides a record of the Investigation objectives and identifies the Applicable or Relevant and Appropriate Requirements (ARARs). It also identifies the Data Quality Objectives (DQO) and analytical detection levels to be used throughout the investigation. The DQO are required throughout the investigation process and become part of the official Administrative Record. See Section on Quality Assurance Quality Control program for further requirements.

E.1.2. Project Management Plan (PMP) : The A&E shall submit a PMP. This plan documents the overall management approach to either the CERCLA Investigations (RI/FS). The PMP includes a description of qualifications of personnel performing or directing the investigations as well as a discussion of technical approaches and schedules.

E.1.3. Data Management Plan (DMP): The A&E shall submit a DMP. The DMP addresses the RI/FS data and report processing procedures, project file requirements, and project-related progress

reporting procedures and documents. This plan provides the formats to be used to present the data, including data reduction. All data and reports shall be provided on five and one-quarter inch floppy disc in a format accessible to IBM PC-compatible machines using MS-DOS and Enable software.

E.1.4. Sampling and Analysis Plan (SAP): The A&E shall submit a SAP which consist of two parts: (1) a quality assurance project plan that describes how the DQO's will be achieved; and, (2) a field sampling plan that provides guidance for all field work. The SAP shall be written in accordance with current EPA, TDHE and Navy guidance.

E.1.4.1 Quality Assurance/Quality Control Requirements for IRP.

E.1.4.1.1 Laboratories performing work under the Navy Installation Restoration Program are required to obtain Navy and appropriate regulatory agency approval, prior to beginning field work or analyses of samples, of their Sampling and Analysis Plan and to maintain approval status throughout the active life of the award. The laboratory acceptance and approval process is outlined in "Sampling and Chemical Analysis Quality Assurance Guide Requirements for the Navy Installation Restoration Program", NEESA 20.2-047B, Applicable Documents. This process follows closely the process that the EPA utilizes to manage and certify its Contract Laboratory Program (CLP).

E.1.4.1.2 The A&E shall have it's laboratory approved for this contract by the procedures outlined in "Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program", NEESA 202.2-047B. The A&E and the A&E Laboratory will be responsible for adhering with the above documents guidelines for QA and QC and deliveries. E.1.4.1.3 The government has implemented a Quality Assurance (QA) and Quality Control (QC) Program to ensure that the contracted for product meets or successfully exceeds its design requirements and/or objectives. The governments QC program is the QA/QC Program developed and implemented by the contractor to validate its own products quality and that of its subcontractor. The governments QA program validates the adherence or lack thereof by the contractor to its own QA/QC program. Therefore, the contractors QA/QC program scope shall encompass each and every property of the product development process and of the final product produced.

E.1.4.1.4 The contractors QA/QC Program shall address the components of each IR Program phase: Work Plan, Data Gathering, Data Analysis and the Final Product/ Report. Work Plan elements include project research, development of project Data Quality Objectives and final Work Plan. Data Gathering includes Field Work which addresses sample location preparation, sampling activities and handling and transporting samples and Laboratory Analysis which includes sample preparation and analysis and equipment calibration and certification. Data Analysis includes data validation, decision process certification and compliance with Data Quality Objectives. The Final Product/Report includes documentation of decisions and the production of a final product/report.

E.1.4.1.5 The contractor shall generate a QA/QC Plan at the onset of the Work Plan scoping. The government must approve the QA/QC Plan before the Work Plan development is the Final submittal is complete. The QA/QC Plan shall include EPA and applicable State requirements for the specific Work Plan and a check off sheet for initialing each requirement as completed.

E.1.4.1.6 The Data Gathering QA/QC, at a minimum shall have, on-site measurements (pH, conductivity, turbidity, etc.) to ensure complete well development, defined sampling procedures to reduce sample variability and limit field contamination, and a system of control checks on laboratory work such as blanks, duplicate samples, and recovery of spikes and surrogates, etc.. Also, provide corrective actions which should include, at no additional cost to the government, re-sampling and/or re-analysis of all samples associated with the out of control event, to include exceeded holding times. The Plan shall include outlined formatted milestone checkoff sheets for initialing as items are completed.

E.1.4.1.7 The government representatives will periodically monitor the quality of the contractors field and laboratory work. Access to the contractors lab and all project files by appropriate Navy, EPA and state personnel for the purpose of validating sample analyses, protocols, and procedures will be required for on-site QA inspections. The contractor, utilizing his SAP, is responsible for validation of the quality and accuracy of laboratory programs, procedures, and submittals.

E.1.4.1.8 The contractor, in conjunction with their laboratory, shall develop a Sampling and Analysis Plan (SAP).

E.1.4.1.9 The minimum format for the plan is :

a. Sampling and Analysis Plan Cover Sheet
   SAP Signature Approval Sheet
b. Quality Assurance Project Plan

   Title
   Table of Contents
   List of Tables
   List of Figures
   Acronyms and Symbols
   1. Project Description
   2. Project Organization and Responsibility
   3. QA Objectives for Measurement
   4. Sampling Procedures
   5. Sample Custody
   6. Calibration Procedures
   7. Analytical Procedures
   8. Data Reduction, Validation, and Reporting
   9. Internal Quality Control
   10. Performance and Systems Audits
   11. Preventative Maintenance
   12. Data Assessment Procedures
   13. Corrective Action Procedures
   14. Quality Assurance Reports

15. Personnel Qualifications and Training

c. Field Sampling Plan

Title Page
Table of Contents
List of Figures and Tables
1. Site Background
2. Sampling Objectives
3. Sample Location and Frequency
4. Sample Designation
5. Sampling Equipment and Procedures
6. Sample Handling and Analysis

d. The Sampling and Analysis Plan shall supply projected project QA/QC needs for the sampling and analysis work. In addition, the contractor shall develop a Site Specific Sampling and Analysis Plans, based on information and data contained in the basic Plan, for each site.

e. Sampling and Analysis Plans shall be approved by the government and appropriate regulatory agencies. Should the plan not receive government or regulatory agency approval, the contractor shall either (a) modify the plan as directed and/or (b) subcontract another laboratory which can meet the requirements. If the contractor cannot obtain and maintain a certified lab or will not develop a plan of sufficient size and scope to meet certification requirements, the government may terminate the contract. The SAP Cover Sheet shall have the signatures of those personnel responsible for developing, operating, managing (both laboratory and contractor) and approving the Sampling and Analysis Plan.

f. As an appendix to the SAP, the contractor shall generate and include initial and periodic report forms that are required to be filed to achieve acceptance of the Plan and detail who is responsible for the filing and who will receive the reports. The same level of effort shall be applied to the specific Site SAP. The following is a minimum list of reports and forms to include:

1. Sampling and Analysis Plan Deliveries :

a Laboratory Quality Assurance Plan
b Site Specific Work Plan with Site Specific Quality Assurance Plan
c Performance sample data (20 days after receipt of sample)
d Corrective Actions in response to audit and performance sample review received within 10 days after laboratory receives audit report.

2. Sampling and Analysis Plan Monthly Progress Report :

a Control Charts
b Corrective Actions (as required)
c Quality Control results and completed sample data
d Site Name and Contract Number
e Number of samples received and status of samples

3. Deliveries due three (3) weeks prior to final project report, FOR NIRP - CERCLA EFFORTS ONLY :

a For level C QC :

- CLP type forms containing sample data, blanks, surrogates, spikes, duplicates, calibration summary, chromatograms and mass spectra from samples;

- Blank / spike control charts

b For Level D QC : a full CLP package

E.1.4.1.10 The contractor is required to submit a Quality Assurance Project Plan (QAPP), in conjunction with laboratory QA/QC personnel, for the laboratory as part of the Sampling and Analysis Plan. The QAPP shall use the processes placed in operation during the laboratory approval process. These processes and laboratory approval must be maintained throughout the project. The QAPPs basic format is included in the above SAP.

E.1.4.1.11. The contractor, in conjunction with their laboratory, develops the Field Sampling Plan (FSP). The FSPs basic format is included in the above SAP. The Basic FSP includes, but is not limited to, :

a. Sample collection procedures to include, but not limited to, measurement of water level, detection of immiscible layers in wells, well evacuation, sample withdrawal, field analyses, well/piezometer installation techniques and construction;

b. Sample preservation and handling procedures to include sample container preparation, handling and identification, sample preservation techniques and sample handling/packing for shipment to laboratory;

c. Chain of Custody control procedures to include sample sealing and labeling, field book management and Chain of Custody record form completion and handling;

d. Field Quality Assurance/Quality Control procedures that assure sample quality and integrity and provide a means to check on field procedure compliance.

E.1.4.2 The level of Data Gathering Quality Assurance and Quality Control for non-NPL IR sites and this project is level "C".

E.1.5. Health and Safety Plan (HSP): The A&E must submit a HSP which includes all personnel expected to conduct site work and includes any needed site-specific safety requirements. The plan will conform to current EPA guidance documents. The plan shall also follow the requirements of 29 CFR 1910.120 (1)(1) and (1)(2), and any subsequent amendments. Subcontract personnel must be included or covered by a separate submittal meeting equivalent standards.

E.1.5.1. Health and Safety Program

The site being studied is suspected of containing hazardous wastes. Whether or not the nature of the hazards is known, the proper safety and health precautions are of paramount importance. Proper planning and preparation are control elements for ensuring protection of personnel during IRP study activities. The EIC, contractor and activity personnel have an important role in assuring that on-site investigations and associated testing are accomplished with the highest level of worker safety.

E.1.5.2. Corporate Safety and Health Plan

One copy of this plan is to be presented to the EIC by the contractor at the beginning of the Installation Restoration Program. Its purpose is to provide an insight to the firms safety and health policies, procedures, and programs and to identify personnel, qualifications, and specialized training.

E.1.5.3. Site Specific Safety and Health Plan

These plans are presented to the EIC in conjunction with the Work Plans for IRP field investigations and related testing studies. They are intended to present site specific procedures such as: site boundaries, personal protective equipment, safety inspections, contingencies in case of emergency, etc. Guidelines for preparing this plan is contained below.

E.1.5.4 A&E

The A&E as prime contractor for the on-site investigation has primary responsibility of protecting the safety and health of all personnel on the work site and ensuring that contractor actions do not endanger surrounding personnel and/or property and that contamination encountered at the site does not contaminate other areas. Contractor personnel are responsible for strict adherence to applicable federal (29 CFR 1910, and 29 CFR 1926) and state occupational safety and health regulations, and federal and state environmental regulations. The contractor shall designate and provide a health and safety contact on-site to ensure that the work is accomplished in compliance with pertinent promulgated standards and regulations and to ensure conformance with health and safety plans approved by the Navy. The contractor is responsible for coordinating emergency assistance with all non-Navy organizations included in the contingency plan. The contractor shall supply the required equipment for performance of his duties in a safe and healthful manner on-site.

E.1.5.4.1 The A&E shall designate a health and safety contact to oversee all work performed at the Installation Restoration Program sites. The health and safety contact shall have an educational background and experience level in engineering or the sciences and must have received adequate formal health and safety training specific to the hazards of the work. Certification, by examination, as a Certified Safety Professional (CSP) or as a Certified Industrial Hygienist (CIH), although not required, is an example of recognized special education, experience and proven professional ability. The

qualifications of the designated safety and health contact and all training records must be provided to the EFD EIC.

E.1.5.4.2 Specific Requirements

a. The A&E is required to submit a written health and safety plan for the Installation Restoration Program to the Navy for approval. The safety and health plan shall include a description of the A&E's medical surveillance and training programs and site work control plans for each site investigated. The health and safety plan shall address the requirements of this section, and shall be performed in accordance with the Applicable Documents.

b. The site specific Health and Safety Plan shall address the anticipated health and safety hazards of each work operation or activity and the means to eliminate the hazards or to effectively control them to prevent injury or illness. The plan shall address, at a minimum, :

1. Those responsible for assuming that the Health and Safety Plan practices and policies are followed;

2. Risk or system analysis for specific work assignments;

3. Employee training assignments;

4. Required personal protective equipment for each task;

5. Employers medical surveillance program;

6. Method for characterization of the health and safety hazards including media monitoring;

7. Site control measures and work zone identification;

8. Decontamination procedures which match anticipated conditions and contaminants;

9. Site standard employee operating procedures;

10. Emergency Response Plan;

11. Confined Spaces Entry Procedures

12. Providing control means for evaluating the plan.

E.1.5.4.3 Medical Program

A medical program is essential to assess and monitor workers health and fitness both prior to employment and during the course of work, to provide emergency and other treatment as needed and to keep accurate records for future references.

E.1.5.4.3.1 The A&E shall develop and provide a medical program for each site based on the specific needs, location and

potential exposure of employees at the site. Minimum plan standards are addressed in Applicable Documents. As a minimum, the site medical program shall contain the following elements :

a. Surveillance

1. Pre employment screening
2. Periodic medical examinations (and follow-up examinations as needed)
3. Termination examinations

b. Treatment

1. Non emergency
2. Emergency

c. Record Keeping

d. Program review

E.1.5.4.4 Education and Training Program

E.1.5.4.4.1 Employees involved in Installation Restoration Program field investigations and/or testing activities shall have been trained in the area of health and safety. Training shall be provided to new employees and periodically to experienced employees at no expense to the Government. Training shall cover specific areas covered by law such as respiratory training and handling of hazardous materials.

E.1.5.4.4.2 The following types of health and safety training shall have been completed by contractor personnel at no cost to the Government, as appropriate to their function during field investigations and/or testing activities :

a. General Safety Procedures

1. Safety practices and procedures for hazardous waste site entry

2. First Aid and Cardiopulmonary Resuscitation (CPR)

3. Hazard Recognition and Evaluation

4. Work Zone Determination and Procedures

5. Decontamination Procedures

6. Preparation and use of Site Safety Plans

c. Safety Equipment Use and Maintenance

1. Field Monitoring Equipment

2. Emergency Equipment

d. Personal Protective Equipment

1. Protective clothing--types, uses, limitations and levels of protection

2. Respiratory equipment--masks, respirators, Self Contained Breathing Apparatus (SCBA); 29 CFR 1910.134 and ANSI Z88.2-1980

3. Site Investigation Safety Decision Making

   a Planning Site Safety Procedures
   b Contingency Planning for Emergencies

E.1.5.4.5 Site Work Control Plan

A site work control plan shall be prepared as part of the HSP for each site being investigated during the Installation Restoration Program. Each site work control plan shall address the areas outlined in this section and shall be kept current and technically correct.

E.1.5.4.5.1 Site Entry Procedures - pre-planning for on-site activity.

a. Routes of entry and exit

b. Communication between workers on and off site

E.1.5.4.5.2 Survey and Reconnaissance

a. Before beginning on-site work, the contractor shall identify potential health and safety hazards inherent to the required tasks, equipment, nature of operations and suspected contaminants. The contractor will determine and implement the necessary control measures for these hazards, including health and safety requirements for personnel working on-site. Potential hazards shall include mechanical, electrical, toxic, and other hazards that may cause serious injury, illness, or significant environmental or property damage.

b. The contractor shall revise the necessary hazard control measures as field work generates additional data.

E.1.5.4.5.3 Levels of Protection

a. Based upon existing information, the appropriate level of protection shall be prescribed ranging from Level A for the highest level of protection needed to Level D, the minimum protection that shall be provided.

b. Where information is incomplete on types, concentrations and potential for worker contact with chemicals, a level of protection shall be designated based on professional judgement of the contractors health and safety contact.

E.1.5.4.5.4 Work Zones and Site Control

To minimize the transfer of hazardous substances from the site, due to site activities, contamination control procedures shall be outlined in the site work control plan.

a. Work Zones--Delineate zones where prescribed operations occur. Work areas shall be designated with boundaries, size of zones, distance between zones and access points into each zone. Numbers of personnel and equipment in each zone shall be listed in the plan for each operation.

b. Site Control--The site shall be controlled to reduce potential for contaminant transport from the site by personnel or equipment.

c. The contractor shall present procedures in the plan to:

1. Exclude unnecessary personnel from the general area;

2. Minimize the amount of people and equipment on-site;

3. Manage work zones to control access of people and equipment; and

4. Implement proper decontamination procedures for equipment and protective clothing.

E.1.5.4.5.5 Decontamination

Contamination of personnel and equipment may occur while working on-site. To prevent transfer of harmful materials into clean areas decontamination procedures shall be established before entering the site. The HSP shall include the following:

a. Initial Decontamination Plans--Establish wash and rinse procedures for all personnel and materials leaving the contaminated area.

b. Equipment Decontamination--A plan shall be developed for decontamination of all equipment to be removed from the site.

c. Waste Disposal-- Develop plans for proper packaging of contaminated clothing, equipment and rinse water generated during site investigation for disposal on-site or off-site at the discretion of the EIC.

d. Contamination Reduction Corridor (CRC)-- Establish a CRC to reduce access into and away from the contaminated area.

e. Medical Emergencies-- Prepare a decontamination plan for medical emergency situations and address the plan in the contingency plan section.

E.1.5.4.5.6 Emergency Response Planning

a. An Emergency Response Plan is to address response actions in the case of an emergency situation. The plan shall address the following, at a minimum:

1. Pre emergency planning:
2. Personnel roles, lines of authority, training and communication;
3. Emergency recognition and prevention;
4. Safe Distance and places of refuge;
5. Site security and control;
6. Evacuation routes and procedures;
7. Decontamination;
8. Emergency medical treatment and first aid;
9. Emergency alerting and response procedures;
10. Response evaluation procedures.

E.1.5.4.5.7 Record Keeping

The HSP shall include how the A&E will maintain records of each health and safety related matter that occurs during the course of the study. This shall include field analytical data collected using field instrumentation (i.e., HNU, OVA), employee health monitoring data, health and safety planning documentation and contingency plan communications and contacts. Provide the EIC through monthly reports periodic health and safety records.

E.2. The A&E shall prepare a 90% Draft and submit and distribute in accordance with Section III, L.1 and L.2 of this scope of work. As directed by the EIC, the A&E shall incorporate formal Government comments on the 90% Draft and prepare a Draft Final and submit and distribute in accordance with Section III, L.1 and L.2 of this scope of work. As directed by the EIC, the A&E shall incorporate formal government comments on the Draft Final and prepare a Final and submit and distribute in accordance with Section III, L.1 and L.2 of this scope of work.

F. PHASE IV - COMMUNITY RELATIONS PLAN, CRP FOR SITES 1,2,3,4,5,6,7,8,9,10,11, and 12

The A&E shall prepare a CRP outline for the activity on how the activity CRP will address the IR work for sites 1,2,3,4,5,6,7,8,9,10,11 and 12.

F.1. Community Relations Plan (CRP) Outline: The purpose of the CRP outline is to identify all items required to be included in NAS's CRP so that NAS may prepare a CRP. The A&E will determine the activity's PAO needs in order for the activity's PAO to determine how to involve the public in activities about the decisions made about the sites under investigation at the facility, how to write a CRP for the activity, how to conduct interviews concerning these sites, and other appropriate function which the PAO should conduct. The A&E shall consider current EPA and NAVY guidance for community relations at Superfund sites as guidance requirements to assist in determining the PAO's needs. The A&E shall confer with the Activities PAO during this plan's development. The A&E shall accommodate the PAO's requests which are within this scope of work. The contractor shall develop and provide a Community Relations Plan Outline that shall include, but is not limited to :

a. Prepare a site specific mailing list for the PAO

b. How to analyses the community attitudes toward the proposed actions.

c. Preparation of a draft news release and draft fact sheet to apprise the community of current and proposed actions.

d. Detail the establishment of a community information center.

e. Detail how to make arrangements for conducting briefings, press conferences, workshops and public and other informal and formal meetings by the station's PAO.

f. Provide a methodology to Assess the successes and failures of the community relations program.

g. Provide coaching to pertinent Installation personnel on CRP matters; i.e., dealing with the public and public media.

F.2. The Navy and Installation will be the sole spokesperson for IRP affairs at the Installation. The contractor shall not act as a spokesperson in any way or fashion under any condition unless specifically detailed and authorized in writing by the Navy.

F.3. The A&E shall prepare a 90% Draft and submit and distribute in accordance with Section III, L.1 and L.2 of this scope of work. As directed by the EIC, the A&E shall incorporate formal Government comments on the 90% Draft and prepare a Draft Final and submit and distribute in accordance with Section III, L.1 and L.2 of this scope of work. As directed by the EIC, the A&E shall incorporate formal government comments on the Draft Final and prepare a Final and submit and distribute in accordance with Section III, L.1 and L.2 of this scope of work.

G. PHASE IV - REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN for SITES 1,2,3,4,5,6,7,8 and 9

The A&E shall prepare site specific RI/FS Work Plans for sites 1,2,3,4,5,6,7,8 and 9. The RI/FS Work Plan will review existing data and define new objectives. It shall also propose methodology and procedures to determine concentration, migration potential, pathways and receptors of any contamination. The A&E will consider all recommendations of all current documents on these sites and all regulator comments on the current documents. The work plan shall delineate methodology(s) necessary to gather data to evaluate remedial action alternatives, risk assessments, and treatability studies for sites 1,2,3,4,5,6,7,8 and 9. The work plans for site 3 shall include sampling of the interior of building N-121 and just underneath the interior sump.

G.1. RI Work Plan: The A&E shall prepare a 90% Draft,Draft

Final, and Final RI/FS Work Plan. It shall include BUT NOT LIMITED TO the following:

a. Waste Characterization : To characterize substances and materials of interest at the site. These materials should include but not limited to wastes stored above or below ground in tanks, drums, lagoons, piles, or other structures. Develop physical, biological and chemical attributes of substances and materials of interest and determine the amount of each waste at the site. Include the substances propensity to migrate along specific pathways and the subsequent endangerment to the public health and environment.

b. Hydrogeologic Investigation : To determine the horizontal and vertical presence and potential migration of groundwater contamination. Survey previous hydrogeologic studies and other existing data. The investigation shall address what natural ground water background condition is, the mobility of pollutants considered (from waste characterization), the saturated zone soils natural physical and chemical attributes and their attenuation capacity and mechanisms, aerial discharge/recharge areas, regional flow directions and quality, and effects of any pumping alternatives that are developed. Provide a well sampling and testing program.

c. Soils and Sediments Investigation : To determine the location and extent of contamination in surface and subsurface unsaturated soils and sediments. This process may overlap with certain aspects of the hydrogeologic study; e.g., soil strata characteristics are relevant to both the transport of contaminants by groundwater and to the location of contaminants in the soil; cores from groundwater monitoring wells may serve as soil samples). Review existing soil data. Include information on local soil and sediment background properties, sampling location, techniques and methods of analysis.

d. Surface Water Investigation : To identify and determine the extent of contamination of both temporary and permanent surface waters at or near the site. This process may overlap with the soils and sediments investigation, i.e., data from estuaries, tidal creek, stream or lake sediments sampled may be relevant to surface water quality. Perform a survey of existing data on surface water flow quantity and quality and obtain or develop information on local background properties.

e. Air Investigation : To determine the presence and extent of atmospheric contamination. The program shall address the tendency of substances (identified through the waste characterization plan) to enter the atmosphere and local meteorological patterns. Include the development of background conditions and of a wind rose.

f. The A&E shall reference the appropriate SMP, PMP, DMP, SAP and HSP in the work plans.

G.2. The RI Work Plan shall conform to current Navy, EPA and TDHE guidance.

G.3. The A&E shall consider all Tennessee Regulation and EPA Regulation and any other appropriate relevant and applicable regulation.

G.4. The A&E shall provide for in the work plans an section on how the A&E will survey these sites. The A&E shall consider closure with property pins will be performed. The proposed survey will need to delineate each site's sampling locations and capable of being used to locate the same locations on the General Development Mapping System employed by the Navy for this activity. Both horizontal and vertical controls will comply with Navy standards for such work or as directed by the EIC.

G.3. The A&E shall prepare a 90% Draft and submit and distribute in accordance with Section III, L.1 and L.2 of this scope of work. As directed by the EIC, the A&E shall incorporate formal Government comments on the 90% Draft and prepare a Draft Final and submit and distribute in accordance with Section III, L.1 and L.2 of this scope of work. As directed by the EIC, the A&E shall incorporate formal government comments on the Draft Final and prepare a Final and submit and distribute in accordance with Section III, L.1 and L.2 of this scope of work.

H. PHASE VIII - RCRA FACILITY ASSESSMENT REVISION

The A&E shall perform the following work under this Phase:

H.1. The A&E shall based on his existing files, ensure the correctness of the identified Solid Waste Management Units (SWMU) and their wastes which was presented in the RFA dated April 1987. If adequate records are not available the A&E will confer with past and present activity personnel about the operations. The A&E shall prepare a Preliminary Review document. This document shall consist of the following:

a. Copies of all documents and reports reviewed

b. Minutes of all meetings or phone conversations concerning data

c. Prepare a summary of each site

1. Facility Name

2. EPA and/or State ID Number

3. Reviewer name

4. Date

5. Solid Waste Management Name and Number

6. Unit characteristics

7. Waste characteristics

8. Pollution migration

9. Evidence of release

10. Exposure

11. Documents Reviewed

12. Summarize Data Gaps

13. Recommended actions, eg. visual site inspection

H.2. The A&E shall conduct a visual site inspection and shall provide a photo of each site. The purpose of the visual site inspection is to document whether or not a release is present. A visual site inspection document shall be prepared which will include visual observations, photos, a map showing the location and direction in which the photo was taken and the field log book.

H.3. The A/E shall revise the RFA dated April 1987 to reflect the Preliminary Review, Visual Site Inspection and the government comments on the RFA and RFI work plan which was summitted April 1987. It should include whether or not sampling is necessary in general terms.

H.4. RFA Report : The RFA report shall include the Preliminary Review document and the Visual Site Inspection docuemtn. The A&E shall prepare a Draft Final and submit and distribute in accordance with Section III, L.1 and L.2 of this scope of work. As directed by the EIC, the A&E shall incorporate formal government comments on the Draft Final and prepare a Final and submit and distribute in accordance with Section III, L.1. and L.2 of this scope of work.

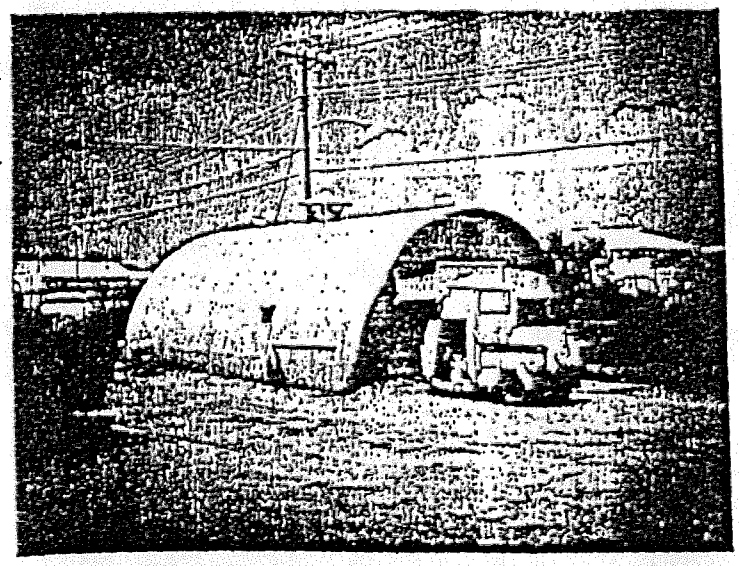
I. PHASE IX - RCRA FACILITY INVESTIGATION WORK PLAN for Site 59 (Old Pesticide Shop)

THE A&E shall prepare a RCRA Facility Investigation (RFI) Work Plan that will meet the projected pertinent requirements of this contract in support of Engineering Service Request number 5045-037.

I.1. The A&E shall conduct a thorough review of records for the site. The A&E shall review the Engineer Service Requests 5045-037.

I.2. Site 59, Pesticide Storage Facility, (Figure 2), an investigation of the surrounding soils and the building's interior materials shall be conducted to determine if the presence of pesticides exist. The storage facility is to be demolished. A total of 10 wipe samples shall be taken for the building's interior materials, 8 shallow borings through the surrounding pavements and soils shall be conducted to obtain 16 soil samples at depths 0' to 1' and 1' to 2 foot in depth. The 8 shallow borings shall be placed at cracks, down gradients, unpaved areas, and any area adjacent the storage facility which in the judgement of the A&E, the pesticide would have been likely to collect. One of the 8 borings is to be used as a back ground sample. Two blind duplicate soil samples, 1 equipment rinsate sample and 1 field blank will be analyzed for QA. The object of the sampling will be to provide a through assessment of

Pesticide Storage



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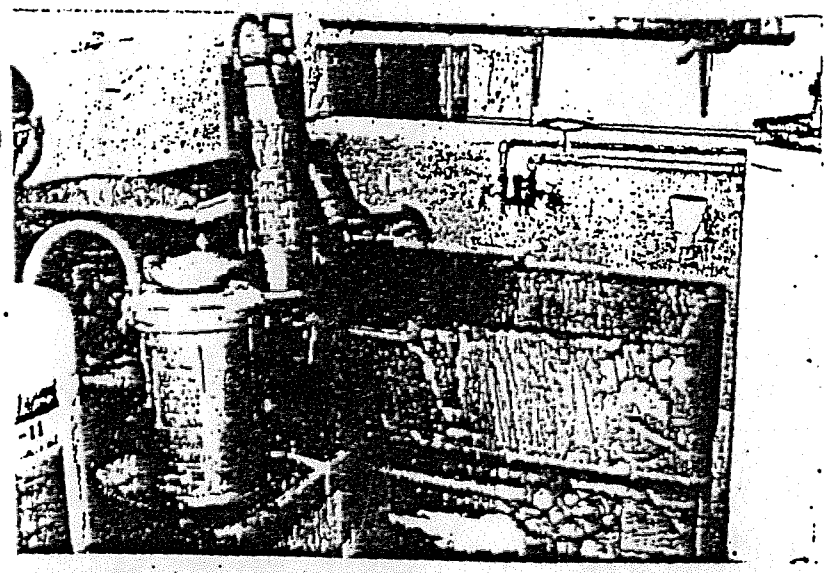
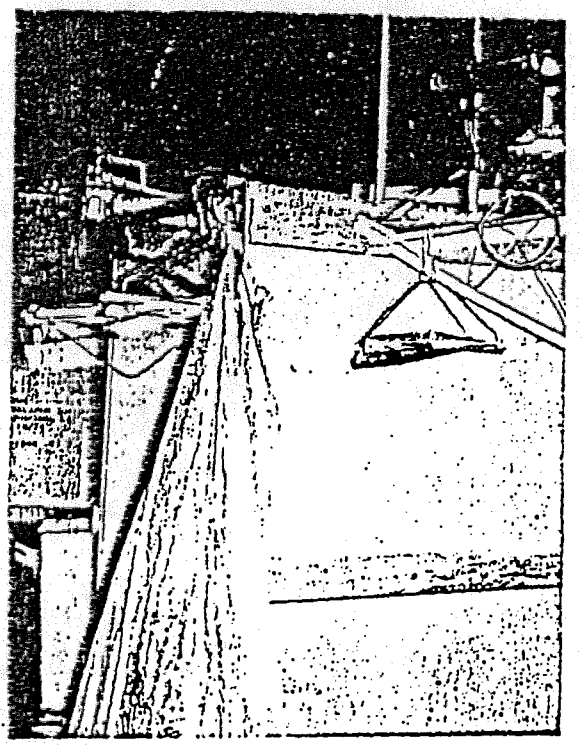
Memphis, Tennessee 25 June 74





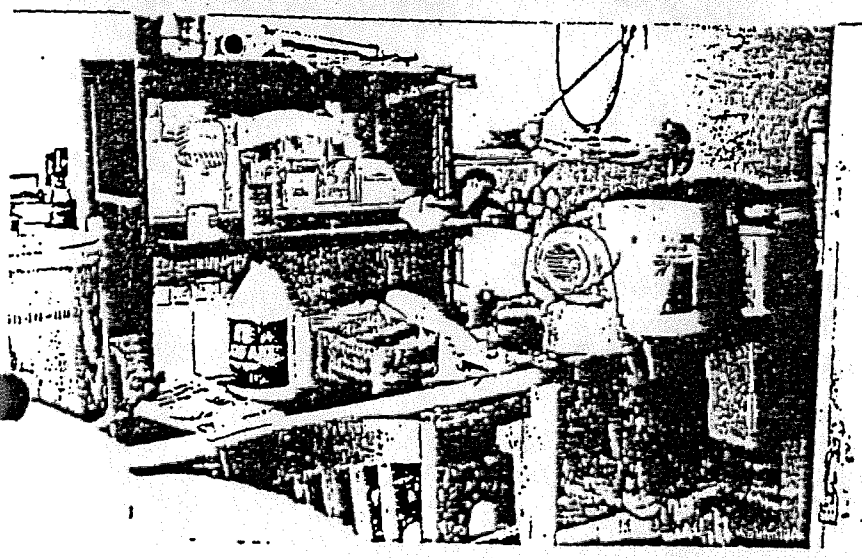


FIGURE 2

the building so that the workers demolishing the building will be protected and the waste material may be properly disposed of. All samples shall be analyzed for DDT and its daughter products, Dieldrin, Chloradane and Arsenic.

I.3. The A&E shall develop a support document which contains the following:

I.3.1. Site Management Plan (SMP) : The A&E must submit a SMP for all field work. This plan provides a record of the investigation objectives and identifies the RCRA Requirements. It also identifies the Data Quality Objectives (DQO) and analytical detection levels to be used throughout the investigation.

I.3.2. Project Management Plan (PMP) : The A&E must submit a PMP. This plan documents the overall management approach to the investigation. The PMP includes a description of qualifications of personnel performing or directing the investigations as well as a discussion of technical approaches and schedules.

I.3.3. Data Management Plan (DMP): The DMP addresses the data and report processing procedures, project file requirements, and project-related progress reporting procedures and documents. This plan provides the formats to be used to present the data, including data reduction. All data and reports will be provided on five and one-quarter inch floppy disc in a format accessible to IBM PC-compatible machines using MS-DOS and Enable software.

I.3.4. Sampling and Analysis Plan (SAP): The A&E must submit a SAP which consist of two parts: (1) a quality assurance project plan (QAPP) that describes how the DQO's will be achieved; and, (2) a field sampling plan that provides guidance for all field work. The SAP shall be written in accordance with current EPA, TDHE and Navy guidance. The A&E shall use background samples, rinsate samples, and field blanks as sampling and analyses quality assurances.

I.3.5. Health and Safety Plan (HSP): The A&E must submit a HSP which includes all personnel expected to conduct site work and includes any needed site-specific safety requirements. The plan will conform to current EPA guidance documents. The plan shall also follow the requirements of 29 CFR 1910.120 (1)(1) and (1)(2), and any subsequent amendments. Subcontract personnel must be included or covered by a separate submittal meeting equivalent standards.

I.4. RFI Work Plan and Support Document : The A&E shall prepare a Draft Final and submit and distribute in accordance with Section III, L.1 and L.2 of this scope of work. As directed by the EIC, the A&E shall incorporate formal government comments on the Draft Final and prepare a Final and submit and distribute in accordance with Section III, L.1. and L.2 of this scope of work.

J. PHASE X - RCRA FACILITY INVESTIGATION for Site 59 (Old Pesticide Shop)

J.1. The purpose of the RFI is to conduct those investigations necessary to characterize the facility setting, define the source, degree and extent of release of hazardous constituents,

and identify actual or potential receptors. Data collected will be adequate to develop a corrective action plan. Upon completion of the field work and receipt of laboratory test results, the A&E shall compile the laboratory test results of the samples in a tabular form. The results of this study is to determine the necessity of additional study and/or remedial action at the site. Public health implications, soil and building material disposal considerations and construction worker safety criteria shall be addressed. All data collected during the field investigation will documented and assigned a confidence level ranking. All data will be reviewed and evaluated for inclusion in the report. The report shall contain the tasks and methods employed, current data, results and observations, estimated quantity of soil and/or building material to be removed, recommendations for soil and/or building material treatment or disposal, air/borehole monitoring results, site map and boring and sampling log.

J.2. RFI Report : The A&E shall prepare a Draft Final and submit and distribute in accordance with Section III, L.1 and L.2 of this scope of work. As directed by the EIC, the A&E shall incorporate formal government comments on the Draft Final and prepare a Final and submit and distribute in accordance with Section III, L.1. and L.2 of this scope of work.

K. Special Notes

K.1. The A&E shall comply with section I of this scope. Provide EIC a copy of all project related correspondence including submission letters to addressees. All Final reports shall be bound in three-ring binders as well as on five and one-quarter inch floppy disc in a format accessible to IBM PC-compatible machines using MS-DOS and Enable software (one copy per FINAL submittal).

K.2. All submittals shall be bound unless otherwise directed by the EIC.

L. Submittal Schedule and Distribution

L.1. SUBMITTAL SCHEDULE

	SUBMITTAL DATE (days after/event)	SUBMITTALS *A	*B	*C
PHASE I - PRELIMINARY ASSESSMENT FOR SITES 10, 11 AND 12				
90 % Draft	90 days after award	4	6	0
Draft Final	15 days after directed by EIC	3	15	0
Final	15 days after directed by EIC	3	15	0
PHASE IV - SMP, PMP,DMP,SAP AND HSP for SITES 1,2,3,4,5,6,7,8 and 9				
90% Draft	90 days after award	3	6	2
Draft Final	15 days after directed by EIC	3	15	2
Final	15 days after directed by EIC	3	15	0

LAB QA PLAN with submittals as required to obtain approval	60 days/award	1	1	1

PHASE IV - COMMUNITY RELATIONS PLAN (CRP) for SITES 1,2,3,4,5,6,7,8,9,10,11 and 12

90% Draft	90 days after award	3	6	0
Draft Final	15 days after directed by EIC	3	15	0
Final	15 days after directed by EIC	3	15	0

Phase IV — RI/FS Work Plan for SITES 1,2,3,4,5,6,7,8 and 9

RI/FS Work Plan

90% Draft	90 days after award	3	6	2
Draft Final	15 days after directed by EIC	3	15	2
Final	15 days after directed by EIC	3	15	0

PHASE VIII — RCRA FACILITY ASSESSMENT REVISION

PRELIMINARY REVIEW DOCUMENT VISUAL SITE INSPECTION DOCUMENT DRAFT FINAL RFA	30 days after award	4	3	0
PRELIMINARY REVIEW DOCUMENT VISUAL SITE INSPECTION DOCUMENT FINAL RFA	15 days after directed by EIC	3	6	0

PHASE IX — RCRA FACILITY INVESTIGATION Work Plan for Site 59 (Old Pesticide Shop)

RFI WORK PLAN, SMP, PMP, DMP, SAP, and HSP

Draft Work P	90 days after award	3	3	0
Final Work P	15 Days after direction by EIC	3	6	0

PHASE X - RCRA FACILITY INVESTIGATION for Site 59 (Old Pesticide Shop)

RFI REPORT

Draft Final	90 days after direction by EIC	3	3	0
Final	20 days after direction by EIC	3	6	0

MONTHLY SUBMITTALS

WORK PROGRESS REPORT

Due on the 15th of each month.		3	3	0

LABORATORY PROGRESS REPORT

Due on the 15th of each month.		1	2	1

MINUTES OF MEETINGS

IRP MEETINGS

Due 10 days after meetings. 3 15 0

OTHER THAN IRP MEETINGS

Due 10 days after meetings. 3 6 0
(NOTE : ONE COPY TO ALL WHO ATTEND)
(NOTE : The EIC will direct the A&E to proceed with the next submittial when the EIC is satisfied with the previous submittial.

L.2. DISTRIBUTION

Addressees

a. **SOUTHDIV**

Commanding Officer
Attn.: (Code 11519) (803) 743-0573
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
PO Box 10068
Charleston, SC 29411-0068

b. **ACTIVITY**

Commanding Officer
Attn.: Public Works Engineering
Naval Air Station MEMPHIS
Millington, TN 38054-5000 (901) 873-5209

c. NCR

MARTIN MARIETTA ENERGY SYSTEMS, INC
Attn: Mitzi S. Miller
Oak Ridge Gaseous Diffusion Plant Oak Ridge, Tennessee 37831
(615) 574-5270

FINAL DRAFT

VOLUME II:

SITE MANAGEMENT PLAN

FOR

NAS MEMPHIS SITES NO. 1-9

REMEDIAL INVESTIGATION/FEASIBILITY STUDY MILLINGTON, TENNESSEE

Prepared For:
Department of the Navy
Southern Division
Naval Facilities Engineering Command
Charleston, South Carolina
Contract No. N62467-88-C-0198

Prepared By:
ERC Environmental and Energy Services Co.
725 Pellissippi Parkway
P.O. Box 22879
Knoxville, Tennessee 37933

15 November 1989

ERCE/EDGe Project No. B880

FINAL DRAFT

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1.0 INTRODUCTION

The purpose of this Site Management Plan is to provide a record of investigation objectives by identifying the Applicable or Relevant and Appropriate Requirements (ARARs) and by identifying the Data Quality Objectives DQOs) and analytical detection levels to be used throughout the NAS Memphis, Tennessee Solid Waste Management Unit (SWMU) contamination assessment/remedial action investigations for nine SWMU sites that are known or suspected to have previously disposed of hazardous substances in an uncontrolled manner.

Section 2.0 of this document provides background information on the NAS Memphis facility. Section 3.0 describes the overall objectives of this investigation. Section 4.0 provides an overview of both the site-specific and program management issues.

The Site Management Plan is subject to evaluation and periodic updates throughout the course of this investigation.

2.0 NAS MEMPHIS PROJECT BACKGROUND

Provided in the following subsections are the regulatory and working history of NAS Memphis, Millington, Tennessee.

2.1 REGULATORY BACKGROUND

The Naval Installation Restoration Program (IRP) was established in 1983 to direct the investigation and remediation of uncontrolled hazardous waste disposal sites associated with naval operations. Prior to 1983, these investigation/remediation activities had been directed under the Navy Assessment and Control of Installation Pollutants Program (NACIP).

In accordance with the National Contingency Plan (NCP), the Naval IRP is currently being implemented in full compliance with statutory requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA).

Furthermore, given that CERCLA/SARA specifies the inclusion of all applicable or relevant and appropriate requirements (ARARs), the Navy IRP also incorporates compliance with other laws and regulations, in particular, the Resource Conservation and Recovery Act of 1976 (RCRA) and the Hazardous and Solid Waste Amendments of 1984 (HSWA).

In September 1986, the U.S. Environmental Protection Agency (EPA) issued Permit Number HSWA-TN002 to the Naval Air Station Memphis (NASM) located at Millington, Tennessee. This permit, issued pursuant to the Solid Waste Disposal Act, required the permittee to prepare a report which identifies and characterizes all existing and closed Solid Waste Management Units (SWMU) located at the facility.

In December 1986, Engineering, Design and Geosciences Group, Inc.

(EDGe), was retained by the Southern Division of the Naval Facilities Engineering Command (Navy) through the Navy IRP to address the requirements of Permit Number HSWA-TN002. Specifically, EDGe was to inventory the NASM facility and identify units, sites, activities or locations which meet the definition of Solid Waste Management Units. Following identification, description and analysis of the SWMUs, EDGe was to prepare investigation plans intended to evaluate SWMUs which are known, suspected, or presumed to have releases of hazardous constituents. During the inventory phase, the EDGe team identified fifty eight potential SWMUs. The previous report dated April, 1987 locates and describes each of these SWMUs. Nine of the SWMU sites were recommended for further study. Their site investigation plans are to be developed under the Comprehensive Environmental Response Compensation and Liability Act/Superfund Amendments and Reauthorization Act (CERCLA/SARA) regulations.

Currently, under Navy Contract N62467-88-C-0198, ERCE/EDGe is preparing management/sampling documents describing recommended procedures for site contamination assessments and remedial activities for the nine SWMU sites at NAS Memphis that must be evaluated in accordance with CERCLA/SARA regulations. The nine sites are as follows:

SWMU No.	SWMU NAME
1	Fire Department Drill Area
2	South-Side Landfill
3	N-121 Plating Shop Dry Well
4	N-121 Plating Shop Storm Sewer
5	Fire-Fighting Training Area
6	N-126 Battery Shop Storm Sewer Ditch
7	N-126 Plating Shop Dry Well
8	Cemetery Disposal Area
9	Sewage Lagoons

2.2 SITE BACKGROUND

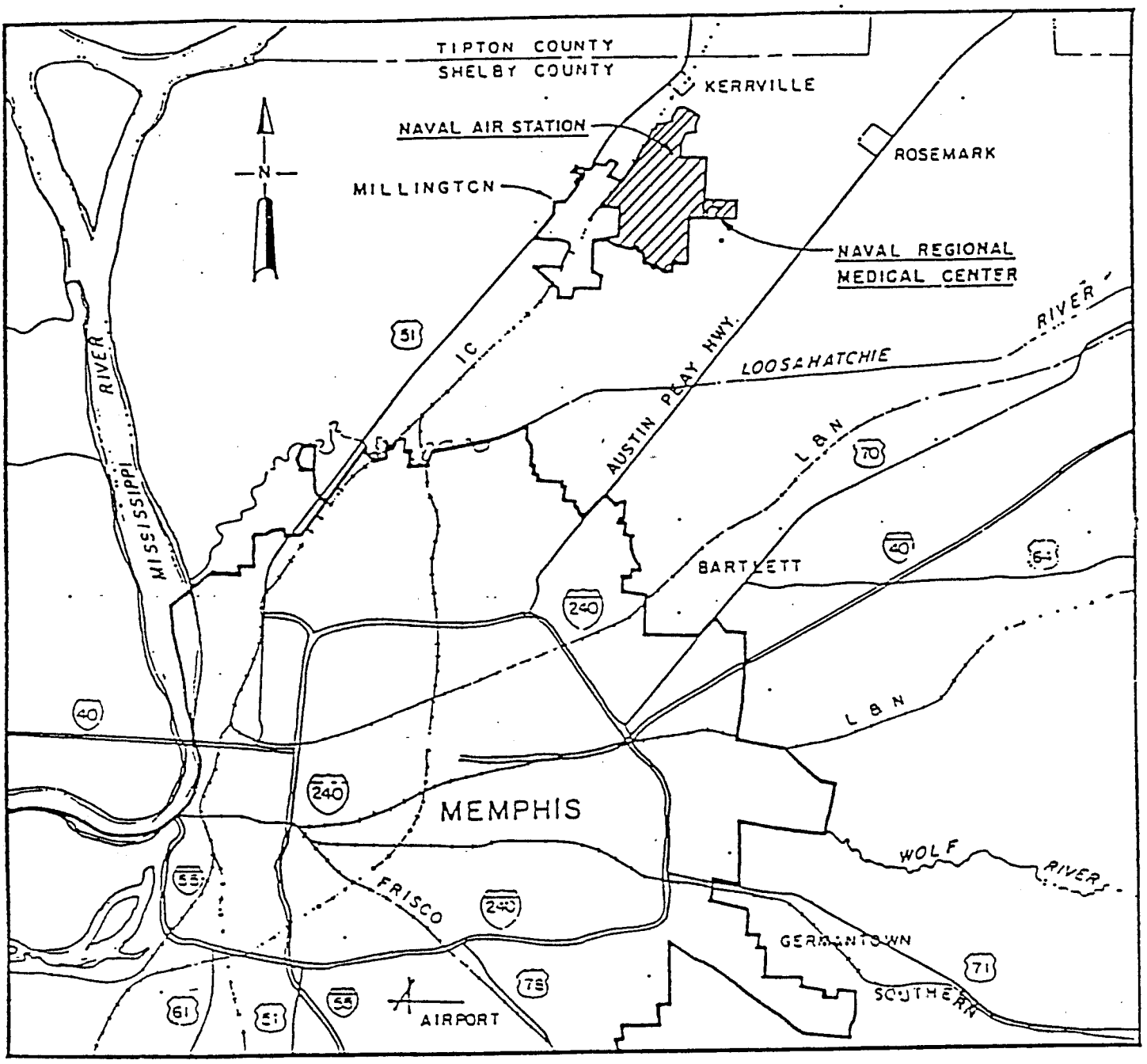
NAS Memphis, a 3,490-acre facility is located in Millington,

Tennessee, approximately twenty miles northeast of the City of Memphis and thirteen miles east of the Mississippi River. The facility is bordered on the west and south by the City of Millington and the north and east by agricultural and residential areas. The general location is shown on Figure 1-1, a map prepared by Geraghty and Miller, Inc., in November 1985.

The source of potable water for both NAS Memphis and the City of Millington is the Memphis Sand Aquifer, the top of which lies at a depth of approximately 400 feet below land surface. The NAS Memphis supply wells are located approximately 0.3 miles west of NAS Memphis. Reportedly, the existing supply wells penetrate a depth that ranges from 345 feet to 523 feet below land surface. The shallow groundwater system generally has relatively high levels of iron; however, occasionally, it is tapped for small-capacity domestic wells.

Since it was commissioned in 1942, the mission of the NAS has been to provide services and material to support operations of aviation activities, units of the Naval Education and Training Command, and other activities and units as designated by the Chief of Naval Operations. These services and materials have included but have not been limited to fire-fighting training, landfilling, metal plating and battery maintenance. In support of these activities, some hazardous wastes have been generated.

Prior use of the site was also investigated. During World War I, the U.S. Army constructed "Park Field", a military aviation training facility. Between the World Wars, the site was used for approximately eight years as a civilian airfield and, beginning in 1929, as a government-supported agricultural facility. The Naval Regional Medical Center is located adjacent to NAS Memphis. It is considered a part of the entire NAS facility which is the subject of this study.



0 1 2 3 4 MILES
SCALE

FIGURE 1-1. LOCATION MAP - NAS MEMPHIS

3.0 INVESTIGATION OBJECTIVES - GENERAL

This section will discuss Applicable or Relevant and Appropriate Requirements (ARARs), To-Be-Considered Criteria (TBCs), Data Quality Objectives (DQOs) and Contract Requirements in a general context. These requirements will be evaluated as part of the RI/RFI/FS process and will be identified during the development of analytical and remedial concerns for site-specific work plans.

3.1 ARARs AND TBCs

A requirement in CERCLA 121(d) is that remedial actions comply with Applicable or Relevant and Appropriate Requirements (ARARs) of Federal laws and State laws. Applicable requirements specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. The requirements are cleanup standards, standards of control, and other considerable environmental protection requirements, criteria, or limitations promulgated under Federal or State law. Relevant and appropriate requirements are nearly identical to applicable requirements; while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, they address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. The relevance and appropriateness of a requirement is judged by comparing the characteristics of the remedial action, the hazardous substances in questions, and the physical circumstances of the site with those addressed in the requirement as well as the requirements' objective and origin. It is possible for only part of a requirement to be considered relevant and appropriate.

There are several different types of requirements with which CERCLA actions may have to comply. These requirements may be classified as described in Table 3-1.

TABLE 3-1 TYPES OF ARARs		
Type	**Description**	**Example**
Ambient or Chemical-Specific Requirements	Set risk-based concentration ranges in various environmental media for specific hazardous substances, pollutants, or contaminants.	• Maximum Contaminant Levels • National Ambient Air Quality Standards
Performance, Design, Action-Specific Requirements	Set controls on particular activities related to management of hazardous substances, pollutants or contaminants.	• RCRA incineration standards • CWA pretreatment standards for discharges to POTWs
Locational Requirements	Set restrictions on activities depending on the characteristics of a site or its immediate environment.	• Sites on National Register of Historic Places • Federal and State siting laws for hazardous waste facilities.

Ambient or chemical-specific requirements may set protective cleanup levels for the chemicals of concern in the designated media, or else indicate an acceptable level of discharge where one occurs in a remedial activity. Performance, design, and action-specific requirements may specify particular performance levels, actions, or technologies, as well as specific levels for discharged or residual chemicals. Location requirements may restrict or preclude alternative remedial actions depending on the location or characteristics of the site. ARARs can be identified only on a site-specific basis.

To-be-considered criteria (TBCs) are advisories issued by Federal or State government that are not legally binding. Although they do not have the status of the ARARs, they are considered along with ARAR in determining site-specific clean-up levels.

3.2 DATA QUALITY OBJECTIVES (DQOs)

Data Quality Objectives (DQOs) are promulgated Federal and State standards which specify the quality and quantity of data that will be required to support decisions regarding remedial response activities at NAS Memphis. In a general sense, DQOs satisfy the CERCLA requirement which requires the Contracting Engineer to provide a quantifiable degree of certainty with regard to data that will be the basis for site-specific decisions and actions. DQOs will be developed for all RI, RFI, FS, PA/SI, RD, and RA data collection activities.

3.3 ANALYTICAL DETECTION LIMITS

The quality of data to be generated from all site activities will be outlined during the initial stages of DQO development. Generally, detection levels and limits set for all analytical methods and equipment and used for site contamination assessments and feasibility studies, define data quality requirements. There are five options with regard to analytical detection limits that are categorized by the sophistication of the analytical methods

and equipment and degree of documentation. They are described as follows:

- LEVEL A - Field screening. This level is characterized by the use of portable instruments which can provide real-time data to assist in the optimization of sampling point locations and for health and safety support. Data can be generated regarding the presence or absence of certain contaminants (especially volatiles) at sampling locations.
- LEVEL B - Field analysis. This level is characterized by the use of portable analytical instruments which can be used on-site, or in mobile laboratories stationed near a site. Depending upon the types of contaminants and sample matrix, qualitative and quantitative data can be obtained.
- LEVEL C - Laboratory analysis using methods other than the EPA Contract Laboratory Program (CLP) Routine Analytical Services (RAS). This level is used primarily in support of engineering studies using standard EPA-approved procedures.
- LEVEL D - CLP RAS. This level is characterized by rigorous QA/QC protocols and documentation as well as qualitative and quantitative analytical data required by Level III.
- LEVEL E - Non-standard methods. Analysis which may require method notification and/or development. CLP Special Analytical Services (SAS) are considered Level V.

Furthermore, different procedures may be used within each level to produce data of different quality.

3.4 CONTAMINATION ASSESSMENT DOCUMENTS

The nine Solid Waste Management Units (SWMUs) identified on the

NAS Memphis facility will undergo a contamination assessment and remedial activity to identify, characterize, and/or control contaminants found to be significant. This broad investigative process can include any of the following steps of the Navy IRP investigation and remediation process:

1. Site Discovery or Notification;
2. Preliminary Assessment and Site Inspection;
3. Establishment of priorities for remedial action;
4. Remedial Investigation and Feasibility Study; and
5. Remedial Design and Remedial Action.

The work under this contract will encompass primarily Step 4, a Remedial Investigation/Feasibility Study (RI/FS), which includes the development of the following documentation:

- Site Management Plan (SMP): A Site Management Plan will be developed for all field work. This plan provides a record of the Investigation objectives and identifies the ARARs, DQOs, and analytical detection levels to be used throughout the investigation.
- Project Management Plan (PMP): The PMP documents the overall management approach to the CERCLA Investigations (RI/FS). It includes a description of personnel performing or directing the investigations as well as a discussion of technical approaches and schedules.
- Data Management Plan (DMP): The DMP addresses the RI/FS data and report processing procedures, project file requirements and project-related progress reporting procedures and documents. This plan provides the formats to be used to present the data, including data reduction.
- Sampling and Analysis Plan (SAP): The SAP will consist of two parts: (1) a quality assurance project plan

that describes how the DQOs will be achieved; and (2) a field sampling plan that provides guidance for all field work. The plan shall be written in accordance with current EPA, TDHE and Navy guidance.

- Health and Safety Plan (HSP): The HSP will include all personnel expected to conduct site work and includes any needed site-specific safety requirements. The plan will conform to current EPA guidance documents. The plan shall also follow the requirements of 29 CFR 1910.120 (1)(1) and (1)(2) and any subsequent amendments.
- Community Relations Plan (CRP) Outline: The purposes of the CRP outline is to identify all items required to be included in NAS's CRP so that NAS may prepare a CRP. The CRP outline shall include, but not be limited to the following:

1. Prepare a site specific mailing list for the PAO.
2. How to analyze the community attitudes toward the proposed actions.
3. Preparation of a draft news release and draft fact sheet to apprise the community of current and proposed actions.
4. Detail the establishment of a community information center.
5. Detail how to make arrangements for conducting briefings, press conferences, workshops and public and other informal and formal meetings by the station's PAO.
6. Provide a methodology to assess the successes and failures of the community relations program.
7. Provide coaching to pertinent installation personnel on CRP matters; i.e., dealing with the public and public media.

The final document to be developed under this contract, the RI/FS Work Plan, will reference all the above listed documents. It shall also include, but not be limited to the following:

- Waste Characterization: To characterize substances and materials of interest at the site. These materials should include but not limited to wastes stored above or below ground in tanks, drums, lagoons, piles, or other structures. Develop physical, biological and chemical attributes of substances and materials of interest and determine the amount of each waste at the site. Include the substances propensity to migrate along specific pathways and the subsequent endangerment to the public health and environment.
- Hydrogeologic Investigation: To determine the horizontal and vertical presence and potential migration of groundwater contamination. Survey previous hydrogeologic studies and other existing data. The investigation shall address what natural groundwater background condition is, the mobility of pollutants considered (from waste characterization), the saturated zone soils natural physical and chemical attributes and their attenuation capacity and mechanisms, aerial discharge/recharge areas, regional flow directions and quality, and effects of any pumping alternatives that are developed. Provide a well sampling and testing program.
- Soils and Sediments Investigation: To determine the locations and extent of contamination in surface and subsurface unsaturated soils and sediments. This process may overlap with certain aspects of the hydrogeologic study; (e.g., soil strata characteristics are relevant to both the transport of contaminants by groundwater and to the location of contaminants in the soil; cores from groundwater monitoring wells may serve

as soil samples). Review existing soil data. Include information on local soil and sediment background properties, sampling location, techniques and methods of analysis.

- Surface Water Investigation: To identify and determine the extent of contamination of both temporary and permanent surface waters at or near the site. This process may overlap with the soils and sediments investigation, i.e., data from stream or lake sediments sampled may be relevant to surface water quality. Perform a survey of existing data on surface water flow quantity and quality and obtain or develop information on local background properties.
- Air Investigation: To determine the presence and extent of atmospheric contamination. The program shall address the tendency of substances (identified through the waste characterization plan) to enter the atmosphere and local meteorological patterns. Include the development of background conditions and of a wind rose.

4.0 INVESTIGATION OBJECTIVES - SITE SPECIFIC

Site-specific ARARs, TCB, and DQOs that guide the investigation of contaminated sites at NAS Memphis are discussed in the following sections.

4.1 SITE ARARs AND TCBs

The identification of ARARs and TCBs involved the evaluation and comparison of a site's physical characteristics, hazardous substance characteristics, and nature of remedial action, with applicable ARARs and TCBs.

SARA mandates that remedial actions comply with Federal and State ARARs and that remedies be protected of human health and the environment and be cost-effective, as well as utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. In some cases, such as the presence of multiple contaminants or cross-contamination of sites may require that remedial actions exceed ARARs. On the other hand, provisions also exist in SARA that allow project-level ARARs to be waived under special circumstances. These exceptions are applicable in the following circumstances:

- When an action taken is an interim measure and is only part of a total remedial action that will attain the requirement when completed;
- When compliance with the requirement presents a greater risk than alternative options;
- When an equivalent standard of performance that is equal or better than that specified by the requirement can be achieved through use of another method or approach;
- When a State has not consistently applied a State requirement in similar circumstances at other remedial actions within the State; and,

- When fund balancing is warranted because meeting the requirement would not provide a balance between the need to be protective at the site and the availability of funds to respond to threats at other sites at the facility.

Two exceptions to the general definition of an ARAR as stated by SARA apply when the goals or criteria are relevant and appropriate to the circumstances of a release or threatened release. These are: (1) on-site actions must attain Maximum Contaminant Level Goals (MCLGs) developed under SDWA, and Water Quality Criteria (WQC) developed under CWA. Table 4-1 identifies the ARARs applicable to the investigation at NAS Memphis. No ARARs have currently been established by the State of Tennessee. Table 4-2 lists other Federal and State criteria, advisories, and guidances to be considered for the NAS Memphis facility.

4.2 SITE DQOs

Data Quality Objectives (DQOs) regarding the NAS Memphis Facility Project have been partially identified in terms of laboratory analytical methods and detection limits in the QAPP and FSP. The amount and quality of data required to support the selection of remedial alternatives will vary from site to site. The identification of DQOs will be conducted in an iterative manner. As additional data are obtained and evaluated, data quality needs will become more clearly defined until all data needs will become more clearly defined until all data needs are identified. Factors affecting the development of DQOs include analytical quality control, instrumentation options, media variability and method detection limits.

The Phase I DQOs for each SWMU site are to provide a sufficient amount of quality data in order to perform the following:

- Evaluate and adjust, if necessary, the health and

TABLE 4-1
POTENTIAL ARARS FOR NAS MEMPHIS*

Location/Action/Chemical	Requirement	Prerequisite	Citation
Within 100-year floodplain	Facility must be designed, constructed, operated, and maintained to avoid washout.	RCRA hazardous waste; treatment storage, or disposal	40 CFR 264,18(b)
Within floodplain	Action to avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values	Action that will occur a floodplain, i.e. lowlands, and relatively flat areas adjoining inland and coastal waters and other flood prone areas	Protection of floodplain, b/ (40 CFR 6); Fish and Wildlife Coordination Act (16 USC 661 et seg.); 40 CFR 6.302
Area affecting storm or river	Action to protect fish or wildlife	Diversion, channeling or other activity that modifies a stream or river and affects fish or wildlife	Fish and Wildlife Coordination Act (16 USC 661 et seq.); 40 CFR 6.302
Within area affecting national wild, scenic, or recreational river	Avoid taking or assisting in action that will have direct adverse effect on scenic river	Activities that effect or may affect any of the rivers specified in section 1276 (a)	Wild and Scenic Rivers Act (16 USC 1271 et seq. section 7 (a); 40 CFR 6.302(a)
Air Stripping	CAA requirements to be provided.		
Capping	Placement of a cap over waste (e.g., closing a surface impoundment or waste pile as a landfill, or similar action, requires a cover designed and constructed to: • Provide long-term minimization of migration liquids through the capped area;	RCRA hazardous waste placed at site after the effective date of the requirement, or placement of hazardous waste into another unit will make requirements applicable when the waste is being covered with a cap for the purpose of leaving it behind after the remedy is completed. Capping without such placement will not make requirements applicable.	40 CFR 264.228(u) (Surface Impoundments) 40 CFR 264.258(b) (Waste Piles) 40 CFR 264.310(a) (Landfills)

* A more generalized list of ARARs is provided in Appendix I .

TABLE 4-1
POTENTIAL ARARS FOR NAS MEMPHIS*

Location/Action/Chemical	Requirement	Prerequisite	Citation
Capping (continued)	• Function with minimum maintenance; • Promote drainage and minimize erosion or abrasion of the cover; • Accommodate settling and subsidence so that the cover's integrity is maintained; and • Have a permeability less than or equal to the permeability of any bottom liner system or natural sub-soils present.		
	Eliminate free liquids, stabilize wastes before capping (surface impoundments).		40 CFR 264.228(a)
	Restrict post-closure use of property as necessary to prevent damage to the cover.		40 CFR 264.117 (c)
	Prevent run-on and run-off from damaging cover.		40 CFR 264.310(b)
	Protect and maintain surveyed benchmarks used to locate waste cells (landfills, waste piles).		40 CFR 264.310(b)

* A more generalized list of ARARs is provided in Appendix I.

TABLE 4-1
POTENTIAL ARARS FOR NAS MEMPHIS*

Location/Action/Chemical	Requirement	Prerequisite	Citation
Closure with No Post-Closure Care (e.g. Clean Closure)	General performance standard requires elimination of need for further maintenance and control; elimination of post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products.	Applicable to land-based unit containing hazardous waste. Applicable to RCRA hazardous waste (listed or characteristic) placed at site after the effective date of the requirements, or placed into another unit. No applicable to material treated, stored, or disposed only before the effective date of the requirements, or if treated in-situ, or consolidated within area of contamination. Designed for cleanup that will not require long-term management. Designed for cleanup to health-based standards.	40 CFR 264.111
	Disposal of decontamination of equipment, structures, and soils. Removal oor decontamination of all waste residues, contaminated containment system components (e.g., liners, dikes), contaminated subsoils, and structures and equipment contaminated with waste and leachate, and management of them as hazardous waste.	May apply to surface impoundments and container or tank liners and hazardous waste residues, and to contaminated soil, including soil from dredging or soil disturbed in the course of drilling or excavation, and returned to land.	40 CFR 264.111 40 CFR 264.178 40 CFR 264.197 40 CFR 264.197 40 CFR 264.288(o) (l) and 40 CFR 264.258
	Heat health-based levels at unit.		40 CFR 244.111

* A more generalized list of ARARs is provided in Appendix I.

TABLE 4-1
POTENTIAL ARARS FOR NAS MEMPHIS*

Location/Action/Chemical	Requirement	Prerequisite	Citation
Container Storage	Containers of RCRA hazardous waste must be: • Maintained in good condition; • Compatible with hazardous waste to be stored; and	Storage of RCRA hazardous waste (listed or characteristic) not meeting small quantity generator criteria held for a temporary period greater than 90 days before treatment, disposal, or storage elsewhere (40 CFR 264.10) in a container (i.e., any portable device in which a material is stored, transported, disposed of, or handled). A generator who accumulates or stores hazardous waste on-site for 90 days or less in compliance with 40 CFR 262.34 (a) (1-4) is not subject to full RCRA storage requirments. Small quantity generators are not subject to the 90 day limit (40 CFR 262.34(c), (d) and (e)).	40 CFR 264.171 40 CFR 264.172
	• Closed during storage (except to add or remove waste).		40 CFR 264.173
	Inspect container storage areas weekly for deterioration.		40 CFR 264.174
	Place containers on a sloped, crack-free base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10 percent of the volume of containers of free liquids. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system.		40 CFR 264.175

* A more generalized list of ARARs is provided in Appendix I.

TABLE 4-1
POTENTIAL ARARS FOR NAS MEMPHIS*

Location/Action/Chemical	Requirement	Prerequisite	Citation
Container Storage (continued)	Keep containers of ignitble or reactive waste at least 50 feet from the facility's property line.		40 CFR 264.176
	Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier.		40 CFR 264.177
	At closure, remove all hazardous waste and residue from the containment system, and decontaminate or remove all containers, liners.		40 CFR 264.178
	Storage of banned wastes must be in accordance with 40 CFR 268. When such storage occurs beyond one year, the owner/operator bears the burden or proving that such storage is solely for the purpose of accumulating sufficient quantities to allow for proper recovery, treatment, and disposal.		40 CFR 268.50

* A more generalized list of ARARs is provided in Appendix I.

TABLE 4-1
POTENTIAL ARARS FOR NAS MEMPHIS*

Location/Action/Chemical	Requirement	Prerequisite	Citation
Closure with Waste-In-Place	Eliminate free liquids by removal or solidification. Stabilization of remaining waste and waste residue to support cover.	Applicable to land disposal of hazardous waste. Applicable to RCRA hazardous waste (listed or characteristic) placed at site after the effective date of the requirements, or placed into another unit. Not aplicable to material treated, stored, or disposed only before the effective date of the requirements, or if treated in-situ or consolidated within area of contamination.	40 CFR 264.228 (a) (2) 40 CFR 264.228 (a) (2) 40 CFR 264.258(b)
	Installation of final cover to provide long-term minimization of infiltration (see Capping).		40 CFR 264.310
	30-year post-closure care and ground water monitoring.		40 CFR 264.310
Discharge to Publicly Owned Treatment Works (POTW)	Discharge of pollutants that pass through the POTW without treatment, interface with POTW operation, contaminate POTW sludge, or endange health/safety of POTW workers, is prohibited. Specific prohibitions preclude the discharge of pollutants to POTWs that: • Create a fire or explosion hazard in the POTW;	Indirect discharge to a POTW.	40 CFR 403.5

* A more generalized list of ARARs is provided in Appendix I.

TABLE 4-1
POTENTIAL ARARS FOR NAS MEMPHIS*

Location/Action/Chemical	Requirement	Prerequisite	Citation
Discharge to Publicly Owned Treatment Works (POTW) (continued)	• Will cause corrosive structural change to POTW; • Obstruct flow resulting in interference; • Are discharged at a flow rate and/or concentration that will result in interference; and • Increase the temperature of wastewater entering the treatment plant that would result in interference, but in no case raise the POTW influent temperature above 104°F (40°C). • Discharge must comply with local POTW pretreatment program, including POTW-specific pollutants, spill prevention program requirements, and reporting and monitoring requirements.		
	• RCRA permit-by-rule requirements (including corrective action where the NPDES permit was issued after November 8, 1984) must be complied with for discharges of RCRA hazardous wastes to POTWs.	Transport of RCRA hazardous wastes to POTWs by truck, rail, or dedicated pipe (i.e., pipe solely dedicated for hazardous waste (as defined in 40 CFR 264) which discharges from within the boundaries of the CERCLA site to within the boundaries of the POTW).	40 CFR 270.60

* A more generalized list of ARARs is provided in Appendix I.

TABLE 4-1
POTENTIAL ARARS FOR NAS MEMPHIS*

Location/Action/Chemical	Requirement	Prerequisite	Citation
Dredging	Removal of all contaminated soil.	RCRA hazardous waste placed at site after the effective date of the requirements, or placed into another unit.	See closure in this Exhibit.
	Dredging must comply with Section 10 of the Rivers and Harbors Act and U.S. Army Corps of Engineers regulations.	Dredging in navigable waters of the United States.	33 U.S.C. 403 33 CFR 320-330
Excavation	Movement of excavated materials to new location and placement in or on land will trigger land disposal restrictions for the excavated waste or closure requirements for the unit in which the waste is being placed.	Materials containing RCRA hazardous wastes subject to land disposal restrictions are placed in another unit.	40 CFR 268 (Subpart D)
	Area from which materials are excavated may require cleanup to levels established by closure requirements.	RCRA hazardous waste placed at site after the effective date of the requirements.	See Closure in this Exhibit.
Gas Collection	(CAA requirements to be provided)		
Ground Water Diversion	Excavation of soil for construction of slurry wall may trigger closure or land disposal restrictions.	Materials containing RCRA hazardous waste subject to land disposal restrictions are placed into another unit.	See Consolidation in this Exhibit.

* A more generalized list of ARARs is provided in Appendix I.

TABLE 4-1
POTENTIAL ARARS FOR NAS MEMPHIS*

Location/Action/Chemical	Requirement	Prerequisite	Citation
Placement of Waste in Land Disposal Unit	Land Disposal Restrictions: Attain land disposal "treatment standards" before putting waste into landfill in order to comply with land ban restrictions. A treatment standard can be either: (1) a concentration level to be achieved (performance-based) or (2) a specified technology that must be used (technology-based). If the standard is performance-based, any technology can be used to achieve the standard. (See Treatment when Waste will be Land Disposed).	Placement of RCRA hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, or underground mine or cave.	40 CFR 268 (Subpart D)
Surface Water Control	Prevent run-on and control and collect run-off from a 24-hour 25-year storm (waste piles, land treatment facilities, landfills). Prevent over-topping of surface impoundment.	RCRA hazardous waste treated, stored, or disposed after the effective date of the requirements.	40 CFR 264.251 (c) (d) 40 CFR 264.273(c) (d) 40 CFR 264.301 (c) (d)
Lead	Health Advisories: MCL = 5 ug/l		USEPA, Office of Drinking Water, April 1989
Total Chromium	Health Advisories: MCL = 100 ug/l NIPDWR = 50 ug/l RfD = 5 ug/kg/day (ADULT)		USEPA, Office of Drinking Water, April 1989

* A more generalized list of ARARs is provided in Appendix I.

TABLE 4-1
POTENTIAL ARARS FOR NAS MEMPHIS*

Location/Action/Chemical	Requirement	Prerequisite	Citation
PCB	Proposed SMCL = 0.03 mg/l		USEPA, Office of Drinking Water, April 1989
TDS	SMCL = 500 mg/l		USEPA, Office of Drinking Water, April 1989
BTEX	Proposed SMCL = 0.02 mg/l		USEPA, Office of Drinking Water, April 1989
Cyanide	Health Advisories: RfD = 22 ug/kg/day Lifetime = 200 ug/l (Adult)		USEPA, Office of Drinking Water, April 1989
Phenols	Health Advisories: RfD = 40 mg/kg/day (Adult)		USEPA, Office of Drinking Water, April 1989
Copper	SMCL = 1 mg/l		USEPA, Office of Drinking Water, April 1989
Nickel	Health Advisories: RfD = 20 mg/kg/day Lifetime = 200 mg/l (Adult)		USEPA, Office of Drinking Water, April 1989
Aluminum	Listed for State Regulation SMCL 0.05 mg/l		USEPA, Office of Drinking Water, April 1989
Zinc	Listed for State Regulation		USEPA, Office of Drinking Water, April 1989

* A more generalized list of ARARs is provided in Appendix I.

TABLE 4-1
POTENTIAL ARARS FOR NAS MEMPHIS*

Location/Action/Chemical	Requirement	Prerequisite	Citation
Arsenic	MCL = 30 mg/l RfD = 1.0 mg/kg/day		USEPA, Office of Drinking Water, April 19B9
Antimony	RfD = 0.4 mg/kg/day		USEPA, Office of Drinking Water, April 1989

* A more generalized list of ARARs is provided in Appendix I.

TABLE 4-2
FEDERAL AND STATE CRITERIAL ADVISORIES AND GUIDANCE TO BE CONSIDERED

Document Type	Description
Federal Criteria, Advisories and Procedures	• Health Effects Assessments (HEAs) and Proposed HEAs; "Health Effects Assessment for (Specific Chemicals)," ECAO, USEPA, 1985. • Drinking Water Equivalent Levels derived from RfDs; USEPA Health Advisories, Office of Drinking Water, March 31, 1987. • Carcinogen Potency Factors (CPFs); USEPA, OHEA/6008 82/005F, July 1985. • Waste load allocation procedures; EPA Office of Water (40 CFR Part 125, 130). • Guidelines for Ground Water Classification Under the EPA Ground Water Protection Strategy. • TSCA Compliance Program Policy; "TSCA Enforcement Guidance Manual-Policy Compendium," USEPA, OECM, OPTS, March 1985. • OSHA health and safety standards that may be used to protect public health (non-workplace). • EPA Water Quality Advisories; EPA Office of Water, Criteria and Standards Division.
USEPA/RCRA Guidance Documents	• Permit Writers Guidance Manual for Hazardous Waste Land Treatment, Storage and Disposal Facilities, Phase 1; EPA/530-SW-84-024. • Waste Analysis Plan Guidance Manual; EPA/530-SW-84-012. • Guidance Manual on Closure and post-closure interim Status Standards.

safety procedures adopted for the investigation and site remediation,

- Confirm suspected contaminants,
- Evaluate the need for additional data and design Phase III sampling plans,
- Compare contaminant concentrations with established criteria (e.g., drinking water standards and NPDES requirements),
- Screen or select remedial alternatives,
- Use as basis for the conceptual design of remedial technologies.

These DQOs will be accomplished through adherence to the field and laboratory techniques given in the SAP. These DQOs are subject to change throughout the course of this investigation.

4.3 ANALYTICAL DETECTION LIMITS

Sampling and analytical methods will be selected that are accurate to be level of concern stipulated in the DQOs.

Each sampling phase of the RI process will incorporate one or more of the analytical levels described in Section 3.3 Phase I sample analyses for the NAS Memphis RI/FS will be NEESA Level C unless directed otherwise by the SOUTHDIV EIC.

4.4 CONTAMINATION ASSESSMENT

As RI/RFI analytical data become available, Phase II work, if required, will be scoped and planned for Navy review. Identification of cleanup alternatives will be performed as part of the FS. Final screening of alternatives on the basis of cost effectiveness and feasibility will follow the completion of a baseline risk assessment and final risk assessment.

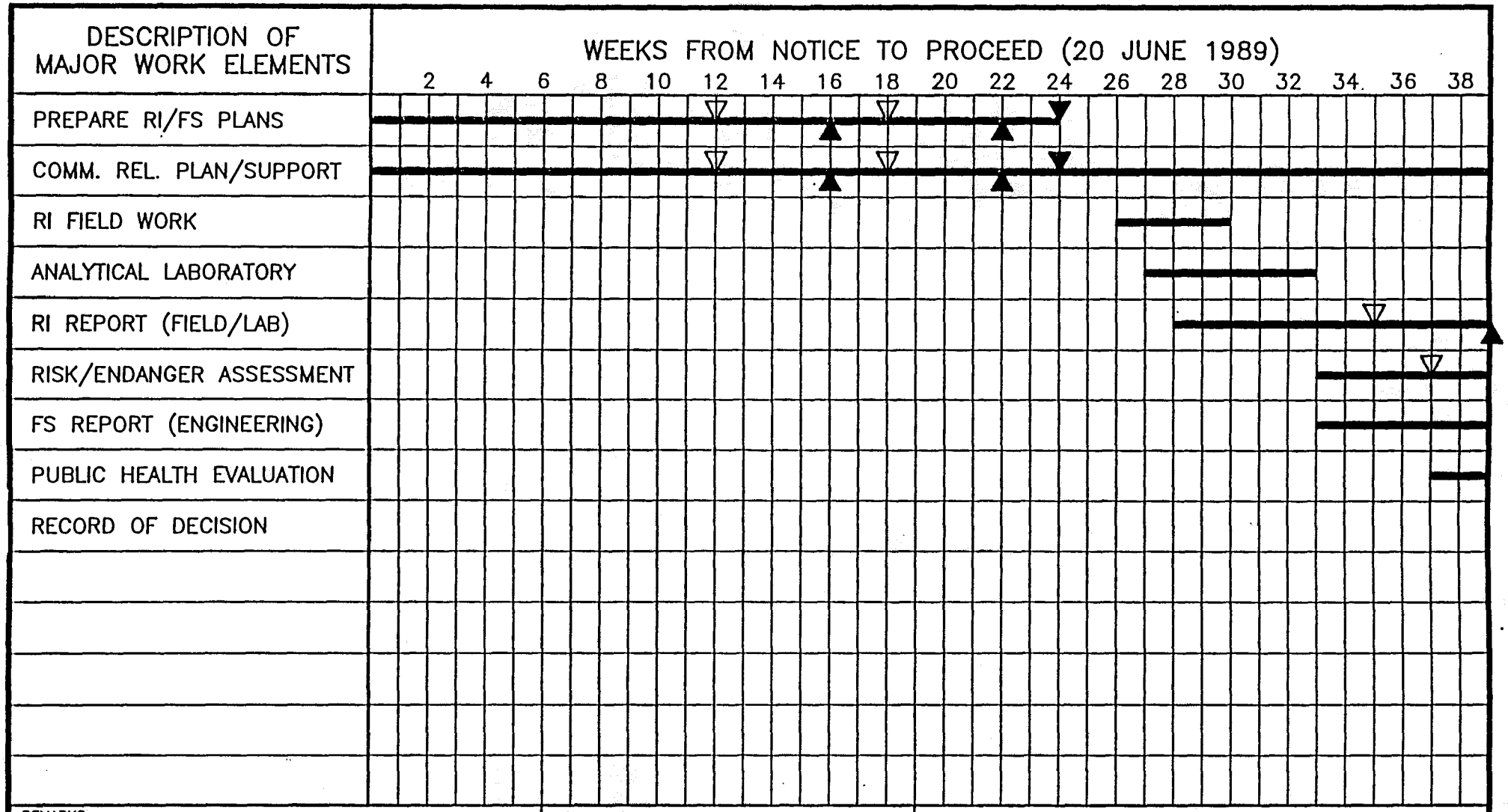
4.5 PROJECT IMPLEMENTATION

The proposed work schedule for the NAS Memphis RI/FS is shown in

Figure 4-1, the tentative overall project schedule. The schedule provides an estimate of the time needed to complete the various project tasks and is subject to periodic updates throughout the course of this investigation.

TABLE 4-2
FEDERAL AND STATE CRITERIAL ADVISORIES AND GUIDANCE TO BE CONSIDERED

Document Type	Description
USEPA Office of Water Guidance Documents	• Water-related Environmental Fate of 129 Priority Pollutants (1979). • Water Quality Standards Handbook; December 1983. • Designation of a USDW (No. 7.1, October 1979). • Evaluating Cover Systems for Solid and Hazardous Waste; EPA 0SW-00-00-867, 1982. • Management of Hazardous Waste Leachate; OSW-00-00-871, September 1982. • Closure of Hazardous Waste Surface Impoundments; OSW-00-00-873, September 1982. • Soil Properties, Classification, and Hydraulic Conductivity Testing; OSW-0000-925, March 1984; OSWER directive 9480.00-70. • Solid Waste Leaching Procedure Manual; OSW-00-00-924, 1984.



REMARKS:

▽ DRAFT SUBMITTALS

▼ FINAL SUBMITTALS

▲ REVIEWER COMMENTS RECIEVED (ASSUMES 4 WEEK CLIENT REVIEW, 2 TO 4 WEEK TURNAROUND)

MADE BY: H.A. BRYSON

DATE: 14 SEPT 1989

LAST REV. DATE: NA

FIGURE 4-1.

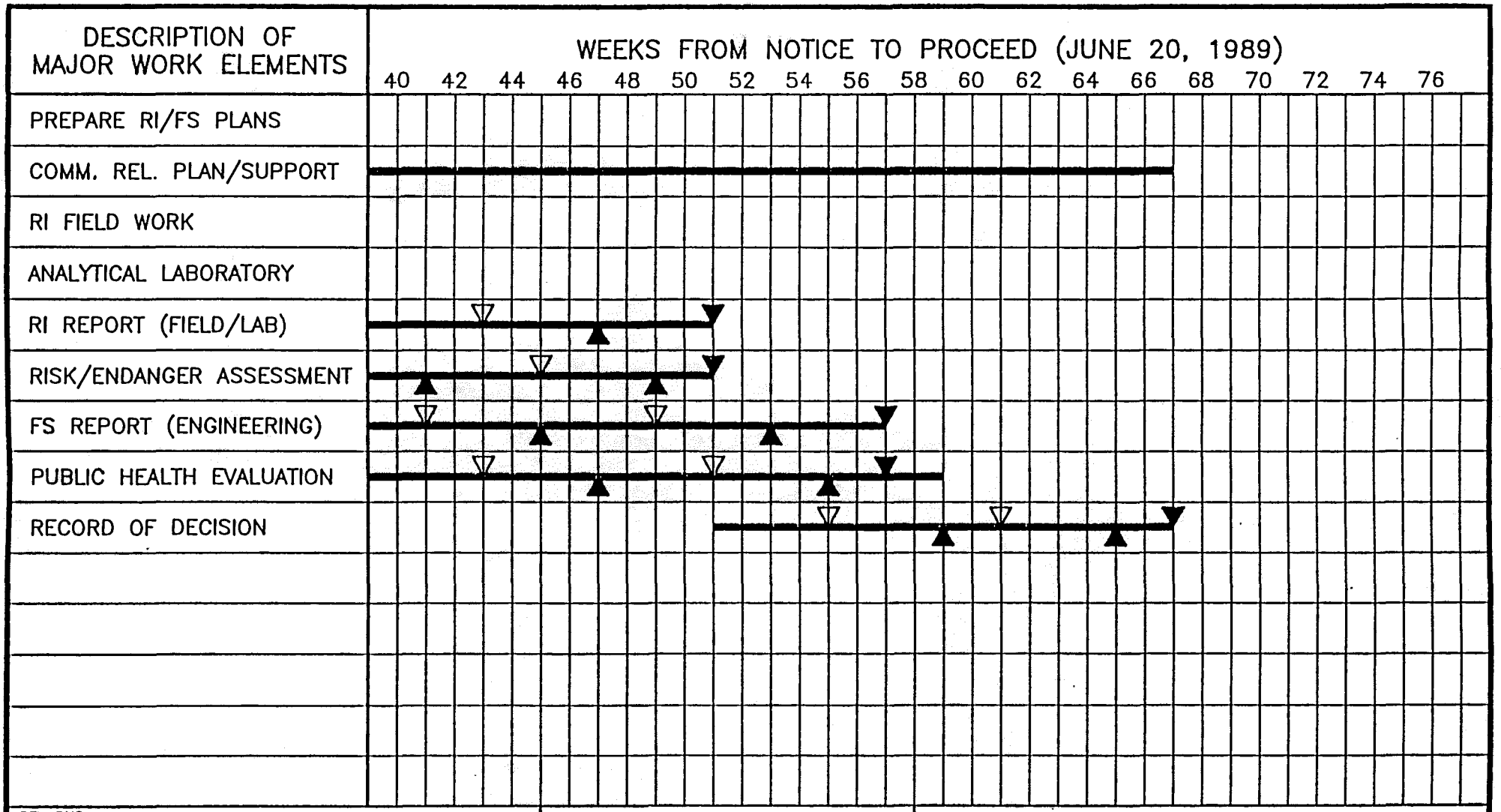
PROJECT SCHEDULE

PROJECT SCHEDULE

FOR: NAS MEMPHIS RI/FS SITES 1 THROUGH 9

PROJECT NO. R880-062

SHEET 1 OF 2



REMARKS:

- ▽ DRAFT SUBMITTALS
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LAST REV. DATE: NA

PROJECT SCHEDULE

PROJECT SCHEDULE

FOR: NAS MEMPHIS RI/FS SITES 1 THROUGH 9

PROJECT NO. B880-062

SHEET 2 OF 2

APPENDIX I

UNIVERSE OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS a/

1. Office of Solid Waste

o Resource Conservation and Recovery Act of 1976 (42 U.S.C. 6901) b/

a. 40 CFR Part 264, applicable for permitted facilities c/, and 40 CFR Part 265, for interim status facilities.

