APPENDIX F

Health and Safety Plan

APPENDIX F

HEALTH AND SAFETY PLAN
THE UNIVERSITY OF NORTH CAROLINA
AT CHAPEL HILL
AIRPORT ROAD WASTE DISPOSAL AREA
CHAPEL HILL, NORTH CAROLINA

February 1997

APPENDIX F

HEALTH AND SAFETY PLAN
THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
AIRPORT ROAD WASTE DISPOSAL AREA
CHAPEL HILL, NORTH CAROLINA

February 1997

Prepared for:

The University of North Carolina at Chapel Hill
Health & Safety
212 Finley Golf Course Road - CB 1650
Chapel Hill, North Carolina 27514

Prepared by:

GERAGHTY & MILLER, INC.
Environment and Infrastructure
CrossPointe II
2840 Plaza Place, Suite 350
Raleigh, North Carolina 27612
(919) 571-1662

CONTENTS

Page

1.0 INTRODUCTION F-1
1.1 BACKGROUND INFORMATION F-1

2.0 HEALTH AND SAFETY PLAN ENFORCEMENT F-4

3.0 SITE SECURITY F-5

4.0 EVALUATION OF POTENTIAL EXPOSURE HAZARDS F-6
4.1 EXPOSURE PATHWAYS F-6
4.2 PHYSICAL HAZARDS F-7
4.3 CHEMICAL HAZARDS F-9

5.0 EMPLOYEE TRAINING REQUIREMENTS F-12

6.0 SITE CONTROL F-15
6.1 EXCLUSION ZONE F-15
6.2 CONTAMINATION REDUCTION ZONE F-16
6.3 SAFETY ZONE F-16
6.4 SAFE WORK PRACTICES F-16
6.5 HEAVY EQUIPMENT F-18
6.6 ELECTRICAL F-21
6.7 TRIP AND FALL HAZARDS F-22
6.8 UTILITY AND POWER LINE CLEARANCE F-22
6.9 NOISE POLLUTION F-22
6.10 SANITATION F-22
6.11 SITE HOUSEKEEPING F-23
6.12 ENFORCEMENT F-23

7.0 PERSONNEL PROTECTION REQUIREMENTS F-24
7.1 DESIGNATED LEVELS OF PROTECTION F-24
7.2 DURATION OF WORK TASKS F-26
7.3 LIMITATIONS OF PROTECTIVE CLOTHING F-27

8.0 ENVIRONMENTAL SURVEILLANCE OF WORK AREAS F-28
8.1 AIR MONITORING F-28
8.2 USE AND MAINTENANCE OF SURVEY INSTRUMENTATION F-30
8.3 HEAT STRESS MONITORING F-31

9. 0 RESPIRATORY PROTECTION PLAN F-33
9.1 EMPLOYEE PROTECTION F-33
9.2 VISITOR PROTECTION F-33
9.3 RESPIRATOR SELECTION, USE AND MAINTENANCE F-33

10. 0 DECONTAMINATION F-38
10.1 PERSONNEL F-38
10.1.1 Station 1: Segregated Equipment Drop F-38
10.1.2 Station 2: Outer Garment, Boots, and Outer Gloves, Wash and Rinse F-38
10.1.3 Station 3: Outer Glove Removal F-38
10.1.4 Station 4: Cartridge Change F-39

CONTENTS

Page

10.1.5 Station 5: Outer Garment and Boots Removal F-39
10.1.6 Station 6: Respiratory Protection Removal F-39
10.1.7 Station 7: Inner Glove Removal F-39
10.2 EQUIPMENT AND VEHICLES F-39
10.3 DECONTAMINATION PERSONNEL F-40
10.4 DECONTAMINATION WASTE DISPOSAL F-40
10.5 EQUIPMENT NEEDS F-40

11.0 HEALTH MONITORING F-43
11.1 MEDICAL SURVEILLANCE F-43
11.2 DOCUMENTATION AND RECORD KEEPING F-43

12.0 COMMUNICATIONS F-44

13.0 ON-SITE EMERGENCY PLAN F-45
13.1 MEDICAL EMERGENCIES F-45
13.2 FIRE OR ATMOSPHERIC-RELATED RELEASE F-45
13.3 EMERGENCY INFORMATION TELEPHONE NUMBERS F-47

14.0 RECORD KEEPING F-48

15.0 REFERENCES F-49

TABLES

F-1. Exposure Limits for the Constituents of Concern.
F-2. Environmental Surveillance Monitoring.
F-3. Action-Level Summary.

FIGURES

1. Site Location Topographic Map.
2. Site Layout.
3. Emergency Situation Plan.

ATTACHMENT

A. Chemical Hazard Support Data.
B. Tail Gate Meeting Form.
C. Emergency Plan, The University of North Carolina at Chapel Hill, December, 1996.

HEALTH AND SAFETY PLAN
THE UNIVERSITY OF NORTH CARQLINA
AT CHAPEL HILL
AIRPORT ROAD WASTE DISPOSAL AREA
CHAPEL HILL, NORTH CAROLINA

1.0 INTRODUCTION

This Health and Safety Plan (HASP) has been prepared for the protection of field personnel performing pre-design data collection and remedial implementation activities for the University of North Carolina at Chapel Hill (UNC or the University) Airport Road Waste Disposal Area (Site), Chapel Hill, North Carolina. Based on the Remedial Investigation (RI) activities, groundwater at the site is contaminated with organic chemicals which were disposed at the site. A Remedial Action Plan (RAP) has been prepared to evaluate and select appropriate remedies for source material and contaminated groundwater. This HASP plan is prepared as a part of the RAP report in accordance with Section 6.0, Subsection 4 of the Inactive Hazardous Sites Program Guidelines (Guidelines) prepared by the North Carolina Department of Environment, Health, and Natural Resources (NCDEHNR), Division of Solid Waste Management, Superfund Section (NCDEHNR, 1996).

Guidelines contained in the National Institute for Occupational Safety and Health (NIOSH), Occupational Safety and Health Administration (OSHA), U.S. Coast Guard (USCG), and U.S. Environmental Protection Agency (USEPA) manual entitled Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (NIOSH et. al., 1985) were used to formulate this plan. This plan may be revised as necessary to reflect changes in federal and state regulations, exposure guidelines, and site conditions.

1.1 BACKGROUND INFORMATION

The site is located near Highway 86 (Airport Road) in Chapel Hill, Orange County, North Carolina (Figure 1). The site layout is presented in Figure 2. The site consists of a 0.5-acre wooded parcel of University property that includes part of the entrance road to the former Airport Road UNC Old Sanitary Landfill. Approximately 0.2 acre of this tract was used from 1973

through 1978, with the approval of the State of North Carolina, to dispose of chemical waste from University facilities in 16 separate burials (see Section 1.2, Summary of Waste Activities). An adjacent 0.3-acre expansion was proposed and approved by the State of North Carolina for use when the original area was full. However, only two burials were made in 1979 in this expanded area. Access to the site is restricted by an 8-foot-high locked fence erected by the University in early 1994 and by several warning signs.

Previous investigations at the site have included sampling soil, groundwater, surface water, and sediments. Volatile organic compounds (VOCs) were detected in groundwater at the site. Constituents detected included: benzene; chloroform; 1,2-dichloroethane; diethyl ether; methylene chloride; and trichlorofluoromethane. Several semi-volatile organic compounds (SVOCs) including, dimethylphthalate, isophorone, and phenol were detected in groundwater. Metals were detected in groundwater at concentrations less than their maximum contaminant levels (MCLs) with the exception of manganese.

After completing the RI and prior to remediation of the site, a RAP is prepared. Based on the evaluation of alternatives in the RAP, in-situ volatilization and solidification was selected as the source remediation alternative. This process consists mixing contaminated soil/waste columns using a mobile equipment setup with a rotary mixing tool capable of injecting high pressure hot air/steam. Initially, the VOCs and some SVOCs in the soil/waste matrix are volatilized by mixing and injecting hot air/steam. The volatilized contaminants are recovered by applying a vacuum on a shroud covering the ground surface where the soil column is being mixed. The recovered vapors during the mixing process are treated and discharged into the atmosphere.

The groundwater remediation alternative selected in the RAP includes a vacuum enhanced recovery (VER) technique to extract shallow groundwater (hot spot) and a conventional recovery system for extracting bedrock groundwater. The groundwater recovered from both shallow and bedrock aquifers will be treated aboveground prior to disposal. An air stripper and an activated carbon polishing system will be required to treat the VOCs. A portion of the treated water is expected to be discharged via an infiltration gallery upgradient of the shallow VER wells and the remaining water will be discharged into Crow Branch Creek.

The implementation of the selected source control and groundwater remediation at the site will include the following major tasks:

- Collection of soil/waste samples from the disposal area to conduct bench-scale volatilization and solidification treatability studies.
- Pilot-scale/full-scale implementation of in-situ volatilization and solidification process for source control/remediation.
- Installation of shallow recovery/monitoring wells and conducting a VER pilot study.
- Installation of deep (bedrock) recovery/monitoring wells and conducting an aquifer pumping test.

Construction of a full-scale VER and conventional groundwater recovery, treatment, and disposal systems.

2.0 HEALTH AND SAFETY PLAN ENFORCEMENT

To facilitate the successful implementation of the health and safety provisions described in this plan, a Site Safety Coordinator (SSC) will be appointed prior to start-up of site activities. The SSC or his/her designee will oversee the field implementation of the health and safety provisions by field personnel and serve as a liaison with regulatory officials on matters regarding health and safety. The SSC will perform the required work area monitoring and have the option and authority to upgrade or downgrade the required levels of protection, based on site-specific conditions. Should an unforeseen or site-specific safety related factor, hazard, or condition become evident, the SSC will coordinate with personnel to reestablish safe working conditions and to safeguard the public. Actions taken to safeguard workers beyond those measures described in this plan will be communicated verbally to personnel during daily safety meetings, along with other relevant safety issues. Any modifications or additions to the procedures outlined in this plan will be incorporated as an addendum.

The SSC should be intimately familiar with the use of personal protective equipment and their limitations and the use of air monitoring to select appropriate respiratory protection. He/she will be required to meet the OSHA training and health monitoring requirements specified in 29 CFR 1910.120, covering hazardous-waste operations.

All personnel and visitors must report to the SSC when entering or leaving the work area. The SSC or his/her designee has the responsibility for final site entry approval. Removal of unauthorized individuals will be performed by the SSC, with support from University Public Safety Department.

The SSC will maintain a logbook which shall, as a minimum, provide a record for all persons entering or leaving the site. The logbook also will have a signature page to confirm that all personnel have read this plan and have been briefed on its contents.

APPENDIX F

Health and Safety Plan

3.0 SITE SECURITY

All persons must be approved by the Project Manager or his designee for entry to areas in which work is being performed. All persons entering work areas must meet medical surveillance and training criteria set forth in this document, as enforced by the SSC. The SSC or his designee has the responsibility for final site entry approval and for removal of unauthorized personnel.

During work activities, site access into the area where work is being conducted will be controlled by the SSC. The location of the work zones may change depending on the field activity being conducted. A Health and Safety Logbook will be maintained by the SSC. The logbook will provide a record for all persons entering and leaving the site. Additionally, the logbook will have a signature page to confirm that all personnel have read the HASP and have been briefed on its contents. This signature page will be maintained in lieu of a signature page in the HASP.

4.0 EVALUATION OF POTENTIAL EXPOSURE HAZARDS

The Airport Road Waste Disposal Area was used to dispose of chemical waste from University facilities. VOCs, SVOCs, and inorganic chemicals are present in groundwater. Data describing the toxicological, human health, and safety data for those constituents detected previously in soil and/or groundwater are presented in the attachment to this plan. Table F-1 lists exposure limits, chemical properties, and potential exposure pathways for the constituents previously detected at the site.

4.1 EXPOSURE PATHWAYS

The principal pathways of exposure to the VOCs and SVOCs are via direct contact (skin or eye), ingestion of contaminated soil or water, and/or inhalation of particulate matter or organic vapors. During implementation of the in-situ volatilization process for source control/remediation, soil/waste columns in the disposal area will be mixed using a large diameter auger with injection of hot air and/or steam. This process will volatilize contaminants which are recovered by using a shroud under negative pressure over the column being mixed. The recovered vapors will be treated using an activated carbon system prior to their discharge to atmosphere. However, there is a high potential for leaks to develop at the interface of shroud and adjacent ground depending upon the soil conditions and injection pressures. As a result vapors may escape into the surrounding area and can expose on-site workers. In addition, the construction of groundwater recovery/monitoring wells, air-rotary drilling, if used, forces a high-pressure air stream into the borehole to fracture existing consolidated sediments and advance the borehole. This applied air escapes up through the borehole and exits at the surface. This flow of air potentially could volatilize many organic compounds associated with the soil and groundwater and transport them into the breathing space of the field crew. Therefore, atmospheric monitoring of mixing and adjacent work areas, coupled with respiratory protection where needed, will be employed to prevent the occurrence of potentially hazardous conditions.

Absorption via dermal pathways could occur if contact is made with fluids or solids containing the VOCs, SVOCs, and metals. Protective garments to be worn by personnel handling potentially contaminated soils or groundwater will afford protection against these substances.

4.2 PHYSICAL HAZARDS

Constant attention will be given to protecting on-site personnel from the physical hazards that may be encountered during site activities. The evaluation of potential hazards presented below is based on Geraghty & Miller's understanding of the results of previous site investigations.

Physical hazards exist at the site from heavy equipment, working outdoors, and existing plant operations, and facilities. In most cases, common sense should rule to prevent accidents; however, the specific items listed below will be given attention.

- Underground and overhead utilities;
- Machinery;
- Traffic;
- Excavations;
- Weather;
- Explosive vapors, fire, explosion, chemical reaction;
- Heat stress; and
- Cold.

General considerations for these common physical hazards are discussed below.

Utilities

Prior to the start of any ground-intrusive work (e.g., in-situ mixing, drilling, grading, excavation, etc.) underground utilities will be located and marked. This includes inquiry to public utility companies (e.g., water, sewer, telephone, natural gas) and to University personnel knowledgeable about utility locations. The locations for above ground utility cables, pipelines, and structures will be determined prior to work startup.

Machinery

During activities involving heavy equipment (e.g., trucks, volatilization/solidification, compaction, excavation equipment) care will be taken to avoid falling or flying objects and being caught between moving and idle pieces of machinery. Hard hats, safety glasses, and steel-toed boots will be worn by all personnel working in close proximity to such equipment. Hearing protection will be used in the event that workers are exposed to excessive noise. Recognition of excessive noise levels will be when workers must strain their voice to communicate, strain to listen, or read lips.

Traffic

In the event that operations are to be conducted in areas of vehicular and/or pedestrian traffic, traffic cones and/or flagging will be used to cordon off the work area. UNC Public Safety will be notified to coordinate appropriate traffic control (if necessary). If excavations must be left open overnight, proper site control measures will be implemented in accordance with the requirement of the local building inspector. This may include placing flashing lights and/or flagging around the perimeter of the excavation. Care will be taken to exclude unauthorized personnel from the work area.

Weather

It is recognized that hazards may result from adverse weather. A decision to discontinue drilling or other activity because of severe or threatening weather conditions (e.g., lightning, strong wind, heavy rain, temperature extremes) will be made by the SSC.

Explosive Vapors

Where the potential for fire explosion, or hazardous reactions can occur because of the presence of flammable or incompatible chemicals exists, monitoring will be conducted. A person who is knowledgeable in the proper operation of a combustible gas indicator (CGI) will monitor the work zone to assure that 20 percent of the lower explosive limit (LEL) for the chemicals of concern is not exceeded.

If explosive vapors are detected at a reading of 20 percent of the LEL or greater, work will be discontinued and the area evacuated until vapors drop below 20 percent of the LEL. Following evacuation, the cause of the potentially explosive atmosphere will be identified and changes in the work plan established as needed.

Heat Stress

Heat stress is usually caused by a number of factors such as meteorological conditions, PPE, workload, and individual characteristics of site personnel. To minimize the potential for heat stress to occur, appropriate actions will be taken to prevent the onset of heat stress. The Contractor shall be responsible for supplying water for potable use during all site activities. Frequent rest periods will be taken in shaded areas to minimize fatigue and exposure to hot temperatures.

Cold

Cold injury from frostbite and hypothermia are potential hazards if field work is performed during the fall and winter seasons. To guard against cold injury, workers will wear warm clothing, have shelter readily available, schedule work around weather conditions when possible and monitor worker's physical condition.

Excavations

Excavations greater than 5 feet deep will not be entered without proper sloping, shoring, and/or sheet piling. Caution tape and barricades will be used to mark any open excavation.

Injuries resulting from physical hazards can be avoided through the adoption of safe work practices and employing caution when working with machinery. Safe work practices to be employed during assessment activities are described under "Safe Work Practices" (Section 6.4).

4.3 CHEMICAL HAZARDS

Groundwater at the site is contaminated with VOCs due to potential leakage of chemicals from the disposal area. Given the planned site activities, and the physical properties of the

chemicals of concern, there is a potential for chemical exposure. The potential chemical exposure pathways are via inhalation of volatilized chemicals, accidental ingestion, and dermal contact with impacted media. Table F-1 lists exposure limits, chemical properties, and potential exposure pathways for the constituents of concern at the site.

Exposure via Ingestion

Chemical exposure via ingestion will be mitigated through the use of the personal hygiene practices listed below:

- Eating, drinking, and/or smoking will be prohibited in the work area.
- All workers will wash hands and face prior to consuming food, beverages, and/or tobacco products.

Exposure via Dermal Contact

Chemical exposure via dermal contact will be mitigated through the use of common sense and PPE appropriate to the task and hazards. Dermal exposure is possible during the implementation of both source control/remediation and groundwater remediation systems. Care will be taken to minimize direct contact with contaminated liquids and solids. The base level of protection required to prevent chemical exposure via dermal contact will include chemical resistant gloves, disposable coveralls and safety glasses. The specific type of gloves and coveralls (i.e., nitrile, natural rubber, Tyvek, or Saranex) will be selected based on the manufacturer's data concerning the resistance of the material to penetration by the chemicals of concern at the site. All PPE will be approved by the SSC and office health and safety officer before beginning field activities.

Exposure via Inhalation

Chemical exposure via inhalation of volatilized chemicals will be mitigated through the use of common sense, air monitoring for chemical vapors and PPE. When possible, personnel will be situated upwind of an impacted area when working at the site. All wells will be allowed to vent for one to two minutes before sampling activities to allow excess vapors to dissipate. Neither

3.0 SITE SECURITY

All persons must be approved by the Project Manager or his designee for entry to areas in which work is being performed. All persons entering work areas must meet medical surveillance and training criteria set forth in this document, as enforced by the SSC. The SSC or his designee has the responsibility for final site entry approval and for removal of unauthorized personnel.

During work activities, site access into the area where work is being conducted will be controlled by the SSC. The location of the work zones may change depending on the field activity being conducted. A Health and Safety Logbook will be maintained by the SSC. The logbook will provide a record for all persons entering and leaving the site. Additionally, the logbook will have a signature page to confirm that all personnel have read the HASP and have been briefed on its contents. This signature page will be maintained in lieu of a signature page in the HASP.

chemicals of concern, there is a potential for chemical exposure. The potential chemical exposure pathways are via inhalation of volatilized chemicals, accidental ingestion, and dermal contact with impacted media. Table F-1 lists exposure limits, chemical properties, and potential exposure pathways for the constituents of concern at the site.

Exposure via Ingestion

Chemical exposure via ingestion will be mitigated through the use of the personal hygiene practices listed below:

- Eating, drinking, and/or smoking will be prohibited in the work area.
- All workers will wash hands and face prior to consuming food, beverages, and/or tobacco products.

Exposure via Dermal Contact

Chemical exposure via dermal contact will be mitigated through the use of common sense and PPE appropriate to the task and hazards. Dermal exposure is possible during the implementation of both source control/remediation and groundwater remediation systems. Care will be taken to minimize direct contact with contaminated liquids and solids. The base level of protection required to prevent chemical exposure via dermal contact will include chemical resistant gloves, disposable coveralls and safety glasses. The specific type of gloves and coveralls (i.e., nitrile, natural rubber, Tyvek, or Saranex) will be selected based on the manufacturer's data concerning the resistance of the material to penetration by the chemicals of concern at the site. All PPE will be approved by the SSC and office health and safety officer before beginning field activities.

Exposure via Inhalation

Chemical exposure via inhalation of volatilized chemicals will be mitigated through the use of common sense, air monitoring for chemical vapors and PPE. When possible, personnel will be situated upwind of an impacted area when working at the site. All wells will be allowed to vent for one to two minutes before sampling activities to allow excess vapors to dissipate. Neither

liquids nor solids will be smelled to confirm the presence or absence of chemicals. Personal protective equipment will be utilized as necessary (based on specific action levels) to prevent chemical exposure in excess of the exposure limits listed in Table F-1. Air monitoring will be conducted in all work areas as described in Section 8.1. Use of PPE will be initiated based on action levels discussed in Section 6.0. A dust meter will be used to monitor for dust (metal bearing, if any).

5.0 EMPLOYEE TRAINING REQUIREMENTS

Personnel, authorized visitors, and others who will participate in environmental assessment activities at the Site are required to meet the minimum training standards outlined in OSHA standard 29 CFR 1910.120 covering Hazardous Waste Operations and Emergency Response. These requirements specify:

- 40 hours of initial training consisting of classroom and hands-on experience in the use of personal protective equipment (PPE), safe operating practices, identification of potential hazards or hazardous situations, etc., in accordance with the OSHA standard or 24 hours of training for workers on-site for specific tasks (surveyors, etc.);
- 8 hours of annual refresher training in addition to the initial 40-hour training program for all personnel;
- 8 hours of specialized supervisory training for personnel serving as supervisory staff; and
- 3 days of work activity for new employees under the supervision of a trained and experienced supervisor.

Documentation confirming these requirements (training certificates, training rosters, etc.) will be obtained by the SSC and retained for reference.

Prior to start-up construction activities, a pre-program briefing will be presented to all personnel and subcontractors by the SSC. The following topics will be addressed during the pre-program briefing:

- names of the SSC and the designated alternate;
- site history;

- hazardous substances which may be encountered during investigative activities, including their properties and symptoms of exposure;
- work tasks to be performed;
- use and maintenance of environmental surveillance equipment;
- action levels and identification of situations which require an upgrade or downgrade in levels of protection;
- level of protection to be employed for work area tasks, including use, operation, limitations, and maintenance of respiratory protection;
- site control measures, including safe operating practices, communication, etc.;
- physical hazards which may be encountered;
- training requirements;
- decontamination procedures, including a hands-on exercise of decontamination procedures;
- confined space entry procedures, if applicable;
- personnel exposure emergency procedure (skin contact, inhalation, ingestion, falls, etc.);
- potential or actual fire or explosion emergency procedure;
- environmental accidents emergency procedure (spread of contamination outside exclusion zone);
- emergency signals and/or codes; and
- location of the nearest medical facility and emergency phone numbers.

Any other health and safety-related topics which may arise prior to program start-up also will be discussed at the pre-program briefing.

Issues which may arise during assessment activities will be addressed during "tailgate" safety meetings, which are to be held daily, prior to shift start-up. Any changes in procedures or site-specific health and safety-related matters will be addressed during these meetings. All personnel will be required to sign and date the Tailgate Meeting form daily before performing any work (Attachment B).

6.0 SITE CONTROL

The following areas will be defined during remedial implementation activities in order to minimize employee and visitor exposure to contaminated media and to prevent the off-site migration or unintentional transfer of affected soils from the work site.

