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SAMPLING AND REMEDIAL OPTION REVIEW WORK PLAN FOR EXCHANGE SERVICE STATION MILLINGTON SUPPACT TN
12/30/1988
ENGINEERING, DESIGN AND GEOSCIENCES GROUP, INC.

ENVIRONMENTAL DIVISION

THE E|D|G e GROUP

Prepared for:
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AMENDMENT NO. 9

# SAMPLING AND REMEDIAL OPTION REVIEW WORK PLAN FOR EXCHANGE SERVICE STATION NAS, MEMPHIS, TENNESSEE

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# NAS, MEMPHIS, TENNESSEE

## 1.0 INTRODUCTION

### 1.1 PROJECT OVERVIEW

Personnel at the Navy Exchange Service Station located at NAS, Memphis, Tennessee, have identified two gasoline leaks and one spill occurring in February 1986 and March 1987. The quantity of gasoline lost was estimated to be approximately 5,400 gallons.

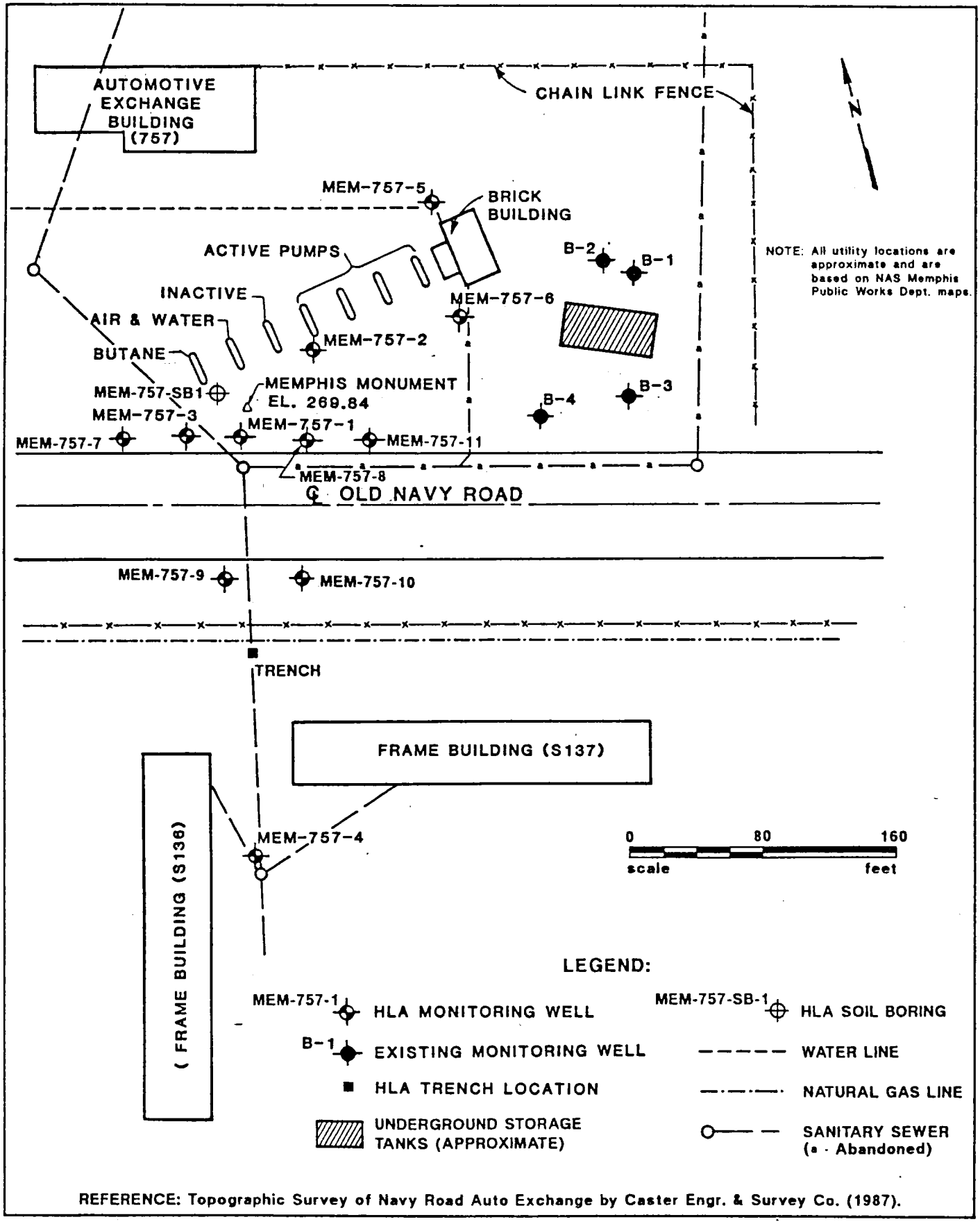
Harding Lawson Associates (HLA) performed a site characterization study which included monitoring well installation and sampling. The study was completed during May 1987, and revealed the highest concentrations of benzene, toluene and xylene (BTX) near the pump islands. This study recommended a continued water product monitoring program and an enhanced biodegradation system for remediation.