- Ground-water Protection (40 CFR 264.90-264.101)
- Ground-water Monitoring, Subpart F (40 CFR 264.98-264.100) d/
- Closure and Post-Closure (40 CFR 264.110-264.120, 265.110-265.120)
- Containers (40 CFR 264.170-264.178, 265.190-265.177)
- Tanks (40 CFR 264.190-264.200, 265.190-265.199)
- Surface Impoundments (40 CFR 264.220-264.249, 265.220-265.230)
- Waste Piles (40 CFR 264.250-264.269, 265.250-265.258)
- Land Treatment (40 CFR 264.270-264.299, 265.270-265.282)
- Incinerators (40 CFR 264.340-264.999, 265.340-265.369)
- Land Disposal Restrictions (40 CFR 268.1-268.50)
- Dioxin-containing Wastes (50 FR 1978). Includes the final rule for the listing of dioxin-containing waste.

b. Statutory requirements, including:

- Liquids in Landfills (RCRA §3004(c))
- Minimum Technology Requirements (RCRA §3004(o), 3005(j))
- Dust Suppression (RCRA §3004(e))
- Hazardous Waste Used as Fuel (RCRA §3004(q))

c. Open Dump Criteria - pursuant to RCRA Subtitle D: criteria for classification of solid waste disposal facilities (40 CFR Part 257). Note: For nonhazardous wastes.

2. Office of Water

o The Safe Drinking Water Act (42 U.S.C. 300(f))

a. Maximum Contaminant Levels (chemicals, turbidity, and microbiological contamination) (for drinking water or human consumption) (40 CFR 141.11-141.16).

b. Maximum Contaminant Level Goals (40 CFR 141.50-141.51, 50 FR 46936)

c. Underground Injection Control Regulations (40 CFR Parts 144, 145, 146, 147).

o Clean Water Act (33 U.S.C. 1251)

Requirements established pursuant to sections 301 (effluent limitations), 302 (effluent limitations), 303 (water quality standards, including State water quality standards), 304 (federal water quality criteria), 306 (national performance standards), 307 (toxic and pretreatment standards, including federal pretreatment standards for discharge into publicly owned treatment works, and numeric standards for toxics), 402 (national pollutant discharge elimination system), 403 (ocean discharge criteria), and 404 (dredged or fill material) of the Clean Water Act, (33 CFR Parts 320-330, 40 CFR Parts 122, 123, 125, 131, 230, 231, 233, 400-469). Available ambient Water Quality

UNIVERSE OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

f. Standards of performance for new stationary sources, including new incinerators (42 U.S.C. 7411), (40 CFR Part 60).

5. Other Federal Requirements

- o OSHA requirements for workers engaged in response or other hazardous waste operations (29 CFR 1910.120).
- o Occupational Safety and Health Act of 1970 (29 U.S.C. 651).

  a. Occupational Safety and Health Standards (General Industry Standards) (29 CFR Part 1910).

  b. The Safety and Health Standards for Federal Service Contracts (29 CFR Part 1926).

  c. The Shipyard and Longshore Standards (29 CFR parts 1915, 1918).

  d. The Health and Safety Standards for Employees engaged in Hazardous Waste Operations. (50 FR 45654)

- o National Historic Preservation Act, 16 U.S.C. 470. Protection of Archaeological Resources: Uniform Regulations -- Department of Defense (32 CFR Part 229, 229.4), Department of the Interior (43 CFR Part 7, 7.4).
- o Federal Land Policy and Management Act, 43 U.S.C. 1700. (Establishes requirements concerning utilization of public lands, particularly rights of way regulation (43 U.S.C. 1761), land use planning and land acquisition and disposition (43 U.S.C. 1711), and appropriation of waters on public lands.
- o Department of Transportation Rules for the Transportation of Hazardous Materials, 49 CFR Parts 107, 171.1-172.558.
- o Endangered Species Act of 1973, 16 U.S.C. 1531. (Generally, 50 CFR Parts 81, 225, 402).
- o Wild and Scenic Rivers Act, 16 U.S.C. 1271.
- o Fish and Wildlife Coordination Act, 16 U.S.C. 661 note.
- o Fish and Wildlife Improvement Act of 1978, and Fish and Wildlife Act of 1956, 16 U.S.C. 742a note. g/
- o Fish and Wildlife Conservation Act of 1980, 16 U.S.C. 2901. (Generally, 50 CFR Part 83). g/
- o Coastal Zone Management Act of 1972, 16 U.S.C. 1451. (Generally, 15 CFR Part 930 and 15 CFR 923,45 for Air and Water Pollution Control Requirements).
- o Farmland Protection Policy Act, 7 U.S.C. 4201. (Generally, 7 CFR Part 658). g/
- o Rivers and Harbors Act (33 U.S.C 403)

---

a/ This is the list of potentially applicable or relevant and appropriate requirements found in the October 2, 1985, Compliance Policy with additions. As additional requirements are promulgated, they must also be considered potentially applicable or relevant and appropriate and added to this list.

b/ In authorized States, federal regulations promulgated under RCRA are not applicable as a State requirement until the State adopts those regulations through its own legislative process, but probably would be relevant and appropriate as a federal requirement. Federal

FINAL DRAFT

SAMPLING AND ANALYSIS PLAN

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

NAVAL AIR STATION (NAS) MEMPHIS
MILLINGTON, TENNESSEE

PART I: QUALITY ASSURANCE PROJECT PLAN

PART II: FIELD SAMPLING PLAN

NOVEMBER 1989

FINAL DRAFT

SAMPLING AND ANALYSIS PLAN

FOR

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
SITES NO. 1-9
NAVAL AIR STATION NAS MEMPHIS
MILLINGTON, TENNESSEE

Prepared By:
ERC Environmental and Energy Services Co.
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Approved: _____ Date: _____
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Approved: _____ Date: _____
Quality Assurance Coordinator,
QEA

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PART II - FIELD SAMPLING PLAN	

LIST OF ACRONYMS

AA - Atomic Absorption

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

CLP - Contract Laboratory Program

EIC - Engineer in Charge

EPA - Environmental Protection Agency

GC - Gas Chromotograph

IRP - Installation Restoration Program

NACIP - Navy Assessment and Control of Installation Pollutants

NAS Memphis - Naval Air Station, Memphis

NBS - National Bureau of Standards

NEESA - Navy Energy an Environmental Support Activity

NPL - National Priority List

OVA - Organic Vapor Analyzer

PMP - Project Management Plan

QAPP - Quality Assurance Project Plan

QA/QC - Quality Assurance/Quality Control

RI - Remedial Investigation

SARA - Superfund Amendments and Reauthorization Act of 1986

SOUTHDIV - Southern Division, Naval Facilities Engineering Command

SWMU - Solid Waste Management Unit

VOC - Volatile Organic Constituents

1.0 INTRODUCTION

Southern Division Naval Facilities Engineering Command (SOUTHDIV NAVFACENGCOM) Contract N62467-88-C-0198, ERC Environmental and Energy Services Co. (ERCE) has prepared the pertinent documents required for the proposed Remedial Investigation/Feasibility Study (RI/FS) work. The purpose of this Sampling and Analysis Plan (SAP) is to establish both the field and laboratory sampling and analysis procedures as well as the quality assurance requirements to ensure that sampling data collection activities will be consistent throughout all phases of the RI/FS. The SAP also serves as a basis for estimating costs of field efforts for inclusion in the work plan. The (RI/FS) tasks and field activities will be conducted at the following nine solid waste management unit (SWMU) sites at the Naval Air Station Memphis (NAS Memphis), Millington, Tennessee:

SWMU NO.	SWMU NAME
1	Fire Department Drill Area
2	South-Side Landfill
3	N-121 Plating Shop Dry Well
4	N-121 Plating Shop Storm Sewer
5	Fire-Fighting Training Area
6	N-126 Battery Shop Storm Sewer Ditch
7	N-126 Plating Shop Dry Well
8	Cemetery Disposal Area
9	Sewage Lagoons

This SAP is comprised to two parts: a quality assurance project plan (QAPP) and a field sampling plan (FSP). The FSP address Phase I of the RI only; the FSP will be updated to include a Phase II sampling plan based on Phase I results. The QAPP establishes the performance requirements, functional activities, and quality assurance/quality control protocols necessary to achieve the data quality objectives as put forth by the intended use of the data generated during the RI/FS task. The FSP provides guidance for all field work by defining the sampling and

measurement methods to be used on each SWMU site.

This Plan is subject to evaluation and periodic updates as phases of the RI/FS are implemented.

The Naval Installation Restoration Program (IRP) was established in 1983 to direct the investigation and remediation of uncontrolled hazardous waste disposal sites associated with Naval Operations. In accordance with the National Contingency Plan (NCP), the Naval IRP is currently being implemented in full compliance with statutory requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA/SARA specifies that inclusion of all applicable or relevant and appropriate requirements in particular, the Resource Conservation and Recovery Act of 1976 (RCRA) and the Hazardous and Solid Waste Amendments of 1984 (HSWA) be made. The Naval IRP also incorporates compliance with other laws and regulations.

FINAL DRAFT

VOLUME I

QUALITY ASSURANCE PROJECT PLAN

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

NAS MEMPHIS

MILLINGTON, TENNESSEE

NOVEMBER 1989

FINAL DRAFT

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RI - Remedial Investigation

SARA - Superfund Amendments and Reauthorization Act of 1986

SOUTHDIV - Southern Division, Naval Facilities Engineering Command

SWMU - Solid Waste Management Unit

VOA - Volatile Organic Analytes/Volatile Organic Analyses.

VOC - Volatile Organic Constituents/Contaminants

1.0 INTRODUCTION

In September 1986, the U.S. Environmental Protection Agency (EPA) issued Permit Number HSWA-TN002 to the Naval Air Station Memphis (NAS Memphis) located at Millington, Tennessee. This permit, issued pursuant to the Solid Waste Disposal Act, required the permittee to prepare a report which identifies and characterizes all existing and closed Solid Waste Management Units (SWMU) located at the facility.

In December 1986, Engineering, Design and Geoscience Group, Inc. (EDGe), was retained by Southern Division Naval Facilities Engineering Command (SOUTHDIV NAVFACENGCOM; Navy) to address the requirements of Permit Number HSWA-TN002. Specifically, EDGe was to inventory the NAS Memphis facility and identify units, sites, activities or locations which meet the definition of Solid Waste Management Units. Following identification, description and analysis of the SWMUs, EDGE was to prepare investigation plans intended to evaluate SWMUs which are known, suspected, or presumed to have releases of hazardous constituents. During the inventory phase, the EDGe team identified fifty-eight potential SWMUs. The RCRA Facility Investigation draft Work Plan report dated April, 1987 locates and describes each of these SWMUs. Nine of these SWMU sites were recommended for further study under CERCLA rules. Their site investigation plans will be developed under the Comprehensive Environmental Response Compensation and Liability Act/Superfund Amendments and Reauthorization Act (CERCLA/SARA) regulations.

This Quality Assurance Project Plan (QAPP) has been prepared by ERCE/EDGe, Inc., for the Southern Division, Naval Facilities Engineering command, under Contract No. N62467-88-C-0198, which encompasses the planning of contamination assessments for nine sites at NAS Memphis in Tennessee. The QAPP presents the policies, organization, objectives, functional activities, and

specific quality assurance/quality control (QA/QC) procedures that shall be employed by the contracting consultant engineer to ensure that all technical data generated during the performance of the investigations at NAS Memphis are accurate and representative.

2.0 PROJECT DESCRIPTION

The NAS Memphis installation occupies an area of approximately 3,490 acres in Millington, Tennessee, approximately twenty miles northeast of the City of Memphis and thirteen miles east of the Mississippi River. The facility is bordered on the west and south by the City of Millington and on the north and east by agriculture and residential areas. Figure 2-1 is a map of NAS Memphis.

NAS Memphis has historically provided services and materials to support the operations of aviation activities, the activities of the Naval Education and Training Command and other activities as designated by the Chief of Naval Operations. In support of these operations, hazardous materials have been used and/or generated.

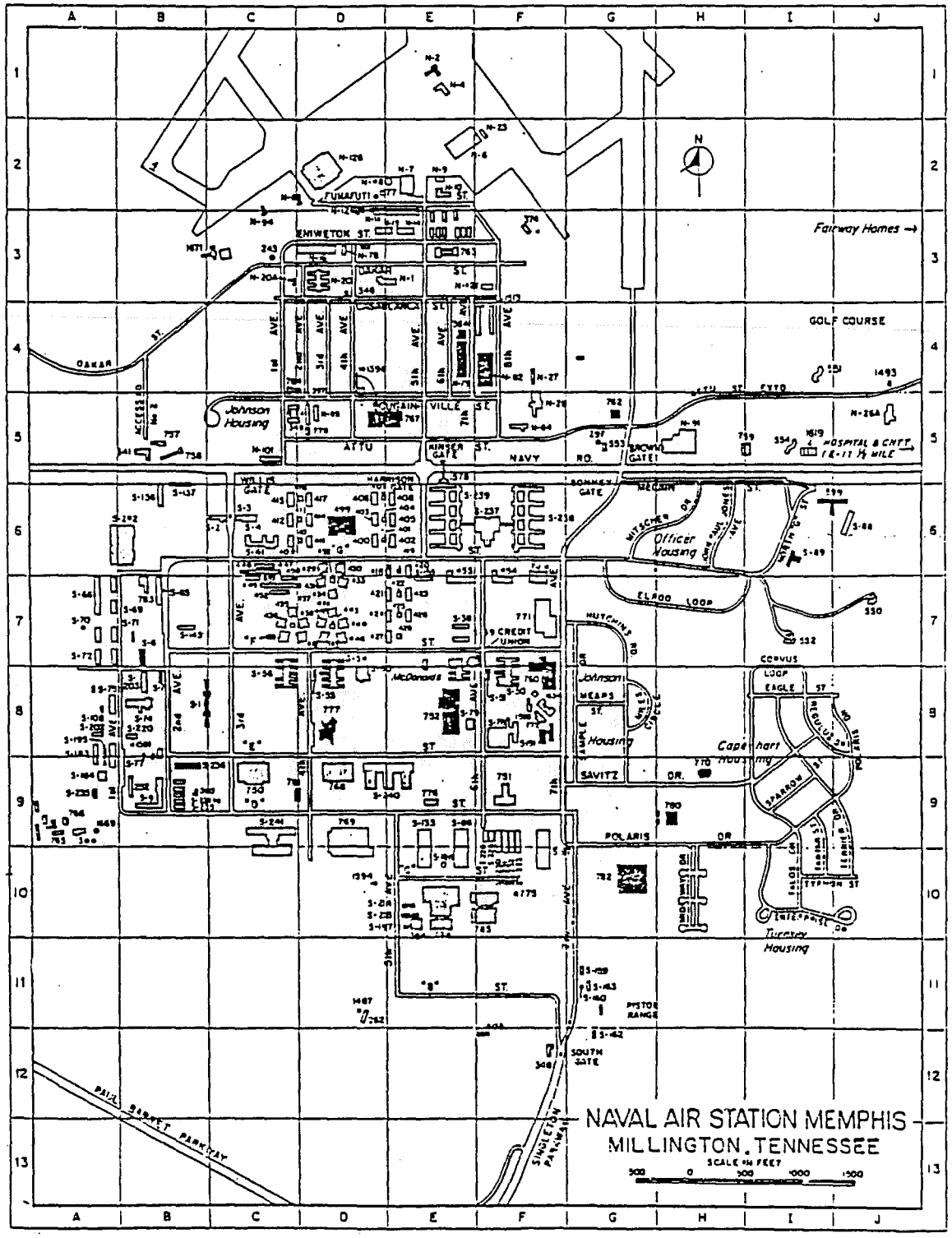


FIGURE 2-1. NAS MEMPHIS MAP

FIGURE 2-1.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The overall responsibility for the NAS Memphis SWMU Investigation has been assigned to the Southern Division, Naval Facilities Engineering Command (SOUTHDIV) under the Naval IRP. SOUTHDIV will therefore be responsible for overseeing the Quality Assurance/Quality Control (QA/QC) for the remedial investigation.

Figure 3-1 presents the basic organizational structure for the QA/QC program. The Generic Project Management Plan (PMP) should be referenced for the detailed project organization and field personnel assignments.

The Contracting Consulting Engineer will perform all field investigation, sample collection, and data summary tasks. Certain subcontractors will also participate in the investigation. Environmental and Safety Designs, Inc., Memphis, Tennessee, will participate in certain health and safety, quality management, and local coordination activities. The proposed subcontracting laboratory is Pioneer Laboratory, Inc. (a subsidiary of ERCE) located in Pensacola, Florida. Pioneer Laboratory, Inc., will obtain prior to sample analyses and maintain through the Remedial Investigation approval from the Navy.

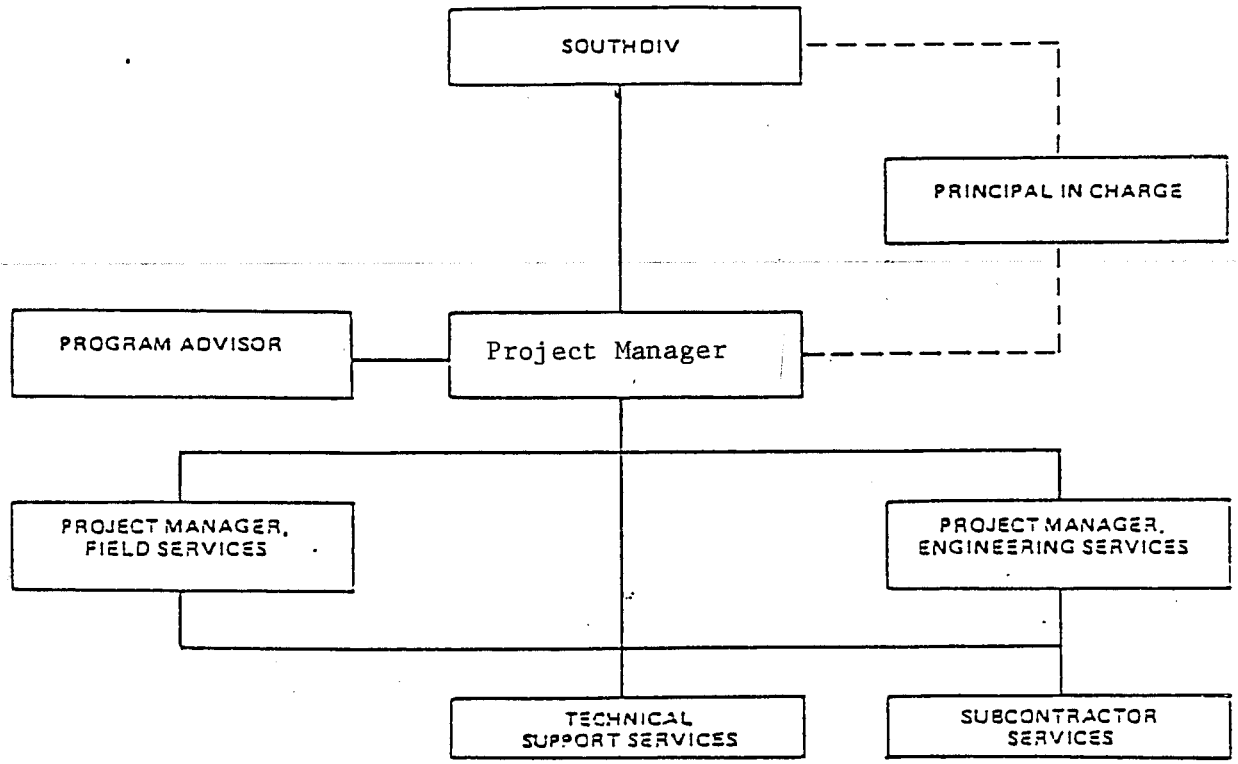


Figure 3-1: Generic Organizational Structure for QA/QC Program.

4.0 QUALITY ASSURANCE/QUALITY CONTROL OBJECTIVES FOR MEASUREMENT OF DATA

In the document entitled "Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program, the Navy Energy and Environmental Support Activity (NEESA)" specifies three levels of analytical data quality that are applicable to investigations of naval facilities. These levels are summarized as:

- **Level C** is applicable to sites not included on the National Priorities List (NPL) and not likely to undergo litigation, but located near populated areas; EPA-approved methods without a data package, but validated against the Contract Laboratory Program (CLP) criteria, are required.

- **Level D** is applicable to NPL sites that are likely to undergo litigation; full CLP methods and validation, together with all CLP deliverables, are required.

- **Level E** is applicable to non-NPL sites in a non-populated area; EPA methods or equivalent are required.

Site investigations performed by the Contracting Engineer Consultant at NAS Memphis shall incorporate but not be limited to NEESA Level C during the initial phase(s) of SWMU site investigations. Phase I of the RI is planned on NEESA Level C, per SOW specification.

In combination, QA and QC represent a set of procedures designed to produce analytical data of known and measurable quality. A useful distinction between QA and QC can be made as follows: QC represents the set of measurement procedures (spikes, blanks, replicates, calibration, etc.) used to provide overall evidence

of the quality of a particular analytical batch; QA represents the set of procedures used to ensure that this evidence is available and used properly to evaluate and, if necessary, qualify data quality.

For the specific SWMU sites or RI/RS tasks, the Contracting Engineer Consultants and their subcontractors will adopt the QA/QC procedures of either the USEPA CLP or the USEPA Office of Solid Waste and Emergency Response.

5.0 FIELD WORK AND SAMPLING PROCEDURES

The following sections briefly describe the anticipated field sampling procedures for the NAS Memphis SWMU site investigations.

5.1 SOIL SAMPLING

5.1.1 Surface Soil

Surface soil sampling will involve the collection of soil material to a maximum depth of 12 inches. Sampling implements will include stainless steel trowels, coring devices, and mixing bowls. All implements if not disposable shall be decontaminated between the collection of each sample (Refer to Section 5.7). During the collection of each sample, the physical characteristics of the soil materials shall be recorded. Each soil sample will be of sufficient volume for subsequent analytical testing requirements and shall be contained in a glass container.

Composite samples, a homogeneous soil sample comprised of proportionately equal volumes of soil aliquots collected at equivalent depths, shall be collected with the same implements used for grab sample collection. Decontamination is required between each sample collection, but will not be required between the collection of the composite sample aliquots.

Field personnel will record, along with the soil's physical characteristics, a description of the sample location, the time period for each sample collection, surface conditions surrounding the sampling location, and all pertinent meteorological information.

5.1.2 Subsurface Soil Sampling

For soil samples which are to be subjected to physical and chemical testing, sample collection will be obtained by the use

of a hollow stem auger rig. For split-spoon or drive-sampling, ASTM D-1586 will be followed; and for relatively undisturbed thin wall, or Shelby tube sampling, ASTM D-1587 will be followed.

As soil cores are retrieved, the headspace will be screened with either an Organic Vapor Analyzer (OVA) or a Photoionizer (HNu) to determine the presence of volatile compounds. The data will be recorded for health and safety purposes and for the formulation of Phase II site specific sampling plans. Health and Safety action levels are given in the Health and Safety Plan.

The samples will then be transferred to labeled glass jars. In the case of Shelby tube sampling, samples will be sealed on both ends and the tube labeled. Samples selected from each representative unit will be subject to the following analyses:

- Grain-size Distribution (ASTM D 421 and 422);
- Atterberg Limits (ASTM D 423 and 424);
- Moisture Content (ASTM D 2216);
- Hydraulic conductivity;
- Cation exchange capacity;
- Soil organic content; and
- Soil pH.

Split-spoon samples will be collected using 2 or 3-inch diameter stainless steel split-spoon samplers that are 1.5 to 2.0 feet long. The spoon will be advanced with a standard 140-pound hammer. After the spoon has been driven to the required depth, it will be retrieved and "split" open to collect the core sample.

To preclude cross-contamination between samples, strict cleansing protocol will be followed for both sampling methods. Shelby tubes will be washed with soapy water, thoroughly rinsed with water, rinsed with selected decontamination solution or other suitable rinse, and wrapped in aluminum foil prior to being

transported to the site. After each use, the split spoon sampler will receive the same cleansing and rinsing procedure as above, except the cleaning will be conducted on-site. Only one person will handle the Shelby tube sampler through any one sampling event and that person shall wear disposable surgical gloves. The storage of split -spoon samples for chemical analyses shall be in wide-mouth 8-ounce glass containers as provided by the subcontracting laboratory. The Shelby tube samples will remain within the sealed tube. Before analysis, the laboratory will trim the exterior of the Shelby tube sample to remove any possible contamination carried down the hole from a higher horizon. Specific decontamination procedures to be used between each sample collection are described in Section 5.7.

Upon completion of the borehole, the open hole will be backfilled with a grout mixture or the drill cuttings if the borehole is less than 20 feet or unless otherwise instructed in the site-specific field plan. Drill cuttings which are not used for backfill will be drummed or otherwise disposed of in accordance with applicable regulations and the site-specific field plan.

5.1.3 Geologic/Hydrogeologic Descriptions

Each Boring shall classify and describe soil units using SCS soil classification. Each boring shall be described in narrative form for the following criteria:

- porosity (effective and total);
- lithology;
- interpretation of hydraulic interconnections between saturated zones;
- attenuation capacity and mechanisms of the natural earth materials;
- zones of fracturing or channeling in consolidated or unconsolidated deposits;
- zones of higher or lower permeability that might direct

or restrict the flow of contaminants;

- uppermost aquifer;
- water bearing zones above the first confining layer;
- water level/fluid pressure;
- water level contour;
- hydrologic cross sections with vertical gradients;
- flow system;
- soil profile;
- relative permeability;
- bulk density;
- infiltration;
- moisture content; and,
- mineral content.

5.2 DRILLING AND WELL INSTALLATION

Well installations or soil borings will be performed in accordance with all applicable local, state and federal regulations. If possible, all boreholes for monitoring wells and split-spoon samples will be drilled using hollow stem augers. This drilling method involves advancing a bit attached to the appropriate diameter hollow stem auger without the use of any drilling fluid. When the desired depth is achieved the well casing is installed through the hollow center of the auger. This drilling method prevents borehole caving and potential fluid circulation and has the ability to drill without introducing any fluids into the formation.

If boreholes cannot be drilled with a hollow stem auger due to great depths or hardness of formation, mud-rotary drilling techniques shall be used. This method advances a bit at the end of a hollow drilling rod. Drilling mud, pumped through the hollow rod out past the bit, acts as a lubricant for the bit and carries drill cuttings to the surface.

A certificate of conformance shall be provided to the EIC for any

of the items below that are used in well installation. The certificate shall describe in detail how the material meets or exceeds the required specifications for the following, as appropriate:

- Casing;
- Screen;
- Grout;
- Drilling mud;
- Caps and plugs;
- Centralizers;
- Surface casing;
- Well protective cover;
- Flush mount protective cover;
- Padlock;
- Protective post;
- Well designation sign; and
- Epoxy paint.

5.2.1 Standard Monitoring Well Construction

All monitoring wells will be completed with 2 or 4-inch I.D. Schedule 40 PVC casing and well screen unless otherwise stated in the site-specific field plan. All well casing segments will have flush-threaded joints (ASTM F480 and ASTM D1785). End fittings will be double entry flush screw threads.

The casing will be cleaned prior to delivery in the following manner: 5 minute immersion in static bath of dilute acid, pressure wash with detergent and cold water, rinse with warm water and allow to air dry.

The casing for each well will end in 10 feet of manufactured 0.010-inch slotted screen.* Water velocity through the screen shall not exceed 0.1 ft/sec. Two inch I.D. screens will have 3 rows of slots with a spacing of 1/8 inch between slots. Four

inch I.D. screen will have 6 rows of slots with a spacing of 1/8 inch between slots. End fittings will be welded to the screen body. The end plug shall be flush threaded and shall be constructed of the same type of material selected for the casing.

The annulus will have a minimum radius of three inches with respect to the well casing and will be backfilled with clean, medium-grained sand to a depth of at least one foot above the screen/casing joint. The filler pack will be 98% silica with a uniformly coefficient of 1-3 and specific gravity of 2.6 to 2.7. Bridges shall be avoided by backfilling at two foot intervals. Should bridges form, they will be broken by tamping or by washing with potable water.

A one-foot bentonite seal will top the sand pack. If the seal is above the water table, 1/4 inch bentonite pellets (90% montmorillonite clay, with a bulk dry density of 80 lb/cuft., specific gravity 1-2., pH of 8.5 to 10.5) will be placed by free-fall and wetted with potable water using a ratio of 1 gallon of water for 2 pounds of bentonite. A bentonite slurry placed with a tremie rod shall be used to top the sandpack if the seal is below the water table.

The remaining annular space shall be filled with grout to a depth two feet below the land surface. The consistency of the grout will be approved by the on-site geologist prior to placement.

* Screens that monitor groundwater quality at the top of the water table are usually 10 to 20 ft. in length, depending on the anticipated long-term changes in groundwater elevation. Ten foot long screens will be used for this study at intervals ranging from 40 to 70 feet.

The auger casing will be removed a section at a time during grouting. Cement will fill the remaining two feet of annular space and the well will be capped with a flush-mounted security cover.

Surface casings constructed of Schedule 40 PVC casing will be used when deemed necessary by the on-site geologist and will be installed to provide a 3-inch radius with respect to the well casing to a depth that is well below the contaminated zone.

The surface casing shall be constructed of steel meeting ASTM A 120 and shall have a wall thickness as follows:

- 24 inch diameter, 0.25 inch wall thickness;
- 20 inch diameter, 0.25 inch wall thickness;
- 16 inch diameter, 0.25 inch wall thickness;
- 10.75 inch diameter, 0.25 inch wall thickness;
- 24 inch diameter, 0.5 inch wall thickness;
- 20 inch diameter, 0.5 inch wall thickness;
- 16 inch diameter, 0.5 inch wall thickness; and
- 10.75 inch diameter, 0.365 inch wall thickness.

The casing shall then be grouted in place and allowed to set up for 24 hours before monitoring well drilling continues.

All materials provided for a well surface completion shall conform to the specifications listed below:

- Locking 16-gauge steel protective well cover, round or square and 5 feet in length;
- Flush mount 22-gauge steel, water resistant welded box with 3/8 inch steel lid, locking device and padlock guard;
- Concrete pad at ground surface (3' X 4' X 6") ASTM C 150;

- Padlock (brass, corrosion resistant, keyed alike) ASTM F 883;
- Steel protective post (4 inch diameter, 6 feet in length, 1/4 inch thickness, concrete filled) ASTM A 120;
- Well designation sign, sheet aluminum, ASTM B 209, 1/8 inch by 18 inch by 6 inch, anchors and fasteners compatible with sign, designation to be provided by EIC, the designation shall be stamped into the plate with 4 inch letters and numbers; and
- High visibility yellow epoxy paint AASHTO M220.

5.2.2 Development of Monitoring Wells

Well development shall commence no sooner than 24 hours after placement of the grout. Monitoring wells will be developed by pumping until specific conductance and pH have stabilized. The pumping method shall be capable of removing all drilling fluids and cuttings from inside the well, within the gravel pack and from within the formation. The development method shall not introduce any type of contamination into the aquifer. Figures 5-1 and 5-2 are well reports to be completed in the field by the Site Geologist describing well construction details and well installation, respectively.

5.2.3 Surveying of Wells

The top of the completed well casing from which water level measurements are to be taken will be surveyed to a vertical accuracy of 0.01 foot. The horizontal location shall be surveyed to third order accuracy. Each location shall be depicted on a site map and shall be tied into a USGS datum or on-site benchmarks.

5.3 GROUNDWATER SAMPLING

Prior to the sampling event, the well water level and total well depth will be measured with a calibrated weighted tape and all

available information on aquifer characteristics (transmissivity, hydraulic , conductivity etc.) will be reviewed. This information will be used to assess the appropriate method and amount of static water purging necessary in new and existing wells.

Before a groundwater sample is obtained, at least 3 volumes of static water shall be purged from the well. If the well does not recover quickly enough to permit the removal of 3 volumes of static water, the well will be pumped dry and sampled immediately following a sufficient recovery. In the case where the groundwater is to be sampled for volatile organics the wells shall not be drawn down more than 50% of the original volume during purging.

Before and periodically during purging, groundwater samples shall be tested for temperature, pH and conductivity to indicate when the chemistry of the groundwater has reached equilibrium temperature within 1°C, pH within 0.1 units, and specific conductivity within 25 micromhos or 10%, whichever is greater within a three-sample interval. These samples should be collected from the well's screened interval. Purging will be performed using decontaminated stainless steel or teflon bailers, dedicated PVC bailers, or pumps. Subsequent testing of the water up within the casing is also necessary to determine if this upper casing water is also being exchanged. If the field measurements indicate that the water is not being exchanged, then the pump should be set higher or the bailer retrieved at the appropriate shallower depth.

The bailer used will be dedicated to that well, and its construction will be compatible with the well material and the contaminants of concern. When bailing, care will be taken to keep the bailer rope clean so as not to introduce possible surface contaminants into the well. Discharged water will be

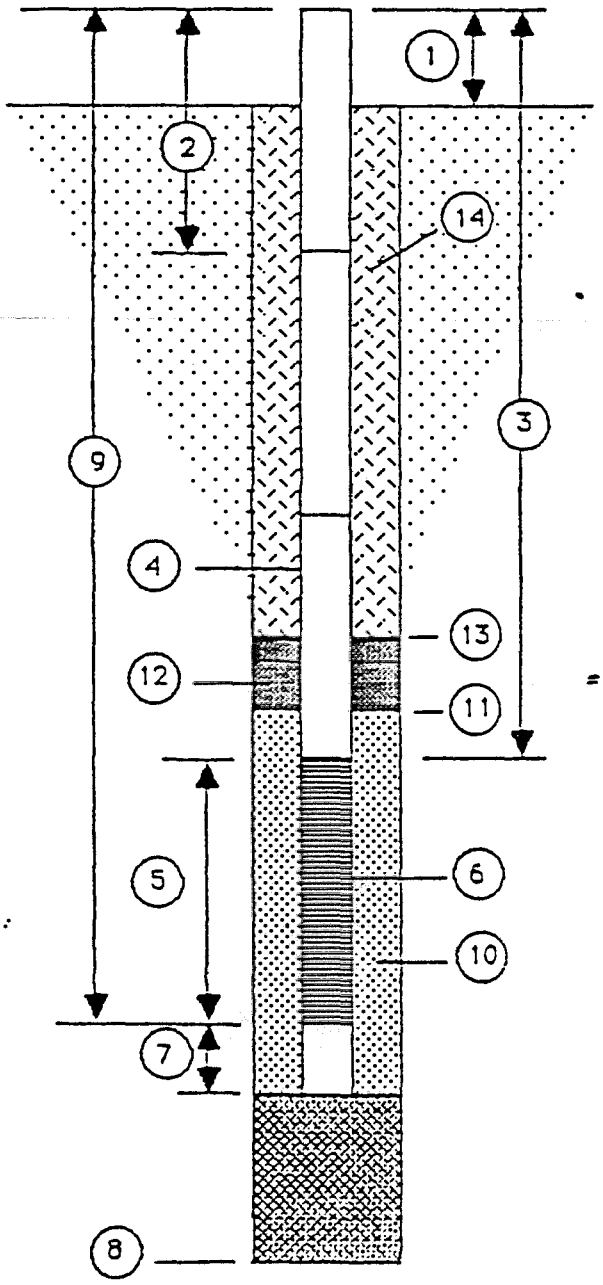
FIGURE 5-1.

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
2155 EAGLE DR., P. O. BOX 10068
CHARLESTON, S. C. 29411-0068

WELL CONSTRUCTION DETAILS

WELL NUMBER _____

DATE OF INSTALLATION _____



1. Height of Casing above ground _____
2. Depth to first Coupling _____

   Coupling Interval Depths _____

   _____
3. Total Length of Blank Pipe _____
4. Type of Blank Pipe _____
5. Length of Screen _____
6. Type of Screen _____
7. Length of Sump _____
8. Total Depth of Boring _____ Hole Diameter _____
9. Depth To Bottom of Screen _____
10. Type of Screen Filter _____

    Quantity Used _____ Size_____ U/C_____
11. Depth To Top of Filter _____
12. Type of Seal _____

    Quantity Used _____
13. Depth To Top of Seal _____
14. Type of Grout _____

    Grout Mixture _____

    Method of Placement _____

COMMENTS ON INSTALLATION:

Figure 5-1: Well Construction Detail Form

FIGURE 5-2.

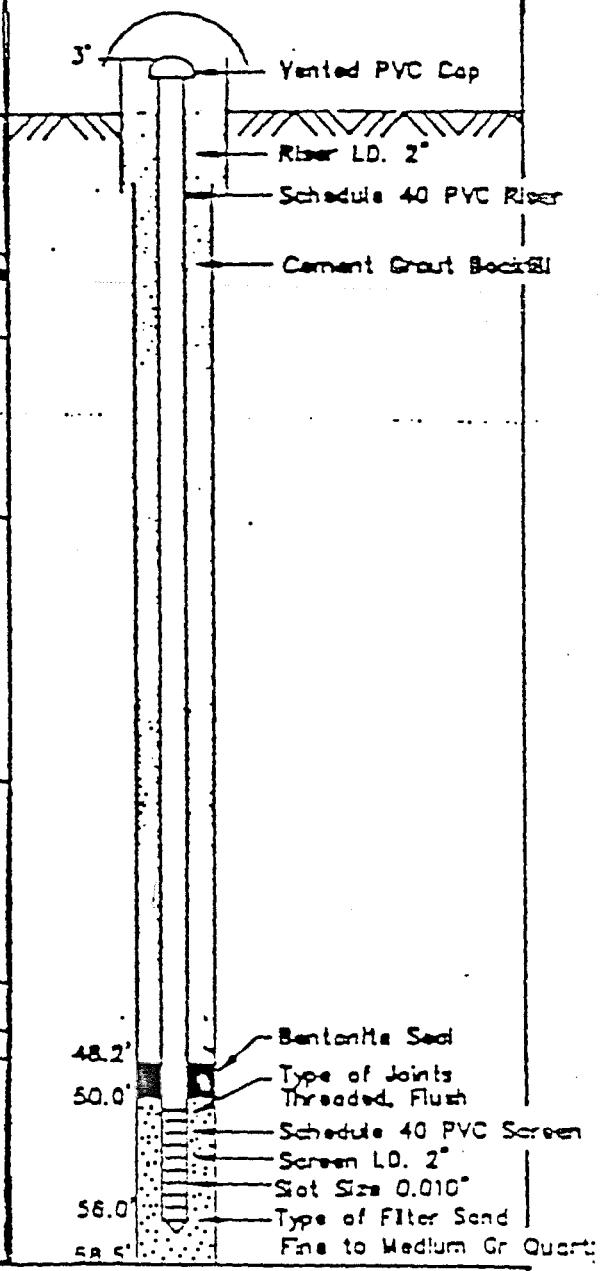
SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

LOCATION EXAMPLE OF A COMPLETED WELL SHEET

LOG OF BORING NO. _____ LOG OF WELL NO. _____

DEPTH IN FEET	SYMBOL	SAMPLES	MATERIAL DESCRIPTION
			SAND, dark to light brown, fine grained
10			CLAY, gray, soft with sand pockets and sa
			SAND, gray, fine grained, silty with shell fragments
20			CLAY, gray, firm
30			
			SAND, gray, silty, fine grained with greenish gray seams and sandy clay pockets
40			
			CLAY, greenish gray, scattered shell and sand pockets
			Phosphatic zone ? Weathered limestone ?
50			LIMESTONE with numerous shells, weak to medium strong
			T.D. - 58.5 ft

WELL CONSTRUCTION



Boring Completion Date:
Well Completion Date:
Well Development Date:
Drilling Method:
Depth to Water:

Boring Diameter:
Ground Elevation:
Top of Casing Elevation:
Driller:

Figure 5-2: Example Well Installation Report

kept as far away from the well head as possible.

Subsequent to the purging process, all samples will be collected with the dedicated bailer, unless the well depth precludes use of a bailer. Groundwater will be transferred from the bailer to the appropriate sample bottles supplied by the subcontracting laboratory. The bottles will contain the necessary preservatives, added by the laboratory. Care will be taken during bailer retrieval and pouring so as not to agitate the groundwater collected for organic analyses and also to insure that minimal degassing occurs. Water samples shall be filtered through a 0.45 micron filter into a glass carboy then poured into a one liter glass sampling bottle.

At the conclusion of sampling, the bailer and rope will be washed, rinsed, and placed in a clean protective covering, such as a polyethylene bag. The water level reader and field measurement probes will be washed and rinsed also. The pump and all cables and tubing will be cleaned by placing the pump in a decontamination container and pumping trough approximately ten pump/discharge hose-volumes of potable water and by rinsing the exterior of the hoses with potable or distilled water. More specific decontamination procedures are listed in Section 5.6.

5.4 SURFACE WATER/SEDIMENT SAMPLING

The purpose of collecting surface water and sediment samples from a drainage ditch, pit or any surface water ponding site is to identify the source of contaminants and to assess the environmental impact posed by the contamination via surface water transport.

Prior to sampling, surface drainage patterns should be studied to determine background (upstream) sampling locations. A minimum of one upstream sample is required for each site. Generally, both surface water and sediment samples are taken from any one

location. In this case, the water sample should be collected before the sediment sample to avoid extraneous cross contamination of the water sample by disturbed sediments. All samples will be progressively collected from areas of least contamination to areas of highest concentration unless otherwise stated in the site-specific field plan. Water samples should generally be taken using a stainless steel bucket at the end of a long pole which should be decontaminated (rinsed, washed, rinsed) between sample collections. Water samples not designated for Volatile Organic Constituents (VOC) analysis may require field filtering before they are preserved. If field filtering is required, the water should be filtered through a 0.45 micron filter into a glass carboy then poured into a one liter glass sampling bottle. Samples may be taken at a depth by a Kemmerer bottle or a similar device designed to open and close at the required depth. Recorded at the time the sample is taken should be the water's temperature, pH, specific conductance and velocity. The water's physical characteristics and the weather conditions at the time of sampling should also be recorded.

Grab sediment samples will be taken from the surface of the material to be sampled using a hand-held stainless steel or polypropylene scoop with a six inch long blade. The scoop shall be cleaned and rinsed between sample collections as directed by decontamination procedures in Section 5.7. Sediment samples will be placed in appropriate containers and held at 4°C until analysis. In deep waters sampling devices shall include Ekman dredges, bucket augers, coring devices and other standard equipment. Techniques described for soil sampling will apply to sediment sampling activities as well.

5.5 WIPE SAMPLING

Wipe sampling has been historically and universally used as one of the most reasonable, quick and inexpensive ways to sample surfaces. Its disadvantages are that (1) it is difficult to

determine precision and accuracy; (2) variations in results can occur due to samplers, porosity of surfaces sampled and details of sampling procedures; and (3) sampling can be complicated by surface absorption/bonding.

Each site to be sampled should be prepared in the following manner:

- Mark the exact sample site with the template or a ruler.
- If the site is not easily marked with a template or ruler, write a detailed description of the area sampled.
- Prepare all necessary forms and sampling logs for entry of the sampling time, date, location, and other information describing the sampling at the particular site.
- Prepare all sampling equipment for the sampling site.

Following site preparation, a trained technician will perform the following tasks:

1. With gloved hands, remove the cap from the sampling vial.
2. With forceps, remove the gauge from the sampling vial.
3. From a solvent bottle, use the volumetric delivery device to fill a graduated cylinder with 5 milliliters of solvent to wet the gauze.
4. Immediately begin wiping the entire marked area twice, from left to right and then from top to bottom.
5. Let the gauze air dry.
6. Fold the dry gauze (sampled side inward) and

return it to the sample vial.

7. Cap the sample vial.
8. Remove and discard the gloves.
9. Label the vial and fill out sampling details on the sampling forms.
10. Fill out chain-of-custody forms and prepare the sample for storage and shipping.

Quality control measures for wipe sampling should include field blanks, duplicate samples, and spiked samples. From each spill the following quality control samples should be prepared:

- Field blanks
  - Unopened sampling vials containing gauze.
  - Sampling vials containing gauze that has been removed, but not used to wipe.
  - Sampling vials containing gauze used to wipe an uncontaminated surface.
- Duplicate Samples
  - Duplicate samples should total at least 5% of the total samples.
  - Double wipe at least two sample sites (chosen method).
  - Side by side wipe at least two sample sites.

- Spiked Samples
  - Spiked samples should total at least 5% of the total samples.
  - Spike gauze, then wipe (chosen method).
  - Wipe first, then spike gauze.
  - Spike the site, then wipe.

In addition to documenting quality control measures, quality assurance activities should be documented including: who did it, what was done, when it was done, where it was done, and why it

was done. Any deviations from documented procedures and policies should also be documented and justified.

5.6 SUBSURFACE GAS MONITORING

Characterization of subsurface gas releases can be accomplished through a phase monitoring approach. The objective of initial monitoring is to begin characterizing known or likely subsurface gas releases. If initial monitoring confirms a contaminant release, the owner/operator should expand the monitoring program to determine the vertical and horizontal extent of the release, as well as the concentrations of all constituents of concern on the release.

Initial monitoring will use methane gas as the primary indicator of subsurface gas migration. If warranted, secondary monitoring shall include that of other suspected hazardous gases. During the initial monitoring phase, bar punch probe monitoring will be conducted at least twice a week and well monitoring will be conducted at least once a week for one month unless otherwise directed by the site-specific field plan. The bar punch is simply a steel or metal perforated bar with a sharp penetrating point which is hand-driven to depths of 3 feet. Once this hole is made it is covered with a stopper or seal to confine the head space in the hole. A threaded galvanized steel cap, with a short length of copper tubing penetrating the center of the cap is sometimes used to seal the upper end of the soil gas point. The hole shall be allowed to equilibrate for up to an hour prior to gas monitoring to provide sufficient time for subsurface gas to replace the air in the hole. During this study, in situ methane readings will be measured using either an explosimeter or OVA.

If Phase II measurements are required, soil gas sampling points will be mechanically driven into the soil to obtain data on subsurface gas concentrations at depths greater than 3 feet. Sampling point depths shall be determined in the field. Once the

gas sampling pipes are placed, equilibrium times of a least 24 hours shall be allowed prior to collection of subsurface gas samples for analysis. Explosimeters will be used for methane monitoring. Upon completing monitoring at each location, the soil gas sampling point will be removed and the hole backfilled using a grout mixture.

5.7 DECONTAMINATION

The sampling methods prescribed herein have been chosen in accord with EPA regulations to minimize decontamination requirements and the possibility of cross-contamination. Those sampling implements which cannot be decontaminated effectively shall be disposed of between and after sample collection. Unless otherwise specified in the site-specific field plan and work plan, decontamination procedures for sampling equipment will be as follows:

- Potable water rinse (provided by Contractor);
- Steam clean (drill equipment) with detergent (Alconox) solution;
- Alconox scrub with brushes;
- Potable water rinse;
- Deionized ASTM Type II water rinse;
- Air dry.

Rinsate and field blanks will be collected for decontamination quality control.

Teflon implements, used for the collection of samples for metals analysis, will require the following decontamination procedure:

- Alconox scrub;
- Potable water rinse;
- Nitric Acid rinse;
- ASTM Type II water rinse;

- Air dry.

All derived wastes from each investigation will be containerized by the Contractor in labeled 55-gallon drums unless otherwise noted in the site-specific field plan. The drums will be transported to a waste storage facility on the Naval Air Station grounds as directed by the EIC.

5.8 FIELD AND LABORATORY CONTROL CHECKS

The controls used to maintain a check on the quality of both field and laboratory practices are:

- **Method Blanks.** Method blanks also known as reagent blanks or equipment blanks are used to check laboratory contamination. Method blanks are analyzed each day or every 12-hour shift. An aliquot of laboratory deionized distilled water equal in volume or weight to the samples is used for method blank analyses. The method blank is subjected to the complete analytical process as though it were another sample. The blank should be free of any parameters being tested or interferences.
- **Method Standards or Quality Control Check Samples.** Method standards are deionized distilled water which have been spiked with known concentrations of the parameters being tested. They are used to check the complete analytical system under optimum conditions excluding any chemical from sample matrix. The method standards are prepared at concentrations corresponding to the mid ranges for each parameter as defined in the calibration procedure of the respective analytical method. The quality control check samples are analyzed once with each set of 27 samples to ensure at least 10% quality control.
- **Spiked Samples.** Spiked samples are samples which have

specific concentrations of various parameters of interest added, and are used to measure the performance of the complete analytical system including any chemical interference from sample matrix. Pioneer Laboratory also uses the spike sample as the duplicate to reduce the number of analysis without reducing the amount of quality control. A minimum of a sample spike, a duplicate sample spike, and a quality control check sample are analyzed with each set of twenty-seven samples to insure at least ten percent (10%) quality control. Duplicate spike samples are prepared by first removing one aliquot of sample for a complete analysis and then spiking the remaining sample with the spiking standard. The spike concentration should correspond to the mid rang of the parameter concentration defined in the calibration procedure of the respective analytical method. The spiked sample is then divided into two aliquots and one analyzed with each set of nine samples.

Water samples are thoroughly mixed by shaking the sample container before measuring out sample aliquots, and soil samples are mixed with a glass rod in a sample or a stainless steel mixing bowl before removing aliquots.

The value of the sample before spiking is determined from the first aliquot and the value of the spiked sample is determined on the remaining aliquots. Should the sample have a value for the spike parameter, the value of the sample is subtracted from the value of the spike and the percent recovery of the spike is calculated using the following equation:

$$\% \text{ recovery} = \frac{(\text{spiked sample result} - \text{sample result}) \times 100}{\text{spike added}}$$

Duplication of the spiked sample is used for evaluating the laboratory precision. Occasionally, the sample and the spike sample will require dilution to perform analysis of a particular sample within the linear range of the instrument. This dilution will adjust the analyte to an acceptable range, but may dilute the spike below a detectable level, in which case the spike recovery can not be calculated.

- **Split Samples.** Samples that require analysis by an outside laboratory are collected in the field by aliquoting a homogenous sample into separate containers. The containers are then labeled as split samples and delivered with the proper chain-of-custody to the specific laboratories.

- **Equipment (Rinsate) Blank.** The equipment (rinsate) blank is designed to address cross contamination in the field between sample sources due to deficient field cleaning procedures. This blank also addresses field preservation procedures, environmental site interference, integrity of the source blank water for field cleaning and those concerns singularly addressed by the travel blank.

  An equipment (rinsate) blank will be prepared for <u>each parameter group sampled</u> where a particular piece of sampling equipment was employed for sample collection and subsequently decontaminated in the field for use in additional sampling. The equipment blank will be composed in the field by collecting, in the appropriate container for the parameter group, a blank water rinse

from the equipment (bailer, pump tubing, spoon, auger, corer, etc.) after execution of the last step or the proper field decontamination protocol. Preservatives or additives must be added to the equipment blank where appropriate for the parameter group.

- **Field Blank.** Field blanks are used to evaluate the sample container filling procedure, the effects of environmental contaminants at the site, purity of preservatives or additives and those concerns uniquely addressed by the travel blank.

  Field blanks are composed in the field, on-site, by filling sample containers (appropriate for the parameter group) using fresh source blank water. Preservatives or additives are added if necessary, and the blank sample container is then sealed. The field blank is then grouped/transported/stored/ with the real samples collected for the same parameter group.

- **Travel (Trip) Blanks.** The travel blank is designed to address interferences derived from improper sample container cleaning preparation, contaminated source blank water, sample cross contamination during storage/transport, and extraneous environmental conditions affecting the sampling event to and from the site, including delivery to the analyzing laboratory.

  Travel blanks are composed in the appropriate sample container using source blank water. Preservatives or additives are added if required for that parameter group. Travel blanks are then sealed and stored in the ice chest where real samples will be stored and transported. Travel blanks are to originate at the facility providing the blank water for the equipment

and field blanks. Travel blanks are sent out with each set of samples at a minimum rate of 5% per parameter group per site per day. The Travel blanks are analyzed along with the samples.

- **Surrogate Spike Samples.** Where applicable, the analytical process includes the addition, subsequent detection, and recovery calculations, of surrogate spiking compounds.

  Surrogate compounds are analyte compound substitutes which are chemically similar to the analytes in question, and emulate their respective instrumental response. Surrogate compounds are added to samples for analysis after sample aliquotes have been measured and are subjected to the complete sample preparation and analytical processes. Surrogate compounds are used to monitor the analytical process and must be free from interferences. Only the gas chromatographic methods utilizing mass spectrometer detectors require surrogate spikes.

6.0 SAMPLE CUSTODY

Sample identification and chain-of-custody shall be maintained for all NAS Memphis SWMU sites through the following chain-of-custody procedures and documentation:

- Sample labels, which prevent misidentification of samples;
- Custody seals to preserve the integrity of the sample from the time it is collected until it is opened in the laboratory;
- Field logbook and pictures to record information about each SWMU's site investigation and sample collection;
- Chain-of-Custody record to establish the documentation necessary to trace sample possession from the time of collection to laboratory analysis; and
- Laboratory logbook and analysis notebooks, which are maintained at the laboratory to record all pertinent information about the sample.

The purpose of these procedures is to insure that the quality of the sample is maintained during its collection, transportation, storage and analysis. All chain-of-custody requirements comply with standard operating procedures indicated in USEPA sample handling protocol. All sample control and chain-of-custody procedures applicable to the Pioneer Laboratory, Inc., are presented in Pioneer's Generic Quality Assurance Program, February 1989 in Section 8.0 of this document.

6.1 CHAIN-OF-CUSTODY

A sample is in custody if it is in someone's physical possession or view, locked up or kept in a secure area that is restricted to authorized personnel.

6.1.1 Field Custody Procedures

As few persons as possible should handle samples in the field. The sample collector is personally responsible for the care and custody of samples collected until they are transferred to another person. The site team leader will determine whether proper custody procedures were followed during field work and decide if additional samples are required.

6.1.2 Sample Labels

Identification sample labels are to be attached to the field sample containers. The labels shall not obscure any QA/QC lot numbers on the bottles. Sample information will be printed on the label in a legible manner using waterproof ink. The identification on the label must be sufficient to enable cross-reference with the logbook. Figure 6-1 depicts a field sample label.

6.1.3 Chain-of-Custody Record

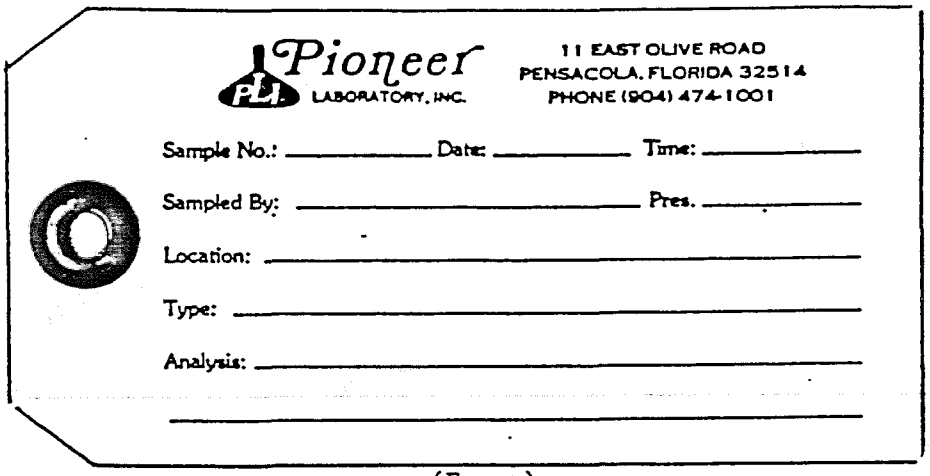
The chain-of-custody record must be completed in duplicate by the person responsible for sample shipment to the subcontracting laboratory. All constraints on time and analytical procedures should be marked on the record. The custody record should also indicate any special preservation of filtering techniques required by the laboratory. Figure 6-2 depicts a typical custody form.

6.1.4 Transfer of Custody and Shipment

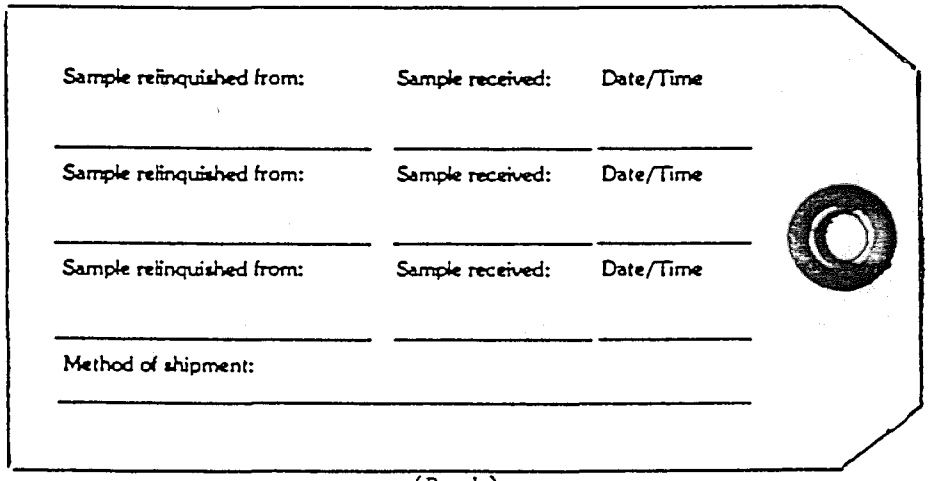
Chain-of-Custody records must be kept with the samples at all times. When transferring the samples, the parties relinquishing and receiving them must sign, date, and note the time on the record. Each shipment of samples to the laboratory must have its own chain-of-custody record with the contents of the shipment, method of shipment, name of courier, and other pertinent information written in the "remarks" section of the record. The original record accompanies the shipment and the copies are

FIGURE 6-1.

Sample Tag



(Front)



(Back)

Figure 6-1: Example Field Sample Label.

FIGURE 6-2.

NAS MEMPHIS
MILLINGTON, TENNESSEE
CHAIN OF CUSTODY RECORD

SWMU NAME _____

SWMU No. _____

SAMPLE TYPE: WASTES _____ GROUND WATER _____					SAMPLERS: (Signature)			
WELL NO.	SAMPLE NO.	WELL LOCATION	DATE	TIME	SAMPLE TYPE		NO. OF CONTAINERS	ANALYSES REQUIRED
					COMP	GRAB		
					TOTAL NO. OF CONTAINERS			

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIM
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIM
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIM
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIM
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIM
FIELD ANALYSIS PERFORMED BY: (Signature)	DISPATCHED BY: (Signature)	DATE/TIM

METHOD OF SHIPMENT

ADDITIONAL COMMENT/DESCRIPTION OF SAMPLES:

FIGURE 6-2 CHAIN-OF-CUSTODY FORM

distributed to the site team leader and project manager. Freight bills, Postal Service receipts and bills of lading are retained as permanent documentation.

6.1.5 Custody Seals

Custody seals are preprinted adhesive-backed seals with security slots designed to break if the seals are disturbed. Seals are placed over the cap of the individual sample bottle and in as many places as possible on shipping containers. Seals shall be signed and dated before use. Figure 6-3 depicts an example field sample seal.

6.2 SAMPLE DESIGNATION

Sampling locations at each SWMU site will be marked with stakes and surveyed to determine the coordinate and elevation where possible. Once the stake is marked and in place, the area will be photographed. The stake shall be marked with the following information:

NASM;
Sample Code; and
Station Number (XXOO).

Sample codes will be written as follows:

- Surface Water (SW)
- Surface Water Sediment (SD)
- Surface Soil (SU)
- Subsurface Soil (SS)
- Groundwater (GW)
- Surface Wipe (WS)

Samples collected from each location, other than those collected for on-site field measurements or analyses, shall be identified by using a standard label which is attached to the sample

FIGURE 6-3.

Sample Seal

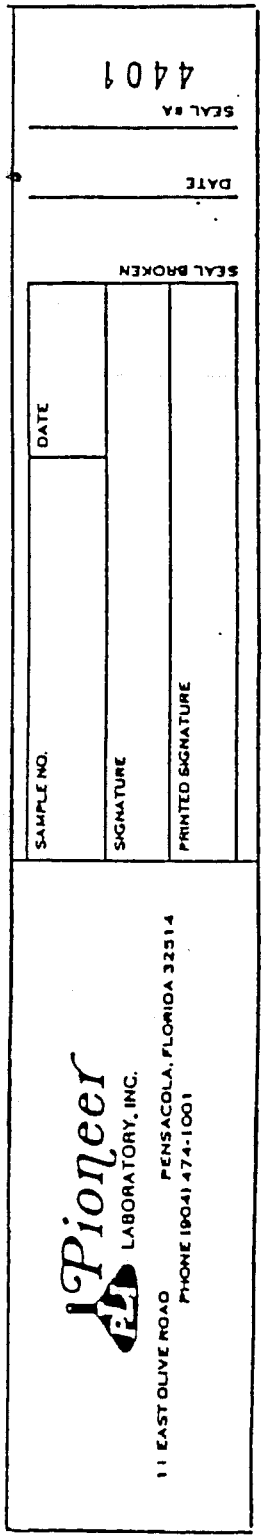


Figure 6-3: Example Field Sample Seal

container. The sample labels are sequentially numbered and are accountable. The following information shall be included on the sample label:

1. Site name;
2. SWMU identification number;
3. Date and time of sample collection;
4. Designation of the sample (i.e. grab or composite);
5. Type of sample with brief description of sampling location (depth);
6. Signature of sampler;
7. Sample preservative used; and
8. General types of analyses to be conducted.

The SWMU sample identification number will be of the form:

NASM - SWMU# - SAMPLE CODE AND LOCATION # - DEPTH - ORIGINAL (O) OR DUPLICATE (D)

For example, a sample number such as NASM-02-SS01-04-D would identify a duplicate NAS Memphis subsurface soil sample taken at location 1 on SWMU site 2 at a depth of four feet.

6.2.1 Daily Logs

Daily logs and data forms are necessary to provide sufficient data to enable field participants to reconstruct events that occurred during the site investigation. All logs should be kept in a waterproof bound notebook with numbered pages. All entries shall be printed in waterproof ink, dated and signed. No pages shall be removed and corrections shall be made by drawing a single line through the incorrect data and initialing and dating the correction that was made to the side of the error. The daily logs shall consist of a Site Log and a Task Log. The Site Log is the responsibility of the team leader and will contain a complete summary of the day's activities. An example site log is shown in

Figure 6-3. The Task Log will be signed by the person making the entry and will contain the names of the working crew, levels of personal protection used on the site, sample documentation, on-site measurement data, weather conditions, field observations, time spent collecting the sample and any unusual circumstances.

6.2.2 Photographs

Documentation of a photograph is crucial to its validity as a representation of an existing situation. Therefore, the following information regarding photographs will be recorded in the Task Log:

- Date, time, location of photograph;
- Photographer;
- Weather conditions;
- Reasons why photograph was taken;
- Sequential number of photograph and the film role number; and
- Camera lens system used.

Once the photographs have been developed, this information will be recorded on the back of the photograph.

6.3 SAMPLE HANDLING, PACKAGING, AND SHIPPING

Regulations for packaging, marking, labeling, and shipping hazardous materials are promulgated by the USDOT in the Code of Federal Regulations, 49 CFR 171 through 177.

6.4 SAMPLE PRESERVATION AND HOLDING TIMES

All field sample containers will be obtained from the subcontracting laboratory and shall be prepared with a predetermined amount of preservative for each specified sample unless otherwise stated in the site specific field plan. Those samples collected in the field which do not have a prepared sample container shall be preserved in the field and pH paper

FIGURE 6-4.

SWMU NAME:	*SAMPLE LOG SHEET*

PROJECT SITE NAME:	SWMU NO.	
SOURCE NO.	DATE:	TIME:
SAMPLE NAME:	SAMPLER(S):	
SOURCE: ☐ A. CONTAINER ☐ B. OTHER _____	SIGNATURE(S): ☐ ENVIRONMENTAL SAMPLE ☐ HAZARDOUS SAMPLE	
SOURCE LOCATION:	RADIOACTIVITY (MR/HR):	

SOURCE

A. CONTAINER SOURCE

CONTAINER TYPE:

- ☐ DRUM
  - ☐ BUNG TOP ☐ BOLTED RING
  - ☐ LEVER LOCK ☐ OTHER _____
- ☐ BAG/SACK
- ☐ TANK
- ☐ OTHER _____

DISPOSITION OF CONTAINER

- ☐ CONTAINER SAMPLED
- ☐ CONTAINER OPENED BUT NOT SAMPLED

REASON _____

CONTAINER DESCRIPTION

COLOR _____

CONDITION _____

MARKINGS _____

_____

VOL OF CONTENTS _____

OTHER _____

B. OTHER SOURCE

TYPE:

☐ WELL ☐ LAKE ☐ LAGOON/POND ☐ SEDIMENT ☐ OTHER

☐ SPRING ☐ STREAM ☐ SOIL ☐ WASTE PILE _____

DESCRIPTION _____

DISPOSITION: ☐ SAMPLE OBTAINED ☐ NOT OBTAINED _____

DESCRIPTION OF SAMPLE

A. CONTAINER SOURCE

	LAYER 1	LAYER 2	LAYER 3
PHASE	☐ SOL ☐ LIQ	☐ SOL ☐ LIQ	☐ SOL ☐ LIQ
COLOR	_____	_____	_____
VISCOSITY	☐ L ☐ M ☐ H	☐ L ☐ M ☐ H	☐ L ☐ M ☐ H
% OF TOTAL VOL	_____	_____	_____
OTHER	_____	_____	_____

TYPE OF SAMPLE: ☐ GRAB ☐ COMPOSITE ☐ GRAB-COMPOSITE

B. OTHER SOURCE

COLOR _____

TURBIDITY ☐ L ☐ M ☐ H

OTHER _____

_____

_____

TOTAL APPROXIMATE VOLUME OF SAMPLE

FIGURE 6-4 EXAMPLE SITE LOG

(Figure 6-4 cont'd)

DISPOSITION OF SAMPLE

☐ FORWARDED TO LAB: TRAFFIC REPORT NOS. _____

DATE: _____ TIME: _____

☐ ANALYZED ON-SITE: PROJECT LOGBOOK PAGE NO. _____

☐ RESULTS FORWARDED TO _____ DATE: _____ TIME: _____

☐ IN STORAGE ON-SITE ☐ OTHER: _____

SKETCH OF SOURCE LOCATION

ADDITIONAL COMMENTS

FIGURE 6-4. (continued)

will be used to determine if a sufficient amount of preservative has been used. A list of preservatives and holding times for each type of priority pollutant's analysis are included in the Pioneer's Generic Quality Assurance Program in Section 8.0 of this document. Additional preservation requirements and holding times for non-priority pollutant analyses are listed, in 40 CFR, Part 136, July 1, 1987.

7.0 FIELD CALIBRATION PROCEDURES AND FREQUENCY

All instruments and equipment used during sampling and analysis will be operated, calibrated, and maintained according to the manufacturer's guidelines and recommendations. Operation, calibration and maintenance will be performed by trained personnel on a daily basis. All maintenance and calibration information will be documented and will be available upon request. The following paragraphs are brief descriptions of calibration procedures for field equipment. Field cross-checks and duplicate analyses will be performed and their data documented for assessing the precision and accuracy of the field equipment.

7.1 HNu PHOTOIONIZER

Static or dynamic gas generation systems can be utilized for calibration of the instrument. The most convenient calibration packages are the non-toxic gas mixtures available from HNu Systems in pressurized containers. These containers can be used as a spot check for the instrument by simply cracking the valve on the tank while it is next to the instrument.

The recommended procedure for calibration of the instrument using the pressurized containers is to connect each end of a "T" to a container of gas, a rotameter and to the 8-inch extension to the photoionization probe. The valve of the gas container is opened until a slight flow is indicated by the rotameter. The instrument then draws in the volume of sample required for detection, and the flow in the rotameter indicates an excess of sample. The span pot is then adjusted so that the instrument is reading the exact value of the calibration gas. For toxic gases, special calibration precautions such as working in a hood and in similar matrices should be maintained to avoid inaccurate readings. Field cross-checks and duplicate analyses will be documented for assessing precision and accuracy of the HNu

photoionizer.

7.2 TEMPERATURE, SPECIFIC CONDUCTANCE, AND pH TESTS

Temperature instruments are factory calibrated. The instrument's accuracy will be checked against an NBS certified thermometer prior to field use. Cross-checks and duplicate field analyses will be taken and should agree within ± 0.5°C.

Conductance instruments are also factory calibrated, but may be recalibrated as deemed necessary. To recalibrate, remove the black plug to reveal the adjustment screw for the potentiometer. Rinse the cup with standard solution (KCl) until the display indicates the same value twice in a row and then adjust the potentiometer until the display indicates the known value of conductance. Before use in the field the instrument will be checked daily with known standards. Duplicate field analyses should agree within ± 10 percent. Results will be reported to the nearest 10 units for readings under 1000 umhos/cm and the nearest 100 units readings over 1000 umhos/cm. The pH meter shall be calibrated daily before use with two buffers bracketing the expected sample pH.

To standardize the pH meter, fill the cup with pH 7.0 buffer and discard three times. Using the "zero" potentiometer, adjust the display reading to 7.0. Repeat the same procedure with 4.0 and 10.0 buffers, but adjust the display to read 4.0 and 10.0 using the "slope" potentiometer. Once the final adjustments have been made, refill the cup with the 7.0 buffer; the display should read 7.0± 0.05 or the calibration should be repeated. Rinse the electrode with distilled water when going from one buffer to another and do not subject the electrode to freezing temperatures. When not in use, fill the cup with standard conductivity solution and cap. All pH recorders shall be checked for recording accuracy and time scale accuracy. Cross-checks and duplicate analyses will be taken and should agree within 0.1

standard units.

7.3 ORANGIC VAPOR ANALYZER

Manufacturer's recommended procedures for regular maintenance, calibration, and pump system check for the OVA instrument are as follows:

Maintenance

- check particle filters daily;
- check quad rings weekly;
- clean burner chamber weekly;
- check calibration weekly;
- check pumping system daily.

Calibration

- remove instrument from case;
- turn on electronics and zero instrument on X10 scale; gas select dial to 300;
- turn on pump and hydrogen; ignite flame; go to survey mode;
- introduce a methane standard near 100 ppm;
- adjust R-32 trimpot on circuit board to make meter read to standard;
- turn off hydrogen flame and adjust meter needle to read 4 ppm;
- switch to X1 scale and adjust R-31 trimpot to make meter read 4ppm;
- return to X10 scale and adjust meter needle to 40 ppm;
- switch to X100 scale and adjust R-33 trimpot to make meter read 40 ppm.

Pump System Check

- with pump on, hold unit upright and observe flow gauge;
- ball level significantly below a reading of 2 is low flow;
- clean or replace particle filters;

- re-assemble and retest flow;
- if flow still low, replace pump diaphragm and valves;
- if flow normal, plug air intake; pump should slow and stop;
- if no noticeable change in pump, tighten fittings and retest;
- if still no change, replace pump diaphragm and valves.

Field cross-checks and duplicate analyses will be documented for assessing the precision and accuracy of the OVA.

8.0 LABORATORY QUALITY ASSURANCE PROGRAM

The following document contains in whole the Generic Quality Assessment Program (GQAP) utilized by Pioneer Laboratory, Inc. (a subsidiary of ERCE) located in Pensacola, Florida. Included in but not limited to this written program or a similar NEESA-approved program are the following required information:

- Sampling bottle sizes and holding times
- Calibration Procedures;
- Analytical Procedures;
- Data Reduction, Validation, and Reporting;
- Internal Quality Control;
- Performance and Systems Audits;
- Preventative Maintenance;
- Data Assessment Procedures;
- Corrective Action Procedures;
- Quality Assurance Reports; and
- Personnel Qualifications and Training.

FINAL DRAFT

VOLUME II

FIELD SAMPLING PLAN

NAS MEMPHIS

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

NOVEMBER 1989

FINAL DRAFT

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LIST OF ACRONYMS

AA - Atomic Absorption

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

CLP - Contract Laboratory Program

EIC - Engineer in Charge

EPA - Environmental Protection Agency

GC - Gas Chromatograph

IRP - Installation Restoration Program

NACIP - Navy Assessment and Control of Installation Pollutants

NAS Memphis - Naval Air Station, Memphis

NBS - National Bureau of Standards

NEESA - Navy Energy an Environmental Support Activity

NPL - National Priority List

OVA - Organic Vapor Analyzer

PMP - Project Management Plan

QAPP - Quality Assurance Project Plan

QA/QC - Quality Assurance/Quality Control

RI - Remedial Investigation

SARA - Superfund Amendments and Reauthorization Act of 1986

SOUTHDIV - Southern Division, Naval Facilities Engineering Command

SWMU - Solid Waste Management Unit

VOC - Volatile Organic Constituents

1.0 GENERAL SITE BACKGROUND

NAS Memphis, is 3,490-acre facility located in Millington, Tennessee, approximately twenty miles northeast of the City of Memphis and thirteen miles east of the Mississippi River as shown in Figure 1-1. The facility is bordered on the west and south by the City of Millington and the north and east by agricultural and residential areas.

Since it was commissioned in 1942, the mission of the NAS Memphis has been to provide services and materials to support operations of aviation activities, units of the Naval Education and Training Command and other activities and units as designated by the Chief of Naval Operations. The Naval Hospital, Millington is located adjacent to the NAS Memphis and is part of the entire installation which is the subject of this study. In support of these activities, some hazardous wastes have been generated. It is the purpose of this site specific Field Sampling Plan to define the methods by which the constituents and extent of contamination of known or suspected hazardous waste discharges will be determined.

FIGURE 1-1 NAS MEMPHIS LOCATION MAP

2.0 GENERAL SAMPLING PROCEDURES

2.1 SURFACE WATER AND SEDIMENT

2.1.1 Objective

Collect surface water and sediment samples from a drainage ditch, a pit or any surface water ponding on site to determine if any contaminants enter the surface drainage locations of concern. The purpose of collecting samples is to identify the source of contaminants and to assess the environmental impact posed by the contamination via surface water transport.

2.1.2 Sampling Method/Technique

Surface water and sediment samples will be collected at each selected location (refer to Section 3.0). The water sample should be collected before the sediment sample to avoid extraneous cross contamination of the water sample by disturbed sediments. All samples shall be collected from areas of least contamination and progress to areas of highest contamination. In the event that little or no flow is found, only a sediment sample will be taken.

Generally, a surface water sample will be collected directly into the sampling bottle by holding the bottle just below the water surface with the bottle opening pointing upstream. In a case where the water is too shallow to submerge the bottle, water samples will be collected using a clean glass beaker from which they will be transferred to the sample bottle.

Alternatively, the surface water from the selected location may be collected by using a stainless steel bucket at the end of a long pole. Care shall be taken to avoid stirring up the sediment. Between samples, the bucket will be decontaminated as discussed in Section 5.7 of the Quality Assurance Project Plan.

Grab sediment samples will be taken using a stainless steel or

polypropylene scoop with a blade approximately six inches long. The sample will be taken from the surface of the material to be sampled and transferred to containers. The scoop will be cleaned and rinsed using the decontamination procedures as described in Section 5.7 of the QAPP. More detailed sampling procedures are given Section 5.4 of the QAPP.

2.1.3 On-site Activities

The first on-site assembly step will be the establishment of the exact sampling location. Where practical, stakes will be driven into the ground at all the locations selected by the hydrogeologist before the sampling begins. Surface drainage patterns shall be carefully studied to determine background sampling locations. A minimum of one upstream sample is required for each site. For standing bodies of water a background sample may be obtained from a similar water body located away from the suspected point-source discharge.

2.1.4 Special Sampling Equipment

See Table 2-1.

2.1.5 Sample Containers and Preservation

The following chemical groups may be analyzed: volatile organics, metals, acid extractables, base/neutral extractables, petroleum hydrocarbons, pesticides and selected conventional parameters. Container cleaning procedures should be performed in the analytical laboratory as follows:

- Nutrients, Demands, Non-Metal Analysis, and Radiological.
  Bottle type: plastic or glass, minimum 250 ml size.
  Soap: Liquinox or equivalent (phosphate and ammonia-free).
  1. Wash bottles and caps in hot soapy water, rinse liberally with water until soap suds are no longer

present.

2. Rinse bottles and caps with 1 + 1 HCL, then follow with D.I. water. Rinse at least 3 to 5 times.
3. Drain and store, tightly capped, until used.

o Metals

Bottle Type: 1 liter plastic bottle and lid.

Soap: Metal free-Acationox or equivalent

1. Wash bottles and caps in hot soapy water. Rinse liberally with tap water until soap suds are gone.
2. Rinse bottles and caps with 1 + 1 HCL, followed by a tap water rinse.
3. Rinse all components with 1 + 1 Nitric, then rinse three times with liberal amounts of deionized water.
4. Drain and cap tightly until used.

o Extractable Organics

Bottle Type: 1 liter narrow necked glass bottle with teflon lined caps. Plastic bottles and plastic or rubber lined caps are not acceptable.

Soap: Alconox or equivalent. Do not use liquid or powdered detergent that have been stored in plastic containers.

1. Wash bottles and caps in hot soapy water. Do not use brushes with rubber or plastic parts. The use of gloves while washing or rinsing organic bottles is not recommended as they can be a source of contamination.
2. Rinse bottles and caps five times with tap water or until suds are gone.
3. Rinse each bottle with 10 ml of pesticide grade isopropanol. Cap tightly and shake approximately 10 seconds.
4. The final aqueous rinse should be with organic-

free water. There should be no isopropanol smell in the bottle. This means rinsing at least five times.

5. Drain bottles and cap until used.

- Purgeable Organics (Volatile organic solvents)
  Bottle Type: 40 ml glass vials or 100 ml glass bottles with teflon lined septum.
  1. Wash caps, liners and vials in same detergent as organics.
  2. Rinse liberally with tap water and deionized water.
  3. Rinse finally with pesticide grade isopropanol.
  4. Dry caps, septa and vials in oven at 105°C for at least 60 minutes.
  5. Cool in an inverted position, and cap immediately after bottles are cool enough to handle.

Samples not designated for analysis of volatile organic constituents may require field filtering before they are preserved. If field filtering is required, the water should be composited in a clean glass carboy, filtered through a 0.45 micron filter, and collected in a second glass carboy. The filtered sample is then poured into one liter glass bottles.

Samples should be shipped to the laboratory at a frequency such that the holding time of the samples are not exceeded.

2.1.6 Special Precautions/Hazards

The protection procedures addressed in the generic Health and Safety Plan will be followed.

TABLE 2-1 SURFACE WATER SAMPLING EQUIPMENT

Equipment	Use
Sample containers	Appropriate to analysis required (See Table 2-2).
Sample preservatives	See Table 2-2.
Coolers with ice	Preserve samples.
Field blanks	For organics analysis, use organic-free water. For inorganics, use deionized or distilled water.
Telescoping aluminum pole with clamp & teflon beaker	Used to extend reach and depth so that water sampling can be safely taken from the shore of a steam or pond. Rinse thoroughly between use to avoid contamination of samples.
Thermometer	Measure water and air temperature.
Portable pH meter	Measure pH of water at time of sampling.
Field logbook	Record field observations.
Camera/film	Document sampling activity.
Sample tags Chain-of-Custody records Receipt for sample forms Ink pen (waterproof)	Sample documentation.

TABLE 2-2 (Page 1 of 6)

REQUIREMENTS FOR SAMPLE CONTAINERS, PRESERVATION PROCEDURES AND MAXIMUM HOLDING TIMES OF SAMPLES

TEST	CONTAINER(a)	PRESERVATION(b)	MAXIMUM HOLDING TIME (c)
Fluoride	P	None required	28 days
Hardness	P,G	HNO_3 to pH 2 or H_2SO_4 to pH 2	6 months
Hydrogen ion (pH)	P,G	None required	Analyze immediately
Kjeldahl and organic nitrogen	P,G	Cool, 4°C H_2SO_4 to pH 2	28 days
Chromium VI	P,G	Cool, 4°C	24 hours
Mercury	P,G	HNO_3 to pH 2	28 days
Metals except[d] above	P,G	HNO_3 to pH 2	6 months
Nitrate	P,G	Cool, 4°C	48 hours
Nitrate-nitrite	P,G	Cool, 4°C H_2SO_4 to pH 2	28 days
Nitrite	P,G	Cool, 4°C	48 hours
Purgeables (Halocarbons and Aromatics)	G, Teflon-lined septum	Cool, 4°C Add 1+1 HCL to pH = 2**	14 days
Oil and Grease	G	Cool, 4°C H_2SO_4 to pH 2	28 days
Purgeables (Acrolein+++ Acrylonitrile)	G, Teflon-lined septum	Cool, 4°C 0.008% $Na_2S_2O_3$*	14 days

TABLE 2-2 (Page 2 of 6)

REQUIREMENTS FOR SAMPLE CONTAINERS, PRESERVATION PROCEDURES AND MAXIMUM HOLDING TIMES OF SAMPLES

TEST	CONTAINER(a)	PRESERVATION(b)	MAXIMUM HOLDING TIME (c)
Organic Carbon	P,G	Cool, 4°C HCL or H_2SO_4 to pH 2	28 days
Orthophosphate	P,G	Filter on site Cool, 4°C	48 hours
Phenols	G	Cool, 4°C H_2SO_4 to pH 2	28 days
Phosphorus (elemental)	G	Cool, 4°C	48 hours
Phosphorus	P,G	Cool, 4°C H_2SO_4 to pH 2	28 days
Alpha, beta and radium	P,G	HNO_3 to pH 2	6 months
Residue, total	P,G	Cool, 4°C	7 days
Residue, filterable	P,G	Cool, 4°C	7 days
Residue, non-filterable	P,G	Cool, 4°C	7 days
Residue, settle	P,G	Cool, 4°C	48 hours
Residue, volatile	P,G	Cool, 4°C	7 days
Silica	P	Cool, 4°C	28 days
Specific conductance	P,G	Cool, 4°C	28 days
Sulfate	P,G	Cool, 4°C	28 days

TABLE 2-2 (Page 3 of 6)

REQUIREMENTS FOR SAMPLE CONTAINERS, PRESERVATION PROCEDURES AND MAXIMUM HOLDING TIMES OF SAMPLES

TEST	CONTAINER(a)	PRESERVATION(b)	MAXIMUM HOLDING TIME (c)
Sulfide	P,G	Add 2ml zinc-acetate plus NaOH to pH 9	7 days
Sulfite	P,G	None required	Analyze immediately
Surfactants	P,G	Cool, 4°C	48 hours
Temperature	P,G	Non required	Analyze immediately
Turbidity	P,G	Cool, 4°C	48 hours
Extractables - 600 Series:			
Benezidines	Amber G Teflon-lined cap	Cool, 4°C 0.008% $Na_2S_2O_3$* Adjust pH 2 to 7 with H_2SO_4	7 days (until extract days) (after extract if stored)
Phenols PAH's TCDD B/N acids Haloethers Phthalate Esters Nitrosamines+ Pesticides & PCB's ++ Nitroaromatics & Isophorone Chlorinated Hydrocarbons	Amber G, Teflon-lined	Cool, 4°C 0.008% $Na_2S_2O_3$*	7 days (until extract 40 days)
(End of Extractables - 600 Series)			

TABLE 2-2 (Page 4 of 6)

REQUIREMENTS FOR SAMPLE CONTAINERS, PRESERVATION PROCEDURES AND MAXIMUM HOLDING TIMES OF SAMPLES

TEST	CONTAINER(a)	PRESERVATION(b)	MAXIMUM HOLDING TIME(c)
Extractables - 8000 Series:			
PAH's TCDD Nitrosamines Haloethers B/N acids	Amber G, Teflon-lined Cap	Cool, 4°C 0.008% $Na_2S_2O_3$*	7 days (until extract) 40 days (after extraction)
Benzidine	G, Teflon-Lined Cap	Cool, 4°C 0.008% $Na_2S_2O_3$*	7 days (until extraction) 7 days (after extraction)
Phthalate Esters	G, Teflon-Lined Cap	Cool, 4°C	7 days (until extraction) 40 days (after extraction)
PCB's Acrylonitrile	G, Teflon Lined Cap	Cool, 4°C	7 days (until extraction) 40 days (after extraction)
Total Organic Halogens	G, Teflon-Lined Cap	Cool, 4°C H_2SO_4 to pH 2	7 days
Pesticides	G, Teflon-Lined Cap	Cool, 4°C pH 5-9	7 days (until extraction) 40 days (after extraction)
Chlorinated Hydrocarbons	G, Teflon-Lined Cap	Cool, 4°C H_2SO_4 to pH 2	7 days (until extraction) 40 days (after extraction)

(End of Extractables - 8000 Series)

TABLE 2-2 (Page 5 of 6)

NOTES

a) Polyethylene (P) or Glass (G). Volumes required for water samples are generally 1 gallon for organic analyses and 1 liter for inorganic analyses. Volumes required for soil sample organic and inorganic analyses are generally 6 ounces.

b) Sample preservation should be performed immediately upon sample collection. Aliquotes of a composite sample, which would require multiple preservatives, should be preserved only by maintaining at 4°C until compositing and sample splitting is completed.

c) Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still considered valid.
Some sample may not be stable for the maximum time period given in the table. The laboratory is obligated to hold the sample for a shorter time of knowledge exists to show this is necessary to maintain sample stability.

d) Samples should be filtered immediately in the laboratory before adding preservation for dissolved metals.