6.1 EXCLUSION ZONE

The exclusion zone is the area where physical or chemical hazards exist or could occur. The purposes of specifying this zone are to limit the spread of contaminants to clean areas, and to provide for the safety of those persons not authorized to enter the exclusion zone. The flow of personnel and equipment into and out of the exclusion zone will be controlled by the SSC, who will limit access to field personnel and authorized visitors involved in the project. The exclusion zone will be established around the disposal area for the implementation of in-situ volatilization and solidification.

A general work area will be defined around the recovery/monitoring well installation and groundwater sampling location. The general work will include all field activities, contaminated soil and groundwater which is produced, and all decontamination activities. Access to the general work areas will be controlled by the SSC, who will limit access to field personnel and authorized visitors involved in the project.

All people entering the exclusion/work zone will wear the appropriate level of protection (described under "Personnel Protection Requirements"). All persons entering the general work area must provide documentation of required training and medical approval. Required documentation includes physician approval to work and certificates for 40-hour safety training and annual 8-hour refresher courses. Visitors are permitted to enter the work area, but must meet the training and medical monitoring criteria outlined above.

The exclusion zone/general work area perimeter will be visually defined using flagging tape (the "hotline"), barricades, barricade tape or other suitable means of physical control. Ingress and egress from this area will be limited to a single exit.

6.2 CONTAMINATION REDUCTION ZONE

A contamination reduction zone (CRZ) will be established at the general work area exit. All personnel and construction equipment leaving the general work area must pass through the CRZ decontamination procedure before entering the surrounding "clean" or safety zone. Decontamination procedures are outlined under "Decontamination Procedures."

6.3 SAFETY ZONE

The safety zone encompasses all areas outside of the work area and the CRZ. The function of the safety zone includes:

- an entry for personnel, material, and equipment;
- an exit area for decontaminated personnel, materials, and equipment;
- a storage area for clean safety and work equipment; and
- an area for rest breaks, the consumption of food and beverage, and all other activities.

Waste materials resulting from construction activities (contaminated protective clothing, etc.) will be contained within the general work area and will be disposed of properly. Only approved and trained personnel and individuals will be allowed within the general work areas during assessment activities. Site security will be performed by the SSC or his/her designee.

6.4 SAFE WORK PRACTICES

Safe work practices (SWPs) to be followed by field personnel within the work areas are presented below

- All personnel, inspectors, etc., will enter the exclusion zone only through the CRZ. All personnel leaving the work area must exit through the CRZ and pass through the CRZ decontamination procedure.

- Only those vehicles and equipment required to complete work tasks will be permitted within the work area (i.e., drill rig, support trucks, etc.). All nonessential vehicles will remain within the safety zone.

- Containers (i.e., drums, hoppers, etc.) will be moved only with the proper equipment and will be secured to prevent dropping or loss of control during transport.

- All personnel will be required to field wash (hands and face) as a minimum at the end of their shift before leaving the job site. Hands and face will be washed during breaks.

- Equipment will not be placed on possibly contaminated surfaces.;

- Field survey instrumentation (i.e., monitox, OVA, combustible gas meters, etc.) will be covered with plastic or similar covering to minimize the potential for contamination.

- Contact lenses will not be worn by personnel within the exclusion zone.

- Food and beverages will not be permitted or consumed in the exclusion zone or CRZ. Possession or use of tobacco products and the application of cosmetics are also prohibited in these areas.

- No matches or lighters will be permitted in the exclusion zone or CRZ.

- Contaminated protective equipment, such as respirators, hoses, boots, disposable protective clothing etc., will not be removed from the work area or CRZ until it has been cleaned or properly packaged and labeled.

- All personnel will avoid contact with potentially contaminated material whenever possible.

- Employ the buddy system when performing any activity within the work area; do not work within any exclusion zone without a co-worker/partner.

- Field personnel must observe each other for signs of toxic exposure and heat/cold illness. Indications of adverse effects include, but are not limited to:
  - changes in complexion and skin discoloration;
  - changes in coordination;
  - changes in demeanor;
  - excessive salivation and pupillary response; and
  - changes in speech pattern.
- Field personnel are cautioned to inform each other of non-visual effects of illness such as:
  - headaches;
  - dizziness;
  - nausea;
  - blurred vision;
  - cramps; and
  - irritation of eyes, skin, or respiratory tract.
- If any indications of explosive or unusual conditions are observed, exit immediately and report to the SSC.

6.5 HEAVY EQUIPMENT

Heavy equipment can represent a substantial hazard to workers. In general, requirements for motor vehicles and material handling equipment are provided in the OSHA Construction Industry Standards, 29 CFR 1926, Subpart O. The following SWPs are to be followed when heavy equipment is in use (i.e., drilling rig, mixing tool, etc.):

- Use common sense. Do not assume that the equipment operator is keeping track of your whereabouts. Never walk directly in back of, or to the side of, heavy equipment without the operator's knowledge.

- Hard hats, steel-toed boots, and safety glasses are to be worn at all times around heavy equipment. Other protective gear as specified in the Health and Safety Plan is also applicable.

- Remain alert at all times.

- Maintain visual contact at all times.

- Establish hand signal communication when verbal communication is difficult. Determine one person per work group to give hand signals to equipment operators.

- Be aware of footing at all times.

- Only qualified/licensed people are to operate heavy equipment.

- Use chains, hoists, straps, and any other equipment to safely aid in moving heavy materials.

- Use proper personal lifting techniques. Use your legs, not your back.

- Never use a piece of equipment unless you are familiar with its operation. This applies to heavy as well as light equipment (for example, blow torches).

- Be sure that no underground or overhead power lines, sewer lines, gas lines, or telephone lines will present a hazard in the work area.

- Keep all non-essential personnel out of the work area.

- Prohibit loose-fitting clothing or loose long hair around moving machinery (i.e., spinning augers).

- Keep cabs free of all non-essential items and secure all loose items.
- Instruct equipment operators to report to their supervisor(s) any abnormalities such as equipment failure, oozing liquids, unusual odors, etc.
- When an equipment operator must negotiate in tight quarters, provide a second person to ensure adequate clearance.
- Implement an ongoing maintenance program for all tools and equipment. Inspect all tools and moving equipment regularly to ensure that parts are secured and intact with no evidence of cracks or areas of weakness, that the equipment turns smoothly with no evidence of wobble, and that it is operating according to manufacturer's specifications. Promptly repair or replace any defective items.
- Store tools in clean, secure areas so that they will not be damaged, lost, or stolen.
- Keep all heavy equipment that is used in the general work area in that zone until the job is done. Completely decontaminate such equipment within the designated vehicle decontamination area.
- Vehicles may not have cracked windshields or windows.
- Blades, buckets, dump bodies, and other hydraulic systems must be fully lowered when equipment is not in use.
- Parking brakes shall be engaged when equipment is not is use.
- Seat belts must be provided in all vehicles having rollover protective structures (ROPS).
- With certain exceptions provided in 29 CFR 1926, Subpart O, all material handling equipment will be provided with ROPS.

- Equipment with an obstructed rear view must have an audible alarm that sounds when it is operating in the reverse direction (unless a spotter guides the vehicle operator).

- Material handling equipment that lacks a ROP must not be operated on a grade, unless the grade can safely accommodate the equipment involved.

- A safety barrier will be used to protect workers whenever tires are inflated, removed, or installed on split rims.

- Heavy equipment will be inspected by the operator prior to the beginning of each work shift, and the SSC shall ensure the compliance to this regulation.

6.6 ELECTRICAL

All electrical wiring used during the construction activities will satisfy the requirements of 29 CRF 1926, Subpart K, and any applicable local electric codes. Some specific electrical safety requirements follow:

- All wiring will be done by a licensed electrician.

- All extension cords must have functional grounding conductors.

- All equipment that is not "double insulated" must have a functional grounding conductor.

- All electrical cords must be in good condition.

- In lieu of a documented "assured equipment grounding conductor program," ground fault protected circuits can be utilized.

- Electrical cords and power tools will be inspected by the SSC prior to use. Workers will inspect their power tools and cords prior to each use.

6.7 TRIP AND FALL HAZARDS

Workers will be apprised of any potential trip hazards through regular health and safety "tailgate" meetings. Whenever possible, trip and fall hazards will be eliminated or clearly identified with yellow "caution" tape. Impalement hazards to workers will be neutralized as soon as they are identified.

6.8 UTILITY AND POWER LINE CLEARANCE

The following clearance distances will be observed between equipment and energized power lines:

Voltage	Working Clearance (Ft)	Transit Clearance (Ft)
50 Kv or less	10	4
50 to 345 Kv	10 ft + 0.4 in. per Kv	
	10	
345 to 750 Kv	10 ft + 0.4 in. per Kv	
	16	

6.9 NOISE POLLUTION

Workers will be protected from excessive noise exposure through equipment maintenance, noise monitoring, and hearing conservation programs (annual audiometric exam/training) which comply with 29 CFR 1910.95. The daily equipment inspection will include the exhaust system; perforated exhaust pipes and mufflers will be replaced as they are documented.

Hearing protective equipment will be required whenever continuous noise levels equal or exceed 85 DBA (slow meter response) and/or impulse/impact noise exceeds current ACGIH TLVs or OSHA 29 CFR 1910.95 limits.

6.10 SANITATION

Provision of potable water, drinking cups, non-potable water, washing basins, and other sanitation requirements will be in compliance with specifications of OSHA 29 CFR 1910.120 (n).

6.11 SITE HOUSEKEEPING

Debris generated during the field activities will be contained in drums and disposed of in an approved manner.

6.12 ENFORCEMENT

The SSC will be responsible for enforcement of SWPs during construction activities. Personnel who fail to follow these practices will face disciplinary action up to and including dismissal from the job site.

A list of SWPs will be distributed to all personnel taking part in the construction program and will be conspicuously posted at the command post. At least one copy of this site-specific plan will be available at each work site. A review of SWPs and any necessary changes in these practices will be performed at the beginning of each day by the SSC.

7.0 PERSONNEL PROTECTION REQUIREMENTS

The selection of PPE for use is based on the potential for exposure to VOCs, SVOCs, and metals while performing site activities and OSHA standards for workers involved in hazardous-waste operations.

7.1 DESIGNATED LEVELS OF PROTECTION

During the implementation of the in-situ volatilization step, Level B personnel protection will be required within the exclusion zone. However, during the solidification step or during the installation of groundwater recovery wells Level C or Level D protection is expected. Furthermore, during trenching/piping installation Level D protection is anticipated. However, the level of protection may be upgraded or downgraded depending on results obtained from field analysis taken to monitor organic vapor levels, dust, and other specific compounds (to be determined). The levels of protection and equipment utilized are defined in the following subsections.

Level D

- disposable Tyvek coveralls;
- neoprene or PVC boots with steel toe (over-the-shoe boots are acceptable provided requirement for steel toe is met);
- hard hat;
- protective gloves (neoprene, nitrile, etc.); and
- safety glasses or goggles.

Level C

- full-face air-purifying respirator equipped with organic vapor-high efficiency particulate absorbing combination cartridges (color coded purple over black);

- chemical-resistant clothing (one-piece polyethylene-coated Tyvek coverall; requirement for hood to be determined);
- gloves, outer (nitrile);
- gloves, inner (skin-tight latex);
- boots, chemical resistant to substances of concern, steel toe and shank;
- hard hat (face shield optional);
- safety glasses, if not wearing respirator; and
- sleeves will be taped to gloves, and cuffs will be taped to boots, as applicable.

Level B

- supplied air respirator (airline respirator with escape bottle) or self-contained breathing apparatus (SCBA) approved NIOSH. Respirators shall be positive-pressure demand-type;
- chemical-resistant clothing (one-piece polyethylene or saran-coated Tyvek);
- work clothes;
- gloves (outer), chemical-resistant (nitrite);
- gloves (inner), chemical-resistant (latex);
- boots (outer), chemical resistant (disposable);
- hard hat (face shield or safety glasses); and
- sleeves will be taped to gloves, and cuffs taped to boots, as applicable.

Protection levels may also be upgraded, downgraded, or modified as deemed necessary by the SSC or his designee, based upon work task or site-specific, safety-related factors, such as:

- change in work tasks within a work area/exclusion zone, or work that begins on a different portion of the site;
- change of season/weather;
- when temperature extremes or individual medical considerations (i.e., heat stress, medication, etc.) limit the effectiveness of PPE;
- contaminants other than those previously identified are encountered;
- change in ambient levels of contaminants; and
- change in work space which affects the degree of contact with contaminants.

7.2 DURATION OF WORK TASKS

The duration of field activities involving the usage of PPE will be established by the SSC or his/her designee based on ambient temperature and weather conditions, the capacity of personnel to work in the designated level of PPE (heat stress and cold stress; see "Environmental Surveillance of Work Areas,"), and limitations of the protective equipment, i.e., ensemble permeation rates, life expectancy of air-purifying respirator cartridges, SCBA air supply consumption, etc. As a minimum, rest breaks will be observed at the following intervals:

- 15 minutes midway between shift start-up and lunch;
- one-half to one hour for lunch; and
- 15 minutes in the afternoon, between lunch and shift end.

All rest breaks will be taken in a clean area (e.g., support zone) after full decontamination and PPE removal. Additional rest breaks will be observed, based upon the heat stress monitoring guidelines.

7.3 LIMITATIONS OF PROTECTIVE CLOTHING

PPE ensembles designated for use during construction activities have been selected to provide protection against contaminants at known or anticipated concentrations in soil or water matrices. However, no protective garment, glove, or boot is chemical-proof, nor will it afford protection against all chemical types. Permeation of a given chemical through PPE is a complex process governed by contaminant concentrations, environmental conditions, physical condition of the protective garment, and the resistance of a garment to a specific contaminant; chemical permeation may continue even after the source of contamination has been removed from the garment.

8.0 ENVIRONMENTAL SURVEILLANCE OF WORK AREAS

Based upon the evaluation of potential exposure hazards and known contaminant concentrations, the use of respiratory protection is anticipated to be limited. However, due to the fact that potential concentrations of VOCs, SVOCs, and metals in the soil and groundwater are unknown, an air monitoring program will be conducted during the course of the project. This monitoring program will facilitate the identification of potentially hazardous conditions existing within or around the treatment area and provide information necessary to select appropriate respiratory protection to be used by construction personnel. In the event that respiratory protection is required, workers either will be supplied with appropriate air-purifying or supplied-air-type respirators by their employer or workers will evacuate the work area as ordered by the SSC. Only respirators approved by the NIOSH will be used by site personnel.

In order to obtain optimum usage from PPE, the following procedures are to be followed by all site personnel using PPE: when using disposable coveralls, don a clean, new garment after each rest break or at the beginning of each shift. Reusable gloves, boots or coveralls exhibiting any of the characteristics listed above will be discarded. PPE used in areas known or suspected to exhibit elevated concentrations of contaminants will not be reused.

8.1 AIR MONITORING

Air monitoring for VOCs, dust, and other specific compounds (to be determined) will be periodically conducted by the SSC during all field activities or when workers have the potential to be exposed to impacted media. Upwind monitoring will be conducted before beginning field activities and periodically during site activities to characterize ambient air quality. Breathing zone monitoring will be conducted during field activities to monitor worker exposure. Periodic monitoring of the breathing zone will be conducted during regrading. At a minimum, monitoring will be conducted whenever work activities or location changes (i.e., moving to a grading/excavation location). Air monitoring results will be recorded to document site conditions. The results of the air monitoring will be used to evaluate worker exposure and to determine the appropriate level of PPE.

Monitoring Equipment

Organic Vapors

An organic vapor meter equipped with a photo ionization detector ([PID] Hnu or equivalent) or ambient air analyzer equipped with infrared spectrometer (Foxboro MIRAN 1B2 or equivalent) will be used to monitor ambient air quality and the breathing zone. The organic vapor meter will be calibrated at least daily according to the manufacturer's specifications. Direct-reading instruments will be used to identify the specific compounds and their concentration., (e.g., colorimetric tubes).

Dust

An electronic dust meter will be used to monitor the breathing zone for dust. A MiniRam or equivalent will be used.

Action Levels

The action level is the concentration above the ambient air-quality concentration at which work will be stopped until further evaluation is made of the need for a higher level PPE. The site-specific action level has been established taking into consideration the type and concentration of chemical contaminants, the type of work and the duration of potential exposure. The site-specific action level will be the lowest time weighted average (TWA), short-term exposure limit (STEL), or immediately dangerous to life and health (IDLH) concentration for the chemicals of concern at the site, listed on Table F-1.

The TWA of a chemical is the time-weighted average concentration for a normal 8-hour work day over a 40-hour work week, to which workers may be exposed without adverse effect (ACGIH, 1993). A STEL is a 15-minute TWA exposure which should not be exceeded at any time during an 8-hour workday (ACGIH,1993). The IDLH is the maximum concentration from which, in the event of respirator failure, a worker could escape within 30 minutes without a respirator and without experiencing escape-impairing or irreversible health effects (NIOSH, 1990).

The following respiratory action levels will be employed during the construction program (see Tables F-2 and F-3):

- Should organic vapor concentrations within the work area approach or exceed 5 ppm, as measured with a photoionization detector, the level of personal protection will be upgraded to a full level C. The SSC will use benzene detector tubes to quantify the concentration of benzene present.

- If organic vapor concentrations within the work area approach or exceed 250 ppm, if benzene concentrations exceed 50 ppm, or if the oxygen concentration drops below 19.5 percent, personnel will be evacuated from the affected area. Re-entry will be permitted only upon attainment of safe atmospheric concentrations of oxygen or organic vapors in their affected area or after upgrading the respiratory protection level to require approved supplied-air respirators (Level B).

- If combustible gas concentrations reach 20 percent of the LEL, personnel will evacuate the work area. Work will not proceed until concentrations of combustible gas return to below 20 percent LEL.

- The action level for dust will be based on the TWA for the most hazardous metal in the work area. A sustained level above the TWA and background for 5 minutes or longer will indicate the need to stop work and modify working conditions.

8.2 USE AND MAINTENANCE OF SURVEY INSTRUMENTATION

All personnel who will be using field survey meters or personal air sampling devices will be thoroughly briefed on the operation, limitations, and maintenance of these devices. All maintenance and calibration procedures, including frequency of calibration, will be in strict accordance with the manufacturer's guidelines by a designated individual familiar with the devices. Any repairs, maintenance, or routine calibration of these devices will be recorded in an equipment maintenance logbook which will be signed by the servicing technician.

8.3 HEAT STRESS MONITORING

Heat stress is probably one of the most common and more serious of illnesses occurring when personnel employ PPE. Heat stress is caused by several interacting factors such as environmental conditions, clothing, workload, physical condition and characteristics of the employee, and the type of PPE required for the work task. Dependent upon the type of PPE worn, this equipment can add considerable weight, increase the body's expenditure of energy, and reduce the body's normal heat-exchange mechanisms.

Heat stress may be of concern especially when the dry-bulb air temperature exceeds 70°F. The following control measures shall be used to help control heat stress if ambient temperatures above 70°F are expected:

- Provisions of adequate liquids to replace lost body fluids. Employees must replace water and salt lost from sweating. Employees must be encouraged to drink more than the amount required to satisfy thirst. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement.

- Replacement fluids can be a 0.1 percent salt water solution, commercial mixes such as Gatorade or Quick Kick, or a combination of these and fresh water.

- Establishment of work regimen that will provide adequate rest periods for cooling down. This may require additional shifts for workers or earlier/later work schedules.

- Cooling devices, such as cooling vests, can be worn beneath protective garments.

- All breaks are to be taken in a shaded rest area.

- Employees will remove impermeable protective garments during rest periods.

- Employees will not be assigned other tasks during rest periods.

- To prevent heat stress, all employees will be informed of the importance of adequate rest, acclimatization, proper diet, health hazards, recognition of heat illness, and first aid.

Because the incident of heat stress depends on a variety of factors, all workers, even those not wearing protective equipment, should be monitored. For workers wearing permeable clothing (e.g., standard cotton or synthetic work clothes) follow recommendations for monitoring requirements and suggested work/rest schedules in the current ACGIH TLVs for Heat Stress. If the actual clothing worn differs from the ACGIH standard ensemble in insulation value and/or wind and vapor permeability, change the monitoring requirements and work/rest schedules accordingly.

9.0 RESPIRATORY PROTECTION PLAN

9.1 EMPLOYEE PROTECTION

Air-purifying or air-supplying respirators shall be used, where appropriate, to reduce employee exposure to airborne substances. All contractors will provide air-purifying respirators for their own employees from those approved by the NIOSH.

9.2 VISITOR PROTECTION

Visitors authorized to enter the work area must wear appropriate PPE within the work area as approved by the SSC or his/her designee. Visitors are required to provide their own PPE. Visitors who wish to enter the work area(s) must produce evidence that they have had a complete physical examination and respiratory protection training within the past 12 months prior to donning respiratory protection and entering the work area(s). This evidence must consist of a physician's letter authorizing the use of respiratory protection and copies of training certificates for OSHA-approved safety classes (40-hour and 8-hour annual refresher) as required by OSHA 29 CFR 1910.120.

The PPE worn by visitors shall enable them to avoid skin contact with contaminated or suspected contaminated surfaces. During visitation, hand-to-mouth transfers should be reduced with special precautions not to eat, drink, smoke, or chew gum or tobacco. The use of alcohol or medicine is prohibited.

9.3 RESPIRATOR SELECTION, USE AND MAINTENANCE

The following air-purifying respirator has been selected for use, when required, during remedial activities:

- full-face air-purifying respirator equipped with highly toxic particulate/organic vapor cartridge (color coded purple over black).

Respirators are to be used only in conjunction with breathing space air monitoring with strict adherence to the action levels previously outlined. A respirator may be used only when the device affords protection from the substances being encountered. Respirators have been selected based upon the substances which may be present at coal-tar-contaminated sites. Respirator cartridges used at full level C protection will be discarded, and fresh cartridges/canisters will be installed:

- after 8 hours of use for cartridges or daily, whichever is less;
- upon experiencing increased resistance to breathing;
- upon experiencing breakthrough of VOCs as determined by odor or irritation; or
- at the request of the respirator wearer.

If an air-purifying respirator cannot provide protection against all substances present at concentrations exceeding the action level, upgrading of respiratory protection to require a clean breathing air source will be required (Level B). Other conditions which preclude or limit the use of air-purifying respirators are:

- oxygen-deficient atmospheres (less than 19.5 percent oxygen);
- concentrations of substances which may be immediately dangerous to life and health (IDLH);
- entry into confined or unventilated areas which may contain airborne contaminants that have not been characterized;
- unknown contaminant concentrations or concentrations which exceed designated maximum use levels;
- presence of unidentified contaminants; and
- high relative humidity (reduces sorbent life).

Respirators issued to individuals will be cleaned and disinfected at least daily, if used. Where respirators are used by more than one person, the respirator will be cleaned and disinfected after each use. Respirators will be inspected during cleaning, and any necessary repairs will be made at that time. Damaged respirators will not be worn. After cleaning, respirators will be placed in clean, plastic bags and stored in a clean location convenient to the work area. The following representative respirator cleaning and inspection procedures are to be used during site activities:

- Daily Cleaning Procedures:

  - Respirator Disassembly. Respirators are taken to a clean location where the cartridges are removed, damaged to prevent accidental reuse, and discarded. For thorough cleaning, the inhalation and exhalation valves, speaking diaphragm, and any hoses are removed.

  - Cleaning. In most instances, the cleaning and disinfecting solution provided by the manufacturer is used and is dissolved in warm water in an appropriate tub. Using gloves, the respirator is placed in the tub and swirled for a few moments. A soft brush may be used to facilitate cleaning.