HLA also prepared a Remedial Action Plan (RAP) which included additional monitoring well installation and sampling, evaluation of enhanced biodegradation remediation and a limited feasibility study. The RAP was completed in August 1988 and recommended further hydrocarbon migration investigation and a two phase remediation. The remediation recommended was excavation of contaminated soils with on-site aeration and aboveground biodegradation of contaminated ground water.

The HLA site plan of the service station area showing well locations is included on the following page for reference.

### 1.2 OBJECTIVE

The objective of this investigation is to provide additional sampling of the fifteen monitoring wells at the Exchange Service Station to further assess the contamination within the ground water. Also, the HLA RAP will be reviewed and a additional remediation alternative of vacuum




REFERENCE: Topographic Survey of Navy Road Auto Exchange by Caster Engr. & Survey Co. (1987).

**Harding Lawson Associates**
Engineers, Geologists & Geophysicists

# SITE PLAN
NAS MEMPHIS
Millington, Tennessee

PLATE **2**

| DRAWN | JOB NUMBER | APPROVED | DATE | REVISED | DATE |
|---|---|---|---|---|---|
| S.K. | 02176,178.12 | MKB | 8/12/88 | | |

extraction will be considered. The new data and evaluation of remediation options will be presented in a report.

## 2.0 ADDITIONAL SAMPLING

### 2.1 PERMITTING/SITE VISIT

Prior to implementing the sampling, EDGe personnel will meet with government representatives and NAS Public Works officer to discuss the aspects of the work and obtain the necessary permits and authorizations.

Specific items include:

- Authorization to enter upon NAS Memphis property,
- Any health or hazard related permits which are required by the Public Works office,
- Exchange Service Station site visit

### 2.2 MEASUREMENT OF WATER/PRODUCT DEPTH

Before purging and sampling, the static water level and product thickness will be measured and recorded. Water/product level readings will be taken by use of a interface probe. Decontamination of any measuring device will be performed prior to introduction into the wells.

### 2.3 WELL PURGING

After measurements of product thickness and water level have been completed, each well will be purged with a clean decontaminated PTFE bailer. A volume of water equal to three times the submerged volume of the casing will be removed from each well. If recharge is too slow to permit removal of three casing volumes, the well will be bailed dry. As per Naval protocol, the physical parameters for each well such as temperature, pH and specific conductance will be measured until stabilization (within 10%) is evident over a three sample interval.

### 2.4 GROUND WATER MONITORING WELL SAMPLING

Upon stabilization of the physical ground water parameters, the fifteen wells previously installed at the exchange service station will be sampled. Up-gradient wells and wells less contaminated as indicated in previous

reports will be sampled first. The proposed sequence for ground water sampling is presented below.

| | | | | | |
|---|---|---|---|---|---|
| 1 | MEM-757-4 | 6 | MEM-757-B4 | 11 | MEM-757-B1 |
| 2 | MEM-757-9 | 7 | MEM-757-B4 | 12 | MEM-757-B2 |
| 3 | MEM-757-10 | 8 | MEM-757-7 | 13 | MEM-757-3 |
| 4 | MEM-757-5 | 9 | MEM-757-6 | 14 | MEM-757-1 |
| 5 | MEM-757-B3 | 10 | MEM-757-8 | 15 | MEM-757-2 |

Specific ground water sampling protocol is discussed in Section 3.0. A decontaminated PTFE bailer and dedicated clean unused cotton cord will be utilized to obtain each ground water sample.

## 3.0 SAMPLING PROTOCOL AND ANALYSIS

### 3.1 OVERVIEW

The following plan describes the collection, control documentation and analysis of samples obtained from the fifteen wells located at the Exchange Service Station. This plan is developed as part of the overall project plan and is to be implemented and followed by all personnel involved in sample collection activities.

The ground water samples will be analyzed for the purgeable volatile organics, benzene, toluene and xylene (BTX).

### 3.2 DECONTAMINATION PROCEDURES

To prevent the possibility of cross-contamination during the sampling program, all sampling equipment will be decontaminated. A central location will be designed as a staging area for equipment and decontamination activities.