\+ Nitrosamines: If N-nitrosodipheynlamine is to be determined, the pH is adjusted to a pH 7-10.

++ Pesticides & PCB's: If the samples are not extracted within 72 hours the pH is adjusted to 5-9 with NaOH or H_2SO_4.

+++ Acrolein: pH must be adjusted to 4-5.

* Required if residual chlorine present.

** Required for aromatics only.

Key:

$Na_2SO_2O_3$	=	Sodium Thiosulfate
H_2SO_4	=	Sulfuric Acid
HNO_3	=	Nitric Acid
NaOH	=	Sodium Hydroxide

TABLE 2-2 (Page 6 of 6)

NOTES (continued)

HCL	=	Hydrochloric Acid
PCB	=	Polychlorobiphenyl
PAH	=	Polynuclear Aromatic Hydrocarbons
TCDD	=	2,3,7,8 - Tetrachlorodibenzo-p-Dioxin
B/N Acids	=	Base/Neutrals and Acids

2.2 LAGOON SAMPLING

2.2.1 Objectives

The objective of the lagoon sampling is to assess the environmental impact posed by past sewage treatment operation and to determine the appropriate closure method for the inactive unit.

2.2.2 Sampling Method/Technique

A pre-sampling reconnaissance and the on-site assembly activities (see Section 2.2.5) are required for this sampling. Special attention will be paid to the dike stability and lagoon bank conditions. This will be done to identify suitable locations for the placement of floating work station transportation equipment. An evaluation of expected weather conditions will be made to determine how they might affect sampling personnel. Lagoon sludge and soil samples shall be collected as discussed in Sections 5.1 and 5.4 of the QAPP, respectively.

2.2.3 On-site Activities

The first on-site assembly step will be the establishment of the sampling points. Stakes will be driven into the dike at 100-foot intervals from a chosen reference point at the corner of the lagoon. These stakes will be given a letter designation in the north-south direction, and a number designation in the east-west direction. This will allow the identification of sampling points on the lagoon surface (actual boat positioning during sampling activities will be confirmed through the use of surveying equipment).

A means will be provided for safe access to the work station. The lagoon surface elevation will be monitored during the sampling episode. Floatation devices for the crew along with personal protective clothing and respiratory protection (in reserve) will be placed on the boat in case of need.

Sampling of the bottom sludge layer and soil beneath it will be carried out at each sampling station whenever practical.

A hollow core sampling device with extension (or equivalent) will be used. It is recognized that it may be impossible to obtain bottom sludge samples in areas of great depth, but these limitations in the sampling program will become more evident during lagoon depths determinations.

Before extrusion into sampling jars, the collected samples will be observed for visible characteristics. Attempts will be made to collect underlying soil samples for analysis.

2.2.4 Special Sampling Equipment

See Table 2-3.

2.2.5 Sample Containers and Preservation

See Section 2.1.5.

2.2.6 Special Precautions/Hazards

Three people will man the floating work station at all times. This will allow two people to function in the case of a mishap to one individual. A safety officer should be "on-board" at all times to monitor safe working procedures or any potentially hazardous conditions. Two trained technicians will be required to carry out all sampling activities. A fourth individual, presumably the team leader, could be used for on-shore functions such as record keeping and sample labeling, etc.

A fifth individual will assist in other on-shore activities such as vehicle relocation and tow line handling. The presence of

TABLE 2-3 LAGOON SAMPLING EQUIPMENT

Equipment	Use
Work station boat	Gain access to the designated sampling points.
Sample preservatives	See Table 2-2.
Coolers with ice	See Table 2-2.
Field blanks	For organic analysis, use organic-free water. For inorganics analysis, use deionized or distilled water.
Telescoping aluminum pole with clamp & teflon beaker	Used to extend reach and depth so that water samples can be safely taken from the shore of a stream or pond. Rinse thoroughly between use to avoid contamination of samples.
Thermometer	Measure water and air temperature.
Portable pH meter	Measure pH of water at time of sampling.
Field logbook	Record field observations.
Camera/Film	Document sampling activity.
Sample tags Chain-of-Custody forms Receipt of sample forms Ink pen (waterproof)	Sample documentation.

five individuals would be most desirable for timely and safe collection of all samples.

Provisions will be made to insure that the floating work station can be quickly returned to shore in case of emergency. An emergency power source (gas driven generator or equivalent) will be provided. If an explosion hazard is identified, remote mechanical (i.e. tow truck or equivalent) or manual power will be available.

Since personnel on the floating work station will not have immediate access to additional personal safety equipment, these materials will be provided before the station is allowed to leave shore in the need of personal protection level upgrading. Such safety equipment will include three spare respirators, at least one change of cartridges for all personnel, water with detergent (mixed together to prevent drinking), three spare protective suits, extra inner and outer gloves and a first aid kit. Additional safety equipment will include emergency oars or paddles and a life preserver and escape masks for all the boat crew. Self Contained Breathing Apparatus (SCBA) may be substituted for escape masks if necessary.

2.3 SOIL

2.3.1 Objective

Soil samples will help to define vertical zones and horizontal extent of contamination. In addition to soil samples for chemical analysis, characteristic samples of lithology will be taken from cuttings.

2.3.2 Sampling Method/Technique

During the test boring, subsurface soil samples will be collected with a split-spoon sampler. All samples will be collected from the area of least contamination and progress to the areas of highest contamination.

The drilling crew will perform the split-spoon sampling at the direction of the on-site hydrogeologist. Upon opening of the split-spoon sampler, a description of the soil core will be recorded by the on-site geologist with regard to its composition, structure, consistency, color and condition. Portions of the soil core from the top, middle and bottom of the sampler will be cut away with a stainless steel spatula, divided in half, placed in the soil VOC sample jars and sealed immediately. Care must be taken to clean the threads of the jar lid to ensure a good seal. All results will be fully documented in the daily sample logs.

The remainder of the split-spoon sample to be transported for chemical analysis, other than for VOC, will be mixed in a glass or stainless steel mixing-bowl and placed into glass sample jars. The bottles will be labeled with the date, time, sample number and laboratory analysis required. The sample number, boring number, depth penetration record, length of recovery, sample date and time will be recorded in the field logbook. Samples for analysis will be iced immediately and shipped within 24 hours of sampling to the laboratory. Between samples, the equipment will be cleaned and rinsed using the equipment decontamination procedures established for cleaning and rinsing sample devices. More detailed sampling procedures are given in Section 5.1 of the QAPP.

2.3.3 On-site Activities

All on-site utilities will be field located prior to any sampling activities. The Project Site Manager will then proceed to establish the exact sample locations. Stakes will be marked and placed at all the selected locations prior to sampling.

2.3.4 Special Sampling Equipment

See Table 2-4.

TABLE 2-4 SUGGESTED SOIL SAMPLING EQUIPMENT

Equipment	Use
Sample containers	See Table 2-2.
Sample preservatives	See Table 2-2.
Coring devices	Hand-driven implements used for collecting surface soil samples such as steel trowels.
Hollow stem augering	Machine-driven coring devices used for collecting subsurface soil samples.
Split-spoon sampler	Coring device used to collect subsurface soil sample.
Field logbook	Used to record field observations.
Camera/Film Sample tags Chain-of-Custody forms Receipt of sample forms Ink pen (waterproof)	Used to document procedures.

2.3.5 Sample Containers and Preservation

Refer to Section 2.1.5.

2.3.6 Special Precautions/Hazards

Procedures described in the Health and Safety Plan will be followed.

2.4 GROUNDWATER

2.4.1 Objective

Collect groundwater samples from monitoring wells to determine if any contaminants have entered the upper aquifer underlying the site. The groundwater monitoring program will provide information on groundwater flow, chemical composition of groundwater, source of contaminants and migration of the contaminant plume. Information gained from groundwater monitoring activities will aid in the selection and planning of remedial alternatives.

2.4.2 Sampling Method/Technique

Observation

- The monitoring well should be locked. Arrangements must be made to gain access to the monitoring wells. The diameter of the well should be noted.
- The type of casing materials should be noted, i.e. PVC, stainless steel, etc., and casing integrity.
- The conditions at the time of sampling should be noted, including air temperature, recent rainfall or drought conditions which might affect groundwater flow.

In-Situ Measurements

- Measure the elevation of the groundwater table. The electric water level indicator consists of a spool of small diameter steel cable with a probe attached to the end. When the probe comes into contact with the water, the circuit is closed and a meter, light and/or buzzer

attached to the spool will signal contact.

- The following activities will be performed as deemed necessary by the field hydrogeologist:
  1. The temperature, pH and specific conductance of the water should be measured and recorded both at the time of the initial purging of the well and at the time of sampling.
  2. Measure and record the pH of water.
  3. Measure and record the specific conductivity.

Purging

- Use a stainless steel bailer or a teflon bailer for well purging.
- A minimum of three (3) well volumes should be purged before a sample is collected.
- Purged water will be collected and upon NAS environmental personnel approval, will be discharged into a nearby existing storm sewer. However, if visual inspection and odors indicate the necessity, a sample will be screened for VOC using an organic vapor analyzer. If screening results are above 5 ppm, the water will be containerized and properly disposed of.

Sample Collection

- If a bailer has been used to purge the well, a previously cleaned second bailer will be used to obtain the sample. Bailers will be decontaminated between wells.
- When transferring the water from the bailer to the sample containers, care should be used to avoid agitation, which promotes the loss of volatile constituents.
- If more than one sample volume is required to fill the sample bottle, the last sample volume is required to fill the bottle to overflowing. However, this

procedure cannot be used if preservatives are placed in the sample bottle prior to filling.

2.4.3 On-site Activities

The groundwater sampling will follow the drilling and monitoring well installation. The protocol for well installation and development is addressed in Section 5.2 and 5.3 of the QAPP.

2.4.4 Special Sampling Equipment

See Table 2-5.

2.4.5 Sample Containers and Preservation

Refer to Section 2.1.5.

2.4.6 Special Precautions/Hazards

Prior to drilling, all underground storage tanks and utilities must be located or detected by using plans and/or a metal detector. Procedures addressed in the Health and Safety Plan will be followed.

2.5 SURFACE WIPE SAMPLING

2.5.1 Objective

Collect surface samples from objects/buildings to determine the extent of contamination.

2.5.2 Sampling Method/Technique

Before sampling, the exact sample site should be marked and described in detail in the field logbook. Also at this time, all necessary forms and sampling equipment should be prepared. Each site will then be sampled by a gloved, trained technician. With forceps, the gauze will be removed from the glass vial and soaked with approximately 5 milliliters of the appropriate solvent. Immediately following the solvent step, the marked area should be wiped from left to right and from top to bottom. The gauze should then be allowed to dry before being returned to its glass

TABLE 2-5 SUGGESTED GROUNDWATER SAMPLING EQUIPMENT

Equipment	Use
Sample containers	Appropriate to analysis required (See Table 2-2).
Sample preservatives	See Table 2-2.
Field blanks	For organics analysis, use organic-free water. for inorganics, use deionized or distilled water.
Tape measure	For locked monitoring wells.
Electronic water level/ indicator/graduated depth sounder	Used to determine static water level and total depth of well.
Pocket calculator	Use for static water volume calculations.
Well bailer	A bailer is a device which is lowered into a well to obtain water samples. Recommended material for construction includes stainless steel with teflon ball valve or all teflon construction.
Decontamination solutions water	Used for decontamination bailer and water level indicator between wells.
Plastic pails, graduated	Used for measuring volume of water from well prior to sampling.
Thermometer	Used to measure temperature of groundwater.
Portable pH meter	Used to measure specific pH of groundwater.
Portable specific conductivity meter	Used to measure specific conductivity of groundwater.
Field logbook	Used to record field observations.
Camera/Film tags Chain-of-Custody forms Receipt of sample forms Ink pen (waterproof)	Used to document sampling Sample procedures.

vial. The vial should then be capped and the technician should remove the gloves.

2.5.3 On-Site Activities

Prior to wipe sampling, all sample locations shall be clearly marked and photographed.

2.5.4 Special Sampling Equipment

Sampling equipment will include glass vials, gauze and appropriate extraction solvent. Technicians performing the sampling shall wear surgical gloves and use forceps for wiping. Camera and film, sample tags, chain-of-custody records and field log sheets will also be available to document the sampling locations and approach.

2.5.5 Sample Containers and Preservation

Glass vials will be provided by the subcontracting laboratory. Extraction solvents will also be provided by the subcontracting laboratory.

2.5.6 Special Precautions/Hazards

Special care and attention are of utmost importance in wipe sampling to produce reasonable, reproducible results.

Special health procedures addressed in the Health and Safety Plan will be followed.

3.0 SITE-SPECIFIC SAMPLING PROCEDURES

The Phase I RI sampling procedures for the NAS Memphis SWMU sites, SWMUs No. 1 through 9, are described in detail in subsections 3.1 through 3.9, respectively. NEESA Level C requirements will apply, per SOW requirements. Table 3-1 summarizes each SWMU site's field samples and laboratory analyses. Table 3-2 is a listing of analytical methods and analytes for planned chemical testing of environmental samples. Tables 3-3 through 3-11 are detailed listings of samples, including QA samples, identified for SWMUs No. 1 through 9, respectively. These tables are located in the respective subsection for each SWMU. Table 3-12, located at the end of this section, contains a summary of environmental and QA/QC samples for laboratory analyses.

TABLE 3-1. SWMU SAMPLES AND ANALYSES (p. 1 of 2)

SWMU (SITE) NUMBER	GROUND WATER SAMPLES*	SURFACE WATER SAMPLES*	SEDIMENT SAMPLES*	SURFACE SOIL	SUBSURFACE SAMPLES*	WIPE SAMPLES*	PHASE I LABORATORY ANALYSES	PHASE I FIELD ANALYSES
1 FDDA	N/A	N/A	1 Grab	1 Grab	6 Grab	N/A	Refer to Table 3-2	HNu/OVA measuremens (air monitoring).
2 SSLF	5 Grab	2 Grab	2 Grab	3 Grab	6 Grab	N/A	Refer to Table 3-2	HNu/OVA measurements (air monitoring), subsurface gas monitoring; pH, temperature, specific conductance.
3 PSDW	3 Grab	N/A	1 Grab	1 Grab	8 Grab	5 Wipe	Refer to Table 3-2	HNu/OVA measurements (air monitoring); pH, temperature, specific conductance.
4 PSDD	N/A	N/A	4 Grab	N/A	N/A	N/A	Refer to Table 3-2	HNu/OVA measurements (air monitoring).
5 FFTA	N/A	N/A	4 Grab	9 Grab	18 Grab	N/A	Refer to Table 3-2	HNu/OVA measurements air monitoring.
6 BATT SS	N/A	N/A	3 Grab	N/A	N/A	N/A	Refer to Table 3-2	HNu/OVA measurements (air monitoring).

TABLE 3-1. SWMU SAMPLES AND ANALYSES (p. 2 of 2)

SWMU (SITE) NUMBER	GROUND WATER SAMPLES*	SURFACE WATER SAMPLES*	SEDIMENT SAMPLES*	SURFACE SOIL	SUBSURFACE SAMPLES*	WIPE SAMPLES*	PHASE I LABORATORY ANALYSES	PHASE I FIELD ANALYSES
7 BATT DW	3 Grab	N/A	N/A	4 Grab	8 Grab	N/A	Refer to Table 3-2	HNu/OVA measurements (air monitoring); pH, temperature, specific conductance.
8 CLF	3 Grab	0	N/A	3 Grab	6 Grab	N/A	Refer to Table 3-2	HNu/OVA measurements (air monitoring); subsurface gas monitoring; pH, temperature, specific conductance.
9 LAG	3 Grab	N/A	3 Grab	N/A	8 Sludge Grab 6 Soil Grab	N/A	Refer to Table 3-2	HNu/OVA measurements (air monitoring); pH temperature, specific conductance.

* The number of samples listed herein does not include QC samples. QC samples will be collected as discussed in Section 5.8 of the QAPP. QC samples are summarized in Table 3-2.

FDDA = Fire Department
SSLF = Southside Landfill
PSDW = Plating Shop Dry Well
PSDD = Plating Shop Drainage Ditch
FFTA = Fire Fighting Training Area

BATT SS = Battery Shop Storm Sewer
BATT DW = Battery Shop Dry Well
CLF = Cemetery Landfill
LAG = Lagoon

TABLE 3-2. ANALYTICAL METHODS AND ANALYTES (p. 1 of 18)

A. AROMATIC VOLATILE ORGANICS--SW-846 METHOD 8020 (Benzene/toluene/ethylbenzene/xylene [BTEX])

Analyte	CAS No.	Minimum Detection Limit (ppb)
Benzene	71-43-2	0.2
(Chlorobenzene)	-------	0.2
(1,4-Dichlorobenzene)	106-46-7	0.3
(1,3-Dichlorobenzene)	541-73-1	0.4
(1,2-Dichlorobenzene)	95-50-1	0.4
Ethylbenzene	--------	0.4
Toluene	108-88-3	0.2
Xylenes	--------	0.2

TABLE 3-2. (p. 2 of 18)

B. VOLATILE ORGANICS BY GC/MS: SW-846 METHOD 8240

Analyte	CAS No.	Minimum Detection Limit (ppb)
Acetone (2-Proponane)	67-64-1	All analytes: See SW-846 Method Description. Detection Limit generally 5-50 ppb
Acrolein	107-02-8	
Acrylonitrile	107-13-1	
Benzene	71-43-2	
Bromochloromethane (I.S.)	74-97-5	
4-Bromofluorobenzene (surr.)	-------	
	75-25-2	
Bromomethane	74-83-9	
2-Butanone (MEK)	78-93-3	
Carbon disulfide	75-15-0	
Carbon tetrachloride	56-23-5	
Chlorobenzene	108-90-7	
Chlorobenzene-d_5 (I.S.)	-------	
Chlorodibromomethane		
Chloroethane	75-00-3	
2-Chloroethyl vinyl ether	110-75-8	
Chloroform	67-66-3	
Chloromethane	74-87-3	
Dibromomethane	74-95-3	
1,4-Dichloro-2-butane	764-41-0	
Dichlorodifluoromethane	75-71-8	
1,1-Dichloroethane	75-34-3	
1,2-Dichloroethane	107-06-2	
1,2-Dichloroethane-d_4 (surr.)	--------	
1,1-Dichloroethene	75-35-4	
trans-1,2-Dichloroethene	--------	
1,2-Dichloropropane	--------	
cis-1,3-Dichloropropene	--------	
trans-1,3-Dichloropropene	--------	
1,4-Difluorobenzene (I.S.)	--------	
Ethanol	64-17-5	
Ethylbenzene	100-41-4	
Ethyl methacrylate	97-63-2	
2-Hexanone (MEBK)	591-78-6	
Iodomethane	74-88-4	

TABLE 3-2. (p. 3 of 18)

B. VOLATILE ORGANICS BY GC/MS: SW-846 METHOD 8240 (continued)

Analyte	CAS No.	Minimum Detection Limit (ppb)
Methylene chloride	75-09-2	
4-Methyl-2-pentanone (MIBK)	108-10-1	
Styrene (vinylbenzene)	100-42-5	
1,1,2,2-Tetrachloroethane	79-34-5	
Tetrachloroethene	127-18-4	
Toluene	108-88-3	
Toluene-d_8 (surr.)	--------	
1,1,1-Trichloroethane	71-55-6	
1,1,2-Trichloroethane	79-00-5	
Trichloroethene	79-01-6	
Trichlorofluoromethane	75-69-4	
1,2,3-Trichloropropane	96-18-4	
Vinyl acetate	108-05-4	
Vinyl chloride	75-01-4	
Xylene	--------	

TABLE 3-2 (p. 4 of 18)

C. SEMIVOLATILE ORGANICS SW-846 METHOD 8250 - (GC/MS Packed Column Technique)

Analyte	CAS No.	Minimum Detection Limit (ppb)
Acenaphthene	-------	1.9
Acenaphthene-d_{10} (I.S.)	-------	---
Acenaphthylene	-------	3.5
Acetophenone	98-86-2	---
Aldrin	309-00-2	1.9
Aniline	62-53-3	---
Anthracene	--------	1.9
4-Aminobiphenyl	92-67-1	---
Aroclor-1016	(1336-36-3)	---
Aroclor-1221	(1336-36-3)	30
Aroclor-1232	(1336-36-3)	---
Aroclor-1242	(1336-36-3)	---
Aroclor-1248	(1336-36-3)	---
Aroclor-1254	(1336-36-3)	---
Aroclor-1260	(1336-36-3)	36
Benzidine	92-87-5	44
Benzoic acid	65-85-0	---
Benzo (a) anthracene	56-55-3	7.8
Benzo (b) fluoranthene	205-99-2	4.8
Benzo (k) fluoranthene	205-82-3	2.5
Benzo (g,h,i) perylene	--------	4.1
Benzo (a) pyrene	50-32-8	2.5
Benzyl alcohol	100-51-6	---
alpha-BHC	--------	---
beta-BHC	--------	4.2
delta-BHC	--------	3.1
gamma-BHC (Lindane)	--------	---
bis (2-chloroethoxy) methane	--------	5.3
bis (2-chloroethyl) ether	111-44-4	5.7
bis (2-chloroisopropyl) ether	--------	5.7
bis (2-ethylhexyl) phthalate	--------	2.5
4-Bromophenyl phenyl ether	--------	1.9
Butyl benzyl phthalate	--------	2.5
Chlordane	57-74-9	---
4-Chloroaniline	--------	---
1-Chloronaphthalene	--------	---
2-Chloronaphthalene	--------	1.9
4-Chloro-3-methylphenol	--------	3.0

TABLE 3-2 (p. 5 of 18) (continued)

C. SEMIVOLATILE ORGANICS SW-846 METHOD 8250 - (GC/MS Packed Column Technique)

Analyte	CAS No.	Minimum Detection Limit (ppb)
2-Chlorophenol	--------	3.3
4-Chlorophenyl phenyl ether	--------	4.2
Chrysene	218-01-9	2.5
Chrysene-d_{12} (I.S.)	218-01-9	---
4,4'-DDD	72-54-8	2.8
4,4'-DDE	72-55-9	5.6
4,4'-DDT	50-29-3	4.7
Dibenz (a,j) acridine	224-42-0	---
Dibenz (a,h) anthracene	53-70-3	2.5
Dibenzofuran	--------	---
Di-n-butylphthalate	84-74-2	2.5
1,3-Dichlorobenzene	541-73-1	1.9
1,4-Dichlorobenzene	106-46-7	4.4
1,4-Dichlorobenzene-d_4 (I.S.)	--------	---
1,2-Dichlorobenzene	95-50-1	1.9
3,3'-Dichlorobenzidine	91-94-1	16.5
2,4-Dichlorophenol	120-83-2	2.7
2,6-Dichlorophenol	87-65-0	---
Dieldrin	60-57-1	2.5
Diethylphthalate	84-66-2	1.9
p-Dimethylaminoazobenzene	60-11-7	---
7,12-Dimethylbenz (a) anthrace	57-97-6	---
a-,a-Dimethylphenethylamine	102-09-8	---
2,4-Dimethylphenol	105-67-9	2.7
Dimethylphthalate	131-11-3	1.6
4,6-Dinitro-2-methylphenol	--------	24
2,4-Dinitrophenol	--------	42
2,4-Dinitrotoluene	121-14-2	5.7
2,6-Dinitrotoluene	606-20-2	1.9
Diphenylamine	122-39-4	---
1,2-Diphenylhydrazine	122-66-7	---
Di-n-octylphthalate	117-84-0	2.5
Endosulfan I[a]	115-29-7	---
Endosulfan II[a]	--------	---
Endosulfan sulfate	--------	5.6
Endrin	72-20-8	---
Endrin aldehyde	--------	---
Endrin ketone	--------	---

TABLE 3-2 (p. 6 of 18) (continued)

C. SEMIVOLATILE ORGANICS SW-846 METHOD 8250 - (GC/MS Packed Column Technique)

Analyte	CAS No.	Minimum Detection Limit (ppb)
Ethyl methanesulfonate	62-50-8	---
Fluoranthene	206-44-0	2.2
Fluorene	--------	1.9
2-Fluorobiphenyl (surr.)	--------	---
2-Fluorophenol (surr.)	--------	---
Heptachlor	76-44-8	1.9
Heptachlor epoxide	1024-57-3	2.2
Hexachlorobenzene	118-74-1	1.9
Hexachlorobutadiene	87-68-3	0.9
Hexachlorocyclopentadiene	77-47-4	---
Hexachloroethane	67-72-1	1.6
Indeno (1,2,3-cd) pyrene	193-39-5	3.7
Isophorone	--------	2.2
Methoxychlor	72-43-5	---
3-Methylcholanthrene	56-49-5	---
Methyl methanesulfonate	66-27-3	---
2-Methylnaphthalene	--------	---
2-Methylphenol	--------	---
4-Methylphenol	--------	---
Naphthalene	91-20-3	1.6
Naphthalene-d_8 (I.S.)	--------	---
1-Naphthylamine	--------	---
2-Naphthylamine	--------	---
2-Nitroaniline	--------	---
3-Nitroaniline	--------	---
4-Nitroaniline	--------	---
Nitrobenzene	98-95-3	1.9
Nitrobenzene-d_5 (surr.)	--------	---
2-Nitrophenol	--------	3.6
4-Nitrophenol	100-02-7	2.4
N-Nitroso-di-n-butylamine	924-16-3	---
N-Nitrosodimethylamine	62-75-9	---
N-Nitrosodiphenylamine	--------	1.9
N-Nitroso-di-N-propylamine	--------	---
N-Nitrosopiperidine	100-75-4	---
Pentachlorobenzene	608-93-5	---
Pentachloronitrobenzene	82-68-8	---
Pentachlorophenol	87-86-5	3.6
Perylene-d_{12} (I.S.)	--------	---
Phenacetin	62-44-2	---

TABLE 3-2 (p. 7 of 18) (continued)

C. SEMIVOLATILE ORGANICS SW-846 METHOD 8250 - (GC/MS Packed Column Technique)

Analyte	CAS No.	Minimum Detection Limit (ppb)
Phenanthrene	--------	5.4
Phenanthrene-d_{10} (I.S.)	--------	---
Phenol	108-95-2	1.5
Phenol-d_6 (surr.)	--------	---
2-Picoline	109-86-8	---
Pronamide	23950-58-5	---
Pyrene	--------	1.9
Terphenyl-d_{14} (surr.)	--------	---
1,2,4,5-Tetrachlorobenzene	95-94-3	---
2,3,4,6-Tetrachlorophenol	58-90-2	---
2,4,6-Tribromophenol (surr.)	--------	---
1,2,4-Trichlorobenzene	120-82-1	1.9
2,4,5-Trichlorophenol	95-95-4	---
2,4,6-Trichlorophenol	88-06-2	2.7
Toxaphene	8001-35-2	---

TABLE 3-2 (p. 8 of 18)

D. **CYANIDE, TOTAL AND AMENABLE--SW-846 METHOD 9012**

Analyte	CAS No.	Minimum Detection Limit (ppb)
Cyanide		

E. **PHENOLS, TOTAL--SW-846 METHOD 8040**

Analyte	CAS No.	Minimum Detection Limit (ppb)
2-sec-Butyl-4,6-dinitrophenol (DNBP)	88-85-7	0.36
4-Chloro-3-methylphenol	59-50-7	0.31
2-Chlorophenol	95-57-8	----
Cresols (methyl phenols)	(1319-77-3)	----
2-Cyclohexyl-4,6-dinitrophenol	131-89-5	0.39
2,4-Dichlorophenol	120-83-2	----
2,6-Dichlorophenol	87-65-0	0.32
2,4-Dinitrophenol	105-67-9	13.0
*2-Methyl-4,6-dinitrophenol	51-28-5	16.0
2-Nitrophenol	88-85-7	0.45
4-Nitrophenol	100-95-2	2.8
Pentachlorophenol	100-02-7	7.4
Phenol	87-86-5	0.14
Tetrachlorophenols	100-95-2	----
Trichlorophenols	--------	----
2,4,6-Trichlorophenol	88-06-2	0.64

TABLE 3-2 (p. 9 of 18)

F. ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS (PCBs)--SW-846 METHOD 8080

Analyte	CAS No.	Minimum Detection Limit (ppb)
Aldrin	309-00-2	0.004
Alpha-BHC	--------	0.003
Beta-BHC	--------	0.006
Delta-BHC	--------	0.009
Gamma-BHC (Lindane)	58-89-9	0.004
Chloride (technical)	57-74-9	0.014
4,4'-DDD	72-54-8	0.011
4,4'-DDE	72-55-9	0.004
4,4'-DDT	50-29-3	0.012
Dieldrin	60-57-1	0.002
Endosulfan I	115-29-7	0.014
Endosulfan II	--------	0.004
Endosulfan sulfate	--------	0.066
Endrin	72-20-8	0.006
Endrin aldehyde	--------	0.023
Heptachlor	76-44-8	0.003
Heptachlor epoxide	1024-57-3	0.083
Methoxychlor	72-43-5	0.176
Toxaphene	8001-35-2	0.24
PCB-1016	(1336-36-3)	nd
PCB-1221	(1336-36-3)	nd
PCB-1232	(1336-36-3)	nd
PCB-1242	(1336-36-3)	0.065
PCB-1248	(1336-36-3)	nd
PCB-1254	(1336-36-3)	nd
PCB-1260	(1336-36-3)	nd

TABLE 3-2 (p. 10 of 18)

G. METALS, INDUCTIVELY COUPLED PLASMA (ICP)--SW-846 METHOD 6010

Analyte	Minimum Detection Limit (ppb)
Aluminum	45
Antimony	32
Arsenic	53
Barium	2
Beryllium	0.3
Boron	5
Cadmium	4
Calcium	10
Chromium	7
Cobalt	7
Copper	6
Iron	7
Lead	42
Magnesium	30
Manganese	2
Molybdenum	8
Nickel	15
Potassium	See note c
Selenium	75
Silicon	58
Silver	7
Sodium	29
Thallium	40
Vanadium	8
Zinc	2

[Appendix IX added by 52 FR 25946, July 9, 1987]

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
Acenaphthene	83-32-9	Acenaphthylene, 1,2-dihydro-	8100	200
			8270	10
Acenaphthylene	208-96-8	Acenaphthylene	8100	200
			8270	10
Acetone	67-64-1	2-Propanone	8240	100
Acetophenone	98-86-2	Ethanone, 1-phenyl-	8270	10
Acetonitrile; Methyl cyanide	75-05-8	Acetonitrile	8015	100
2-Acetylaminofluorene; 2-AAF	53-96-3	Acetamide, N-9H-fluoren-2-yl-	8270	10
Acrolein	107-02-8	2-Propenal	8030	5
			8240	5
Acrylonitrile	107-13-1	2-Propenenitrile	8030	5
			8240	5
Aldrin	309-00-2	1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro- (1α,4α,4aβ,5α,8α,8aβ)-	8080	0.05
			8270	10
Allyl chloride	107-05-1	1-Propene, 3-chloro-	8010	5
			8240	100
4-Aminobiphenyl	92-67-1	[1,1'-Biphenyl]-4-amine	8270	10
Aniline	62-53-3	Benzenamine	8270	10
Anthracene	120-12-7	Anthracene	8100	200
			8270	10
Antimony	(Total)	Antimony	6010	300
			7040	2,000
			7041	30
Aramite	140-57-8	Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester	8270	10
Arsenic	(Total)	Arsenic	6010	500
			7060	10
			7061	20
Barium	(Total)	Barium	6010	20
			7080	1,000
Benzene	71-43-2	Benzene	8020	2
			8240	5

[Appendix IX]

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Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (μg/L) [6]
Benzo[a]anthracene; Benzanthracene	56-55-3	Benz[a]anthracene	8100	200
			8270	10
Benzo[b]fluoranthene	205-99-2	Benz[e]acephenanthrylene	8100	200
			8270	10
Benzo[k]fluoranthene	207-08-9	Benzo[k]fluoranthene	8100	200
			8270	10
Benzo[ghi]perylene	191-24-2	Benzo[ghi]perylene	8100	200
			8270	10
Benzo[a]pyrene	50-32-8	Benzo[a]pyrene	8100	200
			8270	10
Benzyl alcohol	100-51-6	Benzenemethanol	8270	20
Beryllium	(Total)	Beryllium	6010	3
			7090	50
			7091	2
alpha-BHC	319-84-6	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2α,3β,4α,5β,6β)-	8080	0.05
			8250	10
beta-BHC	319-85-7	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2β,3α,4β,5α,6β)-	8080	0.05
			8250	40
delta-BHC	319-86-8	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2α 3α,4β,5α,6β)-	8080	0.1
			8250	30
gamma-BHC; Lindane	56-89-9	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1α,2α,3β,4α,5α,6β)-	8080	0.05
			8250	10
Bis(2-chloroethoxy)methane	111-91-1	Ethane, 1,1'-[methylenebis (oxy)]bis[2-chloro-	8270	10
Bis(2-chloroethyl)ether	111-44-4	Ethane, 1,1'-oxybis[2-chloro-	8270	10
Bis(2-chloro-1-methylethyl) ether; 2,2'-Dichlorodiisopropyl ether	108-60-1	Propane, 2,2'-oxybis[1-chloro-	8010	100
			8270	10
Bis(2-ethylhexyl) phthalate	117-81-7	1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl)ester	8060	20
			8270	10
Bromodichloromethane	75-27-4	Methane, bromodichloro-	8010	1
			8240	5
Bromoform; Tribromomethane	75-25-2	Methane, tribromo-	8010	2
			8240	5
4-Bromophenyl phenyl ether	101-55-3	Benzene, 1-bromo-4-phenoxy-	8270	10
Butyl benzyl phthalate; Benzyl butyl phthalate	85-68-7	1,2-Benzenedicarboxylic acid, butyl phenylmethyl ester	8060	5
			8270	10
Cadmium	(Total)	Cadmium	6010	40
			7130	50
			7131	1
Carbon disulfide	75-15-0	Carbon disulfide	6240	5
Carbon tetrachloride	56-23-5	Methane, tetrachloro-	8010	1
			8240	5
Chlordane	57-74-9	4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-	8080	0.1
			8250	10
p-Chloroaniline	106-47-8	Benzenamine, 4-chloro-	8270	20
Chlorobenzene	108-90-7	Benzene, chloro-	8010	2
			8020	2
			8240	5
Chlorobenzilate	510-15-6	Benzeneacetic acid, 4-chloro-α-(4-chlorophenyl)-α-hydroxy-ethyl ester	8270	10
p-Chloro-m-cresol	59-50-7	Phenol, 4-chloro-3-methyl-	8040	5
			8270	20
Chloroethane; Ethyl chloride	75-00-3	Ethane, chloro-	8010	5
			8240	10
Chloroform	67-66-3	Methane, trichloro-	8010	0.5
			8240	5
2-Chloronaphthalene	91-58-7	Naphthalene, 2-chloro-	8120	10
			8270	10
2-Chlorophenol	95-57-8	Phenol, 2-chloro-	8040	5
			8270	10

APPENDIX IX (13 of 18)

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
4-Chlorophenyl phenyl ether	7005-72-3	Benzene, 1-chloro-4-phenoxy-	8270	10
Chloroprene	126-99-8	1,3-Butadiene, 2-chloro-	8010	50
			8240	5
Chromium	(Total)	Chromium	6010	70
			7190	500
			7191	10
Chrysene	218-01-9	Chrysene	8100	200
			8270	10
Cobalt	(Total)	Cobalt	6010	70
			7200	500
			7201	10
Copper	(Total)	Copper	6010	60
			7210	200
m-Cresol	108-39-4	Phenol, 3-methyl-	8270	10
o-Cresol	95-48-7	Phenol, 2-methyl-	8270	10
p-Cresol	106-44-5	Phenol, 4-methyl-	8270	10
Cyanide	57-12-5	Cyanide	9010	40
2,4-D; 2,4-Dichlorophenoxyacetic acid	94-75-7	Acetic acid, (2,4-dichlorophenoxy)-	8150	10
4,4'-DDD	72-54-8	Benzene 1,1'-(2,2-dichloroethylidene)bis[4-chloro-	8080	0.1
			8270	10
4,4'-DDE	72-55-9	Benzene 1,1'-(dichloroethylidene)bis[4-chloro-	8080	0.05
			8270	10
4,4'-DDT	50-29-3	Benzene 1,1'-(2,2,2-trichloroethylidene)bis[4-chloro-	8080	0.1
			8270	10
Diallate	2303-16-4	Carbamothioic acid, bis(1-methylethyl)- , S- (2,3-dichloro-2-propenyl) ester	8270	10
Dibenz[a,h]anthracene	53-70-3	Dibenz[a,h]anthracene	8100	200
			8270	10
Dibenzofuran	132-64-9	Dibenzofuran	8270	10
Dibromochloromethane; Chlorodibromomethane	124-48-1	Methane, dibromochloro-	8010	1
			8240	5
1,2-Dibromo-3-chloropropane; DBCP	96-12-8	Propane, 1,2-dibromo-3-chloro-	8010	100
			8240	5
			8270	10
1,2-Dibromoethane; Ethylene dibromide	106-93-4	Ethane, 1,2-dibromo-	8010	10
			8240	5
Di-n-butyl phthalate	84-74-2	1,2-Benzenedicarboxylic acid, dibutyl ester	8060	5
			8270	10
o-Dichlorobenzene	95-50-1	Benzene, 1,2-dichloro-	8010	2
			8020	5
			8120	10
			8270	10
m-Dichlorobenzene	541-73-1	Benzene, 1,3-dichloro-	8010	5
			8020	5
			8120	10
			8270	10
p-Dichlorobenzene	106-46-7	Benzene, 1,4-dichloro-	8010	2
			8020	5
			8120	15
			8270	10
3,3'-Dichlorobenzidine	91-94-1	[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dichloro-	8270	20
trans-1,4-Dichloro-2-butene	110-57-6	2-Butene, 1,4-dichloro-, (E)-	8240	5
Dichlorodifluoromethane	75-71-8	Methane, dichlorodifluoro-	8010	10
			8240	5
1,1-Dichloroethane	75-34-3	Ethane, 1,1-dichloro-	8010	1
			8240	5
1,2-Dichloroethane; Ethylene dichloride	107-06-2	Ethane, 1,2-dichloro-	8010	0.5
			8240	5

APPENDIX IX (p. 14 of 18)

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
1,1-Dichloroethylene; Vinylidene chloride	75-35-4	Ethene, 1,1-dichloro-	8010 8240	1 5
trans-1,2-Dichloroethylene	156-60-5	Ethene, 1,2-dichloro-, (E)-	8010 8240	1 5
2,4-Dichlorophenol	120-83-2	Phenol, 2,4-dichloro-	8040 8270	5 10
2,6-Dichlorophenol	87-65-0	Phenol, 2,6-dichloro-	8270	10
1,2-Dichloropropane	78-87-5	Propane, 1,2-dichloro-	8010 8240	0.5 5
cis-1,3-Dichloropropene	10061-01-5	1-Propene, 1,3-dichloro-, (Z)-	8010 8240	20 5
trans-1,3-Dichloropropene	10061-02-6	1-Propene, 1,3-dichloro-, (E)-	8010 8240	5 5
Dieldrin	60-57-1	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aα,2β,2aα,3β,6β,6aα,7β,7aα)-	8080 8270	0.05 10
Diethyl phthalate	84-66-2	1,2-Benzenedicarboxylic acid, diethyl ester	8060 8270	5 10
O,O-Diethyl O-2-pyrazinyl phosphorothioate; Thionazin	297-97-2	Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester	8270	10
Dimethoate	60-51-5	Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester	8270	10
p-(Dimethylamino)azobenzene	60-11-7	Benzenamine, N,N-dimethyl-4-(phenylazo)-	8270	10
7,12-Dimethylbenz[a]anthracene	57-97-6	Benz[a]anthracene, 7,12-dimethyl-	8270	10
3,3'-Dimethylbenzidine	119-93-7	[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethyl-	8270	10
alpha, alpha-Dimethylphenethylamine	122-09-8	Benzeneethanamine, α,α-dimethyl-	8270	10
2,4-Dimethylphenol	105-67-9	Phenol, 2,4-dimethyl-	8040 8270	5 10
Dimethyl phthalate	131-11-3	1,2-Benzenedicarboxylic acid, dimethyl ester	8060 8270	5 10
m-Dinitrobenzene	99-65-0	Benzene, 1,3-dinitro-	8270	10
4,6-Dinitro-o-cresol	534-52-1	Phenol, 2-methyl-4,6-dinitro-	8040 8270	150 50
2,4-Dinitrophenol	51-28-5	Phenol, 2,4-dinitro-	8040 8270	150 50
2,4-Dinitrotoluene	121-14-2	Benzene, 1-methyl-2,4-dinitro-	8090 8270	0.2 10
2,6-Dinitrotoluene	606-20-2	Benzene, 2-methyl-1,3-dinitro-	8090 8270	0.1 10
Dinoseb; DNBP; 2-sec-Butyl-4,6-dinitrophenol	88-85-7	Phenol, 2-(1-methylpropyl)-4,6-dinitro-	8150 8270	1 10
Di-n-octyl phthalate	117-84-0	1,2-Benzenedicarboxylic acid, dioctyl ester	8060 8270	30 10
1,4-Dioxane	123-91-1	1,4-Dioxane	8015	150
Diphenylamine	122-39-4	Benzenamine, N-phenyl-	8270	10
Disulfoton	298-04-4	Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)- S-[2-ethyl]ester	8140 8270	2 10
Endosulfan I	959-98-8	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide, (3α,5aβ,6α,9α,9aβ)-	8080 8250	0.1 10
Endosulfan II	33213-65-9	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro- -1,5,5a,6,9,9a-hexahydro-, 3-oxide, (3α,5aα,6β,9β,9aα)-	8080	0.05
Endosulfan sulfate	1031-07-8	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro- 1,5,5a,6,9,9a-hexahydro-, 3,3-dioxide.	8080 8270	0.5 10
Endrin	72-20-8	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aα,2β,2aβ,3α,6α, 6aβ,7β,7aα)-	8080 8250	0.1 10
Endrin aldehyde	7421-93-4	1,2,4-Methenocyclopenta[cd]pentalene-5-carboxaldehyde, 2,2a,3,3,4,7-hexachlorodecahydro-, (1α,2β,2aβ,4β,4aβ,5β,6aβ,6bβ,7R*)-	8080 8270	0.2 10

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Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
Ethylbenzene	100-41-4	Benzene, ethyl-	8020	2
			8240	5
Ethyl methacrylate	97-63-2	2-Propenoic acid, 2-methyl-, ethyl ester	8015	10
			8240	5
			8270	10
Ethyl methanesulfonate	62-50-0	Methanesulfonic acid, ethyl ester	8270	10
Famphur	52-85-7	Phosphorothioic acid, O-[4-[(dimethylamino)sulfonyl]phenyl]-O,O-dimethyl ester	8270	10
Fluoranthene	206-44-0	Fluoranthene	8100	200
			8270	10
Fluorene	86-73-7	9H-Fluorene	8100	200
			8270	10
Heptachlor	76-44-8	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-	8080	0.05
			8270	10
Heptachlor epoxide	1024-57-3	2,5-Methano-2H-indeno[1,2-b]oxirene, 2,3,4,5,6,7,7-heptachloro-1a,1b,5,5a,6,6a,-hexahydro-, (1aα,1bβ,2α,5α,5aβ,6β,6aα)	8080	1
			8270	10
Hexachlorobenzene	118-74-1	Benzene, hexachloro-	8120	0.5
			8270	10
Hexachlorobutadiene	87-68-3	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	8120	5
			8270	10
Hexachlorocyclopentadiene	77-47-4	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-	8120	5
			8270	10
Hexachloroethane	67-72-1	Ethane, hexachloro-	8120	0.5
			8270	10
Hexachlorophene	70-30-4	Phenol, 2,2'-methylenebis[3,4,6-trichloro-	8270	10
Hexachloropropene	1888-71-7	1-Propene, 1,1,2,3,3,3-hexachloro-	8270	10
2-Hexanone	591-78-6	2-Hexanone	8240	50
Indeno(1,2,3-cd)pyrene	193-39-5	Indeno[1,2,3-cd]pyrene	8100	200
			8270	10
Isobutyl alcohol	78-83-1	1-Propanol, 2-methyl-	8015	50
Isodrin	465-73-6	1,4,5,8-Dimethanonaphthalene,1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a hexahydro-(1α,4α,4aβ,5β,8β,8aβ)-	8270	10
Isophorone	78-59-1	2-Cyclohexen-1-one, 3,5,5-trimethyl-	8090	60
			8270	10
Isosafrole	120-58-1	1,3-Benzodioxole, 5-(1-propenyl)-	8270	10
Kepone	143-50-0	1,3,4-Metheno-2H-cyclobuta-[cd]pentalen-2-one, 1,1a,3,3a,4,5,5,5a,5b,6-decachlorooctahydro-	8270	10
Lead	(Total)	Lead	6010	40
			7420	1,000
			7421	10
Mercury	(Total)	Mercury	7470	2
Methacrylonitrile	126-98-7	2-Propenenitrile, 2-methyl-	8015	5
			8240	5
Methapyrilene	91-80-5	1,2,Ethanediamine, N,N-dimethyl-N'-2-pyridinyl-N'-(2-thienylmethyl)-	8270	10
Methoxychlor	72-43-5	Benzene, 1,1'-(2,2,2,trichloroethylidene)bis[4-methoxy-	8080	2
			8270	10
Methyl bromide; Bromomethane	74-83-9	Methane, bromo-	8010	20
			8240	10
Methyl chloride; Chloromethane	74-87-3	Methane, chloro-	8010	1
			8240	10
3-Methylcholanthrene	56-49-5	Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-	8270	10
Methylene bromide; Dibromomethane	74-95-3	Methane, dibromo-	8010	15
			8240	5
Methylene chloride; Dichloromethane	75-09-2	Methane, dichloro-	8010	5
			8240	5

Common name [2]	CAS RN [3]	Chemical abstracts service Index name [4]	Suggested methods [5]	PQL (µg/L) [6]
Methyl ethyl ketone; MEK	78-93-3	2-Butanone	8015	10
			8240	100
Methyl iodide; Iodomethane	74-88-4	Methane, iodo-	8010	40
			8240	5
Methyl methacrylate	80-62-6	2-Propenoic acid, 2-methyl-, methyl ester	8015	2
			8240	5
Methyl methanesulfonate	66-27-3	Methanesulfonic acid, methyl ester	8270	10
2-Methylnaphthalene	91-57-6	Naphthalene, 2-methyl-	8270	10
Methyl parathion; Parathion methyl	298-00-0	Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester	8140	0.5
			8270	10
4-Methyl-2-pentanone; Methyl isobutyl ketone	108-10-1	2-Pentanone, 4-methyl-	8015	5
			8240	50
Naphthalene	91-20-3	Naphthalene	8100	200
			8270	10
1,4-Naphthoquinone	130-15-4	1,4-Naphthalenedione	8270	10
1-Naphthylamine	134-32-7	1-Naphthalenamine	8270	10
2-Naphthylamine	91-59-8	2-Naphthalenamine	8270	10
Nickel	(Total)	Nickel	6010	50
			7520	400
o-Nitroaniline	88-74-4	Benzenamine, 2-nitro-	8270	50
m-Nitroaniline	99-09-2	Benzenamine, 3-nitro-	8270	50
p-Nitroaniline	100-01-6	Benzenamine, 4-nitro-	8270	50
Nitrobenzene	98-95-3	Benzene, nitro-	8090	40
			8270	10
o-Nitrophenol	88-75-5	Phenol, 2-nitro-	8040	5
			8270	10
p-Nitrophenol	100-02-7	Phenol, 4-nitro-	8040	10
			8270	50
4-Nitroquinoline 1-oxide	56-57-5	Quinoline, 4-nitro-, 1-oxide	8270	10
N-Nitrosodi-n-butylamine	924-16-3	1-Butanamine, N-butyl-N-nitroso-	8270	10
N-Nitrosodiethylamine	55-18-5	Ethanamine, N-ethyl-N-nitroso-	8270	10
N-Nitrosodimethylamine	62-75-9	Methanamine, N-methyl-N-nitroso-	8270	10
N-Nitrosodiphenylamine	86-30-6	Benzenamine, N-nitroso-N-phenyl-	8270	10
N-Nitrosodipropylamine; Di-n-propylnitrosamine	621-64-7	1-Propanamine, N-nitroso-N-propyl-	8270	10
N-Nitrosomethylethylamine	10595-95-6	Ethanamine, N-methyl-N-nitroso-	8270	10
N-Nitrosomorpholine	59-89-2	Morpholine, 4-nitroso-	8270	10
N-Nitrosopiperidine	100-75-4	Piperidine, 1-nitroso-	8270	10
N-Nitrosopyrrolidine	930-55-2	Pyrrolidine, 1-nitroso-	8270	10
5-Nitro-o-toluidine	99-55-8	Benzenamine, 2-methyl-5-nitro-	8270	10
Parathion	56-38-2	Phosphorothioic acid, O,O-diethyl-O-(4-nitrophenyl) ester	8270	10
Polychlorinated biphenyls; PCBs	See Note 7	1,1'-Biphenyl, chloro derivatives	8080	50
			8250	100
Polychlorinated dibenzo-p-dioxins; PCDDs	See Note 8	Dibenzo[b,e][1,4]dioxin, chloro derivatives	8280	0.01
Polychlorinated dibenzofurans; PCDFs	See Note 9	Dibenzofuran, chloro derivatives	8280	0.01
Pentachlorobenzene	608-93-5	Benzene, pentachloro-	8270	10
Pentachloroethane	78-01-7	Ethane, pentachloro-	8240	5
			8270	10
Pentachloronitrobenzene	82-68-8	Benzene, pentachloronitro-	8270	10
Pentachlorophenol	87-86-5	Phenol, pentachloro-	8040	5
			8270	50
Phenacetin	82-44-2	Acetamide, N-(4-ethoxyphenyl)	8270	10
Phenanthrene	85-01-8	Phenanthrene	8100	200
			8270	10
Phenol	108-95-2	Phenol	8040	1
			8270	10
p-Phenylenediamine	106-50-3	1,4-Benzenediamine	8270	10
Phorate	298-02-2	Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester	8140	2
			8270	10

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Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (µg/L) [6]
2-Picoline	109-06-8	Pyridine, 2-methyl-	8240	5
			8270	10
Pronamide	23950-58-5	Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-	8270	10
Propionitrile; Ethyl cyanide	107-12-0	Propanenitrile	8015	60
			8240	5
Pyrene	129-00-0	Pyrene	8100	200
			8270	10
Pyridine	110-86-1	Pyridine	8240	5
Safrole	94-59-7	1,3-Benzodioxole, 5-(2-propenyl)-	8270	10
Selenium	(Total)	Selenium	6010	750
			7740	20
			7741	20
Silver	(Total)	Silver	6010	70
			7760	100
Silvex; 2,4,5-TP	93-72-1	Propanoic acid, 2-(2,4,5-trichlorophenoxy)-	8150	2
Styrene	100-42-5	Benzene, ethenyl-	8020	1
			8240	5
Sulfide	18496-25-8	Sulfide	9030	10,000
2,4,5-T; 2,4,5-Trichlorophenoxyacetic acid	93-76-5	Acetic acid, (2,4,5-trichlorophenoxy)-	8150	2
2,3,7,8-TCDD; 2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	Dibenzo[b,e][1,4]dioxin, 2,3,7,8-tetrachloro-	8280	0.005
1,2,4,5-Tetrachlorobenzene	95-94-3	Benzene, 1,2,4,5-tetrachloro-	8270	10
1,1,1,2-Tetrachloroethane	630-20-6	Ethane, 1,1,1,2-tetrachloro-	8010	5
			8240	5
1,1,2,2-Tetrachloroethane	79-34-5	Ethane, 1,1,2,2-tetrachloro-	8010	0.5
			8240	5
Tetrachloroethylene; Perchloroethylene; Tetrachloroethene	127-18-4	Ethene, tetrachloro-	8010	0.5
			8240	5
2,3,4,6-Tetrachlorophenol	58-90-2	Phenol, 2,3,4,6-tetrachloro-	8270	10
Tetraethyl dithiopyrophosphate; Sulfotepp	3689-24-5	Thiodiphosphoric acid ($[(HO)_2P(S)]_2O$), tetraethyl ester	8270	10
Thallium	(Total)	Thallium	6010	400
			7840	1,000
			7841	10
Tin	(Total)	Tin	7870	8,000
Toluene	108-88-3	Benzene, methyl-	8020	2
			8240	5
o-Toluidine	95-53-4	Benzenamine, 2-methyl-	8270	10
Toxaphene	8001-35-2	Toxaphene	8080	2
			8250	10
1,2,4-Trichlorobenzene	120-82-1	Benzene, 1,2,4-trichloro-	8270	10
1,1,1-Trichloroethane; Methylchloroform	71-55-6	Ethane, 1,1,1-trichloro-	8240	5
1,1,2-Trichloroethane	79-00-5	Ethane, 1,1,2-trichloro-	8010	0.2
			8240	5
Trichloroethylene; Trichloroethene	79-01-6	Ethene, trichloro-	8010	1
			8240	5
Trichlorofluoromethane	75-69-4	Methane, trichlorofluoro-	8010	10
			8240	5
2,4,5-Trichlorophenol	95-95-4	Phenol, 2,4,5-trichloro-	8270	10
2,4,6-Trichlorophenol	88-06-2	Phenol, 2,4,6-trichloro-	8040	5
			8270	10
1,2,3-Trichloropropane	96-18-4	Propane, 1,2,3-trichloro-	8010	10
			8240	5
O,O,O-Triethyl phosphorothioate	126-68-1	Phosphorothioic acid, O,O,O-triethyl ester	8270	10
sym-Trinitrobenzene	99-35-4	Benzene, 1,3,5-trinitro-	8270	10
Vanadium	(Total)	Vanadium	6010	80
			7910	2,000
			7911	40

Common name [2]	CAS RN [3]	Chemical abstracts service index name [4]	Suggested methods [5]	PQL (μg/L) [6]
Vinyl acetate	108-05-4	Acetic acid, ethenyl ester	8240	5
Vinyl chloride	75-01-4	Ethene, chloro-	8010	2
			8240	10
Xylene (total)	1330-20-7	Benzene, dimethyl-	8020	5
			8240	5
Zinc	(Total)	Zinc	6010	20
			7950	50

[1] The regulatory requirements pertain only to the list of substances; the right hand columns (Methods and PQL) are given for informational purposes only. See also footnotes 5 and 6.

[2] Common names are those widely used in government regulations, scientific publications, and commerce; synonyms exist for many chemicals.

[3] Chemical Abstracts Service registry number. Where "Total" is entered, all species in the ground water that contain this element are included.

[4] CAS index names are those used in the 9th Cumulative Index.

[5] Suggested Methods refer to analytical procedure numbers used in EPA Report SW-846 "Test Methods for Evaluating Solid Waste", third edition, November 1986. Analytical details can be found in SW-846 and in documentation on file at the agency. CAUTION: The methods listed are representative SW-846 procedures and may not always be the most suitable method(s) for monitoring an analyte under the regulations.

[6] Practical Quantitation Limits (PQLs) are the lowest concentrations of analytes in ground waters that can be reliably determined within specified limits of precision and accuracy by the indicated methods under routine laboratory operating conditions. The PQLs listed are generally stated to one significant figure. CAUTION: The PQL values in many cases are based only on a general estimate for the method and not on a determination for individual compounds; PQLs are not a part of the regulation.

[7] Polychlorinated biphenyls (CAS RN 1336-36-3); this category contains congener chemicals, including constituents of Aroclor-1016 (CAS RN 12674-11-2), Aroclor-1221 (CAS RN 11104-28-2), Aroclor-1232 (CAS RN 11141-16-5), Aroclor-1242 (CAS RN 53469-21-9), Aroclor-1248 (CAS RN 12672-29-6), Aroclor-1254 (CAS RN 11097-69-1), and Aroclor-1260 (CAS RN 11096-82-5). The PQL shown is an average value for PCB congeners.

[8] This category contains congener chemicals, including tetrachlorodibenzo-p-dioxins (see also 2,3,7,8-TCDD), pentachlorodibenzo-p-dioxins, and hexachlorodibenzo-p-dioxins. The PQL shown is an average value for PCDD congeners.

[9] This category contains congener chemicals, including tetrachlorodibenzofurans, pentachlorodibenzofurans, and hexachlorodibenzofurans. The PQL shown is an average value for PCDF congeners.

[Appendix IX]

3.1 SWMU NO. 1 - FIRE DEPARTMENT DRILL AREA

3.1.1 Site Background

The Fire Department Drill Area (SWMU No. 1) consisted of an area of asphalt runway and grass at the approach (west) end of inactive Runway 09 (see Figure 3-1 at the end of this section.) The area was used to train firemen in rescue techniques for downed aircraft. One training session per month was conducted at SWMU No. 1 from 1960 until 1984. During each training session, approximately 55 to 100 gallons of JP-4 and waste fuels were sprayed on and around an aircraft simulator in the drill area and ignited. Fires were set both on the asphalt area and in the grassy area. The fire created by the burning fuel was extinguished by the fire fighting crew. From 1960 until the late 1970's, there was no containment to prevent surface runoff from leaving SWMU No. 1. In addition, deterioration of the asphalt was probably accelerated by the fuel and the fuel may have penetrated through the asphalt to the soil below.

3.1.2 Sampling Objectives

Since it has not yet been determined whether a release of hazardous wastes or hazardous waste constituents occurred at the Fire Department Drill Area, a multiple phase sampling plan will be initiated for this site to determine (1) if a release has occurred (Phase I) and (2) if a release has occurred, the subsequent degree of environmental contamination in and around the site (Phase II). Figure 3-1 displays the various sampling locations. Table 3-3 is a summary of analyses to be performed.

3.1.3 Groundwater Sampling

No groundwater samples will be collected at SWMU No. 1.

3.1.4 Surface Water Sampling

No surface water samples will be collected at SWMU No. 1.

TABLE 3-3. SWMU NO. 1 -- SUMMARY OF ANALYSES, PHASE I

Sample Type (No. of Samples)	BTEX (SW-8020)	VOCs (SW-8240)	SVOCs (SW-8250)	CYANIDE (SW-9012)	PHENOLS (SW-8040)	PCBs/OC-PEST (SW-8080)	METALS (SW-6010	TCL	EP TOX (TCLP) Metals
Ground Water	0	0	0	0	0	0	0	0	0
Surface Water	0	0	0	0	0	0	0	0	0
Sediment	0	0	0	0	0	0	0	1	1
Soil, Surface	0	0	0	0	0	0	0	1	1
Soil, Subsurface	5	0	0	0	0	5	0	1	5
Wipe	0	0	0	0	0	0	0	0	0
Field Duplicate	2	0	0	0	0	2	0	3	0
Field Blank	2	0	0	0	0	2	0	2	0
Rinsate	2	0	0	0	0	2	0	0	0
Trip Blank	1	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A

3.1.5 Sediment Sampling

One sediment sample will be collected approximately two hundred feet west of SWMU No. 1 from the drainage ditch which carries runoff away from the runway. It will be analyzed during Phase I analysis.

3.1.6 Soil Sampling

Twenty foot deep soil cores will be collected at SWMU No. 1 from the following locations: (1) beneath the asphalt at the center of the SWMU No. 1 site (B-1); (2) beneath the asphalt approximately two hundred feet east of the site (B-2); and (3) approximately 30 feet west of the end of the runway (B-3). One surface soil grab sample and 6 subsurface soil grab samples will be collected for laboratory analysis. The surface soil samples will be collected from an area of suspected contamination (e.g., a surface depression) as determined by the on-site geologist. Two subsurface soil samples will be collected from each soil core as determined by the on-site geologist. All sample locations shall be documented in the field notebook.

3.1.7 Wipe Sampling

No wipe samples will be collected at SWMU No. 1.

3.1.8 Subsurface Gas Monitoring

The presence of subsurface gas shall not be monitored at SWMU No. 1.

3.1.9 Air Monitoring

Air monitoring shall be conducted at SWMU No. 1 in accordance with the procedures outlined in the Health and Safety Plan.

3.1.10 Sample Custody

Refer to Section 6.0 of the QAPP for Chain-of-Custody procedures.

3.1.11 Sample Designation

Sampling locations at each SWMU site will be marked with stakes and surveyed to determine the coordinate and elevation where possible. Once the stake is marked and in place, the area will be photographed. The stake shall be marked with the following information:

NASM;
Sample Code; and
Station Number (XXOO).

Sample codes used at SWMU No. 1 will include SD, SU, and SS for surface water sediment, surface soil and subsurface soil samples, respectively.

Samples collected from each location, other than those collected for on-site field measurements or analyses, shall be identified by using a standard label which is attached to the sample container. The sample labels shall be sequentially numbered and shall be accountable. The following information shall be included on the sample label:

1. Site name;
2. SWMU number;
3. Date and time of sample collection;
4. Designation of the sample (i.e. grab or composite);
5. Type of sample with brief description of sampling location (depth);
6. Signature of sampler;
7. Sample preservative used; and
8. General types of analyses to be conducted.

The SWMU No.1 sample identification number will be of the form:

NASM - SWMU 1 - SAMPLE CODE AND LOCATION # - DEPTH - ORIGINAL (O) OR DUPLICATE (D)

For example, a sample number such as NASM-01-SS1-04-D would identify a duplicate NAS Memphis SWMU No. 1 subsurface soil sample taken at location 1 at a depth of four feet.

3.1.12 <u>In-Situ/Laboratory Measurements</u>

Field work conducted by the on-site geologist shall generate data that may be used directly or indirectly to best describe the following parameters as recommended by the site manager:

- hydraulic conductivity (saturated and unsaturated) and porosity (total and effective);
- lithology and sorting;
- an interpretation of hydraulic interconnections between saturated zones;
- the attenuation capacity and mechanisms of the natural earth materials;
- zones of fracturing or channeling in consolidated or unconsolidated deposits;
- zones of higher or lower permeability that might direct or restrict the flow of contaminants;
- the uppermost aquifer;
- water-bearing zones above the first confining layer;
- description of water level/fluid pressure;
- water level contour;
- hydrologic cross sections showing vertical gradients;
- the flow system;
- surface soil distribution;
- soil profile;
- relative permeability;
- soil pH;
- particle size distribution;
- moisture content;

- infiltration; and
- storage capacity.

Each of the SWMU No. 1 soil and sediment samples shall be analyzed in the laboratory by the following methods:

- BTEX (SW-8020);
- Total Metals (SW-6010);
- EP Toxicity Characteristics (EPTC)/Toxicity Characteristics Leaching Procedures (TCLP) (Metals) ;
- RCRA Appendix VIII
- PCBs (SW-8080).

Refer to Table 3-2 for summaries of analytes and analyses, respectively.

3.1.13 Special Sampling Equipment

Teflon implements will be used to collect all samples being analyzed for metals.

3.1.14 Special Instructions

NAS Memphis Runway 09 is an inactive runway. Special coordination between NAS Memphis and the contracting consultant with respect to sampling schedules shall be required.

Boreholes shall be sealed with grout an order of magnitude less permeable than the surrounding soil/rock/sediment.

Spoils generated from the development of boreholes will be drummed by the subcontractor and disposed of under the direction of the SOUTHDIV.

If evidence of soil or sediment contamination is found in the initial sampling, the groundwater receptor will be investigated in Phase II.

3.1.15 Personal Protection

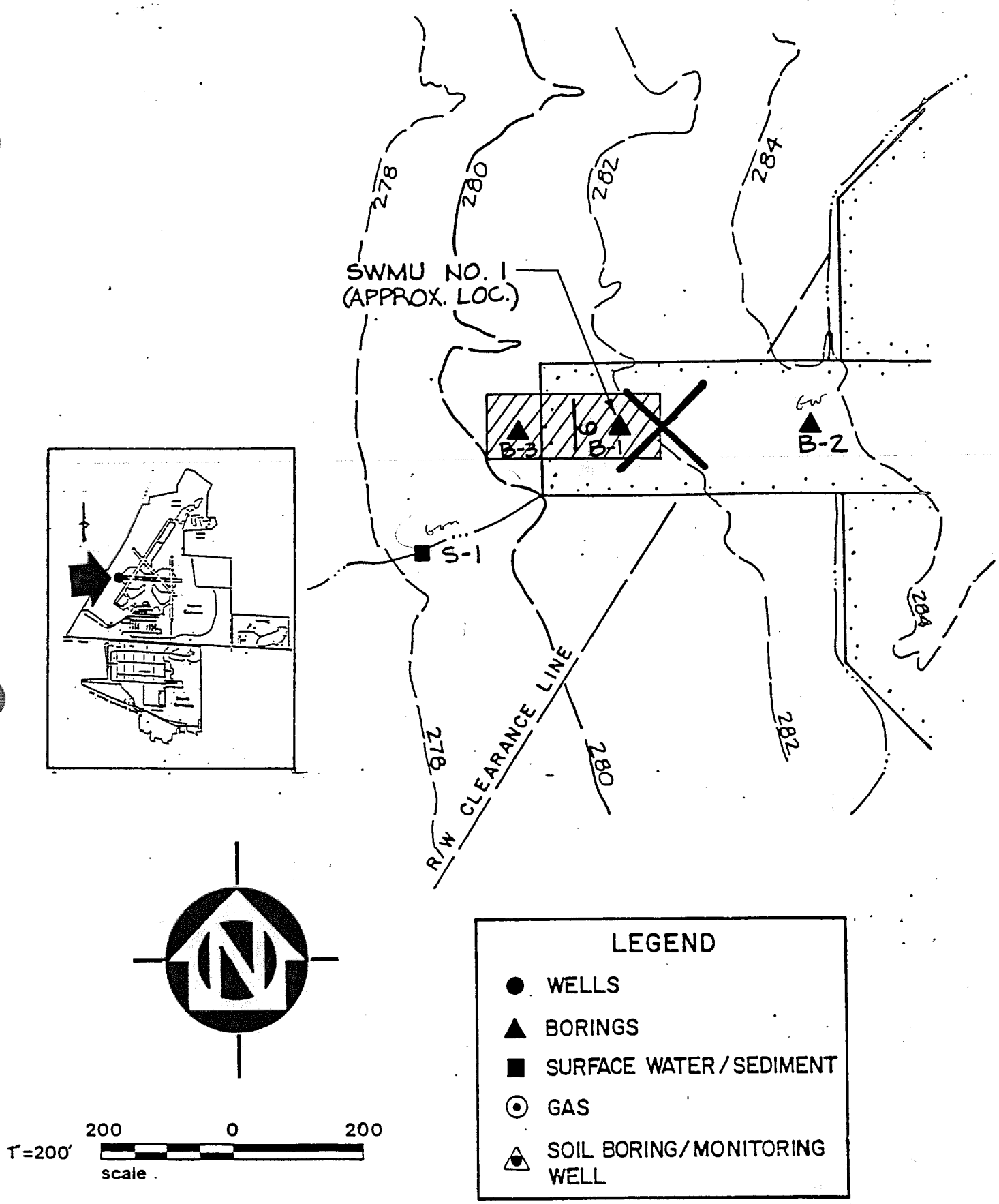
Level D protection is expected to be sufficient while investigating SWMU No. 1. The sampling team leader will be responsible for upgrading the personal protection level and for adhering to that level's protection requirements. The detailed protection levels are outlined in the Health and Safety Plan,.

3.1.16 Quality Assurance

The sampling plan will be subject to the following requirements for quality assurance of environmentally related measurements:

- A complete set of field blanks for each site (1/source/event);
- a trip blank will be included for each day of sampling (for volatile organics analyses only);
- duplicate samples from each site for each media at a frequency of 10% per sample matrix; and
- equipment rinsates at a frequency of one per day.

Detailed quality assurance procedures are outlined in the QAPP.



SWMU NO. 1
FIGURE 3-1

FIRE DEPARTMENT DRILL AREA SAMPLING LOCATIONS

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3.2 SWMU NO. 2 - SOUTHSIDE LANDFILL

3.2.1 Site Background

The Southside Landfill (SWMU No.2) is a forty acre solid waste disposal area which was utilized by the NAS in Memphis from 1942 until 1970 . The approximate landfill boundaries are shown in Figure 3-2 at the end of this section. Although the specific depth of fill was unrecorded, a shallow fill is suspected due to the trench and cover method of operation which was reportedly used. The landfill contains no liner, leachate collection system, or gas ventilation system. However, the presence of an upper confining clay layer may protect the uppermost aquifer from contamination. Existing monitoring wells indicate a south to southwesterly groundwater flow.

3.2.2 Sampling Objectives

Due to the vast diversity of the waste deposited in the Southside Landfill, soil, groundwater, and surface water contamination from a variety of constituents is highly probable.

It is, therefore, recommended that the landfill site (SWMU No. 2) be investigated through the use of soil, groundwater, and surface water sampling plans. Figure 3-2 depicts the various sampling locations. Table 3-4 is a summary of analyses to be performed.

3.2.3 Groundwater Sampling

One grab groundwater sample shall be collected daily for 1 week from each monitoring well at SWMU No. 2 (GM1 through GM5). Monitoring well GM1 will provide background water quality. Monitoring wells GM2 through GM5 will provide downgradient water quality conditions.

3.2.4 Surface Water Sampling

Two grab surface water samples shall be collected for upstream (S-1) and downstream (S-2) water quality characterizations.

TABLE 3-4. SWMU NO. 2 -- SUMMARY OF ANALYSES, PHASE I

Sample Type (No. of Samples)	BTEX (SW-8020)	VOCs (SW-8240)	SVOCs (SW-8250)	CYANIDE (SW-9012)	PHENOLS (SW-8040)	PCBs/OC-PEST (SW-8080)	METALS (SW-6010	TCL	EP TOX (TCLP) Metals
Ground Water	0	0	4	0	4	4	0	1	0
Surface Water	0	0	1	1	1	0	0	1	0
Sediment	0	0	1	1	1	0	0	1	2
Soil, Surface	0	0	2	2	2	0	0	1	3
Soil, Subsurface	0	0	5	5	5	0	0	1	6
Wipe	0	0	0	0	0	0	0	0	0
Field Duplicate	0	0	4	4	4	4	0	4	4
Field Blank	0	0	3	3	3	3	0	3	3
Rinsate	0	0	3	3	3	3	0	0	2
Trip Blank	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A

3.2.5 Sediment Sampling

Two grab sediment samples will be collected at SWMU No. 2.

3.2.6 Soil Sampling

Two subsurface soil grab samples will be collected from each of 3 borings drilled to a depth of 20 feet using the split-spoon method at (1) approximately 200 feet north of the site (B-1) for background conditions, (2) ten feet to the southeast of the landfill boundary (B-2) for downgradient soil quality condition, and (3) ten feet to the southwest of the landfills boundary (B-3). Phase I laboratory analyses shall include the qualitative analysis of one composite surface soil sample and quantitative analysis of 3 grab surface soil samples. The samples will be collected from depths determined by the on-site geologist. Three surface soil grab samples shall be collected from an area of suspected contamination or a depressed area as determined by the on-site geologist.

3.2.7 Wipe Sampling

No wipe samples will be collected at SWMU No. 2.

3.2.8 Subsurface Gas Monitoring

The presence of subsurface gas shall be monitored at 8 locations on the SWMU No. 2 site.

3.2.9 Air Monitoring

Air monitoring shall be conducted at SWMU No. 2 in accordance with the procedures outlined in the Health and Safety Plan.

3.2.10 Sample Custody

Refer to Section 6.0 of the QAPP for chain-of-custody procedures.

3.2.11 Sample Designation

Sampling locations at each SWMU site will be marked with stakes and surveyed to determine the coordinate and elevation where

possible. Once the stake is marked and in place, the area will be photographed. The stake shall be marked with the following information:

NASM;
Sample Code; and
Station Number (XXOO).

Sample codes used at SWMU No. 2 will be SD, SW, SS, and GW for sediment, surface water, subsurface soil and groundwater samples, respectively.

Samples collected from each location, other than those collected for on-site field measurements or analyses, shall be identified by using a standard label which is attached to the sample container. The sample labels are sequentially numbered and are accountable. The following information shall be included on the sample label:

1. Site name;
2. SWMU Sample Identification Number;
3. Date and time of sample collection;
4. Designation of the sample (i.e. grab or composite);
5. Type of sample with brief description of sampling location (depth);
6. Signature of sampler;
7. Sample preservative used; and
8. General types of analyses to be conducted.

The SWMU No. 2 sample identification number will be of the form:

NASM - SWMU 2 - SAMPLE CODE AND LOCATION # - DEPTH - ORIGINAL (O) OR DUPLICATE (D)

For example, a sample number such as NASM-02-SS1-04-D would identify a duplicate NAS Memphis SWMU No. 2 subsurface soil sample taken at location 1 at a depth of four feet.

3.2.12 In-Situ/Laboratory Measurements

In-situ measurements taken at SWMU No. 2 shall include pH, temperature, specific conductance and turbidity with respect to both surface water and groundwater. Subsurface gas (methane) will also be monitored.

Field work conducted by the on-site geologist shall generate data that may be used directly or indirectly to best describe the following parameters as recommended by the site manager:

- hydraulic conductivity (saturated and unsaturated) and porosity (total and effective);
- lithology and sorting;
- an interpretation of hydraulic interconnections between saturated zones;
- the attenuation capacity and mechanisms of the natural earth materials;
- zones of fracturing or channeling in consolidated or unconsolidated deposits;
- zones of higher or lower permeability that might direct or restrict the flow of contaminants;
- the uppermost aquifer;
- water-bearing zones above the first confining layer;
- description of water level/fluid pressure;
- water level contour;
- hydrologic cross sections showing vertical gradients;
- the flow system;
- surface soil distribution;
- soil profile;
- relative permeability;
- soil pH;

- particle size distribution;
- moisture content;
- infiltration; and
- storage capacity.

SWMU No. 2 field samples shall be analyzed by the following analytical methods:

- Semi-volatile organics (SW-8250),
- Cyanide (SW-9012),
- Phenols (SW-8040,
- PCBs (SW-8080),
- RCRA Appendix VIII contaminants, and
- EPTC (TCLP) Metals.

Tables 3-2 and 3-4 summarize the specific analytes and number of analyses respectively.

3.2.13 Special Sampling Equipment

Teflon implements shall be used to collect all samples being analyzed for metals.

An explosimeter shall be used to monitor subsurface methane gas. Prior to testing, a one-quarter to one half-inch diameter pipe shall be hand-driven to an approximate depth of three feet below the ground surface. After allowing time for any gas to replace air in the pipe, approximately one hour, the probe shall be inserted into the pipe to measure methane gas concentration.

3.2.14 Special Instructions

No sampling or monitoring shall be performed within the landfill boundary.

The existing monitoring wells shall be inspected by the on-site geologist to insure that all requirements are met and that the

wells are in working order. Refer to sections 5.2 and 5.3 of the QAPP for groundwater well installation and sampling requirements.

Refer to Section 5.7 of the QAPP for decontamination procedures.

A completed "Southern Division Naval Facilities Engineering Command Groundwater Monitoring Well Installation Report" and "Well Construction Details Form" will submitted for each well installation. Refer to section 5.2 of the QAPP for a description of the forms.

A permanent well designation sign will be attached to the wells' protective casing. The sign shall be an 18 inch by 6 inch by 1/8 inch thick sheet of aluminum plate, bolted to 1/4 inch studs welded to the casing. The sign shall be stamped with the following 4-inch letters and numbers:

MPH - Site #-Well #.

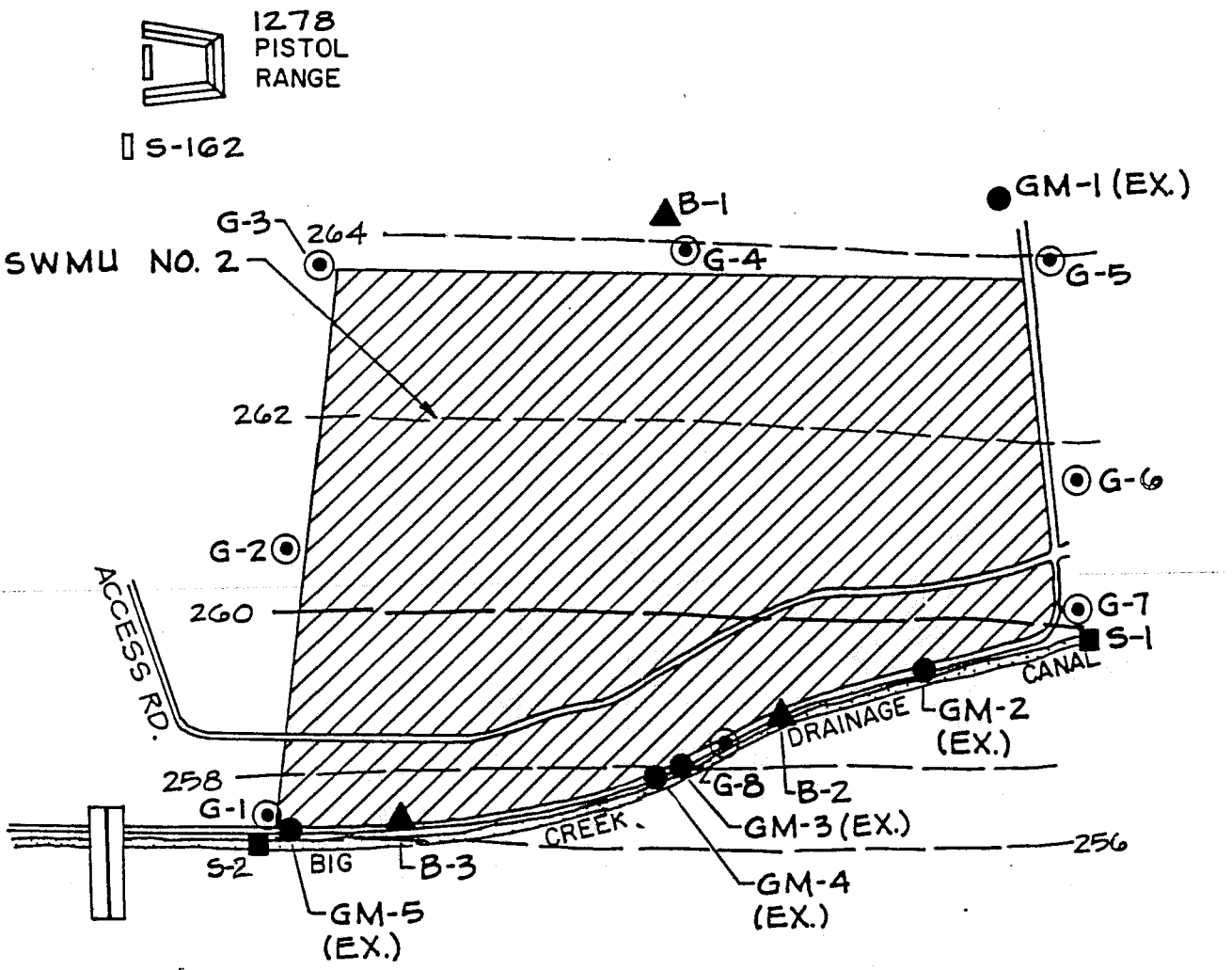
The big creek drainage canal area adjacent to the landfill area shall be inspected for leachate streams.

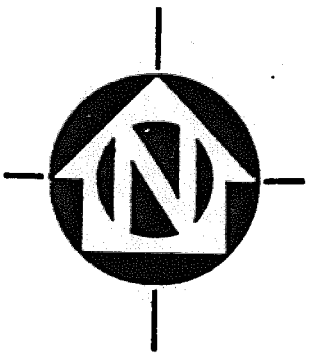
3.2.15 Personal Protection

Level D protection is expected to be sufficient while investigating SWMU No. 2. The sampling team leader will be responsible for upgrading the personal protection level and for adhering to that levels protection requirements. The detailed protection levels are outlined in the Health and Safety Plan.

3.2.16 Quality Assurance

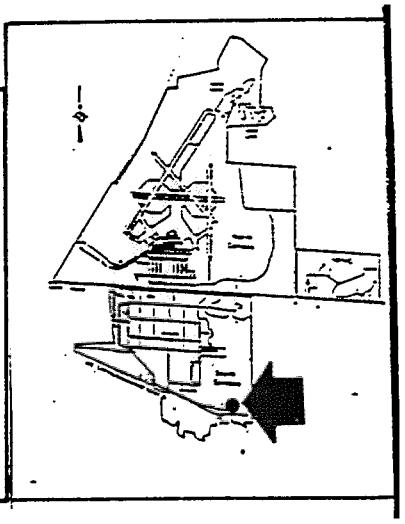
Refer to Section 3.1.16.





LEGEND

- ● WELLS
- ▲ BORINGS
- ■ SURFACE WATER / SEDIMENT
- ⊙ GAS
- SOIL BORING / MONITORING WELL



1"=500'

500 0 500

scale

SWMU NO. 2 SOUTHSIDE LANDFILL
FIGURE 3-2 SAMPLING LOCATIONS

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3.3 SWMU NO. 3 - BUILDING N-121 PLATING SHOP DRY WELL

3.3.1 Site Background

Building N-121 Plating Shop Dry Well (SWMU No. 3) is located on the North Complex as shown in Figure 3-3 at the end of this section. Building N-121 contained a plating shop which conducted cadmium, chromium, copper and nickel plating using cyanide based solutions. The dry well was used for disposal of both concentrated plating solutions and overflows from the plating tanks. The remaining wastewater discharged into the storm sewer and drainage ditch. The exact dates of operation of the plating solutions and overflows from the plating tanks are unclear; however, it is believed that the operations lasted from 10 to 20 years. During operation, the dry well (10 feet x 10 feet x 6 feet) was filled with gravel. For disposal, the spent solutions were discharged into the dry well and percolated through the gravel and into the surrounding soil. The amount of waste that entered the well is estimated at 900 gallons per day.

The remaining plating waste, estimated at 17,000 gallons per day, was discharged into the storm sewer and drainage ditch.

3.3.2 Sampling Objectives

Although some plating waste contamination exists in the area of the dry well, the extent of contamination is unknown. The initial sampling of soil, groundwater, and surface water sediment will provide an indication of the extent of contamination in the area. If in any sampling media contamination is found, subsequent sampling phases may be necessary to define the extent and abundance of contaminants. The sampling plans for SWMU No. 3 shall include wipe sampling of the interior of Building N-121 and just underneath the interior sump. Figure 3-3 depicts the various sampling locations. Table 3-5 is a summary of analyses to be performed.

TABLE 3-5. SWMU NO. 3 -- SUMMARY OF ANALYSES, PHASE I

Sample Type (No. of Samples)	BTEX (SW-8020)	VOCs (SW-8240)	SVOCs (SW-8250)	CYANIDE (SW-9012)	PHENOLS (SW-8040)	PCBs/OC-PEST (SW-8080)	METALS (SW-6010	TCL	EP TOX (TCLP) Metals
Ground Water	0	0	0	2	0	0	2	0	0
Surface Water	0	0	0	0	0	0	0	0	0
Sediment	0	0	0	0	0	0	0	1	1
Soil, Surface	0	0	0	0	0	0	0	1	1
Soil, Subsurface	0	0	0	7	0	0	7	1	8
Wipe	0	0	0	4	0	0	4	0	0
Field Duplicate	0	0	0	3	0	0	3	3	4
Field Blank	0	0	0	3	0	0	3	3	3
Rinsate	0	0	0	3	0	0	3	3	2
Trip Blank	0	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A

3.3.3 Groundwater Sampling

One groundwater monitoring well (GM1) shall be installed to a depth approximately 10 feet into the perched aquifer approximately 200 feet southwest of SWMU No. 3. Grab groundwater samples will be collected from GM1 and from two existing monitoring wells previously installed by Geraghty and Miller, Inc. (GM6 and GM7).

3.3.4 Surface Water Sampling

No surface water samples shall be collected at SWMU No. 3.

3.3.5 Sediment Sampling

One sediment sample will be collected at SWMU No. 3 approximately 175 feet southwest of the dry well to confirm sediment contamination has occurred from the plating shop.

3.3.6 Soil Sampling

Two subsurface soil grab samples will be collected from each of 4 borings (B-1, B-2, B-3, and B-4) drilled to a depth of 20 feet using a continuous sampling device. Prior to drilling B-4, the store media lining the dry well will be exhumed, drummed and properly disposed of on the NAS grounds. B-4 will be drilled directly beneath the dry well and will be grouted after the soil samples have been collected. The samples will be collected from depths determined in the field by the on-site geologist. One grab surface soil sample shall be collected from a location of suspected contamination or surface depression as determined by the on-site geologist.

3.3.7 Wipe Sampling

Wipe sampling will include 1 wipe sample in the sump of Building N-121 and 4 wipe samples surrounding the sump. Specific sample locations will be chosen in the field by the site manager based upon his observations of any obvious spill areas.

3.3.8 Subsurface Gas Monitoring

The presence subsurface gas shall not be monitored at SWMU No. 3.

3.3.9 Air Monitoring

Air monitoring shall be conducted at SWMU No. 3 in accordance with the procedures outlined in the Health and Safety Plan.

3.3.10 Sample Custody

Refer to Section 6.0 of the QAPP for chain-of-custody procedures.

3.3.11 Sample Designation

Sampling locations at each SWMU site will be marked with stakes and surveyed to determine the coordinate and elevation where possible. Once the stake is marked and in place, the area will be photographed. The stake shall be marked with the following information:

NASM;
Sample Code; and
Station Number (XXOO).

Sample codes to be used at SWMU No. 3 shall include SS, SD, GW and WS for subsurface soil, surface water sediment, groundwater, and surface wipe sampling, respectively.