  - Rinsing. The cleaned and disinfected respirators are rinsed thoroughly in water to removed all traces of detergent and disinfectant. This is very important for preventing dermatitis.

  - Drying. The respirators may be allowed to dry in room air on a clean surface. They also may be hung upside-down like drying clothes, but care must be taken not to damage or distort the face-pieces.

  - Reassembly and Inspection. The clean, dry respirator face-pieces should be reassembled and inspected in an area separate from the disassembly area to avoid contamination. Special emphasis should be given to inspecting the respirators for

dividuals will be cleaned and disinfected at least daily, if used.
ore than one person, the respirator will be cleaned and disinfected
l be inspected during cleaning, and any necessary repairs will be
espirators will not be worn. After cleaning, respirators will be
d stored in a clean location convenient to the work area. The
or cleaning and inspection procedures are to be used during site

dures:

sembly. Respirators are taken to a clean location where the
noved, damaged to prevent accidental reuse, and discarded. For
g, the inhalation and exhalation valves, speaking diaphragm, and
ıoved.

st instances, the cleaning and disinfecting solution provided by the
ısed and is dissolved in warm water in an appropriate tub. Using
ator is placed in the tub and swirled for a few moments. A soft
d to facilitate cleaning.

aned and disinfected respirators are rinsed thoroughly in water to
es of detergent and disinfectant. This is very important for
titis.

pirators may be allowed to dry in room air on a clean surface.
e hung upside-down like drying clothes, but care must be taken
distort the face-pieces.

Inspection. The clean, dry respirator face-pieces should be
inspected in an area separate from the disassembly area to avoid
pecial emphasis should be given to inspecting the respirators for

detergent or soap residue left by inadequate rinsing. This appears most often under the seat of exhalation valve and can cause valve leakage or sticking.

- After Routine Use in General Work Areas:
  - The mask may be washed/rinsed with soap and water.
  - At a minimum, the mask should be wiped with disinfectant wipes (benzoalkaloid or isopropyl alcohol) and allowed to air dry in a clean area.
- Air-Purifying Respirator Inspection and Check-out:
  - Visually inspect the entire unit for any obvious damages, defects, or deteriorated rubber.
  - Make sure that the face-piece harness is not damaged.
  - Inspect lens for damage and proper seal in face-piece.
  - Exhalation Valve - pull off plastic cover and check valve for debris or for tears in the neoprene valve (which could cause leakage).
  - Inhalation Valves (two) - screw off cartridges and visually inspect neoprene valves for tears. Make sure that the inhalation valves and cartridge receptacle gaskets are in place.
  - Make sure a protective cover is attached to the lens.
  - Make sure the speaking diaphragm retainer ring is hand tight.
  - Don and perform negative and positive pressure checks.

The effectiveness of the respiratory protection program will be monitored continuously by the SSC or his/her designee. Monitoring of worker stress levels during activities which require respiratory protection will also be performed by the SSC or his/her designee.

All personnel who will be taking part in construction activities will be required to provide evidence at the start of the field program that they have completed the training and health monitoring requirements of OSHA 29 CFR 1910.120. No employee shall be assigned to tasks requiring the use of respirators if, based upon the most recent examination, a physician determines that the employee will be unable to function normally wearing a respirator or that the safety or health of the employee or other employees will be impaired by use of a respirator. Personnel will be briefed on the proper use, maintenance, and limitations of air-purifying respirators prior to program start-up.

Should upgrading to Level B (supplied-air systems) be required, all previously described requirements for the use and maintenance of respirators will continue to be enforced. In addition, the requirements for breathing quality air outlined in OSHA 29 CFR 1910.134 will be met.

Respirator selection, use and maintenance will be in compliance with OSHA 29 CFR 1910.134, "Respiratory Protection."

10.0 DECONTAMINATION

All personnel involved in work area activities must pass through the CRZ, regardless of the work task or protection level used. All equipment and tools used within work areas will likewise undergo decontamination prior to removal from the work area. Final inspection of the equipment prior to leaving the site is the responsibility of the SSC or his/her designee.

10.1 PERSONNEL

The following representative decontamination procedure will be employed for those work tasks requiring Level C and Level B protection. Level D decontamination will follow this procedure, except for stations involving respiratory protection removal.

10.1.1 Station 1: Segregated Equipment Drop

Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Tools and devices will be washed/wiped in a detergent solution and rinsed with clean water, then stored or serviced for reuse.

10.1.2 Station 2: Outer Garment, Boots, and Outer Gloves, Wash and Rinse

Scrub outer boots and gloves with decon solution consisting of detergent and water. Rinse gloves, boots, and garment with hand-pump spray bottle into plastic bucket or tub.

10.1.3 Station 3: Outer Glove Removal

Remove outer gloves and any accompanying tape, if used. Tape should be placed in a container with a plastic liner. Reusable gloves will be cleaned and stored for future use.

10.1.4 Station 4: Cartridge Change

If a worker leaves the general work area to change respirator cartridges, this is the last step in the decontamination procedure. Once the worker's cartridges are exchanged, the outer glove and boot covers are donned and joints taped, if required. The worker may then return to the general work area.

10.1.5 Station 5: Outer Garment and Boots Removal

Remove outer garment and boots, in that order. The outer, disposable, chemically-resistant garment should be deposited in a plastic-lined container. Reusable protective garments will be removed and stored for future use.

10.1.6 Station 6: Respiratory Protection Removal

Remove the respirator face-piece and place respirator in plastic-lined container for decontamination.

10.1.7 Station 7: Inner Glove Removal

Upon removal of inner protective gloves, boots, and protective clothing, personnel will pass into the clean portion of the CRZ for washing of hands and face. Respirators will be stored within the clean area after being decontaminated. Outer boots and coveralls will be stored or discarded and not worn within the support areas.

Personnel will pass through the decontamination procedure prior to eating lunch and when leaving the CRZ.

10.2 EQUIPMENT AND VEHICLES

Tools and equipment will be washed with decon solution, rinsed with clean water and, if required, steam cleaned to the satisfaction of the SSC, at the site decontamination pad prior to removal from the work area. Heavy equipment will be decontaminated by removing all

contaminated soil and pressure-washing or steam cleaning at the decontamination pad prior to leaving the work area. Support vehicles will be decontaminated, as deemed necessary by the SSC. Wash water generated during wash-down will be containerized and disposed of properly.

10.3 DECONTAMINATION PERSONNEL

Personnel working in the CRZ will wear, as a minimum, one less level of protection than on-site workers. Decontamination personnel will be required to pass through the decontamination procedure prior to leaving the CRZ.

10.4 DECONTAMINATION WASTE DISPOSAL

All soil wastes generated during drilling activities will be placed in 55-gallon drums and transferred to the staging area located on-site within the fenced area. Wash-water resulting from decontamination or steam cleaning will be collected and containerized for disposal.

In addition, a housekeeping program will be implemented during the course of the work to avoid the spread of any contaminants beyond the general work area. The program shall include:

- periodic policing of the work areas for debris, including paper products, cans, etc.;
- periodic changing of wash and rinse water for hand, face, and equipment; and
- periodic removal (weekly minimum) of all garbage bags and containers used to dispose of disposable clothing. Contaminated materials will be disposed of in an approved manner.

10.5 EQUIPMENT NEEDS

The following equipment may be used during the decontamination procedure for Levels B and C protection and are recommended:

Station 1:

- plastic drop cloths
- plastic 30- or 50-gallon containers

Station 2:

- hand-operated garden-type sprayers (2)
- large (30- to 50-gallon) tubs or wash basins
- plastic buckets
- brushes
- decon solution
  - micro laboratory cleaner
  - commercially available detergent

Station 3:

- plastic sheeting
- plastic containers (30 to 50 gallons)
- storage racks for gloves

Station 4:

- duct tape
- respirator cartridges
- fully-charged air bottles (if SCBAs are required)

Station 5:

- plastic sheeting
- plastic containers (30- to 50-gallon)
- bench
- rack for boots

Station 6:

- plastic sheeting
- plastic containers (30- to 50-gallon)
- detergent and/or boric acid for respirator decontamination

Station 7:

- plastic container

Other Equipment:

- hand-operated garden-type sprayers or garden hose for vehicle and equipment washing and rinsing
- steam cleaner
- potable water supply
- wash basins
- toilets

11.0 HEALTH MONITORING

11.1 MEDICAL SURVEILLANCE

Personnel and visitors entering the general work area shall participate in a medical surveillance program meeting the minimum requirements outlined in OSHA 29 CFR 1910.129(f). This program shall provide for annual employee physical, the results of which are reviewed by a physician specializing in occupational health. Results of the annual physical will be used to determine whether the subject should be permitted to wear respiratory protection and/or has specific physical limitations for performing certain work tasks (OSHA 29 CFR 1910.120).

11.2 DOCUMENTATION AND RECORD KEEPING

The SSC will maintain a medical surveillance file containing a copy of the physician's written opinion and date of latest annual physical examination for each employee participating in construction activities. Any visitor or observer approved for entry into the general work area will be required to provide the above documentation to the SSC prior to site entry (OSHA 29 CFR 1910.120).

The recording and reporting of illnesses and injuries, as required by OSHA, will be the responsibility of the selected contractor. Recordable occupational accidents and illnesses are those defined in OSHA 29 CFR 1910 and 1926.

12.0 COMMUNICATIONS

Communication within the work area will be accomplished through verbal communication or with two-way radios. Communication with outside emergency and medical facilities will be through a cellular phone located near the work area. The telephone near the work area will be identified during the pre-startup safety and health briefing.

13.0 ON-SITE EMERGENCY PLAN

A step-wise approach for dealing with emergency situations has been developed to address the immediate needs of on-site emergency activities (Figure 3). This plan describes the action that shall be implemented in the event of an emergency and includes a list of Emergency Information Telephone Numbers to assist during the event.

13.1 MEDICAL EMERGENCIES

In the event of any injury or chemical exposure requiring movement of the patient to the hospital by ambulance, the SSC or his/her designee will contact the University Public Safety Telecommunicator (962-6565) while the victim is removed from the work area and through decontamination for pickup by the ambulance. A map showing the route to the hospital and a list of emergency telephone numbers will be conspicuously posted at the work site and will be kept within support vehicles.

In the event of chemical exposure requiring emergency treatment, all personnel within the affected work area will be evacuated, along with removal of the victim, until an investigation by the SSC is conducted and the area is declared safe for work to continue. Personnel will assemble at the CRZ upon evacuation. An emergency report must be completed by the SSC for each instance of employee injury or possible exposure.

A first aid kit for use on minor cuts, abrasions, etc., will be kept at the CRZ. Portable emergency eyewash stations will be kept at the CRZ.

13.2 FIRE OR ATMOSPHERIC-RELATED RELEASE

In the event of fire or atmospheric release requiring evacuation, the notice to evacuate will be given verbally or by radio, and all site personnel will assemble at the CRZ or other agreed-upon location. SSC or his/her designee will then contact the University Public Safety Telecommunicator (962-6565). The University Public Safety Telecommunicator will notify and

dispatch one or more of the following emergency response organizations according to the University Emergency Plan (Attachment C):

- University Public Safety Department
- Chapel Hill Fire Department.
- South Orange Emergency Medical Services
- University Health & Safety Office
- Orange County Hazardous Materials Team (at the discretion of the Chapel Hill Fire Department).

Information to be supplied to emergency response personnel will include the nature of the emergency, area involved in the emergency situation, if known, presence of toxic or flammable substances which may be encountered, and other pertinent information. Personnel will not be permitted into the work area until the emergency is resolved and the all-clear signal is given by the SSC.

In order to prevent the occurrence of potentially hazardous conditions, work area monitoring will be performed as discussed under "Environmental Surveillance." In addition to organic vapor monitoring, combustible gas measurements will be performed during actual remedial activities. If combustible gas concentrations reach 20 percent of the LEL during remedial operations, personnel will evacuate the work area and the SSC will be notified. Work will not proceed until concentrations of combustible gas return to below 20 percent LEL.

To prevent potential fire hazards, all vehicle or equipment refueling will take place with the vehicle shut off and in a safe area without sources of ignition. Fuel for equipment will be stored and transported in metal jerry-can-type containers which will be properly secured during transit. Dry chemical fire extinguishers (A, B, C type) will be kept aboard equipment. Subcontractor equipment and vehicles will be required to meet the pertinent sub-parts of the general Construction Industry Standards, OSHA 29 CFR 1910 and 1926.

13.3 EMERGENCY INFORMATION TELEPHONE NUMBERS

- UNC Public Safety Telecommunicator: (919) 962-6565;
- UNC Health & Safety Office: (919) 962-5507;
- Chapel Hill Fire Department: 911;
- South Orange County Emergency Medical Services: 911;
- Orange County Emergency Management: (919) 968-2050;
- UNC Hospitals: (919) 966-4131; and
- USEPA National Response Center: (800) 424-8802.

14.0 RECORD KEEPING

The SSC shall establish and maintain records of all necessary and prudent monitoring activities as described below:

- The dates, number, duration, and results of air samples taken. These measurements shall be written on an instrument log form.
- A description of the sampling and analytical methods used.
- Name, social security number, and job classification of the employees involved on specific tasks.
- Signed health and safety acknowledgment form.
- Records of use and qualitative fit-testing results for subcontractor and environmental monitoring personnel.
- Emergency report sheets describing any incidents or accidents.
- Records of maintenance of monitoring devices.
- Log Book including visitors information.

15.0 REFERENCES

American Conference of Governmental Industrial Hygienists (ACGIH), 1993. 1993-1994 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.

National Institute for Occupational Safety and Health (NIOSH, 1990). Pocket Guide to Chemical Hazards. June.

National Institute for Occupational Safety and Health, Occupational Safety and Health Administration, U.S. Coast Guard, U.S. Environmental Protection Agency (NIOSH et. al.), 1985. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.

TABLES

Table F-1. Exposure Limits for the Constituents of Concern, University of North Carolina at Chapel Hill, (Airport Road Waste Disposal Area), Chapel Hill, North Carolina.

Constituents of Concern	TLV-TWA ppm	TLV-TWA mg/m³	STEL ppm	STEL mg/m³	IDLH ppm	IDLH mg/m³	Medium of Concern Soil	Medium of Concern Groundwater
Benzene	10[a],A2	32[a],A2	---	---	3,000	---		X
Chloroform	10,A2	49,A2	---	---	1,000	---	X	X
1,2-Dichloroethane	10	40	---	---	1,000	---		X
Diethyl ether	400	1,210	500	1,520	19,000	---		X
Dimethylphthalate	---	5	---	---	---	9,300		X
Isophorone	C 5	C 28	---	---	800	---		X
Manganese (dust & compounds)	---	5[b]	---	---	NE			X
Methylene chloride	50,A2	174,A2	---	---	5,000	---		
Phenol	5	19	---	---	250	---		X
Trichlorofluoromethane	C 1,000	C 5,620	---	---	NE	---		X

Footnotes appear on page 2.

Table F-1. Exposure Limits for the Constituents of Concern, University of North Carolina at Chapel Hill, (Airport Road Waste Disposal Area), Chapel Hill, North Carolina.

TLV-TWA	Threshold Limit Value, Time Weighted Average.
STEL	Short Term Exposure Limit.
IDLH	Immediately Dangerous to Life and Health.
ppm	Parts per million.
mg/m^3	Milligrams per cubic meter.
A1	Confirmed Human Carcinogen: The agent is carcinogenic to humans based on the weight of evidence from epidemiologic studies of, or convincing clinical evidence in, exposed humans.
A2	Suspected Human Carcinogen: The agent is carcinogenic in experimental animals at dose levels, by route(s) or administration, at site(s), of histologic type(s), or by mechanism(s) that are considered relevant to worker exposure. Available epidemiologic studies are conflicting or insufficient to confirm an increased risk of cancer in exposed humans.
C	Ceiling limit.
a	Proposed change: 0.1 ppm, A1; 0.3 mg/m^3, A1.
b	Proposed change: 0.2 mg/m^3.

Table F-2. Environmental Surveillance Monitoring.

Substance	Monitoring Instrument	Monitoring Frequency
Organic Vapors	Photoionization Detector (TIP, HNU) and benzene detector tubes	Continuous operation; check and record every half hour.
Oxygen/Combustible Gases	Combination Combustible Gas and Oxygen Meter	Continuous operation; check and record every half hour.

* Instrument operates continuously and is factory-equipped with an alarm.

Table F-3. Action-Level Summary.

Level D Protection

- Organic vapor concentrations less than 5 ppm as measured with a photoionization detector; and
- Oxygen concentrations measured between 19.5 and 21 percent with a direct-reading oxygen sensor; and
- Combustible gas concentration less than 20 percent as measured with a combustible gas indicator.

Level C Protection

- Organic vapor concentrations between 5 ppm and 250 ppm and benzene concentrations less than 50 ppm; and
- Oxygen concentrations between 19.5 and 21 percent; and
- Combustible gas concentration less than 20 percent.

Level B Protection

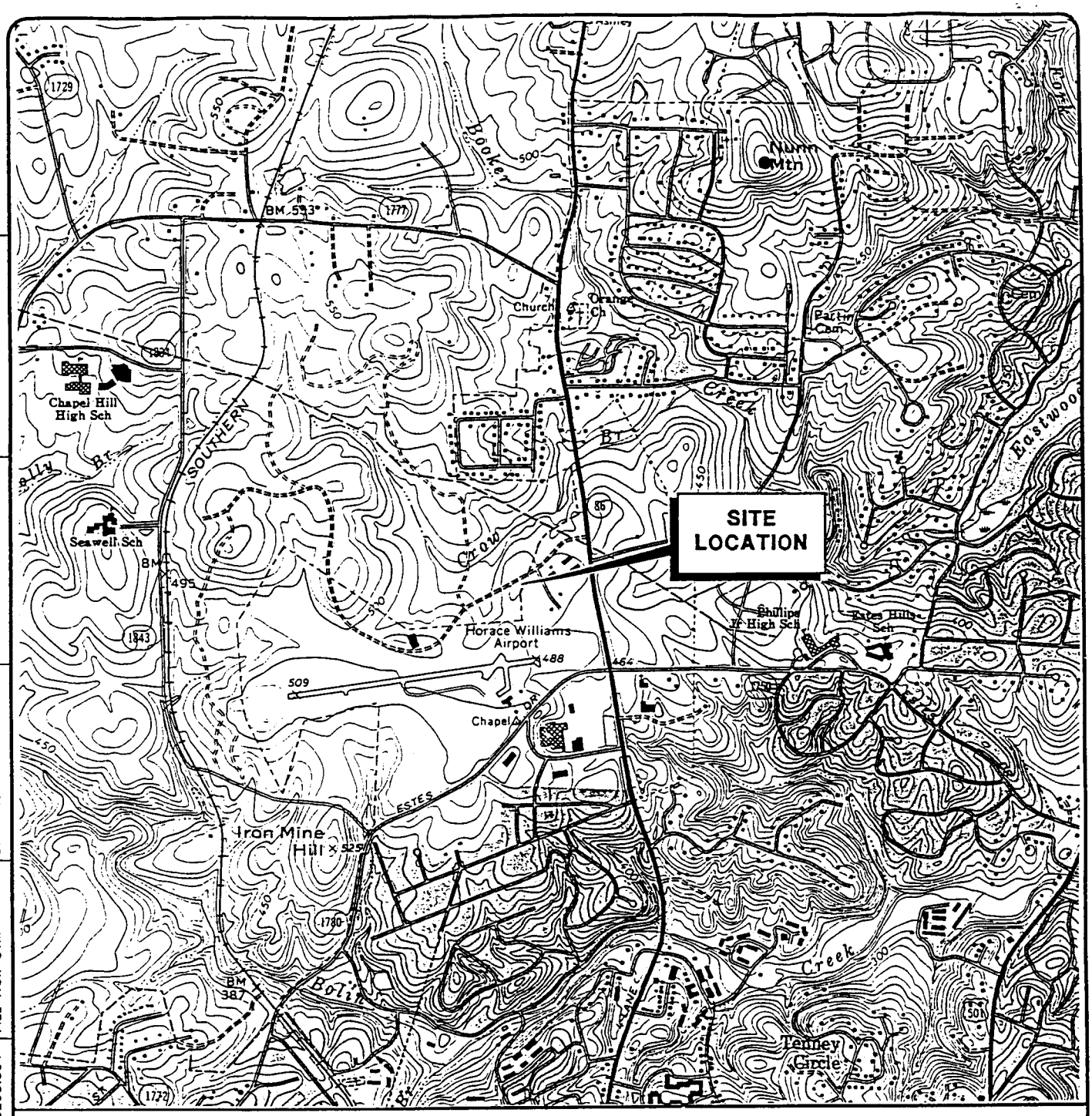
- Organic vapor concentration above 250 ppm; or
- Benzene concentrations above 50 ppm; or
- Oxygen concentration below 19.5 percent

Table F-3. Action-Level Summary.

Evacuate Until Levels Return to Normal When:

- Oxygen concentrations exceed 21 percent; or
- Combustible gas concentrations exceed 20 percent of the LEL.
- Inspect all clothing, gloves, and boots both prior to and during use for:
  - Imperfect seams;
  - Non-uniform coatings;
  - Tears;
  - Poorly functioning closures.
- Inspect reusable garments, boots and gloves both prior to and during use for:
  - Visible signs of chemical permeation:
  - Swelling;
  - Discoloration;
  - Stiffness;
  - Brittleness.
  - Cracks;
  - Any sign of puncture; and
  - Any sign of abrasion.

FIGURES



County Location

SCALE 1:24000

Contour Interval 10 Feet Datum is Mean Sea Level

U.S.G.S. 7.5 Minute Series Chapel Hill, N.C.

Topographic Quadrangle, Photorevised 1981.