Sampling equipment will be cleaned with a nonphosphatic detergent and rinsed with isopropyl alcohol and deionized water between each sampling point.

### 3.3 GROUND WATER SAMPLING

A total of eighteen ground water samples will be collected and submitted for analysis from the fifteen monitoring wells. One sample will be taken from each well plus two duplicate samples and one blank sample. All samples will be analyzed for BTX.

### 3.4 SAMPLE CONTAINMENT IDENTIFICATION

Each of the ground water samples for BTX will be contained within a pre-cleaned 40 ml VOA vial with teflon® sealed cap and teflon® lined septum. Each sample will be contained such that no air pockets are present to induce volatization.

Samples shall be labeled in the field with the following information:

1. Project Number
2. Location
3. Sample Number
4. Date
5. Time
6. Intended Analysis
7. Initials of Sampling Personnel
8. Company Name

### 3.5 SAMPLE TRANSPORTATION AND CUSTODY

Samples collected during the project will be classified and shipped to the specified laboratory under the direction of the site project manager. Generally, there are two types of sample classifications, environmental and hazardous material. Previous ground water sampling at this site has indicated that the samples can be classified as environmental. However, should free product be encountered or excessive vapor levels be detected by the monitoring equipment, these samples may be classified as hazardous material. This determination will be made by the site project leader.

Samples identified as being hazardous material will be packaged, labeled and shipped in accordance with United States Department of

Transportation (DOT) as outlined in 49 CFR Part 171 through 177. The guidance for complying with DOT regulations in shipment of environmental laboratory samples is outlined in the "National Guidance Package for Compliance with DOT Regulations" in the shipment of environmental samples.

Regardless of the nature of the sample, as each sample is collected, it will be assigned a project control number. This number will be recorded on the sample tag, the field log book and the chain-of-custody form. The outside of each container will be decontaminated, followed by the container being placed in a self-sealing plastic bag. The sample will then be placed in an outer container, if necessary, and placed inside an ice chest.

The ground water samples will be cooled to 4°C by placing on ice and shall be maintained at that temperature for shipping. An adequate amount of instant ice, a disposable cooling agent, will be provided to pack the material on the sides and bottom. Styrofoam packing chips will be placed between the sample containers as an inert cushioning material. The samples will be packed in the cooler with an inventory of samples being recorded on the chain-of-custody form and the project field log book.

As each ice chest is packaged, the chain-of-custody form will be completed, executed by the project manager, double-sealed in plastic"zip-lock" storage bags and taped to the inside of the lid. A copy of a typical chain-of-custody form is shown on the following page. The lid will then be placed and secured on the cooler. Fabric or duct tape will be used to secure the lid. A copy of the chain-of-custody will be retained by the project manager.

A label identifying the type(s) of sample(s), environmental and/or hazardous material will be attached to the top of the ice chest along with DOT labels required for these representative samples. An air ship bill will be attached to the outside listing the origin point of the shipment destination, contact persons and addresses for both parties.

# CHAIN OF CUSTODY RECORD

| PROJECT NO. | PROJECT NAME | SAMPLERS: *(Signature)* | *(Printed)* |
|---|---|---|---|
| | | | |

| FIELD SAMPLE NUMBER | DATE | TIME | COMP. | GRAB | WATER | SOIL | SEDI-MENT | STATION LOCATION | NUMBER OF CONTAINERS | PARAMETERS | | | | | | | | LABORATORY I.D. # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | |
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| Relinquished by: *(Signature)* | Date | Time | Received by: *(Signature)* | Relinquished by: *(Signature)* | Date | Time | Received by: *(Signature)* |
|---|---|---|---|---|---|---|---|
| (Printed) | | | (Printed) | (Printed) | | | (Printed) |

| Relinquished by: *(Signature)* | Date | Time | Received for Laboratory by: *(Signature)* | Date | Time | Remarks (Type of Preservative) |
|---|---|---|---|---|---|---|
| (Printed) | | | (Printed) | | | |

ENGINEERING, DESIGN & GEOSCIENCES GROUP, INC.
ENVIRONMENTAL DIVISION
NASHVILLE, TENNESSEE

E|D|G e

### 3.6 ANALYSIS

All ground water samples will be presented to Pioneer Laboratories in Pensacola, Florida. Pioneer is NIRP approved and copies of their certification documents will be submitted for review.

The analytical testing program specified for this project is designed to identify and quantify benzene, toluene and xylene (BTX) present in the ground water at the Exchange Service Station. To accomplish this task, the following analytical test method will be utilized.

