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SITE CHARACTERIZATION WORK PLAN

CEDAR CHEMICAL
WEST HELENA, ARKANSAS

for:

Cedar Chemical Corporation
Memphis, Tennessee

June 1990

Woodward-Clyde Consultants

Consulting Engineers, Geologists, and Environmental Scientists
2822 O'Neal Lane, Baton Rouge, LA 70896

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1	Health and Safety Plan, Site Characterization and Drum Disposal Area Delineation, Cedar Chemical, West Helena, Arkansas

FIELD INVESTIGATION PLAN
CEDAR CHEMICAL FACILITY

1.0 INTRODUCTION

1.1 Site Description

The Cedar Chemical facility is located near West Helena, Arkansas. The site consists of approximately 40 acres located by the intersection of Highway 22 and Industrial Park Road. The site location is shown in Figure 1. The existing site plan is shown in Figure 2.

Cedar Chemical is currently finalizing plans for activities related to construction of a dichloroaniline (DCA) plant at their West Helena facility. Proposed construction activities will take place in the central portion of the facility. This 1.2-acre area is shown in Figure 2. Excavations in this area were recently conducted in order to construct an underground storm sewer and a buried drum storage site was discovered. The drums appeared to be systematically placed approximately 6 feet below the ground surface. Eight drums were removed from the storage site which is estimated to be 20 to 35 feet wide and 60 to 85 feet long. The contents of some of the drums has been identified as 2 (sec butyl) 4,6 dinitrophenol (DNBP), and formulations of DNBP. Interviews with long term present and former employees have tentatively established that the drums were buried when Ansul Corporation controlled the operation of the site and manufactured DNBP in 1972.

1.2 Objective

The area of proposed construction activities is addressed in this sampling plan. An area immediately adjacent to the proposed construction area was used in the past as a drum disposal area. Woodward-Clyde Consultants (WCC) performed a

magnetometer survey to delineate the boundary lines of the drum disposal area, and to find any additional drums or drum disposal areas in or adjacent to the 1.2-acre construction area.

In order to accomplish the objectives:

- a magnetometer survey was conducted at the DCA construction site in order to delineate the identified drum disposal area and to identify if there are any additional buried drum sites within the area of proposed construction or adjacent to that area, and

- a multi-point grid will be superimposed on the entire construction area, as shown in Figure 3. This grid was integrated with the magnetometer survey results in order to locate sample points. Details of the sampling plan are discussed in Section 3.0.

2.0 RESULTS OF MAGNETOMETER SURVEY

Assuming that the buried drums contain large amounts of metallic (i.e., ferrous) materials and occur approximately 6 to 12 feet below the ground surface, the following methodology was proposed and executed.

2.1 Travel, Site Walk-through and Set-up

A review of available pertinent information such as aerial photographs and briefings from knowledgeable sources at Cedar Chemical has preceded this field effort and the information was used to establish and carry out the plan.

2.2 Field Investigation

The area surveyed was approximately 210 feet by 250 feet, or 1.2 acres. Using a 10-foot station spacing, an EG and G geometrics model 856 proton precession gradiometer was used to record at approximately 575 evenly spaced intersection points.

2.3 Data Review, Reduction and Interpretation

Because the magnetic gradient (ie, difference between two simultaneous fields measured by vertically separated sensors) of the total earth field was determined, the effect of diurnal changes in the earth's magnetic field was ignored, since it was removed in the calculation.

All field data were reviewed with documented sources of magnetic noise (ie, surface metal such as tanks) removed. Maps of the resultant magnetic gradient is displayed as Figure 2a.

A 55 gallon metal drum, buried 10 feet beneath the surface, has a corresponding magnetic gradient of 10 to 12 gammas per foot. Given that the sensor spacing utilized in the surveys, the above gradient translates into approximately 30 to 40 gammas per sensor spacing. All values presented on the map in Figure 2a is gammas per sensor spacing, not gammas per foot.

Inspection of Figure 2a reveals numerous anomalies (ie, significant variations in the magnetic gradient) in the proposed DCA Process Area which are circular in form and elongate in extent, as if quantities of metal-bearing materials were buried. Cedar Chemical personnel verified such by digging trenches across some of these anomalies and removing metal-bearing debris. It should be noted that although metallic debris was excavated, 55 gallon drums were not found.

3.0 SCOPE OF SOIL SAMPLING

3.1 Summary

The sampling activities outlined in sampling plan described in this Site Characterization Work Plan were designed to characterize soils at the construction site, to supplement the magnetometer survey in locating additional buried drums, and to characterize soils in the area of the drum disposal site (s) in order to delineate the boundaries of that site. Soil samples will be collected as 5-foot soil boring intervals down to fifteen feet below ground surface. The ground water was determined to be about 18 feet below ground surface in existing well MW 3 which is near the proposed DCA area. Data collected during this study will be used to delineate the horizontal and vertical distribution of DNBP and additional compounds which could be found in the drum disposal area(s) by virtue of previous manufacture or use at the site.