GERAGHTY & MILLER, INC.
Environmental Services

SITE LOCATION TOPOGRAPHIC MAP

THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

AIRPORT ROAD WASTE DISPOSAL AREA

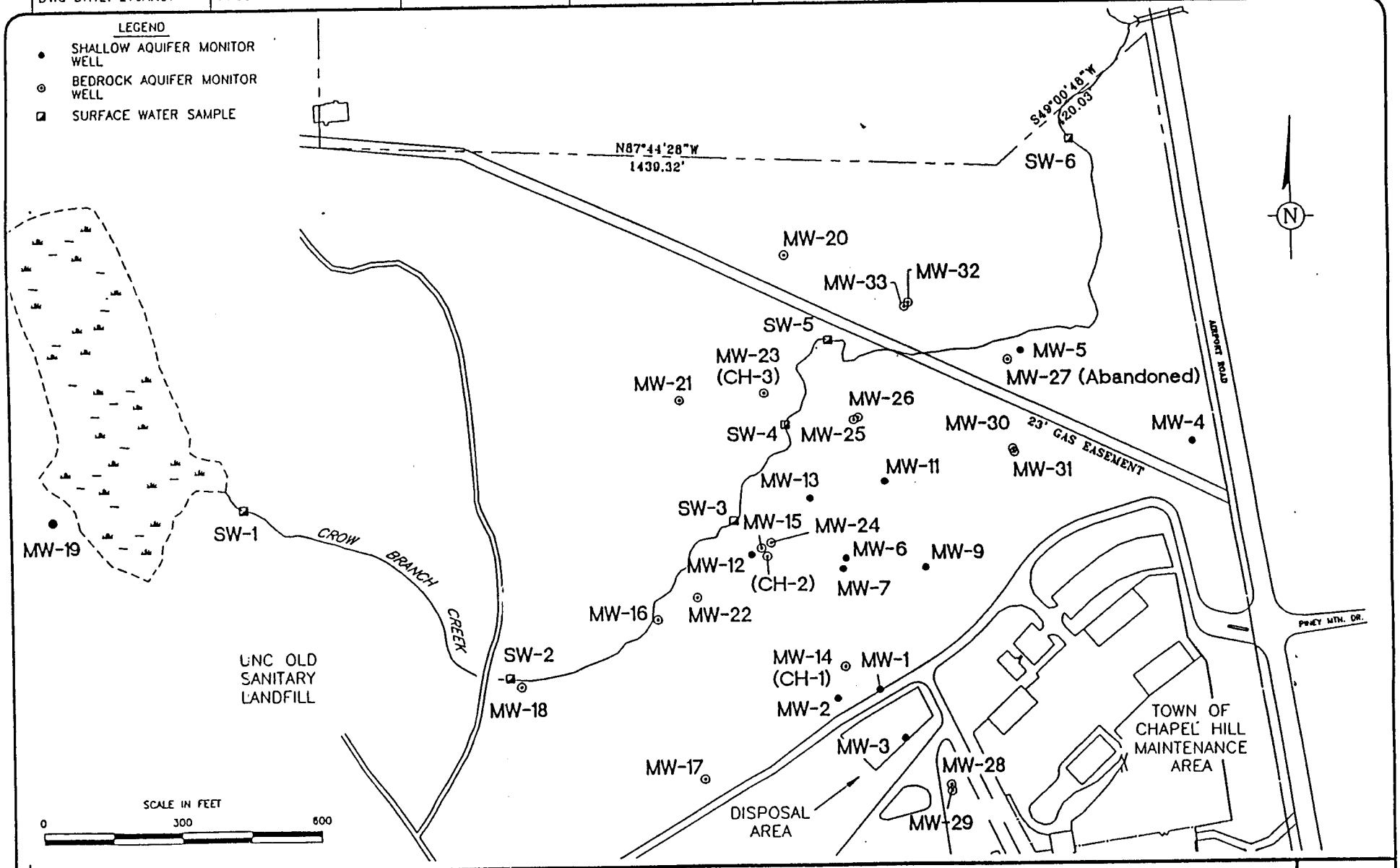
CHAPEL HILL, NORTH CAROLINA

FIGURE

1

DWG DATE: 28JAN97 | PRJCT NO.: NC0293.004 | FILE NO.: SYM | DRAWNG: TDPD-NC | CHECKED: N. SHETTY | APPROVED: J. SHILLIDAY | DRAFTER: A. WARREN

DWG DATE: 27JAN97	PRJCT NO.: NC0239.004	FILE NO.: UNC-CHAP	DRAWING: MW-LOC2	CHECKED: N. SHETTY	APPROVED: J. SHILLIDAY	DRAFTER: A. WARREN

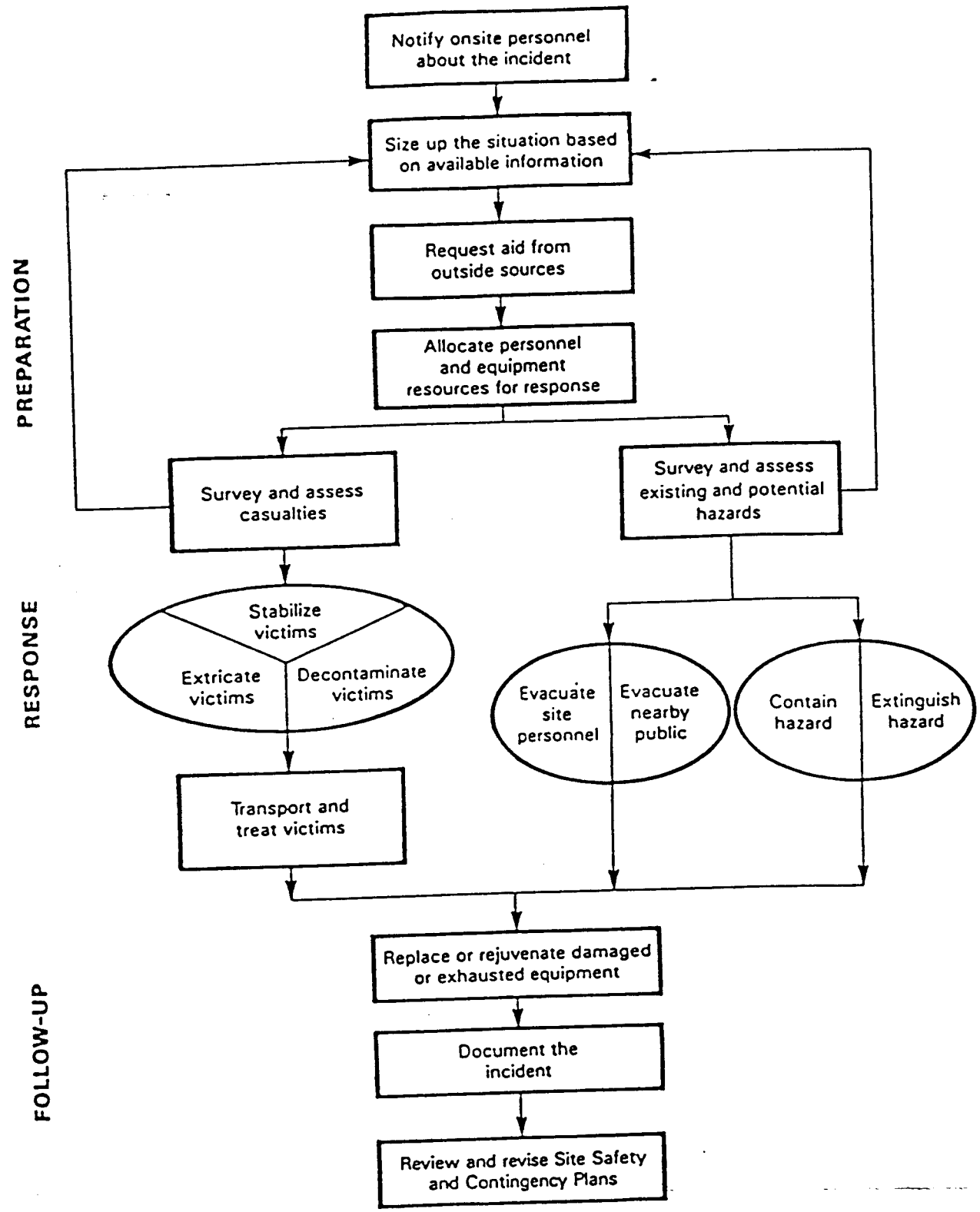


GERAGHTY & MILLER, INC.
Environmental Services

SITE LAYOUT

THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
AIRPORT ROAD WASTE DISPOSAL AREA
CHAPEL HILL, NORTH CAROLINA

FIGURE
2



DWG DATE: 18 NOV 93 | PROJECT NO.: NC0202.007 | FILE NO.: CHANNEL | DRAWING: EMERPLAN | CHECKED: B. MIDGETTE | APPROVED: B. MIDGETTE | DRAFTER: N. JOHNSON

GERAGHTY & MILLER, INC.
Environmental Services

EMERGENCY SITUATION PLAN
THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
AIRPORT ROAD WASTE DISPOSAL AREA
CHAPEL HILL, NORTH CAROLINA

FIGURE
3

neous routes. A severe eye and moderate skin irritant. Human systemic effects by inhalation and ingestion: euphoria, somnolence, changes in REM sleep, changes in motor activity, nausea or vomiting, reduced number of blood platelets, other unspecified blood effects, dermatitis, and fever. A human carcinogen which produces myeloid leukemia and lymphomas by inhalation. An experimental carcinogen, neoplastigen, tumorigen, and teratogen. Other experimental animal reproductive effects. Human mutagenic data. A narcotic. In industry, inhalation is the primary route of chronic benzene poisoning. Poisoning by skin contact has been reported. Recent (1987) research indicates that effects are seen at less than 1 ppm. Exposures needed to be reduced to 0.1 ppm before no toxic effects were observed. Elimination is chiefly through the lungs. A common air contaminant.

A dangerous fire hazard when exposed to heat or flame. Explodes on contact with diborane; bromine pentafluoride; permanganic acid; peroxomonosulfuric acid; and peroxodisulfuric acid. Forms sensitive, explosive mixtures with iodine pentafluoride; silver perchlorate; nitryl perchlorate; nitric acid; liquid oxygen; ozone; arsenic pentafluoride + potassium methoxide (explodes above 30°C). Ignites on contact with sodium peroxide + water; dioxygenyl tetrafluoroborate; iodine heptafluoride; and dioxygen difluoride. Vigorous or incandescent reaction with hydrogen + Raney nickel (above 210°C); uranium hexafluoride; and bromine trifluoride. Can react vigorously with oxidizing materials, such as Cl_2; CrO_3; O_2; $NClO_4$; O_3; perchlorates; ($AlCl_3$ + $FClO_4$); (H_2SO_4 + permanganates); K_2O_2; ($AgClO_4$ + acetic acid); Na_2O_2. Moderate explosion hazard when exposed to heat or flame. Use with adequate ventilation. To fight fire, use foam, CO_2, dry chemical. For further information, see Vol. 4, No. 6 of *DPIM Report*.

Poisoning occurs most commonly via inhalation of the vapor, although benzene can penetrate the skin and cause poisoning. Locally, benzene has a comparatively strong irritating effect, producing erythema and burning, and, in more severe cases, edema and even blistering. Exposure to high concentrations of the vapor (3000 ppm or higher) may result from failure of equipment or spillage. Such exposure, while rare in industry, may cause acute poisoning, characterized by the narcotic action of benzene on the central nervous system. The anesthetic action of benzene is similar to that of other anesthetic gases, consisting of a preliminary stage of excitation followed by depression and, if exposure is continued, death through respiratory failure. The chronic, rather than the acute form, of benzene poisoning is important in industry. It is a recognized leukemogen. There is no specific blood picture occurring in cases of chronic benzol poisoning. The bone marrow may be hypoplastic, normal, or hyperplastic, the changes reflected in the peripheral blood. Anemia, leucopenia, macrocytosis, reticulocytosis, thrombocytopenia, high color index, and prolonged bleeding time may be present. Cases of myeloid leukemia have been reported. For the worker, repeated blood examinations are necessary, including hemoglobin determinations, white and red cell counts and differential smears. Where a worker shows a progressive drop in either red or white cells, or where the white count remains low, 5,000/mm_3 or the red count <4.0 million/mm_3, on two successive monthly examinations, he should be immediately removed from benzene exposure. Elimination is chiefly through the lungs, when fresh air is breathed. The portion that is absorbed is oxidized, and the oxidation products are combined with sulfuric and glycuronic acids and eliminated in the urine. This may be used as a diagnostic sign. Benzene has a definite cumulative action, and exposure to a relatively high concentration is not serious from the point of view of causing damage to the blood-forming system, provided the exposure is not repeated. In acute poisoning, the worker becomes confused and dizzy, complains of tightening of the leg muscles and of pressure over the forehead, then passes into a stage of excitement. If allowed to remain exposed, he quickly becomes stupefied and lapses into coma. In non-fatal cases, recovery is usually complete with no permanent disability. In chronic poisoning the onset is slow, with the symptoms vague; fatigue, headache, dizziness, nausea and loss of appetite, loss of weight and weakness are common complaints in early cases. Later, pallor, nosebleeds, bleeding gums, menorrhagia, petechiae and purpura may develop. There is great individual variation in the signs and symptoms of chronic benzene poisoning.

BBL500 ***HR: 2***

BENZENEACETALDEHYDE

CAS: 122-78-1 NIOSH: CY 1420000

mf: C_8H_8O mw: 120.16

PROP: Oily, colorless liquid which polymerizes and grows more viscous on standing. Odor similar to lilac and hyacinth. Has been crystallized, mp: 33-34°, d:(25/25) 1.023-1.030, bp: (10) 78°, n (20/D) 1.524-1.528. Sltly sol in water. Sol in alc, ether. One part is sol in two parts of 80% alc forming a clear solution.

SYNS:

HYACINTHIN
PAA
PHENYLACETALDEHYDE
PHENYLACETIC ALDEHYDE
PHENYLETHANAL
α-TOLUALDEHYDE
α-TOLUIC ALDEHYDE

TOXICITY DATA:	CODEN:
skn-hmn 2%/48H	FCTXAV 17,377,79
orl-rat LD50:1550 mg/kg	FCTXAV 17,377,79
orl-mus LD50:3890 mg/kg	FCTXAV 17,377,79
orl-gpg LD50:3890 mg/kg	FCTXAV 17,377,79

Reported in EPA TSCA Inventory.

THR: Moderately toxic by ingestion. Human skin irritant. When heated to decomposition it emits acrid smoke and irritating fumes. Used in perfumery. See also ALDEHYDES.

SYNS:
6-[3-(2-CHLORO-6-FLUOROPHE-NYL)-5-METHYL-4-ISOXAZOLE-CARBOXAMIDO]PENICILLANIC ACID SODIUM SALT
CULPEN
FLOXACILLIN SODIUM MONOHYDRATE
FLOXAPEN
FLUCLOXACILLIN SODIUM MONOHYDRATE
STAPHYLEX

TOXICITY DATA:
orl-mus LD50:3800 mg/kg
scu-mus LD50:2200 mg/kg

CODEN:
MEIEDD 10,589,83
MEIEDD 10,589,83

THR: Moderately toxic by ingestion and subcutaneous routes. When heated to decomposition it emits very toxic fumes of Cl^-, F^-, NO_x, Na_2O and SO_x. See other penilillin entries.

CHJ250 **HR: 3**

3-CHLORO-2-FLUOROPROPENE

CAS: 6186-91-0 NIOSH: UC 7700000
mf: C_3H_4ClF mw: 94.52

SYN: 3-CHLORO-2-FLUORO-1-PROPENE

TOXICITY DATA:
orl-rat LD50:280 mg/kg
ihl-rat LCLo:1000 ppm/4H
skn-rbt LD50:200 mg/kg

CODEN:
AIHAAP 23,95,62
AIHAAP 23,95,62
AIHAAP 23,95,62

THR: Poison by ingestion and skin contact. Mildly toxic by inhalation. When heated to decomposition it emits very toxic fumes of F^- and Cl^-. See also CHLORINATED HYDROCARBONS, ALIPHATIC; and FLUORIDES.

CHJ500 **HR: 3**

CHLOROFORM

CAS: 67-66-3 NIOSH: FS 9100000
DOT: 1888
mf: $CHCl_3$ mw: 119.37

PROP: Colorless liquid; heavy, ethereal odor. Mp: −63.5°, bp: 61.26°, fp: −63.5°, flash p: none, d: 1.49845 @ 15°, vap press: 100 mm @ 10.4°, vap d: 4.12.

SYNS:
CHLOROFORME (FRENCH)
CLOROFORMIO (ITALIAN)
FORMYL TRICHLORIDE
METHANE TRICHLORIDE
METHENYL TRICHLORIDE
METHYL TRICHLORIDE
NCI-C02686
R 20 (REFRIGERANT)
RCRA WASTE NUMBER U044
TCM
TRICHLOORMETHAAN (DUTCH)
TRICHLORMETHAN (CZECH)
TRICHLOROFORM
TRICHLOROMETHANE
TRICLOROMETANO (ITALIAN)

TOXICITY DATA:
skn-rbt 10 mg/24H open MLD
skn-rbt 500 mg/24H MLD
eye-rbt 148 mg
eye-rbt 20 mg/24H MOD
orns-grh-ihl 562 mg/L
sce-hmn:lym 10 mmol/L
dnd-rat-orl 1 µmol/kg
dns-mus-ipr 50 mg/kg
sce-mus-orl 200 mg/kg/4D-I
dnd-mam:lym 1 mmol/L
orl-rat TDLo:1260 mg/kg (6-15D preg):TER
ihl-rat TCLo:30 ppm/7H (6-15D preg):TER
orl-mus TDLo:2115 mg/kg (3W male/3W pre-5D post):REP
orl-rat TDLo:13832 mg/kg/2Y-C:CAR
orl-mus TDLo:127 gm/kg/92W-I:CAR
orl-rat TD :98 gm/kg/78W-I: NEO
orl-mus TD :18 gm/kg/17W-I: NEO
orl-rat TD :7020 mg/kg/78W-I: CAR
orl-rat TD :70 gm/kg/78W-I: NEO
orl-mus TD :24752 mg/kg/2Y-C:ETA
orl-rat TD :58968 mg/kg/2Y-C: NEO
ihl-hmn TCLo:10 mg/m³/1Y: CNS,GIT
ihl-hmn TCLo:5000 mg/m³/7M: CNS
ihl-hmn LCLo:25000 ppm/5M
orl-hmn LDLo:140 mg/kg
unr-man LDLo:546 mg/kg
orl-rat LD50:908 mg/kg
ihl-rat LCLo:8000 ppm/4H
orl-mus LD50:36 mg/kg
ihl-mus LC50:28 g/m³
ipr-mus LD50:1484 mg/kg
scu-mus LD50:704 mg/kg
orl-dog LDLo:1000 mg/kg
ihl-dog LC50:100 g/m³
ipr-dog LD50:1000 mg/kg
ivn-dog LDLo:75 mg/kg
ihl-cat LCLo:35000 mg/m³/4H
orl-rbt LDLo:500 mg/kg
ihl-rbt LC50:59 gm/m³
scu-rbt LDLo:800 mg/kg
orl-gpg LD50:820 mg/kg
ihl-gpg LCLo:20000 ppm/2H
ihl-frg LCLo:6000 mg/m³
ihl-mam LCLo:25000 ppm/5M

CODEN:
ENVRAL 32,72,83
TOLED5 11,243,82
TXAPA9 29,348,74
TXAPA9 28,442,74
EVHPAZ 46,127,82
FAATDF 5,760,85
NCITR* NCI-CG-TR-0,76
NCITR* NCI-CG-TR-0,76
JNCIAM 5,251,45
EVHPAZ 31,171,79
NCITR* NCI-CG-TR-0,76
FAATDF 5,760,85
FAATDF 5,760,85
IRGGAJ 24,127,67
AHBAAM 116,131,36
TABIA2 3,231,33
32ZWAA 8,275,74
85DCAI 2,73,70
JPFCD2 17,205,82
AIHAAP 23,95,62
ATSUDG 2,371,79
PCOC** -,230,66
TXAPA9 45,861,78
JPETAB 123,224,58
QJPPAL 7,205,34
PCOC** -,230,66
TXAPA9 10,119,67
QJPPAL 7,205,34
AHBAAM 116,131,36
AEXPBL 97,86,23
PCOC** -,230,66
QJPPAL 7,205,34
GISAAA 48(3),10,83
FLCRAP 1,197,67
AEXPBL 97,86,23
AEPPAE 138,65,28

IARC Cancer Review: Animal Limited Evidence IMEMDT 1,61,72; Human Limited Evidence IMEMDT 20,401,79; Animal Sufficient Evidence IMEMDT 20,401,79; NCI Carcinogenesis Bioassay (gavage); Clear Evidence: mouse, rat NCITR* NCI-CG-TR,1976. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program. EPA Extremely Hazardous Substances List. Community Right To Know List.

OSHA PEL: CL 50 ppm
ACGIH TLV: TWA 10 ppm; Suspected Carcinogen
DFG MAK: 10 ppm (50 mg/m³)
NIOSH REL: (Waste Anesthetic Gases and Vapors) CL 2 ppm/1H; (Chloroform) CL 2 ppm/60M

THR: Moderately toxic by intraperitoneal and intravenous routes. When heated to decomposition it emits toxic fumes of Cl^-.

TIP500 *HR: 3*

TRICHLOROFLUOROMETHANE

CAS: 75-69-4 NIOSH: PB 6125000

mf: CCl_3F mw: 137.36

PROP: Colorless liquid. Mp: −111°, bp: 24.1°, d: 1.484 @ 17.2°.

SYNS:

ALGOFRENE TYPE 1
ARCTON 9
ELECTRO-CF 11
ESKIMON 11
FLUOROCARBON NO. 11
FLUOROTRICHLOROMETHANE
FLUOROTROJCHLOROMETAN (POLISH)
FREON 11
FREON MF
FRIGEN 11
GENETRON 11
HALOCARBON 11
ISCEON 131
ISOTRON 11
LEDON 11
MONOFLUOROTRICHLORO-METHANE
NCI-C04637
RCRA WASTE NUMBER U121
TRICHLOROMONOFLUORO-METHANE
UCON REFRIGERANT 11

TOXICITY DATA:

ihl-hmn TDLo: 50000 ppm/30M: EYE,PUL,LIV
ihl-rat LCLo: 10 pph/20M
ihl-mus LC50: 10 pph/30M
ipr-mus LD50: 1743 mg/kg
ihl-rbt LC50: 25 pph/30M
ihl-gpg LC50: 25 pph/30M

CODEN:

EJTXAZ 9,385,76

AIHOAX 2,335,50
EJTXAZ 9,385,76
TOIZAG 18,363,71
JETOAS 9,385,76
JETOAS 9,385,76

NCI Carcinogenesis Bioassay (gavage); No Evidence: mouse NCITR* NCI-CG-TR-106,78; (gavage); Inadequate Studies: rat NCITR* NCI-CG-TR-106,78. Reported in EPA TSCA Inventory.

OSHA PEL: TWA 1000 ppm
ACGIH TLV: CL 1000 ppm

THR: Poison by inhalation. Moderately toxic by intraperitoneal route. Human systemic effects by inhalation: conjunctiva irritation, fibrosing alveolitis and liver changes. High concentrations cause narcosis and anesthesia. Reacts violently with aluminum; barium; or lithium. When heated to decomposition it emits highly toxic fumes of F^- and Cl^-. Used as an aerosol propellant, refrigerant, an blowing agent for polymeric foams. See also CHLORINATED HYDROCARBONS, ALIPHATIC and FLUORIDES.

TIP750 *HR: 3*

4',4",5-TRICHLORO-2-HYDROXY-3-BIPHENYL-CARBOXANILIDE

CAS: 4019-40-3 NIOSH: DV 1800000

mf: $C_{19}H_{12}Cl_3NO_2$ mw: 392.67

SYNS:

3-(4-CHLOROPHENYL)-4',5-DI-CHLOROSALICYLANILIDE
CP 43858
4',5-DICHLORO-N-(4-CHLOROPHE-NYL)-2-HYDROXY-(1,1'-BIPHE-NYL)-3-CARBOXAMIDE
ENT 27,139
MONSANTO CP-43858
OM-1463

TOXICITY DATA:

orl-rat LD50: 2810 mg/kg
ipr-mus LD50: 73 mg/kg

CODEN:

ARSIM* 20,16,66
BCPCA6 18,1389,69

THR: Poison by intraperitoneal route. Moderately toxic by ingestion. When heated to decomposition it emits very toxic fumes of Cl^- and NO_x.