Method 8240 - Gas Chromotography/Mass Spectrometry for Volatile Organics

Test methods for evaluating solid waste (SW 846 - Third Edition, September, 1986). This method is used specifically to determine volatile organic compounds in a variety of solid waste matrices.

## 4.0 SAFETY TRAINING AND HEALTH MONITORING VERIFICATION

### 4.1 SAFETY TRAINING

The site health and safety officer will be trained in the safety aspects of hazardous waste investigations. He will have successfully attended and completed a forty-hour hazardous waste site investigation health and safety training program. This program shall contain specific training and demonstrations which will allow the site health and safety officer to react in a proper and expeditious manner to contingencies which may arise in investigative activities as required in this contract. A course syllabus outlining the training program is included and elaborates on the details of specific health and safety training.

It is our intention that the site health and safety officer responsible for this project be the field geologist assigned to the sampling program.

### 4.2 HEALTH MONITORING

The Engineering, Design & Geosciences Group, Inc., provides annual medical surveillance programs for employees who have risk of exposure

to environmental waste products. This program is based on OSHA recommendations and includes the following areas of concern:

1. Occupational History
2. Medical History
3. Physical Examination
4. Ophthalmology Assessment
5. Audiometry
6. Chest X-Ray
7. Electrocardiogram
8. Blood and Urine Screening
9. Pulmonary Function Test

In addition to this base line medical monitoring which is provided on an annual basis, specific tests are conducted for individual constituents of concern when indicated by project requirements. Each employee working in a potentially toxic site is included in this program, and each employee who has been working in such a situation will have an evaluation at the time of leaving his or her employment. If any employee working in a potentially toxic site should demonstrate any symptoms typical of exposure to individual constituents, he or she is immediately referred to medical personnel for testing and evaluation for those specific constituents.

When time schedules for field operations are determined and crews are assigned to this project, verification of medical monitoring will be provided for individual personnel involved in this task.

**4.3 SELECTED PERSONNEL**

Robert L. Higgs - EDGe

| | |
|---|---|
| Health Monitored | October 1988 |

Kent B. Evetts - EDGe

| | |
|---|---|
| Hazardous Waste Health and Safety Trained | January 1987 |
| Health Monitored | March 1988 |

## COURSE SYLLABUS

## HAZARDOUS WASTE SITE INVESTIGATION
## HEALTH AND SAFETY TRAINING

| | | |
|---|---|---|
| DAY 1 | | |
| Introduction by Geologic Associates | Throckmorton | 0.1 hour |
| Introduction to Training Course | Speakman | 0.2 hour |
| Applicable Laws, Regulations, Guidelines | Coop | 0.5 hour |
| EPA/State Site Activity Programs | Speakman | 0.5 hour |
| Introduction to Hazardous Substances | Coop | 2.0 hour |
| Hazardous Substances (Continued) | Coop | 1.0 hour |
| Case Histories | O'Brien | 1.0 hour |
| Introduction to Toxicology | Coop | 2.0 hour |
| DAY 2 | | |
| Site Safety Planning | Speakman | 1.0 hour |
| Field Organization | Speakman | 0.5 hour |
| Emergency Preparedness/Contingency Planning | O'Brien | 1.0 hour |
| Ambient Air Characterization | Speakman | 0.5 hour |
| Field Instruments | Speakman | 1.0 hour |
| Field Sampling/Sample Management | Coop | 1.0 hour |
| Drum & Container Safety | O'Brien | 0.5 hour |
| Desk-top Exercise | PGC/JNS/JLOB | 2.0 hour |
| Multimedia First Aid | Am Red Cross | Evening |

| | | |
|---|---|---|
| DAY 3 | | |
| Personal Protective Equipment - Theory | Coop | 1.0 hour |
| Skin, Face, Eyes | Coop | 1.0 hour |
| Respiratory " | O'Brien | 2.0 hour |
| Equipment Checkout &Exercise | O'Brien | 2.0 hour |
| Decontamination | Speakman | 1.0 hour |
| Respirator FIT Testing | Coop | 1.0 hour |
| Multimedia First Aid | Am Red Cross | Evening |
| DAY 4 | | |
| Field Exercise Preparation | Speakman | 1.0 hour |
| Level A Demonstration (Voluntary) | O'Brien | 1.0 hour |
| Field Exercise<br>Site Safety Plan Site Emergency<br>Site Investigation Decontamination | PGC/JNS/JLOB | 5.0 hour |
| Debrief Field Exercise | | 1.0 hour |
| DAY 5 | | |
| Cardiopulmonary Resuscitation | Am Red Cross | 7.0 hour |

J. Chris Rutherford - EDGe

| | |
|---|---|
| Hazardous Waste Health and Safety Trained | September 1988 |
| Health Monitored | September 1988 |

Roger L. White - EDGe

| | |
|---|---|
| Hazardous Waste Health and Safety Trained | September 1988 |
| Health Monitored | September 1988 |

Edmond J. Douglas - EDGe

| | |
|---|---|
| Hazardous Waste Health and Safety Trained | December 1988 |
| Health Monitored | May 1988 |

William L. Barron

| | |
|---|---|
| Hazardous Waste Health and Safety Trained | December 1988 |
| Health Monitored | November 1988 |

In addition, all personnel assigned to this task will be required to sign a certification form verifying participation in the Health and Safety Plan.