3.2 Site Characterization

A 50-foot grid will be outlined on the construction area using a tape measure and fluorescent orange paint. This grid served as a sample location guide for the placement of 11 boring locations inside the proposed construction site (see Figure 3).

Prior to the commencement of drilling activities at the site, a magnetometer survey was employed as described in Section 2.0. The results of this survey was overlain with the 50-foot grid outline and used to select the final sample locations noted in Figure 3.

Soil samples will be analyzed for DNBP, 3,4-Dichloroaniline (DCA), Propanil Methoxychlor, Anisol, Phenol, o-Dichlorobenzene, 2,3-Dichloro nitrobenzene, and 3,4-Dichloro nitrobenzene by Cedar Chemical by combination of their on-site laboratory and independent off-site laboratory, Sorrells Research.

4.0 SUBSURFACE SOIL SAMPLING EQUIPMENT AND PROCEDURES

4.1 Drilling Operations

A series of shallow borings will be drilled to evaluate the soils in the construction area and drum disposal site(s). The borings will be drilled by hollow-stem auger drilling and sampling techniques to fifteen feet or the depth at which ground water is encountered if less than fifteen feet. Ground water is anticipated to be found at eighteen feet below ground surface. Soil samples will be obtained as 5-foot intervals. Samples will be collected with a Shelby tube or split-spoon sampler, depending upon soil type (i.e., cohesive or granular). If free liquid wastes are encountered, temporary surface casing will be used in drilling operations or drilling will be terminated for that boring location if sealing of the zone is not successful.

4.1.1 Drilling Equipment. In order to prevent contaminants form being moved vertically down boreholes, subsurface sampling will be performed by hollow stem auger drilling and sampling methods. The drilling apparatus will consist of a truck-mounted rotary drilling rig. Boreholes will be drilled by rotary drilling using either 8 1/4- or 6 1/4-inch diameter auger flights and collecting samples through the hollow stem augers with either a split spoon or Shelby tube sampler. The samples will be taken continuously from undisturbed strata immediately below the cutting head of the auger. Following the sampling event, the augers will be rotated down to the bottom of the previously sampled interval. As the augers are rotated and pressed downward, the cuttings are rotated up the flighting or the outside of the auger, thereby reducing the potential for pushing contaminants downward.

To prevent intrusion of material inside the borehole during drilling, a center plug will be installed on the bottom of the drill rods and inserted during drilling. Samples will be collected by removing the drill rods and the attached center plug and inserting the sampler through the hollow stem. Following the sampling, the drill rods and plug will

be replaced prior to cleaning out the samples interval and the entire process will be repeated. This procedure is illustrated in Figure 5.

Only petroleum jelly, teflon tape, lithium grease, or vegetable-based lubricants shall be used on the threads of downhole drilling equipment. Additives containing lead or copper shall not be used. Any hydraulic or other fluids used in the drilling rig, pumps, or other field equipment/vehicles shall not contain any polychlorinated biphenols (PCBs).

If antifreeze is added to any pump, hose, etc., in an area in contact with drilling fluids, this antifreeze shall be completely purged prior to the equipment's use in drilling, mud, mixing, or any other part of the overall drilling operation. Only antifreeze without rust inhibitors and/or sealants may be used.

Drilling equipment that has a visible loss of grease, hydraulic fluids, oils, fuels and/or transmission oil to drilling fluids to the borehole will not be allowed for borings and/or well installation until the problem is corrected.

4.1.2 Drilling Procedure. The borings shall be continuously sampled with a thin-walled Shelby tube sampler or split-spoon sampler, extruded in the field and described or logged, (See Figure 4) following the guidelines of the appropriate and most current American Society for Testing and Materials (ASTM) Standards:

- D 1452 Practice for Soil Investigation and Sampling by Auger Borings.
- D 1586 Method for Penetration Test and Split-Barrel Sampling of Soils.
- D 1587 Practice for Thin-Walled Tube Sampling of Soils.
- D 2487 Test Method for Classification of Soils for Engineering Purposes.
- D 2488 Practice for Description and Identification of Soils (Visual Manual Procedure).

All borings shall be sampled and described by a qualified WCC representative. The qualified WCC representative is to be on site during all boring and sampling operations. Samples taken from borings will be handled as described later in this section.

All soil borings will be advanced with hollow-stem rotary drilling techniques with continuous soil sampling techniques unless it is determined to be unnecessary for strata identification and sample collection by the qualified WCC representative based on consistent site conditions.

If free liquid wastes are encountered or conditions indicate concern for downward contaminate mobility, temporary surface casing may be used in the drilling operations to seal off the contaminated zone. Surface casing would be placed within the borehole 1 to 2 feet below the contaminated zone and grouted in place. A smaller diameter auger would be used to continue drilling below the casing after the casing and grout will have had a minimum of 24 hours to set. A 10-inch surface casing is suggested to be placed in a minimum 12 1/2-inch borehole (drilled with an 8 1/4-inch auger with a 12 1/2-inch diameter auger head). Drilling would continue with a 4 1/4-inch auger with and 8 1/4-inch auger head cutting diameter. A conceptual diagram of this procedure is given in Figure 5.