TIQ000 *HR: 3*

2,4,4'-TRICHLORO-2'-HYDROXYDIPHENYL ETHER

CAS: 3380-34-5 NIOSH: KO 1100000

mf: $C_{12}H_7Cl_3O_2$ mw: 289.54

SYNS:

CH 3565
5-CHLORO-2-(2,4-DICHLOROPHE-NOXY)PHENOL
2'-HYDROXY-2,4,4'-TRICHLORO-PHENYLETHER
IRGASAN
IRGASAN DP300
TCC
TRICLOSAN

TOXICITY DATA:

skn-hmn 750 µg/3D-I MLD
dnr-bcs 5 mg/disc
orl-rat LD50: 3700 mg/kg
skn-rat LD50: 9300 mg/kg
scu-rat LD50: 14700 mg/kg
ivn-rat LD50: 19 mg/kg
orl-mus LD50: 4530 mg/kg
ipr-mus LD50: 184 mg/kg

CODEN:

85DKA8 -,127,77
JOSCDQ 15,243,81
26UZAB 6,245,68/70
26UZAB 6,245,68/70
26UZAB 6,245,68/70
TXAPA9 42,1,77
26UZAB 6,245,68/70
JTEHD6 10,699,82

Chlorophenol compounds are on the Community Right To Know List. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

THR: Poison by intravenous and intraperitoneal routes. Moderately toxic by ingestion. Mildly toxic by skin contact. Mutagenic data. A human skin irritant. When heated to decomposition it emits toxic fumes of Cl^-. See also ETHERS and CHLOROPHENOLS.

TIQ250 *HR: 3*

((2,2,2-TRICHLORO-1-HYDROXYETHYL) DIMETHYLPHOSPHONATE)

CAS: 52-68-6 NIOSH: TA 0700000

mf: $C_4H_8Cl_3O_4P$ mw: 257.44

SYNS:

AEROL 1 (PESTICIDE)
AGROFOROTOX
ANTHON
BAY 15922
BAYER 15922
BAYER L 13/59
BILARCIL
BOVINOX
BRITON
BRITTEN
CEKUFON
CHLORAK
CHLORFOS
CHLOROFOS

TOXICITY DATA:

oms-bcs 10 mmol/L
unr-man TDLo:117 mg/kg/2.5Y: EYE
orl-rat LD50:34 mg/kg
ipr-rat LD50:40 mg/kg
scu-rat LD50:45 mg/kg
ivn-rat LD50:44 mg/kg
orl-mus LD50:150 mg/kg
ipr-mus LD50:48 mg/kg
scu-mus LD50:95 mg/kg
ivn-mus LD50:12 mg/kg
scu-cat LDLo:30 mg/kg
ivn-cat LDLo:30 mg/kg

CODEN:

MUREAV 5,343,68
BMJOAE 1,331,63
27ZQAG -,353,72
27ZQAG -,353,72
27ZQAG -,353,72
27ZQAG -,353,72
JJPAAZ 13,186,63
JJPAAZ 13,186,63
ANYAA9 80,568,59
ARZNAD 12,352,62
JPETAB 128,7,60
JPETAB 128,7,60

THR: Poison by ingestion, intraperitoneal, subcutaneous, and intravenous routes. Human systemic effects by an unspecified route: visual field effects. Mutagenic data. When heated to decomposition it emits toxic fumes of NO_x.

PDN250 *HR: 3*

PHENIPRAZINE HYDROCHLORIDE

CAS: 66-05-7 NIOSH: MV 7400000
mf: $C_9H_{14}N_2 \cdot ClH$ mw: 186.71

SYNS:

CATRON HYDROCHLORIDE
CATRONIACID
JB 516
(1-METHYL-2-PHENYLETHYL)-HYDRAZINEIUM CHLORIDE
PHENYLISOPROPYLHYDRAZINE HYDROCHLORIDE

TOXICITY DATA:

orl-mus LD50:59 mg/kg
ipr-mus LD50:112 mg/kg
scu-mus LD50:87 mg/kg
ivn-mus LD50:66 mg/kg

CODEN:

IJNEAQ 5,125,66
JMCMAR 18,20,75
IJNEAQ 5,125,66
IJNEAQ 5,125,66

THR: Poison by ingestion, intraperitoneal, subcutaneous and intravenous routes. When heated to decomposition it emits very toxic fumes of Cl^-, NO_x and HCl.

PDN500 *HR: 3*

PHENODIANISYL HYDROCHLORIDE

CAS: 537-05-3 NIOSH: MF 2000000
mf: $C_{23}H_{25}N_3O_3 \cdot ClH$ mw: 427.97

PROP: Crystals, odorless. Mp: 176°. Very sol in alc; insol in water, oils.

SYNS:

ACOINE
AKOIN HYDROCHLORID (GERMAN)
N,N'-BIS(4-METHOXYPHENYL) N''-(4-ETHOXYPHENYL)GUANIDINE HYDROCHLORIDE
α,γ-DI-p-ANISYL-β-(ETHOXYPHENYL)GUANIDINE HYDROCHLORIDE
DIANISYL-MONOPHENETHYL-GUANIDINE HYDROCHLORIDE
DIPARAANISYL-MONOPHENETHYL-GUANIDIN-HYDROCHLORID (GERMAN)
2-(4-ETHOXYPHENYL)-1,3-BIS(4-METHOXYPHENYL)GUANIDINE HYDROCHLORIDE
GUANICAINE
PHENODIANISYL

TOXICITY DATA:

scu-mus LDLo:300 mg/kg
ivn-mus LDLo:53 mg/kg
orl-dog LDLo:75 mg/kg
scu-rbt LD50:150 mg/kg
scu-gpg LDLo:150 mg/kg

CODEN:

HDTU** -,-,33
WDMU** -,-,36
HBAMAK 4,1291,35
12VXA5 9,940,76
HBAMAK 4,1291,35

THR: Poison by ingestion, intravenous, and subcutaneous routes. Solutions are decomposed by light. When heated to decomposition it emits very toxic fumes of HCl and NO_x.

PDN750 *HR: 3*

PHENOL

CAS: 108-95-2 NIOSH: SJ 3325000
DOT: 1671/2312/2821
mf: C_6H_6O mw: 94.12

PROP: White, crystalline mass which turns pink or red if not perfectly pure; burning taste, distinctive odor. Mp: 40.6°, bp: 181.9°, flash p: 175°F (CC), d: 1.072, autoign temp: 1319°F, vap press: 1 mm @ 40.1°, vap d: 3.24. Sol in water; misc in alc, ether.

SYNS:

ACIDE CARBOLIQUE (FRENCH)
BAKER'S P AND S LIQUID AND OINTMENT
BENZENOL
CARBOLIC ACID
CARBOLSAURE (GERMAN)
FENOL (DUTCH, POLISH)
FENOLO (ITALIAN)
HYDROXYBENZENE
MONOHYDROXYBENZENE
MONOPHENOL
NCI-C50124
OXYBENZENE
PHENIC ACID
PHENOL ALCOHOL
PHENOL, MOLTEN (DOT)
PHENOLE (GERMAN)
PHENYL HYDRATE
PHENYL HYDROXIDE
PHENYLIC ACID
PHENYLIC ALCOHOL
RCRA WASTE NUMBER U188

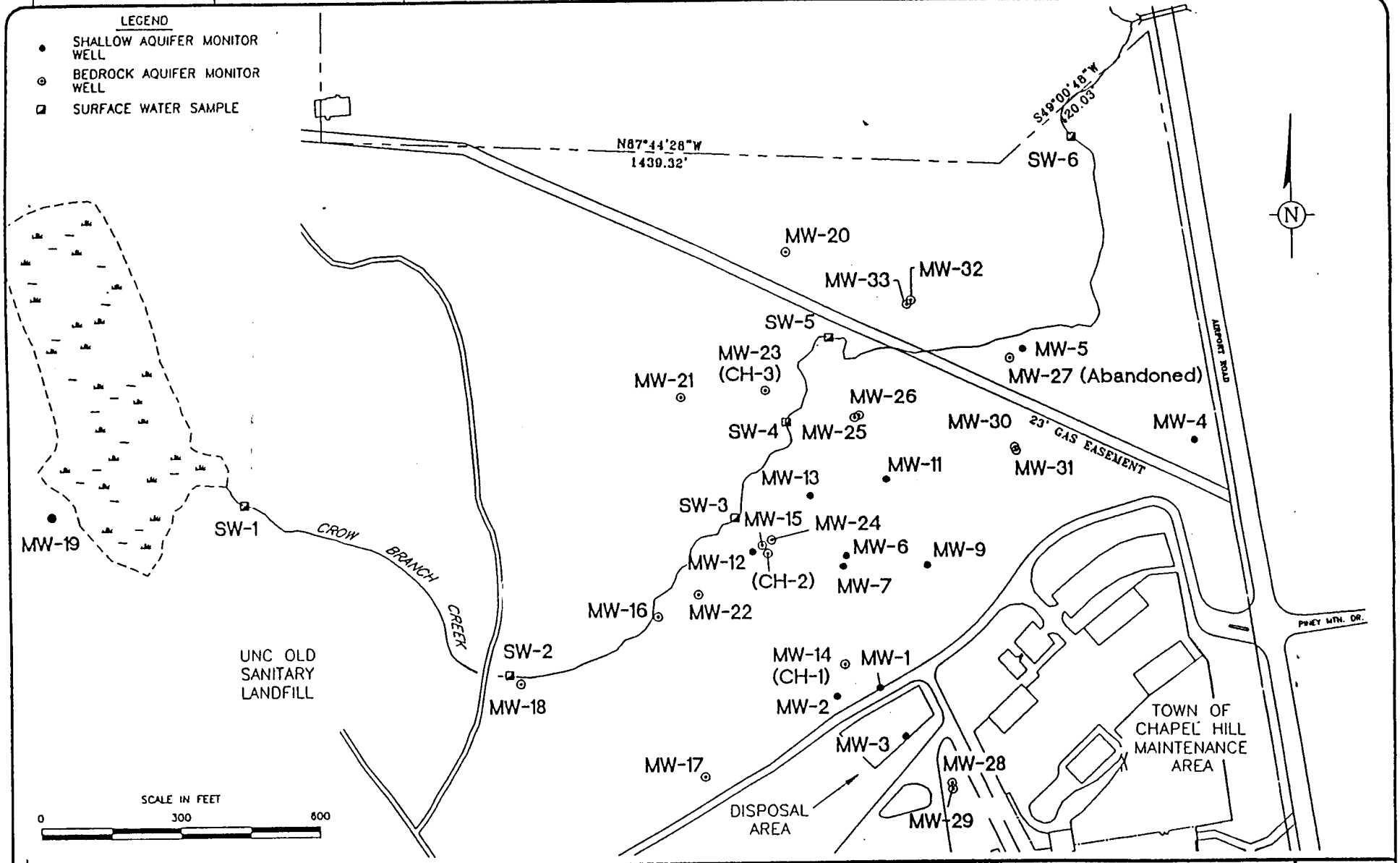
TOXICITY DATA:

skn-rbt 500 mg/24H SEV
skn-rbt 535 mg open SEV
eye-rbt 5 mg SEV
oms-hmn:hla 17 mg/L
oms-hmn:lym 5 µmol/L
sce-hmn:lym 5 µmol/L
dns-rat-orl 4 g/kg
oms-rbt:bmr 250 µmol/L
dnd-mam:lym 250 mmol/L
skn-mus TDLo:16 g/kg/40W-I: CAR
skn-mus TD :4000 mg/kg/24W-I:NEO
orl-hmn LDLo:140 mg/kg
skn-rat LD50:669 mg/kg
scu-rat LDLo:650 mg/kg
scu-mus LD50:344 mg/kg
ivn-mus LD50:112 mg/kg
orl-dog LDLo:500 mg/kg
par-dog LDLo:2000 mg/kg
orl-cat LDLo:80 mg/kg
scu-cat LDLo:80 mg/kg
par-cat LDLo:500 mg/kg
orl-rbt LDLo:420 mg/kg
skn-rbt LD50:850 mg/kg
ipr-rbt LDLo:620 mg/kg
scu-rbt LDLo:620 mg/kg
ivn-rbt LDLo:180 mg/kg
par-rbt LDLo:300 mg/kg

CODEN:

BIOFX* 27-4/73
UCDS** 1/6/66
UCDS** 1/6/66
WATRAG 19,577,85
CNREA8 45,2471,85
CNREA8 45,2471,85
JJIND8 74,1283
AJIMD8 7,485,85
PNASA6 48,686,62
CNREA8 19,413,59
CNREA8 19,413,59
29ZWAE -,329,68
BJIMAG 27,155,70
HBAMAK 4,1319,35
INHEAO 5,143,67
QJPPAL 12,212,39
HBAMAK 4,1319,35
RMSRA6 15,561,1895
HBAMAK 4,1319,35
JPETAB 80,233,44
RMSRA6 15,561,1895
JPETAB 80,233,44
AIHAAP 37(10),596,76
JPETAB 80,233,44
JPETAB 80,233,44
JPETAB 80,233,44
RMSRA6 15,561,1895

DWG DATE: 27JAN97	PRJCT NO.: NC0239.004	FILE NO.: UNC-CHAP	DRAWING: HW-LOC2	CHECKED: N. SHETTY	APPROVED: J. SHILLIDAY	DRAFTER: A. WARREN



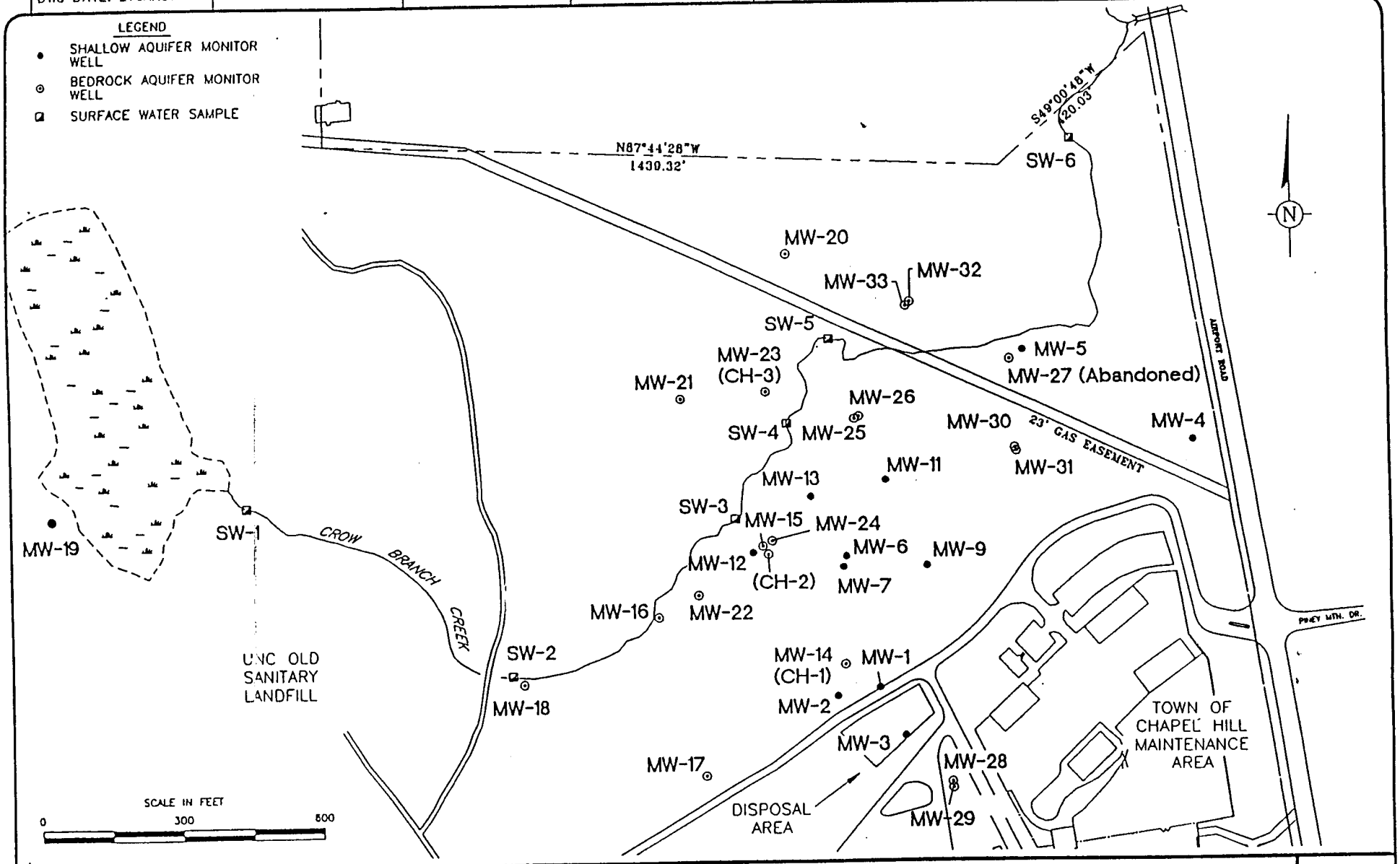
GERAGHTY & MILLER, INC.
Environmental Services

SITE LAYOUT

THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
AIRPORT ROAD WASTE DISPOSAL AREA
CHAPEL HILL, NORTH CAROLINA

FIGURE
2

DWG DATE: 27JAN97	PRJCT NO.: NC0239.004	FILE NO.: UNC-CHAP	DRAWING: MW-LOC2	CHECKED: N. SHETTY	APPROVED: J. SHILLIDAY	DRAFTER: A. WARREN



GERAGHTY & MILLER, INC.
Environmental Services

SITE LAYOUT

THE UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
AIRPORT ROAD WASTE DISPOSAL AREA
CHAPEL HILL, NORTH CAROLINA

FIGURE
2

ipr-gpg LDLo:300 mg/kg	HBTXAC 1,228,56
scu-gpg LDLo:450 mg/kg	HBTXAC 1,228,56
scu-frg LDLo:75 mg/kg	HBAMAK 4,1319,35
par-frg LDLo:290 mg/kg	AEPPAE 166,437,32
scu-frg LDLo:290 mg/kg	HBTXAC 1,228,56

NCI Carcinogenesis Bioassay (oral); No Evidence: mouse, rat NCITR* NCI-CG-TR-203,80. EPA Extremely Hazardous Substances List. Community Right To Know List. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

OSHA PEL: TWA 5 ppm (skin)
ACGIH TLV: TWA 5 ppm (skin)
DFG MAK: 5 ppm (19 mg/m^3)
NIOSH REL: TWA 20 mg/m^3; CL 60 mg/m^3/15M

DOT Classification: Poison B, Label: Poison

THR: Human poison by ingestion. An experimental poison by ingestion, subcutaneous, intravenous, parenteral, and intraperitoneal routes. Moderately toxic by skin contact. A severe eye and skin irritant. An experimental carcinogen and neoplastigen. Human mutagenic data. Absorption of phenolic solutions through the skin may be very rapid, and can cause death within 30 minutes to several hours by exposure of as little as 64 square inches of skin. Lesser exposures can cause damage to the kidneys, liver, pancreas and spleen, and edema of the lungs. Ingestion can cause corrosion of the lips, mouth, throat, esophagus and stomach, and gangrene. Ingestion of 15 grams has killed. Chronic exposures can cause death from liver and kidney damage. Dermatitis resulting from contact with phenol or phenol-containing products is fairly common in industry. A common air contaminant.

Combustible when exposed to heat, flame, or oxidizers. Potentially explosive reaction with aluminum chloride + nitromethane (at 110°C/100 bar); formaldehyde; peroxydisulfuric acid; peroxymonosulfuric acid; sodium nitrite + heat. Violent reaction with aluminum chloride + nitrobenzene (at 120°C); sodium nitrate + trifluoroacetic acid; butadiene. Dangerous; when heated it emits toxic fumes; can react with oxidizing materials. To fight fire, use alcohol foam, CO_2, dry chemical. For further information, see Vol. 3, No. 4 in *DPIM Report*.

PDO000 ***HR: 3***
PHENOL (liquid)
CAS: 108-95-2 NIOSH: SJ 3330000
mf: C_6H_5•OH mw: 94.11

PROP: A liquid tar acid containing over 50% benzophenol (FEREAC 41,15972,76).

SYN: CARBOLIC ACID, LIQUID (DOT)

EPA Extremely Hazardous Substances List. Community Right To Know List. Reported in EPA TSCA Inventory.

NIOSH REL: TWA 20 mg/m^3; CL 60 mg/m^3/15M

DOT Classification: Poison B, Label: Poison

THR: Poison by ingestion, inhalation and skin contact. See also PHENOL.

PDO250 ***HR: 3***
PHENOL-p-ARSONIC ACID
CAS: 98-14-6 NIOSH: CY 5075000
mf: $C_6H_7AsO_4$ mw: 218.05

PROP: White powder. Mp: 175-180° decomp. Very sol in water; sol in alc.

SYNS:
p-HYDROXYBENZENEARSONIC ACID
p-HYDROXYPHENYLARSONIC ACID
OXARSANILIC ACID

TOXICITY DATA:	CODEN:
orl-rat LDLo:450 mg/kg	JPETAB 63,122,38
ivn-rat LDLo:100 mg/kg	JPETAB 63,122,38
ims-rat LDLo:90 mg/kg	JPETAB 63,122,38
ivn-mus LD50:56 mg/kg	CSLNX* NX#04548

Arsenic and its compounds are on the Community Right To Know List.

OSHA PEL: TWA 0.5 mg(As)/m^3

THR: Poison by intravenous and intramuscular routes. Moderately toxic by ingestion. When heated to decomposition it emits toxic fumes of As. See also ARSENIC COMPOUNDS.

PDO750 ***HR: 2***
PHENOLPHTHALEIN
CAS: 77-09-8 NIOSH: SM 8380000
mf: $C_{20}H_{14}O_4$ mw: 318.34

PROP: Small crystals. Mp: 258-262°, d: 1.299. Insol in water; very sol in chloroform.

SYNS:
3,3-BIS(p-HYDROXYPHENOL) PHTHALIDE
NCI-C55798

TOXICITY DATA:	CODEN:
ipr-rat LDLo:500 mg/kg	NCNSA6 5,30,53

Reported in EPA TSCA Inventory.

THR: Moderately toxic by intraperitoneal route. Used in medicine as a laxative; in chemistry as an indicator. When heated to decomposition it emits acrid smoke and irritating fumes.

PDP100 ***HR: 2***
PHENOSMOLIN
CAS: 63496-48-0 NIOSH: SN 4940000

MAP000 *HR: 3*

MANDELIC ACID

CAS: 90-64-2 NIOSH: OO 6300000

mf: $C_8H_8O_3$ mw: 152.16

PROP: Large, white crystals or powder; faint odor. Bp: decomp. D: 1.30, mp: 117-119°. Sol in water, alc and ether. Darkens and decomposes on prolonged exposure to light.

SYNS:

AMYGDALIC ACID
AMYGDALINIC ACID
α-HYDROXYPHENYLACETIC ACID
α-HYDROXY-α-TOLUIC ACID
PARAMANDELIC ACID
PHENYLGLYCOLIC ACID
PHENYLHYDROXYACETIC ACID
racemic MANDELIC ACID

TOXICITY DATA:	CODEN:
orl-rat LDLo:3000 mg/kg	AIPTAK 64,79,40
ims-rat LD50:300 mg/kg	EMSUA8 4,223,46
orl-rbt LDLo:2000 mg/kg	AIPTAK 64,79,40

Reported in EPA TSCA Inventory.

THR: Poison by intramuscular route. Moderately toxic by ingestion. Continued absorption can cause kidney irritation. When heated to decomposition it emits acrid smoke and irritating fumes.

MAP250 *HR: 3*

MANDELIC ACID NITRILE

CAS: 532-28-5 NIOSH: OO 8400000

mf: C_8H_7NO mw: 133.16

PROP: Yellow, viscous liquid. Mp: −10°, bp: 170° decomp, d: 1.124.