## 5.0 HEALTH AND SAFETY PLAN

### 5.1 INTRODUCTION

The following is the Safety Plan for the additional sampling to be conducted at NAS, Memphis, Tennessee. The investigation is designed to determine the extent of BTX contamination related to gasoline leaks at the Exchange Service Station.

Previous site assessments have not shown any IDLH hazards, nor any evidence of on-going reactions, ionizing radiation or continuing releases of organic vapors.

The activities which will be performed during the sampling are ground water monitoring well sampling and measurements.

#### 5.1.1 PLAN SUMMARY

This sampling prescribes a Level D for personal protective equipment and sets a 10 ppm total organic vapor in air limit for

site stand-down. The basis for the 10 ppm limit is the TLV for benzene, which is considered an air contaminant associated with the previous leaks and a very conservative assumption would be that benzene would constitute 40% of the total organic vapor with toluene and/or xylene constituting the remainder.

## 5.2 RESPONSIBILITIES/KEY PERSONNEL

### 5.2.1 PROJECT MANAGER OR DESIGNEE

The Project Manager or Designee will direct the site activities and safety and health protection procedures. He will have primary responsibility for:

- Assuring that all personnel are aware of the potential hazards of the site and the proper procedures of handling those hazards should they occur, including all the health and safety provisions and standards in this plan,

- Assuring that the proper personal protection equipment is available and utilized properly by all site personnel,
- 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,

- Coordinating safety procedures with NAS, Memphis, Tennessee, personnel,

- Preparation and submittal of any and all project reports - includes progress, accident, incident and contractual.

### 5.2.2 SITE HEALTH AND SAFETY OFFICER

The designated 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 or she may determine that a member of the project team may assume the duties of site health and

safety officer. The primary responsibilities of the site safety officer (or the delegate) will be:

- 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.

### 5.2.3 FIELD PERSONNEL

These individual will be those employees involved in performing the scope of work. Their primary responsibilities will be:

- Perform all required work safely,
- Familiarize themselves with and understand the site Health and Safety Plan, including proper use of personal protection equipment,
- Report any unsafe conditions to supervisory personnel,
- Watch for signs and symptoms of exposure to site contaminants and weather stress.

## 5.3 THERMAL EXPOSURE MONITORING

### 5.3.1 OVERVIEW

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.

### 5.3.2 HEAT STRESS

Heat stress and associated symptoms are not expected during this sampling phase.

### 5.3.3 COLD EXPOSURE

Persons working outdoors in low temperatures, especially at or below freezing are subject to cold stress. Exposure to extreme cold for a short time causes severe injury to the surface of the body, or results in profound generalized cooling and may cause death. Areas of the body which have high surface area-to-volume ratio, such as fingers, toes and ears, are the most susceptible to damage.

Protective clothing generally does no afford protection against cold stress. In many instances, it increases susceptibility due to a reduction in wind chill awareness and exposure to lower than perceived ambient temperatures. Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature.

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 chemical-protective equipment is removed if the clothing underneath is perspiration soaked. Warm, dry clothing must be available and donned as soon as possible when these conditions are present.

<u>FROSTBITE</u>

Local injury resulting from cold is included in the generic term frostbite. Frostbite of the extremities can be categorized into:

- Frost nip or incipient frostbite is characterized by sudden blanching or whitening of skin.

- Superficial frostbite is characterized by skin with a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep frostbite is characterized by tissues that are cold, pale and solid.

To administer first aid for frostbite, bring the victim indoors and rewarm the areas quickly in warm water. Never place frostbitten tissue in hot water as the area will have a reduced heat awareness and such treatment could result in burns. Give a warm drink, not coffee, tea or alcohol. The victim must not smoke. Keep the frozen parts in warm water or covered with warm clothes for thirty minutes, even though the tissue will be very painful as it thaws. Then elevate the injured area and protect it from physical injury. Do not allow blisters to be broken. Use sterile, soft, dry material to cover the injured areas. Keep victim warm and get immediate medical care.