Samples collected from each location, other than those collected for on-site field measurements or analyses, shall be identified by using a standard label which is attached to the sample container. The sample labels are sequentially numbered and are accountable. The following information shall be included on the sample label:

1. Site name;
2. SWMU Sample Identification Number;
3. Date and time of sample collection;

4. Designation of the sample (i.e. grab or composite);
5. Type of sample with brief description of sampling location (depth);
6. Signature of sampler;
7. Sample preservative used; and
8. General types of analyses to be conducted.

The SWMU No. 3 sample identification number will be of the form:

NASM - SWMU 3 - SAMPLE CODE AND LOCATION # - DEPTH - ORIGINAL (O) OR DUPLICATE (D)

For example, a sample number such as NASM-03-SS1-04-D would identify a duplicate NAS Memphis SWMU No. 3 subsurface soil sample taken at location 1 at a depth of four feet.

3.3.12 <u>In-Situ/Laboratory Measurements</u>

In-situ measurements shall include the pH, temperature, specific conductance and turbidity of groundwater.

Field work conducted by the on-site geologist shall generate data that may be used directly or indirectly to best describe the following parameters as recommended by the site manager:

- hydraulic conductivity (saturated and unsaturated) and porosity (total and effective);
- lithology and sorting;
- an interpretation of hydraulic interconnections between saturated zones;
- the attenuation capacity and mechanisms of the natural earth materials;
- zones of fracturing or channeling in consolidated or unconsolidated deposits;
- zones of higher or lower permeability that might direct

or restrict the flow of contaminants;

- the uppermost aquifer;
- water-bearing zones above the first confining layer;
- description of water level/fluid pressure;
- water level contour;
- hydrologic cross sections showing vertical gradients;
- the flow system;
- surface soil distribution;
- soil profile;
- relative permeability;
- soil pH;
- particle size distribution;
- moisture content;
- infiltration; and
- storage capacity.

Each of SWMU No. 3 samples will be analyzed in the laboratory by the following analytical methods:

- Cyanide (SW-9012);
- Total Metals (SW-6010);
- EP Toxic (TCLP) Metals, and;
- RCRA Appendix VIII contaminants.

Tables 3-2 and 3-5 summarizes the specific analytes and number of analyses to be performed for SWMU No. 3 samples, respectively.

3.3.13 Special Sampling Equipment

Teflon implements shall be used to collect all samples to be analyzed for metals.

3.3.14 Special Instructions

Refer to Section 5.7 in the QAPP for decontamination procedures.

A completed "Southern Division Naval Facilities Engineering

Command Groundwater Monitoring Well Installation Report" and "Well Construction Details Form" will be submitted for each well installation. Refer to Section 5.2 of the QAPP for a description of the forms.

A permanent well designation will be attached to each well's protective casing. The sign shall be an 18 inch by 6 inch by 1/8 inch thick sheet of aluminum plate, bolted to 1/4 inch studs welded to the casing. The sign shall be stamped with the following 4 inch letters and numbers:

MPH - Site # - Well #.

Boreholes shall be grouted with material at least an order of magnitude less permeable that the surrounding soil/rock/sediment.

Spoils generated from the development of boreholes shall be drummed and disposed of as directed by the EIC.

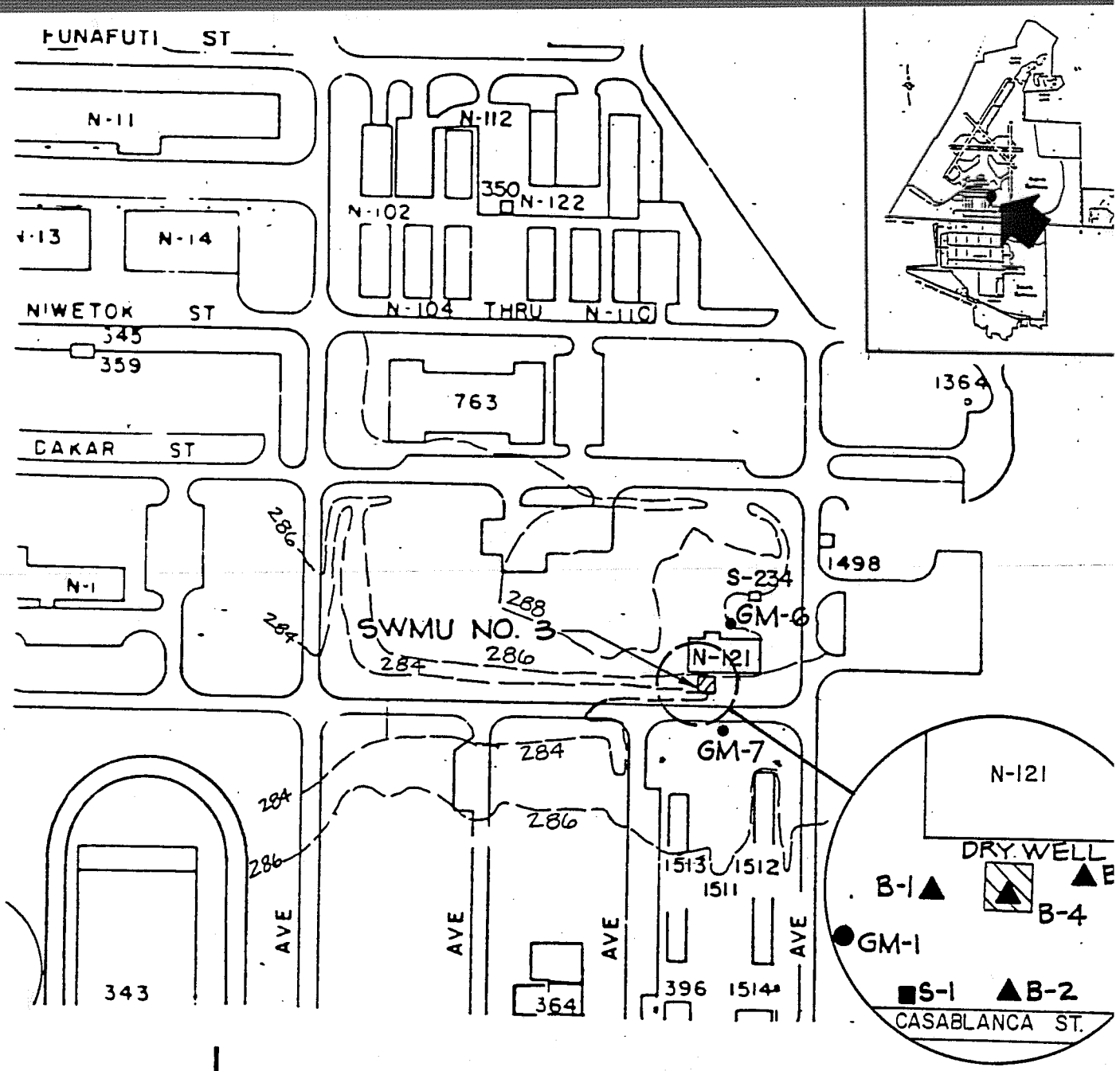
Special precautions will be used when developing boreholes to prevent penetration into groundwater by taking water level measurements from the existing monitoring wells prior to drilling or excavating.

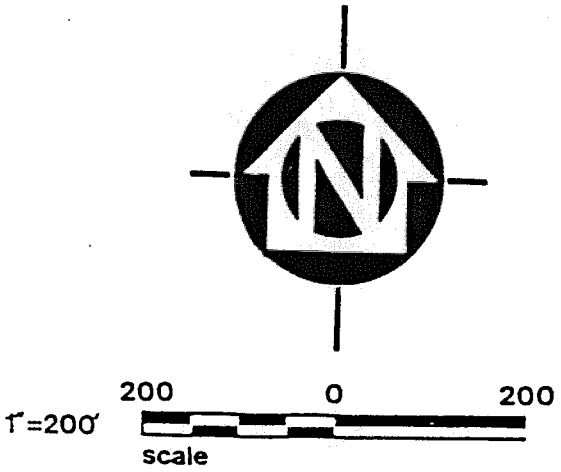
3.3.15 Personal Protection

Level D protection is expected to be sufficient while investigating SWMU No. 3. The sampling team leader will be responsible for upgrading the personal protection level and for adhering to that levels protection requirements. The detailed protection levels are outlined in the Health and Safety Plan.

3.3.16 Quality Assurance

Refer to Section 3.1.16.





LEGEND

- ● WELLS
- ▲ BORINGS
- ■ SURFACE WATER / SEDIMENT
- ⊙ GAS
- SOIL BORING/MONITORING WELL

SWMU NO. 3
FIGURE 3-3

N-121 PLATING SHOP DRY WELL
SAMPLING LOCATIONS

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3.4 SWMU NO. 4 - BUILDING N-121 PLATING SHOP STORM SEWER AND DRAINAGE DITCH

3.4.1 Site Background

Building N-121 Plating Shop Storm Sewer and Drainage Ditch (SWMU No. 4) is located on the North Complex on Casablanca Road. The storm sewer and ditch flow westward from N-121 along Casablanca Road to First Avenue, then south-westwardly to a section of open drainage ditch which eventually discharges to North Fork Creek (see Figure 3-4 at the end of this section). Building N-121 contained a plating shop which conducted cadmium, chromium, copper and nickel plating using cyanide based solutions. Underneath the floor of Building N-121 are 4 inch and 6 inch drain lines which lead to either the dry well (SWMU No. 3) or to the storm sewer (exact discharge location unknown). Nine hundred gallons per day of concentrated waste from the plating tanks were disposed of through the dry well. The remaining wastewater, estimated at 17,000 gallons per day, was discharged into the storm sewer and drainage ditch, each approximately 3,000 feet in length.

3.4.2 Sample Objectives

Contaminants identified by the June 1981 Hazardous Waste Notification Form, potentially released to the SWMU No. 4 environment are cyanide, cadmium, chromium, copper, nickel and aluminum. Initial investigations to identify the extent of contamination will concern only the sediments of the storm sewer and drainage ditch. Phase II sampling may be required for both soil and groundwater if extensive sediment contamination is found to exist. Figure 3-4 depicts the various sampling locations. Table 3-6 is a summary of analyses to be performed.

3.4.3 Groundwater Sampling

No groundwater samples will be collected at SWMU No. 4.

TABLE 3-6. SWMU NO. 4 -- SUMMARY OF ANALYSES, PHASE I

Sample Type (No. of Samples)	BTEX (SW-8020)	VOCs (SW-8240)	SVOCs (SW-8250)	CYANIDE (SW-9012)	PHENOLS (SW-8040)	PCBs/OC-PEST (SW-8080)	METALS (SW-6010	TCL	EP TOX (TCLP) Metals
Ground Water	0	0	0	0	0	0	0	0	0
Surface Water	0	0	0	0	0	0	0	0	0
Sediment	3	0	0	3	0	3	3	3	1
Soil, Surface	0	0	0	0	0	0	0	0	0
Soil, Subsurface	0	0	0	0	0	0	0	0	0
Wipe	0	0	0	0	0	0	0	0	0
Field Duplicate	1	0	0	1	0	1	1	0	1
Field Blank	1	0	0	1	0	1	1	0	1
Rinsate	1	0	0	1	0	1	1	0	0
Trip Blank	1	0	NA	NA	NA	NA	NA	NA	NA

3.4.4 Surface Water Sampling

No surface water samples will be collected at SWMU No. 4.

3.4.5 Sediment Sampling

A single grab sediment sample shall be collected at 4 locations on the SWMU No. 4 site.

3.4.6 Soil Sampling

No soil samples will be collected at SWMU No. 4.

3.4.7 Wipe Sampling

No wipe samples will be collected at SWMU No. 4.

3.4.8 Subsurface Gas Monitoring

The presence of subsurface gas at SWMU No. 4 will not be monitored.

3.4.9 Air Monitoring

Air monitoring shall be conducted at SWMU No. 4 in accordance with the procedures outlined in the Health and Safety Plan.

3.4.10 Sample Custody

Refer to Section 6.0 of the QAPP for chain-of-custody procedures.

3.4.11 Sample Designation

Sampling locations at each SWMU site will be marked with stakes and surveyed to determine the coordinate and elevation where possible. Once the stake is marked and in place, the area will be photographed. The stake shall be marked with the following information:

NASM;
Sample Code; and
Station Number (XXOO).

The sample code to be used at SWMU No. 4 is SD for surface water sediment samples.

Samples collected from each location, other than those collected for on-site field measurements or analyses, shall be identified by using a standard label which is attached to the sample container. The sample labels are sequentially numbered and are accountable. The following information shall be included on the sample label:

1. Site name;
2. SWMU Sample Identification Number;
3. Date and time of sample collection;
4. Designation of the sample (i.e. grab or composite);
5. Type of sample with brief description of sampling location (depth);
6. Signature of sampler;
7. Sample preservative used; and
8. General types of analyses to be conducted.

The SWMU No. 4 sample identification number will be of the form:

NASM - SWMU 4 - SAMPLE CODE AND LOCATION # - DEPTH - ORIGINAL (O) OR DUPLICATE (D)

For example, a sample number such as NASM-04-SS1-04-D would identify a duplicate NAS Memphis SWMU No. 4 subsurface soil sample taken at location 1 at a depth of four feet.

3.4.12 <u>In-Situ/Laboratory Measurements</u>

Since the discharge from the Building N-121 plating shop to the drainage ditch may have been only one of several contaminated discharges to the ditch, it is prudent to analyze the sediment samples for a more comprehensive list of contaminants that the

list of potential contaminants associated with Building N-121 Plating Shop alone. Each of the samples collected at SWMU No. 4 will be analyzed for the following contaminants:

- BTEX (SW-8020);
- Cyanide (SW-9012);
- Phenols (SW-8040);
- PCBs (SW-8080);
- Total Metals (SW-6010);
- EP Toxic (TCLP) Metals;
- RCRA Appendix VIII contaminants.

Tables 3-2 and 3-6 summaries the specific analytes and number of analyses to be performed for SWMU No. 4 samples, respectively.

3.4.13 Special Sampling Equipment

Teflon implements shall be used to collect all samples.

3.4.14 Special Instructions

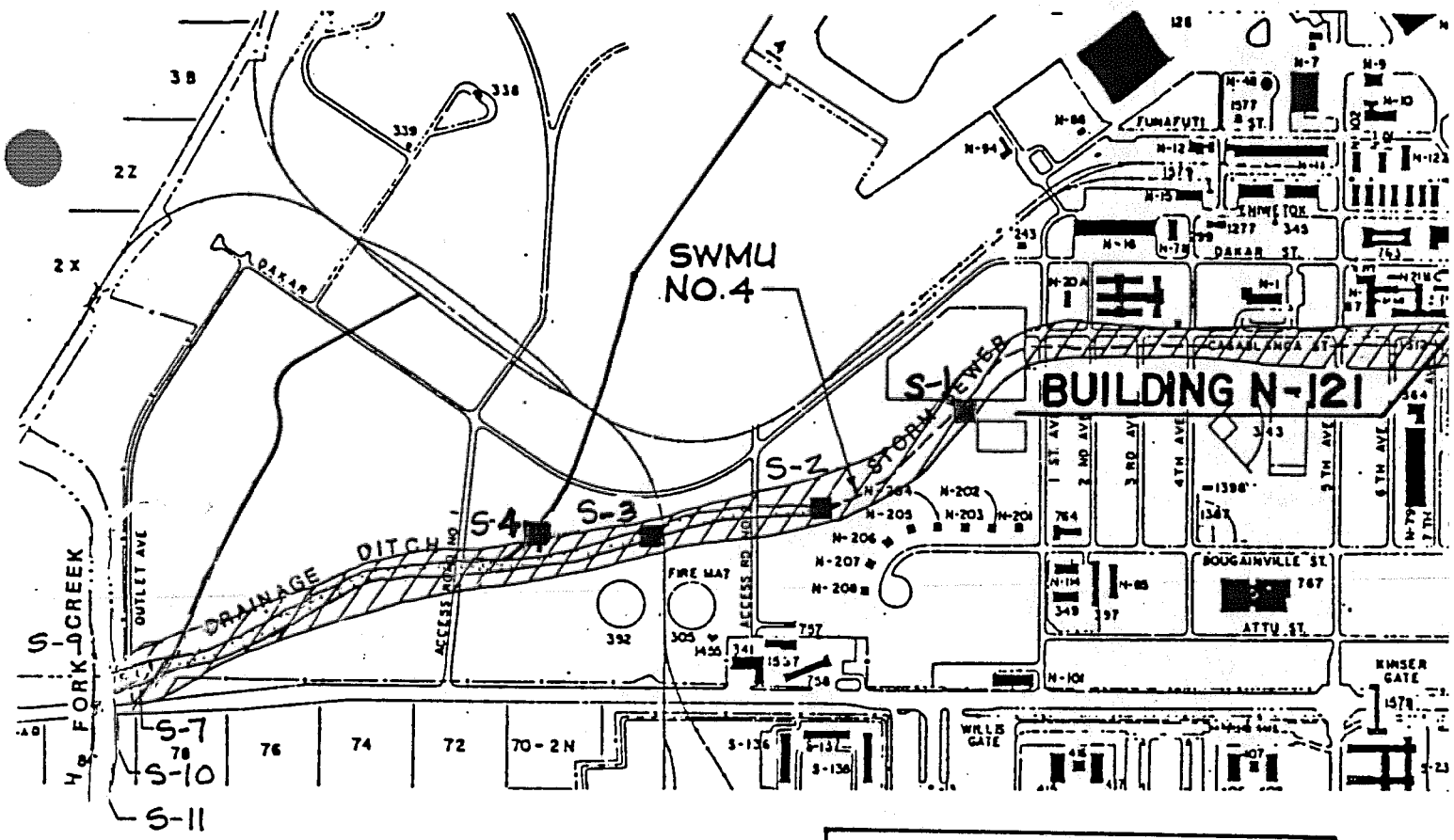
Refer to Section 5.7 in the QAPP for decontamination procedures.

3.4.15 Personal Protection

Level D protection is expected to be sufficient while investigating SWMU No. 4. The sampling team leader will be responsible for upgrading the personal protection level and for adhering to that levels protection requirements. The detailed protection levels are outlined in the Health and Safety Plan.

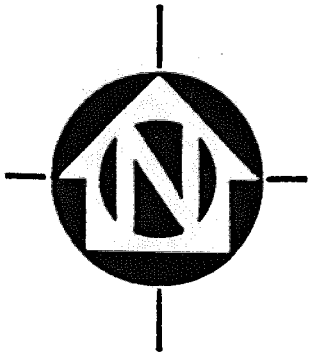
3.4.16 Quality Assurance

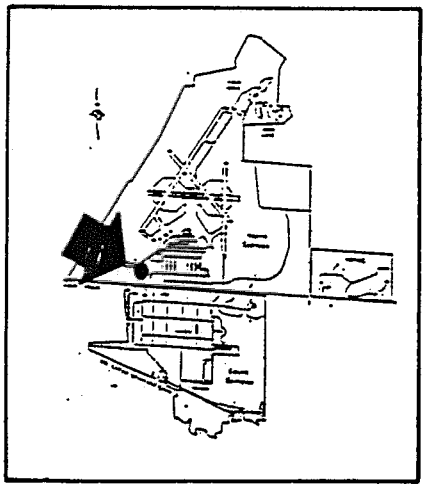
Refer to Section 3.1.16.



LEGEND

- ● WELLS
- ▲ BORINGS
- ■ SURFACE WATER / SEDIMENT
- ⊙ GAS
- ◬ SOIL BORING/MONITORING WELL





SWMU NO. 4
FIGURE 3-4

N-121 PLATING SHOP DITCH
SAMPLING LOCATIONS

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3.5 SWMU NO. 5 - FIRE FIGHTING TRAINING AREA

3.5.1 Site Background

The Fire Fighting Training Area (SWMU No. 5) is located in Southwest corner of the North Complex adjacent to Navy Road. The area is used to train firemen in rescue techniques. The procedure which began at this site in 1949 consisted of extinguishing a fire set at one of two places: a rectangular un-bermed concrete lined pit or a double lipped circular concrete pit; the pits are 2 feet x 8 feet x 1 foot and 75 feet in diameter, respectively. Training at the area was conducted in two ways: (1) the rectangular pits were filled with JP-4 fuel, ignited and extinguished with hand held fire extinguishers; and (2) located inside one of the circular pits, aircraft fuselage was sprayed with JP-4 fuel, ignited and extinguished with mobile fire fighting units. The circular concrete pit and corresponding training methods are currently in use. Prior to 1977 overflows occurred in the rectangular pits; however, since 1977 the fuel was allowed to burn itself out thereby preventing overflow discharge. Also occurring in 1977 was the installation of an oil/water separator and corrections to the sanitary sewer system to prevent the training center's discharge from flowing into the storm sewer system. Most recently, in September of 1980, approximately 50 gallons of oil were spilled due to a malfunctioning drain line. Figure 3-5 displays the SWMU No. 5 site.

3.5.2 Sampling Objectives

It is likely that a waste fuel/solvent mixture, possibly containing one or more of petroleum naphtha, xylene, methyl ethyl ketone, toluene and benzene, was utilized at SWMU No. 5. Initial soil and sediment sampling will be done in the areas around SWMU No. 5 from where release was likely to have occurred to determine the extent of contamination. Figure 3-5 depicts the various sampling locations. Table 3-7 is a summary of analyses to be performed.

TABLE 3-7. SWMU NO. 5 -- SUMMARY OF ANALYSES, PHASE I

Sample Type (No. of Samples)	BTEX (SW-8020)	VOCs (SW-8240)	SVOCs (SW-8250)	CYANIDE (SW-9012)	PHENOLS (SW-8040)	PCBs/OC-PEST (SW-8080)	METALS (SW-6010	TCL	EP TOX (TCLP) Metals
Ground Water	0	0	0	0	0	0	0	0	0
Surface Water	0	0	0	0	0	0	0	0	0
Sediment	3	0	0	0	0	3	3	1	4
Soil, Surface	8	0	0	0	0	8	8	1	9
Soil, Subsurface	17	0	0	0	0	17	17	1	18
Wipe	0	0	0	0	0	0	0	0	0
Field Duplicate	2	0	0	0	0	2	2	2	4
Field Blank	2	0	0	0	0	2	2	2	2
Rinsate	2	0	0	0	0	2	2	0	2
Trip Blank	1	0	NA	NA	NA	NA	NA	NA	NA

3.5.3 Groundwater Sampling

No groundwater samples will be collected at SWMU No. 5.

3.5.4 Surface Water Sampling

No surface water samples will be collected at SWMU No. 5.

3.5.5 Sediment Sampling

Four grab sediment samples shall be collected from the drainage ditch that runs away from SWMU No. 5 to the north.

3.5.6 Soil Sampling

Nine soil cores will be drilled at SWMU No. 5 using a continuous sampling device to a depth of 10 feet. Two subsurface soil grab samples will be collected from each soil core at a depth determined by the on-site geologist. Four surface soil samples shall be collected at SWMU No. 5 from areas of suspected contamination or from depressed areas as determined by the on-site geologist.

3.5.7 Wipe Sampling

No wipe samples will be collected at SWMU No. 5.

3.5.8 Subsurface Gas Monitoring

The presence of subsurface gas will not be monitored at SWMU No. 5.

3.5.9 Air Monitoring

Air monitoring shall be conducted at SWMU No. 5 in accordance with the procedures outlined in the Health and Safety Plan.

3.5.10 Sample Custody

Refer to Section 6.0 of the QAPP for chain-of-custody procedures.

3.5.11 In-Situ/Laboratory Measurements

Field work conducted by the on-site geologist shall generate data

that may be used directly or indirectly to best describe the following parameters as recommended by the site manager:

- hydraulic conductivity (saturated and unsaturated) and porosity (total and effective);
- lithology and sorting;
- an interpretation of hydraulic interconnections between saturated zones;
- the attenuation capacity and mechanisms of the natural earth materials;
- zones of fracturing or channeling in consolidated or unconsolidated deposits;
- zones of higher or lower permeability that might direct or restrict the flow of contaminants;
- the uppermost aquifer;
- water-bearing zones above the first confining layer;
- description of water level/fluid pressure;
- water level contour;
- hydraulic cross sections showing vertical gradients;
- the flow system;
- surface soil distribution;
- soil profile;
- relative permeability;
- soil pH;
- particle size distribution;
- moisture content;
- infiltration; and
- storage capacity.

Laboratory analyses of all SWMU No. 5 samples shall include following:

- BTEX (SW-8020);
- Total Metals (SW-6010);
- EP Toxic (TCLP) Metals;

- RCRA Appendix VIII contaminants, and
- PCBs (SW-8080).

Tables 3-2 and 3-7 summarize the specific analytes and number of analyses for SWMU No. 5 samples, respectively.

3.5.12 Sample Designation

Sampling locations at each SWMU site will be marked with stakes and surveyed to determine the coordinate and elevation where possible. Once the stake is marked and in place, the area will be photographed. The stake shall be marked with the following information:

NASM;
Sample Code; and
Station Number (XXOO).

The sample codes to be used at SWMU No. 5 are SD, SU and SS for surface water sediment, surface soil and subsurface soil samples, respectively.

Samples collected from each location, other than those collected for on-site field measurements or analyses, shall be identified by using a standard label which is attached to the sample container. The sample labels are sequentially numbered and are accountable. The following information shall be included on the sample label:

1. Site name;
2. SWMU Sample Identification Number;
3. Date and time of sample collection;
4. Designation of the sample (i.e. grab or composite);
5. Type of sample with brief description of sampling location (depth);
6. Signature of sampler;

7. Sample preservative used; and
8. General types of analyses to be conducted.

The SWMU No. 5 sample identification number will be of the form:

NASM - SWMU 5 - SAMPLE CODE AND LOCATION # - DEPTH - ORIGINAL (O) OR DUPLICATE (D)

For example, a sample number such as NASM-05-SS1-04-D would identify a duplicate NAS Memphis SWMU No. 5 subsurface soil sample taken at location 1 at a depth of four feet.

3.5.13 Special Sampling Equipment

Teflon implements shall be used to collect all samples being analyzed for metals.

3.5.14 Special Instructions

The Fire Fighting Drill Area is an active training location for new personnel. Special coordination between NAS Memphis and the contracting consultant with respect to sampling schedules shall be required.

Boreholes shall be grouted with material at least an order of magnitude less permeable that the surrounding soil/rock/sediment.

Spoils generated from the development of boreholes shall be drummed by the subcontractor and disposed of by the NAS EIC.

Refer to Section 5.7 of the QAPP for decontamination procedures.

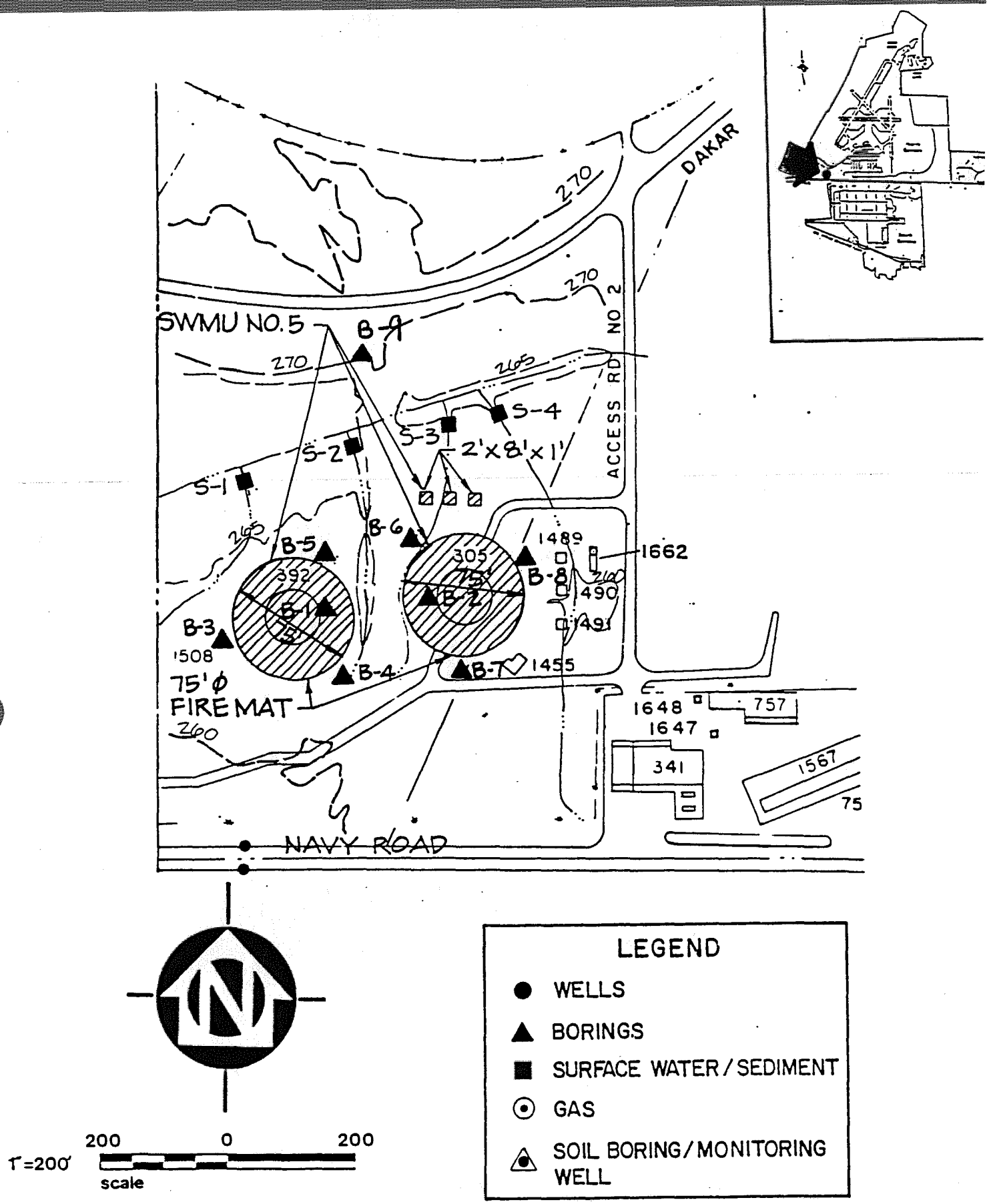
3.5.15 Personal Protection

Level D protection is expected to be sufficient while investigating SWMU No. 5. The sampling team leader will be responsible for upgrading the personal protection level and for adhering to that levels protection requirements. The detailed

protection levels are outlined in the Health and Safety Plan.

3.5.16 Quality Assurance

Refer to Section 3.1.16.



SWMU NO. 5
FIGURE 3-5

FIRE FIGHTING TRAINING AREA
SAMPLING LOCATIONS

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3.6 SWMU NO. 6 - BUILDING N-126 BATTERY SHOP STORM SEWER AND DITCH

3.6.1 Site Background

The N-126 Battery Shop Storm Sewer and Ditch (SWMU No. 6) is located on the North Complex. The shop operated from 1955 until 1981 during which time electrolyte spills and drippings were discharged into floor drains located in Building N-126. These floor drains connected to 3 inch and 4 inch acid resistant pipes which emptied into a storm sewer. Approximately 100 gallons per day of a mixture of diluted and neutralized acid was discharged into the storm sewer. The storm sewer discharged into a drainage ditch. Figure 3-6 depicts the SWMU No. 6 site.

3.6.2 Sampling Objectives

According to the Department of Navy Information, the spent electrolyte from batteries manufactured at the Battery Shop that possibly discharged into the storm sewer and ditch likely contained lead, cadmium, zinc, and sulfuric acid. Therefore, sediment samples will be collected from the site to determine the extent of contamination. Phase II sampling, soil and groundwater, may be required should the sediments prove to contain significant concentrations of contaminants. Figure 3-6 depicts the sediment sampling locations. Table 3-8 is a summary of analyses to be performed.

3.6.3 Groundwater Sampling

No groundwater samples shall be collected at SWMU No. 6.

3.6.4 Surface Water Sampling

No surface water samples shall be collected at SWMU No. 6.

3.6.5 Sediment Sampling

Three sediment grab samples shall be collected from the streambed at SWMU No. 6.

TABLE 3-8. SWMU NO. 6 -- SUMMARY OF ANALYSES, PHASE I

Sample Type (No. of Samples)	BTEX (SW-8020)	VOCs (SW-8240)	SVOCs (SW-8250)	CYANIDE (SW-9012)	PHENOLS (SW-8040)	PCBs/OC-PEST (SW-8080)	METALS (SW-6010	TCL	EP TOX (TCLP) Metals
Ground Water	0	0	0	0	0	0	0	0	0
Surface Water	0	0	0	0	0	0	0	0	0
Sediment	2	0	0	2	2	2	2	1	2
Soil, Surface	0	0	0	0	0	0	0	0	0
Soil, Subsurface	0	0	0	0	0	0	0	0	0
Wipe	0	0	0	0	0	0	0	0	0
Field Duplicate	1	0	0	1	1	1	1	1	1
Field Blank	1	0	0	1	1	1	1	1	1
Rinsate	1	0	0	1	1	1	1	0	1
Trip Blank	1	0	NA	NA	NA	NA	NA	NA	NA

3.6.6 Soil Sampling

No soil samples shall be collected at SWMU No. 6.

3.6.7 Wipe Sampling

No wipe samples shall be collected at SWMU No. 6.

3.6.8 Subsurface Gas Monitoring

The presence of subsurface gas at SWMU No. 6 will not be monitored.

3.6.9 Air Monitoring

Air monitoring shall be conducted at SWMU No. 6 in accordance with the procedures outlined in the Health and Safety Plan.

3.6.10 Sample Custody

Refer to Section 6.0 of the QAPP for chain-of-custody procedures.

3.6.11 Sample Designation

Sampling locations at each SWMU site will be marked with stakes and surveyed to determine the coordinate and elevation where possible. Once the stake is marked and in place, the area will be photographed. The stake shall be marked with the following information:

NASM;
Sample Code; and
Station Number (XXOO).

The sample codes to be used at SWMU No. 6 is SD for surface water sediment samples.

Samples collected from each location, other than those collected for on-site field measurements or analyses, shall be identified by using a standard label which is attached to the sample container. The sample labels are sequentially numbered and are

accountable. The following information shall be included on the sample label:

1. Site name;
2. SWMU Sample Identification Number;
3. Date and time of sample collection;
4. Designation of the sample (i.e. grab or composite);
5. Type of sample with brief description of sampling location (depth);
6. Signature of sampler;
7. Sample preservative used; and
8. General types of analyses to be conducted.

The SWMU No. 6 sample identification number will be of the form:

NASM - SWMU 6 - SAMPLE CODE AND LOCATION # - DEPTH - ORIGINAL (O) OR DUPLICATE (D)

For example, a sample number such as NASM-06-SS1-04-D would identify a duplicate NAS Memphis SWMU No. 6 subsurface soil sample taken at location 1 at a depth of four feet.

3.6.12 <u>In-Situ/Laboratory Measurements</u>

Since the discharge from the Building N-126 Battery Shop to the drainage ditch may have been only one of several contaminated discharges to the ditch, it is prudent to analyze the sediment samples for a more comprehensive list of contaminants that the list of potential contaminants associated with Building N-126 Battery Shop alone. Each of the samples collected at SWMU No. 6 will be analyzed using the following analytical methods:

- BTEX (SW-8020);
- Cyanide (SW-9012);
- Phenols (SW-8040);

- PCBs (SW-8080);
- Total Metals (SW-6010);
- EP Toxic (TCLP) Metals, and
- RCRA Appendix VIII contaminants

Tables 3-2 and 3-8 summarize the specific analytes and number of analyses for the SWMU No. 6 samples, respectively.

3.6.13 Special Sampling Equipment

Teflon implements shall be used to collect all sediment samples.

3.6.14 Special Instructions

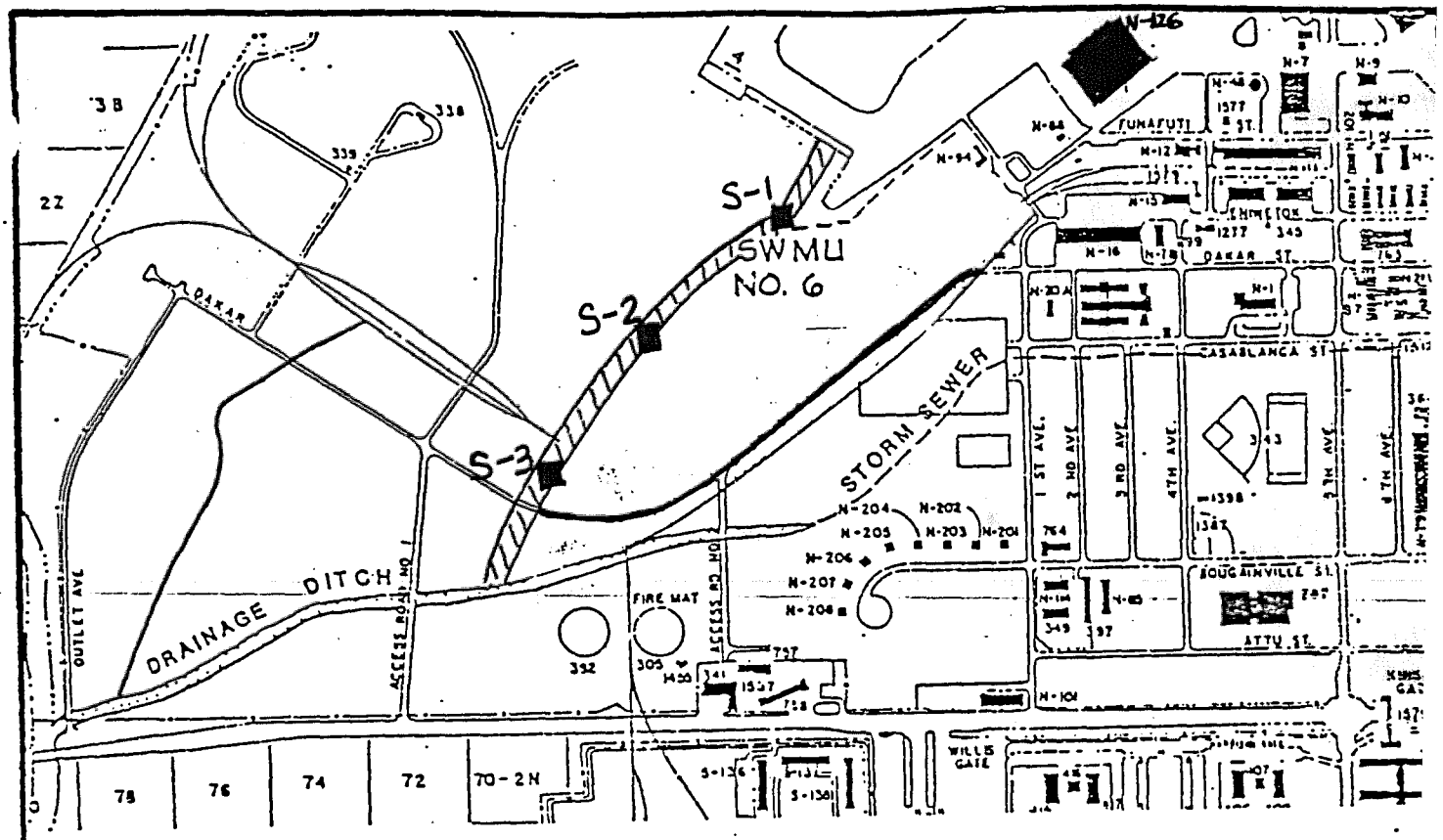
Equipment decontamination will be maintained between sample collections. Refer to Section 5.7 of the QAPP for decontamination procedures. If significant sediment contamination is found, subsequent sampling phases may be required.

3.6.15 Personal Protection

Level D protection is expected to be sufficient while investigating SWMU No. 6. The sampling team leader will be responsible for upgrading the personal protection level and for adhering to that levels protection requirements. The detailed protection levels are outlined in the Health and Safety Plan.

3.6.16 Quality Assurance

Refer to Section 3.1.16.



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SWMU NO. 6

FIGURE 3-6

N-126 BATTERY SHOP STORM SEWER AND DITCH SAMPLING LOCATIONS

3.7 SWMU NO. 7 - BUILDING N-126 PLATING SHOP DRY WELL

3.7.1 Site Background

Building N-126 (SWMU No. 7) is located in the North Complex with a dry well located adjacent to the building on the southeast side. The building housed the plating operations of the Aircraft Intermediate Maintenance Department. The plating shop operated from 1955 until 1978 and produced waste containing concentrated nickel, cadmium and chromium cyanide-based plating solutions, as well as rinse water from the operation. The plating wastes were discharged into the gravel-filled well (10 feet x 10 feet x 6 feet) and allowed to percolate into the soil surrounding the dry well. Soil samples collected from the dry well indicated the presence of nickel at 32 ppm, cadmium at 1240 ppm and chromium at 223 ppm. Soil samples taken during the confirmation study showed the permeability of clay at a depth of 50 feet below the dry well to be 5.9×10^{-6} to 5.3×10^{-7} cm/sec. Figure 3-7 depicts the SWMU No. 7 site.

3.7.2 Sampling Objectives

Constituents that were potentially released from SWMU No. 7 include nickel, cadmium, chromium, and cyanide. Initially, soil and groundwater samples will be taken at three locations fashioned triangularly around the Plating Shop Dry Well to determine the extent of contamination. Figure 3-7 depicts the various sampling locations. Table 3-9 is a summary of analyses to be performed.

3.7.3 Groundwater Sampling

Single grab groundwater samples shall be collected from each of three 60 foot monitoring wells.

3.7.4 Surface Water Sampling

Surface water samples will not be collected at SWMU No. 7.

TABLE 3-9. SWMU NO. 7 -- SUMMARY OF ANALYSES, PHASE I

Sample Type (No. of Samples)	BTEX (SW-8020)	VOCs (SW-8240)	SVOCs (SW-8250)	CYANIDE (SW-9012)	PHENOLS (SW-8040)	PCBs/OC-PEST (SW-8080)	METALS (SW-6010	TCL	EP TOX (TCLP) Metals
Ground Water	0	0	0	0	0	0	2	1	0
Surface Water	0	0	0	0	0	0	0	0	0
Sediment	0	0	0	0	0	0	0	0	0
Soil, Surface	0	0	0	0	0	0	3	1	4
Soil, Subsurface	0	0	0	0	0	0	7	1	8
Wipe	0	0	0	0	0	0	0	0	0
Field Duplicate	0	0	0	0	0	0	2	2	3
Field Blank	0	0	0	0	0	0	2	2	2
Rinsate	0	0	0	0	0	0	2	0	2
Trip Blank	0	0	NA	NA	NA	NA	NA	NA	NA

3.7.5 Sediment Sampling

Sediment samples will not be collected at SWMU No. 7.

3.7.6 Soil Sampling

Two subsurface soil grab samples will be collected from each of three 60 foot soil borings that will surround SWMU No. 7 in a triangular fashion and from a 20 foot boring drilled from the center of the dry well after the stone is exhumed. All subsurface samples will be collected from depths determined in the field by the on-site geologist. Four grab surface soil samples will also be collected at SWMU No. 7 from locations of suspected contamination or areas of depression as determined by the on-site geologist.

3.7.7 Wipe Sampling

Wipe samples will not be collected at SWMU No. 7.

3.7.8 Subsurface Gas Monitoring

The presence of subsurface gas at SWMU No. 7 will not be monitored.

3.7.9 Air Monitoring

Air monitoring shall be conducted at SWMU No. 7 in accordance with the procedures outlined in the Health and Safety Plan.

3.7.10 Sample Custody

Refer to Section 6.0 of the QAPP for chain-of-custody procedures.

3.7.11 Sample Designation

Sampling locations at each SWMU site will be marked with stakes or paint and surveyed to determine the coordinate and elevation where possible. Once sampling location is marked, the area will be photographed. The marker shall be labeled with the following information:

NASM;
Sample Code; and
Station Number (XXOO).

Sample codes to be used at SWMU No. 7 shall include SU, SS, and GW for surface soil, subsurface soil, and groundwater, respectively.

Samples collected from each location, other than those collected for on-site field measurements or analyses, shall be identified by using a standard label which is attached to the sample container. The sample labels are sequentially numbered and are accountable. The following information shall be included on the sample label:

1. Site name;
2. SWMU Sample Identification Number;
3. Date and time of sample collection;
4. Designation of the sample (i.e. grab or composite);
5. Type of sample with brief description of sampling location (depth);
6. Signature of sampler;
7. Sample preservative used; and
8. General types of analyses to be conducted.

The SWMU No. 7 sample identification number will be of the form:

NASM - SWMU 7 - SAMPLE CODE AND LOCATION # - DEPTH - ORIGINAL (O) OR DUPLICATE (D)

For example, a sample number such as NASM-07-SS1-04-D would identify a duplicate NAS Memphis SWMU No. 7 subsurface soil sample taken at location 1 at a depth of four feet.

3.7.12 <u>In-situ/Laboratory Measurements</u>

In-situ groundwater measurements shall be taken for pH, temperature, specific conductance, and turbidity.

Field work conducted by the on-site geologist shall generate data that may be used directly or indirectly to best describe the following parameters as recommended by the site manager:

- hydraulic conductivity (saturated and unsaturated) and porosity (total and effective);
- lithology and sorting;
- an interpretation of hydraulic interconnections between saturated zones;
- the attenuation capacity and mechanisms of the natural earth materials;
- zones of fracturing or channeling in consolidated or unconsolidated deposits;
- zones of higher or lower permeability that might direct or restrict the flow of contaminants;
- the uppermost aquifer;
- water-bearing zones above the first confining layer;
- description of water level/fluid pressure;
- water level contour;
- hydrologic cross sections showing vertical gradients;
- the flow system;
- surface soil distribution;
- soil profile;
- relative permeability;
- soil pH;
- particle size distribution;
- moisture content;
- infiltration; and
- storage capacity.

Laboratory methods used for the analysis of SWMU No. 7 samples

are as follows:

- Total Metals (SW-6010);
- EP Toxic (TCLP) Metals, and
- RCRA Appendix VIII contaminants.

3.7.13 Special Sampling Equipment

Teflon implements shall be used to collect all samples which will be analyzed for metals.

3.7.14 Special Instructions

Refer to Section 5.7 of the QAPP for decontamination procedures.

A complete "Southern Division Naval Facilities Engineering Command Groundwater Monitoring Well Installation Report" and "Well Construction Details Form" will be submitted for each well installation. Refer to Section 5.2 of the QAPP for a description of the forms.

A permanent well designation sign will be attached to each well's protective casing. The sign shall be 18 inch by 6 inch by 1/8 inch thick sheet of aluminum plate, bolted to 1/4 inch studs welded to the casing. The sign shall be stamped with the following 4-inch letters and numbers:

MPH - Site # - Well #.

The existing monitoring wells shall be inspected by the on-site geologist to insure that all requirements are met and that the wells are in working order. Refer to Sections 5.2 and 5.3 of the QAPP for groundwater well installation and sampling requirements.

Boreholes shall be sealed with grout materials at least an order of magnitude less permeable that the surrounding soil/rock/sediment.

Spoils generated from the development of boreholes and monitoring wells shall be drummed by the Contractor and disposed of under the direction of the NAS EIC.

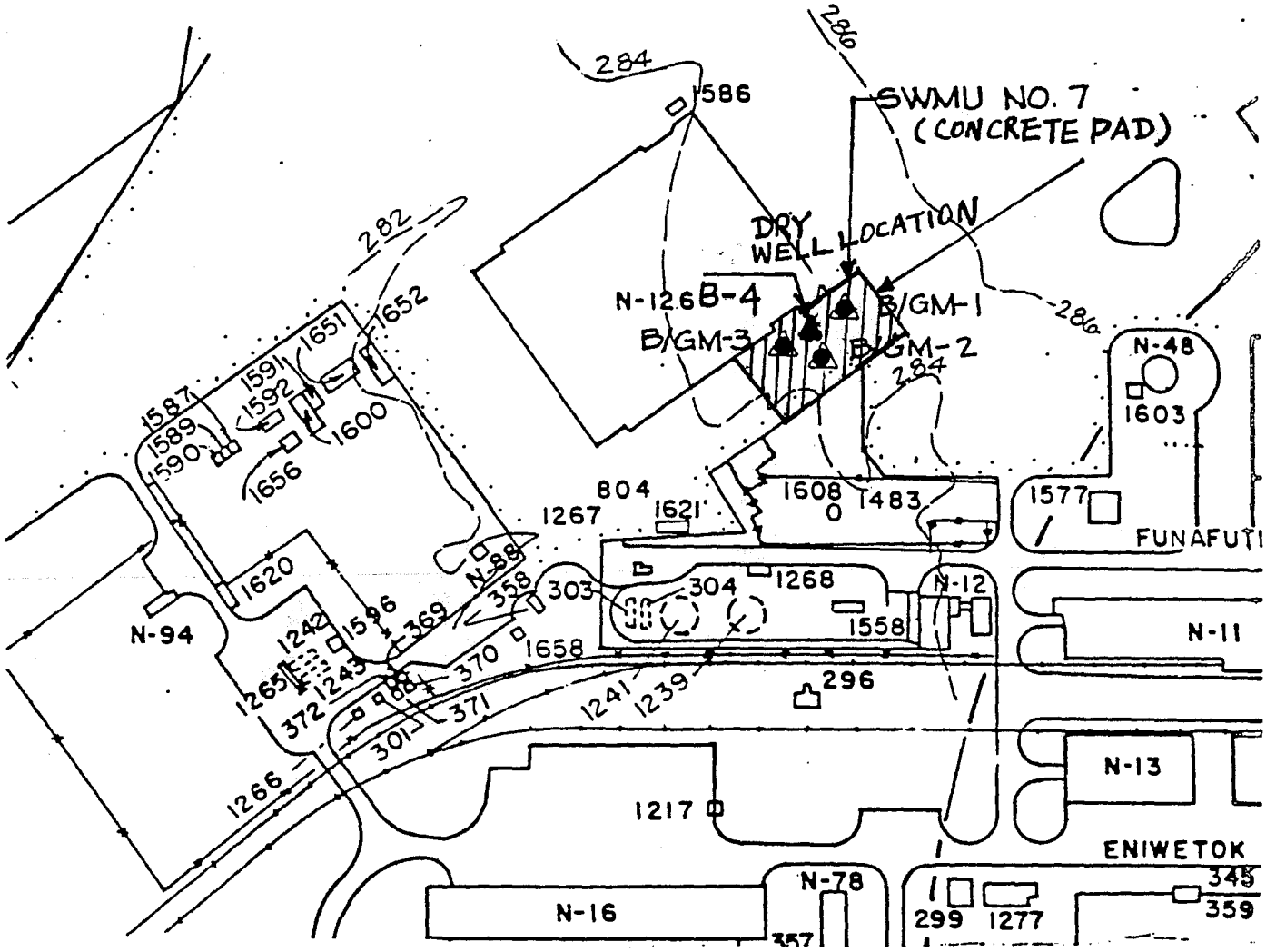
Monitoring wells will be finished flush with the ground surface since SMWU No. 7 is located in a vehicle and aircraft access area.

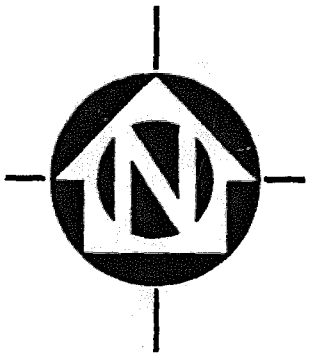
3.7.15 Personal Protection

Level D protection is expected to be sufficient while investigating SWMU No. 7. The sampling team leader will be responsible for upgrading the personal protection level and for adhering to that levels protection requirements. The detailed protection levels are outlined in the Health and Safety Plan.

3.7.16 Quality Assurance

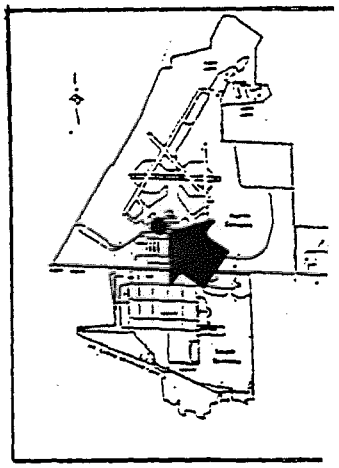
Refer to Section 3.1.16.





LEGEND

- ● WELLS
- ▲ BORINGS
- ■ SURFACE WATER / SEDIMENT
- ⊙ GAS
- SOIL BORING / MONITORING WELL



1"=200'

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scale

SWMU NO. 7
FIGURE 3-7

N-126 PLATING SHOP DRY WELL SAMPLING LOCATIONS

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3.8 SWMU NO. 8 - CEMETERY DISPOSAL AREA

3.8.1 Site Background

The Cemetery Disposal Area (SWMU No. 8) is a five to eight acre landfill area which was used for solid and hazardous waste disposal by the NAS in Memphis from 1965 to 1980. The site is located on the North Complex adjacent to runway 22-4 as depicted in Figure 3-8. Reports indicate the disposal of wastes to a depth of eight feet below the original ground line. No liner, leachate collection or gas collection system is in place at the site. Previous subsurface investigations suggest an upper, pliable clay layer, twelve to seventeen feet in depth. A perched water table is also indicated at a depth of approximately ten feet. Flow appears to be in an easterly direction.

3.8.2 Sampling Objectives

The Cemetery Disposal Area was originally intended as a hazardous waste burial area; however, only three 25-pound canisters of ethylene oxide were reported as being disposed of there. However, also reported as being contained in the fill are metallic scraps, waste chemicals, waste oil, cleaning solution, transformers and capacitors. The previously determined degradation of groundwater quality in one well, a chromium concentration of 0.077 ppm, along with the documented disposal of hazardous waste material within the Cemetery Disposal Area warrant the classification of the site as a suspected SWMU and subsequent environmental sampling to determine the extent of contamination. Figure 3-8 depicts the various sampling locations. Table 3-10 is a summary of analyses to be performed.

3.8.3 Groundwater Sampling

Single grab groundwater samples shall be collected from three existing monitoring wells (GM10, GM11 and GM12). Samples from GM10 will serve for background data.

TABLE 3-10. SWMU NO. 8 -- SUMMARY OF ANALYSES, PHASE I

Sample Type (No. of Samples)	BTEX (SW-8020)	VOCs (SW-8240)	SVOCs (SW-8250)	CYANIDE (SW-9012)	PHENOLS (SW-8040)	PCBs/OC-PEST (SW-8080)	METALS (SW-6010	TCL	EP TOX (TCLP) Metals
Ground Water	0	2	2	2	2	0	2	1	0
Surface Water	0	0	0	0	0	0	0	0	0
Sediment	0	0	0	0	0	0	0	0	0
Soil, Surface	0	0	2	2	2	2	2	1	3
Soil, Subsurface	0	5	5	5	5	5	5	1	6
Wipe	0	0	0	0	0	0	0	0	0
Field Duplicate	0	2	3	3	3	3	3	3	3
Field Blank	0	2	3	2	3	2	3	3	2
Rinsate	0	2	2	2	2	2	2	0	2
Trip Blank	0	2	NA	NA	NA	NA	NA	NA	NA

3.8.4 Surface Water Sampling

No surface water samples will be collected at SWMU No. 8.

3.8.5 Sediment Sampling

No sediment samples will collected at SWMU No. 8.

3.8.6 Soil Sampling

Soil borings will be drilled at three locations a minimum of 10 feet outside the cemetery boundary and will be stopped if fill material is encountered. The depth of the boring shall be finalized in the field by the on-site geologist, but will be at least 20 feet deep. Two subsurface soil grab samples will be taken from each boring at a depth specified by the on-site geologist. Three grab surface soil samples will also be collected at SWMU No. 8 from locations of suspected contamination of from areas of depression as determined by the on-site geologist.

3.8.7 Wipe Sampling

No wipe samples will be collected at SWMU No. 8.

3.8.8 Subsurface Gas Monitoring

The presence of subsurface gas at SWMU No. 8 shall be monitored at eight locations.

3.8.9 Air Monitoring

Air monitoring shall be conducted at SWMU No. 8 in accordance with the procedures outlined in the Health and Safety Plan.

3.8.10 Sample Custody

Refer to Section 6.0 of the QAPP for chain-of-custody procedures.

3.8.11 Sample Designation

Sampling locations at each SWMU site will be marked with stakes and surveyed to determine the coordinate and elevation where

possible. Once the stake is marked and in place, the area will be photographed. The stake shall be marked with the following information:

NASM;
Sample Code; and
Station Number (XXOO).

Sample codes used at SWMU No. 8 shall include SW, SU, SS, and GW for surface water, surface soil, subsurface soil and groundwater samples, respectively.

Samples collected from each location, other than those collected for on-site field measurements or analyses, shall be identified by using a standard label which is attached to the sample container. The sample labels are sequentially numbered and are accountable. The following information shall be included on the sample label:

1. Site name;
2. SWMU Sample Identification Number;
3. Date and time of sample collection;
4. Designation of the sample (i.e. grab or composite);
5. Type of sample with brief description of sampling location (depth);
6. Signature of sampler;
7. Sample preservative used; and
8. General types of analyses to be conducted.

The SWMU No. 8 sample identification number will be of the form:

NASM - SWMU 8 - SAMPLE CODE AND LOCATION # - DEPTH - ORIGINAL (O) OR DUPLICATE (D)

For example, a sample number such as NASM-08-SS1-04-D would

identify a duplicate NAS Memphis SWMU No. 8 subsurface soil sample taken at location 1 at a depth of four feet.

3.8.12 In-Situ/Laboratory Measurements

In-situ measurements taken at SWMU No. 8 shall include pH, temperature, specific conductance, and turbidity with respect to the site's surface water and groundwater. Subsurface gas (methane) will also be measured.

Field work conducted by the on-site geologist shall generate data that may be used directly or indirectly to best describe the following parameters as recommended by the site manager:

- hydraulic conductivity (saturated and unsaturated) and porosity (total and effective);
- lithology and sorting;
- an interpretation of hydraulic interconnections between saturated zones;
- the attenuation capacity and mechanisms of the natural earth materials;
- zones of fracturing or channeling in consolidated or unconsolidated deposits;
- zones of higher or lower permeability that might direct or restrict the flow of contaminants;
- the uppermost aquifer;
- water-bearing zones above the first confining layer;
- description of water level/fluid pressure;
- water level contour;
- hydrologic cross sections showing vertical gradients;
- the flow system;
- surface soil distribution;
- soil profile;
- relative permeability;
- soil pH;
- particle size distribution;

- moisture content;
- infiltration; and
- storage capacity.

SWMU No. 8 field samples shall be analyzed by the following analytical methods:

- Volatile Organics (SW-8240),
- Semi-volatile Organics (SW-8250),
- Cyanide (SW-9012),
- Phenols (SW-8040),
- PCBs (SW-8080),
- RCRA Appendix VIII contaminants,
- EP Toxic (TCLP) Metals, and
- Total Metals (SW-6010).

Tables 3-2 and 3-10 summarize the specific analytes and number of analyses, respectively, for SWMU No. 8 samples.

3.8.13 Special Sampling Equipment

Teflon implements shall be used to collect all samples being analyzed for metals.

An explosimeter shall be used to monitor subsurface methane gas. Prior to testing, a one-quarter to one half-inch diameter pipe shall be hand-driven to an approximate depth of three feet below the ground surface. After allowing time for any gas to replace the air in the pipe, approximately one hour, the probe shall be inserted into the pipe to measure methane gas concentration.

3.8.14 Special Instructions

No monitoring of gas, groundwater, or soil shall be performed within the Cemetery Disposal Area boundary.

Refer to Section 5.7 of the QAPP for decontamination procedures.

A complete "Southern Division Naval Facilities Engineering Command Groundwater Monitoring Well installation Report" and "Well Construction Details Form" will be submitted for each well installation. Refer to Section 5.2 of the QAPP for a description of the forms.

A permanent well designation sign will be attached to each well's protective casing. The sign shall be 18 inch by 6 inch by 1/8 inch thick sheet of aluminum plate, bolted to 1/4 inch studs welded to the casing. The sign shall be stamped with the following 4 inch letters and numbers:

MPH - Site # - Well #.

The existing monitoring wells shall be inspected by the on-site geologist to insure that all requirements are met and that the wells are in working order. Refer to Sections 5.2 and 5.3 of the QAPP for groundwater well installation and sampling requirements.

Boreholes shall be sealed with grout materials at least an order of magnitude less permeable that the surrounding soil/rock/sediment.

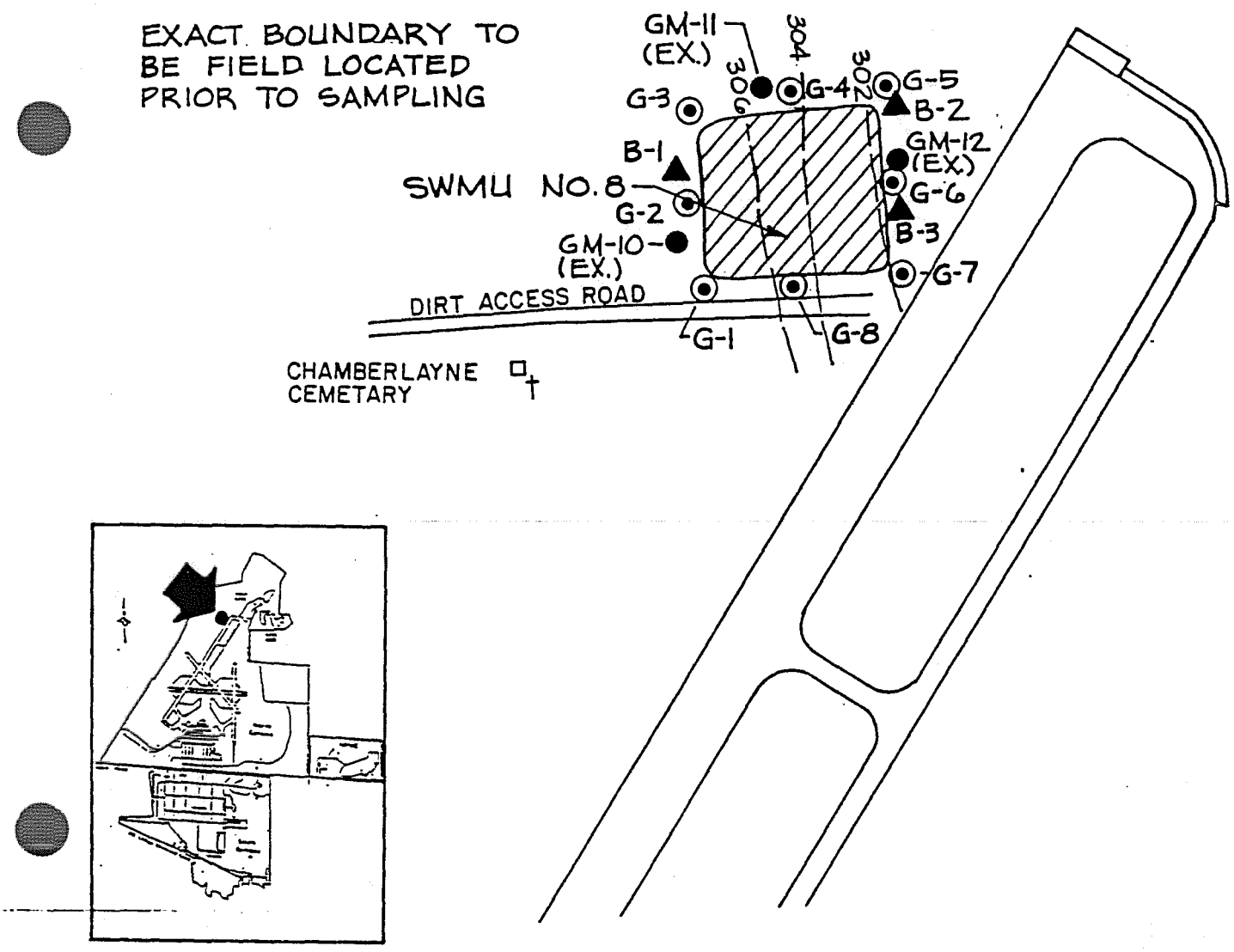
Spoils generated from the development of boreholes and monitoring wells shall be drummed by the subcontractor and disposed of under the direction of the NAS EIC.

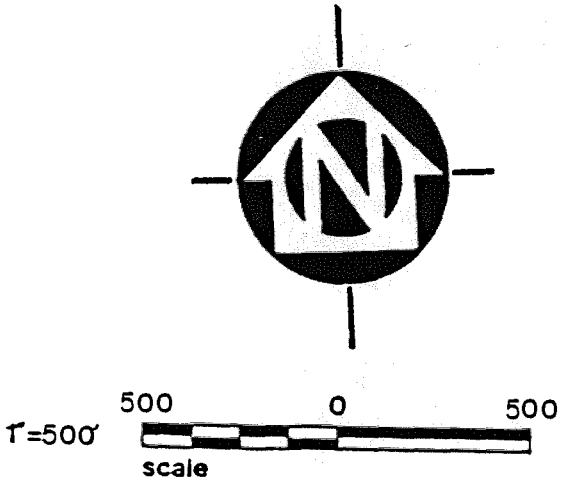
3.8.15 Personal Protection

Level D protection is expected to be sufficient while investigating SWMU No. 8. The sampling team leader will be responsible for upgrading the personal protection level and for adhering to that levels protection requirements. The detailed protection levels are outlined in the Health and Safety Plan.

3.8.16 Quality Assurance

Refer to Section 3.1.16.





LEGEND

- ● WELLS
- ▲ BORINGS
- ■ SURFACE WATER/SEDIMENT
- ⊙ GAS
- SOIL BORING/MONITORING WELL

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SWMU NO. 8 CEMETERY LANDFILL
FIGURE 3-8 SAMPLING LOCATIONS

3.9 SWMU NO. 9 - SEWAGE LAGOONS

3.9.1 Site Background

The inactive sewage lagoons (SWMU No. 9) are located on the South Complex, south of the Big Creek Drainage Canal (see Figure 3-9). From 1969 to 1978 the two lagoons were used as part of the wastewater treatment system for the NAS Memphis. The wastewater treatment facility treated mostly sanitary waste; however, limited amounts of industrial waste were also treated. Sludges from the wastewater treatment plant were pumped to the lagoons for further treatment. The larger lagoon is approximately 625 feet square with an approximate area of 400,000 square feet; and the smaller lagoon is approximately 250 feet x 560 feet for a total area of 141,000 square feet.

3.9.2 Sampling Objectives

Treatment residues from domestic sewage treatment process possibly contaminated the soil and groundwater environment of SWMU No. 9 from 1969 to 1978. The toxicological, physical and chemical characteristics of the contaminants are unknown, however sampling plans will be initiated to determine these contaminants and their effects on the area's soils and groundwater. Figure 3-9 depicts the various sampling locations. Table 3-11 is a summary of analyses to be performed.

3.9.3 Groundwater Sampling

Single grab groundwater samples shall be collected from three monitoring wells drilled to a depth of 60 feet. Samples collected from GM-1 will serve for background data.

3.9.4 Surface Water Sampling

No surface water samples will be collected at SWMU No. 9.

3.9.5 Sediment Sampling

One sediment sample will be collected from the lagoons' original discharge point. Two sediment samples shall be collected from

TABLE 3-11. SWMU NO. 9 -- SUMMARY OF ANALYSES, PHASE I

Sample Type (No. of Samples)	BTEX (SW-8020)	VOCs (SW-8240)	SVOCs (SW-8250)	CYANIDE (SW-9012)	PHENOLS (SW-8040)	PCBs/OC-PEST (SW-8080)	METALS (SW-6010	TCL	EP TOX (TCLP) Metals
Ground Water	0	0	2	0	2	0	2	2	0
Surface Water	0	0	0	0	0	0	0	0	0
Sediment	0	0	0	2	2	2	2	1	3
Soil, Surface	0	0	0	0	0	0	0	0	0
Soil, Subsurface	0	0	5	5	5	5	5	1	6
Sludge	0	0	7	7	7	7	7	1	8
Wipe	0	0	0	0	0	0	0	0	0
Field Duplicate	0	0	3	3	4	3	4	4	4
Field Blank	0	0	3	3	4	3	4	4	4
Rinsate	0	0	3	3	4	3	4	0	3
Trip Blank	0	0	NA	NA	NA	NA	NA	NA	NA

Big Creek; one upstream of the site and one downstream of the site.

3.9.6 Soil Sampling

Two subsurface soil grab samples will be collected from each of three 60 foot soil borings at depths determined by the on-site geologist. Eight lagoon sludge samples will be collected at SWMU No. 9; 5 from the bottom of the large lagoon and 3 from the bottom of the small lagoon.

3.9.7 Wipe Sampling

No wipe samples will be collected at SWMU No. 9.

3.9.8 Subsurface Gas Monitoring

The presence of subsurface gas at SWMU No. 9 will not be monitored.

3.9.9 Air Monitoring

Air monitoring shall be conducted at SWMU No. 9 in accordance with the procedures outlined in the Health and Safety Plan.

3.9.10 Sample Custody

Refer to Section 6.0 of the QAPP for chain-of-custody procedures.

3.9.11 Sample Designation

Sampling locations at each SWMU site will be marked with stakes and surveyed to determine the coordinate and elevation where possible. Once the stake is marked and in place, the area will be photographed. The stake shall be marked with the following information:

NASM;
Sample Code; and
Station Number (XXOO).

Sample codes to be used at SWMU No. 9 are SS, GW and SD for subsurface soil, groundwater and sediment samples, respectively.

Samples collected from each location, other than those collected for on-site field measurements or analyses, shall be identified by using a standard label which is attached to the sample container. The sample labels are sequentially numbered and are accountable. The following information shall be included on the sample label:

1. Site name;
2. SWMU Sample Identification Number;
3. Date and time of sample collection;
4. Designation of the sample (i.e. grab or composite);
5. Type of sample with brief description of sampling location (depth);
6. Signature of sampler;
7. Sample preservative used; and
8. General types of analyses to be conducted.

The SWMU No. 9 sample identification number will be of the form:

NASM - SWMU 9 - SAMPLE CODE AND LOCATION # - DEPTH - ORIGINAL (O) OR DUPLICATE (D)

For example, a sample number such as NASM-09-SS1-04-D would identify a duplicate NAS Memphis SWMU No. 9 subsurface soil sample taken at location 1 at a depth of four feet.

3.9.12 <u>In-Situ/Laboratory Measurements</u>

In-situ measurements taken at SWMU No. 9 shall include but not be limited to pH, temperature,specific conductance, and turbidity with respect to groundwater.

Field work conducted by the on-site geologist shall generate data

that may be used directly or indirectly to best describe the following parameters as recommended by the site manager:

- hydraulic conductivity (saturated and unsaturated) and porosity (total and effective);
- lithology and sorting;
- an interpretation of hydraulic interconnections between saturated zones;
- the attenuation capacity and mechanisms of the natural earth materials;
- zones of fracturing or channeling in consolidated or unconsolidated deposits;
- zones of higher or lower permeability that might direct or restrict the flow of contaminants;
- the uppermost aquifer;
- water-bearing zones above the first confining layer;
- description of water level/fluid pressure;
- water level contour;
- hydrologic cross sections showing vertical gradients;
- the flow system;
- surface soil distribution;
- soil profile;
- relative permeability;
- soil pH;
- particle size distribution;
- moisture content;
- infiltration; and
- storage capacity.

SWMU No. 9 field samples will be analyzed by the following laboratory methods:

- Semi-volatile Organics (SW-8250),
- Cyanide (SW-9012),
- Phenols (SW-8040),
- PCBs (SW-8080),

- Total Metals (SW-6010)
- EP Toxic (TCLP) Metals, and
- RCRA Appendix VIII contaminants

Tables 3-2 and 3-11 summarize the specific analytes and number of analyses for SWMU No. 9 samples, respectively.

3.9.13 Special Sampling Equipment

Teflon implements will be used to collect all samples being analytical for metals. In addition to the soil/sludge sampling equipment described in Section 5.1 of the QAPP, a small boat and boating equipment will be needed to obtain sludge samples. This equipment should include but not be limited to a motor, fire extinguisher, oars, life jackets, depth finder and ropes.

3.9.14 Special Instructions

It may be necessary for the consulting engineer to coordinate with NAS Memphis in regard to sampling schedules.

A complete "Southern Division Naval Facilities Engineering Command Groundwater Monitoring Well installation Report" and "Well Construction Details Form" will be submitted for each well installation. Refer to Section 5.2 of the QAPP for a description of the forms.

A permanent well designation sign will be attached to each well's protective casing. The sign shall be 18 inch by 6 inch by 1/8 inch thick sheet of aluminum plate, bolted to 1/4 inch studs welded to the casing. The sign shall be stamped with the following 4 inch letters and numbers:

MPH - Site # - Well #.

Spoils generated from the development of boreholes and monitoring wells shall be drummed by the Contractor and disposed of under

the direction of the SOUTHDIV EIC.

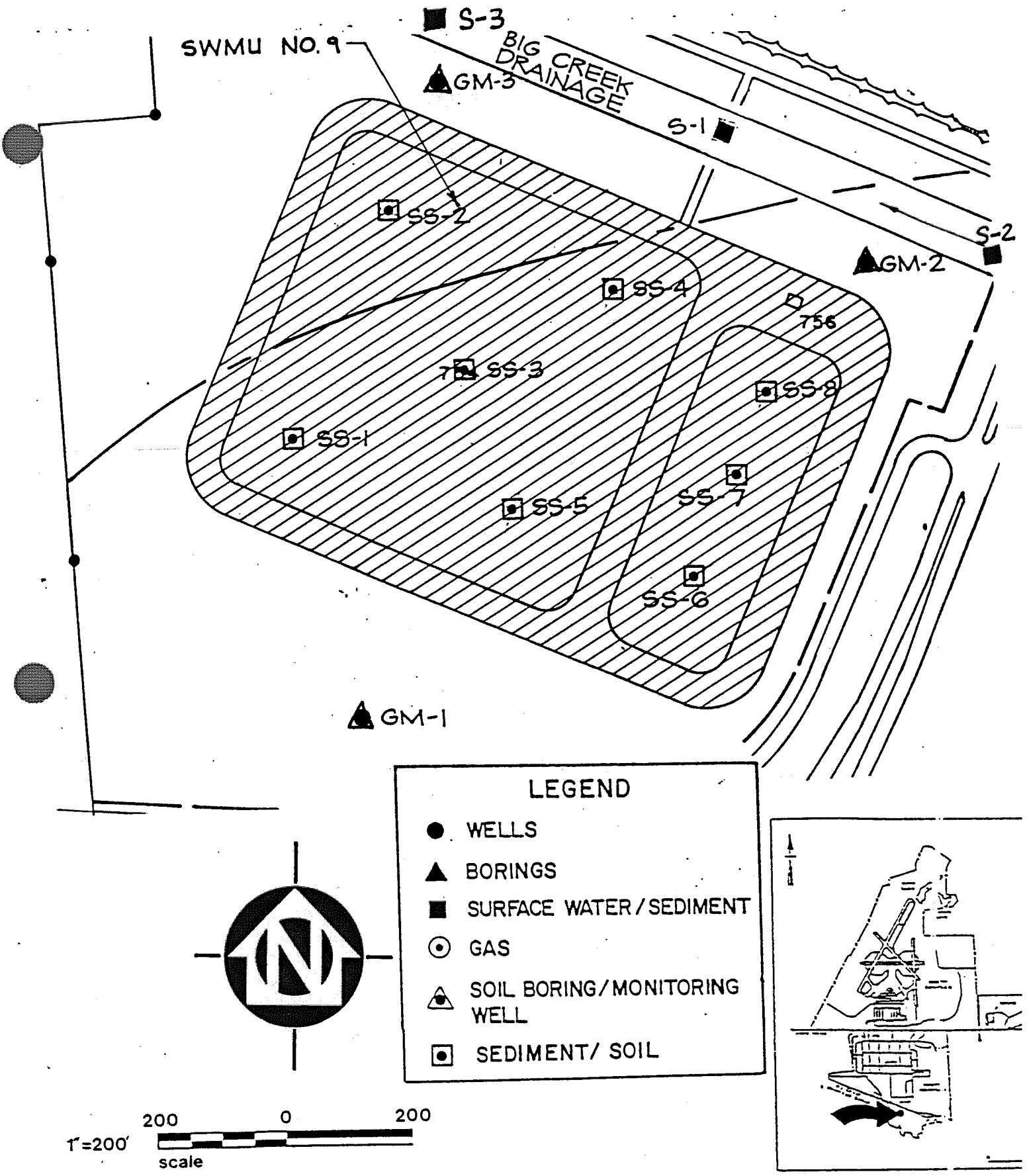
Refer to Section 5.7 of the QAPP for decontamination procedures.

3.9.15 Personal Protection

Level D protection is expected to be sufficient while investigating SWMU No. 9. The sampling team leader will be responsible for upgrading the personal protection level and for adhering to that levels protection requirements. The detailed protection levels are outlined in the Health and Safety Plan.

3.9.16 Quality Assurance

Refer to Section 3.1.16.



SWMU NO. 9
FIGURE 3-9

SEWAGE LAGOONS
LOCATION MAP

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3.4 SUMMARY OF PHASE I RI ANALYSIS

Table 3-12 is a summary of environmental and QA/QC samples to be analyzed in the Phase I RI. This table contains the summation of samples listed for SWMUs No. 1-9 in Tables 3-3 through 3-11, respectively.

TABLE 3-12. SWMUs NO. 1-9 -- SUMMARY OF ANALYSES, PHASE I

Sample Type (No. of Samples)	BTEX (SW-8020)	VOCs (SW-8240)	SVOCs (SW-8250)	CYANIDE (SW-9012)	PHENOLS (SW-8040)	PCBs and OC-PEST SW-8080)	METALS (SW-6010	TCL	EP TOX (TCLP) Metals
Ground Water	0	2	8	6	8	4	8	5	0
Surface Water	0	0	1	1	1	0	0	1	0
Sediment	8	0	1	8	5	10	10	9	14
Soil, Surface	8	0	4	4	4	10	13	7	21
Soil, Subsurface	22	5	15	22	15	32	46	7	57
Sludge	0	0	7	7	7	7	7	1	8
Wipe	0	0	0	0	0	0	4	0	0
Field Duplicate	6	2	10	15	12	16	16	22	24
Field Blank	6	2	9	13	11	14	16	20	18
Rinsate	6	2	8	13	10	14	15	0	15
Trip Blank	4	2	NA	NA	NA	NA	NA	NA	NA
Total	60	15	63	89	73	107	135	72	157

FINAL DRAFT

VOLUME IV

DATA MANAGEMENT PLAN
FOR
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
NAS MEMPHIS SITES NO. 1-9
MILLINGTON, TENNESSEE

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15 November 1989

ERC/EDGe Project No. B880

FINAL DRAFT

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1.0 INTRODUCTION

Authorized by the Department of Navy, Southern Division, Naval Facilities Engineering Command (SOUTHDIV), ERC Environmental and Energy Services Co. (ERCE formerly EDGe) has prepared the pertinent documents required for the proposed Remedial Investigation/Feasibility Study (RI/FS) work. The purpose of this Data Management Plan is to establish the data management protocol and project report processing procedures for the (RI/FS) tasks and field activities to be conducted at the following nine (9) solid waste management (SWMU) sites at the Naval Air Station (NAS) Memphis, Millington, Tennessee:

SWMU NO.	SWMU NAME
1	Fire Department Drill Area
2	South-Side Landfill
3	N-121 Plating Shop Dry Well
4	N-121 Plating Shop Storm Sewer
5	Fire-Fighting Training Area
6	N-126 Battery Shop Storm Sewer Ditch
7	N-126 Plating Shop Dry Well
8	Cemetery Disposal Area
9	Sewage Lagoons

This Plan is subject to evaluation and periodic updates at phases of the RI/FS implementation.

1.1 APPLICABLE REGULATION

Prior to 1983, the investigation/ remediation activities had been directed under the Navy Assessment and Control of Installation Pollutants Program (NACIP). The Naval Installation Restoration Program (IRP) was established in 1983 to direct the investigation and remediation of uncontrolled hazardous waste disposal sites associated with naval operations. In accordance with the National Contingency Plan (NCP), the Naval IRP is currently being implemented in full compliance with statutory requirements of the

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). The CERCLA/SARA specifies that inclusion of all applicable or relevant and appropriate requirements, the Navy IRP also incorporates compliance with other laws and regulations, in particular, the Resource Conservation and Recovery Act of 1976 (RCRA) and the Hazardous and Solid Waste Amendments of 1984 HSWA).

1.2 OBJECTIVE

The proposed RI/FS work involves many entities including Navy, EPA, state and local agencies, consulting engineers, contractors, and other interest groups. The involved institutions and organizations generate extensive information. This Plan outlines procedures to ensure that the quality and integrity of the data collected are maintained for a feasibility study and for any legal or cost recovery actions. The disposition of data generated during an RI/FS, as well as any special data handling procedures, are established in this Plan. This Data Management Plan also described the procedures for the identification and control of project documents to ensure that documents are reviewed for adequacy, completeness, and correctness for release by the Project Manager and the designated personnel. Changes to documents will be reviewed and approved by the Project Manager or the authorized personnel that perform the original review and approval process.

1.3 CONFIDENTIALITY

The Navy may disclose information during RI/FS activities with a request for confidentiality thereby making a document exempt for public access under the Freedom of Information Act, 5 U.S.C. 9552. Some data, documents, and other materials generated during the RI/FS activities may be confidential either for national security or legal reasons. These confidential data may include: (1) trade secret information; (2) information compiled as

investigatory records for enforcement purposes; (3) classified information related to national security; (4) internal rules and practices; (5) inter-agency and intra-agency memorandums or letters; (6) medical records and personal files; (7) reports and data prepared in the regulation of financial institutions; and (8) geological and geophysical data for oil and gas well owners and operators. These data should be treated according to guidelines provided by the Department of Navy or outlined in the following publications:

- TSCA confidential Business Information Security Manual, U.S. EPA 1981;
- Contractor Requirements for the Control and Security of TSCA Confidential Business Information, U.S. EPA, 1981a;
- Draft Contractor Requirements for the Control and Security of RCRA Confidential Business Information, U.S. EPA 1984d; and
- FIFRA Confidential Business Information Security Manual, U.S. EPA 1981f.

A separate, locked file must be maintained for the segregation and storage of all confidential and trade secret information. Upon receipt, this information is directed to and recorded in a confidential inventory by the Project Manager. The information is then made available to authorized personnel, but only after it has been logged out. The information must be returned to the locked file at the conclusion of each working day. Confidential information may not be reproduced except upon approval by, and under the supervision of, the Project Manager. Reproduction of confidential information should be kept to an absolute minimum.

1.4 REFERENCES

The following guidance/policies have been consulted to establish this plan:

- Guidance for conducting Remedial Investigations and

Feasibility Studies under CERCLA (U.S. EPA, March 1987);

- A Compendium of Superfund Field Operations Methods (U.S. EPA, December 1987);
- Navy Assessment and Control of Installation Pollution Programs: Guide for Conducting an Initial Assessment Study, November 1983
- National Enforcement Investigations Center (NEIC) Policies and Procedures Manual (U.S. EPA, 1981b);
- Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (U.S. EPA, 1980c); and
- Report Guidance Manual - Southern Division Naval Facilities Engineering Command, March 14, 1989.

2.0 PROJECT FILE REQUIREMENTS

2.1 DOCUMENTS AND RECORDS

There are two types of documents that require special handling for the NAS Memphis RI/FS as follows:

Accountable Documents

Those documents where there is a reasonable belief that they will be used as evidence during litigation. In addition to controlled documents, these documents include logbooks, field data records, sample tags/labels, chain-of-custody records, bench cards, photographs, and correspondences that contain project data of evidentiary nature.

Controlled Documents

Those documents that describe activities affecting quality which will be used for evidentiary purposes during litigation. These documents are released by authorized personnel and distributed for use by the individuals performing the activities.

Section 4.0 of this Plan provides detailed procedures for the identification and distribution of controlled documents.

Records contained in these documents provide the direct evidence and support necessary for technical interpretations, judgments, and discussions concerning project activities. These records, particularly those that are anticipated to be used as evidentiary data, must directly support current or ongoing technical studies and activities and must provide the historical evidence needed for later reviews and analyses. The control of records is essential in providing evidence of technical adequacy and quality for all project activities. Records that furnish documentary evidence related to quality assurance activities will be specified, prepared and maintained (Section 3.0). Other records to be generated during the project are specified in the work plan or task outline. Records must be legible, identifiable, and

retrievable and will be protected against damage, deterioration, or loss. Requirements and responsibilities for record preparation, transmittal, distribution, retention, maintenance and disposition will be in accordance with quality-assurance-approved instructions such as those identified in the following sections.

2.2 TASK - RELATED DATED FILE

There are two main types of data associated with the NAS Memphis RI/FS that must be documented. They may be defined as follows:

Technical data -- The first type of information consists technical data that are either required for or generated by a specific RI/FS task such as scoping or site characterization. This information includes both field data, e.g. samples, sample tags, field log books, and data resulting from subsequent laboratory or engineering analyses, e.g. graphs or modeling results.

Project Tracking Data -- The second type of information consists of data that needs to be tracked in order to monitor, manage, and document the actual performance of the RI tasks. The project tracking data includes schedules, cost estimates, technical progress reports, and financial management reports. Appendix I lists the technical and management documentation that are applicable to this project.