SYNS:

AMYGDALONITRILE
BENZALDEHYDE CYANOHYDRIN
BENZALDEHYDKYANHYDRIN (CZECH)
HYDROXYPHENYLACETONITRILE
NITRIL KYSELINY MANDLOVE (CZECH)
PHENYLGLYCOLONITRILE

TOXICITY DATA:	CODEN:
eye-rbt 250 µg/24H SEV	28ZPAK -,161,72
mmo-sat 225 nmol/plate	SCIEAS 198,625,77
mma-sat 225 nmol/plate	SCIEAS 198,625,77
orl-rat LD50:116 mg/kg	28ZPAK -,161,72
scu-mus LDLo:23 mg/kg	AIPTAK 12,447,04
ivn-mus LD50:5600 µg/kg	CSLNX* NX#07767
scu-rbt LDLo:6 mg/kg	AIPTAK 5,161,1899
scu-frg LDLo:600 µg/kg	AIPTAK 5,161,1899

Cyanide and its compounds are on the Community Right To Know List. Reported in EPA TSCA Inventory.

THR: Poison by ingestion, intravenous, and subcutaneous routes. Mutagenic data. A severe eye irritant. When heated to decomposition it emits toxic fumes of NO_x and CN^-. See also NITRILES.

MAP600 *HR: 2*

MANETOL

NIOSH: OO 9133300

PROP: Extracted from animal spinal marrow and has blood coagulation properties (KSRNAM 8,7,74).

TOXICITY DATA:	CODEN:
ims-rat TDLo:3745 mg/kg (35D male):REP	KSRNAM 8,7,74
ims-rat TDLo:11235 mg/kg (35D pre):REP	KSRNAM 8,7,74
ipr-rat LD50:3082 mg/kg	KSRNAM 8,7,74
ivn-rat LD50:788 mg/kg	KSRNAM 8,7,74
ipr-mus LD50:3840 mg/kg	KSRNAM 8,7,74
ivn-mus LD50:628 mg/kg	KSRNAM 8,7,74

THR: Moderately toxic by intraperitoneal and intravenous routes. Experimental reproductive effects. When heated to decomposition it emits acrid smoke and irritating fumes.

MAP750 *HR: 3*

MANGANESE

CAS: 7439-96-5 NIOSH: OO 9275000

af: Mn aw: 54.94

PROP: Reddish-grey or silvery, brittle, metallic element. Mp: 1260°, bp: 1900°, d: 7.20, vap press: 1 mm @ 1292°.

SYNS:

COLLOIDAL MANGANESE
MAGNACAT
MANGAN (POLISH)
MANGAN NITRIDOVANY (CZECH)
TRONAMANG

TOXICITY DATA:	CODEN:
skn-rbt 500 mg/24H MLD	28ZPAK -,21,72
eye-rbt 500 mg/24H MLD	28ZPAK -,21,72
mrc-smc 8 mmol/L/18H	MUREAV 42,343,77
ims-rat TDLo:400 mg/kg/1Y-I: ETA	NCIUS* PH 43-64-886,SEPT,71
ihl-man TCLo:2300 µg/m³: BRN,CNS	AIHAAP 27,454,66

Manganese and its compounds are on the Community Right To Know List. Reported in EPA TSCA Inventory.

OSHA PEL: CL 5 mg/m³
ACGIH TLV: TWA 5 mg/m³ (dust)
DFG MAK: 5 mg/m³

THR: An experimental tumorigen. Human systemic effects by inhalation: degenerative brain changes, change in motor activity, muscle weakness. A skin and eye irritant. Mutagenic data. Flammable and moderately explosive in the form of dust or powder when exposed to flame. The dust may be pyrophoric in air and may explode when heated in carbon dioxide. Mixtures of aluminum dust and manganese dust may explode in air. Mixtures with ammonium nitrate may explode when heated. The powdered metal ignites on contact with fluorine; chlorine + heat; hydrogen peroxide; bromine pentafluoride; sulfur dioxide + heat. Violent reaction with NO_2 and oxidants. Incandescent reaction with phosphorus; nitryl fluoride; nitric acid. Will react with water or steam to produce hydrogen; can react with oxidizing materials. To fight fire, use special dry chemical.

See also MANGANESE COMPOUNDS. For further information, see Vol. 1, No. 2 of *DPIM Report*.

MAQ000 *HR: 2*

MANGANESE ACETATE

CAS: 638-38-0 NIOSH: AI 5770000

mf: $C_4H_6O_4 \cdot Mn$ mw: 173.04

PROP: Pale red crystals, very sol in water and alc.

SYNS:

ACETIC ACID MANGANESE(II) SALT (2:1)
DIACETYLMANGANESE
MANGANESE(2+) ACETATE
MANGANESE(II) ACETATE
MANGANESE DIACETATE
MANGANOUS ACETATE
OCTAN MANGANATY (CZECH)

TOXICITY DATA:	CODEN:
dnr-bcs 50 mmol/L	MUREAV 31,185,75
orl-rat LD50:2940 mg/kg	MarJV# 29MAR77

Manganese and its compounds are on the Community Right To Know List. Reported in EPA TSCA Inventory.

ACGIH TLV: 5 mg(Mn)/m^3

THR: Moderately toxic by ingestion. Mutagenic data. Used in food packaging. When heated to decomposition it emits acrid smoke and irritating fumes. See also MANGANESE COMPOUNDS.

MAQ250 *HR: 2*

MANGANESE ACETATE TETRAHYDRATE

CAS: 6156-78-1 NIOSH: AI 5775000

mf: $C_4H_6O_4 \cdot Mn \cdot 4H_2O$ mw: 245.12

PROP: Pale red, transparent, monoclinic crystals. D: 1.59. Sol in water.

SYNS:

MANGANESE(II) ACETATE TETRAHYDRATE
MANGANESE DIACETATE TETRAHYDRATE
MANGANOUS ACETATE TETRAHYDRATE

TOXICITY DATA:	CODEN:
orl-rat LD50:3730 mg/kg	AIHAAP 30,470,69

Manganese and its compounds are on the Community Right To Know List.

ACGIH TLV: 5 mg(Mn)/m^3

THR: Moderately toxic by ingestion. When heated to decomposition it emits acrid smoke and irritating fumes. See also MANGANESE COMPOUNDS.

MAQ500 *HR: 3*

MANGANESE ACETYLACETONATE

CAS: 14024-58-9 NIOSH: OO 9350000

mf: $C_{10}H_{14}O_4Mn$ mw: 253.18

SYN: MANGANOUS ACETYLACETONATE

TOXICITY DATA:	CODEN:
ims-rat TDLo:1200 mg/kg/26W-I:NEO	JNCIAM 60,1171,78
ims-rat TD :1350 mg/kg/21W-I:ETA	NCIUS* PH 43-64-886,SEPT,71

Manganese and its compounds are on the Community Right To Know List. Reported in EPA TSCA Inventory.

ACGIH TLV: 5 mg(Mn)/m^3

THR: An experimental neoplastigen and tumorigen. When heated to decomposition it emits acrid smoke and irritating fumes. See also MANGANESE COMPOUNDS.

MAQ780 *HR: 3*

MANGANESE(II) BIS(ACETYLIDE)

mf: C_4H_2Mn mw: 105.00

$$Mn(C{\equiv}CH)_2$$

Manganese and its compounds are on the Community Right To Know List.

THR: Highly explosive. When heated to decomposition it emits acrid smoke and irritating fumes. See also MANGANESE COMPOUNDS and ACETYLIDES.

MAR000 *HR: 3*

MANGANESE(II) CHLORIDE (1:2)

CAS: 7773-01-5 NIOSH: OO 9625000

mf: Cl_2Mn mw: 125.84

PROP: Cubic, deliquescent, pink crystals. Mp: 650°, bp: 1190°, d: 2.977 @ 25°.

SYNS:

MANGANESE DICHLORIDE
MANGANOUS CHLORIDE

TOXICITY DATA:	CODEN:
mmo-esc 5 µmol/L	MUREAV 126,9,84
pic-esc 1600 µmol/L	ENMUDM 6,59,84
sln-rat-orl 10640 µg/kg/30W-C	GISAAA 49(11),80,84
dlt-rat-orl 106 mg/kg/30W-C	GISAAA 49(11),80,84
msc-mus:lym 40 mg/L	JTEHD6 9,367,82
orl-rat TDLo:106 mg/kg (30W pre):REP	GISAAA 49(11),80,84
ipr-pig TDLo:4581 mg/kg (12-16W preg):TER	DABBBA 33,2872,72
ivn-ham TDLo:30 mg/kg (8D preg):REP	ADTEAS 5,51,72
ipr-mus TDLo:2080 mg/kg/26W-I:CAR	FEPRA7 23,393,64
scu-mus TDLo:2080 mg/kg/26W-I:CAR	FEPRA7 23,393,64
orl-mus LD50:1715 mg/kg	TOLEDS 7,221,81
ims-rat LD50:700 mg/kg	RPTOAN 38,221,75
ipr-mus LD50:121 mg/kg	AEPPAE 244,17,62
scu-mus LDLo:210 mg/kg	12VXA5 8,642,68
ims-mus LD50:255 mg/kg	RPTOAN 38,221,75
ivn-dog LD50:202 mg/kg	EQSSDX 1,1,75
par-dog LDLo:56 mg/kg	CRSBAW 102,262,29
unr-dog LDLo:600 µg/kg	CRSBAW 102,262,29
unr-cat LDLo:4 mg/kg	CRSBAW 102,262,29

scu-rbt LDLo: 180 mg/kg	EQSSDX 1.1.75
ivn-rbt LDLo: 65 mg/kg	EQSSDX 1.1.75
par-rbt LDLo: 18 mg/kg	CRSBAW 102,262,29
unr-rbt LDLo: 6500 µg/kg	CRSBAW 102,262,29
scu-gpg LDLo: 180 mg/kg	EQSSDX 1.1.75
unr-gpg LDLo: 60 mg/kg	EQSSDX 1.1.75

Manganese and its compounds are on the Community Right To Know List. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

ACGIH TLV: 5 mg(Mn)/m^3

THR: Poison by intraperitoneal, subcutaneous, intramuscular, intravenous, parenteral and possibly other routes. Moderately toxic by ingestion. Mutagenic data. An experimental carcinogen and teratogen. Experimental reproductive effects. Explosive reaction when heated with zinc foil. Reacts violently with potassium or sodium. When heated to decomposition it emits toxic fumes of Cl^-. See also MANGANESE COMPOUNDS and CHLORIDES.

MAR250 ***HR: 3***

MANGANESE(II) CHLORIDE TETRAHYDRATE

CAS: 13446-34-9 NIOSH: OO 9650000
mf: $Cl_2Mn \cdot 4H_2O$ mw: 197.92

PROP: Reddish, sltly deliquescent, monoclinic crystals. D: 2.01, mp: 58°, sol in alc, insol in ether. Keep well closed.

SYN: MANGANOUS CHLORIDE TETRAHYDRATE

TOXICITY DATA:	CODEN:
orl-rat TDLo: 141 g/kg (90D pre-21D post): REP	NTOTDY 5,377,83
par-rat TDLo: 239 mg/kg (8-12D preg): REP	JINCAO 41,1507,79
orl-rat LD50: 1484 mg/kg	EVHPAZ 10,95,75
ipr-rat LD50: 138 mg/kg	EVHPAZ 10,95,75
par-rat LD50: 225 mg/kg	JINCAO 41,1507,79
ipr-mus LD50: 190 mg/kg	AEPPAE 244,17,62

Manganese and its compounds are on the Community Right To Know List. EPA Genetic Toxicology Program.

ACGIH TLV: 5 mg(Mn)/m^3

THR: Poison by intraperitoneal and parenteral routes. Moderately toxic by ingestion. Experimental reproductive effects. When heated to decomposition it emits toxic fumes of Cl^-. See also MANGANESE COMPOUNDS.

MAR500 ***HR: 3***

MANGANESE COMPOUNDS

Manganese and its compounds are on the Community Right To Know List.

THR: Can cause central nervous system and pulmonary system damage by inhalation of fumes and dust. Very few poisonings have occured from ingestion. Some are experimental tumorigens. Chronic manganese poisoning is a clearly characterized disease which results from inhalation of fumes or dusts of manganese. Exposure to heavy concentrations of dusts or fumes for as little as three months may produce the condition, but usually cases develop after 1-3 years of exposure. The central nervous system is the chief site of damage. If cases are removed from exposure shortly after appearance of symptoms, some improvement in the patient's condition frequently occurs, though there may be some residual disturbances in gait and speech. When well established, however, the disease results in permanent disability. Exposure to dusts and fumes can possibly increase the incidence of upper respiratory infections and pneumonia. Chronic manganese poisoning usually begins with complaints of languor and sleepiness. This is followed by weakness in the legs and the development of stolid, mask-like faces. The patient speaks with a slow monotonous voice. Then muscular twitchings appear, varying from a fine tremor of the hands to coarse, rhythmical movements of the arms, legs and trunk. Nocturnal cramps of the legs appear about the same time. There is a slight increase in tendon reflexes, ankle and patellar clonus, and a typical Parkinsonian slapping gait. The handwriting may be quite minute. The symptoms may simulate progressive bulbar paralysis, postencephalitic Parkinsonism, multiple sclerosis, amyotrophic lateral sclerosis and progressive lenticular degeneration (Wilson's Disease). Often a history of exposure is the only aid in establishing the diagnosis. Manganese compounds are common air contaminants.

MAR750 ***HR: 3***

MANGANESE DIMETHYL DITHIOCARBAMATE

CAS: 15339-36-3 NIOSH: OO 9290000
mf: $C_3H_7NS_2 \cdot 1/2Mn$ mw: 148.69

SYN: MANGANOUS DIMETHYLDITHIOCARBAMATE

TOXICITY DATA:	CODEN:
ivn-mus LD50: 32 mg/kg	CSLNX* NX#03752

Manganese and its compounds are on the Community Right To Know List.

ACGIH TLV: 5 mg(Mn)/m^3

THR: Poison by intravenous route. A pesticide. When heated to decomposition it emits very toxic fumes of NO_x and SO_x. See also MANGANESE COMPOUNDS and CARBAMATES.

MAS000 ***HR: 3***

MANGANESE DIOXIDE

CAS: 1313-13-9 NIOSH: OP 0350000
DOT: 1479
mf: MnO_2 mw: 86.94

PROP: Tetragonal crystals. Mp: $-O_2$ @ 535°, d: 5.0. Insol in water, nitric or cold sulfuric acid.

TOXICITY DATA:
scu-mus TDLo:200 mg/kg:ETA

CODEN:
CNREA8 1,685,41

THR: An experimental tumorigen. When heated to decomposition it emits toxic fumes of NO_x. See also ESTERS.

HR: 3

EJT500
ETHYL ESTER of 3-METHYLCHOLANTHRENE-endo-α,β-SUCCINOGLYCINE

NIOSH: UX 9675000

mf: $C_{29}H_{23}NO_4$ mw: 449.53

TOXICITY DATA:
scu-mus TDLo:200 mg/kg:ETA

CODEN:
CNREA8 1,685,41

THR: An experimental tumorigen. When heated to decomposition it emits toxic fumes of NO_x. See also ESTERS.

HR: D

EJT600
ETHYLESTRENOL

CAS: 965-90-2

NIOSH: RC 8961100

mf: $C_{20}H_{32}O$ mw: 288.52

PROP: Crystals. Mp: 76-78°.

SYNS:

DURABOLIN-O	NEODURABOLIN
DURABORAL	ORABOLIN
ETHYLNANDROL	ORG-483
MAXIBALIN	ORGABOLIN
MAXIBOLIN	ORGABORAL

TOXICITY DATA:
orl-rat TDLo:20 mg/kg (17-20D preg):REP
scu-rat TDLo:28 mg/kg (14D pre):REP

CODEN:
ECJPAE 24,77,77
CCPTAY 5,489,72

THR: Experimental reproductive effects. When heated to decomposition it emits acrid smoke and irritating fumes.

HR: 3

EJU000
ETHYL ETHER

CAS: 60-29-7

NIOSH: KI 5775000

DOT: 1155

mf: $C_4H_{10}O$ mw: 74.14

$CH_3CH_2OCH_2CH_3$

PROP: A clear, volatile liquid; sweet, pungent odor. Sol in water; misc in alcohol and ether; sol in chloroform. Mp: −116.2°, bp: 34.6°, ulc: 100, lel: 1.85%, uel: 36%, flash p: −49°F, d: 0.7135 @ 20°/4°, autoign temp: 320°F, vap press: 442 mm @ 20°, vap d: 2.56.

SYNS:

AETHER	ETERE ETILICO (ITALIAN)
ANAESTHETIC ETHER	ETHER
ANESTHESIA ETHER	ETHER ETHYLIQUE (FRENCH)
ANESTHETIC ETHER	ETHOXYETHANE
DIAETHYLAETHER (GERMAN)	1,1'-OXYBISETHANE
DIETHYL ETHER (DOT)	OXYDE d'ETHYLE (FRENCH)
DIETHYL OXIDE	RCRA WASTE NUMBER U117
DWUETYLOWY ETER (POLISH)	SOLVENT ETHER

TOXICITY DATA:
eye-hmn 100 ppm
skn-rbt 360 mg open MLD
eye-rbt 100 mg MOD
skn-gpg 50 mg/24H SEV
dnr-esc 50 µL/well/16H
dyt-smc 100 mmol/tube
oms-ham:fbr 1 pph
orl-man LDLo:260 mg/kg
orl-hmn LDLo:420 mg/kg
ihl-hmn TCLo:200 ppm:NOSE
orl-rat LD50:1215 mg/kg
ihl-rat LC50:73000 ppm/2H
ihl-mus LC50:6500 ppm/99M
ipr-mus LD50:2420 mg/kg
scu-mus LDLo:8 mg/kg
ivn-mus LD50:996 mg/kg
ihl-dog LCLo:76000 ppm
ihl-rbt LCLo:106000 ppm
ipr-gpg LDLo:2000 mg/kg
scu-frg LDLo:24 g/kg

CODEN:
JIHTAB 25,282,43
UCDS** 4/5/73
FEPRA7 35,729,76
HIFUAG 22,373,80
CBINA8 15,219,76
HEREAY 33,457,47
ANESAV 43,21,75
85DCAI 2,73,70
32ZWAA 8,275,74
JIHTAB 25,282,43
TXAPA9 19,699,71
TXAPA9 17,275,70
TXAPA9 17,275,70
PWPSA8 27,511,84
HBAMAK 4,1295,35
JPMSAE 67,566,78
HBAMAK 4,1294,35
HBAMAK 4,1294,35
AIHAAP 35,21,74
HBAMAK 4,1295,35

Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

OSHA PEL: TWA 400 ppm
ACGIH TLV: TWA 400 ppm; STEL 500 ppm

DOT Classification: Flammable Liquid, Label: Flammable Liquid

THR: Moderately toxic to humans by ingestion. Poison experimentally by subcutaneous route. Moderately toxic by intraperitoneal and intravenous routes. Mildly toxic by inhalation. Human systemic effects by inhalation: olfactory changes. Mutagenic data. A severe and moderate skin and eye irritant. Ethyl ether is not corrosive or dangerously reactive. It must not be considered safe for individuals to inhale or ingest. It is a depressant of the central nervous system and is capable of producing intoxication, drowsiness, stupor, and unconsciousness. Death due to respiratory failure may result from severe and continued exposure.

A very dangerous fire and explosion hazard when exposed to heat or flame. A storage hazard. It auto-oxidizes to form explosive polymeric 1-oxy-peroxides. Explosive reaction with boron triazide; bromine trifluoride; bromine pentafluoride; perchloric acid; uranyl nitrate + light; wood pulp extracts + heat. Violent reaction or ignition on contact with halogens (e.g.; bromine; chlorine); interhalogens (e.g., iodine heptafluoride); oxidants (e.g., silver perchlorate; nitrosyl perchlorate; nitryl perchlorate; chromyl chloride; fluorine nitrate; permanganic acid; nitric acid; hydrogen peroxide; peroxodisulfuric acid; iodine(VII) oxide; sodium peroxide; ozone; and liquid air); sulfur and sulfur compounds (e.g., sulfur when dried with peroxidized ether; sulfunoyl chloride). Can react vigorously with acetyl peroxide; air; bromoazide; ClF_3; CrO_3; $Cr(OCl)_2$; $LiAlH_2$; $NOClO_4$; O_2; $NClO_2$; (H_2SO_4 + permanganates); K_2O_2; [$(C_2H_5)_3Al$ + air]; [$(CH_3)_3Al$ + air]. To fight fire, use alcohol foam, CO_2, dry chemical. When heated to decom-

position it emits acrid smoke and irritating fumes. See also ETHERS. For further information, see Vol. 4, No. 1 of *DPIM Report*.

EJV000 **HR: 1**

ETHYL ETHER OF PROPYLENE GLYCOL

CAS: 52125-53-8 NIOSH: TZ 0640000

mf: $C_5H_{12}O_2$ mw: 104.17

PROP: Vap d: 3.59.

TOXICITY DATA:	CODEN:
eye-rbt 20 mg	AJOPAA 29,1363,46

Glycol ether compounds are on the Community Right To Know List.

THR: An eye irritant. Combustible when exposed to heat or flame; can react with oxidizers. When heated to decomposition it emits acrid smoke and irritating fumes. See also GLYCOL ETHERS.

EJV500 **HR: 1**

ETHYL-β-ETHOXYPROPIONATE

CAS: 763-69-9 NIOSH: UF 3325000

mf: $C_7H_{14}O_3$ mw: 146.21

PROP: Liquid. Mp: −100°, bp: 170.1°, flash p: 180°F (OC), d: 0.9496 @ 20°/20°, vap d: 5.03.

SYNS:

ETHOXYPROPIONIC ACID, ETHYL ESTER

3-ETHOXYPROPIONIC ACID, ETHYL ESTER

TOXICITY DATA:	CODEN:
skn-rbt 10 mg/24H open MLD	AMIHBC 4,119,51
eye-rbt 500 mg open	AMIHBC 4,119,51
orl-rat LD50:5000 mg/kg	AMIHBC 4,119,51
skn-rbt LD50:10 g/kg	AMIHBC 4,119,51

Reported in EPA TSCA Inventory.

THR: Mildly toxic by ingestion and skin contact. A skin and eye irritant. Flammable when exposed to heat or flame; can react with oxidizing materials. To fight fire, use foam, CO_2, dry chemical. When heated to decomposition it emits acrid smoke and irritating fumes. See also ESTERS.

EJW500 **HR: 3**

ETHYL-N-ETHYL CARBAMATE

CAS: 623-78-9 NIOSH: FA 9100000

mf: $C_5H_{11}NO_2$ mw: 117.17

SYN: ETHYLCARBAMIC ACID, ETHYL ESTER

TOXICITY DATA:	CODEN:
ipr-mus TDLo:6500 mg/kg/13W-I:ETA	JNCIAM 9,35,48
scu-mus LD50:860 mg/kg	AJEBAK 45,507,67

Reported in EPA TSCA Inventory.

THR: Moderately toxic by subcutaneous routes. An experimental tumorigen. When heated to decomposition it emits toxic fumes of NO_x. See also CARBAMATES and ESTERS.

EJZ000 **HR: 3**

1-ETHYL-4-(p-(p-((p-((1-ETHYLPYRIDINIUM-4-YL) AMINO)-2-AMINOPHENYL)CARBAMOYL) CINNAMAMIDO)ANILINO)PYRIDINIUM, DI-BROMIDE

CAS: 102584-01-0 NIOSH: UU 4023400

mf: $C_{36}H_{37}N_7O_2 \cdot Br$ mw: 759.62

TOXICITY DATA:	CODEN:
dnd-mus:lym 1500 nmol/L	JMCMAR 22,134,79
ipr-mus LD10:7500 µg/kg	JMCMAR 22,134,79

THR: Poison by intraperitoneal route. Mutagenic data. When heated to decomposition it emits very toxic fumes of Br^- and NO_x. See also BROMIDES.