After thawing, the victim should try to move the injured areas a little, but no more than can be done alone, without help.

Note:

- Do not rub the frostbitten part (this may cause gangrene).
- Do not use ice, snow, gasoline or anything cold on the frostbitten area.
- Do not use heat lamps or hot water bottles to rewarm the part.
- Do not place the part near a hot stove.

HYPOTHERMIA

System hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages:

1. Shivering.
2. Apathy, listlessness, sleepiness and (sometimes)rapid cooling of the body to less than 95°F.

3. Unconsciousness, glassy stare, slow pulse and slow respiratory rate.
4. Freezing of the extremities.
5. Death.

## 5.4 HEALTH AND SAFETY PROCEDURES

### 5.4.1 PERSONAL PRECAUTIONS

- Eating, drinking, chewing gum or tobacco, smoking or any practices that increase 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.

- No contact lenses will 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 response operations where the potential for absorption, inhalation or ingestion of toxic substances exists unless specifically approved by a qualified physician. Alcoholic beverages intake should be avoided during response operations.

### 5.4.2 ON-SITE FIELD PERSONNEL REQUIREMENTS

- 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.

- Any 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 interferes with a satisfactory fit to the mask-to-face seal is allowed on personnel required to wear respirators.

- Personnel on-site must use the buddy system when wearing respiratory protective equipment.

- Visual contact must be maintained between pairs on-site 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,

- site access and
- nearest water sources.

- Personnel and equipment in the contaminated area should be kept to a minimum, consistent with effective site operations.

- Procedures for leaving a contaminated area must be planned and implemented prior to going on-site 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 exposure risk. Any modifications must be approved by the site Health and Safety Officer.

## 5.5 EMERGENCY INFORMATION

### 5.5.1 EMERGENCY SITUATION

All hazardous waste site activities present a potential risk to on-site personnel. During routing operations, a 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.

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.

### 5.5.2 EMERGENCY PROCEDURES

Overview

The following emergency procedures should be followed:

- In the event of emergency, the contacts identified in Appendix A shall be notified.

- Personnel on-site should use the "buddy" system (pairs). Buddies should prearrange hand signals or other means of emergency signals for communications in case of being out of hearing range.

- Visual contact should be maintained between "pairs" on site with other field personnel remaining in close proximity in order to assist each other in case of emergencies.

- In the event that any member of the field crew experiences any adverse effects or symptoms of exposure while on the scene, the entire crew should immediately halt work and act according to the instructions provided by the project manager or Site Health and Safety Officer.

- the discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the on-site personnel and reevaluation of the hazard and the level of protection required.

- In the event that an accident occurs, the Project Manager is to complete an Accident Report Form. Follow-up action should be taken to correct the situation that caused the accident.

### 5.5.3 PERSONAL INJURY

In case of personal injury at the site, the following procedures should be followed:

- Any on-site personnel trained in first aid can administer treatment to an injured worker.

- The victim should be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.

### 5.5.4 CHEMICAL EXPOSURE

If a member of the field crew is exposed to chemicals, the procedures outlined below should be followed:

- Another crew member (buddy) should remove the individual from the immediate area of contamination.

- Precautions should be taken to avoid exposure of other individuals to the chemicals.

- If the chemical is on the individual's clothing, first rinse the clothing if possible and then the clothing should be removed if it is safe to do so.

- If the chemical has contacted the skin, the skin should be washed with copious amounts of water.

- In case of eye contact, an emergency eye wash should be used. Eyes should be washed for at least fifteen minutes.

- If necessary, the victim should be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.

- All chemical exposure incidents must be reported in writing by the Project Manager on an Accident Report Form.

## 5.6 PERSONAL PROTECTION PROGRAM

### 5.6.1 OVERVIEW

Protective clothing and respiratory protection help prevent on site workers from coming in contact with contaminants. It is imperative that personal protection equipment be appropriate to protect against the known potential hazards for each investigation and each work site. The selection of protective equipment will be based upon the types, concentrations and routes of personal protection for initials site entry will be based upon a conservation assessment of the best available site contamination information.

There are four (4) levels of personal protection specified by the Environmental Protection Agency. They range from Level D used when the least amount of contamination is known, upgrading to Level C when least amount of contamination requires protection from bodily contact and the use of a supplied breathable air source is necessary; up to Level A, which is used when the contamination levels require the highest available protection from bodily contact, respiratory and eye irritation. Following are descriptions of the levels of personal protection and criteria for their selection.

### 5.6.2 LEVEL D

Level D protection will be selected when it has been determined that there is no possibility of skin contact with contamination or respiratory hazard. This level is primarily a work uniform.