The two types of data associated with the project, including data required to perform a specific activity or data generated by the activity, will be managed in accordance with this Data Management Plan. Data processing and storage are essential to preserve both the results of the individual task and the inputs for other tasks still to be conducted. The information will be carefully documented to support any future legal or administrative actions that may be taken.

2.3 REPORTS

2.3.1 Overall Project Status Reporting

Monthly progress reports will include the following items:

- Technical Progress Report
  - Identification of the site.
  - Identification of project task and milestone.
  - Status of work at each site and progress to date.
  - Percent of completion (e.g. percent of task completed and work hours expanded) for each site and overall project.
  - Difficulties encountered during the report period.
  - Actions being taken to rectify problems.
  - Activities planned for the next month.
  - Personnel change.

The progress report will list target and actual completion dates for each project task, including project completion; and will provide an explanation of any deviation from the work plan schedule.

Because the work will be performed on a firm fixed price (FFP) Contract, a Financial Management Report is not required.

ERCE Subcontractors, if any, will prepare monthly progress reports and submit them to ERCE for review and comment. The Subcontractors' progress reports will be incorporated into progress reports submitted to SOUTHDIV by ERCE.

2.3.2 Report Review Process

Ninety percent draft, final draft, and final RI and FS reports will be submitted to the Navy. These reports will include a copy of all data, and will describe, discuss, evaluate, and interpret the data, and make recommendations. The 90% draft will be presented to the Navy for review. ERCE will incorporate the Navy's comments into a draft final for delivery to TRC member. A meeting with the TRC will be scheduled by SOUTHDIV to discuss the

incorporated comments as well as and the Navy's responses to the draft final. Appendix III presents a standard transmittal form and lists members of the TRC who will receive submittals. Distribution will be made by the Navy. Following the discussion of comments with the TRC on the draft final, appropriate comments will be incorporated into the final report. The following is a general summary of the report production schedule.

Report	Submittal Date	Navy Review	TRC Review
90% Draft	As instructed by Navy	60 days	
Draft Final	15 days after receipt of formal comments from EIC	45 days	120 days
Final	45 days after discussion of formal comments from EIC		

ERCE will provide the SOUTHDIV EIC with a copy of all project related correspondence including submission letters to the addressees. All Final reports shall be bound in three-ring binders as well as on five and one-quarter inch floppy discs in a format accessible to IBM PC-compatible machines using MS-DOS and Enable software (one copy per FINAL submittal).

2.4 PROJECT FILES

Project files will be established upon issuance of Technical Directive Documents (TDDs), Work Assignments (WAs), or award of a contract. Each project file will be identified according to SWMU site name and TDD/WA/contract number or by other appropriate means that have been documented and approved by the Project Manager.

The Project Manager is responsible for the collection, assembly, and inventory of all documents related to the project.
The Project Manager will designate a document custodian who will be responsible for record maintenance. A project file procedure

is shown in Appendix IV.

The document custodian is responsible for itemizing and, if the project size warrants, giving the accumulated documents a unique sequential docket number. Each docket number should be logged-in on a file inventory form (Appendix IV). Documents should be placed into separate file folders according to the controlled document project. Project personnel who remove documents from the project file will sign out the document, give the date documents were removed, and enter the date that the documents were returned to the project file.

Access to project files will be controlled to restrict non-project personnel from having free and open access. An authorized access list will be placed outside the central filing room door or outside each individual filing cabinet and shall name the personnel who have unrestricted access to the files. Personnel not identified on the authorized access label must obtain project file access from the document custodian designated by the Project Manager.

The document custodian will assure that the central filing room and individual filing cabinets are locked at the end of each day.

3.3 SITE CHARACTERIZATION QA/QC

The purpose of site characterization quality assurance and quality control is to ensure that the data collected are of known and sufficient quality to assess contamination at each SWMU site qualitatively and quantitatively. QA/QC control for each site characterization will include records of traceability and adherence to prescribed protocols, complete descriptions of quality control procedure deviations and corrective actions. Deficiencies that may affect quality and uncertainty limits for results will be recorded.

4.0 DATA PROCESSING AND STORAGE PROCEDURES

This section addresses the procedures and requirements for data processing and storage. The topics covered include:

- Documenting field Measurements and observations;
- Sample identification and chain-of-custody; and
- Document control, inventory, and filing system.

These three topics provide the basis for a documentation system suitable for the proposed tasks.

4.1 PROJECT LOGBOOKS

Field Team Leaders who are responsible for conducting field investigations must be issued serialized logbooks. The Field Team Leader is responsible for recording all pertinent project information including field work documentations, field instrumentation readings, calculations, calibration records, work plan distributions, photograph references, sample tag/label numbers, meeting information, and important times and dates of telecons, correspondence, or deliverables.

Onsite measurements and field operations will be recorded in the logbooks along with sufficient pertinent information o explain and reconstruct sampling operations. Entries made in the log book will be dated and signed by the individual who made the entry unless the entry is by the individual to whom the logbook was originally assigned. The Field Team Leader will review the logbook at the close of each day.

Project logbooks are the property of the Navy and are to be turned over to the project file when a project assignment has been concluded.

As an alternative to recording detailed sampling information or instrument calibration in field logbooks, separate sampling

record forms may be used. However, general site information must be recorded in the field logbook, and the use of such forms will be referenced in the field logbook.

4.2 DOCUMENTING FIELD MEASUREMENTS AND OBSERVATIONS

All field measurements and observations will be recorded in project log books, field data records, or similar types of record-keeping books. Field measurements, including pH, temperature, conductivity, and water flow shall be entered into field log books with all entries signed and dated. If entries are changed, the change should not obscure the original entry. The reason for the change should also be stated. In addition, the change and reason for the change should be signed and dated or identified at the time the change is made. Field data records should be organized into standard formats whenever possible and retained in permanent files such as those described in the Section 2.0 Project File Requirement.

4.3 SAMPLE IDENTIFICATION AND CHAIN-OF-CUSTODY

Field samples will be identified by a sample tag or other appropriate labeling technique. The information on the sample tag shall include the following:

- Sampling Date;
- Sampling Time;
- Sampling Location, cross-reference to the Sampling and Analytical Plan;
- Name (s) of the Sampling Crew; and
- Comments.

A copy of the sample tags will be stored in a permanent file maintained for each SWMU site.

Sample possession will be traceable from the time the sample is collected and developed until the derived data are stored in the permanent project file. For each task, chain-of-custody

procedures will be followed to document sample possession. The chain-of-custody procedures shall address the following:

- Field custody procedures;
- Transfer of custody and shipment;
- Receipt of samples; and
- Laboratory custody procedures.

A copy of the Chain-of-Custody form is enclosed in Appendix V. Sample identification and chain-of-custody procedures are established in the Quality Assurance Project Plan (QAPP). Any documentation associated with these procedures, e.g. chain-of-custody records or receipts for sample forms, shall be placed in a permanent project file.

4.4 DOCUMENT CONTROL, INVENTORY, AND FILING SYSTEMS

Precautions will be taken in the analysis and storage of the data collected during an RI to prevent the introduction of errors and the loss or misinterpretation of data. The data storage and information system shall be capable of the following:

- Receiving all data;
- Screen and validating data to identify and reject outline or errors;
- Preparing, sorting, and entering all data into the data storage files (either computerized or manual);
- Providing storage data points with associated quality assurance/quality control (QA/QC) "labels," which can indicate the level of confidence or quality of the data; and
- Assuring efficiency in data security and disclosure.

The QA/QC label is used to indicate what QA/QC activities were included in the major steps of the monitoring process, to quantitatively describe the precision/accuracy of the analysis, and to make data available to users.

Specific requirements and procedures for the data processing are described in the QAPP and Site Management Plan (SMP). A member of the project team will be designated to establish and maintain the document control system for the duration of the investigation.

The document inventory/filing systems will be based on serially numbered documents. These systems may be manual or automated. A suggested structure and sample contents of a data file for this project are shown in Appendix VI. The document control system shall be protected from intentional or accidental destruction or damage.

5.0 DATA MANAGEMENT

The following subsections establish the data management procedures for the RI/FS activities.

5.1 DATA MANAGEMENT FOR SCOPING

Scoping objectives and activities are described in the project work plan. Scoping is the initial step of a remedial response. The existing site data gathered and assessed during scoping define the subsequent tasks.

The most important information or reports produced to support and document the scoping tasks include the following:

- Site background, including a description of the problem;
- Site chronology;
- Site map;
- Site-specific plans for QA/QC, health and safety, institutional issues, and management procedures;
- Sampling plan and map;
- Final RI work plans.

The extensive information assembled during the preparation of these reports will be systematically filed so that it can be readily procured if needed to support the conclusions of the feasibility study. Suggested filing and document control systems are described in previous text. The rationale, results, and costs of scoping and other RI tasks will be documented to support any future administrative actions.

5.2 DATA MANAGEMENT FOR SITE CHARACTERIZATION AND SAMPLING

Site characterization and sampling will be conducted to verify existing data and to fill data gaps stated in the RFA for subsequent RI/FS work. Documentation and record-keeping procedures are most important during site characterization and

sampling because these steps produce the basic data used in making all subsequent decisions including remedial technology selection and enforcement programs.

The most important aspects of data management in these steps are:

- QA/QC Plans - to provide records of traceability, adherence to prescribed protocols, nonconformity events, corrective actions, and inherent data deficiencies
- Data Security System - to ensure that records cannot be tampered with or accidentally lost or damaged
- Detailed Work Plan - to maintain timing and scheduling requirements with field work, laboratories, holding times, and data turnaround
- Sampling Plan - to provide sampling guidance and to address all elements specified in the Work Plan.

ERCE shall generate required initial and periodic progress report forms in order to achieve acceptance of the Plan. The following is a list of reports and forms to be included in the data management process:

1. <u>Sampling and Analysis Plan Deliveries</u>
   a. Laboratory Quality Assurance Plan.
   b. Site Specific Work Plan with Site Specific Quality Assurance Plan.
   c. Performance sample data (20 days after receipt of sample).
   d. Corrective Actions in response to audit and performance sample review received within 10 days after laboratory receives audit report.

2. <u>Sampling and Analysis Plan Monthly Progress Report</u>
   a. Control Charts.

b. Corrective Actions (as required).

c. Quality Control results and completed sample data.

d. Site Name and Contract Number.

e. Number of samples received and status of samples.

3. Deliveries due three (3) weeks prior to final project report, FOR NIRP - CERCLA EFFORTS ONLY:

a. For Level C QC:

- CLP forms containing sample data, blanks, surrogates, spikes, duplicates, calibration summary, chromatograms and mass spectra from samples.
- Blank/spike control charts.

b. For Level D QC:

- A full CLP package

5.3 DATA MANAGEMENT FOR HEALTH AND SAFETY PROGRAMS

Health and safety program documentation during RI/FS activities shall include the following:

- Physician's reports;
- Site-specific health and safety plan;
- Site visitors' log;
- Personnel monitoring results;
- Incident reports;
- Non-conformity reports;
- Site Safety Officer's daily log;
- Team leader log;
- Equipment calibration logs; and
- Personnel training documentation.

Further information on the aspects of the Health and Safety Program is provided in Appendix II of the Field Sampling Plan (FSP).

Health and safety data will be stored for more than thirty (30)

years in order to document previous exposure to the hazardous materials. In order to ensure confidentiality of personal health status, records will be kept in the personnel files rather than site files.

5.4 DATA MANAGEMENT FOR INSTITUTIONAL ISSUES

The NAS remedial investigation activities include the following institutional requirements:

- Site access;
- Community relation planning; and
- Coordination with EPA, other Naval offices, Tennessee Department of Health and Environment, Shelby County, and the City of Millington.

The events leading to site access and the nature of the access, including operation, remediation, enforcement, and emergency, will be clearly recorded. This record will be stored in case it is required at a later date. Any agreements regarding the liability of EPA or its representatives during the RI/FS will be documented and safely stored.

The Community Relations Plan is a guide to all community relations activities at a site. All actions taken in accordance with this plan will be documented and the records stored. Particular attention will be made while recording actions designed to inform the public about work at the site and public comments. The public comments are a critical input to the "Responsiveness Summary" that must be completed for the feasibility study.

A written record will be prepared to document the coordination efforts made by EPA and its representatives and other Federal and State Agencies.

5.5 COMPUTER CODES AND DOCUMENTATION

Computer codes used for analysis, modeling, or design applications should be baselined, controlled, and documented. Documentation stored by IBM-DOS compatible computer system (e.g., chain-of-custody records and analysis reports) will be adequately safeguarded.

5.5.1 Documentation, Verification and Retention of Software Programs

The Project Manager and Field Team Leader are responsible for ensuring that all computer programs, whether developed internally or acquired from an outside source, are documented in sufficient detail so that each can be understood and verified by an independent reviewer. The program documentation is specified in Table 5.1.

TABLE 5.1
PROGRAM DOCUMENTATION

DOCUMENTATION	DESCRIPTION
Program Identification	Give the program name, descriptive title, and information necessary to uniquely define the current version.
Description of Problem	Define the problem to be or Function solved or function to be performed by the program.
Method of Solution	Summarize mathematical techniques, procedures, and numerical algorithms employed for solution.
Related Material	List any auxiliary programs or external data files required for implementation of this program.
Restrictions	Discuss limitations imposed by the mathematical model or computer facilities.
Computer(s)	Identify the computer(s) on which the program has been successfully executed.
Programming Languages	Indicate the languages used and approximate function of each (Appendix VII).
Operating Systems	Identify the software system and versions used (Appendix VII).
Machine Requirements	List the computer hardware required for implementation of the program.
Authors	Give the names and addresses of the author(s) and the individuals currently responsible for the program.

TABLE 5.1
PROGRAM DOCUMENTATION
(continued)

DOCUMENTATION	DESCRIPTION
References	List directly related publications and other reference materials.
User's Manual	Describe all input required for the program including input format. Include all information required for a successful computer run (e.g., special input techniques, handling of consecutive cases, default values of input parameters). Provide sample problems with control cards and physical interpretations of input and output.
Source	List the source program as compiled or assembled.

5.5.2 Verification

Verification is the process of ensuring that the program performs correctly. Verification is required for all computer programs that are used for quality affecting work. The extent and degree of verification will depend on the end use of the results of the analysis for which the program was developed.

The extent of verification will be documented on a formal record and retained. An example Verification Record is provided in Appendix VII.

For programs that are widely used and accepted, verification may be limited to running originator-supplied sample problems. For other programs, verification should be accomplished by checking the mathematical modeling, numerical analysis, and computer logic, and then by doing either of the following:

- Demonstrate that the computer program solutions to a series of test problems are in substantial agreement with those obtained by a similar, independently written program in the public domain. The program from the public domain should be a generally recognized program with sufficient history to justify its applicability and validity without further demonstration.

- Demonstrate that the program's solutions to a series of test problems are in substantial agreement with those obtained by hand calculations or from accepted experimental or analytical results published in the technical literature.

The test problems chosen for program verification should be demonstrated to be representative of the range of applicability of the problems to be analyzed by the program.

The program verification will be fully documented by the Project Manager including methods used, details of independent calculations (manual or computer), results, and conclusions. This document must be attached to the record of computer software verification.

5.5.3 Retention

The documentation generated for a software program will be labeled with sufficient information to uniquely identify the version of the program to which it is applicable. It will be retained in the project files in accordance with document control procedures. A master copy of the production program disk will be maintained. No changes to this disk will be made without the proper authorization. Such authorization may be granted by the Project Manager only after the modifications have complied with the provisions of the document control procedure.

6.0 DATA REDUCTION, VALIDATION AND REPORTING

Data generated during RI/FS tasks will be reported according to the proposed procedures of quality assurance and data validation. Data reduction will consider the treatment of duplicate measurements, identification of outlier values, and reporting of results below detection limits.

Analytical data will be reduced at the laboratory before they are reported; and the instrument readings or intermediate calculations will not be reported.

6.1 TREATMENT OF REPLICATES

Replicate measurements of a single sample will be averaged prior to further data reduction. For example, Table 6-1 shows how to calculate an overall mean when replicate analyses for a single sample have been performed. The three "B" values are averaged before the mean is calculated. This removes bias from the overall mean. "N" indicates the number of analyses.

TABLE 6.1
OVERALL MEAN CALCULATION FOR REPLICATE ANALYSES

RAW DATA		DATE SUMMARY		
Sample	Concentration	Sample	Concentration	n
A	4.3	A	4.3	1
B	1.8	B	1.8	3
B	2.0	C	7.6	1
B	1.6	D	6.3	1
C	7.6			
D	6.3	mean [(A+B+C+D)/4]	5.0	6

6.2 REPORTING OF OUTLIERS

Any program of environmental measurement will produce some numbers that lie outside the "expected" range of values. Since field variability of environmental measurements can be great, it may be difficult to decide whether an extreme (outlier) value is representative of actual contaminant levels.

Statistical methods for identifying outliers require that the analytical laboratory have an ongoing program of quality assurance, and that sufficient replicate samples be analyzed to account for field variability.

All data including suspected outliers or contaminated samples, will be reported. The rejected data will be presented in footnotes. The treatment and reporting of outliers will follow the requirements addressed within the Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program. The interpretation of control charts can reveal shifts, trends, biases, and conditions where parts of the analytical system are out-of-control are specified in the Pioneer Laboratory QA plan. The Pioneer Laboratory Manager will identify what actions need to be taken when the warning and/or control limits are exceeded. Warning conditions may only require more frequent observations of a piece of equipment, while rejection conditions require shutting down an instrument.

Any incident that delays sample processing for a period or time, affects holding times, or delays work by more than two days Field Manager or Laboratory Manager should immediately report by phone to the ERCE Project Manager. The ERCE Project Manager should be informed as soon as the problem is solved and an explanation given as to the corrective action taken. An example of this type of event would be the breakdown of a GC/MS system used for VOAs which could not be repaired for several days. If the laboratory could not use another instrument in its laboratory, then

provisions for another Navy approved laboratory to analyze the samples would need to be made by ERCE Project Manager.

6.3 REPORTING OF VALUES BELOW DETECTION LIMITS

Analytical values measured at below the detection limit should be reported numerically (e.g.,<0.1 ppm). The data presentation procedures should cite analytical methods to be used including appropriate detection limits.

6.4 VALIDATION

The CLP requirements in effect at the time of RI implementation will be complied with. The current criteria are addressed in the QAPP.

All data generated by non-CLP methods will be reviewed by comparing calibration, accuracy and precision to the established QC criteria. The validation procedures are described by the following:

- verify correct samples were analyzed and reported in appropriate units;
- verify holding times as specified in the Sampling and Analysis Plan;
- verify calibration curve is valid and checked daily;
- verify no analytes are present in the method blanks and that one blank is run every 15 samples;
- verify that a blank spike laboratory control sample is run every 15 samples and that percent recovery is within tolerances of Level C data validation guidelines stated in NEESA 20.2-047; and
- verify that a replicate and matrix spike, or matrix spike and spike duplicate are run every 15 samples, and that QC criteria are in-control. Out-of-Control events will be managed in accordance with the Level C data validation guidelines stipulated in NEESA 20.2-047 and

referenced documents.

Equations used to calculate the concentration for each test parameter shall be presented with their respective methods.

All basic calculations involve calibration factors which relate a known concentration to an instrumental, chemical, or physical measurement. The reported units shall be based on the respective calibrations which are defined in each analytical method. All raw data and final results shall be recorded by the analysts in bound laboratory log books, on specific data forms or on computerized reports directly from the instrument. These forms will be reviewed by the respective supervisors and then filed in numerical order according to test parameters.

The final results shall be recorded by the Laboratory Supervisor on the laboratory work sheet and submitted to the laboratory manager for their approval. Appendix VIII describes the data flow and reporting scheme. The enforcement of the entire Quality Control program as described in the SAP depends upon the criteria used to validate data from collection to reporting. There are numerous factors that influence data and each must be constantly monitored to insure valid results.

All data will be evaluated for precision, accuracy and completeness. Some of the procedures which must be constantly monitored to ensure data validation include the following:

1. Sample preparation and treatment.
2. Analytical operations.
3. Calibration procedures.
4. Instrumental conditions and adjustments.
5. Data handling:
    a. calculations, corrections, adjustments to standard conditions, computer programs;

b. statistical procedures used to report data; and

c. checks for internal consistency.

6.5 REPORTING

For each site, an analytical report will be reviewed by the laboratory supervisor, the QA Officer and the Project Manager. The following information will be provided in the analytical reports:

For those analyses requiring CLP procedures (e.g., full priority pollutant scans), the laboratory will provide a data package in the CLP format. This will include results, matrix spike and duplicate information, calibration, tuning where appropriate, and blank results. All supporting raw information will be provided. Full details of the data package contents are provided in the SAP.

For those analyses or series of analyses which do not require CLP procedures, a data tabulation including results and supporting QC information will be provided. Currently, tabulated results are separated by method and by matrix with several samples reported per page. Raw data will be available for later inspection, if required, and maintained in the control job file.

6.6 RECORD KEEPING

The project reports and raw data will be stored in a job file at the Contract Laboratory for a period of five years after the final report is issued.

6.7 DATA PRESENTATION

Data obtained from the RI/FS tasks will be arranged and presented in an orderly format. RI/FS studies typically produce large amounts of data, including results of chemical analyses of numerous waste constituents in different media, over many sampling locations and dates. Tabular, graphical methods, and other visual displays such as maps and isopleth plots for data presentation are essential for organizing and displaying these data.

Tables and graphs are not only essential for expressing results to the regulatory agency, but are also necessary for decision-making. Appendix IX presents some uses of these data presentation methods during the RI/FS.

6.7.1 Listed (Raw) Data

Simple lists of data alone do not fully illustrate the extent of a contaminant release. However such lists serve as a good starting point for other presentation formats. Such listing is also valuable for sample validation and auditing purposes. Each data record will provide the following information:

- SWMU Site name;
- Unique sample code;
- Sampling location and sample type;
- Sampling date;
- Laboratory analysis ID number;
- Property or component measured;
- Result of analysis (e.g., concentration);
- Detection limits; and
- Reporting units.

In addition to analytical data, field data for all samples obtained during the investigation will be provided. Sampling logs are records of procedures used in taking environmental samples and conditions prevailing at the site during sampling. Information included in the log will include:

- Sample type (e.g., soil);
- Sampling location, description or grid coordinates;
- Sampling method;
- Date and time of sampling;
- Temperature; and
- Weather.

The field log sheets should also describe any unusual conditions encountered during sampling, e.g., difficulties with the sampling equipment, post-sampling contamination or loss of samples (Appendix IX).

6.7.2 Sorted Summary Tables

Presentation of results grouped according to data categories is the simplest format used to display trends or patterns in the data. Examples of categories of data include medium tested, sampling date, sampling location, and constituent or property measured.

6.7.3 Graphical Presentation of Data (Appendix X)

Graphical methods of data presentation will often illustrate trends and patterns better than tables. Some graphical formats that are useful for environmental data include bar graphs, line graphs, areal maps, and contour-plots. Use of the graphical method for data presentation will be determined during the project implementation phase.

Bar graphs and line graphs will be used to display changes in contaminant concentrations with time, distance from a source, or

other variables. Bar graphs are preferable to line graphs in instances where there is not enough information to assume continuity between data points.

Attention to the following principles of graphing should provide clear and effective line and bar graphs:

- On a graph plots will be limited to three or four lines or bar subdivisions. Different symbols or textures will be used to distinguish each line or bar;
- The scale of the x and y axes will be chosen so that data is spread out over the full range of the graph. If one or two data points are far outside the range of the rest, a broken line or bar will be used to indicate a discontinuous scale. If the data range exceeds two orders of magnitude, the logarithms of the data will be plotted;
- The x and y axes of the plot will be clearly labeled with the parameter measured and the units of measurement; and
- The x axis generally represents the independent variable and the y axis generally represents the dependent variable.

6.8 CORRECTIVE ACTION

In the event of an out-of-control incident, the nature of the incident and the corrective actions taken to resume the system will be documented by Pioneer Laboratory QA/QC officer and ERCE QA/QC Manager. A corrective action report, to be signed by the laboratory director and the ERCE Project Manager, will be completed and reported in the Monthly Laboratory Progress Report (MPR) to the Navy. The following topics will be included and discussed, per Section 4.6 of NEESA 20.2-047B.

- The place where the out-of-control incident occur (laboratory name, address, telephone number, section name):
- The time when - did the incident occur.
- The name of the person who - discovered the out-of-control incident.
  - verified the incident.
  - corrected the problem.
- The type of the test/parameter
  instrhmedisposition of the test or control and/or
  - the nature of the corrective action.
  - measures taken to prevent the reoccurrence of the problem?
- The cause of the incident.

A copy of the subject control charts and other data describing the out-of-control conditions will be included in the corrective action report.

All out-of-control incident documentation and copies of the corrective action reports sent to the Navy will be:

(1). placed in the laboratory archive record for the sample(s) in question.
(2). placed in the ERCE file of incidents documentation, and
(3). referenced and briefly described in the MPR to the Navy.

7.0 REPORTS

7.1 PROGRESS AND FINANCIAL REPORTS

Project tracking reports are critical for tracking both financial and technical progress. The collection, documentation, and reporting of the financial and project tracking data for the NAS Memphis investigation will take a system approach.

The final RI/FS Work Plan shall include estimates of the costs, manhours, and schedules associated with each task. Detailed project tracking reports for each site shall include the following:

- Monthly Work Assignment Technical Status Report;
- Monthly Work Assignment Financial Status Report,;and
- Cumulative Project Costs Graph.

7.2 REMEDIAL INVESTIGATION REPORT

This section addresses the recommended format for reports prepared for NAS Memphis remedial investigations to be conducted under CERCLA. This format has been designed to:

- Ensure that all major issues are adequately addressed;
- Produce comparable presentations from different sites;
- Promote high quality remedial investigation reports; and
- Ensure adequate documentation and complete data for use in decision making.

The recommended format will consolidate data from several investigation activities into a single presentation and serve as a checklist of activities conducted and data obtained.

The draft Remedial Investigation Report is produced at the end of the remedial investigation process. This report characterizes the site and summarizes the data collected and conclusions drawn from all investigative areas and levels. If appropriate, this

report may be combined with the associated Feasibility Study Report to provide one site report containing both support data and decision making documentation.

The draft, following review, approval, and revision, becomes the final report.

Appendix XI presents the recommended NAS Memphis Remedial Investigation Report format. The report will be prepared for every remedial investigation and will present only the data generated in the investigation to support analysis of remedial alternatives in the feasibility study. The report contents should be adjusted based on the focus of the data collection and the analyses conducted.

Contaminant levels in the environment will be reported on a media-specific basis. For example, contaminant levels in sediments will be presented in the surface-water investigation section, while contaminant concentrations in groundwater will be presented in the hydrogeologic investigation section.

7.3 FEASIBILITY STUDY REPORT

To ensure that all major issues are addressed within the FS report for NAS Memphis Facilities, Appendix XI presents the recommended report format. A consistent report format makes it possible to compare feasible alternatives for each site; and ensures that decisions are adequately documented.

APPENDIX I

APPLICABLE DOCUMENTS FOR NAS MEMPHIS RI/FS

NAS MEMPHIS
MILLINGTON, TENNESSEE
APPLICABLE DOCUMENTS FOR NAS MEMPHIS RI/FS

Field/Laboratory Documentation

Project/Field Log Books
Sample Tags
Sample Data Sheets and Logs
Chain-of-Custody Records, Seals
Receipt of Sample Forms
Laboratory Log Books
Laboratory Data, Calculations, Graphs

RI Management Reports

Draft/Final Work Plan(s)
Health/Safty Plan
Sampling Plan (Quality Assurance/Quality Control Plan)
Data Management Plan
Project Management Plan

RI Task Reports

Site Description
Contamination Assessment
Environmental Assessment
Public Health Assessment
Endangerment Assessment
Draft/Final RI Report

Technical Progress and Financial Reports

Monthly Technical Progress Report
Monthly Financial Progress Report
Cumulative Project Cost Report

APPENDIX II

SAMPLE STATUS REPORT

SAMPLE STATUS REPORT FORMAT
NAS MEMPHIS
WORK ASSIGNMENT FINANCIAL STATUS REPORT

Site:

Work Assignment (WA) Number:
Month Ending:

Project Start Date
Scheduled Completion Date
% Complete:

	Actual Costs			Estimated Costs			
	Current Month	Cummulative to Date	% Spent	Cost to Complete	Cost to Completion	Budget at Completion	Variance at Completion
Cost							
Contractor Hours							
Subcontractor Hours							
Total Hours							
Contractor Sec. Hours							
Subcontractor Sec. Hours							
Total Sec. Hours							
Total Hours							
Direct Labor							
Equipment ($)							
Travel							
Subcontract Cost							
Indirect Costs							
Subcontract Cost							
Base Fee							
Total WA							

	Month 1	Month 2	Month 3	Total
WA Next 3 Month Projections				

SAMPLE STATUS REPORT FORMAT

Work Assignment Number:	
Site Name/Activity:	
Prepared By:	
Date:	
Period (Month, Year):	
Copies:	

Progress made this reporting period:	
Problems resolved:	
Anticipated problem areas and recommended solutions:	
Deliverables submitted:	
Upcoming events/activities planned:	
Key personnel changes:	
Subcontracting:	
Travel:	
Contract laboratories:	
Percent complete:	
Schedule:	

APPENDIX III

DESIGNATED RECIPIENTS

OF

REPORT SUBMITTALS

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FORMAL TRANSMITTAL FORM

DOCUMENT TRANSMITTAL

TO:	DATE:
	REFERENCE NUMBER

SENDER:

THE FOLLOWING DOCUMENT(S) IS TRANSMITTED TO YOU FOR: ☐ USE ☐ RECORDS ☐ INFORMATION

TITLE ID NO.	REV. NO	NO. OF COPIES	CONTROLLED NUMBERS	UNCONTROLLED NUMBERS

NOTE:

- ☐ ABOVE DOCUMENT(S)IS TO BE USED FOR WORK PLAN
- ☐ ABOVE DOCUMENT(S) IS RESTRICTED TO USE ONLY FOR WORK PLAN
- ☐ DESTROY PREVIOUS REVISION OF THE ABOVE DOCUMENT(S)
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- ☐ RETAIN PREVIOUS REVISION OF THE ABOVE DOCUMENT(S) FOR YOUR RECORDS.
- ☐ THIS DOCUMENT IS PROPRIETARY INFORMATION
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PLEASE ACKNOWLEDGE RECEIPT OF THE ABOVE DOCUMENT(S) BY SIGNING THIS TRANSMITTAL FORM AND PROMPTLY RETURNING IT TO THE ADDRESS NOTED BELOW IF PREVIOUS REVISION OF THE DOCUMENT(S) IS TO BE DESTROYED. THE FOLLOWING SIGNATURE ALSO CERTIFIES THE DESTRUCTION OF THE DOCUMENT(S).

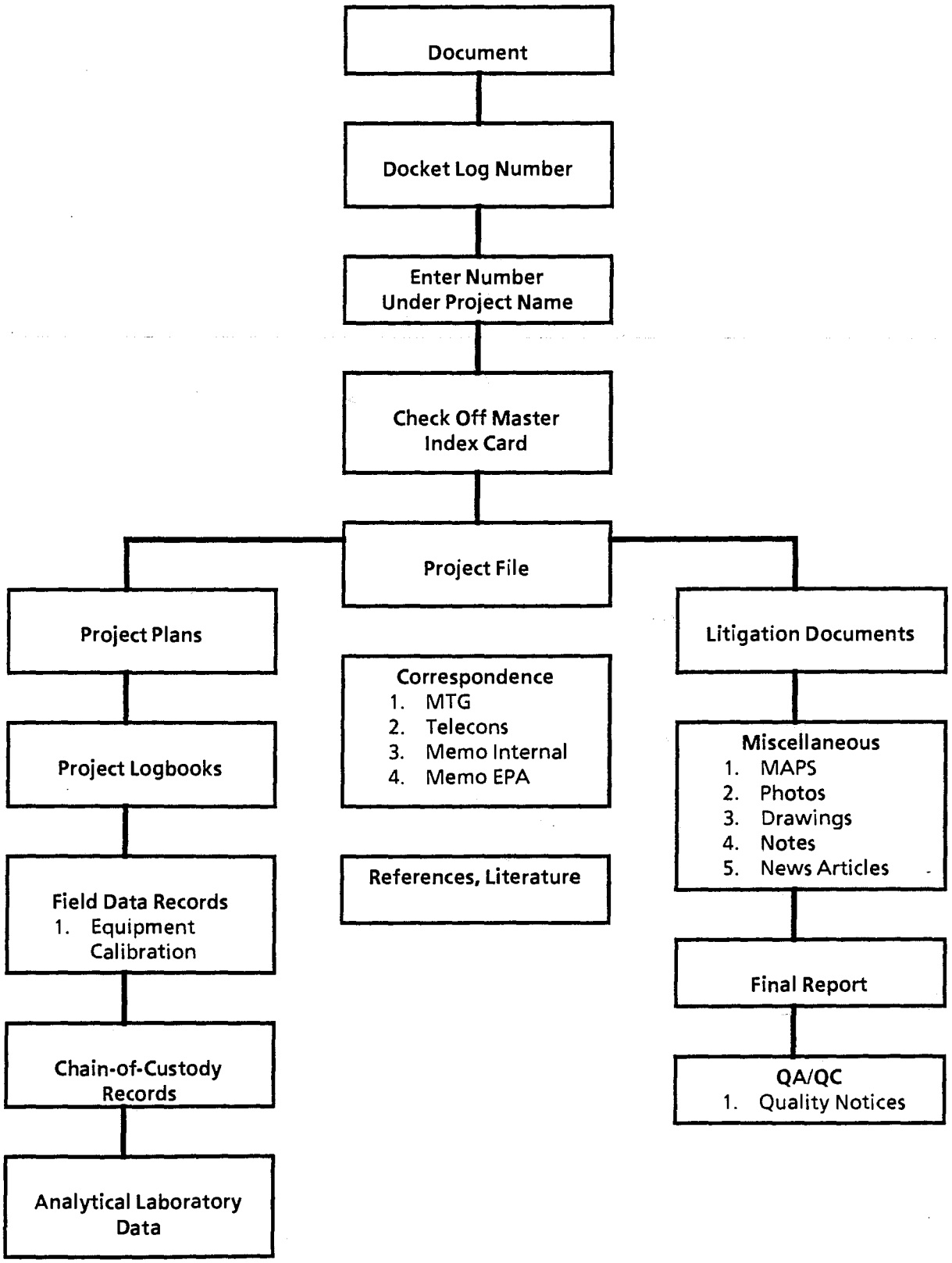
SIGNATURE:	DATE:

SIGNED COPY OF THIS TRANSMITTAL SHOULD BE RETURNED TO:

APPENDIX IV

PROJECT FILE PROCEDURES
AND
INVENTORY FORM

PROJECT FILES PROCEDURES



NAS MEMPHIS
MILLINGTON, TENNESSEE

FILE INVENTORY

SWMU Site Name _____
Job No. _____
TDD No. _____
Date _____

Docket Number	Date of Entry	Title of Document

APPENDIX V

CHAIN-OF-CUSTODY RECORD

NAS MEMPHIS
MILLINGTON, TENNESSEE
CHAIN OF CUSTODY RECORD

SWMU NAME _____

SWMU No. _____

SAMPLE TYPE: WASTES _____ GROUND WATER _____					SAMPLERS: (Signature)			
WELL NO.	SAMPLE NO.	WELL LOCATION	DATE	TIME	SAMPLE TYPE		NO. OF CONTAINERS	ANALYSES REQUIRED
					COMP	GRAB		
					TOTAL NO. OF CONTAINERS			

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIM
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIM
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIM
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIM
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIM
FIELD ANALYSIS PERFORMED BY: (Signature)	DISPATCHED BY: (Signature)	DATE/TIM

METHOD OF SHIPMENT

ADDITIONAL COMMENT/DESCRIPTION OF SAMPLES:

APPENDIX VI

OUTLINE OF THE FILE STRUCTURE

NAS MEMPHIS
MILLINGTON, TENNESSEE
OUTLINE OF THE FILE STRUCTURE

1. **Congressional inquiries/hearings**
   - Correspondence
   - Transcripts
   - Testimony
   - Published hearing records

2. **Remedial Response**
   - Discovery
     - Initial investigation reports
     - Preliminary assessment report
     - Site inspection report
     - Hazardous ranking system
     - Sampling and analysis data

   - Remedial Planning
     - Correspondence
     - Work plans for remedial investigation/feasibility study
     - Remedial investigation/feasibility study reports
     - Health and safety plan
     - Quality assurance/quality control plan

   - Remedial Implementation
     - Remedial design reports
     - Permits
     - Contractor work plans and progress reports
     - Corps of Engineers agreements, reports and correspondence

   - State and Other Agency Coordination
     - Correspondence
     - Cooperative agreement/Superfund State contract
     - State quarterly reports
     - Status of State assurances
     - Interagency agreements
     - Memorandum of Understanding with State

- Community Relations
  - Correspondence
  - Community relations plan
  - List of people to contact, e.g., local officials, civic leaders, environmental groups
  - Meeting summaries
  - Press releases
  - News clippings

3. **Imagery**
   - Photographs
   - Illustrations
   - Other graphics

4. **Enforcement**
   - Status reports
   - Cross-reference to any confidential enforcement files and person to contact
   - Correspondence
   - Administrative orders

5. **Contracts**
   - Site-specific contracts
   - Procurement packages
   - Contract status notifications
   - List of contractors

6. **Financial Transactions**
   - Cross-reference to other financial files and person to contact

APPENDIX VII

RECORD OF COMPUTER SOFTWARE VERIFICATION FORM

NAS MEMPHIS
MILLINGTON, TENNESSEE
RECORD OF COMPUTER SOFTWARE VERIFICATION

DESCRIPTION OF VERIFICATION ACTIVITIES AND FINDINGS (CONT'D):	Page of
VERIFIED BY:	DATE:
ACCEPTED BY (REGIONAL/OFFICE MANAGER):	DATE:
REVIEWED BY CA:	DATE:

NAS MEMPHIS
MILLINGTON, TENNESSEE
RECORD OF COMPUTER SOFTWARE VERIFICATION
(Continued)

RECORD OF COMPUTER SOFTWARE VERIFICATION

SOFTWARE PACKAGE NAME:	PAGE OF
DEVELOPER:	
PROGRAMMER:	
COMPUTER TYPE:	

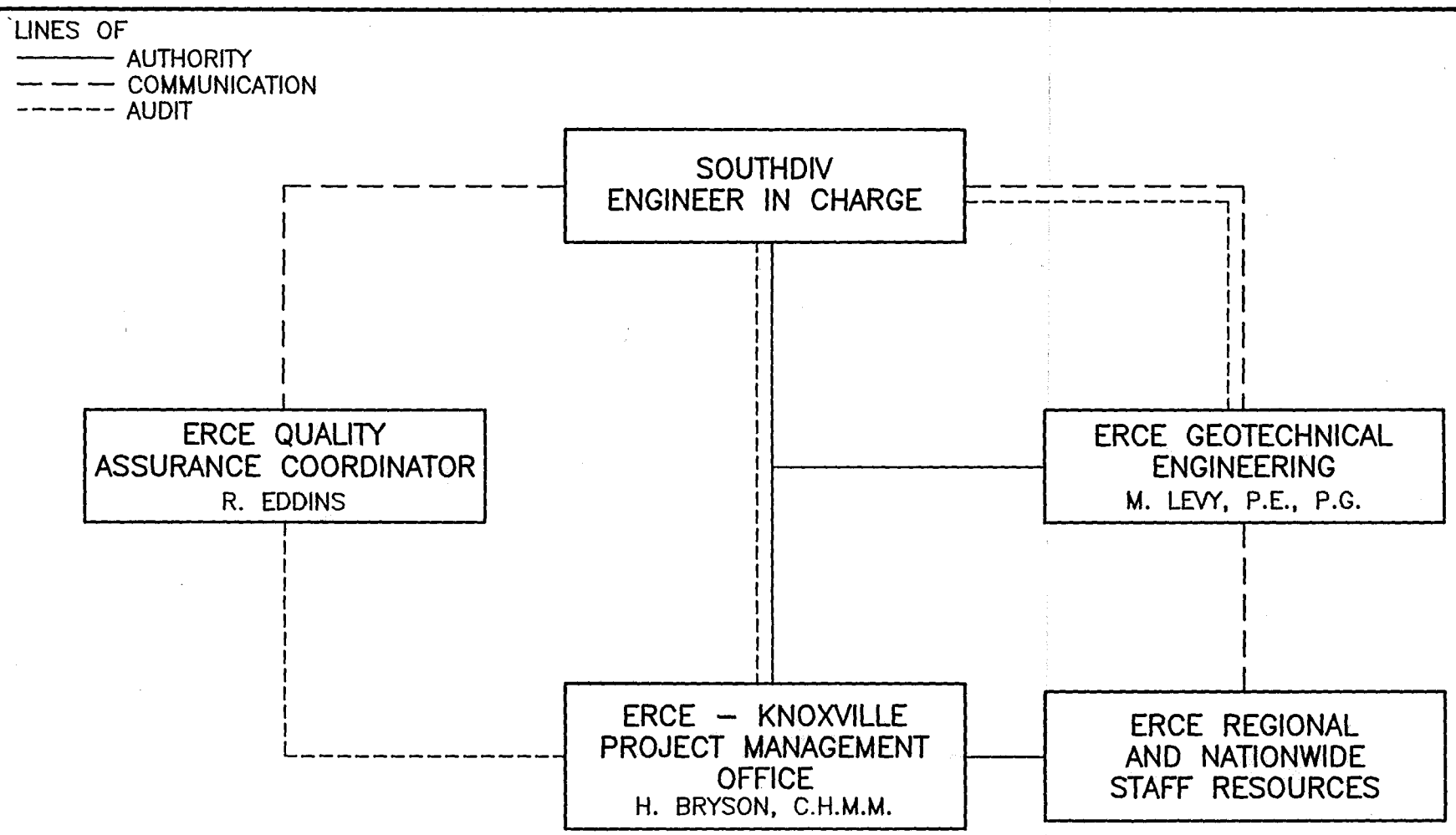
VERIFICATION SCOPE:	PROGRAM USE:
☐ SAMPLE PROBLEM FROM ORIGINATOR ☐ MATHEMATICAL MODELING ☐ COMPLETE ☐ SPOT CHECK ☐ NUMERICAL ANALYSIS ☐ COMPLETE ☐ SPOT CHECK ☐ DATA LIBRARIES USED ☐ COMPLETE ☐ SPOT CHECK ☐ BENCHMARK AGAINST EXISTING PROGRAMS ☐ BENCHMARK AGAINST EXPERIMENTAL RESULTS ☐ BENCHMARK AGAINST HAND CALCULATION(S) ☐ VERIFICATION TESTING PROGRAM	☐ DESIGN ☐ CALCULATIONS ☐ MANAGEMENT INFORMATION ☐ ANALYSIS ☐ OTHER

DESCRIPTION OF VERIFICATION ACTIVITIES AND FINDINGS:

ADOPTED FROM REFERENCE ____.

APPENDIX VIII

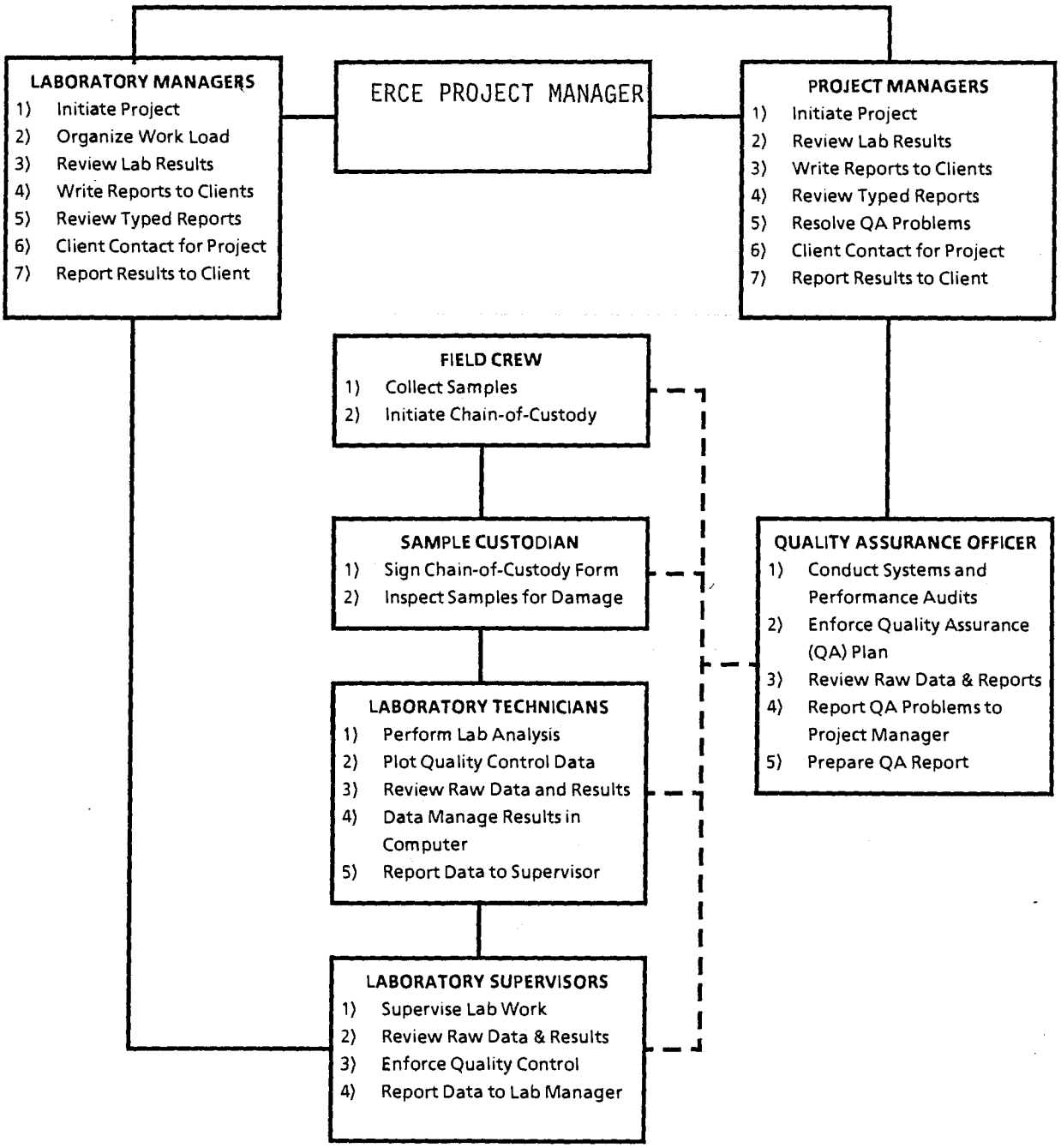
DATA FLOW AND REPORTING SCHEME



PROJECT MANAGEMENT LINES OF AUTHORITY AND COMMUNICATION

ERC Environmental and Energy Services Company

NAS MEMPHIS
MILLINGTON, TENNESSEE
DATA FLOW AND REPORTING SCHEME



Solid Line: Flow of Data and Reporting
Dotted Line: Flow of QA Auditing

APPENDIX IX

SAMPLE LOG SHEET

SWMU NAME:	SAMPLE LOG SHEET

PROJECT SITE NAME:	SWMU NO.	
SOURCE NO.	DATE:	TIME:
SAMPLE NAME:	SAMPLER(S):	
SOURCE: ☐ A. CONTAINER ☐ B. OTHER _____	SIGNATURE(S): ☐ ENVIRONMENTAL SAMPLE ☐ HAZARDOUS SAMPLE	
SOURCE LOCATION:	RADIOACTIVITY (MR/HR):	

SOURCE

A. CONTAINER SOURCE

CONTAINER TYPE:

☐ DRUM
- ☐ BUNG TOP ☐ BOLTED RING
- ☐ LEVER LOCK ☐ OTHER _____

☐ BAG/SACK

☐ TANK

☐ OTHER _____

DISPOSITION OF CONTAINER

☐ CONTAINER SAMPLED

☐ CONTAINER OPENED BUT NOT SAMPLED

REASON _____

CONTAINER DESCRIPTION

COLOR _____

CONDITION _____

MARKINGS _____

_____

VOL OF CONTENTS _____

OTHER _____

B. OTHER SOURCE

TYPE:

☐ WELL ☐ LAKE ☐ LAGOON/POND ☐ SEDIMENT ☐ OTHER

☐ SPRING ☐ STREAM ☐ SOIL ☐ WASTE PILE _____

DESCRIPTION _____

DISPOSITION: ☐ SAMPLE OBTAINED ☐ NOT OBTAINED _____

DESCRIPTION OF SAMPLE

A. CONTAINER SOURCE

	LAYER 1	LAYER 2	LAYER 3
PHASE	☐ SOL ☐ LIQ	☐ SOL ☐ LIQ	☐ SOL ☐ LIQ
COLOR	_____	_____	_____
VISCOSITY	☐ L ☐ M ☐ H	☐ L ☐ M ☐ H	☐ L ☐ M ☐ H
% OF TOTAL VOL	_____	_____	_____
OTHER	_____	_____	_____

TYPE OF SAMPLE: ☐ GRAB ☐ COMPOSITE ☐ GRAB-COMPOSITE

B. OTHER SOURCE

COLOR _____

TURBIDITY ☐ L ☐ M ☐ H

OTHER _____

_____

_____

TOTAL APPROXIMATE VOLUME OF SAMPLE

DISPOSITION OF SAMPLE

☐ FORWARDED TO LAB: TRAFFIC REPORT NOS. _____

DATE: _____ TIME: _____

☐ ANALYZED ON-SITE: PROJECT LOGBOOK PAGE NO. _____

☐ RESULTS FORWARDED TO _____ DATE: _____ TIME: _____

☐ IN STORAGE ON-SITE ☐ OTHER: _____

SKETCH OF SOURCE LOCATION

ADDITIONAL COMMENTS

APPENDIX X

SAMPLE USES OF TABLES AND GRAPHICS

NAS MEMPHIS
MILLINGTON, TENNESSEE
SAMPLE USES OF TABLES AND GRAPHICS

Tabular Displays

1. Display site information and measurements
   - Water table elevations
   - Subsurface stratigraphy
   - Sampling location coordinates
   - Precipitation and temperature data
   - Lists of site fauna and flora species

2. Display analytical data
   - List of contaminants of concern and other monitoring parameters with associated analytical measurements
   - Display sorted results (e.g. by medium, sampling data, soil type)
   - Compare study and background area data
   - Report input data, boundary conditions, and output values from mathematical modeling

Graphical Displays

1. Display site features
   - Layout and topography (equivalent to required RCRA Part B permit application map)
   - Sampling locations and sampling grids
   - Boundaries of sampling area
   - Subsurface stratigraphy (profile, transect or fence diagram)
   - Wind rose
   - Potentiometric contour map
   - Population plot and/or local residential map
   - Features affecting intermedia transport

2. Illustrate the extent of contamination
   - Geographical (areal) extent of contamination
   - Vertical distribution of contaminant(s)
   - Contamination values, averages, or maxima at sampling locations

3. Demonstrate patterns and trends in the data
   - Plot change in concentration with distance from the source
   - Change in concentration with time
   - Display estimates of future contaminant transport derived from modeling

Tables

- Unsorted (raw) data
- Sorted tables

Graphical Formats and Other Visual Displays

- Bar graphs
- Line graphs
- Area or plan Maps
- Isopleth (contour) plots
- Cross-sectional plots, transects, or fence diagrams
- Three dimensional graphs

APPENDIX XI

REMEDIAL INVESTIGATION REPORT FORMAT
AND
FEASIBILITY STUDY REPORT FORMAT

NAS MEMPHIS
MILLINGTON, TENNESSEE
REMEDIAL INVESTIGATION REPORT FORMAT

SWMU SITE:

EXECUTIVE SUMMARY

1.0 INFORMATION

- 1.1 Site Background Information
- 1.2 Nature and Extent of Problem(s)
- 1.3 Remedial Investigation Summary
- 1.4 Overview of Report

2.0 SITE FEATURES INVESTIGATION

- 2.1 Demography
- 2.2 Land Use
- 2.3 Natural Resources
- 2.4 Climatology

3.0 HAZARDOUS SUBSTANCES INVESTIGATION

- 3.1 Waste Types
- 3.2 Waste Component Characteristics and Behavior

4.0 HYDROGEOLOGIC INVESTIGATION

- 4.1 Soils
- 4.2 Geology
- 4.3 Ground Water

5.0 SURFACE-WATER INVESTIGATION

- 5.1 Surface Water
- 5.2 Sediments
- 5.3 Flood Potential
- 5.4 Drainage

6.0 AIR INVESTIGATION

7.0 BIOTA INVESTIGATION

7.1 Flora
7.2 Fauna

8.0 BENCH AND PILOT TESTS

9.0 PUBLIC HEALTH AND ENVIRONMENTAL CONCERNS
9.1 Potential Receptors
9.2 Public Health Impacts
9.3 Environmental Impacts

REFERENCES

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NAS MEMPHIS
MILLINGTON, TENNESSEE
FEASIBILITY STUDY REPORT FORMAT

EXECUTIVE SUMMARY

1.0 INTRODUCTION

- 1.1 Site Background Information
- 1.2 Nature and Extent of Problems
- 1.3 Objectives of Remedial Action

2.0 SCREENING OF REMEDIAL ACTION TECHNOLOGIES

- 2.1 Technical Criteria
- 2.2 Remedial Action Alternatives Developed
- 2.3 Environmental and Public Health Criteria
- 2.4 Other Screening Criteria
- 2.5 Cost Criteria

3.0 REMEDIAL ACTION ALTERNATIVES

- 3.1 Alternative 1 (No Action)
- 3.2 Alternative 2
- •
- •
- •
- 3.N Alternative N

4.0 ANALYSIS OF REMEDIAL ACTION ALTERNATIVES

- 4.1 Non-cost Criteria Analysis
  - 4.1.1 Technical Feasibility
  - 4.1.2 Environmental Evaluation
  - 4.1.3 Institutional Requirements
  - 4.1.4 Public Health Evaluation
- 4.2 Cost Analysis

5.0 SUMMARY OF ALTERNATIVES

6.0 RECOMMENDED REMEDIAL ACTION (optional)

7.0 RESPONSIVENESS SUMMARY (in final version only)

REFERENCES

APPENDICES

FINAL DRAFT

VOLUME V

HEALTH AND SAFETY PLAN

FOR

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

NAS MEMPHIS SITES NO. 1-9

MILLINGTON, TENNESSEE

Prepared For:
Commanding Officer
Attn: (Code 11519)
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
P.O. Box 10068
Charleston, SC 29411-0068

Prepared By:
ERC Environmental and Energy Services Co.
725 Pellissippi Parkway
Knoxville, Tennessee 37933

16 November 1989

ERC/EDGe Project No. B880

FINAL DRAFT

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APPENDIX I - ERC CORPORATE HEALTH AND SAFETY PLAN

APPENDIX II - SITE-SPECIFIC HEALTH AND SAFETY PLAN

1.0 INTRODUCTION

The purpose of this Health and Safety Plan (HSP) is to establish the field health and safety procedures to protect all personnel on site and to ensure that RI/FS activities will not endanger surrounding NAS personnel and property. The HSP includes personnel expected to conduct site work and any needed site-specific safety requirements. The (RI/FS) tasks and field activities will be conducted at the following nine solid waste management unit (SWMU) sites at the Naval Air Station Memphis (NAS Memphis), Millington, Tennessee:

SWMU NO.	SWMU NAME
1	Fire Department Drill Area
2	South-Side Landfill
3	N-121 Plating Shop Dry Well
4	N-121 Plating Shop Storm Sewer
5	Fire-Fighting Training Area
6	N-126 Battery Shop Storm Sewer Ditch
7	N-126 Plating Shop Dry Well
8	Cemetery Disposal Area
9	Sewage Lagoons

The Naval Installation Restoration Program (IRP) was established in 1983 to direct the investigation and remediation of uncontrolled hazardous waste disposal sites associated with naval activities. In accordance with the Defense Environmental Restoration Program (DERP) and the National Contingency Plan (NCP), the Naval IRP is currently being implemented in full compliance with statutory requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA/SARA specifies that inclusion of all applicable or relevant and appropriate requirements in particular, the Resource Conservation and Recovery Act of 1976

(RCRA) and the Hazardous and Solid Waste Amendments of 1984 (HSWA) be made. The Naval IRP also incorporates compliance with other laws and regulations. This HSP also follow the requirements of 20 CFR 1910.120 (1) (1) and (1)(2).

This Plan is subject to evaluation and periodic updates as phases of the RI/FS are implemented.

2.0 HEALTH AND SAFETY

The nine SWMU sites subject to the RI/FS are suspected of containing hazardous wastes. Whether or not the nature of the hazards is known, the proper safety and health precautions are control elements for ensuring protection of personnel during field study activities. The EIC, consulting engineer and subcontracting personnel should undertake responsibility in assuring that on-site investigations and associated testing are accomplished with the highest level of worker safety.

2.1 CORPORATE HEALTH AND SAFETY PLAN

One copy of the ERC Environmental and Energy Company corporate Health and Safety Plan is included as Appendix I. This plan provides an insight to the firm's safety and health qualifications, and specialized training.

2.2 RESPONSIBILITY

The ERCE as prime contractor for the on-site investigations has primary responsibility of protecting the safety and health of all personnel on the work site and ensuring that on-site RI/FS activities do not endanger surrounding personnel and/or property and that contamination encountered at the site does not contaminate other areas. ERCE personnel are responsible for strict adherence to applicable federal (29 CFR 1910, and 29 CFT 1926) and Tennessee occupational safety and health regulations. The ERCE Project Manager will designate a health and safety contact on-site to ensure that the field investigation task is accomplished in compliance with pertinent promulgated standards and regulations and to ensure conformance with health and safety plans approved by the Navy. ERCE is responsible for coordinating emergency assistance with all non-Navy organizations included in the contingency plan. The ERCE and its subcontractors will supply the required equipment for performance of all RI/FS tasks in a safe and healthful manner on-site.

2.3 QUALIFICATIONS

The designated ERCE health and safety contact, Ms. Denise Daggett, oversees all work performed at the NAS Memphis sites. MS. Daggett is a Certified Industrial Hygienist (CIH), who has an educational background and experience level in the health science and occupational safety, has received adequate formal health and safety training specific to the hazardous of the work. The qualifications of the designated health and safety contact and all training records will be provided to the Navy prior to the field study.

3.0 SITE SPECIFIC HEALTH AND SAFETY PLANS

The site-specific HSPs were developed by Environmental and Safety Designs, Inc., (EnSafe), Memphis, Tennessee, in conjunction with the RI/FS Work Plans and supporting documents for the field investigations and related testing studies. They are intended to present site specific procedures such as: site boundaries, personal protective equipment, safety inspections, contingencies in case of emergency, etc. The site-specific HSPs for SWMU sites No. 1-9 are included as Appendix II and supporting documents.

4.0 RECORD KEEPING

The HSP describes how the ERCE will maintain records of each health and safety related matter that occurs during the course of the study. This includes field analytical data collected using field instrumentation (i.e., HNU, OVA), employee health monitoring data, health and safety planning documentation and contingency plan communications and contacts. The ERCE Project Manager will provide the SOUTHDIV EIC monthly updates on the health and safety program as part of the monthly work progress report.

APPENDIX I

ERC CORPORATE HEALTH AND SAFETY PLAN

Prepared By:
ERC Environmental and Energy Services Co.
5510 Morehouse Drive
San Diego, California 92121

April 1989

Revision 0

ERC ENVIRONMENTAL AND ENERGY SERVICES CO.
SITE CORPORATE HEALTH & SAFETY PROGRAM

Prepared by: D.L. Daggett, CIH
April 1989

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A	Applicable Standards and Regulations
B	ERCE Medical Surveillance Program
C	ERCE Respiratory Protection Standard Operating Procedure

PREFACE

ERCE Environmental and Energy Services Co. (ERCE) has established this Corporate Health and Safety Program in accordance with its policy to provide ERCE employees with a safe and healthful working environment. For personnel who participate in field assignments that involve hazardous materials/wastes, protection from adverse health effects or injuries is provided through the implementation of the procedures contained in this document.

The key to successful implementation of this Site Corporate Health and Safety Program is a shared management-employee responsibility for all health and safety matters. Although ERCE management is committed to maintaining the safest possible work conditions, it is vital that employees accept the responsibility to protect themselves while involved in site work assignments. This responsibility includes becoming familiar and complying with all ERCE health and safety procedures, and being actively involved with procedural improvements.

SECTION 1
INTRODUCTION

ERCE personnel must work periodically on contaminated sites where there is a potential for a variety of hazardous situations, including exposure to hazardous waste in soil, water, air, and/or groundwater. The potential health and safety hazards to ERCE employees in these situations depend upon the nature and extent of the contamination, chemical and physical stresses, and the characteristics of the site. All ERCE staff participating in such site work, therefore, must receive health and safety training to enable them to recognize the hazards at each site, follow standard procedures and guidelines for dealing with each hazard and use appropriate protective equipment when working in hazardous areas.

This ERCE Site Health and Safety Program outlines and describes the means by which ERCE provides protection for its employees. It includes provisions for management of the program, employee training, medical surveillance, personal protective equipment, personal and area monitoring, emergency response, Hazard Communication Program and accident prevention. It also includes guidelines for developing a site Health and Safety Plan (HSP).

Both management and staff have responsibilities for implementing proper health and safety procedures during incineration site work. ERCE has a legal and moral responsibility to provide a safe and healthful workplace for its employees. Each employee, in turn, is responsible for following the established procedures for his/her own personal protection and also the protection of co-workers.

The ERCE Site Corporate Health and Safety Program complies with all the current safety and health regulations, including:

OSHA 29CF1910.120: Hazardous Waste Operations and Emergency Response.
OSHA 29CFR1910, General Industry Standards.
OSHA 29CFR1926, Construction Industry Standards.

A list of other applicable federal and state standards is presented in Appendix A.

SECTION 2

HEALTH AND SAFETY PROGRAM MANAGEMENT AND RESPONSIBILITIES

2.1 INTRODUCTION

The goal of the ERCE Corporate Site Health and Safety Program is the prevention of occupationally related accidents and illnesses.

Accordingly, it is ERCE policy to:

- Provide safe working conditions.
- Conduct all company operations within the guidelines of established health and safety practices.
- Comply with all government regulations related to employee health and safety.
- Maintain high standards in the areas of industrial health, environmental protection and safety.

To carry out this policy, ERCE has established the health and safety management structure. The key person in this structure is the ERCE Certified Industrial Hygienist, who is responsible for the overall direction and management of the program. Site Health and Safety Officers and Assistants will be assigned to individual projects or locations. The number and type of health and safety personnel for a given site will be based upon project size, operation scope, and the particular health and safety training requirements relative to the proposed site.

The duties and responsibilities of each position in the site health and safety organization are discussed in the following sections.

2.2 CERTIFIED INDUSTRIAL HYGIENIST

The Certified Industrial Hygienist (CIH) designated for site work shall be certified in comprehensive practice by the American Board of Industrial Hygiene (ABIH) with a

minimum of three years of experience in hazardous waste projects. The CIH shall have a working knowledge of the regulations for worker safety and health and environmental protection. The CIH provides guidance and technical support to the Health and Safety Officer. Any major site health and safety difficulty or injury/accident must be reported by the site Health and Safety Officer to the CIH. The CIH will be onsite on an as needed basis.

2.3 Health and Safety Officer

ERCE shall provide the services of a Health and Safety Officer (HSO) for site projects. The HSO shall have, at a minimum, two years of hazardous waste experience, working knowledge of state and federal occupational safety and health regulations, and training in health and safety. The HSO shall be certified in CPR and first aid. The HSO will be on site on a day-to-day basis to implement the ERCE Health and Safety Program. The HSO will be responsible for the control of specific field operations and all related activities such as personnel decontamination, worker monitoring, distribution of protective equipment, documentation/recordkeeping, and adherence with all procedures outlined in the HSP.

2.4 Health and Safety Assistant

At some large sites, a Health and Safety Officer Assistant (HSOA) may be designated. The HSOA can act for the HSO at the HSO's direction. This individual will be required to support the HSO when multiple operations are conducted that require monitoring and HSO supervision. The HSOA prime responsibility would be to accompany field sampling teams, and to provide the appropriate monitoring to ensure the safe conduct of field operations. Continuous communications access with the command post will be available to the HSOA. In times of emergency the HSOA will support the HSO and CIH and will assist with the responses and recovery resources he/she can initiate immediately and effectively.

2.5 Medical Consultant

ERCE shall provide the services of a medical consultant who is a physician board certified in Occupational Medicine. The physician shall have extensive experience in the occupational health area and be familiar with site hazards and remedial action projects. The physician will work very closely with the ERCE CIH to anticipate and prevent occupational

illness. Physicals required for the project work will be conducted under the supervision of the Occupational Physician, but can actually be performed by a designated physician in the vicinity of the sites.

SECTION 3
SITE HAZARDS ASSESSMENT

3.1 INTRODUCTION

ERCE site work can pose a variety of health and safety concerns, some of which could possibly result in serious injury or death. Certain hazards are a function of the physical and chemical nature of the site itself, while others are a direct consequence of the work being performed. Hazards to ERCE personnel are likely to fall in the following categories:

- Chemical exposure
- Fire and explosion
- Physical safety hazards
- Electrical hazards
- Noise
- Heat stress
- Cold exposure
- Biological hazards
- Oxygen deficiency

The following sections present a general overview of the categories listed above. Not all of these hazards are typically encountered a a single site, but they are described here for informational purposes. Hazards are specifically addressed in the HSP of each project.

3.2 SITE HAZARDS

- <u>Chemical Exposure</u>

Field operations may present exposure potential to toxic gases, vapors, liquids, and solid materials. These substances can enter the unprotected human body by inhalation, direct skin contact, ingestion, or through a puncture wound (injection) whereupon they may cause a variety of toxic effects, depending on the chemical.

Some chemical exposure effects, such a burning eyes, coughing, nausea, and skin rashes, may become obvious during or shortly after an exposure. These effects are termed "acute." These effects may be temporary and reversible., or they may be more serious and cause

permanent disability or death. Some chemicals can cause permanent health damage without any short-term warning signs. This is particularly true for repeated exposures to low levels of very toxic chemicals. These "chronic" health effects, such as cancer, liver damage, or respiratory disease, may not manifest themselves for several years or even decades after exposure. The susceptibility of an individual to adverse health effects from chemical exposure may be influenced by a number of personal factors, including smoking, alcohol consumption, mediation medication use, nutrition, age, sex, fitness, and genetic predisposition.

The primary exposure route of concern on ERCE project sites is inhalation. With a surface area of 70 to 100 m^2, the lungs are extremely vulnerable to chemical agents. Even substances that do not directly affect the lungs may pass through the lung tissue into the bloodstream, where they are transported to other portions of the body where they can manifest "systemic" effects. Toxic chemicals present in the atmosphere are frequently not detected by human senses, i.e., they may be colorless, odorless, and their toxic effects may not produce any immediate symptoms. Respiratory protection is therefore extremely important if there is a possibility that the work site atmosphere may contain hazardous substances.

Direct contact of the skin and eyes by gaseous, liquid, or solid substances is another important route of exposure. Some chemicals directly injure the skin. This "local" effect is true of strong acids and bases and many organic chemicals which defat the skin. Some pass through the skin into the bloodstream where they are transported to vulnerable organs. Skin absorption is enhanced by abrasions, cuts, heat, and moisture. The eye is particularly vulnerable because airborne chemicals can dissolve onto its moist surface and be carried to the rest of the body through the blood stream (capillaries are very close to the surface of the eye). To protect against dermal and eye contact, employees must wear protective clothing, gloves, goggles, and faceshields. The proper selection of protective material with low permeability to hazardous substances is essential when contact with highly contaminated materials may occur. Using gloves or clothing of inappropriate material may actually increase dermal absorption by trapping the liquid between the skin and the protective material. Under most circumstances, lightweight disposable gloves and clothing will be suitable for low hazard situations. The HSP will address specific requirements.

Although ingestion should be the least significant route of exposure at an ERCE site, it may occur if standard operating procedures are not observed. Deliberate ingestion of chemicals

is unlikely, however, prohibited personal habits such as chewing gum or tobacco, drinking, eating, and smoking cigarettes in contaminated site areas provide a route of entry for chemicals.

The last primary route of chemical exposure is injection, whereby chemicals are introduced into the body through puncture wounds. Examples are a worker stepping on a contaminated nail or receiving a deep laceration while being splashed by a hazardous liquid.

One protective control measure against chemical injection via the foot is to have workers wear boots with steel toes and shanks. Another means of protection is to guard against trips, falls, etc. Avoidance of physical hazards and common sense precautions are equally important protective measures.

- Fire and Explosion

The most common fires and explosion incidents arise at sites from activities such as moving drums, accidentally mixing incompatible chemicals, or introducing an ignition source into an explosive or flammable environment. At site operations, explosions and fires not only pose the obvious hazard of intense heat, open flame, smoke inhalation, and flying objects, but may also cause the release of toxic chemicals into the environment such as dioxin or cyanide. To protect against fire and explosion, the HSO will monitor, as required, for dangerous atmospheres. Efforts will be made to keep all potential ignition sources away from flammable or explosive environments, to use non-sparking, explosion-proof equipment, and follow safe practices when performing tasks that might result in the release of toxic vapors.

All the necessary fire suppression equipment on all ERCE sites will be available with personnel trained to put out incipient fires. Fires or explosions of any greater magnitude will result in the notification of the local fire department and emergency response unit.

- Physical Safety Hazards

ERCE is aware that work at hazardous waste sites can pose safety hazards. Efforts will be made through training to inform personnel that they should be aware of potential site hazards (ditches, uneven terrain, etc.), and should immediately inform their supervisor or

the HSO of any new hazards so that corrective action can be taken quickly to eliminate the safety problem.

Many site job activities pose unique safety hazards, such as: hot surface, rotating machinery, the potential for falling or dropped objects, and excessive weight loads. ERCE is familiar with these safety hazards and has instituted policies and procedures that assist in minimizing injury. At a minimum, all ERCE personnel onsite are required to wear hard hats, safety glasses and steel-toed safety shoes/boots. Applicable OSHA and EPA signs are posted warning of potential hazards at all ERCE sites.

Some protective equipment can impair a worker's agility, hearing, and vision, thus increasing the chance of an accident. Physical hazards can injure workers directly. Injuries can also create additional danger by increasing chemical exposure due to broken skin or damaged protective equipment. Site personnel should be constantly on the lookout for potential safety hazards, and should immediately inform the ERCE HSO.

Electrical Hazards

Electrical equipment used onsite may pose electrical hazards to workers resulting in shock or electrocution. To help minimize this hazard, low-voltage equipment with ground-fault interrupters and water-tight corrosion resistant connecting cables will be used onsite. In addition, at certain times of the year lightning may pose a hazard, especially to personnel handling metal drums or equipment. To minimize this hazard, weather conditions will be monitored and work will be suspended during electrical storms.

Noise

Site activities in proximity to construction and large equipment often exposes workers to excessive noise. The effects of this noise can be:

- Psychological effects: workers being startled, annoyed, or distracted.
- Physiological effects: pain, temporary and/or permanent hearing loss, reduced muscular control (when exposure is severe).

- Communication interference: increase in potential hazard due to the inability to warn of danger or properly issue instructions.

It is anticipated that situations may arise when ERCE personnel may be exposed to noise levels in excess of 85 dBA, 8 hour time-weighted average (TWA). An example of this possibility could be when ERCE personnel have to work in close proximity to the subcontractor using heavy equipment to excavate the site. If excessive noise levels occur, efforts will be made to control the noise through administrative and engineering controls. If monitoring reveals noise exposure in excess of 85 dBA 8-hour TWA, a hearing conservation program will be initiated by the CIH and/or the HSO.

- Heat Stress

Heat stress is a major hazard for workers wearing fully or partially encapsulating protective clothing. The same protective materials that shield the body from chemical exposure prevent heat and moisture from dissipating. Personal protective clothing can therefore rapidly create a hazardous condition. Depending on the ambient temperature and the work being performed, heat stress can occur very rapidly—within as little as 15 minutes. It can pose as great a danger to worker health as chemical exposure. In its early stages, heat stress causes discomfort and drowsiness, resulting in impaired functional ability that threatens the safety of both the individual and his/her co-workers. Continued heat stress can lead to heat stroke and death. When the ambient temperature exceeds 70°F, the HSO must carefully select appropriate personnel protective equipment, monitor personnel wearing protective clothing, judiciously schedule work and rest periods, and assure that personnel frequently replace fluids (with water or juices) to protect against this hazard.

- Cold Exposure

At certain times of the year, site work will have to continue during times when the ambient temperature and the wind chill factor could be very low. To prevent hypothermia and frostbite, the staff will be trained to wear appropriate clothing. Shelter, carefully scheduled work/rest periods, drinking warm sweet drinks and soup, and monitoring of the staffs' physical condition will help to prevent injury.

- Biological Hazards

Due to the site locations and terrain, there is a possibility of biological hazards arising from poisonous plants, insects, and reptiles. The ERCE staff will be trained to identify and avoid potentially hazardous plants, and animals. Site first aid stations will be equipped to respond to minor bites, stings, or scratches. Any worker with a major injury will be stabilized and transported to the contracting medical facility.

- Oxygen Deficiency

The oxygen content of normal air at sea level is 21 percent. Physiological effects of oxygen deficiency become apparent when the oxygen concentration decreases to 16 percent. The effects include: impaired attention, judgement and coordination, and increased respiration and heart rate. Lower oxygen levels result in nausea and vomiting, brain damage, heart damage, unconsciousness, and death. To take into account individual physiological responses and errors in measurement, a concentration of 19.5 percent oxygen or lower is considered to be oxygen deficient. The minimum acceptable oxygen content for compressed breathing air is 19.5 percent by volume.

Oxygen deficiency may result from the displacement of oxygen by another gas, or the consumption of oxygen by a chemical or physical reaction. Confined spaces or low-lying areas in the presence of large solvent or gas sources are particularly vulnerable to oxygen deficiency. Health and safety site personnel must monitor oxygen levels and implement use of NIOSH-approved supplied-air respiratory equipment or ventilation techniques when needed to assure protection from oxygen deficiency.

3.3 Monitoring to Evaluate Hazards

Prior to beginning work at any ERCE project site, a thorough evaluation of the potential hazards must be made. This hazards information forms the core of the HSP. The first step in this evaluation is the collection of available data regarding potential health and safety hazards of the site. These data may take the form of conversations with individuals knowledgeable with the site, previous investigation reports, health and safety survey data, or historical information about former site operations and waste disposal practices. If the available information is insufficient to prepare the site HSP, then a walk-through site survey may have to be conducted by ERCE health and safety personnel.

Preliminary Survey

The objective of the preliminary site survey is to determine the presence of conditions that could result in health and safety hazards to personnel during the site investigation. The survey team may need to utilize a variety of sampling and direct reading instruments to monitor for hazardous conditions. Direct reading instruments normally available to ERCE personnel include combustible gas indicators/oxygen meters, colorimetric indicator tubes, and organic vapor monitors.

Based on the survey team's knowledge of the site, it is vital to select appropriate personal protective equipment for the survey.

Instrument readings should be taken in all potential work areas and at locations of special interest. Appropriate documentation should be made of each location where readings exceed background. In addition, visual observations and any odors detected should also be noted. Sufficient data must be obtained to determine the levels of personnel protection needed during the subsequent field work and to establish hazardous (i.e., restricted) zones at the site.

Periodic Monitoring

Air monitoring should be conducted at the start of the site investigation and periodically during the work to delineate areas where protection is needed, to ensure that the level of protection in use is appropriate, and to evaluate changes in site conditions. Monitoring is especially warranted when work begins on a different part of the site, a new operation is initiated, or different contaminants are encountered. In addition to change in work activities, a number of other variables present significant challenges to the task of accurately and safely assessing airborne contaminants. These include parameters such as temperature, wind speed and direction, weather conditions, humidity, and fluctuating contaminant releases.

It is very important that monitoring instruments be operated by ERCE employees who have been thoroughly trained in use and who understand the limitations of the instruments. The HSP will address specific monitoring requirements.

Personal Monitoring

Due to the fact that ERCE personnel will be involved primarily in the activities associated with site evaluation, ERCE Health and Safety professionals have determined that personal monitoring, along with perimeter monitoring for environmental purposes will frequently constitute the ERCE Health and Safety Monitoring Program.

In the practice of Industrial Hygiene, it is important to evaluate a workplace for hazards so that control measures can be developed to reduce the likelihood of adverse health effects. Evaluation is best accomplished by monitoring the air surrounding a worker, either by a personal sampling device placed on the worker in his/her breathing zone, or monitoring the immediate work area for representative sampling. Data derived from personal monitoring can alert health professionals to overexposures and allow for rapid remediation of the situation. OSHA requires that workers be monitored whenever exposure concentrations are unknown. Air monitoring can also build a historical record of exposure and the opportunity to pick up on trends.

ERCE has extensive experience with monitoring workers for numerous air contaminants. All worker monitoring is accomplished by following the respective NIOSH Air Monitoring Method (or equivalent) for the contaminants of interest.

The major drawback to personal monitoring is the time it takes to obtain analytical results. ERCE site plans allow for the fastest turnaround time for results as possible. For quality control purposes, a subset of samples will be sent offsite to an American Industrial Hygiene Association (AIHA) accredited laboratory for analysis.

Perimeter Monitoring

Fixed location monitoring at the perimeter, where personal protective equipment is no longer required, measures contaminant migration away from the site and will enable the HSO to evaluate the integrity of the site clean areas. Since the fixed location samples may reflect exposures either upwind or downwind from the site, wind speed and direction data will be recorded to aid in interpreting the sample results.

Immediately Dangerous to Life or Health (IDLH) and Dangerous Conditions Monitoring

ERCE will be prepared to respond to potentially IDLH conditions or dangerous atmospheres with direct reading instruments such as a combustion meter, direct reading colorimetric indicator tubes, organic vapor analyzers and an oxygen meter in case of an emergency. All the instruments will be operated by an experienced individual and will be calibrated and maintained to be ready for use.

Recordkeeping

All monitoring data, observations and results will be recorded either in notebooks or on prepared sampling data sheets. The name and signature of the sampler must appear, along with the area description or worker's name and identification if applicable, as well as the date, equipment description, observations and atmospheric information for the monitoring situations. Calibration and maintenance records will be kept on file onsite and will be regularly updated.

SECTION 4
TRAINING REQUIREMENTS

4.1 INTRODUCTION

It is of utmost importance that anyone who enters a hazardous waste site must recognize and understand the potential hazards to health and safety associated with the cleanup of that site. This awareness is promoted by an effective training program. ERCE has had extensive experience training and preparing their staff for site investigations. The ERCE training curriculum is comprehensive covering Hazard Communication, toxicology, industrial hygiene, monitoring equipment, medical aspects, control measures, decontamination, the regulatory context, and emergency response. No employee, contractor, or subcontractor is allowed onsite without the level of training that is appropriate for their work tasks. Visitors to the sites will receive adequate training on hazard recognition and the procedures necessary for safe conduct during a visit.

The objectives of a training program for ERCE employees involved in hazardous field work are:

- To ensure that workers are aware of the potential hazards they may encounter.
- To provide the knowledge and skills necessary to perform the work with minimal risk to worker health and safety.
- To ensure compliance with all occupational and environmental health and safety laws, regulations, and guidelines.
- To enhance the ability of field personnel to react responsibly, safely, and quickly to emergency situations.

4.2 BASIC SITE TRAINING REQUIREMENTS

OSHA regulations for hazardous waste workers require that all employees at the time of job assignment receive a minimum of 40 hours of initial offsite instruction, and a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor. The training consists of both classroom and "hands-on" practice and drills.

An 8-hour refresher course must be attended annually. The table provided below outlines the topics of training:

Training Topic	Subject Matter
Hazard Communication	Hazard recognition—OSHA Title 29
Toxicology	Doses, routes of exposure, IDLH, LD_{50}, PELs
Industrial Hygiene	Basic concepts Selection of PPE Exposure evaluation, control measures
Monitoring Equipment	Functions, uses, selection, limitations
Site Safety Plan	Safe practices, safety briefings, site map, standard operating procedures
Standard Operating Procedures	Hands-on practice Development and compliance
Engineering Controls	Ventilation, isolation, distance
Personal Protective Clothing and Equipment	Fitting, Maintenance, uses, limitations, hands-on Selection Ergonomics
Medical Program	Monitoring, first aid, stress recognition Advanced first aid Planning, design, implementation
Decontamination	Hands-on simulated Design and maintenance
Legal and Regulatory	Safety and health regulations
Emergency Contingency	Help and rescue, drills Response, followup, documentation

On-site management and supervisors directly responsible for or who supervise employee engaged in hazardous waste operations shall receive the 40-hour basic training plus at least 8 additional hours of specialized training on managing such operations at the time of job assignment.

4.3 VISITORS

Visitors to the sites will receive a briefing on safety at the time of arrival. Written health and safety site information sheets will assist in this orientation task. Visitors must read and sign the information sheet as well as be given the opportunity to ask questions and receive

adequate answers. Every effort will be made to allow visitors to observe the site work, but only from clean areas unless otherwise prearranged.

4.4 DOCUMENTATION OF TRAINING

Attendance rosters will be retained for each training class taught. This information may also be maintained on electronic database. Completed and corrected exams that are administered will be maintained in each employee's contractor, or subcontractor personnel file. The exams confirm that every person assigned to a task has had adequate training for that task, and that the training is up-to-date. A certificate is issued to each attendee upon successful completion of each course. Copies of the certificates are maintained in each employee's personnel or health and safety file.

Signed visitor briefing sheets will also be maintained and available on each ERCE site for inspection.

SECTION 5
MEDICAL SURVEILLANCE PROGRAM

5.1 INTRODUCTION

The ERCE Medical Surveillance Program was specifically designed for the protection of the employee health for those involved with the handling of hazardous waste. The document is stand alone and is included in Appendix B.

SECTION 6
PERSONAL PROTECTIVE CONTROL MEASURES

6.1 INTRODUCTION

In the practice of industrial hygiene, it is important to attempt to control worker exposure to hazardous materials by first engineering and administrative measures. The use of personal protective equipment (PPE) should always be a last resort for exposure control because of the physiological and sometimes psychological stresses that the equipment places on the wearer. Even though site work does not lend itself easily to the use and cost of engineering controls, ERCE makes every effort to incorporate its knowledge and experience in this field to create a safe and healthful worksite.

In the instances of emergencies or when engineering and administrative control measures are not feasible, personal protective equipment will be utilized to protect the workers.

6.2 PPE PROCEDURE DEVELOPMENT

A written PPE procedure will be established for the site work and part of the HSP. The purpose of any PPE procedure should be to protect the wearer from safety and health hazards, and to prevent injury to the wearer from incorrect use and/or malfunction of the PPE. To effectively accomplish these goals, the procedure will be integrated into the ERCE medical monitoring; Hazard Communication and PPE training; personal and environmental air monitoring; and selection, use, maintenance and decontamination of PPE.

6.3 SELECTION OF PPE

ERCE personnel involved in hazardous work must be protected against potential hazards they may encounter. The purpose of personal protective clothing and equipment is to shield or isolate individuals from the chemical and physical hazards presented by a particular work environment. Careful selection of PPE should protect the:

- Respiratory system.
- Skin and body.
- Eyes and face.
- Hands and arms.
- Head.
- Ears (hearing).
- Feet.

ERCE Health and Safety Officers and supervisors have the responsibility to:

- Identify the types of task in which protective clothing and/or equipment are required.

- Specify the types of protective clothing and equipment necessary to ensure employee health and safety on specific work sites.

- Provide training in the proper use of protective clothing and equipment.

- Provide required protective clothing and equipment for all employees.

- Ensure that all required protective clothing and equipment are actually used by employees.

- Arrange for proper maintenance, decontamination, storage, and issuance of all required personal protective equipment.

The selection of appropriate personal protective clothing and equipment can be a fairly simple task if the expected site hazards are minimal, or it can be a more difficult task when a complex array of hazards and site conditions are evident. The ERCE CIH should be consulted if there are any questions regarding proper PPE selection. The following factors must be considered when choosing an ensemble of protective items:

- Chemical or physical agents present.

- Contaminant concentrations.

- Dose-response relationships.
- Permissible exposure limits (threshold limit values, ceiling limits, and short-term exposure limits).
- Odor threshold.
- Skin absorption.
- Task to be performed and duration.
- Worker proximity to zones of contamination.
- Accident/major injury potential.
- Level of site activity.
- Route of exposure.
- Physical properties of contaminants.
- Atmospheric dispersion characteristics.

Ensembles of protective clothing and equipment for uncontrolled hazardous waste site work have been formulated by the U.S. EPA, Office of Emergency and Remedial Response. These levels indicate the degree of protection recommended for generalized categories of hazardous environments:

Level A - Highest level of respiratory, skin, eye, and mucous membrane protection. Generally used where extremely hazardous substances are known to be present in high atmospheric concentrations and where Level B splash gear does not offer adequate protection against any dermally-active substances present or where materials and concentrations are unknown.

Level B - Highest level of respiratory protection but a lesser level of skin and eye protection. Generally used in those situations where the chemical is

known, the atmosphere is oxygen deficient, no IDLH* concentrations of substances which can injure or be absorbed through the skin are present, or where dermal contact with hazardous substances is unlikely. This level of protection is normally the minimum used for initial response or reconnaissance, unless the respiratory hazards allow a lesser level of respiratory protection than a self-contained breathing apparatus.