EKA000 **HR: 3**

1-ETHYL-4-(p-(p-((1-ETHYLPYRIDINIUM-4-YL) AMINO)BENZAMIDO)ANILINO)QUINOLINIUM DIBROMIDE

CAS: 68772-29-2 NIOSH: VC 3675300

mf: $C_{31}H_{31}N_5O \cdot 2Br$ mw: 649.49

TOXICITY DATA:	CODEN:
dnd-mus:lym 1600 nmol/L	JMCMAR 22,134,79
ipr-mus LD10:10 mg/kg	JMCMAR 22,134,79

THR: Poison by intraperitoneal route. Mutagenic data. When heated to decomposition it emits very toxic fumes of NO_x and Br^-. See also BROMIDES.

EKA500 **HR: 3**

1-ETHYL-4-(p-((p-((1-ETHYLPYRIDINIUM-4-YL) AMINO)PHENYL)CARBAMOYL)ANILINO) QUINOLINIUM, DIBROMIDE

CAS: 68772-10-1 NIOSH: VC 3675400

mf: $C_{31}H_{31}N_5O \cdot 2Br$ mw: 649.49

TOXICITY DATA:	CODEN:
dnd-mus:lym 2 µmol/L	JMCMAR 22,134,79
ipr-mus LD10:15 mg/kg	JMCMAR 22,134,79

THR: Poison by intraperitoneal route. Mutagenic data. When heated to decomposition it emits very toxic fumes of NO_x and Br^-. See also BROMIDES.

EKB000 **HR: 3**

1-ETHYL-4-(p-(p-((p-((1-ETHYLPYRIDINIUM-4-YL)AMINO)PHENYL)CARBAMOYL)CIN-NAMAMIDO)ANILINO)PYRIDINIUM, DI-p-TOLUENE SULFONATE

CAS: 20719-23-7 NIOSH: UU 4023500

mf: $C_{36}H_{36}N_6O_2 \cdot 2C_7H_7O_3S$ mw: 927.18

orl-wmn TDLo:360 mg/kg: PNS,EYE,SKN — NEJMAG 306,125,82
orl-rat LD50:7500 µg/kg — ARSIM* 20,7,66
ihl-rat LD50:9 mg/kg — TXAPA9 45,232,78
skn-rat LD50:50 mg/kg — 28ZEAL 5,149,76
ipr-rat LD50:15 mg/kg — PCBPBS 13,267,80
orl-mus LD50:30 mg/kg — 28ZEAL 5,149,76
ihl-mus LD50:19 mg/kg — TXAPA9 45,232,78
orl-rbt LD50:10 mg/kg — 28ZEAL 5,149,76
skn-rbt LD50:118 mg/kg — GUCHAZ 6,333,73
orl-gpg LD50:30 mg/kg — 28ZEAL 5,149,76
scu-gpg LDLo:10 mg/kg — JEENAI 62(4),934,69
orl-ckn LD50:25 mg/kg — 28ZEAL 5,149,76
orl-brd LD50:8 mg/kg — AECTCV 10,185,81

EPA Extremely Hazardous Substances List.

THR: Poison by ingestion, inhalation, skin contact, subcutaneous, and intraperitoneal routes. Human systemic effects by ingestion: fasciculations, pupillary constriction and sweating. A cholinesterase inhibitor type of insecticide. When heated to decomposition it emits very toxic fumes of NO_x, PO_x and SO_x. See also PARATHION.

DTQ600 **HR: 3**

O,O-DIMETHYLPHOSPHOROCHLORIDOTHIOATE

CAS: 2524-03-0 NIOSH: TD 1830000
DOT: 2922
mf: $C_2H_6ClO_2PS$ mw: 160.56

SYNS:
CHLOROPHOSPHONOTHIOIC ACID-O,O-DIMETHYL ESTER
DIMETHYL CHLOROTHIOPHOSPHATE (DOT)
DIMETHYLCHLORTHIOFOSAT (CZECH)
O,O-DIMETHYLESTER KYSELINY CHLORTHIOFOSFORECNE (CZECH)
DIMETHYL PHOSPHOROCHLORIDOTHIOATE (DOT)
METHYL PCT
PHOSPHOROCHLORIDOTHIOIC ACID-O,O-DIMETHYL ESTER

TOXICITY DATA: — CODEN:
orl-rat LDLo:1000 mg/kg — 34ZIAG -,393,69
ihl-rat LC50:340 mg/m³/4H — 85GMAT -,56,82
orl-mus LD50:1800 mg/kg — 85GMAT -,56,82
ihl-mus LC50:320 mg/m³/2 — 85GMAT -,56,82
skn-rbt LDLo:750 mg/kg — 34ZIAG -,393,69

Reported in EPA TSCA Inventory. EPA Extremely Hazardous Substances List.

DOT Classification: Corrosive Material; Label: Corrosive

THR: Poison by inhalation. Moderately toxic by ingestion and skin contact. Corrosive. When heated to decomposition it emits very toxic fumes of Cl^-, PO_x and SO_x.

DTQ800 **HR: 3**

O,O-DIMETHYL PHOSPHOROTHIOATE-O-ESTER WITH 4-HYDROXY-m-ANISONITRILE

CAS: 3581-11-1 NIOSH: TF 7180000
mf: $C_{10}H_{12}NO_4PS$ mw: 273.26

SYNS:
B 11163
O-(4-CYANO-2-METHOXYPHENYL)-O,O-DIMETHYL PHOSPHOROTHIOATE
ENT 27,230
PHOSPHOROTHIOIC ACID-O,O-DIMETHYL-O-(4-CYANO-2-METHOXYPHENYL) ESTER
PHOSPHOROTHIOIC ACID-O,O-DIMETHYL ESTER-O-ESTER with VANNILLONITRILE
STAUFFER B-11163
TP540

TOXICITY DATA: — CODEN:
orl-rat LD50:2710 mg/kg — ARSIM* 20,21,66
orl-mus LD50:4200 mg/kg — TDKNAF 24,221,65
scu-gpg LDLo:100 mg/kg — JEENAI 61,1261,68

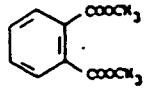
Cyanide and its compounds are on the Community Right To Know List.

THR: Poison by subcutaneous route. Moderately toxic by ingestion. When heated to decomposition it emits very toxic fumes of NO_x, PO_x, CN^- and SO_x. See also ESTERS and NITRILES.

DTR200 **HR: 2**

DIMETHYL PHTHALATE

CAS: 131-11-3 NIOSH: TI 1575000
mf: $C_{10}H_{10}O_4$ mw: 194.20



PROP: Colorless, odorless liquid. Bp: 283.7°, flash p: 295°F (CC), d: 1.189 @ 25°/25°, autoign temp: 1032°F, vap d: 6.69, vap press: 1 mm @ 100.3°.

SYNS:
AVOLIN
1,2-BENZENEDICARBOXYLIC ACID DIMETHYL ESTER
DIMETHYL-1,2-BENZENEDICARBOXYLATE
DIMETHYL BENZENEORTHODICARBOXYLATE
DMP
ENT 262
FERMINE
METHYL PHTHALATE
MIPAX
NTM
PALATINOL M
PHTHALIC ACID METHYL ESTER
PHTHALSAEUREDIMETHYLESTER (GERMAN)
RCRA WASTE NUMBER U102
SOLVANOM
SOLVARONE

TOXICITY DATA: — CODEN:
eye-rbt 119 mg — JPETAB 82,377,44
mmo-sat 200 µg/plate — JTEHD6 16,61,85
cyt-rat-skn 25 g/kg/4W-I — FATOAO 40,454,77
ipr-rat TDLo:338 mg/kg (5-15D preg):TER — JPMSAE 61,51,72
ipr-rat TDLo:1125 mg/kg (5-15D preg):TER — JPMSAE 61,51,72
orl-rat LD50:6800 mg/kg — GTPZAB 24(3),25,80
ipr-rat LD50:3375 mg/kg — JPMSAE 61,51,72
orl-mus LD50:6800 mg/kg — GTPZAB 24(3),25,80
ipr-mus LD50:1580 mg/kg — 34ZIAG -,691,69
scu-mus LDLo:6500 mg/kg — EDWU** -,-,37
ihl-cat LCLo:9630 mg/m³/6H — EDWU** -,-,37
orl-rbt LD50:4400 mg/kg — JPETAB 93,26,48
orl-gpg LD50:2400 mg/kg — JPETAB 93,26,48
orl-ckn LD50:8500 mg/kg — JPETAB 93,26,48

THR: Flammable when heated. When heated to decomposition it emits toxic fumes of SO_x. See also IRON COMPOUNDS and SULFIDES.

IHO000 *HR: 3*

ISOACETOPHORONE

CAS: 78-59-1 NIOSH: GW 7700000
mf: $C_9H_{14}O$ mw: 138.23

PROP: Practically water-white liquid. Bp: 215.2°, flash p: 184°F (OC), d: 0.9229, autoign temp: 864°F, vap press: 1 mm @ 38.0°, vap d: 4.77, lel: 0.8%, uel: 3.8%.

SYNS:

ISOFORON
ISOFORONE (ITALIAN)
ISOPHORONE (ACGIH)
IZOFORON (POLISH)
NCI-C55618
1,1,3-TRIMETHYL-3-CYCLOHEXENE-5-ONE
3,5,5-TRIMETHYL-2-CYCLOHEXENE-1-ONE
3,5,5-TRIMETHYL-2-CYCLOHEXEN-1-ON (GERMAN, DUTCH)
3,5,5-TRIMETIL-2-CICLOESEN-1-ONE (ITALIAN)

TOXICITY DATA:	CODEN:
eye-hmn 25 ppm/15M	JIHIAB 28,262,46
skn-rbt 100 mg/24H MLD	JETOAS 5,31,72
eye-rbt 920 µg SEV	UCDS** 11/15/71
eye-gpg 840 ppm/4H SEV	JIHTAB 22,477,40
msc-mus:lym 1 g/L	NTPTR* NTP-TR-291,86
sce-ham:ovr 1 g/L	NTPTR* NTP-TR-291,86
orl-rat TDLo:364 mg/kg/2Y-C: ETA	NTPTR* NTP-TR-291,86
orl-mus TDLo:182 g/kg/2Y-C: CAR	NTPTR* NTP-TR-291,86
ihl-hmn TCLo:25 ppm: NOSE,EYE,PUL	JIHTAB 28,262,46
orl-rat LD50:2330 mg/kg	TXAPA9 17,498,70
ihl-rat LCLo:1840 ppm/4H	JIHTAB 22,477,40
skn-rbt LD50:1500 mg/kg	UCDS** 11/15/71

NTP Carcinogenesis Studies (gavage); Some Evidence: rat NTPTR* NTP-TR-291,86; (gavage); Equivocal Evidence: mouse NTPTR* NTP-TR-291,86. Reported in EPA TSCA Inventory.

OSHA PEL: TWA 25 ppm
ACGIH TLV: CL 5 ppm
NIOSH REL: TWA (Ketones) 23 mg/m^3

THR: Moderately toxic by ingestion and skin contact. Mildly toxic by inhalation. An experimental carcinogen and tumorigen. Human systemic effects by inhalation: olfactory changes, conjunctiva irritation, and respiratory changes. Human systemic irritant by inhalation. A skin and severe eye irritant. Mutagenic data. Considered to be more toxic than mesityl oxide. However, due to its low volatility, it is not a dangerous industrial hazard. The response of guinea pigs and rats to repeated inhalation of the vapors indicates that it is one of the most toxic of the ketones. It is chiefly a kidney poison. It can cause irritation, lachrimation, possible opacity of the cornea and necrosis of the cornea (experimental). It is irritating at the level of 25 ppm to humans. In animal experiments death during exposure was usually due to narcosis, but occasionally due to irritation of the lungs.

Flammable and explosive when exposed to heat or flame; can react with oxidizing materials. To fight fire, use foam, CO_2, dry chemical. See also KETONES. For further information, see Isophaone, Vol. 2, No. 1 of *DPIM Report*.

IHO200 *HR: 3*

ISOAMINILE CYCLAMATE

CAS: 10075-36-2 NIOSH: GV 7200000
mf: $C_{16}H_{24}N_2 \cdot C_6H_{13}NO_3S$ mw: 423.68

SYNS:

α-(ISOPROPYL)-α-(β-DIMETHYLAMINOPROPYL)PHENYLACETONITRILE CYCLAMATE
MUCALAN

TOXICITY DATA:	CODEN:
orl-rat LD50:270 mg/kg	KSRANM 5,2212,71
scu-rat LD50:138 mg/kg	KSRNAM 5,2212,71
orl-mus LD50:298 mg/kg	KSRNAM 5,2212,71
ivn-mus LD50:57 mg/kg	KSRNAM 5,2212,71

Cyanide and its compounds are on the Community Right To Know List.

THR: Poison by ingestion, subcutaneous and intravenous routes. When heated to decomposition it emits toxic fumes of SO_x, CN^- and NO_x.

IHO700 *HR: D*

ISOAMYGDALIN

CAS: 51371-34-7 NIOSH: OO 8460000
mf: $C_{20}H_{27}NO_{11}$ mw: 457.48

SYNS:

d,l-AMYGDALIN
d,l-MANDELONITRILE-β-d-GLUCOSIDO-6-β-GLUCOSIDE
NSC 251222

TOXICITY DATA:	CODEN:
orl-ham TDLo:225 mg/kg (8D preg):REP	SCIEAS 215,1513,82
ipr-rat LD50:19582 mg/kg	NTIS** PB288-558

Cyanide and its compounds are on the Community Right To Know List.

THR: Experimental reproductive effects. When heated to decomposition it emits toxic fumes of NO_x and CN^-.

IHP000 *HR: 3*

ISOAMYL ALCOHOL

CAS: 123-51-3 NIOSH: EL 5425000
DOT: 1105
mf: $C_5H_{12}O$ mw: 88.17

$(CH_3)_2CHC_2H_4OH$

ivn-rbt LD50:36 mg/kg	IJNEAQ 5,305,66
orl-qal LD50:1 g/kg	AECTCV 12,355,83

EPA Genetic Toxicology Program.

THR: Poison by intraperitoneal and intravenous routes. Moderately toxic by ingestion and subcutaneous routes. An experimental teratogen. Experimental reproductive effects. Mutagenic data. A minor tranquilizer. When heated to decomposition it emits very toxic fumes of HCl and NO_x.

MDQ500 *HR: 3*

l-METHAMPHETAMINE HYDROCHLORIDE

CAS: 826-10-8 NIOSH: SH 5250000

mf: $C_{10}H_{15}N \cdot ClH$ mw: 185.72

PROP: Crystals; bitter taste. Mp: 170-175°. Sol in H_2O, alc and chloroform; almost insol in ether.

SYNS:

ADIPEX	"METH"
l-DESOXYEPHEDRINE HYDROCHLORIDE	l-N-METHYL-β-PHENYLISOPROPYLAMINE HYDROCHLORIDE
(−)-N-α-DIMETHYLPHENETHYLAMINE HYDROCHLORIDE	"SPEED"
	SYNDROX

TOXICITY DATA:	CODEN:
ivn-mus TDLo:15 mg/kg (9-11D preg):TER	TJADAB 4,131,71
ivn-rbt TDLo:6 mg/kg (12-15D preg):TER	TJADAB 4,131,71
ipr-rat LD50:25 mg/kg	27ZQAG -,346,72
scu-rat LD50:30 mg/kg	27ZQAG -,346,72
ipr-mus LD50:70 mg/kg	JPETAB 89,382,47
scu-mus LD50:180 mg/kg	27ZQAG -,346,72
ivn-mus LD50:33 mg/kg	27ZQAG -,346,72
orl-dog LD50:10 mg/kg	27ZQAG -,346,72
ivn-dog LD50:2700 µg/kg	PSEBAA 118,557,65
scu-cat LD50:50 mg/kg	27ZQAG -,346,72

THR: Poison by ingestion, intravenous, intraperitoneal, and subcutaneous routes. An experimental teratogen. Experimental reproductive effects. A powerful central nervous system stimulant. *Caution:* Excessive use may lead to tolerance and habituation. When heated to decomposition it emits very toxic fumes of HCl and NO_x. See also BENZEDRINE.

MDQ750 *HR: 3*

METHANE

CAS: 74-82-8 NIOSH: PA 1490000

DOT: 1971/1972

mf: CH_4 mw: 16.05

PROP: Colorless, odorless, tasteless gas. Mp: −182.6°. Bp: −161.5°, lel: 5.3%, uel: 15%, fp: −183.2°. D: 0.554 @ 0°/4° (air = 1) or 0.7168 g/L, autoign temp: 650°, vap d: 0.6, flash p: −368.6°F. Sol in water, alc and ether.

SYNS:

FIRE DAMP	METHANE, REFRIGERATE LIQUID (DOT)
MARSH GAS	
METHANE, COMPRESSED (DOT)	METHYL HYDRIDE

Reported in EPA TSCA Inventory.

DOT Classification: Flammable Gas; Label: Flammable Gas

THR: A simple asphyxiant. Very dangerous fire and explosion hazard when exposed to heat or flame. Reacts violently with powerful oxidizers (e.g., bromine pentafluoride; chlorine trifluoride; chlorine; fluorine; iodine heptafluoride; dioxygenyl tetrafluoroborate; dioxygen difluoride; trioxygen difluoride; liquid oxygen; ClO_2; NF_3; OF_2). Incompatible with halogens or interhalogens; air (forms explosive mixtures). Explosive in the form of vapor when exposed to heat or flame. To fight fire, stop flow of gas, CO_2 or dry chemical. See also ARGON for a description of asphyxiants.

MDQ800 *HR: 3*

METHANE BORONIC ANHYDRIDE-PYRIDINE COMPLEX

mf: $CH_3BO \cdot C_5H_5N$ mw: 120.95

THR: Ignites spontaneously in air. When heated to decomposition it emits toxic fumes of NO_x. See also ANHYDRIDES, PYRIDINE, and BORON COMPOUNDS.

MDR000 *HR: 3*

METHANE DICHLORIDE

CAS: 75-09-2 NIOSH: PA 8050000

DOT: 1593

mf: CH_2Cl_2 mw: 84.93

PROP: Colorless, volatile liquid. Bp: 39.8°, lel: 15.5% in O_2, uel: 66.4% in O_2, fp: −96.7°, d: 1.326 @ 20°/4°, autoign temp: 1139°F, vap press: 380 mm @ 22°, vap d: 2.93.

SYNS:

AEROTHENE MM	METHYLENE CHLORIDE (ACGIH, DOT)
CHLORURE de METHYLENE (FRENCH)	METHYLENE DICHLORIDE
DCM	METYLENU CHLOREK (POLISH)
DICHLOROMETHANE (DOT)	NCI-C50102
FREON 30	RCRA WASTE NUMBER U080
METHYLENE BICHLORIDE	SOLMETHINE

TOXICITY DATA:	CODEN:
skn-rbt 810 mg/24H SEV	JETOAS 9,171,76
eye-rbt 162 mg MOD	JETOAS 9,171,76
eye-rbt 10 mg MLD	TXCYAC 6,173,76
eye-rbt 17500 mg/m³/10M	TXCYAC 6,173,76
dni-hmn:fbr 5000 ppm/1H-C	MUREAV 81,203,81
cyt-ham:ovr 5 g/L	MUREAV 116,361,83
dni-ham:lng 5000 ppm/1H-C	MUREAV 81,203,81
sce-ham:lng 5000 ppm/1H-C	MUREAV 81,203,81
ihl-rat TCLo:4500 ppm/24H (1-17D preg):REP	TXAPA9 52,29,80
ihl-mus TCLo:1250 ppm/7H (6-15D preg):REP	TXAPA9 32,84,75
ihl-rat TCLo:3500 ppm/6H/2Y-I:CAR	FAATDF 4,30,84
ihl-mus TCLo:2000 ppm/5H/2Y-C:CAR	NTPTR* NTP-TR-306,86

ihl-rat TCLo:500 ppm/6H/2Y: ETA	TXAPA9 48,A185,79
orl-hmn LDLo:357 mg/kg: PNS,CNS	34ZIAG -,390,69
ihl-hmn TCLo:500 ppm/1Y-I: CNS,CVS	ABHYAE 43,1123,68
ihl-hmn TCLo:500 ppm/8H:CNS	SCIEAS 176,295,72
orl-rat LD50:2136 mg/kg	PPGDS* JAN81
ihl-rat LC50:88000 mg/m^3/30M	FAVUAI 7,35,75
ihl-mus LC50:14400 ppm/7H	NIHBAZ 191,1,49
ipr-mus LD50:1500 mg/kg	TXAPA9 9,139,66
scu-mus LD50:6460 mg/kg	TXAPA9 4,354,62
orl-dog LDLo:3000 mg/kg	QJPPAL 7,205,34
ihl-dog LCLo:14108 ppm/7H	NIHBAZ 191,1,49
ipr-dog LDLo:950 mg/kg	TXAPA9 10,119,67
scu-dog LDLo:2700 mg/kg	QJPPAL 7,205,34
ivn-dog LDLo:200 mg/kg	QJPPAL 7,205,34
ihl-cat LCLo:43400 mg/m^3/4.5H	AHBAAM 116,131,36
orl-rab LDLo:1900 mg/kg	HBTXAC 1,94,56
ihl-rbt LCLo:10000 ppm/7H	JIHTAB 26,8,44
scu-rbt LDLo:2700 mg/kg	QJPPAL 7,205,34
ihl-gpg LCLo:5000 ppm/2H	FLCRAP 1,197,67

IARC Cancer Review: Human Inadequate Evidence IMEMDT 41,43,86; Animal Inadequate Evidence IMEMDT 20,449,79; Animal Sufficient Evidence IMEMDT 41,43,86. NTP Carcinogenesis Studies (inhalation); Clear Evidence: mouse, rat NTPTR* NTP-TR-306,86. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program. Community Right To Know List.

OSHA PEL: TWA 500 ppm; CL 1000 ppm; Pk 2000/5M/2H

ACGIH TLV: TWA 50 ppm, Suspected Carcinogen

NIOSH REL: (To Methylene Chloride) TWA 75 ppm; Pk 500 ppm/15M

DOT Classification: Poison B; Label: St. Andrews Cross

THR: Poison by intravenous route. Moderately toxic by ingestion, subcutaneous and intraperitoneal routes. Mildly toxic by inhalation. An experimental carcinogen and tumorigen. Human systemic effects by ingestion and inhalation: paresthesia, somnolence, altered sleep time, convulsions, euphoria, and change in cardiac rate. An experimental teratogen. Experimental reproductive effects. An eye and severe skin irritant. Human mutagenic data. It is flammable in the range of 12-19% in air but ignition is difficult. It will not form explosive mixtures with air at ordinary temperatures. Mixtures in air with methanol vapor are flammable. It will form explosive mixtures with an atmosphere having a high oxygen content; in liquid O_2; N_2O_4; K; Na; NaK. Explosive in the form of vapor when exposed to heat or flame. Reacts violently with Li; NaK; potassium-tert-butoxide; (KOH + n-methyl-n-nitrosourea). It can be decomposed by contact with hot surfaces and open flame, and then yield toxic fumes which are irritating and give warning of their presence. When heated to decomposition it emits highly toxic fumes of phosgene and Cl^-. See also CHLORINATED HYDROCARBONS, ALIPHATIC.

MDR250 **HR: 3**

METHANESULFONIC ACID

CAS: 75-75-2 NIOSH: PB 1140000

mf: CH_4O_3S mw: 96.11

PROP: Solid. D: 1.4812 @ 18°/4°, mp: 20°, bp: 167° @ 10 mm. Sol in water, alc and ether. Corrosive to iron, steel, brass, copper and lead.