Level D Equipment:

- Coveralls
- Leather or chemical-resistant boots or shoes, steel toe and shank
- Hard hat

Options as required:

- Gloves
- Disposable outer boots

- Safety glasses or chemical splash goggles
- Escape mask or respirator

Criteria for Use of Level D:

- The atmosphere contains no known hazard.
- Work functions preclude splashes, immersion or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

### 5.6.3 LEVEL C

Level C protection will be selected when the types and concentrations of respirable material is known, or reasonably assumed to be not greater than the protection factors associated with air-purifying respirators; and exposure to the unprotected areas of the body is unlikely to cause harm.

Level C Equipment:

- Full-faced piece of half-size, air-purifying, canister equipped respirator with appropriate chemical cartridge,
- Chemical-resistant clothing, long sleeves, one or two pieces,
- Chemical-resistant gloves,
- Steel toe and shank boots
- Hard hat
- Options as required:
  - Coveralls
  - Inner chemical-resistant gloves
  - Disposal outer boots
  - Escape mask

Criteria for Use of Level C:

- When total organic vapor levels of unknown substances range from 1 - 5 ppm above background,

- When Level A or Level B is not indicated,

- When doubts exist about air quality, therefore preventing the use of Level D,

- When airborne particulates (dust) warrant respiratory protection,

- Areas containing greater than 19.5 percent oxygen.

### 5.6.4 LEVEL B

Level B protection will be selected when the highest level of respiratory protection is needed, but dermal exposure to the small unprotected areas of the body (i.e., neck and back of head) is unlikely, or where concentrations are known to be within acceptable standards.

Level B Equipment:

- Positive pressure demand, air-supplied breathing apparatus
- Chemical-resistant clothing, long sleeves, one or two pieces
- Outer and inner gloves (both chemical-resistant)
- Steel toe and shank boots
- Hard hat
- Option as required:
  - Coveralls
  - Disposable outer boots

Criteria for Use of Level B

- Atmosphere with concentrations of known substances greater than protective factors associated with full-face, air-purifying respirators with appropriate cartridges.

- Atmospheres with less than 19.5 percent oxygen. Type(s) and concentration(s) of vapors in air do not present a cutaneous or percutaneous hazard to the small, unprotected areas of the body.

- A determination is made that potential exposure to the body parts not protected by a fully-encapsulating suit (primarily neck, ears, etc.) is highly unlikely.

- Known absence of cutaneous, percutaneous or other hazards. Activities performed preclude splashing of individuals.

- Total vapor levels of unknown substances range from 5 ppm to 500 ppm on instruments such OVA or HNu and do not contain high levels of toxic substances affecting skin or eyes.

### 5.6.5 LEVEL A

Level A protection will be selected when the highest available level of respiratory, skin and eye protection is required.

Level A Equipment:

- Positive-pressure demand, air-supplied breathing apparatus,
- Fully encapsulating suit,
- Outer and inner gloves (both chemical-resistant),
- Steel toe and shank boots
- Hard hats (under suit)
- Options as required:
  - Coveralls
  - Long cotton underwear
  - Disposable protective suits, gloves and boots, worn under fully encapsulating suit.

Criteria for Use of Level A:

- Atmospheres which are "immediately dangerous to life and health" (IDLH). IDLHs can be found in the NIOSH/OSHA "Pocket Guide to Chemical Hazards."

- Known atmospheres or potential situations that would affect the skin or eyes, or could be absorbed into the body through these surfaces. Standard reference books should be

consulted to obtain concentrations hazardous to skin, eyes or mucous membrane.

- Potential situations are those where vapors may be generated or splashing occurs through site activities.
- Oxygen deficient atmospheres with the above conditions.
- When the type(s) and/or potential concentration(s) of toxic substances are unknown.
- When total vapor levels of unknown organic substances.
- When total vapor levels of unknown organic substances range from 500 to 1,000 ppm above background on air monitoring instruments such as an OVA or HNu.

### 5.6.6 PERSONAL PROTECTION EQUIPMENT FOR EXCHANGE SERVICE STATION SITE

The conditions expected to exist during the site investigation activities lead to a Level D safety equipment selection. However, the possibility exists that organic vapor (possibly benzene) in excess of the threshold limit values (25 ppm in air) may be encountered at the top of monitoring wells during sampling activities.

Frequent total organic vapor readings will be taken during sampling activities on the site. The readings will be taken using a portable flame ionization detector (OVA). In the event that readings in excess of 25 ppm are obtained, the sampling activity will be temporarily suspended, and all personnel will leave the vicinity of the well until total organic vapors fall below 25 ppm. Forced air ventilation may be used to prevent the buildup of vapors in the breathing zone.