Level C - Generally composed of splash gear and an air-purifying respirator. Provides adequate protection when the type of airborne substance is known, its concentrations measured, the criteria for using air-purifying respirators are met and skin exposure is unlikely. Use of this level of protection requires continuing measurement of air contaminants to ensure that IDLH concentrations do not exist and that the concentrations of the contaminants present do not exceed the service limits of the respirators.

Level D - Primarily a work uniform. Should not be worn in any hazardous environment. It is used when there is no indication of hazardous conditions and the work function precludes contact with any hazardous substance.

The equipment requirements of these levels of protection are summarized below:

- Level A

  - Self-contained breathing apparatus (SCBA), pressure-demand.
  - Chemical-resistant gloves.
  - Fully encapsulating chemical suit.
  - Chemical-resistant safety boots.
  - Hard hat.
  - Disposable boot covers (optional).

* IDLH—Immediately dangerous to life or health.

choice and use of protective garments, however, the final decision to use particular garments will be made after each project has been carefully examined, the operating plan reviewed and the costs considered. The exact definition of the protective gear required for each job task will be outlined in the ERCE HSP.

Consideration must be given for the heat stress that may be experienced by some of the site workers during the course of the project activities. Nonporous protective garments can contribute significantly to inability to dissipate body heat which may enhance the potentially dangerous conditions of heat stress and heat stroke. Cooling garments will be available as necessary and used onsite for personnel who will be required to work in nonporous PPE for any extended length of time.

3. Hand Protection

Double gloving is required for all job tasks where contact with the contaminated wastes could be possible. The first glove a worker puts on is a glove that essentially aids in reducing contamination during PPE doffing or equipment failure. The over-glove will be chemical resistant to the material to be handled.

4. Head Protection

As required by OSHA, all site personnel and visitors will be required to wear a hard hat safety helmet in all areas except the inside labs, eating areas, and any trailers.

5. Eye and Face Protection

Safety glasses are required to be worn at all times by a site worker or visitor except inside the support facilities.

Face shields and goggles are required eye protection whenever splash or projectiles hazards are present. The CIH or HSO will define the work situations where this type of eye protection is required.

6. Foot Protection

Safety boots made of chemical resistant material with steel toes, shank, and insoles are required by all site workers.

Disposable boot covers are often used to protect the leather safety boots from contamination.

7. Hearing Protection

Whenever possible, noise shall be reduced to a level which does not require hearing protection. When this is not possible, approved ear muffs (preferred) or ear plugs shall be used whenever levels exceed 85 dBA. A hearing conservation program must be instituted and adhered to when noise levels exceed 85 dBA.

The type of equipment used and the overall level of protection will be reevaluated periodically by the CIH, HSO, and medical consultant. As information increases about the site from monitoring and from worker experience, the decision to upgrade or downgrade the level of protective equipment required will be made.

6.4 USE OF PPE

Safe use of PPE by ERCE employees requires that they receive training in the proper use and maintenance of each item (including the item's capabilities and limitations), the consequences of not using the PPE, and instruction in inspecting, donning, checking, fitting, using, and doffing each item. This training is included as part of the overall ERCE Health and Safety Training Program and is also provided at work sites by the HSO.

Reuse of chemical-protective clothing will be permitted only if the article is non-porous and has been thoroughly decontaminated and the possibility of chemicals diffusing through to the inside surface is small. ERCE personnel will also use disposable items which can be disposed of after a single use or at the end of the work day. These items include gloves, coveralls, shoe covers, and respirator cartridges. Chemical-resistant boots, "splash" suits,

and certain special use gloves are examples of items where reuse must be based on their condition after use.

New and reusable PPE must be properly stored to prevent damage from heat, dust, moisture, sunlight, and chemicals. All PPE for ERCE personnel will be stored at a suitable location. Each ERCE field staff member should have a designated location to store personal gear, such as hard hat, respirator, boots, safety glasses, etc.

Respiratory Protection Program

The purpose of this program is to establish a Standard Operating Procedure (SOP) for use of respirators to be followed by all ERCE employees engaged in hazardous field work. This program has been developed to comply with OSHA 29CFR1910.134, Cal/OSHA GISO 5144 and the American National Standards Institute (ANSI) Standard Z88.2, "Practices for Respiratory Protection," (1980 Revision). ERCE will provide employees with all necessary equipment for proper respiratory protection. ERCE will only provide equipment approved by NIOSH/MSHA and employees will use only the equipment provided by the company.

The SOP for respiratory protection covers information needed by ERCE employees to properly protect themselves from airborne hazards in areas where they are required to work. The SOP addresses:

- Administration of the program.
- Medical examinations for employees who are required to use respiratory protection.
- Training of employees on the selection, wearing, and maintenance of equipment.
- Selection of proper respiratory protection equipment.
- Fit testing of employees.
- Assignment of respirators/facepieces.

- Inspection and maintenance.
- Cleaning and disinfection.
- Storage of respiratory protection equipment.
- Surveillance of working conditions.
- Reevaluation and supervision of the respiratory protection program to assure its effectiveness.

The SOP is an integral part of the ERCE Corporate Health and Safety Program. Many aspects of the SOP are directly connected to portions of the medical surveillance and training documents. The Respiratory Protection SOP is presented as Appendix C.

SECTION 7
SAFETY HAZARD AND EMERGENCY RESPONSE CONTROLS

7.1 INTRODUCTION

General site safety procedures and guidelines are intended to protect ERCE field personnel from physical injury that are essentially unrelated to the health hazards found at a site. These general safety and emergency hazards may include falls, electrical shock, cuts from sharp objects, injury from rotating or moving machinery, and fire or explosion. Safety requirements range from compliance with OSHA standards to the use of common sense. The following sections outline ERCE's general safety and emergency response control program for site projects.

7.2 ACCIDENT PREVENTION PROGRAM

ERCE's accident prevention program consists of the following elements:

- Training: All ERCE site personnel will receive training to recognize site safety hazards and incorporate procedures and work habits to prevent accidents.

- Safety Meetings: Periodic onsite safety meetings will be held to review the HSP and discuss any safety concerns.

- Inspections: The HSO will inspect each work site on a daily basis for any deficiencies in fulfilling the requirements of the HSP, OSHA regulations, and standard safe operating practices for onsite equipment.

- Reporting: Any individual observing a work site safety hazard should immediately notify the HSO or the Site Supervisor, who will then take appropriate action to correct the situation.

- Warning Signs: Whenever appropriate, warning signs will be posted to alert site personnel to the location of specific hazards or to areas where personnel should use special caution.

- Housekeeping: The HSO will ensure that good housekeeping practices are utilized, including storage of equipment and materials, waste disposal, and maintaining access clearances.

The integration of all of these preventive measures into the work activities at each site will result in minimizing the safety risks to ERCE employees and allow ERCE to achieve its goal of no lost worktime due to job related injuries or illnesses.

7.3 SPECIFIC HAZARDS

A number of safety hazards are likely to be common to many ERCE project sites. A summary of these is presented below along with general safety precaution guidance.

Electrical

ERCE personnel may use electrical equipment such as power tools, generators, steam cleaners, lights, and testing equipment at project sites. Precautions for safe use of electrical equipment in the field include:

- Electrical installations must be grounded.

- Ground-fault interrupters must be used whenever outdoor power cords are utilized, unless an assured equipment ground conductor program is places.

- A portable or vehicle-mounted generator need not be grounded if it energizes only attached equipment or if its receptacles grounding terminals are bonded to the vehicle frame, the generator and plugged-in equipment.

- The safe distance required from overhead powerlines that are energized between 600 and 50,000 volts is 10 feet.

- Electrical equipment and wiring must be protected from accidental contact (live parts), mechanical damage, and environmental deterioration.

Confined Spaces

Work in confined spaces requires special precautions because of the possibility of encountering life-threatening conditions (lack of oxygen, explosive accumulations of vapors, and acutely hazardous concentrations of gases and vapors). A confined space is defined as one which by design has limited openings for entry and exit, unfavorable natural ventilation which could produce dangerous air contaminants, and which is not intended for continuous employee occupancy. Confined spaces include storage tanks, pits, silos, sewers, tunnels, underground utility, and pipelines.

7.4 FIRE PROTECTION

The recognition and elimination of fire hazards is accomplished by identification of potential fire hazards, good housekeeping procedures, and adherence to proper work practices in potentially explosive or combustible atmospheres.

Employee emergency fire training includes:

- Recognition of fire hazards, including thermal decomposition by-products.
- Elimination of fire hazards.
- Use of fire extinguishers.
- Reporting of fire hazards.
- Fire alarm procedures.
- Fire protection equipment.

Fire prevention and alerting procedures are contained in the HSP. In addition to training, the emergency response section includes:

- Control of all flammable materials at, or brought to, the site (solvents, fuels, cleaners, etc.) by confirming them to a designated area when not in use.

- A no smoking policy on all hazardous materials/waste sites.
- Complying with policies for hot work (welding, cutting, soldering, etc.).
- Complying with procedures for safe use of flammable and combustible materials.
- Monitoring for combustion/explosion hazard where such vapors may accumulate.
- Establishing a contingency plan for personnel when a fire alarm is sounded.

Employees will immediately report all fires to the HSO or the nearest supervisor, who will then alert the fire department nearest the work site area. Within the limits of personal safety, employees will assist in personnel evacuation and control the fire to the best of their abilities until the arrival of the fire department or emergency personnel.

Employees will also assist the fire department by providing information relevant to:

- Trapped persons.
- Chemicals involved.
- Potential explosion risks.
- Emergency action taken prior to fire department arrival.
- Any possible unusual aspect of fire area that may affect fire fighting operations.

ERCE will maintain fire extinguishers at any work site. These may be supplied by subcontractors. Fire extinguishers must be kept fully charged and must be inspected and maintained on a regular basis. They must be kept within 50 feet of relevant work areas.

7.5 FIRST AID/CPR

ERCE requires that all personnel assigned to site work complete comprehensive and approved first aid and CPR courses. Records of completed courses are kept on file.

Only trained personnel shall give first aid and attempt to stabilize an individual needing medical assistance. Life support techniques such as CPR and treatment of life threatening problems such as major bleeding, airway maintenance, and shock shall be given top priority. Professional medical assistance shall be obtained at the earliest possible opportunity.

In an emergency involving personal injury occurs, the HSO and emergency response team shall follow these steps:

- Remove the exposed or injured person(s) from immediate danger.
- Render first aid if necessary. Decontaminate affected personnel after critical first aid is given.
- For major injuries, obtain paramedic services or ambulance transport to the local hospital. This procedure shall be followed even if there is no visible injury (suspect serious internal injuries). For minor injuries, transport person to the nearest clinic or emergency room.
- Other personnel in the work area shall be evacuated to a safe distance until the HSO determines that it is safe for work to resume. If there is any doubt regarding the condition of the area, work shall not commence until all hazard control issues are resolved.
- At the earliest time practicable, the HSO shall contact the CIH and the Project Manager, or their designees, giving details of the incident, and the steps taken to prevent its recurrence.
- A written report of the incident shall be forwarded to the CIH and the Project Manager, or their designees, giving details of the incident, and the steps taken to prevent its recurrence.

Onsite first aid/emergency equipment for each field site will include (at a minimum):

- A construction first aid kit.
- Fire blanket.
- Emergency eye wash.

Additional equipment, depending on site characteristics and the number of personnel, includes:

- Additional first aid kits.
- Additional eye wash stations.
- Stretcher.
- Portable emergency shower.
- Additional fire blankets.

SECTION 8
SITE SAFETY PLAN DEVELOPMENT

8.1 INTRODUCTION

A written HSP must be prepared and approved before ERCE employees may begin field work at any project site involving hazardous substances. The HSP describe specific procedures to be implemented to protect workers at the site (ERCE employees and subcontractors) from the health and safety hazards they may encounter. The development of a written plan helps ensure that all health and safety aspects of the site investigation are thoroughly examined prior to the start of work. Provisions are made for modification of the plan as the project evolves.

The HSP is prepared by the health and safety staff with primary input from the Project Manager and selected input from the other technical experts. Each plan must be approved by the Project Manager and the CIH, or designee before it can be implemented. It is important for the person(s) responsible for preparation of the HSP be involved in the project and begin discussions with the Project Manager and CIHas early as possible in the planning stage.

Each HSP should:

- Identify the key personnel and alternates responsible to site health and safety.
- Describe the site, the work activities, and the expected hazards associated with each operation.
- Describe any site-specific training that must be provided to the investigation team members.
- Describe any site-specific medical monitoring requirements.
- Describe the PPE to be used by personnel during various site operations.
- Describe the program for periodic air monitoring, personnel exposure monitoring, and environmental sampling, if needed.
- Describe the actions to be taken to mitigate existing hazards (e.g., engineering controls or containment of contaminated materials) to make the work environment less hazardous.
- Define site control measures (access restrictions) and provide a site map.
- Define decontamination procedures for personnel and equipment.

- Define the site's Standard Operating Procedures (e.g., certain work procedures, respirator fit testing).
- Establish a contingency plan for site emergencies, including telephone numbers for emergency services and a map outlining the route to the nearest hospital.

The following sections provide guidelines for developing each element of the HSP as described above. A generic table of contents is presented in Table 8-1.

8.2 Offsite Emergency Contacts

A listing of all appropriate emergency telephone numbers, contact names (and addresses if necessary) should be located at the front of the plan for ready access. A copy of this list should be posted next to each site telephones. A copy of the plan should be posted at the site at an appropriate location that is made known to all ERCE site personnel.

Emergency contacts should include ambulance/paramedic services, local hospital (or industrial clinic) emergency room, fire department, police department, and poison control center. A number for a chemical hazard information service, such as CHEMTREC (a 24-hour service), should also be included. The names and telephone numbers for ERCE personnel who must be contacted in the event of an emergency should be listed.

In addition, a map which clearly outlines the shortest route to the nearest emergency medical facility should accompany the telephone list.

8.3 Key Health and Safety Personnel

This section should delineate the persons with responsibility for health and safety at the site and their alternates. Their duties and authorities should be described, and the chain of command should be made clear.

8.4 Site Characteristics

Characteristics of the site that should be described include its location (one or more maps are recommended) and its physical layout. Of special importance are those characteristics that may have a bearing on health and safety. It may also be useful to provide a brief

Table 8-1

ERC ENVIRONMENTAL AND ENERGY SERVICES COMPANY HEALTH AND SAFETY PLAN

TABLE OF CONTENTS

Section	Title
I.	General Information
II.	Health and Safety Personnel Designations
III.	Site Description
IV.	Waste Description/Characterization
V.	Hazard Assessment
VI.	Training Requirements
VII.	Medical Requirements
VIII.	Personnel Protection Control Measures
IX.	Zones, Personnel and Communications
X.	Monitoring Procedures for Site Operations
XI.	Decontamination Procedures and Release Criteria
XII.	Disposal Procedures
XIII.	Safe Work Practices
XIV.	Emergency Plan
XV.	Standard Operating Procedures
XVI.	Illumination
XVII.	Sanitation
XVIII.	Authorizations
XIX.	Forms
XX.	Approvals

history of the site if it contains information that sheds light on existing contamination problems.

8.5 Hazard Evaluation

An assessment of the nature and extent of chemical and physical hazards anticipated at the site is provided in this section. It includes a description of each hazard, its physical form, its amount or concentration, likely location where it exists onsite, and information on toxicity or degree of hazard that it presents.

This section also describe the work tasks that are to be performed during the site investigation and how they coincide with the hazards previously outlined. It is important to understand the relationship between work activities and site hazards in order to prescribe necessary PPE and establish restricted zones at the site. Any restricted areas of the site that can be determined prior to the site investigation should be clearly described in this section of the plan.

Finally, a summation of the health and safety concerns should be provided that indicates the priorities for attention of both the technical and the health and safety personnel who will be onsite.

8.6 Training

Requirements for onsite training of site personnel should be outlined in this section. The discussion should include site-specific procedures with which ERCE personnel are not thoroughly familiar and a brief outline of standard topics which will be reviewed with the site investigation team prior to the start of work.

8.7 Medical Monitoring

This section describes any site-specific medical surveillance requirements. At some sites it may be prudent to prescribe biological monitoring tests before and after the site investigation. If such additional tests are not required and the standard ERCE medical surveillance program requirements are adequate, then it should be so stated in the plan.

8.8 PERSONNEL PROTECTIVE EQUIPMENT

This section describes the protective clothing and equipment to be worn by ERCE personnel during various site operations. It clearly states what PPE to be worn and presents the criteria for upgrading and downgrading the protective requirements (only the CIH or HSO can authorize a change in the PPE requirements stated in the HSP). Information on limitations (if any) of the PPE should be provided, as well as site-specific instructions regarding its use.

Standard operating procedures for PPE use should be included in this section, or referenced and appended to the plan.

First aid and other safety/emergency equipment that will be available onsite should be listed and the locations where the equipment will be kept should be described.

8.9 ZONES, PERSONNEL AND COMMUNICATIONS

Establishing methods to restrict access to the site or the hazardous areas of the site is necessary to minimize the potential of harm to site workers and the public. This includes a means for monitoring the movements of personnel and equipment in and out of the site and established restricted areas. In addition, work zones should be designated around each hazardous area. The innermost zone should contain the area of contamination. It is followed by a zone where decontamination takes place. Beyond the decontamination zone is the "clean" zone (or support zone) where workers are not likely to encounter any hazards. This three zone model can be adapted with as many subzones as necessary to meet operational and safety objectives. Control points should be established so that site personnel cross the zones at the minimum number of locations (preferably one).

ERCE personnel must also establish access restrictions. In most cases, general site security will be the responsibility of ERCE or a project partner.

8.10 SITE HAZARD MONITORING

The instrumentations and procedures that will be used by the HSO to monitor the hazards to site personnel are to be included in this section. Instructions for instrument calibration

and operation should be provided, including the instrument response criteria that will be used to make health and safety decisions in the field.

8.11 DECONTAMINATION

Decontamination procedures must be established at every ERCE work site. These procedures should describe:

- The number and location of decontamination stations, and the equipment required for each.
- Decontamination methods.
- Methods for disposing of clothing and equipment that cannot be reused.
- Personnel who are required to assist in the decontamination process (at each station) and the protection they must wear.

Procedures for decontaminating any equipment or vehicles that are used in the restricted zones must also be described. Methods for assessing the effectiveness of the decontamination procedure should also be provided.

Contaminated wastes (e.g., disposable PPE) must be properly disposed of and the procedures for doing so must be included in the HSP. These wastes include spent solutions and wash water from a decontamination station.

8.12 SAMPLE HANDLING AND DISPOSAL

The HSP should include procedures for handling, storing, shipping and disposal of contaminated samples. These standard procedures should comply with federal and state regulations for transporting hazardous materials/wastes.

8.13 WORK PRACTICES

Standard work practices that should be included in the HSP may be standing "dos and don'ts" that apply to every site (e.g., no smoking, eating, or drinking in a restricted zone), procedures for using special tools and equipment, or site-specific work procedures that are designed to minimize exposure of personnel or spread of contaminants. A listing of prohibited practices should be posted at the site or at each contaminated zone if the

prohibitions are different. Site personnel should be thoroughly familiar with the standard site work practices. Daily or periodic safety meetings are appropriate times to discuss these practices.

8.14 Contingency Plan for Emergencies

The contingency plan sets forth policies and procedures for responding to site emergencies. This plan is necessary because site personnel must be prepared to take immediate, decisive action when an emergency occurs, and equipment must be on hand and in good working order. To allow for quick reference and inspection, the contingency plan should be a separate section of the HSP.

The contingency plan should contain the following elements:

- Names of site personnel who are designated for emergency response and their roles, including lines of authority.
- Communication procedures (e.g., emergency horns and hand signals).
- Training.
- Site control, security, and evacuation routes.
- Decontamination stations.
- Medical/first aid procedures.
- Emergency response equipment.
- Standard response procedures.
- Reporting and documentation of incidents.

The complexity of the contingency plan varies with the characteristics of the site and the size of the site team.

8.15 Standard Operating Procedures

A number of operating procedures are common to every hazardous site, with slight modification to make them site-specific. These include procedures for decontamination, site personnel and vehicle traffic controls, site security, work practices, and waste disposal. A discussion of each should be incorporated in the HSP.

8.16 ILLUMINATION

Work areas must be lighted to the minimum illumination intensities as listed below:

General site areas	5 ft-candles
Excavation and waste areas	3 ft-candles
General shops	10 ft-candles
First aid stations/infirmaries and offices	30-ft candles

All wiring for temporary lighting, if required, must conform to the requirements of OSHA 29 CFR 1910 Subpart S.

8.17 SANITATION

Potable Water

An adequate supply of potable water must be provided. Drinking water containers must be marked as such and not used for any other purpose. A sanitary supply of single use cups and a receptacle for used cups must be provided.

Nonpotable Water

If nonpotable water sources are located onsite, they shall be clearly identified as unsuitable for drinking, washing, or cooking.

Washing Facilities

Adequate washing facilities should be provided in near proximity to the work site and/or at decontamination stations. In the absence of onsite facilities, employees should wash with soap and warm water as soon as possible after leaving a site.

APPENDIX A

APPLICABLE STANDARDS AND REGULATIONS

APPENDIX A
APPLICABLE STANDARDS AND REGULATIONS

Prescribed Standards

The ERCE CIH will ensure compliance with all federal, state, and local standards, as well as the requirements which ERCE clients may set for all onsite contractors. The ERCE CIH will assure that the most stringent standard is adopted.

Recommended Guidelines

Recommended guidelines are those which the ERCE CIH shall consider for guidance in addition to the prescribed standards. These may be chosen by the CIH over the prescribed standards if they offer greater protection to ERCE employees.

HAZARDOUS OR TOXIC SUBSTANCES

Prescribed Standards

- Toxic and Hazardous Substances (OSHA 29CFR1910, Subpart Z).
- Control of Hazardous Substances - Group 16, Article 107 (GISO). Dusts, Fumes, Mists, Vapors, and Gases (GISO 5139-5155).
- Hot, Flammable, Poisonous, Corrosive, and Irritant Substances - Group 16, Article 109 (GISO 5160-5185).
- Special Hazardous Substances and Processes - Group 16, Article 110 (GISO 5194-5229).

Recommended Guidelines

- Occupational Health Guidelines for Chemical Hazards (NIOSH/OSHA).
- Threshold Limit Value for Chemical Substances and Physical Agents in the Work Environment (ACGIH) published yearly.

- NIOSH Criteria Documents.

- Hygienic Guide Series (AIHA).

NOISE

- Occupational Noise Exposure (OSHA 29CFR1910.95).

- Noise Control Safety orders - Group 15, Article 105, Standards for Occupational Noise Exposure (GISO 5095-5099) (CSO 1521).

Recommended Guidelines

- Industrial Noise Manual (AIHA).
- Guide for Conversation of Hearing and Noise Control (AAOO).

Prescribed Standards

- Ventilation (OSHA 29CFR1910.94).
- Confined Spaces - Group 16, Article 108 (GISO 5156-5159).
- Flammable Vapors (GISO 5416).

Recommended Guidelines

- Working in Confined Spaces (NIOSH Criteria Document, 1979).
- Industrial Ventilation Manual (ACGIH).

PERSONAL PROTECTIVE EQUIPMENT
(INCLUDES RESPIRATORY PROTECTION)

Prescribed Standards

- Personal Protective Equipment (OSHA 29CFR1910, Subpart I).
- Respiratory Protective Equipment (GISO 5144) (CSO 1531).

- Personal Safety Devices and Safeguards - Article 10 (GISO 3380-3400).
- Personal Protective Equipment (CSO 1515-1522).

Recommended Guidelines

- Guidelines for the Selection of Chemical Protective Clothing (ACGIH).
- A Guide to Industrial Respiratory Protection (NIOSH).
- Personal Protection Equipment for Hazardous Materials Incidents; A Selection Guide (NIOSH).

TRAINING AND RECORDKEEPING

Prescribed Standards

- Hazardous Waste Operations and Emergency Response (OSHA 29CFR1910.120).
- Material Safety Data Sheets (GISO 5194).
- Access to Employee Exposure and Medical Records (GISO 3204).
- Accident Prevention Program (GISO 3203) (CSO 1509).

GENERAL SAFETY

Prescribed Standards

- Safe Practices and Personal Protection; Miscellaneous Safe Practices - Article 7 (GISO 3300-3339).
- Personal Safety Devices and Safeguards - Article 10 (GISO 3380-3400).
- Accident Prevention Program and Safety Precautions (CSO 1509-1511).

- Housekeeping Requirements (CSO 1513, 1549).

- Excavations, Trenches, Earthwork (CSO 1540-1547).

Recommended Guidelines

- Supervisors Safety Manual (NSC).
- Data Sheet Series (NSC).

HAZARDOUS MATERIALS HANDLING

Prescribed Standards

- Flammable Liquids, Gases, and Vapors - Articles 134 and 135 (GISO 5415-5420).

- Department of Transportation Hazardous Material Regulations (49 CFR).

- Protection of the Environment, Resource Conservation, and Recovery Regulation (49CFR).

FIRE PROTECTION

Prescribed Standards

- Fire Protection - Group 27 (GSIO 6150-6183).
- Fire Protection, Prevention, and Fighting (CSO 1920-1922).
- Flammable/Combustible Liquids (OSHA 29CFR1910.106).
- Flammable/Combustible Liquids (GISO 5416-5417).
- Portable Fire Extinguishers (OSHA 29CFR1910.157).
- Fire Extinguishers (CSO 1594).
- National Fire Codes (NFPA).

Recommended Guidelines

- Handbook of Fire Protection (NFPA).
- Fire Prevention Code (AIA).
- Fire Protection Guide on Hazardous Materials (NPFA).

Prescribed Standards

- Hazardous Waste Operations and Emergency Response (OSHA 29CFR1910.120).
- Access to Employee Exposure and Medical Records (GISO 3204).
- Medical Records (OSHA 29CFR1910.20).
- Recording of Illness and Injury (OSHA Form 200).
- Medical Services and First Aid (GISO 3400) (CSO 1512).
- Respiratory Protective Equipment (GISO 5144).

MISCELLANEOUS REGULATIONS

The following prescribed standards may be applicable depending upon the scope of activities at the work site:

- Sanitation (OSHA 29CFR1910.141).
- Accident Prevention Signs and Tags (OSHA 29CFR1910.145).
- Electrical Safety (OSHA 29CFR1910, Subpart S).
- Excavating (OSHA 29CFR1926.651).
- Trenching (OSHA 29CFR1926.652).
- Rollover Protection for Materials Handling Equipment (OSHA 29CFR1926.1000-1003).

APPENDIX B

ERC ENVIRONMENTAL AND ENERGY SERVICES CO. MEDICAL SURVEILLANCE PROGRAM

APPENDIX C

ERC ENVIRONMENTAL AND ENERGY SERVICES CO.
RESPIRATORY PROTECTION PROGRAM
STANDARD OPERATING PROCEDURE

APPENDIX II

SITE-SPECIFIC HEALTH AND SAFETY PLAN

APPENDIX II

SITE-SPECIFIC HEALTH AND SAFETY PLANS

FOR

NAS MEMPHIS SITES NO. 1-9

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

Prepared By:
Environmental Safety Designs, Inc.
5705 Stage Road, Suite 212
Memphis, Tennessee 38184-1315

HEALTH & SAFETY PLAN
FOR THE
FIRE DEPARTMENT DRILL AREA
NAVAL AIR STATION, MEMPHIS TENNESSEE

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

prepared by
Environmental & Safety Designs, Inc.
Memphis, Tennessee

August, 1989

1.0 INTRODUCTION

The following is the Health and Safety Plan for the of the Remedial Investigation/Feasibility Study for the Fire Department Drill Area, NAS Memphis, Tennessee. This Plan is submitted in accordance with the provisions of Department of the Navy Contract N62467-88-C-0198, soil and/or groundwater contamination investigations. The investigation is being conducted to determine the extent, if any, of contamination in soils, subsoils and groundwaters at the fire department drill area, NAS Memphis, Tennessee.

2.0 APPLICABILITY

The provisions of the plan are mandatory for all onsite personnel engaged in hazardous waste operations who will be exposed or have the potential to be exposed to onsite hazardous substances. All personnel will operate in accordance with the most current requirements of 29 CFR 1910.120, Standards for Hazardous Waste Workers and Emergency Responders. These regulations include the following provisions for employees exposed to hazardous substances, health hazards or safety hazards: training as described in 120(e), medical surveillance as described in 120(f), and personal protective equipment described in 120(g).

3.0 SITE CHARACTERIZATION

3.1 SITE CONTROL

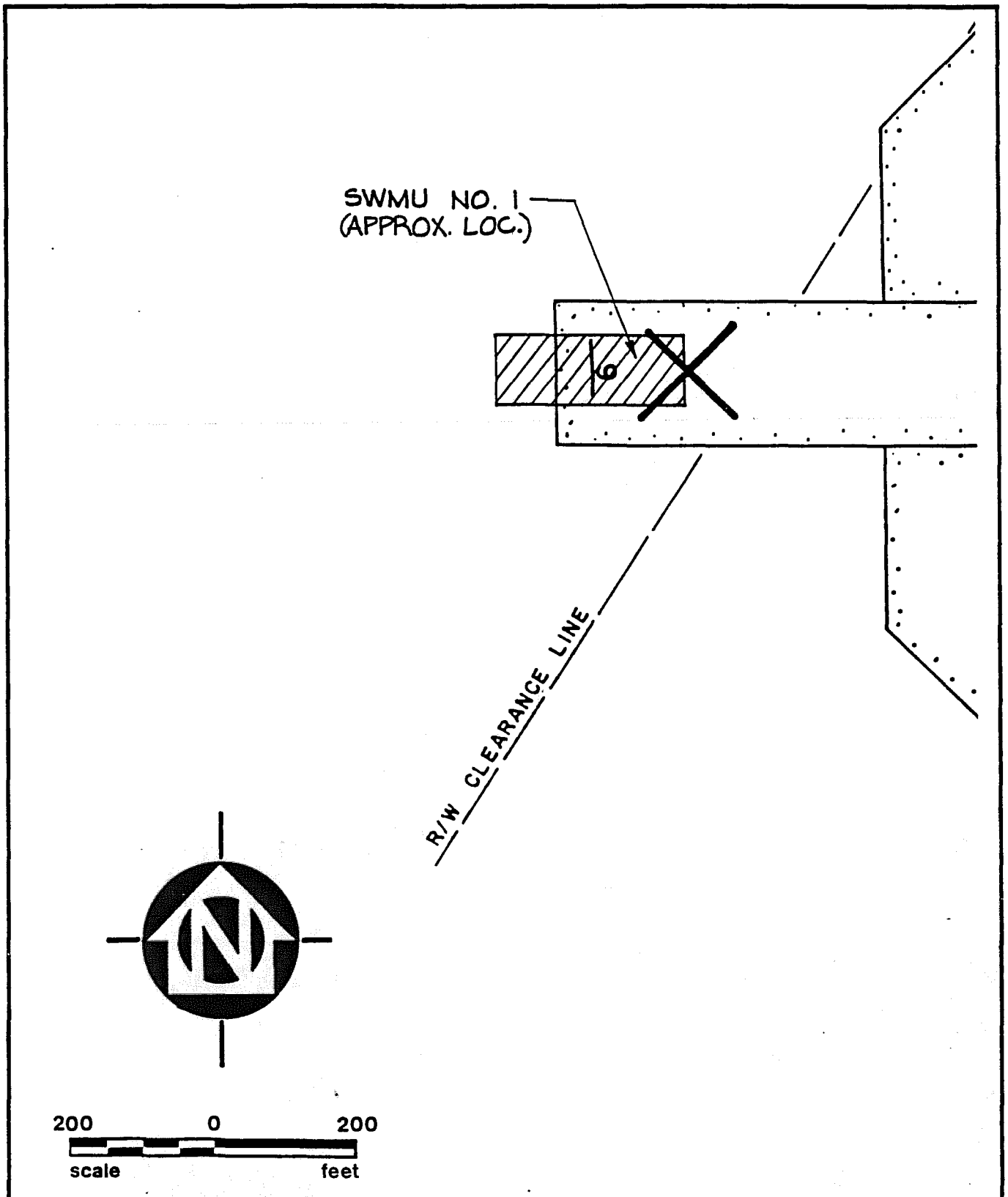
A forty foot perimeter will be established around each work zone and marked with hazard tape. Only authorized personnel with 40 hours health and safety training meeting the requirements of OSHA 29 CFR 1910.120 are permitted within the marked area.

3.2 WORK ZONES

Site activity will be restricted to the fire department drill area, NAS Memphis. See Figure 1.

4.0 SITE ACTIVITIES

The activities to be performed during the investigation will be surface sediment sampling and subsurface soil borings.



Environmental and Safety Designs, Inc.

EN SAFE®

5705 STAGE RD. MEMPHIS, TN. 38134 ☎(901)372-7962

FIGURE 1
FIRE DEPARTMENT DRILL AREA LOCATION MAP

5.0 HAZARD EVALUATION

This is a preliminary site assessment to determine the extent of air, direct contact or surface water impacts. According to Department of the Navy information, prior to 1981, waste solvents were mixed with waste fuels and burned during training. The waste solvents known to have been used at NAS Memphis were petroleum naphtha, xylene, methyl ethyl ketone, toluene and benzene. The waste fuel may have also contained lead, cadmium, chromium and PCBs.

6.0 EMPLOYEE PROTECTION

Employee protection for this project includes standard safe work practices personal protective equipment, procedures and equipment for extreme weather conditions, work limitations and exposure evaluation.

6.1 STANDARD SAFE WORK PRACTICES

Standard safe work practices that will be followed include:

- Eating, drinking, chewing gum or tobacco, smoking or any activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the Site Health and Safety Officer.
- Hands and face must be thoroughly washed upon leaving the work area.
- Contact lenses shall not be worn on site.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate or discolored surfaces; or lean, sit or place equipment on drums, containers or on soil suspected of being contaminated.
- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on cleanup or response operations where the potential for absorption, inhalation or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverages shall not be consumed during site operations.

6.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Field activities will be initiated in Level D protection. Level D Protection consists of one piece chemically-resistant suit (optional), hard hat, gloves and boots. This level of protection was chosen because of the volatile nature of most of the constituents concerned, it is anticipated that any escape of contaminants to the air would have occurred immediately following the release and little or no residual will be present at this time. If field conditions indicate a higher level of contamination than anticipated, field activities will be halted, and a reassessment of the field program will be conducted. The reassessment will include the type of PPE recommended for field activities. If higher levels are necessary, they will be selected based on the contaminants and concentrations. Any adjustments in field procedures as a result of a reassessment will result in an amendment to this health and safety plan.

Criteria for selection of LEVEL C PPE

1. Oxygen level is at least 19.5%
2. Total unknown organic vapor levels exceed 1-5 ppm above background.
3. Doubt exists about the air quality, therefore preventing the use of Level D PPE.
4. Level A or B PPE is not indicated.

Level C PPE consists of full-face piece, air-purifying cartridge-equipped respirator. Cartridges used must be approved by MSHA and/or NIOSH for the hazards encountered. Because of the types of suspected contaminents on the site, a combination organic vapor/high efficiency particulate cartridge is recommended. Additionally, chemical-resistant clothing, chemical-resistant gloves (inner and outer), steel toe and shank boots and hard hat are required.

6.3 PROCEDURES AND EQUIPMENT FOR EXTREME WEATHER CONDITIONS

Field activities for this site are scheduled to take place during the fall winter. Therefore, heat stress and cold exposure will be of concern for the health and safety personnel. Adverse weather conditions are important considerations in planning and conducting site operations. Extremes in hot and cold weather can cause physical discomfort, loss of efficiency and personal injury.

6.3.1 Heat Stress

Heat stress can result when the protective clothing decreases natural body ventilation even when temperatures are moderate. Working under various levels of personal protection may require the wearing of low permeability disposable suits, gloves and boots. This clothing will prevent most natural body ventilation. Discomfort due to increased sweating and body temperature (heat stress) will be expected at the work site. Recommendations to reduce heat stress follow:

- Drink plenty of fluids (to replace loss through sweating).
- Wear cotton undergarments to act as a wick to absorb moisture.
- Make adequate shelter available for taking rest breaks to cool off.

In extremely warm weather, the Site Health and Safety Officer may also require these additional measures:

- Wear cooling devices to aid in ventilation (NOTE: the additional weight may affect efficiency).
- Install portable showers or hose down facilities to cool clothing and body.
- Shift working hours to early morning and early evening. Avoid the hottest time of the day.
- Frequently rotate crews wearing the protective clothing.
- Monitor pulse rate and body temperature of individuals leaving work site.

6.3.2 Cold Exposure

Persons working outdoors in temperatures at or below freezing may experience frostbite or hypothermia. Extreme cold for a short time may cause severe injury to the surface of the body. Areas of the body that have a high surface-area-to volume ratio, such as fingers, toes, and ears are the most susceptible.

Two factors influence the development of cold injury: Ambient temperature and the velocity of the wind. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than

air. Thus the body cools suddenly when protective equipment is removed if the clothing underneath is soaked with perspiration.

Recommendations to reduce effects of cold exposure:

- Stay dry. When the temperature drops below 40°F, change perspiration soaked clothes frequently. When clothes get wet, they lose about 90% of their insulating value.
- Beware of the wind. A slight breeze carries heat away from bare skin much faster than still air. Wind drives cold air under and through clothing. Wind refrigerates wet clothes. Wind multiplies the problems of staying dry.
- Understand cold. Most hypothermia cases develop in temperatures between 30°F and 50°F. Cold water running down the neck and legs or cold water held against the body by sopping clothes causes hypothermia.
- Make adequate dry, warm shelter available.
- Provide warm drinks.
- Monitor the pulse and body temperature of individuals leaving the work area.

Never ignore shivering. Persistent shivering is a clear warning that a person is on the verge of hypothermia. Allow for the fact that exposure greatly reduces normal endurance. Physical activity may be the only thing preventing hypothermia.

6.4 WORK LIMITATIONS

All site activities will be conducted during daylight hours only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e).

6.5 EXPOSURE EVALUATION

All personnel scheduled for site activities have had a baseline physical examination and have been declared fit for duty. An exposure history form will be completed for each worker participating in site activities. It includes onsite monitoring results.

7.0 MONITORING REQUIREMENTS

Air monitoring will be accomplished using an inorganic/organic vapor detector during all sampling. Results of air monitoring are to be recorded in the field log book and maintained with the site records. Instruments will be read while soil samples are obtained; but field technicians will be made aware that they must report any unusual odors or soil discolorations. Each instrument shall be calibrated daily before site activities commence and after termination of site activities. At the end of each work day and prior to calibration, each instrument shall be checked to ensure that they are free from surface contamination.

8.0 DECONTAMINATION

A decontamination zone will be established which will include an area for sampling equipment and personnel decontamination.

8.1 PERSONNEL DECONTAMINATION

The decontamination procedures, based on Level D protection, will consist of brushing heavily soiled overboots, rinsing gloves and overboots with soap and water, removing outer boots and placing in a plastic lined container. Washing and rinsing protective suit, removing protective suit. Protective suits will be place in plastic lined containers. Washing and rinsing gloves and placing in plastic lined containers.

Decontamination procedures will be conducted at lunch breaks and at the end of each work day.

If higher levels of personal protection equipment are needed, adjustments will be made to these procedures and an amendment will be made to this health and safety plan.

8.2 CLOSURE OF THE PERSONNEL DECONTAMINATION STATION

All disposable clothing and plastic sheeting used during site activities will be double-bagged and disposed in a refuse container. Decontamination and rinse solutions will be allowed to drain onsite. Reusable clothing will be dried and prepared for future use. All washtubs, pails, buckets, etc. will be washed, rinsed and dried at the end of each workday.

9.0 AUTHORIZED PERSONNEL

Personnel anticipated to be onsite at various times during site activities include:

- ERC-EDGe Principal-in-Charge --
- ERC-EDGe Project Manager --
- ERC-EDGe Safety Officer --
- ERC-EDGe Representatives --

(NAMES FOR THIS SECTION WILL BE PROVIDED UPON RECEIPT OF AUTHORIZATION TO START THIS PHASE OF THE CONTRACT)

9.1 The responsibilities of the ERC-EDGe project manager are as follows:

The project manager will direct the site investigation and operation. The project manager has the primary responsibility for:

- Assuring that all personnel are aware of:

  a. Names of personnel and alternates responsible for site safety and health;
  b. Safety, health and other hazards present on the site;
  c. Use of personnel protection equipment and assuring that the equipment is available;
  d. Work practices by which the employee can minimize risks from hazards;
  e. Safe use of engineering controls and equipment on the site;
  f. Medical surveillance requirements including recognition of symptoms and signs which might indicate over exposure to hazards; and
  g. Site control measures, decontamination procedures, site standard operating procedures and the contingency plan and responses to emergencies including the necessary PPE.

- Assuring that all employees have received a minimum of 40 hours of instruction, off the site, and actual field experience under the direct supervision of a trained experienced supervisor. Workers who may be exposed to unique or special hazards shall be provided additional training.

- Monitoring the performance of personnel to ensure that mandatory health and safety procedures are being performed and correcting any performances that do not comply with the Health and Safety Plan.

- Ensuring that all field personnel employed on the site are covered by a medical surveillance program

as required by 29 CFR 1910.120(f)

- Consulting with the Health and Safety Officer and/or other personnel.

- Preparation and submittal of any and all project reports - includes progress, accident, incident, contractual, etc.

9.2 The responsibilities of the ERC-EDGe site health and safety officer are as follows:

- Assure that a copy of the health and safety plan is maintained onsite during all field activities.

- Advise the project manager on all health and safety related matters involved at the site.

- Direct and ensure that the safety program is being correctly followed in the field, including the proper use of personal protective and site monitoring equipment.

- Ensure that the field personnel observe the appropriate work zones and decontamination procedures.

- Report any safety violations to the project manager.

- Conducts safety briefings during field activities.

- Based on observation of all site conditions, determine if and when an evacuation is needed. If an evacuation is necessary, notify local law enforcement officials and inform them of the hazardous substance involved, the direction of movement of the substance and the areas that will be immediately affected.

Initially, the site health and safety officer will be a person trained in safety and industrial hygiene. After the project begins and the site safety officer has had time to evaluate actual hazardous site conditions, he/she may determine that a member of the project team may assume the duties of site health and safety officer.

9.3 Responsibilities of onsite field personnel are as follows:

- All personnel going on site must be thoroughly briefed on anticipated hazards and trained on equipment to be worn, safety procedures to be followed, emergency procedures and communications.

- Required respiratory protective devices and clothing must be worn by all personnel going into areas designated for wearing protective equipment.

- Personnel must be fit-tested prior to use of respirators.

- No facial hair which intrudes on the sealing surface of the mask is allowed on personnel.

- Personnel on site must use the buddy system when wearing respiratory protective equipment. As a minimum, a third person, suitably equipped as a safety backup, is required during initial entries.

- Visual contact must be maintained between pairs onsite and site safety personnel. Field personnel should remain close together to assist each other during emergencies.

- All field personnel should make use of their senses to alert themselves to potentially dangerous situations which they should avoid, e.g., presence of strong and irritating or nauseating odors.

- Personnel should practice unfamiliar operations prior to doing the actual procedure in the field.

- Field personnel shall be familiar with the physical characteristics of the site, including:

  - wind direction in relation to contamination zones;
  - accessibility to associates, equipment and vehicles;
  - communications;
  - operation zones;
  - site access; and
  - nearest water sources.

- Personnel and equipment in the contaminated area must be kept to a minimum, consistent with effective site operations.

- Procedures for leaving a contaminated area must be

planned and implemented prior to going onsite in accordance with the Site Health and Safety Plan.

- All visitors to the job site must comply with the Health and Safety Plan procedures. Personal protection equipment may be modified for visitors depending on the situation. Any modifications must be approved by the site Health and Safety Officer.

10.0 EMERGENCY INFORMATION

All hazardous waste site activities present a potential risk to onsite personnel. During routine operations, risk is minimized by establishing good work practices, staying alert and using proper personal protective equipment. Unpredictable events such as physical injury, chemical exposure or fire may occur and must be anticipated.

If any situation or unplanned occurrence requires outside or support services, Diane Lancaster will be informed and the appropriate contact from the following list will be made:

Contact	**Person or Agency**	**Telephone**
Diane Lancaster	NAS Memphis	873-5462
Law Enforcement	NAS Memphis Base Police Department	873-5776
Fire Department	NAS Memphis Base Fire Department	873-5333 873-5580 (non-emergency)
Ambulance Service		873-5444
Southern Poison Control Center		(901) 528-6048
NAS Memphis Information		873-5111
ERC-EDGe, Inc.		(615) 966-9788

10.1 SITE RESOURCES

Contractor to provide a portable telephone for emergency use. Restroom facilities and water supply will be available near the work zone.

10.2 EMERGENCY PROCEDURES

In the event that an emergency develops onsite, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site; or
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.
- Any person not engaged in site activities experiences any adverse effects or symptoms of exposure while near or down wind of the site.

The following emergency procedures should be followed:

- Site work area entrance and exit routes will be planned and emergency escape routes delineated by the site safety officer.
- In the event that any member of the field team experiences any effects or symptoms of exposure while on the scene, the entire field crew will immediately halt work and act according to the instructions provided by the site safety officer.
- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the site safety officer to indicate possible routes for upwind escape.
- The discovery of any conditions that would suggest the existence of a situation more hazardous than anticipated will result in the suspension of work until the safety officer has evaluated the situation and provided the appropriate instructions to the field team.
- In the event that an accident occurs, the project manager is to complete an accident report form for submittal to the managing principal-in-charge of the project.

11.0 FORMS

The following forms will be used in implementing this

health and safety plan:

Plan Acceptance Form
Plan Feedback Form
Accident Report Form
Exposure History Form

The Plan Acceptance Form will be filled out by all employees working on the site prior to commencement of site activities. The Plan Feedback Form will be filled out by the site safety officer and any other onsite employee who wishes to fill one out. The Accident Report Form will be filled out by the Project Manager in the event that an accident occurs. The Exposure History Form will be completed by both the project manager and the individual(s) for whom the form is intended.

All completed forms must be returned to the Principal-in-Charge at ERC-EDGe, Knoxville, Tennessee.

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project work site and returned to , ERC-EDGe, Knoxville, Tennessee.

Job No. _____

Project PRELIMINARY ASSESSMENT/SITE INSPECTION

I represent that I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

_____
Signed

_____
Print Name

_____
Company

_____
Date

LOCATION OF NEAREST HOSPITAL

NAS MEMPHIS NAVAL HOSPITAL
MILLINGTON, TENNESSEE 38054

EMERGENCY ROOM TELEPHONE NUMBER - (901) 873-5280

DIRECTIONS FROM NAS MEMPHIS TO NAS MEMPHIS HOSPITAL

1. from Kinser Gate or Brown Gate, turn east (left) onto Navy Road.

LOCATION OF NEAREST HOSPITAL CAPABLE OF HANDLING CHEMICAL EXPOSURES

METHODIST NORTH
3960 NEW COVINGTON PIKE
MEMPHIS, TENNESSEE 38002

EMERGENCY ROOM TELEPHONE NUMBER - (901) 372-5211

DIRECTIONS FROM NAS MEMPHIS TO METHODIST NORTH HOSPITAL

1. from South Gate, south on SGT. Walter K. Singleton Parkway
2. then,south on New Covington Pike

HEALTH & SAFETY PLAN
FOR THE
SOUTH-SIDE LANDFILL
NAVAL AIR STATION, MEMPHIS TENNESSEE

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

prepared by
Environmental & Safety Designs, Inc.
Memphis, Tennessee

August, 1989

1.0 INTRODUCTION

The following is the Health and Safety Plan for the of the Remedial Investigation/Feasibility Study for the South-Side Landfill, NAS Memphis, Tennessee. This Plan is submitted in accordance with the provisions of Department of the Navy Contract N62467-88-C-0198, soil and/or groundwater contamination investigations. The investigation is being conducted to determine the extent, if any, of contamination in soils, subsoils and groundwaters at the south-side landfill, NAS Memphis, Tennessee.

2.0 APPLICABILITY

The provisions of the plan are mandatory for all onsite personnel engaged in hazardous waste operations who will be exposed or have the potential to be exposed to onsite hazardous substances. All personnel will operate in accordance with the most current requirements of 29 CFR 1910.120, Standards for Hazardous Waste Workers and Emergency Responders. These regulations include the following provisions for employees exposed to hazardous substances, health hazards or safety hazards: training as described in 120(e), medical surveillance as described in 120(f), and personal protective equipment described in 120(g).

3.0 SITE CHARACTERIZATION

3.1 SITE CONTROL

A forty foot perimeter will be established around each work zone and marked with hazard tape. Only authorized personnel with 40 hours health and safety training meeting the requirements of OSHA 29 CFR 1910.120 are permitted within the marked area.

3.2 WORK ZONES

Site activity will be restricted to the south-side landfill, NAS Memphis. See Figure 1.

4.0 SITE ACTIVITIES

The activities to be performed during the investigation will be surface soil sampling subsurface soil borings and examination of existing wells.

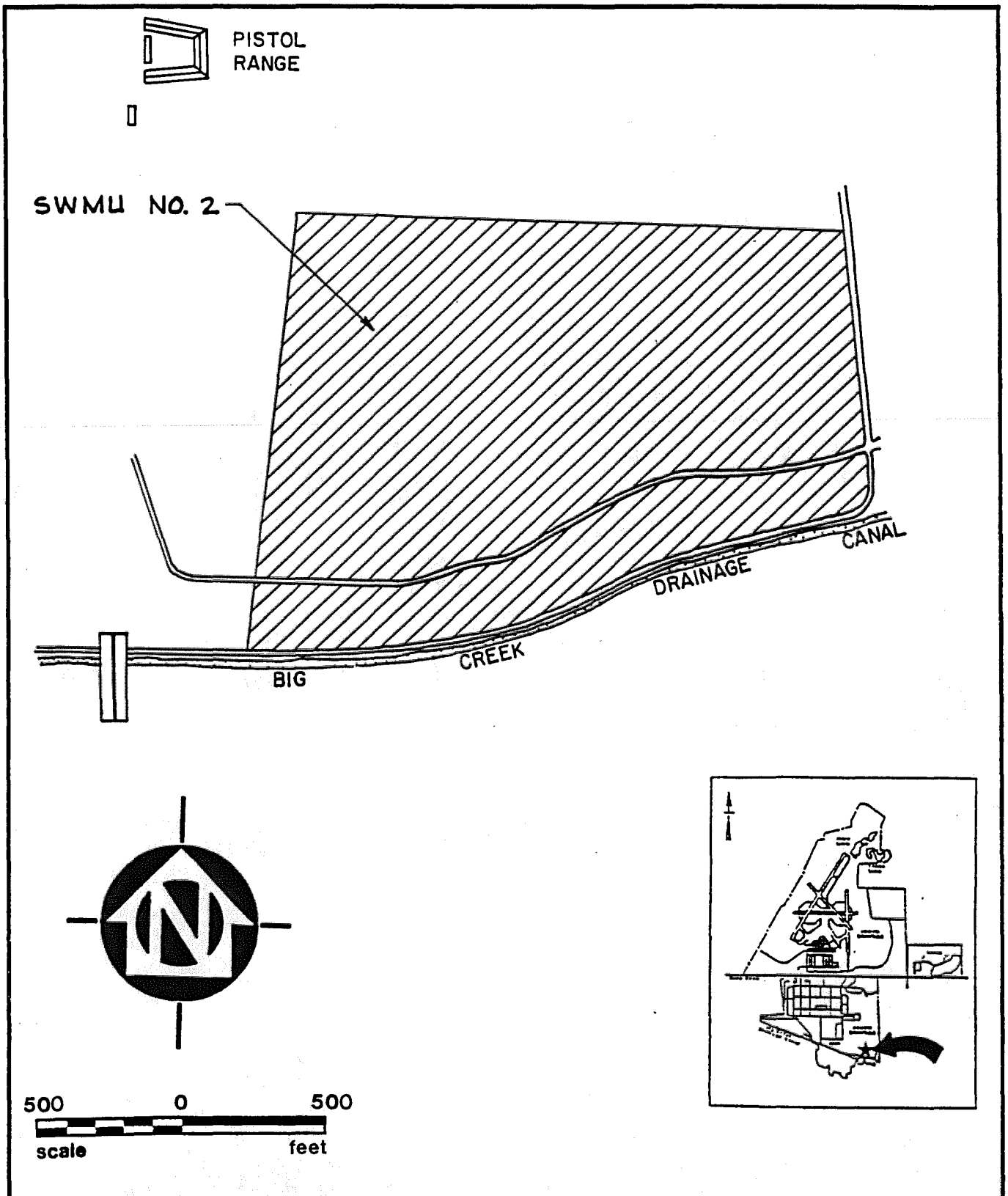


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FIGURE 1

SOUTHSIDE LANDFILL

LOCATION MAP

5.0 HAZARD EVALUATION

This is a preliminary site assessment to determine the extent of air, direct contact or surface water impacts. According to information provided by the Navy, the landfill was used as a depository for household, office and industrial solid wastes. Industrial waste disposed of include two tons per year of wastewater treatment sludge and one ton per year of oils and oily sludges. In addition, an undetermined amount of waste solvents from various industrial operations were reportedly disposed of at this site.

6.0 EMPLOYEE PROTECTION

Employee protection for this project includes standard safe work practices personal protective equipment, procedures and equipment for extreme weather conditions, work limitations and exposure evaluation.

6.1 STANDARD SAFE WORK PRACTICES

Standard safe work practices that will be followed include:

- Eating, drinking, chewing gum or tobacco, smoking or any activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the Site Health and Safety Officer.
- Hands and face must be thoroughly washed upon leaving the work area.
- Contact lenses shall not be worn on site.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate or discolored surfaces; or lean, sit or place equipment on drums, containers or on soil suspected of being contaminated.
- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on cleanup or response operations where the potential for absorption, inhalation or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverages shall not be consumed during site operations.

6.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Field activities will be initiated in Level D protection. Level D Protection consists of one piece chemically-resistant suit (optional), hard hat,splash sheild, gloves and boots. This level of protection was chosen because of previous testing indicated no contamination in the form of metals, cyanide, or VOCs. If field conditions indicate a higher level of contamination than anticipated, field activities will be halted, and a reassessment of the field program will be conducted. The reassessment will include the type of PPE recommended for field activities. If higher levels are necessary, they will be selected based on the contaminants and concentrations. Any adjustments in field procedures as a result of a reassessment will result in an amendment to this health and safety plan.

Criteria for selection of LEVEL C PPE

1. Oxygen level is at least 19.5%
2. Total unknown organic vapor levels exceed 1-5 ppm above background.
3. Doubt exists about the air quality, therefore preventing the use of Level D PPE.
4. Level A or B PPE is not indicated.

Level C PPE consists of full-face piece, air-purifying cartridge-equipped respirator. Cartridges used must be approved by MSHA and/or NIOSH for the hazards encountered. Because of the types of suspected contaminents on the site, a combination organic vapor/high efficiency particulate cartridge is recommended. Additionally, chemical-resistant clothing, chemical-resistant gloves (inner and outer), steel toe and shank boots and hard hat are required.

6.3 PROCEDURES AND EQUIPMENT FOR EXTREME WEATHER CONDITIONS

Field activities for this site are scheduled to take place during the fall and winter. Therefore, heat stress and cold exposure will be of concern for the health and safety personnel. Adverse weather conditions are important considerations in planning and conducting site operations. Extremes in hot and cold weather can cause physical discomfort, loss of efficiency and personal injury.

6.3.1 Heat Stress

Heat stress can result when the protective clothing decreases natural body ventilation even when temperatures are moderate.

Working under various levels of personal protection may require the wearing of low permeability disposable suits, gloves and boots. This clothing will prevent most natural body ventilation. Discomfort due to increased sweating and

body temperature (heat stress) will be expected at the work site. Recommendations to reduce heat stress follow:

- Drink plenty of fluids (to replace loss through sweating).
- Wear cotton undergarments to act as a wick to absorb moisture.
- Make adequate shelter available for taking rest breaks to cool off.

In extremely warm weather, the Site Health and Safety Officer may also require these additional measures:

- Wear cooling devices to aid in ventilation (NOTE: the additional weight may affect efficiency).
- Install portable showers or hose down facilities to cool clothing and body.
- Shift working hours to early morning and early evening. Avoid the hottest time of the day.
- Frequently rotate crews wearing the protective clothing.
- Monitor pulse rate and body temperature of individuals leaving work site.

6.3.2 Cold Exposure

Persons working outdoors in temperatures at or below freezing may experience frostbite or hypothermia. Extreme cold for a short time may cause severe injury to the surface of the body. Areas of the body that have a high surface-area-to volume ratio, such as fingers, toes, and ears are the most susceptible.

Two factors influence the development of cold injury: Ambient temperature and the velocity of the wind. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus the body cools suddenly when protective equipment is removed if the clothing underneath is soaked with perspiration.

Recommendations to reduce effects of cold exposure:

- Stay dry. When the temperature drops below 40°F, change perspiration soaked clothes frequently. When clothes get wet, they lose about 90% of their insulating value.

- Beware of the wind. A slight breeze carries heat away from bare skin much faster than still air. Wind drives cold air under and through clothing. Wind refrigerates wet clothes. Wind multiplies the problems of staying dry.

- Understand cold. Most hypothermia cases develop in temperatures between 30°F and 50°F. Cold water running down the neck and legs or cold water held against the body by sopping clothes causes hypothermia.

- Make adequate dry, warm shelter available.

- Provide warm drinks.

- Monitor the pulse and body temperature of individuals leaving the work area.

Never ignore shivering. Persistent shivering is a clear warning that a person is on the verge of hypothermia. Allow for the fact that exposure greatly reduces normal endurance. Physical activity may be the only thing preventing hypothermia.

6.4 WORK LIMITATIONS

All site activities will be conducted during daylight hours only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e).

6.5 EXPOSURE EVALUATION

All personnel scheduled for site activities have had a baseline physical examination and have been declared fit for duty. An exposure history form will be completed for each worker participating in site activities. It includes onsite monitoring results.

7.0 MONITORING REQUIREMENTS

Air monitoring will be accomplished using an inorganic/organic vapor detector during all sampling. Additionally, a flammable gas indicator shall be used during all subsurface boring to monitor for the presence of methane gas. Instruments will be read while soil samples are obtained; but field technicians will be made aware that they must report any unusual odors or soil discolorations. Results of air monitoring are to be recorded in the field log book and maintained with the site records. Each instrument shall be calibrated daily before site activities commence and after termination of site activities. At the end of each work day and prior to calibration, each instrument shall be checked to ensure that they are free from surface contamination.

8.0 DECONTAMINATION

A decontamination zone will be established which will include an area for sampling equipment and personnel decontamination.

8.1 PERSONNEL DECONTAMINATION

The decontamination procedures, based on Level D protection, will consist of brushing heavily soiled overboots, rinsing gloves and overboots with soap and water, removing outer boots and placing in a plastic lined container. Washing and rinsing protective suit, removing protective suit. Protective suits will be place in plastic lined containers. Washing and rinsing gloves and placing in plastic lined containers.

Decontamination procedures will be conducted at the lunch break and at the end of each work day.

If higher levels of personal protection equipment are needed, adjustments will be made to these procedures and an amendment will be made to this health and safety plan.

8.2 CLOSURE OF THE PERSONNEL DECONTAMINATION STATION

All disposable clothing and plastic sheeting used during site activities will be double-bagged and disposed in a refuse container. Decontamination and rinse solutions will be allowed to drain onsite. Reusable clothing will be dried and prepared for future use. All washtubs, pails, buckets, etc. will be washed, rinsed and dried at the end of each workday.

9.0 AUTHORIZED PERSONNEL

Personnel anticipated to be onsite at various times during site activities include:

- ERC-EDGe Principal-in-Charge --
- ERC-EDGe Project Manager --
- ERC-EDGe Safety Officer --
- ERC-EDGe Representatives --

(NAMES FOR THIS SECTION WILL BE PROVIDED UPON RECEIPT OF AUTHORIZATION TO START THIS PHASE OF THE CONTRACT)

9.1 The responsibilities of the ERC-EDGe project manager are as follows:

The project manager will direct the site investigation and operation. The project manager has the primary responsibility for:

- Assuring that all personnel are aware of:

  a. Names of personnel and alternates responsible for site safety and health;
  b. Safety, health and other hazards present on the site;
  c. Use of personnel protection equipment and assuring that the equipment is available;
  d. Work practices by which the employee can minimize risks from hazards;
  e. Safe use of engineering controls and equipment on the site;
  f. Medical surveillance requirements including recognition of symptoms and signs which might indicate over exposure to hazards; and
  g. Site control measures, decontamination procedures, site standard operating procedures and the contingency plan and responses to emergencies including the necessary PPE.

- Assuring that all employees have received a minimum of 40 hours of instruction, off the site, and actual field experience under the direct supervision of a trained experienced supervisor. Workers who may be exposed to unique or special hazards shall be provided additional training.

- Monitoring the performance of personnel to ensure that mandatory health and safety procedures are being performed and correcting any performances that do not comply with the Health and Safety Plan.

- Ensuring that all field personnel employed on the site are covered by a medical surveillance program as required by 29 CFR 1910.120(f)

- Consulting with the Health and Safety Officer and/or other personnel.

- Preparation and submittal of any and all project reports - includes progress, accident, incident, contractual, etc.

9.2 The responsibilities of the ERC-EDGe site health and safety officer are as follows:

- Assure that a copy of the health and safety plan is maintained onsite during all field activities.

- Advise the project manager on all health and safety related matters involved at the site.

- Direct and ensure that the safety program is being correctly followed in the field, including the proper use of personal protective and site monitoring equipment.

- Ensure that the field personnel observe the appropriate work zones and decontamination procedures.

- Report any safety violations to the project manager.

- Conducts safety briefings during field activities.

- Based on observation of all site conditions, determine if and when an evacuation is needed. If an evacuation is necessary, notify local law enforcement officials and inform them of the hazardous substance involved, the direction of movement of the substance and the areas that will be immediately affected.

Initially, the site health and safety officer will be a person trained in safety and industrial hygiene. After

the project begins and the site safety officer has had time to evaluate actual hazardous site conditions, he/she may determine that a member of the project team may assume the duties of site health and safety officer.

9.3 Responsibilities of onsite field personnel are as follows:

- All personnel going on site must be thoroughly briefed on anticipated hazards and trained on equipment to be worn, safety procedures to be followed, emergency procedures and communications.

- Required respiratory protective devices and clothing must be worn by all personnel going into areas designated for wearing protective equipment.

- Personnel must be fit-tested prior to use of respirators.

- No facial hair which intrudes on the sealing surface of the mask is allowed on personnel.

- Personnel on site must use the buddy system when wearing respiratory protective equipment. As a minimum, a third person, suitably equipped as a safety backup, is required during initial entries.

- Visual contact must be maintained between pairs onsite and site safety personnel. Field personnel should remain close together to assist each other during emergencies.

- All field personnel should make use of their senses to alert themselves to potentially dangerous situations which they should avoid, e.g., presence of strong and irritating or nauseating odors.

- Personnel should practice unfamiliar operations prior to doing the actual procedure in the field.

- Field personnel shall be familiar with the physical characteristics of the site, including:

  - wind direction in relation to contamination zones;
  - accessibility to associates, equipment and vehicles;
  - communications;
  - operation zones;

- site access; and
- nearest water sources.

- Personnel and equipment in the contaminated area must be kept to a minimum, consistent with effective site operations.

- Procedures for leaving a contaminated area must be planned and implemented prior to going onsite in accordance with the Site Health and Safety Plan.

- All visitors to the job site must comply with the Health and Safety Plan procedures. Personal protection equipment may be modified for visitors depending on the situation. Any modifications must be approved by the site Health and Safety Officer.

10.0 EMERGENCY INFORMATION

All hazardous waste site activities present a potential risk to onsite personnel. During routine operations, risk is minimized by establishing good work practices, staying alert and using proper personal protective equipment. Unpredictable events such as physical injury, chemical exposure or fire may occur and must be anticipated.

If any situation or unplanned occurrence requires outside or support services, Diane Lancaster will be informed and the appropriate contact from the following list will be made:

Contact	**Person or Agency**	**Telephone**
Diane Lancaster	NAS Memphis	873-5462
Law Enforcement	NAS Memphis Base Police Department	873-5776
Fire Department	NAS Memphis Base Fire Department	873-5333 873-5580 (non-emergency)
Ambulance Service		873-5444
Southern Poison Control Center		(901) 528-6048

NAS Memphis Information	873-5111
ERC-EDGe, Inc.	(615) 966-9788

10.1 SITE RESOURCES

Portable telephones to be provided by contractor for emergency use. Restroom facilities and water supply will be available near the work zone.

10.2 EMERGENCY PROCEDURES

In the event that an emergency develops onsite, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site; or
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.
- Any person not engaged in site activities experiences any adverse effects or symptoms of exposure while near or down wind of the site.

The following emergency procedures should be followed:

- Site work area entrance and exit routes will be planned and emergency escape routes delineated by the site safety officer.
- In the event that any member of the field team experiences any effects or symptoms of exposure while on the scene, the entire field crew will immediately halt work and act according to the instructions provided by the site safety officer.
- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the site safety officer to indicate possible routes for upwind escape.
- The discovery of any conditions that would suggest the existence of a situation more hazardous than anticipated will result in the suspension of work until the safety officer has evaluated the

situation and provided the appropriate instructions to the field team.

- In the event that an accident occurs, the project manager is to complete an accident report form for submittal to the managing principal-in-charge of the project.

11.0 FORMS

The following forms will be used in implementing this health and safety plan:

Plan Acceptance Form
Plan Feedback Form
Accident Report Form
Exposure History Form

The Plan Acceptance Form will be filled out by all employees working on the site prior to commencement of site activities. The Plan Feedback Form will be filled out by the site safety officer and any other onsite employee who wishes to fill one out. The Accident Report Form will be filled out by the Project Manager in the event that an accident occurs. The Exposure History Form will be completed by both the project manager and the individual(s) for whom the form is intended.

All completed forms must be returned to the Principal-in-Charge at ERC-EDGe, Knoxville, Tennessee.

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project work site and returned to , ERC-EDGe, Knoxville, Tennessee.

Job No. _____

Project PRELIMINARY ASSESSMENT/SITE INSPECTION

I represent that I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

_____
Signed

_____
Print Name

_____
Company

_____
Date

LOCATION OF NEAREST HOSPITAL

NAS MEMPHIS NAVAL HOSPITAL
MILLINGTON, TENNESSEE 38054

EMERGENCY ROOM TELEPHONE NUMBER - (901) 873-5280

DIRECTIONS FROM NAS MEMPHIS TO NAS MEMPHIS HOSPITAL

1. from Willis Gate, Marrison Gate or Bonnie Gate, turn east (right) onto Navy Road.

LOCATION OF NEAREST HOSPITAL CAPABLE OF HANDLING CHEMICAL EXPOSURES

METHODIST NORTH
3960 NEW COVINGTON PIKE
MEMPHIS, TENNESSEE 38002

EMERGENCY ROOM TELEPHONE NUMBER - (901) 372-5211

DIRECTIONS FROM NAS MEMPHIS TO METHODIST NORTH HOSPITAL

1. from South Gate, south on SGT. Walter K. Singleton Parkway
2. then,south on New Covington Pike

HEALTH & SAFETY PLAN
FOR THE
BUILDING N-121 PLATING SHOP DRY WELL
NAVAL AIR STATION, MEMPHIS TENNESSEE

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

prepared by
Environmental & Safety Designs, Inc.
Memphis, Tennessee

August, 1989

1.0 INTRODUCTION

The following is the Health and Safety Plan for the of the Remedial Investigation/Feasibility Study for Building N-121 plating shop dry well, NAS Memphis, Tennessee. This Plan is submitted in accordance with the provisions of Department of the Navy Contract N62467-88-C-0198, soil and/or groundwater contamination investigations. The investigation is being conducted to determine the extent, if any, of contamination in soils, subsoils and groundwaters at the Building N-121 plating shop dry well, NAS Memphis, Tennessee.

2.0 APPLICABILITY

The provisions of the plan are mandatory for all onsite personnel engaged in hazardous waste operations who will be exposed or have the potential to be exposed to onsite hazardous substances. All personnel will operate in accordance with the most current requirements of 29 CFR 1910.120, Standards for Hazardous Waste Workers and Emergency Responders. These regulations include the following provisions for employees exposed to hazardous substances, health hazards or safety hazards: training as described in 120(e), medical surveillance as described in 120(f), and personal protective equipment described in 120(g).

3.0 SITE CHARACTERIZATION

3.1 SITE CONTROL

A forty foot perimeter will be established around each work zone and marked with hazard tape. Only authorized personnel with 40 hours health and safety training meeting the requirements of OSHA 29 CFR 1910.120 are permitted within the marked area.

3.2 WORK ZONES

Site activity will be restricted to the building N-121 plating shop dry well, NAS Memphis. See Figure 1.

4.0 SITE ACTIVITIES

The activities to be performed during the investigation will be subsurface soil borings, groundwater monitoring well installation, groundwater sampling and wipe tests.

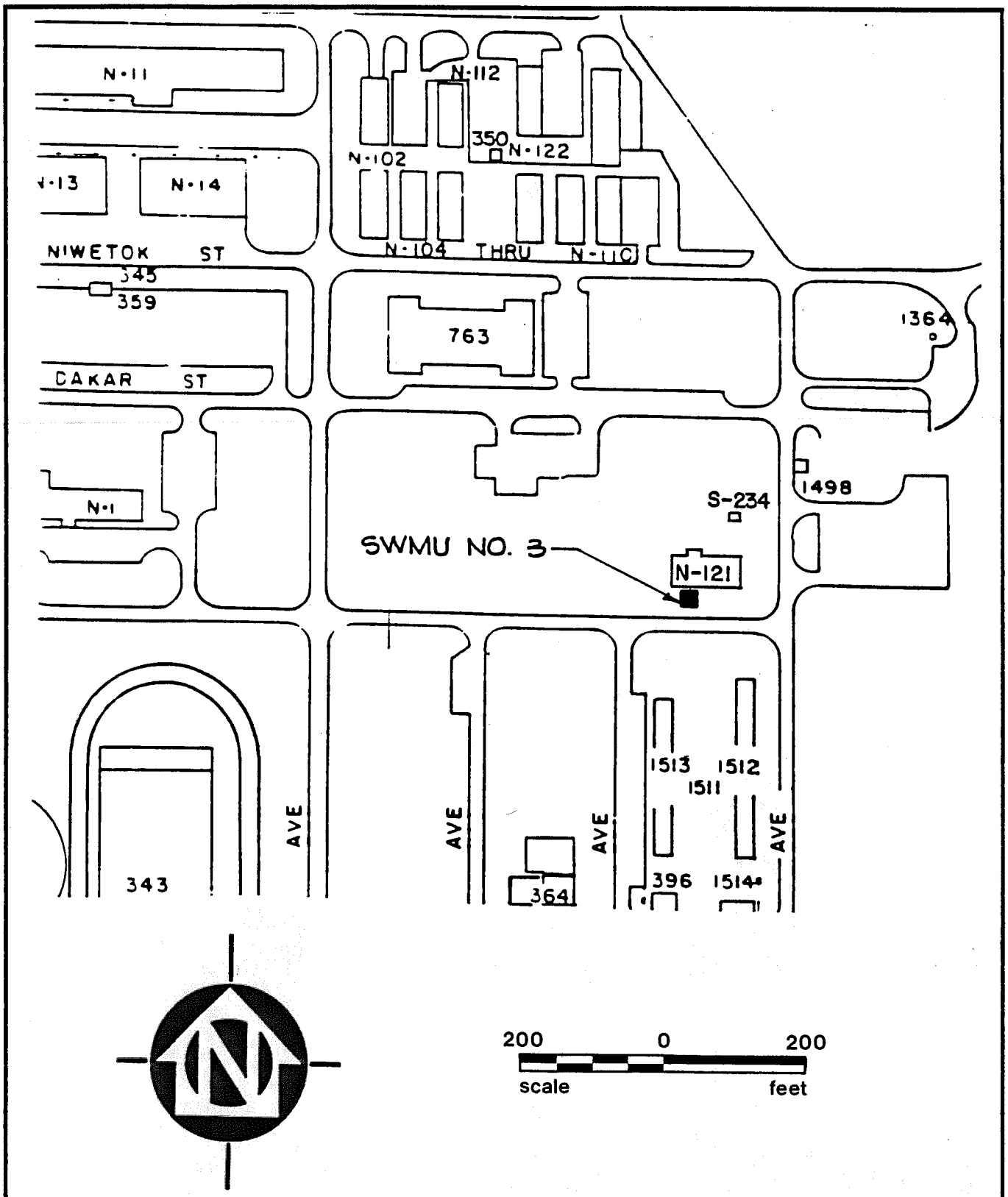

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FIGURE 1

N-121 PLATING SHOP DRY WELL LOCATION MAP

5.0 HAZARD EVALUATION

This is a preliminary site assessment to determine the extent of air, direct contact or surface water impacts. According to Department of the Navy information, the plating shop conducted cadmium, chromium, copper, an nickel plating using cyanide based solutions. The contaminants that have been discharged into the dry well are cadmium, chromium, copper, nickel and cyanide. Aluminum may also have been discharged into the dry well. However, analysis of preliminary sampling data revealed no contaminates in the dry well or the surrounding soil or groundwaters.

6.0 EMPLOYEE PROTECTION

Employee protection for this project includes standard safe work practices personal protective equipment, procedures and equipment for extreme weather conditions, work limitations and exposure evaluation.

6.1 STANDARD SAFE WORK PRACTICES

Standard safe work practices that will be followed include:

- Eating, drinking, chewing gum or tobacco, smoking or any activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the Site Health and Safety Officer.
- Hands and face must be thoroughly washed upon leaving the work area.
- Contact lenses shall not be worn on site.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate or discolored surfaces; or lean, sit or place equipment on drums, containers or on soil suspected of being contaminated.
- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on cleanup or response operations where the potential for absorption, inhalation or ingestion of toxic substances exists unless specifically approved by a

qualified physician. Alcoholic beverages shall not be consumed during site operations.

6.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Field activities will be initiated in Level D protection. Level D Protection consists of one piece chemically-resistant suit (optional), hard hat, gloves and boots. This level of protection was chosen because of the analysis of preliminary sampling data. If field conditions indicate a higher level of contamination than anticipated, field activities will be halted, and a reassessment of the field program will be conducted. The reassessment will include the type of PPE recommended for field activities. If higher levels are necessary, they will be selected based on the contaminants and concentrations. Any adjustments in field procedures as a result of a reassessment will result in an amendment to this health and safety plan.

Criteria for selection of LEVEL C PPE

1. Oxygen level is at least 19.5%
2. Total unknown organic vapor levels exceed 1-5 ppm above the background.
3. Doubt exists about the air quality, therefore preventing the use of Level D PPE.
4. Level A or B PPE is not indicated.

Level C PPE consists of full-face piece, air-purifying cartridge-equipped respirator. Cartridges used must be approved by MSHA and/or NIOSH for the hazards encountered. Because of the types of suspected contaminents on this site, a high efficiency particulate cartridge would be recommended. Additionally, chemical-resistant clothing, chemical-resistant gloves (inner and outer), steel toe and shank boots and hard hat are required.

6.3 PROCEDURES AND EQUIPMENT FOR EXTREME WEATHER CONDITIONS

Field activities for this site are scheduled to take place during the fall and winter. Therefore, heat stress and cold exposure will be of concern for the health and safety personnel. Adverse weather conditions are important considerations in planning and conducting site operations. Extremes in hot and cold weather can cause physical discomfort, loss of efficiency and personal injury.

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Heat stress can result when the protective clothing decreases natural body ventilation even when temperatures are moderate. Working under various levels of personal protection may require the wearing of low permeability disposable suits, gloves and boots. This clothing will prevent most natural body ventilation. Discomfort due to increased sweating and body temperature (heat stress) will be expected at the work site. Recommendations to reduce heat stress follow:

- Drink plenty of fluids (to replace loss through sweating).
- Wear cotton undergarments to act as a wick to absorb moisture.
- Make adequate shelter available for taking rest breaks to cool off.

In extremely warm weather, the Site Health and Safety Officer may also require these additional measures:

- Wear cooling devices to aid in ventilation (NOTE: the additional weight may affect efficiency).
- Install portable showers or hose down facilities to cool clothing and body.
- Shift working hours to early morning and early evening. Avoid the hottest time of the day.
- Frequently rotate crews wearing the protective clothing.
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Persons working outdoors in temperatures at or below freezing may experience frostbite or hypothermia. Extreme cold for a short time may cause severe injury to the surface of the body. Areas of the body that have a high surface-area-to volume ratio, such as fingers, toes, and ears are the most susceptible.

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Recommendations to reduce effects of cold exposure:

- Stay dry. When the temperature drops below 40°F, change perspiration soaked clothes frequently. When clothes get wet, they lose about 90% of their insulating value.

- Beware of the wind. A slight breeze carries heat away from bare skin much faster than still air. Wind drives cold air under and through clothing. Wind refrigerates wet clothes. Wind multiplies the problems of staying dry.

- Understand cold. Most hypothermia cases develop in temperatures between 30°F and 50°F. Cold water running down the neck and legs or cold water held against the body by sopping clothes causes hypothermia.

- Make adequate dry, warm shelter available.

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If higher levels of personal protection equipment are needed, adjustments will be made to these procedures and an amendment will be made to this health and safety plan.

8.2 CLOSURE OF THE PERSONNEL DECONTAMINATION STATION

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9.0 AUTHORIZED PERSONNEL

Personnel anticipated to be onsite at various times

during site activities include:

- ERC-EDGe Principal-in-Charge --
- ERC-EDGe Project Manager --
- ERC-EDGe Safety Officer --
- ERC-EDGe Representatives --

(NAMES FOR THIS SECTION WILL BE PROVIDED UPON RECEIPT OF AUTHORIZATION TO START THIS PHASE OF THE CONTRACT)

9.1 The responsibilities of the ERC-EDGe project manager are as follows:

The project manager will direct the site investigation and operation. The project manager has the primary responsibility for:

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  a. Names of personnel and alternates responsible for site safety and health;
  b. Safety, health and other hazards present on the site;
  c. Use of personnel protection equipment and assuring that the equipment is available;
  d. Work practices by which the employee can minimize risks from hazards;
  e. Safe use of engineering controls and equipment on the site;
  f. Medical surveillance requirements including recognition of symptoms and signs which might indicate over exposure to hazards; and
  g. Site control measures, decontamination procedures, site standard operating procedures and the contingency plan and responses to emergencies including the necessary PPE.

- Assuring that all employees have received a minimum of 40 hours of instruction, off the site, and actual field experience under the direct supervision of a trained experienced supervisor. Workers who may be exposed to unique or special hazards shall be provided additional training.

- Monitoring the performance of personnel to ensure that mandatory health and safety procedures are being performed and correcting any performances that do not comply with the Health and Safety Plan.

- Ensuring that all field personnel employed on the

site are covered by a medical surveillance program as required by 29 CFR 1910.120(f)

- Consulting with the Health and Safety Officer and/or other personnel.

- Preparation and submittal of any and all project reports - includes progress, accident, incident, contractual, etc.

9.2 The responsibilities of the ERC-EDGe site health and safety officer are as follows:

- Assure that a copy of the health and safety plan is maintained onsite during all field activities.

- Advise the project manager on all health and safety related matters involved at the site.

- Direct and ensure that the safety program is being correctly followed in the field, including the proper use of personal protective and site monitoring equipment.

- Ensure that the field personnel observe the appropriate work zones and decontamination procedures.

- Report any safety violations to the project manager.

- Conducts safety briefings during field activities.

- Based on observation of all site conditions, determine if and when an evacuation is needed. If an evacuation is necessary, notify local law enforcement officials and inform them of the hazardous substance involved, the direction of movement of the substance and the areas that will be immediately affected.

Initially, the site health and safety officer will be a person trained in safety and industrial hygiene. After the project begins and the site safety officer has had time to evaluate actual hazardous site conditions, he/she may determine that a member of the project team may assume the duties of site health and safety officer.

9.3 Responsibilities of onsite field personnel are as follows:

- All personnel going on site must be thoroughly briefed on anticipated hazards and trained on equipment to be worn, safety procedures to be followed, emergency procedures and communications.

- Required respiratory protective devices and clothing must be worn by all personnel going into areas designated for wearing protective equipment.

- Personnel must be fit-tested prior to use of respirators.

- No facial hair which intrudes on the sealing surface of the mask is allowed on personnel.

- Personnel on site must use the buddy system when wearing respiratory protective equipment. As a minimum, a third person, suitably equipped as a safety backup, is required during initial entries.

- Visual contact must be maintained between pairs onsite and site safety personnel. Field personnel should remain close together to assist each other during emergencies.

- All field personnel should make use of their senses to alert themselves to potentially dangerous situations which they should avoid, e.g., presence of strong and irritating or nauseating odors.

- Personnel should practice unfamiliar operations prior to doing the actual procedure in the field.

- Field personnel shall be familiar with the physical characteristics of the site, including:

  - wind direction in relation to contamination zones;
  - accessibility to associates, equipment and vehicles;
  - communications;
  - operation zones;
  - site access; and
  - nearest water sources.

- Personnel and equipment in the contaminated area must be kept to a minimum, consistent with effective site operations.

- Procedures for leaving a contaminated area must be

planned and implemented prior to going onsite in accordance with the Site Health and Safety Plan.

- All visitors to the job site must comply with the Health and Safety Plan procedures. Personal protection equipment may be modified for visitors depending on the situation. Any modifications must be approved by the site Health and Safety Officer.

10.0 EMERGENCY INFORMATION

All hazardous waste site activities present a potential risk to onsite personnel. During routine operations, risk is minimized by establishing good work practices, staying alert and using proper personal protective equipment. Unpredictable events such as physical injury, chemical exposure or fire may occur and must be anticipated.

If any situation or unplanned occurrence requires outside or support services, Diane Lancaster will be informed and the appropriate contact from the following list will be made:

Contact	**Person or Agency**	**Telephone**
Diane Lancaster	NAS Memphis	873-5462
Law Enforcement	NAS Memphis Base Police Department	873-5776
Fire Department	NAS Memphis Base Fire Department	873-5333 873-5580 (non-emergency)
Ambulance Service		873-5444
Southern Poison Control Center		(901) 528-6048
NAS Memphis Information		873-5111
ERC-EDGe, Inc.		(615) 966-9788

10.1 SITE RESOURCES

Telephones for emergency use are located in Building 763. Restroom facilities and water supply will be available near the work zone.

10.2 EMERGENCY PROCEDURES

In the event that an emergency develops onsite, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site; or
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.
- Any person not engaged in site activities experiences any adverse effects or symptoms of exposure while near or down wind of the site.

The following emergency procedures should be followed:

- Site work area entrance and exit routes will be planned and emergency escape routes delineated by the site safety officer.
- In the event that any member of the field team experiences any effects or symptoms of exposure while on the scene, the entire field crew will immediately halt work and act according to the instructions provided by the site safety officer.
- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the site safety officer to indicate possible routes for upwind escape.
- The discovery of any conditions that would suggest the existence of a situation more hazardous than anticipated will result in the suspension of work until the safety officer has evaluated the situation and provided the appropriate instructions to the field team.
- In the event that an accident occurs, the project manager is to complete an accident report form for submittal to the managing principal-in-charge of the project.

11.0 FORMS

The following forms will be used in implementing this

health and safety plan:

Plan Acceptance Form
Plan Feedback Form
Accident Report Form
Exposure History Form

The Plan Acceptance Form will be filled out by all employees working on the site prior to commencement of site activities. The Plan Feedback Form will be filled out by the site safety officer and any other onsite employee who wishes to fill one out. The Accident Report Form will be filled out by the Project Manager in the event that an accident occurs. The Exposure History Form will be completed by both the project manager and the individual(s) for whom the form is intended.

All completed forms must be returned to the Principal-in-Charge at ERC-EDGe, Knoxville, Tennessee.

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project work site and returned to , ERC-EDGe, Knoxville, Tennessee.

Job No. _____

Project PRELIMINARY ASSESSMENT/SITE INSPECTION

I represent that I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

_____
Signed

_____
Print Name

_____
Company

_____
Date

LOCATION OF NEAREST HOSPITAL

NAS MEMPHIS NAVAL HOSPITAL
MILLINGTON, TENNESSEE 38054

EMERGENCY ROOM TELEPHONE NUMBER - (901) 873-5280

DIRECTIONS FROM NAS MEMPHIS TO NAS MEMPHIS HOSPITAL

1. from Kinser Gate or Brown Gate, turn east (left) onto Navy Road.

LOCATION OF NEAREST HOSPITAL CAPABLE OF HANDLING CHEMICAL EXPOSURES

METHODIST NORTH
3960 NEW COVINGTON PIKE
MEMPHIS, TENNESSEE 38002

EMERGENCY ROOM TELEPHONE NUMBER - (901) 372-5211

DIRECTIONS FROM NAS MEMPHIS TO METHODIST NORTH HOSPITAL

1. from South Gate, south on SGT. Walter K. Singleton Parkway
2. then,south on New Covington Pike

[THE CONTINGENCY PLAN FOR THIS SITE IS A REQUIRED SECTION OF THE HAZARDOUS WASTE OPERATIONS PERMIT FOR NAS JACKSONVILLE. THIS SITE PLAN WILL BE EXCERPTED IN THE FINAL OH & S CONTINGENCY PLAN.]