SYN: WSQ 1

TOXICITY DATA:	CODEN:
orl-rat LDLo:200 mg/kg	KODAK* 21MAY71
ipr-rat LDLo:50 mg/kg	KODAK* 21MAY71
orl-qal LD50:1000 mg/kg	JRPFA4 48,371,76

Reported in EPA TSCA Inventory.

THR: Poison by ingestion and intraperitoneal routes. May be corrosive to skin, eyes and mucous membranes. Explosive reaction with ethyl vinyl ether. Incompatible with hydrogen fluoride. When heated to decomposition it emits toxic fumes of SO_x. See also SULFONATES.

MDR750 **HR: 3**

METHANESULFONYL FLUORIDE

CAS: 558-25-8 NIOSH: PB 2975000

mf: CH_3FO_2S mw: 98.10

SYNS:
FUMETTE MSF
METHANESULPHONYL FLUORIDE

TOXICITY DATA:	CODEN:
orl-rat LD50:2 mg/kg	IAEC** 17JUN74
ihl-rat LCLo:140 mg/m^3	31ZOAD 1,287,68
ipr-rat LD50:3 mg/kg	NATUAS 173,33,54
scu-rat LD50:3500 µg/kg	28ZEAL 4,271,69
scu-mus LDLo:3500 µg/kg	31ZOAD 1,287,68
ivn-mus LD50:1 mg/kg	IAEC** 17JUN74
scu-dog LDLo:3500 µg/kg	31ZOAD 1,287,68
ivn-dog LD50:5620 µg/kg	IAEC** 17JUN74
scu-rbt LDLo:3500 µg/kg	31ZOAD 1,287,68
ivn-rbt LD50:3370 µg/kg	IAEC** 17JUN74

EPA Extremely Hazardous Substances List. Reported in EPA TSCA Inventory.

THR: Poison by ingestion, inhalation, intraperitoneal, intravenous, and subcutaneous routes. When heated to decomposition it emits very toxic fumes of F^- and SO_x. See also FLUORIDES and SULFONATES.

MDR775 **HR: 3**

METHANETELLUROL

CAS: 25284-83-7

mf: CH_4Te mw: 143.64

THR: A poison. Ignites spontaneously in air. Explodes on contact with oxygen at room temperature. When heated to decomposition it emits toxic fumes of Te. See also TELLURIUM COMPOUNDS.

ATTACHMENT B

Tailgate Meeting Form

TAILGATE MEETING FORM

Project Name: _____ Date & Time: _____

Project Number: _____ Presented by: _____

Location: _____ Weather: _____

Check the Topics/Information Reviewed:

- ☐ safety glasses, hard hat, safety boots
- ☐ site safety plan review and location
- ☐ equipment and machinery familiarization
- ☐ employee Right-To-Know/MSDS location
- ☐ open pits, excavations, and site hazards
- ☐ vehicle safety and driving/road conditions
- ☐ portable tool safety and awareness
- ☐ overhead utility locations and clearance
- ☐ first aid, safety, and PPE location
- ☐ sharp object, rebar, and scrap metal hazards
- ☐ safety is everyone's responsibility
- ☐ latex gloves inner/nitrile gloves outer
- ☐ excavation/trenching inspections/documentation
- ☐ full face respirators with proper cartridges
- ☐ slips, trips, and falls
- ☐ directions to hospital
- ☐ anticipated visitors
- ☐ electrical ground fault
- ☐ public safety and fences
- ☐ excavator swing and loading
- ☐ orderly site and housekeeping
- ☐ smoking in designated areas
- ☐ leather gloves for protection
- ☐ effects of the night before
- ☐ vibration related injuries
- ☐ fire extinguisher locations
- ☐ eye wash station locations
- ☐ decontamination procedures
- ☐ daily work scope
- ☐ emergency protocol
- ☐ parking and laydown
- ☐ hot work permits
- ☐ strains and sprains
- ☐ noise hazards
- ☐ no horseplay
- ☐ heat and cold stress
- ☐ backing up hazards
- ☐ accidents are costly
- ☐ dust and vapor control
- ☐ refueling procedures
- ☐ confined space entry
- ☐ flying debris hazards
- ☐ upgrade to level C at: FID/PID (____ eV) > ____ ppm
- ☐ work stoppage at: FID/PID (____ eV) > ____ ppm, % LEL > 10%

Discussion/Comments/Follow-up Actions: _____

NAME	SIGNATURE	COMPANY

Instructions:

- Conduct a safety meeting prior to beginning each day's site activities.
- Complete form by checking off specific topics and/or hazards.
- Obtain signatures from all G&M staff and G&M subcontractors.
- Follow-up any noted items and document resolution of any action items.

ATTACHMENT C

Emergency Plan
The University of North Carolina at Chapel Hill
December, 1996

EMERGENCY PLAN

UNIVERSITY OF NORTH CAROLINA

AT

CHAPEL HILL

APPROVALS

Director, Public Safety	1-6-97 Date	Asso. Vice Chancellor, Aux. Services	1/6/97 Date
Director, Health and Safety	1-6-97 Date	Asso. Vice Chancellor, Facilities	1/7/97 Date
Director, Physical Plant	1-6-97 Date	Executive Vice Chancellor	1/7/97 Date

EMERGENCY PLAN

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

PURPOSE

The purpose of this plan is to outline an organizational structure and to assign responsibilities for coping with emergencies affecting the safety and well-being of people and/or facilities on campus. The plan is intended as guidance in the management of any unusual occurrence on campus. "Unusual occurrences" connote situations, generally of an emergency nature, that result from civil disturbances, and disasters, both natural and technology-based. Civil disturbances include riots, disorders, and violence arising from dissident gatherings and marches, rock concerts, political conventions, and personal violence among two or more persons. Disasters include floods, hurricanes, earthquakes, explosions, tornadoes, major fires and any event that has the potential for mass casualties.

BACKGROUND

Over the years, the University on occasion has experienced serious fires, natural gas leaks, and minor chemical spills. There are many situations that could result in personal injury and property damage which would require close coordination among various emergency personnel (police, fire, rescue). Quick response to emergencies is often necessary and the University must be prepared to rapidly evaluate the situation to minimize the threat of injury and/or property damage.

CONCEPTS

The University staff has the capability and resources to manage many emergencies, but is dependent on the Chapel Hill Fire Department, the South Orange Emergency Medical Services, and the Orange County Emergency Management Department for services for events that present significant risk to life and/or property. In the event of large-scale incidents or disasters, State and federal agencies also may have a significant role in responding to emergencies. The University's emergency operations will work in coordination with these emergency organizations to mitigate and resolve emergency situations.

The UNC-CH Emergency Plan outlines a process for responding to, assessing, mitigating, and evaluating emergencies. The Plan defines three categories of emergencies and four levels of response, including the roles and responsibilities of various University departments.

UNIVERSITY EMERGENCY MANAGEMENT ORGANIZATION

The University Emergency Management Organization consists of those individuals and departmental representatives whose job responsibilities relate to one or more aspects of emergency preparedness and/or response to emergencies. Responsibilities are identified as follows:

Operations Group

The Operations Group has responsibility for pre-event planning functions, tactical operations during events, and post-event evaluations. The Operations Group is composed of the Directors of Physical Plant, Public Safety, and Health and Safety plus support staff and personnel from other departments necessary for planning for emergency preparedness and post-event evaluation. Depending on the nature of the emergency, the other departments may include: Public Safety Transportation Division, UNC News Services, and representative(s) from the department(s) affected by the emergency.

Planning responsibilities include:

- annual review of the UNC-CH Emergency Plan
- annual report of emergency responses
- annual conduct of field exercises

Incident responsibilities include:

- gather, confirm and evaluate incident information
- define tactics and actions to resolve priority situations
- identify resource needs
- mobilize supplies and equipment as needed
- post-event critique and debriefing of Level Two incidents

Executive Group

The Executive Group has responsibility for review and approval of the Emergency Plan, allocation of resources for emergency preparedness, and staffing of the Emergency Operations Center during Level Three incidents.

Members of the Executive Group include the following persons or their designees:

- Executive Vice Chancellor (leader)
- Provost
- Assistant to the Chancellor and Senior University Counsel
- Vice Chancellor for Student Affairs
- Associate Vice Chancellor for Public Relations
- Associate Vice Chancellor for Auxiliary Services
- Associate Vice Chancellor for Facilities
- Associate Vice Chancellor for Human Resources

Planning responsibilities include:

- review and approval of Emergency Plan
- allocation of resources for emergency preparedness

Level Three incident responsibilities include:

- staff Emergency Operations Center
- define overall University priorities and strategies
- decide whether or not to activate Emergency Warning and Communication Plan
- issue request to establish martial law
- issue public information reports and instructions
- communicate with governments, external organizations

CLASSIFICATION OF EMERGENCIES

For purposes of organizing responses to emergencies, three general categories are designated: incidents involving injuries; fire calls and hazardous material incidents; civil and operational disruptions, and disasters. The response to emergencies will vary depending on whether the event is suspected or confirmed, or whether it is a threat, pending, or actual. Examples of emergencies and the recommended response levels are listed in the following table. The response may vary depending on the location and specificity of the details provided to the Public Safety Telecommunications Center.

Level Zero Incident: The First Responder performs an assessment and evaluation to confirm that there is no potential hazard to persons and/or property and takes appropriate action to resolve the situation.

Level One Incident: First Responder assessment and evaluation determines that the incident poses minimal hazard to persons or property and can be resolved with resources within the University or with minimal assistance from an outside agency.

Level Two Incident: First Responder assessment and evaluation determines that the incident endangers public safety or property and requires assistance from outside agencies.

Level Three Incident: Poses significant risk to persons or property. Requires substantial assistance from resources outside of the University, may require assistance from state and/or federal agencies, and generally persists for several hours.

TYPE OF EMERGENCY	EMERGENCY RESPONSE LEVEL			
	Level Zero	Level One	Level Two	Level Three
Incidents: Fire Calls; Hazardous Materials; Injuries				
Air crash			F,X	
Aircraft accident on ground		F		
Fire alarm, unconfirmed		F		
Fire, confirmed			F,X	
Fire, major (multiple rooms)				F,X
Hazardous material, < 1gal, non-flammable	A			
Hazardous material, < 1gal flammable)		A		
Hazardous material incidents, other			F,X	
Incidents involving death or hospitalization		X		
Odor, natural gas or electrical		F		
Odor, nuisance	A			
Radiological incident	A			
Smoke	A			
Civil/Operational Disruptions				
Bomb threat			X	
Civil disorder			X	
Energy/fuel shortage			X	
Hostage/barricaded person				X
Hurricane watch		A		
Ice/snow storm		A		
Loss of electric/water supplies				X
Power outage		A		
Tornado watch		A		
Disasters				
Earthquake				X
Flood			X	
Hurricane warning			X	
Tornado warning			X	
Water supply contamination				X

A = Notify Assessment Team, escalation or de-escalation may follow assessment
F = Notify Assessment Team and the Chapel Hill Fire Department
X = Notify Assessment Team, if no de-escalation following assessment, notify Executive Group

MOBILIZATION FOR EMERGENCIES

Communications:

The Public Safety Department operates an enhanced 911 communications system for dispatching Public Safety, Health and Safety, Physical Plant, and other University personnel. Orange County Emergency Services operates an enhanced 911 communications system for dispatching emergency fire and rescue services to the University campus. The UNC-CH system has the capability for full communication with the Orange County system, including the transfer of emergency calls from one system to the other. The Public Safety Telecommunications Center console includes four Public Safety radio frequencies as well as frequencies for other University emergency response departments including Health and Safety and Physical Plant, and frequencies for County emergency response departments including

Chapel Hill Police Department and Chapel Hill Fire Department. The Health and Safety Office has an assigned radio frequency and also has the Chapel Hill Fire Department and Public Safety frequencies on its radios. Physical Plant has a radio system that operates during normal work hours. Support personnel on call-back status are assigned radios capable of communication with the Public Safety Telecommunications Center.

Initial Assessment

An Assessment Team, consisting of representatives of Operations Group departments (a Public Safety police officer, a Health and Safety Office staff member, and a Physical Plant staff member) will be notified of emergencies by the Public Safety Telecommunications Center according to the call-alert list or procedure provided by each department. After normal working hours, a Public Safety police officer will constitute the Assessment Team. The Assessment Team members, trained at the first responder level, perform the initial assessment (in conjunction with the CHFD, if they have been dispatched) to determine the nature of the incident and whether additional resources are needed.

Level Two and Three Notification

Upon determination by the Assessment Team that a Level Two or Level Three incident is in progress, the Incident Commander (or University Emergency Mangement Sector Leader if Incident Command is by the Chapel Hill Fire Department) will notify the Public Safety Telecommunicator which of the following personnel shall be advised to report to Incident Command:

- Health and Safety (specify division, e.g. fire, enviromental, and so forth)
- Physical Plant (specify division, e.g. electronics, utilities, Cogen, and so forth)
- News Services
- Public Safety Transportation Division
- Affected School(s) or Department(s) - Department Emergency Coordinator(s)
- Medical School Planning Office (if Medical School buildings are involved)
- Student Affairs (if students or student facilities are involved)
- Housing (if residence halls are involved)

The Public Safety Telecommunicator will notify personnel according to the "call list" provided by the departments. The call list is to provide names and telephone numbers of persons to be called during normal working hours and after-hours.

The Incident Commander shall apprise the Public Safety Operations Division Commander (Major) of all Level Two and Level Three incidents. The Operations Division Commander shall make the following determinations, in consultation with the Director/Chief of Police:

- Whether the Major and/or the Chief should respond to Incident Command
- Whether to notify members of the Executive Group of Level Two incidents
- Whether to invoke Human Resources administrative leave provisions

The Executive Group Leader may be notified of Level Two incidents as determined by the Operations Division Commander and the Chief of Police. The Executive Group Leader shall be notified of all Level Three incidents. The Chief of Police in consultation with the Executive Group Leader shall decide

- Whether to notify all members of the Executive Group
- Whether to establish an Emergency Operations Center for a Level Three incident

If the decision is made to establish an Emergency Operations Center, the location of said center will be determined by the Chief of Police in consultation with the Executive Group Leader.

The Chief of Police shall inform the Incident Commander (or University Sector Leader if Chapel Hill Fire Department is Incident Command) whether to request the Public Safety Telecommunicator to notify Executive Group members of Level Three incidents and whether to advise Group members to report to establish an Emergency Operations Center.

Health and Safety and Physical Plant personnel reporting to Incident Command (either as part of the assessment team or called back on request of the Incident Commander) may request that the management personnel of their respective departments be notified of Level Two incidents when the Executive Group Leader is not notified. The Incident Commander will request the Public Safety Telecommunicator to make such notifications on request of the respective personnel. The Director of Health and Safety and the Director of the Physical Plant shall be notified by the Public Safety Telecommunicator of all Level Two and Level Three incidents involving personnel of their respective departments when the Executive Group Leader has been notified.

Human Resources administrative leave provisions may be invoked for emergencies where employees may not reenter the workplace and an alternate work space cannot be located. Every attempt shall be made to confer with the Senior Director, Human Resources Administration or the Associate Vice Chancellor for Human Resources before such provisions are invoked. The Operations Division Commander, in consultation with the Chief of Police, shall have the power to invoke such provisions when senior Human Resources personnel are unavailable. The Incident Commander shall notify the departmental Emergency Coordinator(s) of affected departments of the duration and ending time of the administrative absence. Emergency Coordinator(s) shall communicate said information to department employees. If the ending time of the administrative absence cannot be determined at the time the administrative leave provisions are invoked, the Incident Commander shall notify the departmental Emergency Coordinator(s) to instruct department employees to call the University Weather and Disaster Line for information regarding when to return to work. In such cases, the Incident Commander also shall notify the Public Safety Special Events Coordinator to stand by to record the return-to-work message on the Weather and Disaster Line as soon as the ending time of the administrative absence has been determined.

INCIDENT MANAGEMENT

Incident Command:

The University cooperates with and is a part of the Orange County Command Team operations which are coordinated by the Orange County Emergency Services Department. The Orange County Command Team uses the National Inter-Agency Incident Management System (NIIMS) for a systems approach to incident management. The Incident Command System (ICS) is utilized for organizing and operating an on-scene management structure in responding to all types of emergencies and disasters. The University also uses ICS for organizing responses to emergencies and unusual occurrences on the University campus and to provide support to emergency responders from off-campus.

Establishing Command

The Public Safety Police Officer responding as part of the Assessment Team shall establish Command until the Police Supervisor arrives and assumes Command. The vehicle of the Police Supervisor shall display a green light signifying the location of Command for all incidents except during periods when Command is transferred to the Chapel Hill Fire Department.

Coordination With Off-Campus Agencies - Unified Command

The CHFD responds to all fires, fire alarms, and hazardous material incidents which threaten life, property, or the environment. When the CHFD responds, they will establish a Fire Sector, UNC will establish a UNC Emergency Management Sector, and a Unified Command will be established consisting of the following positions:

- Incident Commander
- Operations Chief - designated by Incident Commander
- UNC Liaison - UNC Police Supervisor
- Safety Officer - UNC Health & Safety representative
- Tactical Operations Safety Officer - CHFD designee
- Information Officer - UNC News Services representative
- Other personnel as requested by the Incident Commander

The Incident Commander will be either the senior CHFD supervisor or the senior Public Safety police supervisor as determined by mutual agreement of the CHFD and Public Safety. The selection will be based on the nature of the incident.

The CHFD will be responsible for tactical operations for the purpose of reducing the immediate hazard and establishing situation control. University personnel will provide support, as appropriate, to assist the CHFD. Once situation control has been established, University personnel will be responsible for restoration of normal operations.

Line of Authority:

The senior Public Safety police officer, or designee, present at the UNC Emergency Management Sector will serve as the University Emergency Management Sector Leader.

For Level Three incidents, if an Emergency Operations Center is established at a site apart from Command, the Executive Group Leader, or designee, will be in charge of the Emergency Operations Center.

Areas of Responsibility.

- The **Public Safety Telecommunicator** is responsible for making notifications of personnel at the direction of the senior Public Safety police supervisor as specified in this Emergency Plan.

- **Public Safety** police officers serve as first responders which requires recognition and initial assessment of potential hazards in order to activate the UNC-CH Emergency Response Plan. Police officers are to establish the initial Incident Command pending arrival of the police supervisor who will assume command until relieved by senior police personnel, or CHFD. Public Safety personnel are responsible for establishing and securing a "clear zone" around the emergency area, providing traffic control and personnel control, escort for emergency responders, and coordination with other law enforcement agencies.

- The **Health and Safety Office** will advise on potential hazards in buildings, assist in the assessment of hazards and assist in developing plans for mitigating such hazards. HSO will maintain a set of situation maps on its emergency van.

- The **Physical Plant Department** has responsibility for the buildings systems including utility systems and will secure/activate systems as needed. The Physical Plant will normally supervise and conduct cleanup operations after the site has been determined to be free from hazardous materials.

- The **Public Safety Transportation Divison** has responsibility for the transportation of people and supplies to support emergency operations by securing the staging area, assisting with traffic and pedestrian movement, and providing mass transportation if necessary to relocate people.

- UNC News Services has responsibility for media relations on the UNC-CH campus. The News Services representative will serve as the Information Officer (IO) during and after emergencies on campus, regardless of which department's or agency's representative is serving as the Incident Commander. Specific responsibilities include:

  - Authenticate all sources of information received and verify for accuracy
  - Control all rumors by releasing only the verified facts
  - Assist with alerting and with the overall communication process
  - Use the news media to inform the public of the emergency

- Coordinate news releases
- Assign spokes person for all contact with media and assist them if necessary
- Ensure news media has access to facts
- Maintain constant coordination with the news media and Command.

- The **Emergency Coordinator of the department or school** occupying or responsible for the building will to:

  - Sweep through assigned area to alert occupants that an evacuation is in process
  - Report to the University Emergency Command Sector with emergency information regarding location of hazardous materials, location of occupants needing assistance in evacuating, and other information to assist emergency personnel
  - Advise emergency personnel regarding building contents
  - Advise building occupants regarding situation and when re-entry is permitted
  - Advise the Physical Plant personnel in cleanup operations
  - Advise departmental employees regarding implementation of the Human Resources Administrative Leave policy as necessary

EMERGENCY WARNING AND COMMUNICATIONS PLAN

The University has in place a separate Emerncy Warning and Communications Plan which provides a mechanism for warning members of the University community regarding situations which could pose a danger to personal safety. Incidents may occur wherein the UNC-CH Emergency Plan has been activated and wherein the situation poses a danger to personal safety. In the case of such incidents, the Executive Vice Chancellor can request that members of the Emergency Warning Committee not present at the UNC Sector be requested to report to the UNC Sector, or to the Emergency Operations Center if established, to provide assistance in making emergency warning decisions. If a decision to execute the Emergency Warning Plan is made, the procedures as outlined in the Emergency Warning Plan will be followed.

DEPARTMENTAL PLANS

Each department with specific responsibilities under the University's Emergency Plan shall develop an Annex to this Plan which describes the detailed procedures for their department's personnel to fulfill their department's duties and responsibilities.

INCIDENT CRITIQUE

Within two days after the termination of a Level Two incident, the Public Safety Police Supervisor who served as Incident Command will schedule a session to critique the incident to determine the adequacy of the response and to identify training needs. The Physical Plant Director, Public Safety Director, Health and Safety Director, or designees, and other departments involved in the emergency response will be requested to attend the critique. Review of Level Three incidents will be conducted in a session scheduled by the Associate Vice Chancellor for Auxiliary Services or another member of the Executive Group.

TRAINING

To comply with the NC OSHA Emergency Response Standard, the following training will be required for University personnel having responsibilities in emergency situations:

First Responder, Awareness Level. Required of all Public Safety patrol officers and supervisors, all Health and Safety technical staff, and Physical Plant maintenance personnel on stand-by or call-back status. Training at this level will be coordinated by the Health and Safety Office. The regulations do not specify a minimum number of hours of training.

First Responder, Operations Level. Required of Health and Safety personnel entering hazard zone to assist in monitoring and/or assessment. A minimum of eight hours of documented training is required.

Hazardous Materials Technician. Required of Health and Safety personnel who assist in containment of releases of hazardous materials or perform decontamination procedures. A minimum of 24 hours of documented training is required.

Hazardous Materials Specialist. Required of Health and Safety personnel who supervise containment of releases of hazardous materials, specify personnel protection equipment, or develop site safety and control plans. A minimum of 24 hours of documented training plus competency in hazardous material control is required.

Hazardous Materials Incident Commander. Required of Health and Safety personnel who may assume control of an incident scene involving hazardous materials. A minimum of 24 hours of documented training plus competency in managing hazardous material incidents and knowledge of the State emergency response plan is required.

NOTIFICATION OF LOCAL, STATE AND FEDERAL AGENCIES

Notifications required by State and federal occupational and environmental regulations are to be made by the UNC Health and Safety Office. Depending upon the location and nature of an incident, one or more of the following agencies may need to be notified by Health and Safety:

• Orange County Emergency Coordinator (LEPC)	(919) 968-2050
• NC Division of Emergency Management (SERC)	(919) 733-3943
after hours	(800) 858-0368
• NC Division of Environmental Management	(919) 733-5291
• NC Department of Labor, OSHA Division	(919) 662-4575
• NC Radiation Protection Division	(919) 571-4141
• NC Hazardous Waste Section	(919) 733-2178
• National Response Center	(800) 424-8802