## 5.7 OPERATION ZONES

The site organization and the establishment of operation zones are designed to prevent or reduce the transfer of hazardous materials off site by workers and equipment involved in site operations.

Three (3) operation zones are established to reduce the potential for contaminant migration and the risk of personnel exposure to hazardous substances. Site control involves the physical arrangement and control of the operation zones and the methods for removing contaminants from workers and equipment. The three (3) operation zones established on the site are:

1. Exclusion Zone (contamination zone)
2. Contamination Reduction Zone
3. Support Zone

The project manager and health and safety officer shall be responsible for establishing the site and distance between zones at the site. Considerable judgment is required to assure safe working distances for each zone are balanced against practical work considerations.

At the NAS site, the exclusion zone will be defined as a roped off area in the vicinity of the drilling/sampling activity. The reduction zone will be the area used for decontamination of equipment.

## 5.8 DECONTAMINATION PROCEDURES

### 5.8.1 OVERVIEW

Personnel responding to hazardous substances incidents may become contaminated in a number of ways, including:

1. Contacting vapors, gases, mists or particulates in air,
2. Being splashed by materials or handling drilling accessories,
3. Walking through puddles of liquids or on contamination soil,
4. Using contaminated instruments or equipment.

Protective clothing and respirators help prevent the wearer from becoming contaminated or inhaling contaminants, while good

work practices help reduce contamination on protective clothing, instruments and equipment. Even with these safeguards, however, contamination clothing, personnel may contract contaminants on clothing or inhale them. To prevent such occurrences, decontamination procedures and methods to reduce contamination must be established before anyone enters a site, and must continue and/or be modified when necessary throughout site operations.

Decontamination consists of physically removing contaminants or changing their chemical nature into innocuous substances. How extensive decontamination must be depends on a number of factors, the most important being the type of contaminants involved. The more harmful the contaminant, the more extensive and thorough decontamination must be. Less harmful contaminants may require less stringent decontamination

Decontamination, in concern with correctly using personal protective equipment and the use of the site work zones, minimizes cross-contamination from protective clothing to wearer, equipment to personnel and one area to another. Only general guidance can be given on methods and techniques for decontamination. The exact procedure to use must be determined after evaluating a number of factors specific to the site.

The initial decontamination plan assumes all personnel and equipment leaving the Exclusion Zone (the area of potential contamination) are contaminated. A system is then setup for personnel decontamination to wash and rinse, or dispose of, all the protective equipment worn. This is done in combination with a sequential removing of protective equipment, starting with the most heavily contaminated item and progressing to the least contaminated article.

Methods should be developed to prevent the contamination of people and equipment. For example, not opening containers by

hand, bagging monitoring instruments, using drum grapplers, watering down dusty areas and not walking through areas of obvious contamination would reduce the probability of becoming contaminated and require a less elaborate decontamination procedure.

The decontamination plan is based on specific conditions at the site, including:

1. The type of contaminant,
2. The level of contamination,
3. The level so protection required and
4. The type of protective clothing worn.

The initial decontamination plan can be modified, eliminating unnecessary procedures and adapting it to site conditions.

### 5.8.2 DECONTAMINATION EQUIPMENT

Decontamination equipment, materials and supplies are generally selected based on availability. Other considerations are ease of equipment decontamination or disposibility. Most equipment and supplies can be easily produced. For example, soft-bristle scrub brushes or long-handle brushes are used to remove contaminants.

Water in buckets or garden sprayers in use for rinsing. Large galvanized wash tubs or stick tanks can hold wash and rinse solution. Large plastic garbage cans or other similar containers lined with plastic bags may be used to store contaminated clothing and equipment. Contaminated liquids and solids can be stored temporarily in metal or plastic cans or drums. Other gear includes paper or cloth towels for drying protective clothing and equipment.

### 5.8.3 DECONTAMINATION SOLUTION

Personal protective equipment, sampling tools and other equipment are usually decontaminated by scrubbing with a detergent-water solution using a soft-bristle brush, followed by

rinsing with copious amounts of water. This process may not be fully effective in removing some contaminants. In those cases, a decontamination solution is used in addition to soap and water. Use of chemical decontaminating solution (usually solvents) requires that the contaminant be identified.

### 5.8.4 DISPOSAL OF CONTAMINATED MATERIALS

All materials and equipment used for decontamination must be disposed of properly. Clothing, tools, buckets, brushes and all cleaning solutions and spoils must be secured in drums or other containers and labeled correctly.