SPECIAL PRECAUTIONS FOR CYANIDE HAZARDS

FIRST AID

IN CASE OF EYE CONTACT:

- Never introduce oil or ointment into the eyes without medical advice.

- Notify a physician and inform him of the:

  - o name of the chemical, and
  - o nature of the accident.

    1. Remove the victim from the source of contamination.
    2. Wash affected eye or eyes under slowly running water for 15 minutes or longer, making sure that the victim's eyelids are held wide apart and he moves his eyes slowly in every direction.
    3. If pain persists, the medical service will refer the victim to an ophthalmologist and inform him of the nature of the accident and the name of the chemical.
    4. If the victim cannot tolerate direct light, protect his eyes with a bandage or handkerchief.

SPECIAL PRECAUTIONS FOR CYANIDE HAZARDS

The following information comes from "First Aid Manual for Chemical Accidents for use with nonpharmaceutical chemical" by Marc J. LeFevre, M.D.

The information provided below pertains to the following substances:

ACETONE CYANOHYDRIN	FERROCYANIDES (K, Na)
ACRYLONITRILE	HYDROCYANIC ACID
BITTER ALMOND ESSENCE	NITROFERRICYANIDES
CYANOGEN CHLORIDE	POTASSIUM CYANIDE
FERRICYANIDES (K, Na)	SODIUM CYANIDE
CHERRY LAUREL WATER	

HYDROCYANIC ACID, POTASSIUM CYANIDE, and SODIUM CYANIDE are highly toxic substances that interfere with the respiration of the living cells. This can be the result of either inhalation or ingestion.

ACRYLONITRILE is toxic when inhaled and highly irritating to skin and eyes.

The FERRICYANIDES and FERROCYANIDES are less toxic.

SYMPTOMS OF POISONING

Inhalation of HYDROCYANIC ACID is not a suspected contaminant at NAS Memphis, Tennessee.

INGESTION

A. Symptoms of acute poisoning

1. Excitement phase

   - headache
   - breath smells of bitter almond
   - dizziness
   - nausea, occasionally, vomiting
   - rapid breathing

2. Depression phase

   - difficulty in breathing
   - pain in area around heart
   - anguish

3. Convulsion phase

   - convulsions
   - jaws clenched together
   - foaming at mouth
   - loss of consciousness

4. Paralysis phase

   - prolonged coma
   - dilated pupils
   - weak and irregular pulse
   - breathing stops
   - death

If subject survives, there is risk of nervous sequelae.

B. Symptoms of slight poisoning

1. Headache
2. Dizziness
3 Anguish
4. Difficulty in breathing

FIRST AID

IN CASE OF INGESTION

- In all instances, even in mild cases, notify a physician who should be informed of:

  - o the nature of the ingested product, and
  - o the state of the victim and, if possible, his symptoms.

- Never give an unconscious person anything to drink.

A. If the victim is conscious but excited,

1. Sit him down.
2. Reassure him and try to calm him.
3. Loosen his collar and belt
4. Induce vomiting by:
   - o asking him to stick him fingers down his throat, or
   - o tickling his uvula with the handle of a spoon.
5. Give him a large glass of water to which thiosulfate (sodium hyposulfite) has been added (1% solution).

B. If the victim is unconscious but still breathing,

1. Lay him flat on his back.
2 Remove dentures or partial plates.
3. Loosen his collar and belt.
4. Cover him with a blanket.
5. Break a 0.2 ml ampoule of amyl nitrite into a gauze pad and make the victim inhale the vapors for 3 minutes.
6. Repeat this treatment every 5 minutes (maximum 3 ampoules).
7. Protect him from injuring himself by convulsive movements.
8. Keep his head bent backward to help him breathe.
9. As soon as possible, administer oxygen under low pressure with a PULMOTOR or similar type of equipment.

C. If the victim has stopped breathing,

1. Lay him on his back.
2. Quickly loosen his collar and belt.
3. Immediately begin artificial respiration (never use mouth-to-mouth resuscitation).
4. As soon as possible, administer oxygen under low pressure with a PULMOTOR or similar type of equipment.
5. continue the treatment until the physician arrives or until the victim breathes unaided.
6. As soon as the victim is breathing again, remove the oxygen mask.

7. Break a 0.2 ml ampoule of amyl nitrite into a gauze pad and make the victim inhale the vapor for 3 minutes.
8. Repeat this treatment every 5 minutes (maximum 3 ampoules).
9. Afterwards administer oxygen again until the physician arrives.

SKIN CONTACT

The gaseous and liquid compounds are quickly absorbed by the skin and cause symptoms described below:

A. Symptoms of acute poisoning

1. Excitement phase

   - headache
   - breath smells of bitter almond
   - dizziness
   - nausea, occasionally, vomiting
   - rapid breathing

2. Depression phase

   - difficulty in breathing
   - pain in area around heart
   - anguish

3. Convulsion phase

   - convulsions
   - jaws clenched together
   - foaming at mouth
   - loss of consciousness

4. Paralysis phase

   - prolonged coma
   - dilated pupils
   - weak and irregular pulse
   - breathing stops
   - death

If subject survives, there is risk of nervous sequelae.

B. Symptoms of slight poisoning

1. Headache
2. Dizziness
3. Anguish
4. Difficulty in breathing

Depending on their nature, they can be very or only slightly irritating.

FIRST AID

IN CASE OF SKIN CONTACT:

- Notify a physician and inform of:

  - o the nature of the chemical and the accident, and
  - o the state of the victim and, if possible, his symptoms.

- First aiders must take precautions for their own safety when rescuing a person in a contaminated area.

  1. Remove the victim from the source of contamination.
  2. Remove clothing from affected area as quickly as possible under the shower (clothing may be cut away, if necessary).
  3. Remove clothes to prevent the inhalation of toxic vapors that may be released.
  4. Wash the victim with soap and water.
  5. Rinse carefully.
  6. Dry carefully with a clean, soft towel.
  7. In every case, send the victim to the hospital.

     If the skin is inflamed and painful (ACRYLONITRILE),

  8. Apply a dry dressing or, better,
  9. Contact the medical services, who will treat it in the same way as a heat or thermal burn.

SPLASHING IN EYES

When absorbed by mucous membranes of the eyes, these compounds can cause the following symptoms:

A. Symptoms of slight poisoning

1. Headache
2. Dizziness
3. Anguish
4. Difficulty in breathing

Depending on their nature, they can be very or only slightly irrigating.

B. Immediate symptoms

1. Irritation
2. Watering of eyes

PERSONAL PROTECTIVE CLOTHING*

Equipment should prevent any possibility of skin or eye contact with the spilled product. This may include rubber boots, gloves, face shields, splash-proof safety goggles, and other impervious and resistant clothing. Fully encapsulating suits with self-contained breathing apparatus (SCBA) may be necessary to prevent contact with high vapor or fume concentrations in air. Compatible materials may include butyl rubber, neoprene, polyvinyl chloride and Vidian.

For unknown concentrations, fire fighting or high concentrations (above 10 ppm), a self-contained, positive pressure breathing apparatus (SCBA) with full face piece (or the equivalent) is required.

* Information taken from the "EMERGENCY ACTION GUIDES" of the Association of American Railroads, 1984 Edition.

HEALTH & SAFETY PLAN
FOR THE
BUILDING N-121 PLATING SHOP STORM SEWER AND DRAINAGE DITCH
NAVAL AIR STATION, MEMPHIS TENNESSEE

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

prepared by
Environmental & Safety Designs, Inc.
Memphis, Tennessee

August, 1989

1.0 INTRODUCTION

The following is the Health and Safety Plan for the of the Remedial Investigation/Feasibility Study for Building N-121 storm sewer and drainage ditch, NAS Memphis, Tennessee. This Plan is submitted in accordance with the provisions of Department of the Navy Contract N62467-88-C-0198, soil and/or groundwater contamination investigations. The investigation is being conducted to determine the extent, if any, of contamination in soils, subsoils and groundwaters at the Building N-121 storm sewer and drainage ditch, NAS Memphis, Tennessee.

2.0 APPLICABILITY

The provisions of the plan are mandatory for all onsite personnel engaged in hazardous waste operations who will be exposed or have the potential to be exposed to onsite hazardous substances. All personnel will operate in accordance with the most current requirements of 29 CFR 1910.120, Standards for Hazardous Waste Workers and Emergency Responders. These regulations include the following provisions for employees exposed to hazardous substances, health hazards or safety hazards: training as described in 120(e), medical surveillance as described in 120(f), and personal protective equipment described in 120(g).

3.0 SITE CHARACTERIZATION

3.1 SITE CONTROL

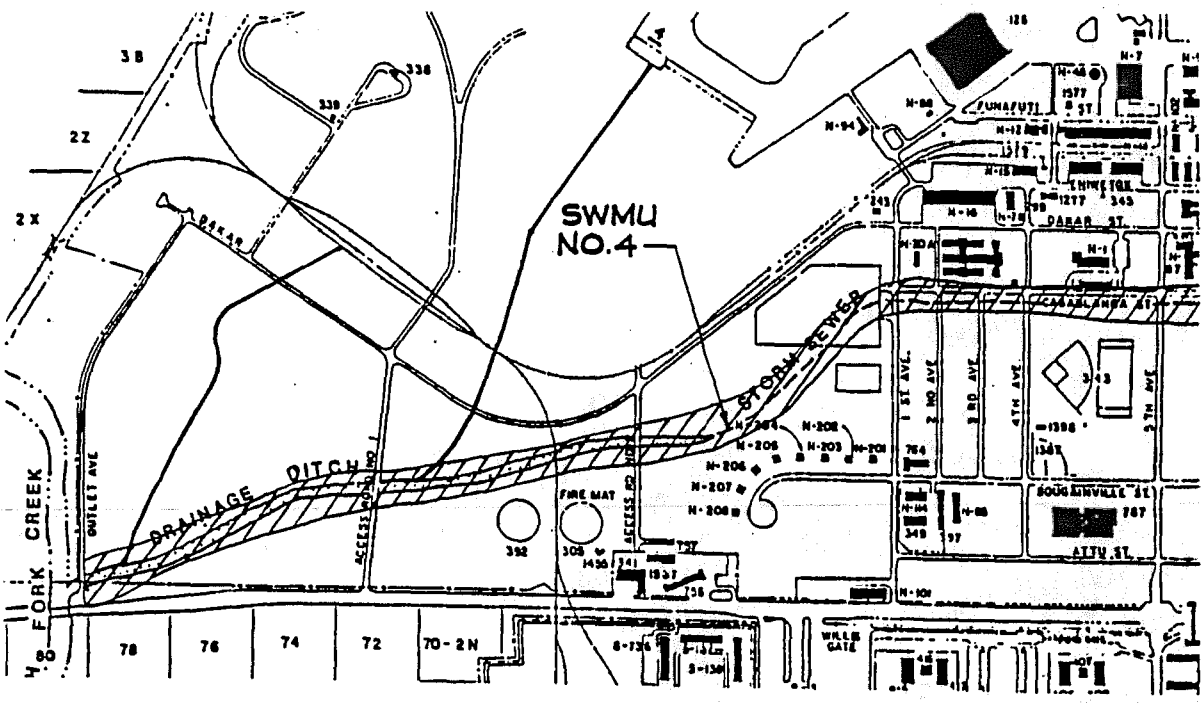
A forty foot perimeter will be established around each work zone and marked with hazard tape. Only authorized personnel with 40 hours health and safety training meeting the requirements of OSHA 29 CFR 1910.120 are permitted within the marked area.

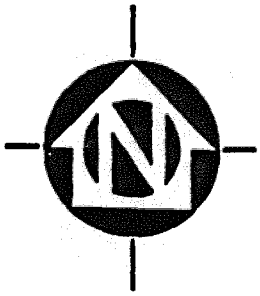
3.2 WORK ZONES

Site activity will be restricted to the building N-121 storm sewer and drainage ditch, NAS Memphis. See Figure 1.

4.0 SITE ACTIVITIES

The activities to be performed during the investigation will be surface water/sediment sampling.





Environmental and Safety Designs, Inc.

EN SAFE®

5705 STAGE RD. MEMPHIS, TN. 38134 ☎(901)372-7962

FIGURE 1

N-121 PLATING SHOP DITCH LOCATION MAP

5.0 HAZARD EVALUATION

This is a preliminary site assessment to determine the extent of air, direct contact or surface water impacts. According to Department of the Navy information, the plating shop conducted cadmium, chromium, copper, an nickel plating using cyanide based solutions. The contaminants that have been discharged into the storm sewer and drainage ditch are cadmium, chromium, copper, nickel, cyanide and aluminum. However, analysis of preliminary sampling data revealed no contaminates in the storm sewer, drainage ditch or the surrounding soil or groundwaters.

6.0 EMPLOYEE PROTECTION

Employee protection for this project includes standard safe work practices personal protective equipment, procedures and equipment for extreme weather conditions, work limitations and exposure evaluation.

6.1 STANDARD SAFE WORK PRACTICES

Standard safe work practices that will be followed include:

- Eating, drinking, chewing gum or tobacco, smoking or any activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the Site Health and Safety Officer.
- Hands and face must be thoroughly washed upon leaving the work area.
- Contact lenses shall not be worn on site.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate or discolored surfaces; or lean, sit or place equipment on drums, containers or on soil suspected of being contaminated.
- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on cleanup or response operations where the potential for absorption, inhalation or ingestion of toxic substances exists unless specifically approved by a

qualified physician. Alcoholic beverages shall not be consumed during site operations.

6.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Field activities will be initiated in Level D protection. Level D Protection consists of one piece chemically-resistant suit (optional), hard hat, gloves and boots. This level of protection was chosen because of the analysis of preliminary sampling data. If field conditions indicate a higher level of contamination than anticipated, field activities will be halted, and a reassessment of the field program will be conducted. The reassessment will include the type of PPE recommended for field activities. If higher levels are necessary, they will be selected based on the contaminants and concentrations. Any adjustments in field procedures as a result of a reassessment will result in an amendment to this health and safety plan.

Criteria for selection of LEVEL C PPE

1. Oxygen level is at least 19.5%
2. Total unknown organic vapor levels exceed 1-5 ppm above background.
3. Doubt exists about the air quality, therefore preventing the use of Level D PPE.
4. Level A or B PPE is not indicated.

Level C PPE consists of full-face piece, air-purifying cartridge-equipped respirator. Cartridges used must be approved by MSHA and/or NIOSH for the hazards encountered. Because of the types of suspected contaminents on the site, a high efficiency particulate cartridge is recommended. Additionally, chemical-resistant clothing, chemical-resistant gloves (inner and outer), steel toe and shank boots and hard hat are required.

6.3 PROCEDURES AND EQUIPMENT FOR EXTREME WEATHER CONDITIONS

Field activities for this site are scheduled to take place during the fall and winter. Therefore, heat stress and cold exposure will be of concern for the health and safety personnel. Adverse weather conditions are important considerations in planning and conducting site operations. Extremes in hot and cold weather can cause physical discomfort, loss of efficiency and personal injury.

6.3.1 Heat Stress

Heat stress can result when the protective clothing decreases natural body ventilation even when temperatures are moderate. Working under various levels of personal protection may require the wearing of low permeability disposable suits, gloves and boots. This clothing will prevent most natural body ventilation. Discomfort due to increased sweating and body temperature (heat stress) will be expected at the work site. Recommendations to reduce heat stress follow:

- Drink plenty of fluids (to replace loss through sweating).
- Wear cotton undergarments to act as a wick to absorb moisture.
- Make adequate shelter available for taking rest breaks to cool off.

In extremely warm weather, the Site Health and Safety Officer may also require these additional measures:

- Wear cooling devices to aid in ventilation (NOTE: the additional weight may affect efficiency).
- Install portable showers or hose down facilities to cool clothing and body.
- Shift working hours to early morning and early evening. Avoid the hottest time of the day.
- Frequently rotate crews wearing the protective clothing.
- Monitor pulse rate and body temperature of individuals leaving work site.

6.3.2 Cold Exposure

Persons working outdoors in temperatures at or below freezing may experience frostbite or hypothermia. Extreme cold for a short time may cause severe injury to the surface of the body. Areas of the body that have a high surface-area-to volume ratio, such as fingers, toes, and ears are the most susceptible.

Two factors influence the development of cold injury: Ambient temperature and the velocity of the wind. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than

air. Thus the body cools suddenly when protective equipment is removed if the clothing underneath is soaked with perspiration.

Recommendations to reduce effects of cold exposure:

- Stay dry. When the temperature drops below 40°F, change perspiration soaked clothes frequently. When clothes get wet, they lose about 90% of their insulating value.

- Beware of the wind. A slight breeze carries heat away from bare skin much faster than still air. Wind drives cold air under and through clothing. Wind refrigerates wet clothes. Wind multiplies the problems of staying dry.

- Understand cold. Most hypothermia cases develop in temperatures between 30°F and 50°F. Cold water running down the neck and legs or cold water held against the body by sopping clothes causes hypothermia.

- Make adequate dry, warm shelter available.

- Provide warm drinks.

- Monitor the pulse and body temperature of individuals leaving the work area.

Never ignore shivering. Persistent shivering is a clear warning that a person is on the verge of hypothermia. Allow for the fact that exposure greatly reduces normal endurance. Physical activity may be the only thing preventing hypothermia.

6.4 WORK LIMITATIONS

All site activities will be conducted during daylight hours only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e).

6.5 EXPOSURE EVALUATION

All personnel scheduled for site activities have had a baseline physical examination and have been declared fit for duty. An exposure history form will be completed for each worker participating in site activities. It includes onsite monitoring results.

7.0 MONITORING REQUIREMENTS

Air monitoring will be accomplished using an inorganic/organic vapor detector during all wipe sampling and surface soil sampling. Instruments will be read while samples are obtained; but field technicians will be made aware that they must report any unusual odors or soil discolorations. Results of air monitoring ar to be recorded in the field log book and maintained with the site records. Each instrument shall be calibrated daily before site activities commence and after termination of site activities. At the end of each work day and prior to calibration, each instrument shall be checked to ensure that they are free from surface contamination.

8.0 DECONTAMINATION

A decontamination zone will be established which will include an area for sampling equipment and personnel decontamination.

8.1 PERSONNEL DECONTAMINATION

The decontamination procedures, based on Level D protection, will consist of brushing heavily soiled overboots, rinsing gloves and overboots with soap and water, removing outer boots and placing in a plastic lined container. Washing and rinsing protective suit, removing protective suit. Protective suits will be place in plastic lined containers. Washing and rinsing gloves and placing in plastic lined containers.

Decontamination procedures will be conducted at the lunch break and at the end of each work day.

If higher levels of personal protection equipment are needed, adjustments will be made to these procedures and an amendment will be made to this health and safety plan.

8.2 CLOSURE OF THE PERSONNEL DECONTAMINATION STATION

All disposable clothing and plastic sheeting used during site activities will be double-bagged and disposed in a refuse container. Decontamination and rinse solutions will be allowed to drain onsite. Reusable clothing will be dried and prepared for future use. All washtubs, pails, buckets, etc. will be washed, rinsed and dried at the end of each workday.

9.0 AUTHORIZED PERSONNEL

Personnel anticipated to be onsite at various times

during site activities include:

- ERC-EDGe Principal-in-Charge --
- ERC-EDGe Project Manager --
- ERC-EDGe Safety Officer --
- ERC-EDGe Representatives --

(NAMES FOR THIS SECTION WILL BE PROVIDED UPON RECEIPT OF AUTHORIZATION TO START THIS PHASE OF THE CONTRACT)

9.1 The responsibilities of the ERC-EDGe project manager are as follows:

The project manager will direct the site investigation and operation. The project manager has the primary responsibility for:

- Assuring that all personnel are aware of:

  a. Names of personnel and alternates responsible for site safety and health;
  b. Safety, health and other hazards present on the site;
  c. Use of personnel protection equipment and assuring that the equipment is available;
  d. Work practices by which the employee can minimize risks from hazards;
  e. Safe use of engineering controls and equipment on the site;
  f. Medical surveillance requirements including recognition of symptoms and signs which might indicate over exposure to hazards; and
  g. Site control measures, decontamination procedures, site standard operating procedures and the contingency plan and responses to emergencies including the necessary PPE.

- Assuring that all employees have received a minimum of 40 hours of instruction, off the site, and actual field experience under the direct supervision of a trained experienced supervisor. Workers who may be exposed to unique or special hazards shall be provided additional training.

- Monitoring the performance of personnel to ensure that mandatory health and safety procedures are being performed and correcting any performances that do not comply with the Health and Safety Plan.

- Ensuring that all field personnel employed on the

site are covered by a medical surveillance program as required by 29 CFR 1910.120(f)

- Consulting with the Health and Safety Officer and/or other personnel.

- Preparation and submittal of any and all project reports - includes progress, accident, incident, contractual, etc.

9.2 The responsibilities of the ERC-EDGe site health and safety officer are as follows:

- Assure that a copy of the health and safety plan is maintained onsite during all field activities.

- Advise the project manager on all health and safety related matters involved at the site.

- Direct and ensure that the safety program is being correctly followed in the field, including the proper use of personal protective and site monitoring equipment.

- Ensure that the field personnel observe the appropriate work zones and decontamination procedures.

- Report any safety violations to the project manager.

- Conducts safety briefings during field activities.

- Based on observation of all site conditions, determine if and when an evacuation is needed. If an evacuation is necessary, notify local law enforcement officials and inform them of the hazardous substance involved, the direction of movement of the substance and the areas that will be immediately affected.

Initially, the site health and safety officer will be a person trained in safety and industrial hygiene. After the project begins and the site safety officer has had time to evaluate actual hazardous site conditions, he/she may determine that a member of the project team may assume the duties of site health and safety officer.

9.3 Responsibilities of onsite field personnel are as follows:

- All personnel going on site must be thoroughly briefed on anticipated hazards and trained on equipment to be worn, safety procedures to be followed, emergency procedures and communications.

- Required respiratory protective devices and clothing must be worn by all personnel going into areas designated for wearing protective equipment.

- Personnel must be fit-tested prior to use of respirators.

- No facial hair which intrudes on the sealing surface of the mask is allowed on personnel.

- Personnel on site must use the buddy system when wearing respiratory protective equipment. As a minimum, a third person, suitably equipped as a safety backup, is required during initial entries.

- Visual contact must be maintained between pairs onsite and site safety personnel. Field personnel should remain close together to assist each other during emergencies.

- All field personnel should make use of their senses to alert themselves to potentially dangerous situations which they should avoid, e.g., presence of strong and irritating or nauseating odors.

- Personnel should practice unfamiliar operations prior to doing the actual procedure in the field.

- Field personnel shall be familiar with the physical characteristics of the site, including:

  - wind direction in relation to contamination zones;
  - accessibility to associates, equipment and vehicles;
  - communications;
  - operation zones;
  - site access; and
  - nearest water sources.

- Personnel and equipment in the contaminated area must be kept to a minimum, consistent with effective site operations.

- Procedures for leaving a contaminated area must be

planned and implemented prior to going onsite in accordance with the Site Health and Safety Plan.

- All visitors to the job site must comply with the Health and Safety Plan procedures. Personal protection equipment may be modified for visitors depending on the situation. Any modifications must be approved by the site Health and Safety Officer.

10.0 EMERGENCY INFORMATION

All hazardous waste site activities present a potential risk to onsite personnel. During routine operations, risk is minimized by establishing good work practices, staying alert and using proper personal protective equipment. Unpredictable events such as physical injury, chemical exposure or fire may occur and must be anticipated.

If any situation or unplanned occurrence requires outside or support services, Diane Lancaster will be informed and the appropriate contact from the following list will be made:

Contact	**Person or Agency**	**Telephone**
Diane Lancaster	NAS Memphis	873-5462
Law Enforcement	NAS Memphis Base Police Department	873-5776
Fire Department	NAS Memphis Base Fire Department	873-5333 873-5580 (non-emergency)
Ambulance Service		873-5444
Southern Poison Control Center		(901) 528-6048
NAS Memphis Information		873-5111
ERC-EDGe, Inc.		(615) 966-9788

10.1 SITE RESOURCES

Portable telephone will be provided by contractor for emergency use. Restroom facilities and water supply will be

available near the work zone.

10.2 EMERGENCY PROCEDURES

In the event that an emergency develops onsite, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site; or
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.
- Any person not engaged in site activities experiences any adverse effects or symptoms of exposure while near or down wind of the site.

The following emergency procedures should be followed:

- Site work area entrance and exit routes will be planned and emergency escape routes delineated by the site safety officer.
- In the event that any member of the field team experiences any effects or symptoms of exposure while on the scene, the entire field crew will immediately halt work and act according to the instructions provided by the site safety officer.
- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the site safety officer to indicate possible routes for upwind escape.
- The discovery of any conditions that would suggest the existence of a situation more hazardous than anticipated will result in the suspension of work until the safety officer has evaluated the situation and provided the appropriate instructions to the field team.
- In the event that an accident occurs, the project manager is to complete an accident report form for submittal to the managing principal-in-charge of the project.

11.0 FORMS

The following forms will be used in implementing this health and safety plan:

Plan Acceptance Form
Plan Feedback Form
Accident Report Form
Exposure History Form

The Plan Acceptance Form will be filled out by all employees working on the site prior to commencement of site activities. The Plan Feedback Form will be filled out by the site safety officer and any other onsite employee who wishes to fill one out. The Accident Report Form will be filled out by the Project Manager in the event that an accident occurs. The Exposure History Form will be completed by both the project manager and the individual(s) for whom the form is intended.

All completed forms must be returned to the Principal-in-Charge at ERC-EDGe, Knoxville, Tennessee.

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project work site and returned to , ERC-EDGe, Knoxville, Tennessee.

Job No. _____

Project PRELIMINARY ASSESSMENT/SITE INSPECTION

I represent that I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

_____
Signed

_____
Print Name

_____
Company

_____
Date

LOCATION OF NEAREST HOSPITAL

NAS MEMPHIS NAVAL HOSPITAL
MILLINGTON, TENNESSEE 38054

EMERGENCY ROOM TELEPHONE NUMBER - (901) 873-5280

DIRECTIONS FROM NAS MEMPHIS TO NAS MEMPHIS HOSPITAL

1. from Kinser Gate or Brown Gate turn east (left) onto Navy Road.

LOCATION OF NEAREST HOSPITAL CAPABLE OF HANDLING CHEMICAL EXPOSURES

METHODIST NORTH
3960 NEW COVINGTON PIKE
MEMPHIS, TENNESSEE 38002

EMERGENCY ROOM TELEPHONE NUMBER - (901) 372-5211

DIRECTIONS FROM NAS MEMPHIS TO METHODIST NORTH HOSPITAL

1. from South Gate, south on SGT. Walter K. Singleton Parkway
2. then,south on New Covington Pike

HEALTH & SAFETY PLAN
FOR THE
FIRE FIGHTING TRAINING AREA
NAVAL AIR STATION, MEMPHIS TENNESSEE

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

prepared by
Environmental & Safety Designs, Inc.
Memphis, Tennessee

August, 1989

1.0 INTRODUCTION

The following is the Health and Safety Plan for the of the Remedial Investigation/Feasibility Study for the Fire Fighting Training Area, NAS Memphis, Tennessee. This Plan is submitted in accordance with the provisions of Department of the Navy Contract N62467-88-C-0198, soil and/or groundwater contamination investigations. The investigation is being conducted to determine the extent, if any, of contamination in soils, subsoils and groundwaters at the fire fighting training area, NAS Memphis, Tennessee.

2.0 APPLICABILITY

The provisions of the plan are mandatory for all onsite personnel engaged in hazardous waste operations who will be exposed or have the potential to be exposed to onsite hazardous substances. All personnel will operate in accordance with the most current requirements of 29 CFR 1910.120, Standards for Hazardous Waste Workers and Emergency Responders. These regulations include the following provisions for employees exposed to hazardous substances, health hazards or safety hazards: training as described in 120(e), medical surveillance as described in 120(f), and personal protective equipment described in 120(g).

3.0 SITE CHARACTERIZATION

3.1 SITE CONTROL

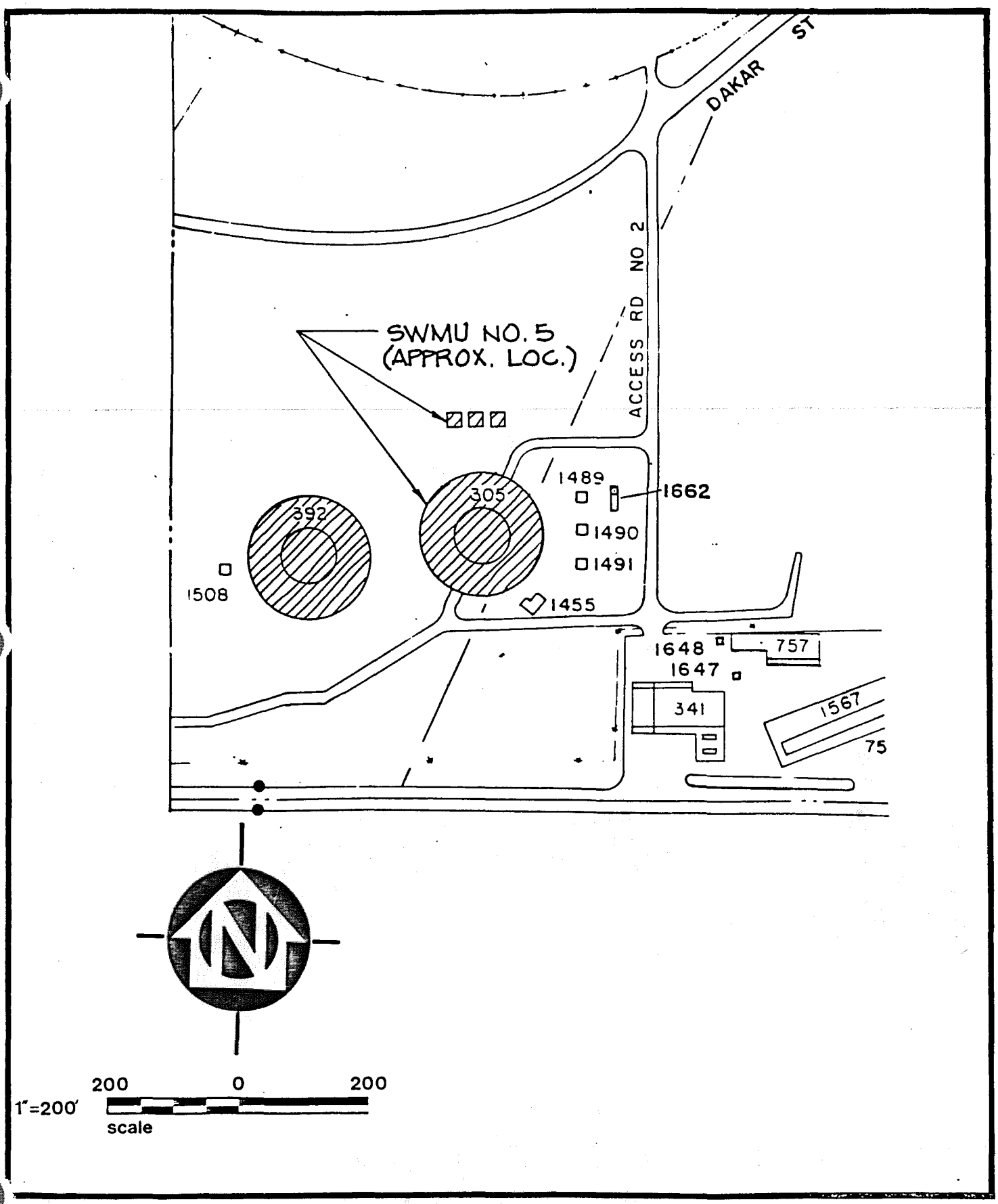
A forty foot perimeter will be established around each work zone and marked with hazard tape. Only authorized personnel with 40 hours health and safety training meeting the requirements of OSHA 29 CFR 1910.120 are permitted within the marked area.

3.2 WORK ZONES

Site activity will be restricted to the fire fighting training area, NAS Memphis. See Figure 1.

4.0 SITE ACTIVITIES

The activities to be performed during the investigation will be subsurface soil borings and surface water/sediment sampling.



SWMU NO. 5 FIRE FIGHTING TRAINING AREA
FIGURE 1 LOCATION MAP

5.0 HAZARD EVALUATION

This is a preliminary site assessment to determine the extent of air, direct contact or surface water impacts. According to Department of the Navy information, the site has been and still is used to train fire fighters. It was common practice to mix waste fuels with waste solvents to fuel the fires. The waste solvents known to have been used are petroleum naphtha, xylene, methyl ethyl ketone, toluene and benzene. However, it is unlikely that this waste fuel/solvent mixture was utilized at this site.

6.0 EMPLOYEE PROTECTION

Employee protection for this project includes standard safe work practices personal protective equipment, procedures and equipment for extreme weather conditions, work limitations and exposure evaluation.

6.1 STANDARD SAFE WORK PRACTICES

Standard safe work practices that will be followed include:

- Eating, drinking, chewing gum or tobacco, smoking or any activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the Site Health and Safety Officer.
- Hands and face must be thoroughly washed upon leaving the work area.
- Contact lenses shall not be worn on site.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate or discolored surfaces; or lean, sit or place equipment on drums, containers or on soil suspected of being contaminated.
- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on cleanup or response operations where the potential for absorption, inhalation or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverages shall not be consumed during site operations.

6.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Field activities will be initiated in Level D protection. Level D Protection consists of one piece chemically-resistant suit (optional), hard hat, gloves and boots. This level of protection was chosen because of the volatile nature of most of the constituents concerned, it is anticipated that any escape of contaminants to the air would have occurred immediately following the release and little or no residual will be present at this time. If field conditions indicate a higher level of contamination than anticipated, field activities will be halted, and a reassessment of the field program will be conducted. The reassessment will include the type of PPE recommended for field activities. If higher levels are necessary, they will be selected based on the contaminants and concentrations. Any adjustments in field procedures as a result of a reassessment will result in an amendment to this health and safety plan.

Criteria for selection of LEVEL C PPE

1. Oxygen level is at least 19.5%
2. Total unknown organic vapor levels exceed 1-5 ppm above background.
3. Doubt exists about the air quality, therefore preventing the use of Level D PPE.
4. Level A or B PPE is not indicated.

Level C PPE consists of full-face piece, air-purifying cartridge-equipped respirator. Cartridges used must be approved by MSHA and/or NIOSH for the hazards encountered. Because of the types of suspected contaminents on the site, an organic vapor cartridge is recommended. Additionally, chemical-resistant clothing, chemical-resistant gloves (inner and outer), steel toe and shank boots and hard hat are required.

6.3 PROCEDURES AND EQUIPMENT FOR EXTREME WEATHER CONDITIONS

Field activities for this site are scheduled to take place during the fall and winter. Therefore, heat stress and cold exposure will be of concern for the health and safety personnel. Adverse weather conditions are important considerations in planning and conducting site operations. Extremes in hot and cold weather can cause physical discomfort, loss of efficiency and personal injury.

6.3.1 Heat Stress

Heat stress can result when the protective clothing decreases natural body ventilation even when temperatures are moderate. Working under various levels of personal protection may require the wearing of low permeability disposable suits, gloves and boots. This clothing will prevent most natural body ventilation. Discomfort due to increased sweating and body temperature (heat stress) will be expected at the work site. Recommendations to reduce heat stress follow:

- Drink plenty of fluids (to replace loss through sweating).
- Wear cotton undergarments to act as a wick to absorb moisture.
- Make adequate shelter available for taking rest breaks to cool off.

In extremely warm weather, the Site Health and Safety Officer may also require these additional measures:

- Wear cooling devices to aid in ventilation (NOTE: the additional weight may affect efficiency).
- Install portable showers or hose down facilities to cool clothing and body.
- Shift working hours to early morning and early evening. Avoid the hottest time of the day.
- Frequently rotate crews wearing the protective clothing.
- Monitor pulse rate and body temperature of individuals leaving work site.

6.3.2 Cold Exposure

Persons working outdoors in temperatures at or below freezing may experience frostbite or hypothermia. Extreme cold for a short time may cause severe injury to the surface of the body. Areas of the body that have a high surface-area-to volume ratio, such as fingers, toes, and ears are the most susceptible.

Two factors influence the development of cold injury: Ambient temperature and the velocity of the wind. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than

air. Thus the body cools suddenly when protective equipment is removed if the clothing underneath is soaked with perspiration.

Recommendations to reduce effects of cold exposure:

- Stay dry. When the temperature drops below 40°F, change perspiration soaked clothes frequently. When clothes get wet, they lose about 90% of their insulating value.

- Beware of the wind. A slight breeze carries heat away from bare skin much faster than still air. Wind drives cold air under and through clothing. Wind refrigerates wet clothes. Wind multiplies the problems of staying dry.

- Understand cold. Most hypothermia cases develop in temperatures between 30°F and 50°F. Cold water running down the neck and legs or cold water held against the body by sopping clothes causes hypothermia.

- Make adequate dry, warm shelter available.

- Provide warm drinks.

- Monitor the pulse and body temperature of individuals leaving the work area.

Never ignore shivering. Persistent shivering is a clear warning that a person is on the verge of hypothermia. Allow for the fact that exposure greatly reduces normal endurance. Physical activity may be the only thing preventing hypothermia.

6.4 WORK LIMITATIONS

All site activities will be conducted during daylight hours only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e).

6.5 EXPOSURE EVALUATION

All personnel scheduled for site activities have had a baseline physical examination and have been declared fit for duty. An exposure history form will be completed for each worker participating in site activities. It includes onsite monitoring results.

7.0 MONITORING REQUIREMENTS

Air monitoring will be accomplished using an inorganic/organic vapor detector during all wipe sampling and surface soil sampling. Instruments will be read while samples are obtained; but field technicians will be made aware that they must report any unusual odors or soil discolorations. Results of air monitoring are to be recorded in the field log book and maintained with the site records. Each instrument shall be calibrated daily before site activities commence and after termination of site activities. At the end of each work day and prior to calibration, each instrument shall be checked to ensure that they are free from surface contamination.

8.0 DECONTAMINATION

A decontamination zone will be established which will include an area for sampling equipment and personnel decontamination.

8.1 PERSONNEL DECONTAMINATION

The decontamination procedures, based on Level D protection, will consist of brushing heavily soiled overboots, rinsing gloves and overboots with soap and water, removing outer boots and placing in a plastic lined container. Washing and rinsing protective suit, removing protective suit. Protective suits will be place in plastic lined containers. Washing and rinsing gloves and placing in plastic lined containers.

Decontamination procedures will be conducted at the lunch break and at the end of each work day.

If higher levels of personal protection equipment are needed, adjustments will be made to these procedures and an amendment will be made to this health and safety plan.

8.2 CLOSURE OF THE PERSONNEL DECONTAMINATION STATION

All disposable clothing and plastic sheeting used during site activities will be double-bagged and disposed in a refuse container. Decontamination and rinse solutions will be allowed to drain onsite. Reusable clothing will be dried and prepared for future use. All washtubs, pails, buckets, etc. will be washed, rinsed and dried at the end of each workday.

9.0 AUTHORIZED PERSONNEL

Personnel anticipated to be onsite at various times

during site activities include:

- ERC-EDGe Principal-in-Charge --
- ERC-EDGe Project Manager --
- ERC-EDGe Safety Officer --
- ERC-EDGe Representatives --

(NAMES FOR THIS SECTION WILL BE PROVIDED UPON RECEIPT OF AUTHORIZATION TO START THIS PHASE OF THE CONTRACT)

9.1 The responsibilities of the ERC-EDGe project manager are as follows:

The project manager will direct the site investigation and operation. The project manager has the primary responsibility for:

- Assuring that all personnel are aware of:

  a. Names of personnel and alternates responsible for site safety and health;
  b. Safety, health and other hazards present on the site;
  c. Use of personnel protection equipment and assuring that the equipment is available;
  d. Work practices by which the employee can minimize risks from hazards;
  e. Safe use of engineering controls and equipment on the site;
  f. Medical surveillance requirements including recognition of symptoms and signs which might indicate over exposure to hazards; and
  g. Site control measures, decontamination procedures, site standard operating procedures and the contingency plan and responses to emergencies including the necessary PPE.

- Assuring that all employees have received a minimum of 40 hours of instruction, off the site, and actual field experience under the direct supervision of a trained experienced supervisor. Workers who may be exposed to unique or special hazards shall be provided additional training.

- Monitoring the performance of personnel to ensure that mandatory health and safety procedures are being performed and correcting any performances that do not comply with the Health and Safety Plan.

- Ensuring that all field personnel employed on the site are covered by a medical surveillance program as required by 29 CFR 1910.120(f)

- Consulting with the Health and Safety Officer and/or other personnel.

- Preparation and submittal of any and all project reports - includes progress, accident, incident, contractual, etc.

9.2 The responsibilities of the ERC-EDGe site health and safety officer are as follows:

- Assure that a copy of the health and safety plan is maintained onsite during all field activities.

- Advise the project manager on all health and safety related matters involved at the site.

- Direct and ensure that the safety program is being correctly followed in the field, including the proper use of personal protective and site monitoring equipment.

- Ensure that the field personnel observe the appropriate work zones and decontamination procedures.

- Report any safety violations to the project manager.

- Conducts safety briefings during field activities.

- Based on observation of all site conditions, determine if and when an evacuation is needed. If an evacuation is necessary, notify local law enforcement officials and inform them of the hazardous substance involved, the direction of movement of the substance and the areas that will be immediately affected.

Initially, the site health and safety officer will be a person trained in safety and industrial hygiene. After the project begins and the site safety officer has had time to evaluate actual hazardous site conditions, he/she may determine that a member of the project team may assume the duties of site health and safety officer.

9.3 Responsibilities of onsite field personnel are as

follows:

- All personnel going on site must be thoroughly briefed on anticipated hazards and trained on equipment to be worn, safety procedures to be followed, emergency procedures and communications.

- Required respiratory protective devices and clothing must be worn by all personnel going into areas designated for wearing protective equipment.

- Personnel must be fit-tested prior to use of respirators.

- No facial hair which intrudes on the sealing surface of the mask is allowed on personnel.

- Personnel on site must use the buddy system when wearing respiratory protective equipment. As a minimum, a third person, suitably equipped as a safety backup, is required during initial entries.

- Visual contact must be maintained between pairs onsite and site safety personnel. Field personnel should remain close together to assist each other during emergencies.

- All field personnel should make use of their senses to alert themselves to potentially dangerous situations which they should avoid, e.g., presence of strong and irritating or nauseating odors.

- Personnel should practice unfamiliar operations prior to doing the actual procedure in the field.

- Field personnel shall be familiar with the physical characteristics of the site, including:

  - wind direction in relation to contamination zones;
  - accessibility to associates, equipment and vehicles;
  - communications;
  - operation zones;
  - site access; and
  - nearest water sources.

- Personnel and equipment in the contaminated area must be kept to a minimum, consistent with effective site operations.

- Procedures for leaving a contaminated area must be planned and implemented prior to going onsite in accordance with the Site Health and Safety Plan.

- All visitors to the job site must comply with the Health and Safety Plan procedures. Personal protection equipment may be modified for visitors depending on the situation. Any modifications must be approved by the site Health and Safety Officer.

10.0 EMERGENCY INFORMATION

All hazardous waste site activities present a potential risk to onsite personnel. During routine operations, risk is minimized by establishing good work practices, staying alert and using proper personal protective equipment. Unpredictable events such as physical injury, chemical exposure or fire may occur and must be anticipated.

If any situation or unplanned occurrence requires outside or support services, Diane Lancaster will be informed and the appropriate contact from the following list will be made:

Contact	**Person or Agency**	**Telephone**
Diane Lancaster	NAS Memphis	873-5462
Law Enforcement	NAS Memphis Base Police Department	873-5776
Fire Department	NAS Memphis Base Fire Department	873-5333 873-5580 (non-emergency)
Ambulance Service		873-5444
Southern Poison Control Center		(901) 528-6048
NAS Memphis Information		873-5111
ERC-EDGe, Inc.		(615) 966-9788

10.1 SITE RESOURCES

Telephones for emergency use are located in Building 1455.

Restroom facilities and water supply will be available near the work zone.

10.2 EMERGENCY PROCEDURES

In the event that an emergency develops onsite, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site; or
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.
- Any person not engaged in site activities experiences any adverse effects or symptoms of exposure while near or down wind of the site.

The following emergency procedures should be followed:

- Site work area entrance and exit routes will be planned and emergency escape routes delineated by the site safety officer.
- In the event that any member of the field team experiences any effects or symptoms of exposure while on the scene, the entire field crew will immediately halt work and act according to the instructions provided by the site safety officer.
- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the site safety officer to indicate possible routes for upwind escape.
- The discovery of any conditions that would suggest the existence of a situation more hazardous than anticipated will result in the suspension of work until the safety officer has evaluated the situation and provided the appropriate instructions to the field team.
- In the event that an accident occurs, the project manager is to complete an accident report form for submittal to the managing principal-in-charge of the project.

11.0 FORMS

The following forms will be used in implementing this health and safety plan:

Plan Acceptance Form
Plan Feedback Form
Accident Report Form
Exposure History Form

The Plan Acceptance Form will be filled out by all employees working on the site prior to commencement of site activities. The Plan Feedback Form will be filled out by the site safety officer and any other onsite employee who wishes to fill one out. The Accident Report Form will be filled out by the Project Manager in the event that an accident occurs. The Exposure History Form will be completed by both the project manager and the individual(s) for whom the form is intended.

All completed forms must be returned to the Principal-in-Charge at ERC-EDGe, Knoxville, Tennessee.

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project work site and returned to , ERC-EDGe, Knoxville, Tennessee.

Job No. _____

Project PRELIMINARY ASSESSMENT/SITE INSPECTION

I represent that I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

_____
Signed

_____
Print Name

_____
Company

_____
Date

LOCATION OF NEAREST HOSPITAL

NAS MEMPHIS NAVAL HOSPITAL
MILLINGTON, TENNESSEE 38054

EMERGENCY ROOM TELEPHONE NUMBER - (901) 873-5280

DIRECTIONS FROM NAS MEMPHIS TO NAS MEMPHIS HOSPITAL

1. from Kinser Gate or Brown Gate turn east (left) onto Navy Road.

LOCATION OF NEAREST HOSPITAL CAPABLE OF HANDLING CHEMICAL EXPOSURES

METHODIST NORTH
3960 NEW COVINGTON PIKE
MEMPHIS, TENNESSEE 38002

EMERGENCY ROOM TELEPHONE NUMBER - (901) 372-5211

DIRECTIONS FROM NAS MEMPHIS TO METHODIST NORTH HOSPITAL

1. from South Gate, south on SGT. Walter K. Singleton Parkway
2. then,south on New Covington Pike

HEALTH & SAFETY PLAN
FOR THE
BUILDING N-126 BATTERY SHOP STORM SEWER AND DITCH
NAVAL AIR STATION, MEMPHIS TENNESSEE

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

prepared by
Environmental & Safety Designs, Inc.
Memphis, Tennessee

August, 1989

1.0 INTRODUCTION

The following is the Health and Safety Plan for the of Remedial Investigation/Feasibility Study for Building N-126 Plating Shop Storm Sewer and Ditch, NAS Memphis, Tennessee. This Plan is submitted in accordance with the provisions of Department of the Navy Contract N62467-88-C-0198, soil and/or groundwater contamination investigations. The investigation is being conducted to determine the extent, if any, of contamination in soils, subsoils and groundwaters at Building N-126 Plating Shop storm sewer and ditch facility, NAS Memphis, Tennessee.

2.0 APPLICABILITY

The provisions of the plan are mandatory for all onsite personnel engaged in hazardous waste operations who will be exposed or have the potential to be exposed to onsite hazardous substances. All personnel will operate in accordance with the most current requirements of 29 CFR 1910.120, Standards for Hazardous Waste Workers and Emergency Responders. These regulations include the following provisions for employees exposed to hazardous substances, health hazards or safety hazards: training as described in 120(e), medical surveillance as described in 120(f), and personal protective equipment described in 120(g).

3.0 SITE CHARACTERIZATION

3.1 SITE CONTROL

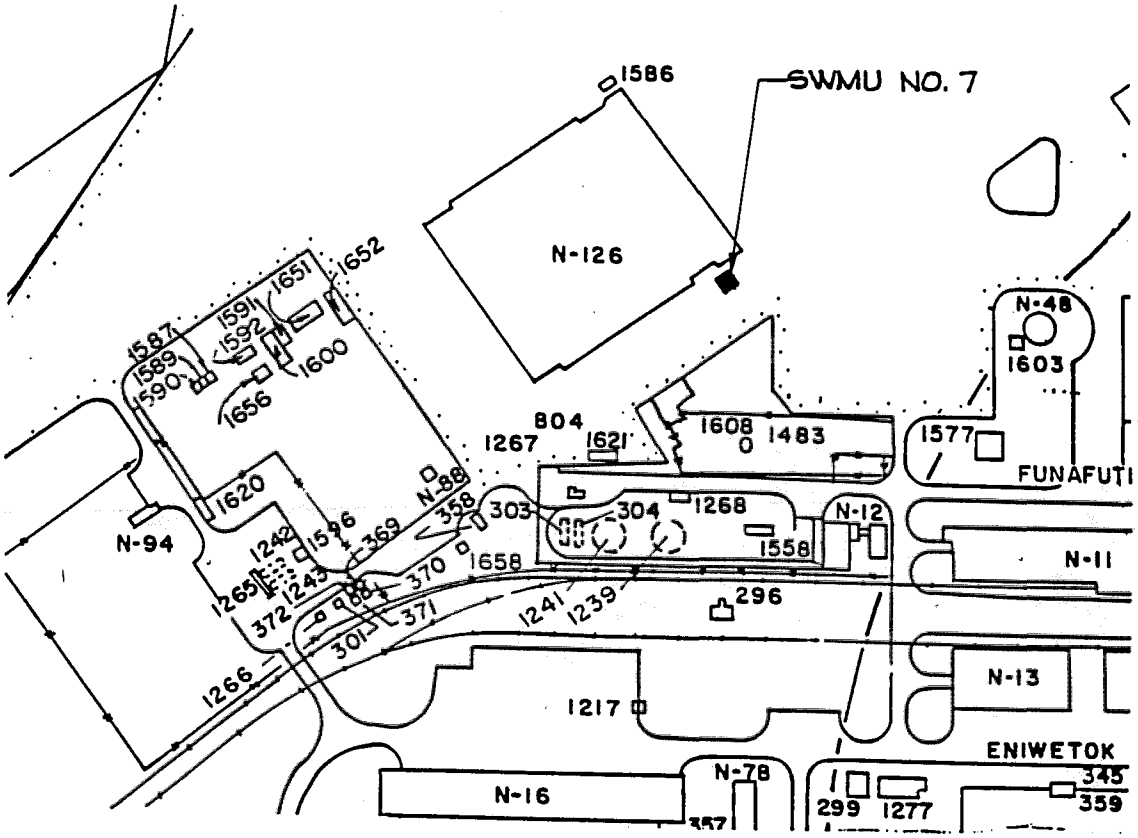
A forty foot perimeter will be established around each work zone and marked with hazard tape. Only authorized personnel with 40 hours health and safety training meeting the requirements of OSHA 29 CFR 1910.120 are permitted within the marked area.

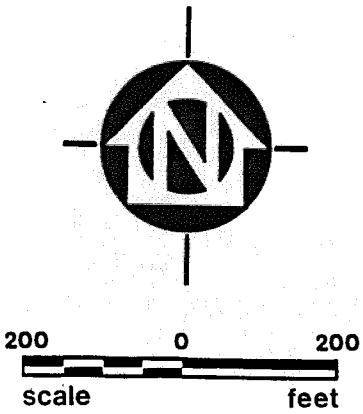
3.2 WORK ZONES

Site activity will be restricted to Building N-126 battery shop storm sewer and ditch, NAS Memphis. See Figure 1.

4.0 SITE ACTIVITIES

The activities to be performed during the investigation will be surface water/sediment sampling.





Environmental and Safety Designs, Inc.

EN SAFE®

5705 STAGE RD. MEMPHIS, TN. 38134 (901)372-7962

FIGURE 1

N-126 PLATING SHOP DRY WELL LOCATION MAP

5.0 HAZARD EVALUATION

This is a preliminary site assessment to determine the extent of air, direct contact or surface water impacts. Spills and drippings of battery acid on the floor of the shop were discharged into floor drains and then into the storm sewer and drainage ditch.

6.0 EMPLOYEE PROTECTION

Employee protection for this project includes standard safe work practices personal protective equipment, procedures and equipment for extreme weather conditions, work limitations and exposure evaluation.

6.1 STANDARD SAFE WORK PRACTICES

Standard safe work practices that will be followed include:

- Eating, drinking, chewing gum or tobacco, smoking or any activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the Site Health and Safety Officer.
- Hands and face must be thoroughly washed upon leaving the work area.
- Contact lenses shall not be worn on site.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate or discolored surfaces; or lean, sit or place equipment on drums, containers or on soil suspected of being contaminated.
- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on cleanup or response operations where the potential for absorption, inhalation or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverages shall not be consumed during site operations.

6.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Field activities will be initiated in Level D protection.

SITE 22

SITE SPECIFIC CONTINGENCY PLAN

OTTO FUEL STORAGE AREA

In addition to analytical data, field data for all samples obtained during the investigation will be provided. Sampling logs are records of procedures used in taking environmental samples and conditions prevailing at the site during sampling. Information included in the log will include:

- Sample type (e.g., soil);
- Sampling location, description or grid coordinates;
- Sampling method;
- Date and time of sampling;
- Temperature; and
- Weather.

The field log sheets should also describe any unusual conditions encountered during sampling, e.g., difficulties with the sampling equipment, post-sampling contamination or loss of samples (Appendix IX).

6.7.2 Sorted Summary Tables

Presentation of results grouped according to data categories is the simplest format used to display trends or patterns in the data. Examples of categories of data include medium tested, sampling date, sampling location, and constituent or property measured.

6.7.3 Graphical Presentation of Data (Appendix X)

Graphical methods of data presentation will often illustrate trends and patterns better than tables. Some graphical formats that are useful for environmental data include bar graphs, line graphs, areal maps, and contour-plots. Use of the graphical method for data presentation will be determined during the project implementation phase.

Bar graphs and line graphs will be used to display changes in contaminant concentrations with time, distance from a source, or

other variables. Bar graphs are preferable to line graphs in instances where there is not enough information to assume continuity between data points.

Attention to the following principles of graphing should provide clear and effective line and bar graphs:

- On a graph plots will be limited to three or four lines or bar subdivisions. Different symbols or textures will be used to distinguish each line or bar;
- The scale of the x and y axes will be chosen so that data is spread out over the full range of the graph. If one or two data points are far outside the range of the rest, a broken line or bar will be used to indicate a discontinuous scale. If the data range exceeds two orders of magnitude, the logarithms of the data will be plotted;
- The x and y axes of the plot will be clearly labeled with the parameter measured and the units of measurement; and
- The x axis generally represents the independent variable and the y axis generally represents the dependent variable.

6.8 CORRECTIVE ACTION

In the event of an out-of-control incident, the nature of the incident and the corrective actions taken to resume the system will be documented by Pioneer Laboratory QA/QC officer and ERCE QA/QC Manager. A corrective action report, to be signed by the laboratory director and the ERCE Project Manager, will be completed and reported in the Monthly Laboratory Progress Report (MPR) to the Navy. The following topics will be included and discussed, per Section 4.6 of NEESA 20.2-047B.

- The place where the out-of-control incident occur (laboratory name, address, telephone number, section name):
- The time when - did the incident occur.
- The name of the person who - discovered the out-of-control incident.
  - verified the incident.
  - corrected the problem.
- The type of the test/parameter
  - the disposition of the test or control and/or
  - the nature of the corrective action.
  - measures taken to prevent the reoccurrence of the problem?
- The cause of the incident.

A copy of the subject control charts and other data describing the out-of-control conditions will be included in the corrective action report.

All out-of-control incident documentation and copies of the corrective action reports sent to the Navy will be:

(1). placed in the laboratory archive record for the sample(s) in question.
(2). placed in the ERCE file of incidents documentation, and
(3). referenced and briefly described in the MPR to the Navy.

7.0 REPORTS

7.1 PROGRESS AND FINANCIAL REPORTS

Project tracking reports are critical for tracking both financial and technical progress. The collection, documentation, and reporting of the financial and project tracking data for the NAS Memphis investigation will take a system approach.

The final RI/FS Work Plan shall include estimates of the costs, manhours, and schedules associated with each task. Detailed project tracking reports for each site shall include the following:

- Monthly Work Assignment Technical Status Report;
- Monthly Work Assignment Financial Status Report,;and
- Cumulative Project Costs Graph.

7.2 REMEDIAL INVESTIGATION REPORT

This section addresses the recommended format for reports prepared for NAS Memphis remedial investigations to be conducted under CERCLA. This format has been designed to:

- Ensure that all major issues are adequately addressed;
- Produce comparable presentations from different sites;
- Promote high quality remedial investigation reports; and
- Ensure adequate documentation and complete data for use in decision making.

The recommended format will consolidate data from several investigation activities into a single presentation and serve as a checklist of activities conducted and data obtained.

The draft Remedial Investigation Report is produced at the end of the remedial investigation process. This report characterizes the site and summarizes the data collected and conclusions drawn from all investigative areas and levels. If appropriate, this

report may be combined with the associated Feasibility Study Report to provide one site report containing both support data and decision making documentation.

The draft, following review, approval, and revision, becomes the final report.

Appendix XI presents the recommended NAS Memphis Remedial Investigation Report format. The report will be prepared for every remedial investigation and will present only the data generated in the investigation to support analysis of remedial alternatives in the feasibility study. The report contents should be adjusted based on the focus of the data collection and the analyses conducted.

Contaminant levels in the environment will be reported on a media-specific basis. For example, contaminant levels in sediments will be presented in the surface-water investigation section, while contaminant concentrations in groundwater will be presented in the hydrogeologic investigation section.

7.3 FEASIBILITY STUDY REPORT

To ensure that all major issues are addressed within the FS report for NAS Memphis Facilities, Appendix XI presents the recommended report format. A consistent report format makes it possible to compare feasible alternatives for each site; and ensures that decisions are adequately documented.

APPENDIX I

APPLICABLE DOCUMENTS FOR NAS MEMPHIS RI/FS

NAS MEMPHIS
MILLINGTON, TENNESSEE
APPLICABLE DOCUMENTS FOR NAS MEMPHIS RI/FS

Field/Laboratory Documentation

Project/Field Log Books
Sample Tags
Sample Data Sheets and Logs
Chain-of-Custody Records, Seals
Receipt of Sample Forms
Laboratory Log Books
Laboratory Data, Calculations, Graphs

RI Management Reports

Draft/Final Work Plan(s)
Health/Safty Plan
Sampling Plan (Quality Assurance/Quality Control Plan)
Data Management Plan
Project Management Plan

RI Task Reports

Site Description
Contamination Assessment
Environmental Assessment
Public Health Assessment
Endangerment Assessment
Draft/Final RI Report

Technical Progress and Financial Reports

Monthly Technical Progress Report
Monthly Financial Progress Report
Cumulative Project Cost Report

APPENDIX II

SAMPLE STATUS REPORT

SAMPLE STATUS REPORT FORMAT
NAS MEMPHIS
WORK ASSIGNMENT FINANCIAL STATUS REPORT

Site:

Work Assignment (WA) Number:
Month Ending:

Project Start Date
Scheduled Completion Date
% Complete:

	Actual Costs			Estimated Costs			
	Current Month	Cummulative to Date	% Spent	Cost to Complete	Cost to Completion	Budget at Completion	Variance at Completion
Cost							
Contractor Hours							
Subcontractor Hours							
Total Hours							
Contractor Sec. Hours							
Subcontractor Sec. Hours							
Total Sec. Hours							
Total Hours							
Direct Labor							
Equipment ($)							
Travel							
Subcontract Cost							
Indirect Costs							
Subcontract Cost							
Base Fee							
Total WA							

	Month 1	Month 2	Month 3	Total
WA Next 3 Month Projections				
WA Total				

SAMPLE STATUS REPORT FORMAT

Work Assignment Number:	
Site Name/Activity:	
Prepared By:	
Date:	
Period (Month, Year):	
Copies:	

Progress made this reporting period:	
Problems resolved:	
Anticipated problem areas and recommended solutions:	
Deliverables submitted:	
Upcoming events/activities planned:	
Key personnel changes:	
Subcontracting:	
Travel:	
Contract laboratories:	
Percent complete:	
Schedule:	

APPENDIX III

DESIGNATED RECIPIENTS

OF

REPORT SUBMITTALS

Captain Jerry Baker, Jr. (Committee Chairman)
Commanding Officer
Naval Air Station Memphis
Millington, TN 38054-5000
(901) 873-5101

Committee Members:

Mayor George R. Harvell, Jr.
City of Millington
7930 Nelson
Millington, TN 38053
(901) 872-2211

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3179 N. Watkins
Memphis, TN 38127
(901) 872-8277 (Home)
(901) 358-4099 (Work)

Mr. Richard Swiggart
Director, Shelby County Health Department
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Memphis, TN 38105
(901) 576-7582

Mr. Paul Patterson
Tennessee Department of Health and Environment
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170 North Mid-America Mall
Memphis, TN 38103
(901) 543-6695

Unknown Representative
U.S. Environmental Protection Agency, Region IV
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Atlanta, Georgia 30365
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Public Works Officer
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Environmental Programs Officer
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Public Works Department
Naval Air Station Memphis
Millington, TN 38054-5000
(901) 873-5209

FORMAL TRANSMITTAL FORM

DOCUMENT TRANSMITTAL

TO:	DATE:
	REFERENCE NUMBER

SENDER:

THE FOLLOWING DOCUMENT(S) IS TRANSMITTED TO YOU FOR: ☐ USE ☐ RECORDS ☐ INFORMATION

TITLE ID NO.	REV. NO	NO. OF COPIES	CONTROLLED NUMBERS	UNCONTROLLED NUMBERS

NOTE:

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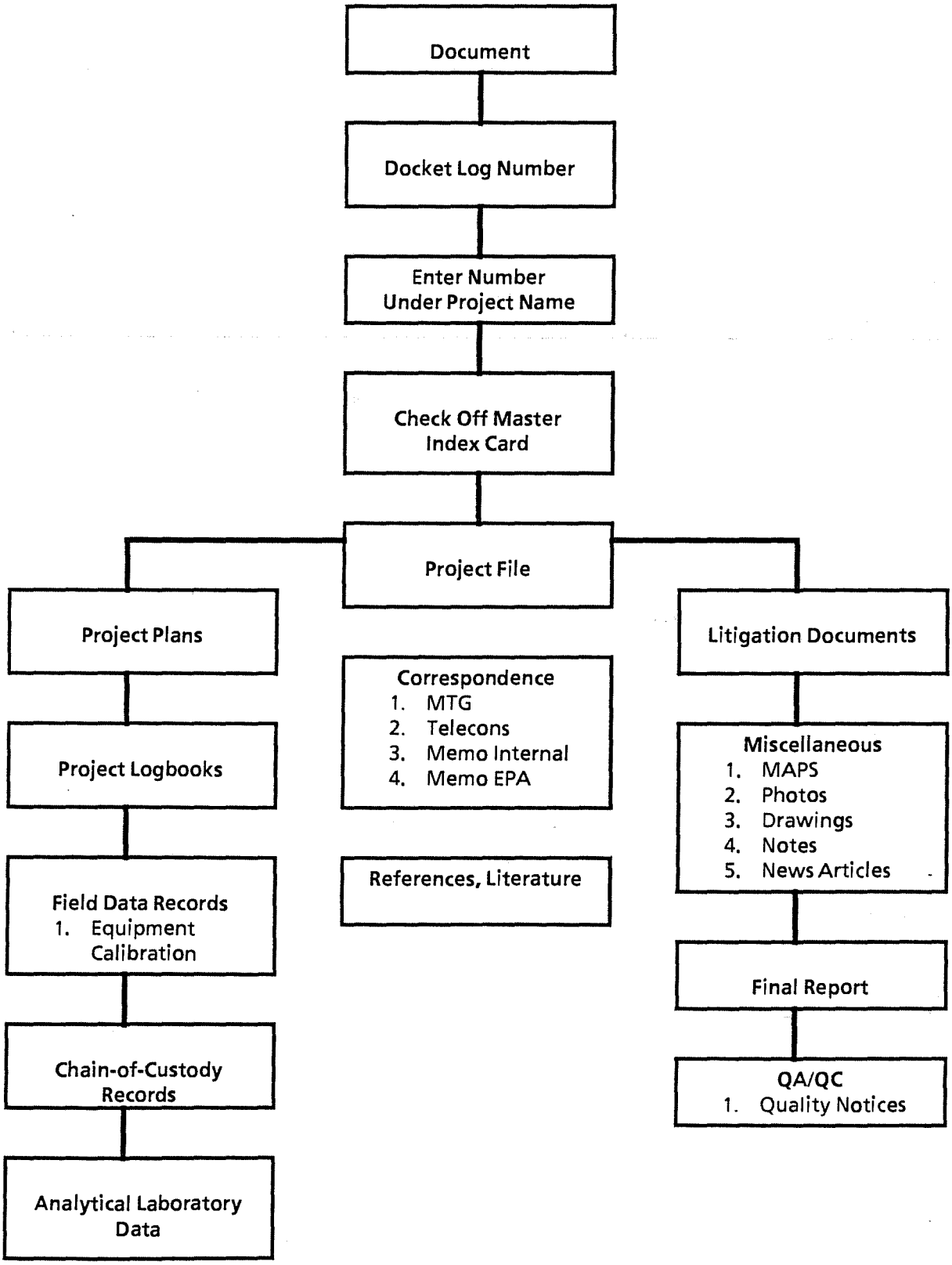
SIGNATURE:	DATE:

SIGNED COPY OF THIS TRANSMITTAL SHOULD BE RETURNED TO:

APPENDIX IV

PROJECT FILE PROCEDURES
AND
INVENTORY FORM

PROJECT FILES PROCEDURES



NAS MEMPHIS
MILLINGTON, TENNESSEE

FILE INVENTORY

SWMU Site Name _____
Job No. _____
TDD No. _____
Date _____

Docket Number	Date of Entry	Title of Document

APPENDIX V

CHAIN-OF-CUSTODY RECORD

NAS MEMPHIS
MILLINGTON, TENNESSEE
CHAIN OF CUSTODY RECORD

SWMU NAME _____

SWMU No. _____

SAMPLE TYPE: WASTES _____ GROUND WATER _____					SAMPLERS: (Signature)			
WELL NO.	SAMPLE NO.	WELL LOCATION	DATE	TIME	SAMPLE TYPE		NO. OF CONTAINERS	ANALYSES REQUIRED
					COMP	GRAB		
					TOTAL NO. OF CONTAINERS			

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
FIELD ANALYSIS PERFORMED BY: (Signature)	DISPATCHED BY: (Signature)	DATE/TIME

METHOD OF SHIPMENT

ADDITIONAL COMMENT/DESCRIPTION OF SAMPLES:

APPENDIX VI

OUTLINE OF THE FILE STRUCTURE

NAS MEMPHIS
MILLINGTON, TENNESSEE
OUTLINE OF THE FILE STRUCTURE

1. **Congressional inquiries/hearings**
   - Correspondence
   - Transcripts
   - Testimony
   - Published hearing records

2. **Remedial Response**
   - <u>Discovery</u>
     - Initial investigation reports
     - Preliminary assessment report
     - Site inspection report
     - Hazardous ranking system
     - Sampling and analysis data

   - <u>Remedial Planning</u>
     - Correspondence
     - Work plans for remedial investigation/feasibility study
     - Remedial investigation/feasibility study reports
     - Health and safety plan
     - Quality assurance/quality control plan

   - <u>Remedial Implementation</u>
     - Remedial design reports
     - Permits
     - Contractor work plans and progress reports
     - Corps of Engineers agreements, reports and correspondence

   - <u>State and Other Agency Coordination</u>
     - Correspondence
     - Cooperative agreement/Superfund State contract
     - State quarterly reports
     - Status of State assurances
     - Interagency agreements
     - Memorandum of Understanding with State

- Community Relations
  - Correspondence
  - Community relations plan
  - List of people to contact, e.g., local officials, civic leaders, environmental groups
  - Meeting summaries
  - Press releases
  - News clippings

3. **Imagery**
   - Photographs
   - Illustrations
   - Other graphics

4. **Enforcement**
   - Status reports
   - Cross-reference to any confidential enforcement files and person to contact
   - Correspondence
   - Administrative orders

5. **Contracts**
   - Site-specific contracts
   - Procurement packages
   - Contract status notifications
   - List of contractors

6. **Financial Transactions**
   - Cross-reference to other financial files and person to contact

APPENDIX VII

RECORD OF COMPUTER SOFTWARE VERIFICATION FORM

NAS MEMPHIS
MILLINGTON, TENNESSEE
RECORD OF COMPUTER SOFTWARE VERIFICATION

RECORD OF COMPUTER SOFTWARE VERIFICATION

DESCRIPTION OF VERIFICATION ACTIVITIES AND FINDINGS (CONT'D):	Page of
VERIFIED BY:	DATE:
ACCEPTED BY (REGIONAL/OFFICE MANAGER):	DATE:
REVIEWED BY CA:	DATE:

NAS MEMPHIS
MILLINGTON, TENNESSEE
RECORD OF COMPUTER SOFTWARE VERIFICATION
(Continued)

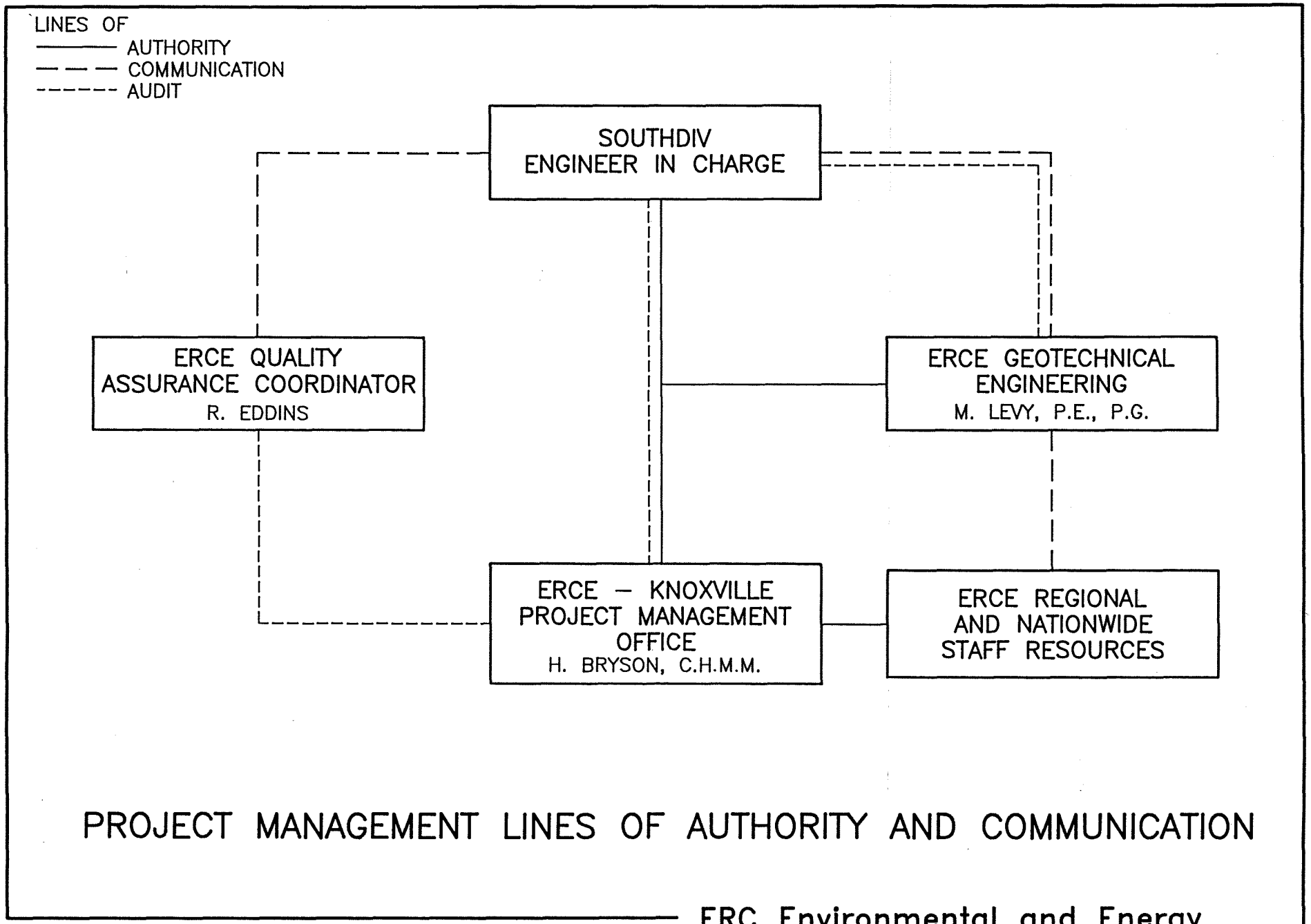
RECORD OF COMPUTER SOFTWARE VERIFICATION

SOFTWARE PACKAGE NAME:	PAGE OF
DEVELOPER:	
PROGRAMMER:	
COMPUTER TYPE:	
VERIFICATION SCOPE: ☐ SAMPLE PROBLEM FROM ORIGINATOR ☐ MATHEMATICAL MODELING ☐ COMPLETE ☐ SPOT CHECK ☐ NUMERICAL ANALYSIS ☐ COMPLETE ☐ SPOT CHECK ☐ DATA LIBRARIES USED ☐ COMPLETE ☐ SPOT CHECK ☐ BENCHMARK AGAINST EXISTING PROGRAMS ☐ BENCHMARK AGAINST EXPERIMENTAL RESULTS ☐ BENCHMARK AGAINST HAND CALCULATION(S) ☐ VERIFICATION TESTING PROGRAM	PROGRAM USE: ☐ DESIGN ☐ CALCULATIONS ☐ MANAGEMENT INFORMATION ☐ ANALYSIS ☐ OTHER
DESCRIPTION OF VERIFICATION ACTIVITIES AND FINDINGS:	

ADOPTED FROM REFERENCE ____.

APPENDIX VIII

DATA FLOW AND REPORTING SCHEME



PROJECT MANAGEMENT LINES OF AUTHORITY AND COMMUNICATION

ERC Environmental and Energy
Services Company

APPENDIX IX

SAMPLE LOG SHEET

SWMU NAME: *SAMPLE LOG SHEET*

PROJECT SITE NAME:	**SWMU NO.**	
SOURCE NO.	**DATE:**	**TIME:**
SAMPLE NAME:	**SAMPLER(S):**	
SOURCE: ☐ A. CONTAINER ☐ B. OTHER _____	**SIGNATURE(S):** ☐ ENVIRONMENTAL SAMPLE ☐ HAZARDOUS SAMPLE	
SOURCE LOCATION:	**RADIOACTIVITY (MR/HR):**	

SOURCE

A. CONTAINER SOURCE

CONTAINER TYPE:

☐ DRUM
- ☐ BUNG TOP ☐ BOLTED RING
- ☐ LEVER LOCK ☐ OTHER _____

☐ BAG/SACK
☐ TANK
☐ OTHER _____

DISPOSITION OF CONTAINER
☐ CONTAINER SAMPLED
☐ CONTAINER OPENED BUT NOT SAMPLED
REASON _____

CONTAINER DESCRIPTION

COLOR _____
CONDITION _____
MARKINGS _____
_____
VOL OF CONTENTS _____
OTHER _____

B. OTHER SOURCE

TYPE:

☐ WELL ☐ LAKE ☐ LAGOON/POND ☐ SEDIMENT ☐ OTHER
☐ SPRING ☐ STREAM ☐ SOIL ☐ WASTE PILE _____

DESCRIPTION _____
DISPOSITION: ☐ SAMPLE OBTAINED ☐ NOT OBTAINED _____

DESCRIPTION OF SAMPLE

A. CONTAINER SOURCE

	LAYER 1	LAYER 2	LAYER 3
PHASE	☐ SOL ☐ LIQ	☐ SOL ☐ LIQ	☐ SOL ☐ LIQ
COLOR	_____	_____	_____
VISCOSITY	☐ L ☐ M ☐ H	☐ L ☐ M ☐ H	☐ L ☐ M ☐ H
% OF TOTAL VOL	_____	_____	_____
OTHER	_____	_____	_____

TYPE OF SAMPLE: ☐ GRAB ☐ COMPOSITE ☐ GRAB-COMPOSITE

B. OTHER SOURCE

COLOR _____
TURBIDITY ☐ L ☐ M ☐ H

OTHER _____
_____
_____

TOTAL APPROXIMATE VOLUME OF SAMPLE

DISPOSITION OF SAMPLE

☐ FORWARDED TO LAB: TRAFFIC REPORT NOS. _____

DATE: _____ TIME: _____

☐ ANALYZED ON-SITE: PROJECT LOGBOOK PAGE NO. _____

☐ RESULTS FORWARDED TO _____ DATE: _____ TIME: _____

☐ IN STORAGE ON-SITE ☐ OTHER: _____

SKETCH OF SOURCE LOCATION

ADDITIONAL COMMENTS

APPENDIX X

SAMPLE USES OF TABLES AND GRAPHICS

NAS MEMPHIS
MILLINGTON, TENNESSEE
SAMPLE USES OF TABLES AND GRAPHICS

Tabular Displays

1. Display site information and measurements
   - Water table elevations
   - Subsurface stratigraphy
   - Sampling location coordinates
   - Precipitation and temperature data
   - Lists of site fauna and flora species

2. Display analytical data
   - List of contaminants of concern and other monitoring parameters with associated analytical measurements
   - Display sorted results (e.g. by medium, sampling data, soil type)
   - Compare study and background area data
   - Report input data, boundary conditions, and output values from mathematical modeling

Graphical Displays

1. Display site features
   - Layout and topography (equivalent to required RCRA Part B permit application map)
   - Sampling locations and sampling grids
   - Boundaries of sampling area
   - Subsurface stratigraphy (profile, transect or fence diagram)
   - Wind rose
   - Potentiometric contour map
   - Population plot and/or local residential map
   - Features affecting intermedia transport

2. Illustrate the extent of contamination
   - Geographical (areal) extent of contamination
   - Vertical distribution of contaminant(s)
   - Contamination values, averages, or maxima at sampling locations

3. Demonstrate patterns and trends in the data
   - Plot change in concentration with distance from the source
   - Change in concentration with time
   - Display estimates of future contaminant transport derived from modeling

Tables

- Unsorted (raw) data
- Sorted tables

Graphical Formats and Other Visual Displays

- Bar graphs
- Line graphs
- Area or plan Maps
- Isopleth (contour) plots
- Cross-sectional plots, transects, or fence diagrams
- Three dimensional graphs

APPENDIX XI

REMEDIAL INVESTIGATION REPORT FORMAT
AND
FEASIBILITY STUDY REPORT FORMAT

NAS MEMPHIS
MILLINGTON, TENNESSEE
REMEDIAL INVESTIGATION REPORT FORMAT

SWMU SITE:

EXECUTIVE SUMMARY

1.0 INFORMATION

- 1.1 Site Background Information
- 1.2 Nature and Extent of Problem(s)
- 1.3 Remedial Investigation Summary
- 1.4 Overview of Report

2.0 SITE FEATURES INVESTIGATION

- 2.1 Demography
- 2.2 Land Use
- 2.3 Natural Resources
- 2.4 Climatology

3.0 HAZARDOUS SUBSTANCES INVESTIGATION

- 3.1 Waste Types
- 3.2 Waste Component Characteristics and Behavior

4.0 HYDROGEOLOGIC INVESTIGATION

- 4.1 Soils
- 4.2 Geology
- 4.3 Ground Water

5.0 SURFACE-WATER INVESTIGATION

- 5.1 Surface Water
- 5.2 Sediments
- 5.3 Flood Potential
- 5.4 Drainage

6.0 AIR INVESTIGATION

7.0 BIOTA INVESTIGATION

7.1 Flora
7.2 Fauna

8.0 BENCH AND PILOT TESTS

9.0 PUBLIC HEALTH AND ENVIRONMENTAL CONCERNS
9.1 Potential Receptors
9.2 Public Health Impacts
9.3 Environmental Impacts

REFERENCES

APPENDICES

NAS MEMPHIS
MILLINGTON, TENNESSEE
FEASIBILITY STUDY REPORT FORMAT

EXECUTIVE SUMMARY

1.0 INTRODUCTION
- 1.1 Site Background Information
- 1.2 Nature and Extent of Problems
- 1.3 Objectives of Remedial Action

2.0 SCREENING OF REMEDIAL ACTION TECHNOLOGIES
- 2.1 Technical Criteria
- 2.2 Remedial Action Alternatives Developed
- 2.3 Environmental and Public Health Criteria
- 2.4 Other Screening Criteria
- 2.5 Cost Criteria

3.0 REMEDIAL ACTION ALTERNATIVES
- 3.1 Alternative 1 (No Action)
- 3.2 Alternative 2
- •
- •
- •
- 3.N Alternative N

4.0 ANALYSIS OF REMEDIAL ACTION ALTERNATIVES
- 4.1 Non-cost Criteria Analysis
  - 4.1.1 Technical Feasibility
  - 4.1.2 Environmental Evaluation
  - 4.1.3 Institutional Requirements
  - 4.1.4 Public Health Evaluation
- 4.2 Cost Analysis

5.0 SUMMARY OF ALTERNATIVES

6.0 RECOMMENDED REMEDIAL ACTION (optional)

7.0 RESPONSIVENESS SUMMARY (in final version only)

REFERENCES

APPENDICES

FINAL DRAFT

VOLUME V

HEALTH AND SAFETY PLAN

FOR

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

NAS MEMPHIS SITES NO. 1-9

MILLINGTON, TENNESSEE

Prepared For:
Commanding Officer
Attn: (Code 11519)
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
P.O. Box 10068
Charleston, SC 29411-0068

Prepared By:
ERC Environmental and Energy Services Co.
725 Pellissippi Parkway
Knoxville, Tennessee 37933

16 November 1989

ERC/EDGe Project No. B880

FINAL DRAFT

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2.2	RESPONSIBILITY	3
2.3	QUALIFICATIONS	4
3.0	**SITE SPECIFIC HEALTH AND SAFETY PLANS**	5
4.0	**RECORD KEEPING**	6

APPENDIX I - ERC CORPORATE HEALTH AND SAFETY PLAN

APPENDIX II - SITE-SPECIFIC HEALTH AND SAFETY PLAN

1.0 INTRODUCTION

The purpose of this Health and Safety Plan (HSP) is to establish the field health and safety procedures to protect all personnel on site and to ensure that RI/FS activities will not endanger surrounding NAS personnel and property. The HSP includes personnel expected to conduct site work and any needed site-specific safety requirements. The (RI/FS) tasks and field activities will be conducted at the following nine solid waste management unit (SWMU) sites at the Naval Air Station Memphis (NAS Memphis), Millington, Tennessee:

SWMU NO.	SWMU NAME
1	Fire Department Drill Area
2	South-Side Landfill
3	N-121 Plating Shop Dry Well
4	N-121 Plating Shop Storm Sewer
5	Fire-Fighting Training Area
6	N-126 Battery Shop Storm Sewer Ditch
7	N-126 Plating Shop Dry Well
8	Cemetery Disposal Area
9	Sewage Lagoons

The Naval Installation Restoration Program (IRP) was established in 1983 to direct the investigation and remediation of uncontrolled hazardous waste disposal sites associated with naval activities. In accordance with the Defense Environmental Restoration Program (DERP) and the National Contingency Plan (NCP), the Naval IRP is currently being implemented in full compliance with statutory requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). CERCLA/SARA specifies that inclusion of all applicable or relevant and appropriate requirements in particular, the Resource Conservation and Recovery Act of 1976

(RCRA) and the Hazardous and Solid Waste Amendments of 1984 (HSWA) be made. The Naval IRP also incorporates compliance with other laws and regulations. This HSP also follow the requirements of 20 CFR 1910.120 (1) (1) and (1)(2).

This Plan is subject to evaluation and periodic updates as phases of the RI/FS are implemented.

2.0 HEALTH AND SAFETY

The nine SWMU sites subject to the RI/FS are suspected of containing hazardous wastes. Whether or not the nature of the hazards is known, the proper safety and health precautions are control elements for ensuring protection of personnel during field study activities. The EIC, consulting engineer and subcontracting personnel should undertake responsibility in assuring that on-site investigations and associated testing are accomplished with the highest level of worker safety.

2.1 CORPORATE HEALTH AND SAFETY PLAN

One copy of the ERC Environmental and Energy Company corporate Health and Safety Plan is included as Appendix I. This plan provides an insight to the firm's safety and health qualifications, and specialized training.

2.2 RESPONSIBILITY

The ERCE as prime contractor for the on-site investigations has primary responsibility of protecting the safety and health of all personnel on the work site and ensuring that on-site RI/FS activities do not endanger surrounding personnel and/or property and that contamination encountered at the site does not contaminate other areas. ERCE personnel are responsible for strict adherence to applicable federal (29 CFR 1910, and 29 CFT 1926) and Tennessee occupational safety and health regulations. The ERCE Project Manager will designate a health and safety contact on-site to ensure that the field investigation task is accomplished in compliance with pertinent promulgated standards and regulations and to ensure conformance with health and safety plans approved by the Navy. ERCE is responsible for coordinating emergency assistance with all non-Navy organizations included in the contingency plan. The ERCE and its subcontractors will supply the required equipment for performance of all RI/FS tasks in a safe and healthful manner on-site.

2.3 QUALIFICATIONS

The designated ERCE health and safety contact, Ms. Denise Daggett, oversees all work performed at the NAS Memphis sites. MS. Daggett is a Certified Industrial Hygienist (CIH), who has an educational background and experience level in the health science and occupational safety, has received adequate formal health and safety training specific to the hazardous of the work. The qualifications of the designated health and safety contact and all training records will be provided to the Navy prior to the field study.

3.0 SITE SPECIFIC HEALTH AND SAFETY PLANS

The site-specific HSPs were developed by Environmental and Safety Designs, Inc., (EnSafe), Memphis, Tennessee, in conjunction with the RI/FS Work Plans and supporting documents for the field investigations and related testing studies. They are intended to present site specific procedures such as: site boundaries, personal protective equipment, safety inspections, contingencies in case of emergency, etc. The site-specific HSPs for SWMU sites No. 1-9 are included as Appendix II and supporting documents.

4.0 RECORD KEEPING

The HSP describes how the ERCE will maintain records of each health and safety related matter that occurs during the course of the study. This includes field analytical data collected using field instrumentation (i.e., HNU, OVA), employee health monitoring data, health and safety planning documentation and contingency plan communications and contacts. The ERCE Project Manager will provide the SOUTHDIV EIC monthly updates on the health and safety program as part of the monthly work progress report.

APPENDIX I

ERC CORPORATE HEALTH AND SAFETY PLAN

Prepared By:
ERC Environmental and Energy Services Co.
5510 Morehouse Drive
San Diego, California 92121

April 1989

Revision 0

ERC ENVIRONMENTAL AND ENERGY SERVICES CO.
SITE CORPORATE HEALTH & SAFETY PROGRAM

Prepared by: D.L. Daggett, CIH
April 1989

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LETTER	TITLE
A	Applicable Standards and Regulations
B	ERCE Medical Surveillance Program
C	ERCE Respiratory Protection Standard Operating Procedure

PREFACE

ERCE Environmental and Energy Services Co. (ERCE) has established this Corporate Health and Safety Program in accordance with its policy to provide ERCE employees with a safe and healthful working environment. For personnel who participate in field assignments that involve hazardous materials/wastes, protection from adverse health effects or injuries is provided through the implementation of the procedures contained in this document.

The key to successful implementation of this Site Corporate Health and Safety Program is a shared management-employee responsibility for all health and safety matters. Although ERCE management is committed to maintaining the safest possible work conditions, it is vital that employees accept the responsibility to protect themselves while involved in site work assignments. This responsibility includes becoming familiar and complying with all ERCE health and safety procedures, and being actively involved with procedural improvements.

SECTION 1
INTRODUCTION

ERCE personnel must work periodically on contaminated sites where there is a potential for a variety of hazardous situations, including exposure to hazardous waste in soil, water, air, and/or groundwater. The potential health and safety hazards to ERCE employees in these situations depend upon the nature and extent of the contamination, chemical and physical stresses, and the characteristics of the site. All ERCE staff participating in such site work, therefore, must receive health and safety training to enable them to recognize the hazards at each site, follow standard procedures and guidelines for dealing with each hazard and use appropriate protective equipment when working in hazardous areas.

This ERCE Site Health and Safety Program outlines and describes the means by which ERCE provides protection for its employees. It includes provisions for management of the program, employee training, medical surveillance, personal protective equipment, personal and area monitoring, emergency response, Hazard Communication Program and accident prevention. It also includes guidelines for developing a site Health and Safety Plan (HSP).

Both management and staff have responsibilities for implementing proper health and safety procedures during incineration site work. ERCE has a legal and moral responsibility to provide a safe and healthful workplace for its employees. Each employee, in turn, is responsible for following the established procedures for his/her own personal protection and also the protection of co-workers.

The ERCE Site Corporate Health and Safety Program complies with all the current safety and health regulations, including:

OSHA 29CF1910.120: Hazardous Waste Operations and Emergency Response.
OSHA 29CFR1910, General Industry Standards.
OSHA 29CFR1926, Construction Industry Standards.

A list of other applicable federal and state standards is presented in Appendix A.

SECTION 2
HEALTH AND SAFETY PROGRAM MANAGEMENT AND RESPONSIBILITIES

2.1 INTRODUCTION

The goal of the ERCE Corporate Site Health and Safety Program is the prevention of occupationally related accidents and illnesses.

Accordingly, it is ERCE policy to:

- Provide safe working conditions.
- Conduct all company operations within the guidelines of established health and safety practices.
- Comply with all government regulations related to employee health and safety.
- Maintain high standards in the areas of industrial health, environmental protection and safety.

To carry out this policy, ERCE has established the health and safety management structure. The key person in this structure is the ERCE Certified Industrial Hygienist, who is responsible for the overall direction and management of the program. Site Health and Safety Officers and Assistants will be assigned to individual projects or locations. The number and type of health and safety personnel for a given site will be based upon project size, operation scope, and the particular health and safety training requirements relative to the proposed site.

The duties and responsibilities of each position in the site health and safety organization are discussed in the following sections.

2.2 CERTIFIED INDUSTRIAL HYGIENIST

The Certified Industrial Hygienist (CIH) designated for site work shall be certified in comprehensive practice by the American Board of Industrial Hygiene (ABIH) with a

minimum of three years of experience in hazardous waste projects. The CIH shall have a working knowledge of the regulations for worker safety and health and environmental protection. The CIH provides guidance and technical support to the Health and Safety Officer. Any major site health and safety difficulty or injury/accident must be reported by the site Health and Safety Officer to the CIH. The CIH will be onsite on an as needed basis.

2.3 Health and Safety Officer

ERCE shall provide the services of a Health and Safety Officer (HSO) for site projects. The HSO shall have, at a minimum, two years of hazardous waste experience, working knowledge of state and federal occupational safety and health regulations, and training in health and safety. The HSO shall be certified in CPR and first aid. The HSO will be on site on a day-to-day basis to implement the ERCE Health and Safety Program. The HSO will be responsible for the control of specific field operations and all related activities such as personnel decontamination, worker monitoring, distribution of protective equipment, documentation/recordkeeping, and adherence with all procedures outlined in the HSP.

2.4 Health and Safety Assistant

At some large sites, a Health and Safety Officer Assistant (HSOA) may be designated. The HSOA can act for the HSO at the HSO's direction. This individual will be required to support the HSO when multiple operations are conducted that require monitoring and HSO supervision. The HSOA prime responsibility would be to accompany field sampling teams, and to provide the appropriate monitoring to ensure the safe conduct of field operations. Continuous communications access with the command post will be available to the HSOA. In times of emergency the HSOA will support the HSO and CIH and will assist with the responses and recovery resources he/she can initiate immediately and effectively.

2.5 Medical Consultant

ERCE shall provide the services of a medical consultant who is a physician board certified in Occupational Medicine. The physician shall have extensive experience in the occupational health area and be familiar with site hazards and remedial action projects. The physician will work very closely with the ERCE CIH to anticipate and prevent occupational

illness. Physicals required for the project work will be conducted under the supervision of the Occupational Physician, but can actually be performed by a designated physician in the vicinity of the sites.

SECTION 3
SITE HAZARDS ASSESSMENT

3.1 INTRODUCTION

ERCE site work can pose a variety of health and safety concerns, some of which could possibly result in serious injury or death. Certain hazards are a function of the physical and chemical nature of the site itself, while others are a direct consequence of the work being performed. Hazards to ERCE personnel are likely to fall in the following categories:

- Chemical exposure
- Fire and explosion
- Physical safety hazards
- Electrical hazards
- Noise
- Heat stress
- Cold exposure
- Biological hazards
- Oxygen deficiency

The following sections present a general overview of the categories listed above. Not all of these hazards are typically encountered a a single site, but they are described here for informational purposes. Hazards are specifically addressed in the HSP of each project.

3.2 SITE HAZARDS

- <u>Chemical Exposure</u>

Field operations may present exposure potential to toxic gases, vapors, liquids, and solid materials. These substances can enter the unprotected human body by inhalation, direct skin contact, ingestion, or through a puncture wound (injection) whereupon they may cause a variety of toxic effects, depending on the chemical.

Some chemical exposure effects, such a burning eyes, coughing, nausea, and skin rashes, may become obvious during or shortly after an exposure. These effects are termed "acute." These effects may be temporary and reversible., or they may be more serious and cause

permanent disability or death. Some chemicals can cause permanent health damage without any short-term warning signs. This is particularly true for repeated exposures to low levels of very toxic chemicals. These "chronic" health effects, such as cancer, liver damage, or respiratory disease, may not manifest themselves for several years or even decades after exposure. The susceptibility of an individual to adverse health effects from chemical exposure may be influenced by a number of personal factors, including smoking, alcohol consumption, mediation medication use, nutrition, age, sex, fitness, and genetic predisposition.

The primary exposure route of concern on ERCE project sites is inhalation. With a surface area of 70 to 100 m^2, the lungs are extremely vulnerable to chemical agents. Even substances that do not directly affect the lungs may pass through the lung tissue into the bloodstream, where they are transported to other portions of the body where they can manifest "systemic" effects. Toxic chemicals present in the atmosphere are frequently not detected by human senses, i.e., they may be colorless, odorless, and their toxic effects may not produce any immediate symptoms. Respiratory protection is therefore extremely important if there is a possibility that the work site atmosphere may contain hazardous substances.

Direct contact of the skin and eyes by gaseous, liquid, or solid substances is another important route of exposure. Some chemicals directly injure the skin. This "local" effect is true of strong acids and bases and many organic chemicals which defat the skin. Some pass through the skin into the bloodstream where they are transported to vulnerable organs. Skin absorption is enhanced by abrasions, cuts, heat, and moisture. The eye is particularly vulnerable because airborne chemicals can dissolve onto its moist surface and be carried to the rest of the body through the blood stream (capillaries are very close to the surface of the eye). To protect against dermal and eye contact, employees must wear protective clothing, gloves, goggles, and faceshields. The proper selection of protective material with low permeability to hazardous substances is essential when contact with highly contaminated materials may occur. Using gloves or clothing of inappropriate material may actually increase dermal absorption by trapping the liquid between the skin and the protective material. Under most circumstances, lightweight disposable gloves and clothing will be suitable for low hazard situations. The HSP will address specific requirements.

Although ingestion should be the least significant route of exposure at an ERCE site, it may occur if standard operating procedures are not observed. Deliberate ingestion of chemicals

is unlikely, however, prohibited personal habits such as chewing gum or tobacco, drinking, eating, and smoking cigarettes in contaminated site areas provide a route of entry for chemicals.

The last primary route of chemical exposure is injection, whereby chemicals are introduced into the body through puncture wounds. Examples are a worker stepping on a contaminated nail or receiving a deep laceration while being splashed by a hazardous liquid.

One protective control measure against chemical injection via the foot is to have workers wear boots with steel toes and shanks. Another means of protection is to guard against trips, falls, etc. Avoidance of physical hazards and common sense precautions are equally important protective measures.

- Fire and Explosion

The most common fires and explosion incidents arise at sites from activities such as moving drums, accidentally mixing incompatible chemicals, or introducing an ignition source into an explosive or flammable environment. At site operations, explosions and fires not only pose the obvious hazard of intense heat, open flame, smoke inhalation, and flying objects, but may also cause the release of toxic chemicals into the environment such as dioxin or cyanide. To protect against fire and explosion, the HSO will monitor, as required, for dangerous atmospheres. Efforts will be made to keep all potential ignition sources away from flammable or explosive environments, to use non-sparking, explosion-proof equipment, and follow safe practices when performing tasks that might result in the release of toxic vapors.

All the necessary fire suppression equipment on all ERCE sites will be available with personnel trained to put out incipient fires. Fires or explosions of any greater magnitude will result in the notification of the local fire department and emergency response unit.

- Physical Safety Hazards

ERCE is aware that work at hazardous waste sites can pose safety hazards. Efforts will be made through training to inform personnel that they should be aware of potential site hazards (ditches, uneven terrain, etc.), and should immediately inform their supervisor or

the HSO of any new hazards so that corrective action can be taken quickly to eliminate the safety problem.

Many site job activities pose unique safety hazards, such as: hot surface, rotating machinery, the potential for falling or dropped objects, and excessive weight loads. ERCE is familiar with these safety hazards and has instituted policies and procedures that assist in minimizing injury. At a minimum, all ERCE personnel onsite are required to wear hard hats, safety glasses and steel-toed safety shoes/boots. Applicable OSHA and EPA signs are posted warning of potential hazards at all ERCE sites.

Some protective equipment can impair a worker's agility, hearing, and vision, thus increasing the chance of an accident. Physical hazards can injure workers directly. Injuries can also create additional danger by increasing chemical exposure due to broken skin or damaged protective equipment. Site personnel should be constantly on the lookout for potential safety hazards, and should immediately inform the ERCE HSO.

Electrical Hazards

Electrical equipment used onsite may pose electrical hazards to workers resulting in shock or electrocution. To help minimize this hazard, low-voltage equipment with ground-fault interrupters and water-tight corrosion resistant connecting cables will be used onsite. In addition, at certain times of the year lightning may pose a hazard, especially to personnel handling metal drums or equipment. To minimize this hazard, weather conditions will be monitored and work will be suspended during electrical storms.

Noise

Site activities in proximity to construction and large equipment often exposes workers to excessive noise. The effects of this noise can be:

- Psychological effects: workers being startled, annoyed, or distracted.
- Physiological effects: pain, temporary and/or permanent hearing loss, reduced muscular control (when exposure is severe).

- Communication interference: increase in potential hazard due to the inability to warn of danger or properly issue instructions.

It is anticipated that situations may arise when ERCE personnel may be exposed to noise levels in excess of 85 dBA, 8 hour time-weighted average (TWA). An example of this possibility could be when ERCE personnel have to work in close proximity to the subcontractor using heavy equipment to excavate the site. If excessive noise levels occur, efforts will be made to control the noise through administrative and engineering controls. If monitoring reveals noise exposure in excess of 85 dBA 8-hour TWA, a hearing conservation program will be initiated by the CIH and/or the HSO.

- Heat Stress

Heat stress is a major hazard for workers wearing fully or partially encapsulating protective clothing. The same protective materials that shield the body from chemical exposure prevent heat and moisture from dissipating. Personal protective clothing can therefore rapidly create a hazardous condition. Depending on the ambient temperature and the work being performed, heat stress can occur very rapidly—within as little as 15 minutes. It can pose as great a danger to worker health as chemical exposure. In its early stages, heat stress causes discomfort and drowsiness, resulting in impaired functional ability that threatens the safety of both the individual and his/her co-workers. Continued heat stress can lead to heat stroke and death. When the ambient temperature exceeds 70°F, the HSO must carefully select appropriate personnel protective equipment, monitor personnel wearing protective clothing, judiciously schedule work and rest periods, and assure that personnel frequently replace fluids (with water or juices) to protect against this hazard.

- Cold Exposure

At certain times of the year, site work will have to continue during times when the ambient temperature and the wind chill factor could be very low. To prevent hypothermia and frostbite, the staff will be trained to wear appropriate clothing. Shelter, carefully scheduled work/rest periods, drinking warm sweet drinks and soup, and monitoring of the staffs' physical condition will help to prevent injury.

- Biological Hazards

Due to the site locations and terrain, there is a possibility of biological hazards arising from poisonous plants, insects, and reptiles. The ERCE staff will be trained to identify and avoid potentially hazardous plants, and animals. Site first aid stations will be equipped to respond to minor bites, stings, or scratches. Any worker with a major injury will be stabilized and transported to the contracting medical facility.

- Oxygen Deficiency

The oxygen content of normal air at sea level is 21 percent. Physiological effects of oxygen deficiency become apparent when the oxygen concentration decreases to 16 percent. The effects include: impaired attention, judgement and coordination, and increased respiration and heart rate. Lower oxygen levels result in nausea and vomiting, brain damage, heart damage, unconsciousness, and death. To take into account individual physiological responses and errors in measurement, a concentration of 19.5 percent oxygen or lower is considered to be oxygen deficient. The minimum acceptable oxygen content for compressed breathing air is 19.5 percent by volume.

Oxygen deficiency may result from the displacement of oxygen by another gas, or the consumption of oxygen by a chemical or physical reaction. Confined spaces or low-lying areas in the presence of large solvent or gas sources are particularly vulnerable to oxygen deficiency. Health and safety site personnel must monitor oxygen levels and implement use of NIOSH-approved supplied-air respiratory equipment or ventilation techniques when needed to assure protection from oxygen deficiency.

3.3 MONITORING TO EVALUATE HAZARDS

Prior to beginning work at any ERCE project site, a thorough evaluation of the potential hazards must be made. This hazards information forms the core of the HSP. The first step in this evaluation is the collection of available data regarding potential health and safety hazards of the site. These data may take the form of conversations with individuals knowledgeable with the site, previous investigation reports, health and safety survey data, or historical information about former site operations and waste disposal practices. If the available information is insufficient to prepare the site HSP, then a walk-through site survey may have to be conducted by ERCE health and safety personnel.

Preliminary Survey

The objective of the preliminary site survey is to determine the presence of conditions that could result in health and safety hazards to personnel during the site investigation. The survey team may need to utilize a variety of sampling and direct reading instruments to monitor for hazardous conditions. Direct reading instruments normally available to ERCE personnel include combustible gas indicators/oxygen meters, colorimetric indicator tubes, and organic vapor monitors.

Based on the survey team's knowledge of the site, it is vital to select appropriate personal protective equipment for the survey.

Instrument readings should be taken in all potential work areas and at locations of special interest. Appropriate documentation should be made of each location where readings exceed background. In addition, visual observations and any odors detected should also be noted. Sufficient data must be obtained to determine the levels of personnel protection needed during the subsequent field work and to establish hazardous (i.e., restricted) zones at the site.

Periodic Monitoring

Air monitoring should be conducted at the start of the site investigation and periodically during the work to delineate areas where protection is needed, to ensure that the level of protection in use is appropriate, and to evaluate changes in site conditions. Monitoring is especially warranted when work begins on a different part of the site, a new operation is initiated, or different contaminants are encountered. In addition to change in work activities, a number of other variables present significant challenges to the task of accurately and safely assessing airborne contaminants. These include parameters such as temperature, wind speed and direction, weather conditions, humidity, and fluctuating contaminant releases.

It is very important that monitoring instruments be operated by ERCE employees who have been thoroughly trained in use and who understand the limitations of the instruments. The HSP will address specific monitoring requirements.

Personal Monitoring

Due to the fact that ERCE personnel will be involved primarily in the activities associated with site evaluation, ERCE Health and Safety professionals have determined that personal monitoring, along with perimeter monitoring for environmental purposes will frequently constitute the ERCE Health and Safety Monitoring Program.

In the practice of Industrial Hygiene, it is important to evaluate a workplace for hazards so that control measures can be developed to reduce the likelihood of adverse health effects. Evaluation is best accomplished by monitoring the air surrounding a worker, either by a personal sampling device placed on the worker in his/her breathing zone, or monitoring the immediate work area for representative sampling. Data derived from personal monitoring can alert health professionals to overexposures and allow for rapid remediation of the situation. OSHA requires that workers be monitored whenever exposure concentrations are unknown. Air monitoring can also build a historical record of exposure and the opportunity to pick up on trends.

ERCE has extensive experience with monitoring workers for numerous air contaminants. All worker monitoring is accomplished by following the respective NIOSH Air Monitoring Method (or equivalent) for the contaminants of interest.

The major drawback to personal monitoring is the time it takes to obtain analytical results. ERCE site plans allow for the fastest turnaround time for results as possible. For quality control purposes, a subset of samples will be sent offsite to an American Industrial Hygiene Association (AIHA) accredited laboratory for analysis.

Perimeter Monitoring

Fixed location monitoring at the perimeter, where personal protective equipment is no longer required, measures contaminant migration away from the site and will enable the HSO to evaluate the integrity of the site clean areas. Since the fixed location samples may reflect exposures either upwind or downwind from the site, wind speed and direction data will be recorded to aid in interpreting the sample results.

Immediately Dangerous to Life or Health (IDLH) and Dangerous Conditions Monitoring

ERCE will be prepared to respond to potentially IDLH conditions or dangerous atmospheres with direct reading instruments such as a combustion meter, direct reading colorimetric indicator tubes, organic vapor analyzers and an oxygen meter in case of an emergency. All the instruments will be operated by an experienced individual and will be calibrated and maintained to be ready for use.

Recordkeeping

All monitoring data, observations and results will be recorded either in notebooks or on prepared sampling data sheets. The name and signature of the sampler must appear, along with the area description or worker's name and identification if applicable, as well as the date, equipment description, observations and atmospheric information for the monitoring situations. Calibration and maintenance records will be kept on file onsite and will be regularly updated.

SECTION 4
TRAINING REQUIREMENTS

4.1 INTRODUCTION

It is of utmost importance that anyone who enters a hazardous waste site must recognize and understand the potential hazards to health and safety associated with the cleanup of that site. This awareness is promoted by an effective training program. ERCE has had extensive experience training and preparing their staff for site investigations. The ERCE training curriculum is comprehensive covering Hazard Communication, toxicology, industrial hygiene, monitoring equipment, medical aspects, control measures, decontamination, the regulatory context, and emergency response. No employee, contractor, or subcontractor is allowed onsite without the level of training that is appropriate for their work tasks. Visitors to the sites will receive adequate training on hazard recognition and the procedures necessary for safe conduct during a visit.

The objectives of a training program for ERCE employees involved in hazardous field work are:

- To ensure that workers are aware of the potential hazards they may encounter.
- To provide the knowledge and skills necessary to perform the work with minimal risk to worker health and safety.
- To ensure compliance with all occupational and environmental health and safety laws, regulations, and guidelines.
- To enhance the ability of field personnel to react responsibly, safely, and quickly to emergency situations.

4.2 BASIC SITE TRAINING REQUIREMENTS

OSHA regulations for hazardous waste workers require that all employees at the time of job assignment receive a minimum of 40 hours of initial offsite instruction, and a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor. The training consists of both classroom and "hands-on" practice and drills.

An 8-hour refresher course must be attended annually. The table provided below outlines the topics of training:

Training Topic	Subject Matter
Hazard Communication	Hazard recognition—OSHA Title 29
Toxicology	Doses, routes of exposure, IDLH, LD_{50}, PELs
Industrial Hygiene	Basic concepts Selection of PPE Exposure evaluation, control measures
Monitoring Equipment	Functions, uses, selection, limitations
Site Safety Plan	Safe practices, safety briefings, site map, standard operating procedures
Standard Operating Procedures	Hands-on practice Development and compliance
Engineering Controls	Ventilation, isolation, distance
Personal Protective Clothing and Equipment	Fitting, Maintenance, uses, limitations, hands-on Selection Ergonomics
Medical Program	Monitoring, first aid, stress recognition Advanced first aid Planning, design, implementation
Decontamination	Hands-on simulated Design and maintenance
Legal and Regulatory	Safety and health regulations
Emergency Contingency	Help and rescue, drills Response, followup, documentation

On-site management and supervisors directly responsible for or who supervise employee engaged in hazardous waste operations shall receive the 40-hour basic training plus at least 8 additional hours of specialized training on managing such operations at the time of job assignment.

4.3 VISITORS

Visitors to the sites will receive a briefing on safety at the time of arrival. Written health and safety site information sheets will assist in this orientation task. Visitors must read and sign the information sheet as well as be given the opportunity to ask questions and receive

adequate answers. Every effort will be made to allow visitors to observe the site work, but only from clean areas unless otherwise prearranged.

4.4 DOCUMENTATION OF TRAINING

Attendance rosters will be retained for each training class taught. This information may also be maintained on electronic database. Completed and corrected exams that are administered will be maintained in each employee's contractor, or subcontractor personnel file. The exams confirm that every person assigned to a task has had adequate training for that task, and that the training is up-to-date. A certificate is issued to each attendee upon successful completion of each course. Copies of the certificates are maintained in each employee's personnel or health and safety file.

Signed visitor briefing sheets will also be maintained and available on each ERCE site for inspection.

SECTION 5
MEDICAL SURVEILLANCE PROGRAM

5.1 INTRODUCTION

The ERCE Medical Surveillance Program was specifically designed for the protection of the employee health for those involved with the handling of hazardous waste. The document is stand alone and is included in Appendix B.

SECTION 6
PERSONAL PROTECTIVE CONTROL MEASURES

6.1 INTRODUCTION

In the practice of industrial hygiene, it is important to attempt to control worker exposure to hazardous materials by first engineering and administrative measures. The use of personal protective equipment (PPE) should always be a last resort for exposure control because of the physiological and sometimes psychological stresses that the equipment places on the wearer. Even though site work does not lend itself easily to the use and cost of engineering controls, ERCE makes every effort to incorporate its knowledge and experience in this field to create a safe and healthful worksite.

In the instances of emergencies or when engineering and administrative control measures are not feasible, personal protective equipment will be utilized to protect the workers.

6.2 PPE PROCEDURE DEVELOPMENT

A written PPE procedure will be established for the site work and part of the HSP. The purpose of any PPE procedure should be to protect the wearer from safety and health hazards, and to prevent injury to the wearer from incorrect use and/or malfunction of the PPE. To effectively accomplish these goals, the procedure will be integrated into the ERCE medical monitoring; Hazard Communication and PPE training; personal and environmental air monitoring; and selection, use, maintenance and decontamination of PPE.

6.3 SELECTION OF PPE

ERCE personnel involved in hazardous work must be protected against potential hazards they may encounter. The purpose of personal protective clothing and equipment is to shield or isolate individuals from the chemical and physical hazards presented by a particular work environment. Careful selection of PPE should protect the:

- Respiratory system.
- Skin and body.
- Eyes and face.
- Hands and arms.
- Head.
- Ears (hearing).
- Feet.

ERCE Health and Safety Officers and supervisors have the responsibility to:

- Identify the types of task in which protective clothing and/or equipment are required.

- Specify the types of protective clothing and equipment necessary to ensure employee health and safety on specific work sites.

- Provide training in the proper use of protective clothing and equipment.

- Provide required protective clothing and equipment for all employees.

- Ensure that all required protective clothing and equipment are actually used by employees.

- Arrange for proper maintenance, decontamination, storage, and issuance of all required personal protective equipment.

The selection of appropriate personal protective clothing and equipment can be a fairly simple task if the expected site hazards are minimal, or it can be a more difficult task when a complex array of hazards and site conditions are evident. The ERCE CIH should be consulted if there are any questions regarding proper PPE selection. The following factors must be considered when choosing an ensemble of protective items:

- Chemical or physical agents present.

- Contaminant concentrations.

- Dose-response relationships.
- Permissible exposure limits (threshold limit values, ceiling limits, and short-term exposure limits).
- Odor threshold.
- Skin absorption.
- Task to be performed and duration.
- Worker proximity to zones of contamination.
- Accident/major injury potential.
- Level of site activity.
- Route of exposure.
- Physical properties of contaminants.
- Atmospheric dispersion characteristics.

Ensembles of protective clothing and equipment for uncontrolled hazardous waste site work have been formulated by the U.S. EPA, Office of Emergency and Remedial Response. These levels indicate the degree of protection recommended for generalized categories of hazardous environments:

Level A - Highest level of respiratory, skin, eye, and mucous membrane protection. Generally used where extremely hazardous substances are known to be present in high atmospheric concentrations and where Level B splash gear does not offer adequate protection against any dermally-active substances present or where materials and concentrations are unknown.

Level B - Highest level of respiratory protection but a lesser level of skin and eye protection. Generally used in those situations where the chemical is

known, the atmosphere is oxygen deficient, no IDLH* concentrations of substances which can injure or be absorbed through the skin are present, or where dermal contact with hazardous substances is unlikely. This level of protection is normally the minimum used for initial response or reconnaissance, unless the respiratory hazards allow a lesser level of respiratory protection than a self-contained breathing apparatus.

Level C - Generally composed of splash gear and an air-purifying respirator. Provides adequate protection when the type of airborne substance is known, its concentrations measured, the criteria for using air-purifying respirators are met and skin exposure is unlikely. Use of this level of protection requires continuing measurement of air contaminants to ensure that IDLH concentrations do not exist and that the concentrations of the contaminants present do not exceed the service limits of the respirators.

Level D - Primarily a work uniform. Should not be worn in any hazardous environment. It is used when there is no indication of hazardous conditions and the work function precludes contact with any hazardous substance.

The equipment requirements of these levels of protection are summarized below:

- Level A

  - Self-contained breathing apparatus (SCBA), pressure-demand.
  - Chemical-resistant gloves.
  - Fully encapsulating chemical suit.
  - Chemical-resistant safety boots.
  - Hard hat.
  - Disposable boot covers (optional).

* IDLH—Immediately dangerous to life or health.

choice and use of protective garments, however, the final decision to use particular garments will be made after each project has been carefully examined, the operating plan reviewed and the costs considered. The exact definition of the protective gear required for each job task will be outlined in the ERCE HSP.

Consideration must be given for the heat stress that may be experienced by some of the site workers during the course of the project activities. Nonporous protective garments can contribute significantly to inability to dissipate body heat which may enhance the potentially dangerous conditions of heat stress and heat stroke. Cooling garments will be available as necessary and used onsite for personnel who will be required to work in nonporous PPE for any extended length of time.

3. Hand Protection

Double gloving is required for all job tasks where contact with the contaminated wastes could be possible. The first glove a worker puts on is a glove that essentially aids in reducing contamination during PPE doffing or equipment failure. The over-glove will be chemical resistant to the material to be handled.

4. Head Protection

As required by OSHA, all site personnel and visitors will be required to wear a hard hat safety helmet in all areas except the inside labs, eating areas, and any trailers.

5. Eye and Face Protection

Safety glasses are required to be worn at all times by a site worker or visitor except inside the support facilities.

Face shields and goggles are required eye protection whenever splash or projectiles hazards are present. The CIH or HSO will define the work situations where this type of eye protection is required.

6. Foot Protection

Safety boots made of chemical resistant material with steel toes, shank, and insoles are required by all site workers.

Disposable boot covers are often used to protect the leather safety boots from contamination.

7. Hearing Protection

Whenever possible, noise shall be reduced to a level which does not require hearing protection. When this is not possible, approved ear muffs (preferred) or ear plugs shall be used whenever levels exceed 85 dBA. A hearing conservation program must be instituted and adhered to when noise levels exceed 85 dBA.

The type of equipment used and the overall level of protection will be reevaluated periodically by the CIH, HSO, and medical consultant. As information increases about the site from monitoring and from worker experience, the decision to upgrade or downgrade the level of protective equipment required will be made.

6.4 USE OF PPE

Safe use of PPE by ERCE employees requires that they receive training in the proper use and maintenance of each item (including the item's capabilities and limitations), the consequences of not using the PPE, and instruction in inspecting, donning, checking, fitting, using, and doffing each item. This training is included as part of the overall ERCE Health and Safety Training Program and is also provided at work sites by the HSO.

Reuse of chemical-protective clothing will be permitted only if the article is non-porous and has been thoroughly decontaminated and the possibility of chemicals diffusing through to the inside surface is small. ERCE personnel will also use disposable items which can be disposed of after a single use or at the end of the work day. These items include gloves, coveralls, shoe covers, and respirator cartridges. Chemical-resistant boots, "splash" suits,

and certain special use gloves are examples of items where reuse must be based on their condition after use.

New and reusable PPE must be properly stored to prevent damage from heat, dust, moisture, sunlight, and chemicals. All PPE for ERCE personnel will be stored at a suitable location. Each ERCE field staff member should have a designated location to store personal gear, such as hard hat, respirator, boots, safety glasses, etc.

Respiratory Protection Program

The purpose of this program is to establish a Standard Operating Procedure (SOP) for use of respirators to be followed by all ERCE employees engaged in hazardous field work. This program has been developed to comply with OSHA 29CFR1910.134, Cal/OSHA GISO 5144 and the American National Standards Institute (ANSI) Standard Z88.2, "Practices for Respiratory Protection," (1980 Revision). ERCE will provide employees with all necessary equipment for proper respiratory protection. ERCE will only provide equipment approved by NIOSH/MSHA and employees will use only the equipment provided by the company.

The SOP for respiratory protection covers information needed by ERCE employees to properly protect themselves from airborne hazards in areas where they are required to work. The SOP addresses:

- Administration of the program.
- Medical examinations for employees who are required to use respiratory protection.
- Training of employees on the selection, wearing, and maintenance of equipment.
- Selection of proper respiratory protection equipment.
- Fit testing of employees.
- Assignment of respirators/facepieces.

- Inspection and maintenance.
- Cleaning and disinfection.
- Storage of respiratory protection equipment.
- Surveillance of working conditions.
- Reevaluation and supervision of the respiratory protection program to assure its effectiveness.

The SOP is an integral part of the ERCE Corporate Health and Safety Program. Many aspects of the SOP are directly connected to portions of the medical surveillance and training documents. The Respiratory Protection SOP is presented as Appendix C.

SECTION 7
SAFETY HAZARD AND EMERGENCY RESPONSE CONTROLS

7.1 INTRODUCTION

General site safety procedures and guidelines are intended to protect ERCE field personnel from physical injury that are essentially unrelated to the health hazards found at a site. These general safety and emergency hazards may include falls, electrical shock, cuts from sharp objects, injury from rotating or moving machinery, and fire or explosion. Safety requirements range from compliance with OSHA standards to the use of common sense. The following sections outline ERCE's general safety and emergency response control program for site projects.

7.2 ACCIDENT PREVENTION PROGRAM

ERCE's accident prevention program consists of the following elements:

- Training: All ERCE site personnel will receive training to recognize site safety hazards and incorporate procedures and work habits to prevent accidents.

- Safety Meetings: Periodic onsite safety meetings will be held to review the HSP and discuss any safety concerns.

- Inspections: The HSO will inspect each work site on a daily basis for any deficiencies in fulfilling the requirements of the HSP, OSHA regulations, and standard safe operating practices for onsite equipment.

- Reporting: Any individual observing a work site safety hazard should immediately notify the HSO or the Site Supervisor, who will then take appropriate action to correct the situation.

- Warning Signs: Whenever appropriate, warning signs will be posted to alert site personnel to the location of specific hazards or to areas where personnel should use special caution.

5.0 HAZARD EVALUATION

This is a preliminary site assessment to determine the extent of air, direct contact or surface water impacts. The dry well was used for the disposal of concentrated nickel, cadmium and chromium cyanide based plating solutions and rinse water from the plating operation. The waste from the plating operation was discharged into the dry well and allowed to percolate into the surrounding soil.

6.0 EMPLOYEE PROTECTION

Employee protection for this project includes standard safe work practices personal protective equipment, procedures and equipment for extreme weather conditions, work limitations and exposure evaluation.

6.1 STANDARD SAFE WORK PRACTICES

Standard safe work practices that will be followed include:

- Eating, drinking, chewing gum or tobacco, smoking or any activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the Site Health and Safety Officer.
- Hands and face must be thoroughly washed upon leaving the work area.
- Contact lenses shall not be worn on site.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate or discolored surfaces; or lean, sit or place equipment on drums, containers or on soil suspected of being contaminated.
- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on cleanup or response operations where the potential for absorption, inhalation or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverages shall not be consumed during site operations.

6.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Field activities will be initiated in Level D protection. Level D Protection consists of one piece chemically-resistant suit (optional), hard hat, gloves and boots. This level of protection was chosen because of the nature of most of the constituents concerned and the length of time since the termination of plating activities, there is little or no possibility of inhalation hazard. If field conditions indicate a higher level of contamination than anticipated, field activities will be halted, and a reassessment of the field program will be conducted. The reassessment will include the type of PPE recommended for field activities. If higher levels are necessary, they will be selected based on the contaminants and concentrations. Any adjustments in field procedures as a result of a reassessment will result in an amendment to this health and safety plan.

Criteria for selection of LEVEL C PPE

1. Oxygen level is at least 19.5%
2. Total unknown organic vapor levels exceed 1-5 ppm above background.
3. Doubt exists about the air quality, therefore preventing the use of Level D PPE.
4. Level A or B PPE is not indicated.

Level C PPE consists of full-face piece, air-purifying cartridge-equipped respirator. Cartridges used must be approved by MSHA and/or NIOSH for the hazards encountered. Because of the types of suspected contaminents on the site, a high efficiency particulate cartridge is recommended. Additionally, chemical-resistant clothing, chemical-resistant gloves (inner and outer), steel toe and shank boots and hard hat are required.

6.3 PROCEDURES AND EQUIPMENT FOR EXTREME WEATHER CONDITIONS

Field activities for this site are scheduled to take place during the fall and winter. Therefore, heat stress and cold exposure will be of concern for the health and safety personnel. Adverse weather conditions are important considerations in planning and conducting site operations. Extremes in hot and cold weather can cause physical discomfort, loss of efficiency and personal injury.

6.3.1 Heat Stress

Heat stress can result when the protective clothing decreases natural body ventilation even when temperatures are moderate. Working under various levels of personal protection may

require the wearing of low permeability disposable suits, gloves and boots. This clothing will prevent most natural body ventilation. Discomfort due to increased sweating and body temperature (heat stress) will be expected at the work site. Recommendations to reduce heat stress follow:

- Drink plenty of fluids (to replace loss through sweating).
- Wear cotton undergarments to act as a wick to absorb moisture.
- Make adequate shelter available for taking rest breaks to cool off.

In extremely warm weather, the Site Health and Safety Officer may also require these additional measures:

- Wear cooling devices to aid in ventilation (NOTE: the additional weight may affect efficiency).
- Install portable showers or hose down facilities to cool clothing and body.
- Shift working hours to early morning and early evening. Avoid the hottest time of the day.
- Frequently rotate crews wearing the protective clothing.
- Monitor pulse rate and body temperature of individuals leaving work site.

6.3.2 Cold Exposure

Persons working outdoors in temperatures at or below freezing may experience frostbite or hypothermia. Extreme cold for a short time may cause severe injury to the surface of the body. Areas of the body that have a high surface-area-to volume ratio, such as fingers, toes, and ears are the most susceptible.

Two factors influence the development of cold injury: Ambient temperature and the velocity of the wind. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus the body cools suddenly when protective equipment is removed if the clothing underneath is soaked with perspiration.

Recommendations to reduce effects of cold exposure:

- Stay dry. When the temperature drops below 40°F, change perspiration soaked clothes frequently. When clothes get wet, they lose about 90% of their insulating value.

- Beware of the wind. A slight breeze carries heat away from bare skin much faster than still air. Wind drives cold air under and through clothing. Wind refrigerates wet clothes. Wind multiplies the problems of staying dry.

- Understand cold. Most hypothermia cases develop in temperatures between 30°F and 50°F. Cold water running down the neck and legs or cold water held against the body by sopping clothes causes hypothermia.

- Make adequate dry, warm shelter available.

- Provide warm drinks.

- Monitor the pulse and body temperature of individuals leaving the work area.

Never ignore shivering. Persistent shivering is a clear warning that a person is on the verge of hypothermia. Allow for the fact that exposure greatly reduces normal endurance. Physical activity may be the only thing preventing hypothermia.

6.4 WORK LIMITATIONS

All site activities will be conducted during daylight hours only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e).

6.5 EXPOSURE EVALUATION

All personnel scheduled for site activities have had a baseline physical examination and have been declared fit for duty. An exposure history form will be completed for each worker participating in site activities. It includes onsite monitoring results.

7.0 MONITORING REQUIREMENTS

Air monitoring will be accomplished using an

inorganic/organic vapor detector during all sampling. Instruments will be read while samples are obtained; but field technicians will be made aware that they must report any unusual odors or soil discolorations. Results of air monitoring are to be recorded in the field log book and maintained with the site records. Each instrument shall be calibrated daily before site activities commence and after termination of site activities. At the end of each work day and prior to calibration, each instrument shall be checked to ensure that they are free from surface contamination.

8.0 DECONTAMINATION

A decontamination zone will be established which will include an area for sampling equipment and personnel decontamination.

8.1 PERSONNEL DECONTAMINATION

The decontamination procedures, based on Level D protection, will consist of brushing heavily soiled overboots, rinsing gloves and overboots with soap and water, removing outer boots and placing in a plastic lined container. Washing and rinsing protective suit, removing protective suit. Protective suits will be place in plastic lined containers. Washing and rinsing gloves and placing in plastic lined containers.

Decontamination procedures will be conducted at the lunch break and at the end of each work day.

If higher levels of personal protection equipment are needed, adjustments will be made to these procedures and an amendment will be made to this health and safety plan.

8.2 CLOSURE OF THE PERSONNEL DECONTAMINATION STATION

All disposable clothing and plastic sheeting used during site activities will be double-bagged and disposed in a refuse container. Decontamination and rinse solutions will be allowed to drain onsite. Reusable clothing will be dried and prepared for future use. All washtubs, pails, buckets, etc. will be washed, rinsed and dried at the end of each workday.

9.0 AUTHORIZED PERSONNEL

Personnel anticipated to be onsite at various times during site activities include:

- ERC-EDGe Principal-in-Charge --
- ERC-EDGe Project Manager --

- ERC-EDGe Safety Officer --
- ERC-EDGe Representatives --

(NAMES FOR THIS SECTION WILL BE PROVIDED UPON RECEIPT OF AUTHORIZATION TO START THIS PHASE OF THE CONTRACT)

9.1 The responsibilities of the ERC-EDGe project manager are as follows:

The project manager will direct the site investigation and operation. The project manager has the primary responsibility for:

- Assuring that all personnel are aware of:

  a. Names of personnel and alternates responsible for site safety and health;
  b. Safety, health and other hazards present on the site;
  c. Use of personnel protection equipment and assuring that the equipment is available;
  d. Work practices by which the employee can minimize risks from hazards;
  e. Safe use of engineering controls and equipment on the site;
  f. Medical surveillance requirements including recognition of symptoms and signs which might indicate over exposure to hazards; and
  g. Site control measures, decontamination procedures, site standard operating procedures and the contingency plan and responses to emergencies including the necessary PPE.

- Assuring that all employees have received a minimum of 40 hours of instruction, off the site, and actual field experience under the direct supervision of a trained experienced supervisor. Workers who may be exposed to unique or special hazards shall be provided additional training.

- Monitoring the performance of personnel to ensure that mandatory health and safety procedures are being performed and correcting any performances that do not comply with the Health and Safety Plan.

- Ensuring that all field personnel employed on the site are covered by a medical surveillance program as required by 29 CFR 1910.120(f)

- Consulting with the Health and Safety Officer and/or other personnel.

- Preparation and submittal of any and all project reports - includes progress, accident, incident, contractual, etc.

9.2 The responsibilities of the ERC-EDGe site health and safety officer are as follows:

- Assure that a copy of the health and safety plan is maintained onsite during all field activities.

- Advise the project manager on all health and safety related matters involved at the site.

- Direct and ensure that the safety program is being correctly followed in the field, including the proper use of personal protective and site monitoring equipment.

- Ensure that the field personnel observe the appropriate work zones and decontamination procedures.

- Report any safety violations to the project manager.

- Conducts safety briefings during field activities.

- Based on observation of all site conditions, determine if and when an evacuation is needed. If an evacuation is necessary, notify local law enforcement officials and inform them of the hazardous substance involved, the direction of movement of the substance and the areas that will be immediately affected.

Initially, the site health and safety officer will be a person trained in safety and industrial hygiene. After the project begins and the site safety officer has had time to evaluate actual hazardous site conditions, he/she may determine that a member of the project team may assume the duties of site health and safety officer.

9.3 Responsibilities of onsite field personnel are as follows:

- All personnel going on site must be thoroughly briefed on anticipated hazards and trained on

equipment to be worn, safety procedures to be followed, emergency procedures and communications.

- Required respiratory protective devices and clothing must be worn by all personnel going into areas designated for wearing protective equipment.

- Personnel must be fit-tested prior to use of respirators.

- No facial hair which intrudes on the sealing surface of the mask is allowed on personnel.

- Personnel on site must use the buddy system when wearing respiratory protective equipment. As a minimum, a third person, suitably equipped as a safety backup, is required during initial entries.

- Visual contact must be maintained between pairs onsite and site safety personnel. Field personnel should remain close together to assist each other during emergencies.

- All field personnel should make use of their senses to alert themselves to potentially dangerous situations which they should avoid, e.g., presence of strong and irritating or nauseating odors.

- Personnel should practice unfamiliar operations prior to doing the actual procedure in the field.

- Field personnel shall be familiar with the physical characteristics of the site, including:

  - wind direction in relation to contamination zones;
  - accessibility to associates, equipment and vehicles;
  - communications;
  - operation zones;
  - site access; and
  - nearest water sources.

- Personnel and equipment in the contaminated area must be kept to a minimum, consistent with effective site operations.

- Procedures for leaving a contaminated area must be planned and implemented prior to going onsite in accordance with the Site Health and Safety Plan.

- All visitors to the job site must comply with the Health and Safety Plan procedures. Personal protection equipment may be modified for visitors depending on the situation. Any modifications must be approved by the site Health and Safety Officer.

10.0 EMERGENCY INFORMATION

All hazardous waste site activities present a potential risk to onsite personnel. During routine operations, risk is minimized by establishing good work practices, staying alert and using proper personal protective equipment. Unpredictable events such as physical injury, chemical exposure or fire may occur and must be anticipated.

If any situation or unplanned occurrence requires outside or support services, Diane Lancaster will be informed and the appropriate contact from the following list will be made:

Contact	**Person or Agency**	**Telephone**
Diane Lancaster	NAS Memphis	873-5462
Law Enforcement	NAS Memphis Base Police Department	873-5776
Fire Department	NAS Memphis Base Fire Department	873-5333 873-5580 (non-emergency)
Ambulance Service		873-5444
Southern Poison Control Center		(901) 528-6048
NAS Memphis Information		873-5111
ERC-EDGe, Inc.		(615) 966-9788

10.1 SITE RESOURCES

Telephones for emergency use are located in Building N-126. Restroom facilities and water supply will be available near the work zone.

10.2 EMERGENCY PROCEDURES

In the event that an emergency develops onsite, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site; or

- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

- Any person not engaged in site activities experiences any adverse effects or symptoms of exposure while near or down wind of the site.

The following emergency procedures should be followed:

- Site work area entrance and exit routes will be planned and emergency escape routes delineated by the site safety officer.

- In the event that any member of the field team experiences any effects or symptoms of exposure while on the scene, the entire field crew will immediately halt work and act according to the instructions provided by the site safety officer.

- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the site safety officer to indicate possible routes for upwind escape.

- The discovery of any conditions that would suggest the existence of a situation more hazardous than anticipated will result in the suspension of work until the safety officer has evaluated the situation and provided the appropriate instructions to the field team.

- In the event that an accident occurs, the project manager is to complete an accident report form for submittal to the managing principal-in-charge of the project.

11.0 FORMS

The following forms will be used in implementing this health and safety plan:

Plan Acceptance Form
Plan Feedback Form
Accident Report Form
Exposure History Form

The Plan Acceptance Form will be filled out by all employees working on the site prior to commencement of site activities. The Plan Feedback Form will be filled out by the site safety officer and any other onsite employee who wishes to fill one out. The Accident Report Form will be filled out by the Project Manager in the event that an accident occurs. The Exposure History Form will be completed by both the project manager and the individual(s) for whom the form is intended.

All completed forms must be returned to the Principal-in-Charge at ERC-EDGe, Knoxville, Tennessee.

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project work site and returned to , ERC-EDGe, Knoxville, Tennessee.

Job No. _____

Project PRELIMINARY ASSESSMENT/SITE INSPECTION

I represent that I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

_____
Signed

_____
Print Name

_____
Company

_____
Date

LOCATION OF NEAREST HOSPITAL

NAS MEMPHIS NAVAL HOSPITAL
MILLINGTON, TENNESSEE 38054

EMERGENCY ROOM TELEPHONE NUMBER - (901) 873-5280

DIRECTIONS FROM NAS MEMPHIS TO NAS MEMPHIS HOSPITAL

1. from Kinser Gate or Brown Gate, turn east (left) onto Navy Road.

LOCATION OF NEAREST HOSPITAL CAPABLE OF HANDLING CHEMICAL EXPOSURES

METHODIST NORTH
3960 NEW COVINGTON PIKE
MEMPHIS, TENNESSEE 38002

EMERGENCY ROOM TELEPHONE NUMBER - (901) 372-5211

DIRECTIONS FROM NAS MEMPHIS TO METHODIST NORTH HOSPITAL

1. from South Gate, south on SGT. Walter K. Singleton Parkway
2. then,south on New Covington Pike

HEALTH & SAFETY PLAN
FOR THE
CEMETERY DISPOSAL AREA
NAVAL AIR STATION, MEMPHIS TENNESSEE

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

prepared by
Environmental & Safety Designs, Inc.
Memphis, Tennessee

August, 1989

1.0 INTRODUCTION

The following is the Health and Safety Plan for the of the Remedial Investigation/Feasibility Study for the Cemetery Disposal Area, NAS Memphis, Tennessee. This Plan is submitted in accordance with the provisions of Department of the Navy Contract N62467-88-C-0198, soil and/or groundwater contamination investigations. The investigation is being conducted to determine the extent, if any, of contamination in soils, subsoils and groundwaters at the cemetery disposal area, NAS Memphis, Tennessee.

2.0 APPLICABILITY

The provisions of the plan are mandatory for all onsite personnel engaged in hazardous waste operations who will be exposed or have the potential to be exposed to onsite hazardous substances. All personnel will operate in accordance with the most current requirements of 29 CFR 1910.120, Standards for Hazardous Waste Workers and Emergency Responders. These regulations include the following provisions for employees exposed to hazardous substances, health hazards or safety hazards: training as described in 120(e), medical surveillance as described in 120(f), and personal protective equipment described in 120(g).

3.0 SITE CHARACTERIZATION

3.1 SITE CONTROL

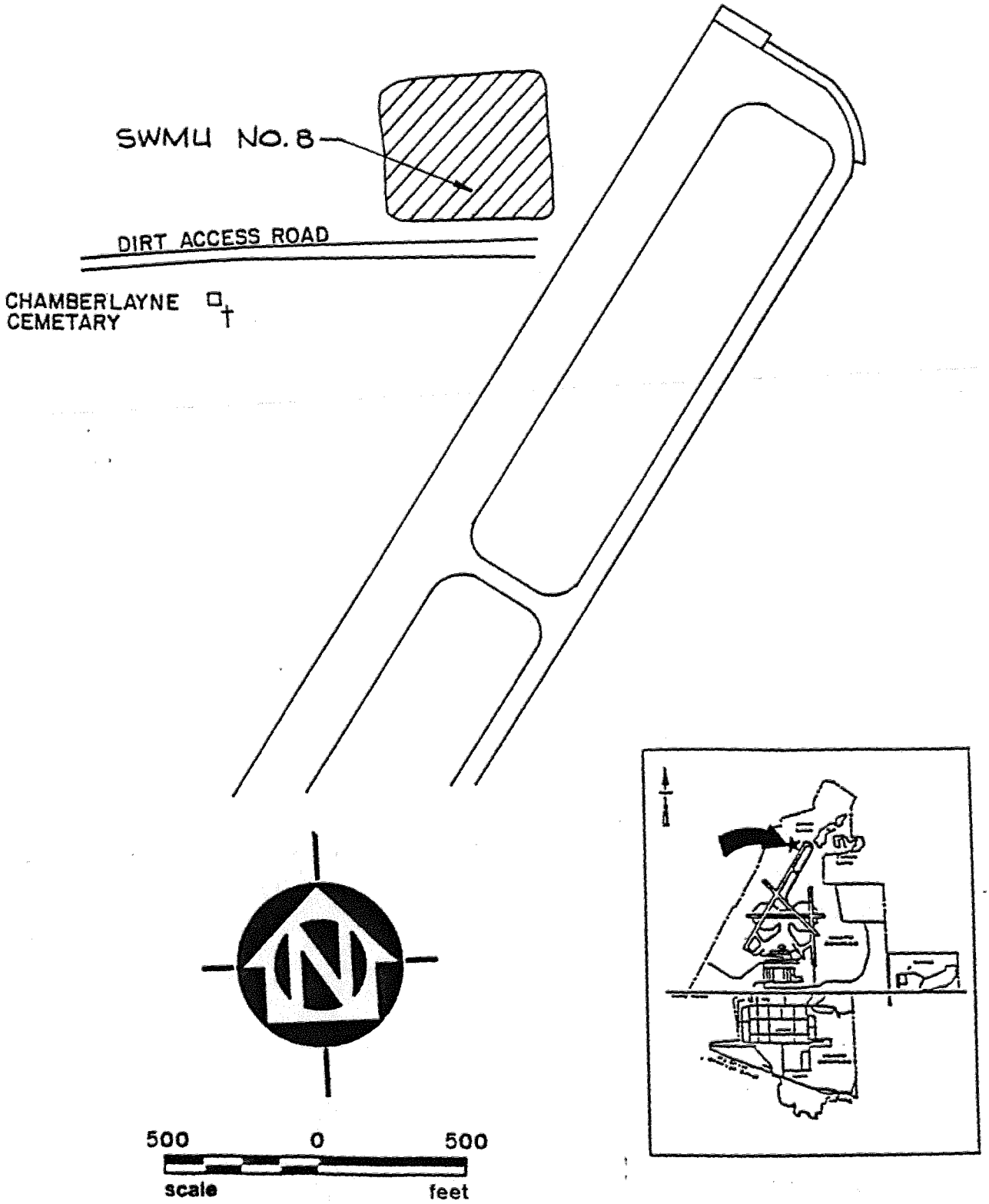
A forty foot perimeter will be established around each work zone and marked with hazard tape. Only authorized personnel with 40 hours health and safety training meeting the requirements of OSHA 29 CFR 1910.120 are permitted within the marked area.

3.2 WORK ZONES

Site activity will be restricted to the area immediately outside the perimeter of the cemetery disposal area, NAS Memphis. See Figure 1.

4.0 SITE ACTIVITIES

The activities to be performed during the investigation will be subsurface soil boring, ground watersampling and subsurface gas monitoring.



Environmental and Safety Designs, Inc.

EN SAFE®

5705 STAGE RD. MEMPHIS, TN. 38134 ☎(901)372-7962

FIGURE 1

CEMETERY LANDFILL

LOCATION MAP

5.0 HAZARD EVALUATION

This is a preliminary site assessment to determine the extent of air, direct contact or surface water impacts. According to the Navy, the cemetery disposal area was originally intended for use as a hazardous waste burial area. Records indicate that three (3) twenty-five pound canisters of ethylene oxide were the only hazardous substances disposed of there. It is reported, however, that shop wastes such as metallic scrap, waste chemicals, waste oils, cleaning solutions, transformers and capacitors were also present in the disposal area. Previous testing of the ground water was conducted for VOCs, cyanide and some metals. No VOCs or cyanide were detected, but a significant concentration of metals was obtained in one of the two down gradient wells.

6.0 EMPLOYEE PROTECTION

Employee protection for this project includes standard safe work practices personal protective equipment, procedures and equipment for extreme weather conditions, work limitations and exposure evaluation.

6.1 STANDARD SAFE WORK PRACTICES

Standard safe work practices that will be followed include:

- Eating, drinking, chewing gum or tobacco, smoking or any activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the Site Health and Safety Officer.
- Hands and face must be thoroughly washed upon leaving the work area.
- Contact lenses shall not be worn on site.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate or discolored surfaces; or lean, sit or place equipment on drums, containers or on soil suspected of being contaminated.
- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on cleanup or response operations where the potential for

absorption, inhalation or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverages shall not be consumed during site operations.

6.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Field activities will be initiated in Level D protection. Level D Protection consists of one piece chemically-resistant suit (optional), hard hat, gloves and boots. This level of protection was chosen because of the nature of most of the constituents concerned, it is anticipated that any escape of contaminants to the air would have occurred immediately following the release and little or no residual will be present at this time. If field conditions indicate a higher level of contamination than anticipated, field activities will be halted, and a reassessment of the field program will be conducted. The reassessment will include the type of PPE recommended for field activities. If higher levels are necessary, they will be selected based on the contaminants and concentrations. Any adjustments in field procedures as a result of a reassessment will result in an amendment to this health and safety plan.

Criteria for selection of LEVEL C PPE

1. Oxygen level is at least 19.5%
2. Total unknown organic vapor levels exceed 1-5 ppm above background.
3. Doubt exists about the air quality, therefore preventing the use of Level D PPE.
4. Level A or B PPE is not indicated.

Level C PPE consists of full-face piece, air-purifying cartridge-equipped respirator. Cartridges used must be approved by MSHA and/or NIOSH for the hazards encountered. Because of the types of suspected contaminents on the site, a high efficiency particulate cartridge is recommended. Additionally, chemical-resistant clothing, chemical-resistant gloves (inner and outer), steel toe and shank boots and hard hat are required.

6.3 PROCEDURES AND EQUIPMENT FOR EXTREME WEATHER CONDITIONS

Field activities for this site are scheduled to take place during the fall and winter. Therefore, heat stress and cold exposure will be of concern for the health and safety personnel. Adverse weather conditions are important considerations in planning and conducting site operations.

Extremes in hot and cold weather can cause physical discomfort, loss of efficiency and personal injury.

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Heat stress can result when the protective clothing decreases natural body ventilation even when temperatures are moderate. Working under various levels of personal protection may require the wearing of low permeability disposable suits, gloves and boots. This clothing will prevent most natural body ventilation. Discomfort due to increased sweating and body temperature (heat stress) will be expected at the work site. Recommendations to reduce heat stress follow:

- Drink plenty of fluids (to replace loss through sweating).
- Wear cotton undergarments to act as a wick to absorb moisture.
- Make adequate shelter available for taking rest breaks to cool off.

In extremely warm weather, the Site Health and Safety Officer may also require these additional measures:

- Wear cooling devices to aid in ventilation (NOTE: the additional weight may affect efficiency).
- Install portable showers or hose down facilities to cool clothing and body.
- Shift working hours to early morning and early evening. Avoid the hottest time of the day.
- Frequently rotate crews wearing the protective clothing.
- Monitor pulse rate and body temperature of individuals leaving work site.

6.3.2 Cold Exposure

Persons working outdoors in temperatures at or below freezing may experience frostbite or hypothermia. Extreme cold for a short time may cause severe injury to the surface of the body. Areas of the body that have a high surface-area-to volume ratio, such as fingers, toes, and ears are the most susceptible.

Two factors influence the development of cold injury: Ambient temperature and the velocity of the wind. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus the body cools suddenly when protective equipment is removed if the clothing underneath is soaked with perspiration.

Recommendations to reduce effects of cold exposure:

- Stay dry. When the temperature drops below 40°F, change perspiration soaked clothes frequently. When clothes get wet, they lose about 90% of their insulating value.

- Beware of the wind. A slight breeze carries heat away from bare skin much faster than still air. Wind drives cold air under and through clothing. Wind refrigerates wet clothes. Wind multiplies the problems of staying dry.

- Understand cold. Most hypothermia cases develop in temperatures between 30°F and 50°F. Cold water running down the neck and legs or cold water held against the body by sopping clothes causes hypothermia.

- Make adequate dry, warm shelter available.

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All site activities will be conducted during daylight hours only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e).

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All personnel scheduled for site activities have had a baseline physical examination and have been declared fit for duty. An exposure history form will be completed for each worker participating in site activities. It includes onsite monitoring results.

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Air monitoring will be accomplished using an inorganic/organic vapor detector during all sampling. Additionally, a flammable gas indicator will be used during all subsurface gas testing. Instruments will be read while soil samples are obtained; but field technicians will be made aware that they must report any unusual odors or soil discolorations. Results of air monitoring are to be recorded in the field log book and maintained with the site records. Each instrument shall be calibrated daily before site activities commence and after termination of site activities. At the end of each work day and prior to calibration, each instrument shall be checked to ensure that they are free from surface contamination.

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A decontamination zone will be established which will include an area for sampling equipment and personnel decontamination.

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If higher levels of personal protection equipment are needed, adjustments will be made to these procedures and an amendment will be made to this health and safety plan.

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All disposable clothing and plastic sheeting used during site activities will be double-bagged and disposed in a refuse container. Decontamination and rinse solutions will be

allowed to drain onsite. Reusable clothing will be dried and prepared for future use. All washtubs, pails, buckets, etc. will be washed, rinsed and dried at the end of each workday.

9.0 AUTHORIZED PERSONNEL

Personnel anticipated to be onsite at various times during site activities include:

- ERC-EDGe Principal-in-Charge --
- ERC-EDGe Project Manager --
- ERC-EDGe Safety Officer --
- ERC-EDGe Representatives --

(NAMES FOR THIS SECTION WILL BE PROVIDED UPON RECEIPT OF AUTHORIZATION TO START THIS PHASE OF THE CONTRACT)

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The project manager will direct the site investigation and operation. The project manager has the primary responsibility for:

- Assuring that all personnel are aware of:

  a. Names of personnel and alternates responsible for site safety and health;
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  d. Work practices by which the employee can minimize risks from hazards;
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  f. Medical surveillance requirements including recognition of symptoms and signs which might indicate over exposure to hazards; and
  g. Site control measures, decontamination procedures, site standard operating procedures and the contingency plan and responses to emergencies including the necessary PPE.

- Assuring that all employees have received a minimum of 40 hours of instruction, off the site, and actual field experience under the direct supervision of a trained experienced supervisor. Workers who may be exposed to unique or special

hazards shall be provided additional training.

- Monitoring the performance of personnel to ensure that mandatory health and safety procedures are being performed and correcting any performances that do not comply with the Health and Safety Plan.

- Ensuring that all field personnel employed on the site are covered by a medical surveillance program as required by 29 CFR 1910.120(f)

- Consulting with the Health and Safety Officer and/or other personnel.

- Preparation and submittal of any and all project reports - includes progress, accident, incident, contractual, etc.

9.2 The responsibilities of the ERC-EDGe site health and safety officer are as follows:

- Assure that a copy of the health and safety plan is maintained onsite during all field activities.

- Advise the project manager on all health and safety related matters involved at the site.

- Direct and ensure that the safety program is being correctly followed in the field, including the proper use of personal protective and site monitoring equipment.

- Ensure that the field personnel observe the appropriate work zones and decontamination procedures.

- Report any safety violations to the project manager.

- Conducts safety briefings during field activities.

- Based on observation of all site conditions, determine if and when an evacuation is needed. If an evacuation is necessary, notify local law enforcement officials and inform them of the hazardous substance involved, the direction of movement of the substance and the areas that will be immediately affected.

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person trained in safety and industrial hygiene. After the project begins and the site safety officer has had time to evaluate actual hazardous site conditions, he/she may determine that a member of the project team may assume the duties of site health and safety officer.

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- Personnel must be fit-tested prior to use of respirators.

- No facial hair which intrudes on the sealing surface of the mask is allowed on personnel.

- Personnel on site must use the buddy system when wearing respiratory protective equipment. As a minimum, a third person, suitably equipped as a safety backup, is required during initial entries.

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  - accessibility to associates, equipment and vehicles;
  - communications;

- operation zones;
- site access; and
- nearest water sources.

- Personnel and equipment in the contaminated area must be kept to a minimum, consistent with effective site operations.

- Procedures for leaving a contaminated area must be planned and implemented prior to going onsite in accordance with the Site Health and Safety Plan.

- All visitors to the job site must comply with the Health and Safety Plan procedures. Personal protection equipment may be modified for visitors depending on the situation. Any modifications must be approved by the site Health and Safety Officer.

10.0 EMERGENCY INFORMATION

All hazardous waste site activities present a potential risk to onsite personnel. During routine operations, risk is minimized by establishing good work practices, staying alert and using proper personal protective equipment. Unpredictable events such as physical injury, chemical exposure or fire may occur and must be anticipated.

If any situation or unplanned occurrence requires outside or support services, Diane Lancaster will be informed and the appropriate contact from the following list will be made:

Contact	**Person or Agency**	**Telephone**
Diane Lancaster	NAS Memphis	873-5462
Law Enforcement	NAS Memphis Base Police Department	873-5776
Fire Department	NAS Memphis Base Fire Department	873-5333 873-5580 (non-emergency)
Ambulance Service		873-5444
Southern Poison Control Center		(901) 528-6048

NAS Memphis Information	873-5111
ERC-EDGe, Inc.	(615) 966-9788

10.1 SITE RESOURCES

Portable telephones will be provided by the contractor for emergency use. Restroom facilities and water supply will be available near the work zone.

10.2 EMERGENCY PROCEDURES

In the event that an emergency develops onsite, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site; or
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.
- Any person not engaged in site activities experiences any adverse effects or symptoms of exposure while near or down wind of the site.

The following emergency procedures should be followed:

- Site work area entrance and exit routes will be planned and emergency escape routes delineated by the site safety officer.
- In the event that any member of the field team experiences any effects or symptoms of exposure while on the scene, the entire field crew will immediately halt work and act according to the instructions provided by the site safety officer.
- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the site safety officer to indicate possible routes for upwind escape.
- The discovery of any conditions that would suggest the existence of a situation more hazardous than anticipated will result in the suspension of work until the safety officer has evaluated the

situation and provided the appropriate instructions to the field team.

- In the event that an accident occurs, the project manager is to complete an accident report form for submittal to the managing principal-in-charge of the project.

11.0 FORMS

The following forms will be used in implementing this health and safety plan:

Plan Acceptance Form
Plan Feedback Form
Accident Report Form
Exposure History Form

The Plan Acceptance Form will be filled out by all employees working on the site prior to commencement of site activities. The Plan Feedback Form will be filled out by the site safety officer and any other onsite employee who wishes to fill one out. The Accident Report Form will be filled out by the Project Manager in the event that an accident occurs. The Exposure History Form will be completed by both the project manager and the individual(s) for whom the form is intended.

All completed forms must be returned to the Principal-in-Charge at ERC-EDGe, Knoxville, Tennessee.

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project work site and returned to , ERC-EDGe, Knoxville, Tennessee.

Job No. _____

Project PRELIMINARY ASSESSMENT/SITE INSPECTION

I represent that I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

_____
Signed

_____
Print Name

_____
Company

_____
Date

LOCATION OF NEAREST HOSPITAL

NAS MEMPHIS NAVAL HOSPITAL
MILLINGTON, TENNESSEE 38054

EMERGENCY ROOM TELEPHONE NUMBER - (901) 873-5280

DIRECTIONS FROM NAS MEMPHIS TO NAS MEMPHIS HOSPITAL

1. from Kinser Gate or Brown Gate, turn east (left) onto Navy Road.

LOCATION OF NEAREST HOSPITAL CAPABLE OF HANDLING CHEMICAL EXPOSURES

METHODIST NORTH
3960 NEW COVINGTON PIKE
MEMPHIS, TENNESSEE 38002

EMERGENCY ROOM TELEPHONE NUMBER - (901) 372-5211

DIRECTIONS FROM NAS MEMPHIS TO METHODIST NORTH HOSPITAL

1. from South Gate, south on SGT. Walter K. Singleton Parkway
2. then,south on New Covington Pike

HEALTH & SAFETY PLAN
FOR THE
SEWAGE LAGOONS
NAVAL AIR STATION, MEMPHIS TENNESSEE

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

prepared by
Environmental & Safety Designs, Inc.
Memphis, Tennessee

August, 1989

1.0 INTRODUCTION

The following is the Health and Safety Plan for the of the Remedial Investigation/Feasibility Study for the Sewage Lagoons, NAS Memphis, Tennessee. This Plan is submitted in accordance with the provisions of Department of the Navy Contract N62467-88-C-0198, soil and/or groundwater contamination investigations. The investigation is being conducted to determine the extent, if any, of contamination in soils, subsoils and groundwaters at the sewage lagoons, NAS Memphis, Tennessee.

2.0 APPLICABILITY

The provisions of the plan are mandatory for all onsite personnel engaged in hazardous waste operations who will be exposed or have the potential to be exposed to onsite hazardous substances. All personnel will operate in accordance with the most current requirements of 29 CFR 1910.120, Standards for Hazardous Waste Workers and Emergency Responders. These regulations include the following provisions for employees exposed to hazardous substances, health hazards or safety hazards: training as described in 120(e), medical surveillance as described in 120(f), and personal protective equipment described in 120(g).

3.0 SITE CHARACTERIZATION

3.1 SITE CONTROL

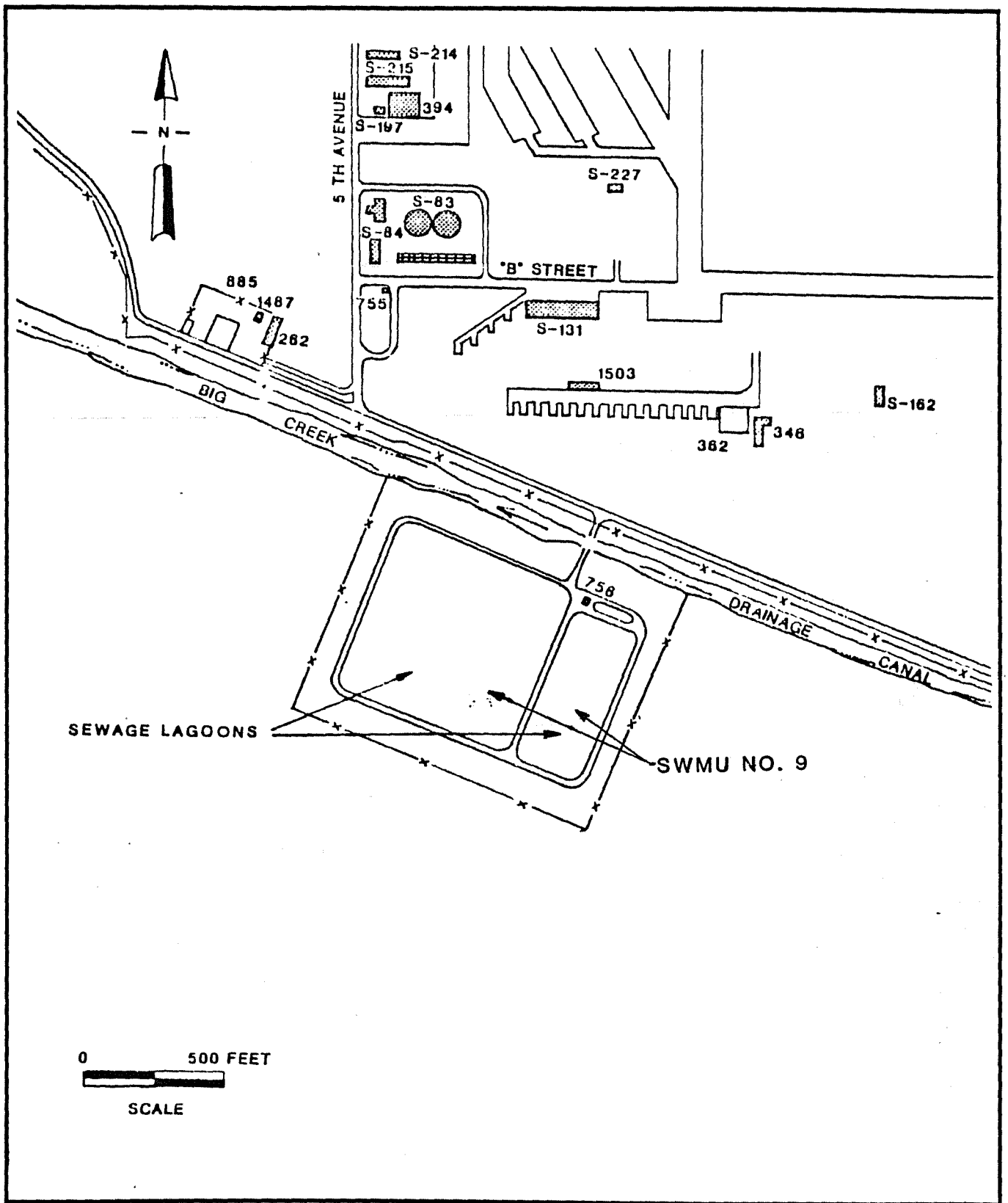
A perimeter will be established around each work zone and marked with hazard tape. Only authorized personnel with 40 hours health and safety training meeting the requirements of OSHA 29 CFR 1910.120 are permitted within the marked area.

3.2 WORK ZONES

Site activity will be restricted to the sewage lagoons, NAS Memphis. See Figure 1.

4.0 SITE ACTIVITIES

The activities to be performed during the investigation will be water/sediment sampling, monitoring well installation and groundwater sampling.



Environmental and Safety Designs, Inc.

EN SAFE®

5705 STAGE RD. MEMPHIS, TN. 38134 ☎(901)372-7962

FIGURE 1

SEWAGE LAGOONS

LOCATION MAP

5.0 HAZARD EVALUATION

This is a preliminary site assessment to determine the extent of direct contact or surface water impacts. According to the Navy, the lagoons were used as a part of the wastewater-treatment systems for NAS Memphis from 1969 to 1978. Wastewater treated at the facility was, primarily, sanitary in nature, though it also included limited amounts of industrial waste generated by such activities as Aircraft Intermediate Maintenance. Results of preliminary soil samples showed the concentrations of metals to be below detection limits. The sewage lagoons, currently, support an abundance of aquatic life.

6.0 EMPLOYEE PROTECTION

Employee protection for this project includes standard safe work practices personal protective equipment, procedures and equipment for extreme weather conditions, work limitations and exposure evaluation.

6.1 STANDARD SAFE WORK PRACTICES

Standard safe work practices that will be followed include:

- Eating, drinking, chewing gum or tobacco, smoking or any activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the Site Health and Safety Officer.
- Hands and face must be thoroughly washed upon leaving the work area.
- Contact lenses shall not be worn on site.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate or discolored surfaces; or lean, sit or place equipment on drums, containers or on soil suspected of being contaminated.
- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on cleanup or response operations where the potential for absorption, inhalation or ingestion of toxic substances exists unless specifically approved by a

qualified physician. Alcoholic beverages shall not be consumed during site operations.

6.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Field activities will be initiated in Level D protection. Level D Protection consists of one piece chemically-resistant suit (optional), hard hat, gloves and boots. This level of protection was chosen because of the nature of most of the constituents concerned. If field conditions indicate a higher level of contamination than anticipated, field activities will be halted, and a reassessment of the field program will be conducted. The reassessment will include the type of PPE recommended for field activities. If higher levels are necessary, they will be selected based on the contaminants and concentrations. Any adjustments in field procedures as a result of a reassessment will result in an amendment to this health and safety plan.

Criteria for selection of LEVEL C PPE

1. Oxygen level is at least 19.5%
2. Total unknown organic vapor levels exceed 1-5 ppm above background.
3. Doubt exists about the air quality, therefore preventing the use of Level D PPE.
4. Level A or B PPE is not indicated.

Level C PPE consists of full-face piece, air-purifying cartridge-equipped respirator. Cartridges used must be approved by MSHA and/or NIOSH for the hazards encountered. Because of the types of suspected contaminents on the site, a high efficiency particulate cartridge is recommended. Additionally, chemical-resistant clothing, chemical-resistant gloves (inner and outer), steel toe and shank boots and hard hat are required.

6.3 PROCEDURES AND EQUIPMENT FOR EXTREME WEATHER CONDITIONS

Field activities for this site are scheduled to take place during the fall and winter. Therefore, heat stress and cold exposure will be of concern for the health and safety personnel. Adverse weather conditions are important considerations in planning and conducting site operations. Extremes in hot and cold weather can cause physical discomfort, loss of efficiency and personal injury.

6.3.1 Heat Stress

Heat stress can result when the protective clothing decreases natural body ventilation even when temperatures are moderate. Working under various levels of personal protection may require the wearing of low permeability disposable suits, gloves and boots. This clothing will prevent most natural body ventilation. Discomfort due to increased sweating and body temperature (heat stress) will be expected at the work site. Recommendations to reduce heat stress follow:

- Drink plenty of fluids (to replace loss through sweating).
- Wear cotton undergarments to act as a wick to absorb moisture.
- Make adequate shelter available for taking rest breaks to cool off.

In extremely warm weather, the Site Health and Safety Officer may also require these additional measures:

- Wear cooling devices to aid in ventilation (NOTE: the additional weight may affect efficiency).
- Install portable showers or hose down facilities to cool clothing and body.
- Shift working hours to early morning and early evening. Avoid the hottest time of the day.
- Frequently rotate crews wearing the protective clothing.
- Monitor pulse rate and body temperature of individuals leaving work site.

6.3.2 Cold Exposure

Persons working outdoors in temperatures at or below freezing may experience frostbite or hypothermia. Extreme cold for a short time may cause severe injury to the surface of the body. Areas of the body that have a high surface-area-to volume ratio, such as fingers, toes, and ears are the most susceptible.

Two factors influence the development of cold injury: Ambient temperature and the velocity of the wind. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than

air. Thus the body cools suddenly when protective equipment is removed if the clothing underneath is soaked with perspiration.

Recommendations to reduce effects of cold exposure:

- Stay dry. When the temperature drops below 40°F, change perspiration soaked clothes frequently. When clothes get wet, they lose about 90% of their insulating value.

- Beware of the wind. A slight breeze carries heat away from bare skin much faster than still air. Wind drives cold air under and through clothing. Wind refrigerates wet clothes. Wind multiplies the problems of staying dry.

- Understand cold. Most hypothermia cases develop in temperatures between 30°F and 50°F. Cold water running down the neck and legs or cold water held against the body by sopping clothes causes hypothermia.

- Make adequate dry, warm shelter available.

- Provide warm drinks.

- Monitor the pulse and body temperature of individuals leaving the work area.

Never ignore shivering. Persistent shivering is a clear warning that a person is on the verge of hypothermia. Allow for the fact that exposure greatly reduces normal endurance. Physical activity may be the only thing preventing hypothermia.

6.4 WORK LIMITATIONS

All site activities will be conducted during daylight hours only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e).

6.5 EXPOSURE EVALUATION

All personnel scheduled for site activities have had a baseline physical examination and have been declared fit for duty. An exposure history form will be completed for each worker participating in site activities. It includes onsite monitoring results.

7.0 MONITORING REQUIREMENTS

Air monitoring will be accomplished using an inorganic/organic vapor detector during all sampling. Instruments will be read while soil samples are obtained; but field technicians will be made aware that they must report any unusual odors or soil discolorations. Results of air monitoring are to be recorded in the field log book and maintained with the site records. Each instrument shall be calibrated daily before site activities commence and after termination of site activities. At the end of each work day and prior to calibration, each instrument shall be checked to ensure that they are free from surface contamination.

8.0 DECONTAMINATION

A decontamination zone will be established which will include an area for sampling equipment and personnel decontamination.

8.1 PERSONNEL DECONTAMINATION

The decontamination procedures, based on Level D protection, will consist of brushing heavily soiled overboots, rinsing gloves and overboots with soap and water, removing outer boots and placing in a plastic lined container. Washing and rinsing protective suit, removing protective suit. Protective suits will be place in plastic lined containers. Washing and rinsing gloves and placing in plastic lined containers.

Decontamination procedures will be conducted at the lunch break and at the end of each work day.

If higher levels of personal protection equipment are needed, adjustments will be made to these procedures and an amendment will be made to this health and safety plan.

8.2 CLOSURE OF THE PERSONNEL DECONTAMINATION STATION

All disposable clothing and plastic sheeting used during site activities will be double-bagged and disposed in a refuse container. Decontamination and rinse solutions will be allowed to drain onsite. Reusable clothing will be dried and prepared for future use. All washtubs, pails, buckets, etc. will be washed, rinsed and dried at the end of each workday.

9.0 AUTHORIZED PERSONNEL

Personnel anticipated to be onsite at various times during site activities include:

- ERC-EDGe Principal-in-Charge --
- ERC-EDGe Project Manager --
- ERC-EDGe Safety Officer --
- ERC-EDGe Representatives --

(NAMES FOR THIS SECTION WILL BE PROVIDED UPON RECEIPT OF AUTHORIZATION TO START THIS PHASE OF THE CONTRACT)

9.1 The responsibilities of the ERC-EDGe project manager are as follows:

The project manager will direct the site investigation and operation. The project manager has the primary responsibility for:

- Assuring that all personnel are aware of:

  a. Names of personnel and alternates responsible for site safety and health;
  b. Safety, health and other hazards present on the site;
  c. Use of personnel protection equipment and assuring that the equipment is available;
  d. Work practices by which the employee can minimize risks from hazards;
  e. Safe use of engineering controls and equipment on the site;
  f. Medical surveillance requirements including recognition of symptoms and signs which might indicate over exposure to hazards; and
  g. Site control measures, decontamination procedures, site standard operating procedures and the contingency plan and responses to emergencies including the necessary PPE.

- Assuring that all employees have received a minimum of 40 hours of instruction, off the site, and actual field experience under the direct supervision of a trained experienced supervisor. Workers who may be exposed to unique or special hazards shall be provided additional training.

- Monitoring the performance of personnel to ensure that mandatory health and safety procedures are being performed and correcting any performances that do not comply with the Health and Safety Plan.

- Ensuring that all field personnel employed on the site are covered by a medical surveillance program

as required by 29 CFR 1910.120(f)

- Consulting with the Health and Safety Officer and/or other personnel.

- Preparation and submittal of any and all project reports - includes progress, accident, incident, contractual, etc.

9.2 The responsibilities of the ERC-EDGe site health and safety officer are as follows:

- Assure that a copy of the health and safety plan is maintained onsite during all field activities.

- Advise the project manager on all health and safety related matters involved at the site.

- Direct and ensure that the safety program is being correctly followed in the field, including the proper use of personal protective and site monitoring equipment.

- Ensure that the field personnel observe the appropriate work zones and decontamination procedures.

- Report any safety violations to the project manager.

- Conducts safety briefings during field activities.

- Based on observation of all site conditions, determine if and when an evacuation is needed. If an evacuation is necessary, notify local law enforcement officials and inform them of the hazardous substance involved, the direction of movement of the substance and the areas that will be immediately affected.

Initially, the site health and safety officer will be a person trained in safety and industrial hygiene. After the project begins and the site safety officer has had time to evaluate actual hazardous site conditions, he/she may determine that a member of the project team may assume the duties of site health and safety officer.

9.3 Responsibilities of onsite field personnel are as follows:

- All personnel going on site must be thoroughly briefed on anticipated hazards and trained on equipment to be worn, safety procedures to be followed, emergency procedures and communications.

- Required respiratory protective devices and clothing must be worn by all personnel going into areas designated for wearing protective equipment.

- Personnel must be fit-tested prior to use of respirators.

- No facial hair which intrudes on the sealing surface of the mask is allowed on personnel.

- Personnel on site must use the buddy system when wearing respiratory protective equipment. As a minimum, a third person, suitably equipped as a safety backup, is required during initial entries.

- Visual contact must be maintained between pairs onsite and site safety personnel. Field personnel should remain close together to assist each other during emergencies.

- All field personnel should make use of their senses to alert themselves to potentially dangerous situations which they should avoid, e.g., presence of strong and irritating or nauseating odors.

- Personnel should practice unfamiliar operations prior to doing the actual procedure in the field.

- Field personnel shall be familiar with the physical characteristics of the site, including:

  - wind direction in relation to contamination zones;
  - accessibility to associates, equipment and vehicles;
  - communications;
  - operation zones;
  - site access; and
  - nearest water sources.

- Personnel and equipment in the contaminated area must be kept to a minimum, consistent with effective site operations.

- Procedures for leaving a contaminated area must be

planned and implemented prior to going onsite in accordance with the Site Health and Safety Plan.

- All visitors to the job site must comply with the Health and Safety Plan procedures. Personal protection equipment may be modified for visitors depending on the situation. Any modifications must be approved by the site Health and Safety Officer.

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All completed forms must be returned to the Principal-in-Charge at ERC-EDGe, Knoxville, Tennessee.

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project work site and returned to , ERC-EDGe, Knoxville, Tennessee.

Job No. _____

Project PRELIMINARY ASSESSMENT/SITE INSPECTION

I represent that I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

_____
Signed

_____
Print Name

_____
Company

_____
Date

LOCATION OF NEAREST HOSPITAL

NAS MEMPHIS NAVAL HOSPITAL
MILLINGTON, TENNESSEE 38054

EMERGENCY ROOM TELEPHONE NUMBER - (901) 873-5280

DIRECTIONS FROM NAS MEMPHIS TO NAS MEMPHIS HOSPITAL

1. from Willis Gate, Morrison Gate or Bonnie Gate, turn east (right) onto Navy Road.

LOCATION OF NEAREST HOSPITAL CAPABLE OF HANDLING CHEMICAL EXPOSURES

METHODIST NORTH
3960 NEW COVINGTON PIKE
MEMPHIS, TENNESSEE 38002

EMERGENCY ROOM TELEPHONE NUMBER - (901) 372-5211

DIRECTIONS FROM NAS MEMPHIS TO METHODIST NORTH HOSPITAL

1. from South Gate, south on SGT. Walter K. Singleton Parkway
2. then,south on New Covington Pike

- Water Operations Safety Procedures

  - Always wear a Coast Guard approved life jacket when in a boat or working near the shoreline of the lagoons.
  - Never load with personnel and equipment a boat beyond its rated capacity.
  - Check the weather before starting water borne sampling activities or monitoring well installation. Do not plan sampling activities or monitor well installation when inclement weather or high winds (above 15 miles per hour) are predicted. If a storm approaches while working on the lagoons, return to shore immediately.
  - Ensure that all personnel working on or near the lagoons know how to swim.
  - A ring buoy with a line shall be provided for each team working on or near the shore line. The attached line should be at least 25 feet long.