For all subsurface soil sampling events, the procedure to be followed will be as follows. After the sample is extended from the core, the sample will be thoroughly described using the classifications discussed above. The sample will then be cut with a decontaminated knife and representative portions of the sample will be shaved from the interior soil sample that has not been in contact with the sampling device and placed in a sealed appropriate containers. Composite sampling will be done in decontaminated stainless steel bowls, thoroughly mixed and placed in appropriate containers. All samples will immediately be stored on ice until delivery to the laboratory.

4.2 List of Necessary Equipment

The following equipment will be necessary for soil sampling activities:

Magnetometer Survey Equipment

Sample Location Equipment

- Flags
- Rolls of Flagging
- Sharpies
- Location Maps
- Tape Measure (200-foot)
- Fluorescent Orange Paint

Decontamination Equipment

- Wash Tubs (10-gallon)
- Wash Tubs (2-1/2- or 5-gallon)
- Holding Tubs (30-gallon)
- Methanol
- Alconox
- Deionized Water
- Saw Horses with Plywood or 8-foot Long Table
- 1 Roll (10 foot x 100 foot) Plastic Sheeting
- Heavy Brushes
- Bottle Brushes
- Rolls of Duct Tape
- Nitrile Gloves/Latex
- Aluminum Foil
- Heavy Duty 55-gallon Trash Bags
- Holding Drums (two for decon water, one for PPE, one for soil cuttings)

- Sprayers (stainless steel) (one for DI water, one for methanol)
- Steam cleaner for drilling rigs

Personal Protective Equipment (PPE)

- Nitrile Gloves (Eight Dozen)
- Latex (Surgical Gloves)
- First Aid Kit
- Insect Repellant
- Wasp Spray
- Boxes (36 pair) Extra Large Polycoat Tyvex
- Boxes (50 pair) Extra Large Tyvex
- Pair Over Boots

Individual PPE

- Hard Hat
- Safety Glasses
- Steel Toe Chemical Protective Boots

Paper Work

- Sample Labels (300)
- Work Plan (one per person)
- Safety Plan (one per person)
- Emergency Numbers (one per person)
- Bore Logging Forms (30 forms)
- Log Book and Location Maps (site + sample locations)

Info - Site Specific

- Project Number - 90B550C
- Sample Numbering System - (Section 5.1)
- Contact Person (Cedar Chemical) - Joe Porter

- Contact Person (Testing Lab) - Greg Satterfield
- Addresses (Cedar Chemical)
- Hotel Reservations
- State Contact Person (ADPCE - David Hartley)

Sampling Equipment

- Sterile Gauze Pads (10 boxes 3-inch x 3-inch)
- Water Proof Pens
- Paint Markers
- Rolls Duct Tape
- Bottle Hexane
- Box Gallon Size Ziplock Bags
- Box Quart Size Ziplock Bags
- Ruler (centimeter)
- 4 Boxes Latex surgical Gloves (100 pair per box)
- 100-foot Measuring Tape
- Sample Jars and Cooler Labels (as necessary) (supplied by lab)
- Camera/Logbook
- Machetes
- Sample Point Location Map
- Sample Jars, Coolers (supplied by lab)
- Water Cooler

4.3 Standard Operating Procedures

The standard procedures for sample collection are defined below. All sampling and other field work associated with the soil boring operations shall be performed in accordance with these standard procedures. If for some reason these procedures can not be followed during the execution of a particular task, the project manager or coordinator will be informed and a written justification shall be placed in the field log

notebook. Additionally, all sampling activities shall be performed in accordance with the Health and Safety (H&S) Plan attached with this document.

4.4 QA/QC Meeting

Prior to beginning work at the site a QA/QC meeting will be held between the Site Project Coordinator and the field team. During this meeting the project sampling plan and H&S plan will be reviewed.

4.5 Locating Sample Points in the Field

Prior to collecting a particular sample or initiating a particular soil boring, the sampling point should be located in the field as precisely as possible. This activity should be accomplished by measuring the precise distance and relative direction to a particular sampling point from an established reference point. Once the position of this sampling point is established, other sampling points in the same area can be located relative to it. Distance measurements should be made using a measuring tape. A compass should be used to determine the relative direction to a sampling point. The actual location of each sampling point should be recorded (along with distance and direction notes and any other pertinent information) on a field copy of the site map and in the field log notebook.

4.6 Soil Boring Depths

Borings will be drilled using the hollow-stem auger method in conjunction with either a split-spoon or a Shelby-tube core barrel. Prior to drilling borings within 10 feet of the drum areas the area will be manually probed to depth of 6 feet. Composite samples will be collected in each boring in 5-foot intervals. Sampling will continue until ground water is encountered.

4.7 Sample Collection and Analyses

All borings will be sampled and described by a qualified WCC representative. The WCC representative will be onsite during all boring and sampling operations. Samples collected from borings will be processed as described later in this section.

The borings will be drilled by dry rotary auger techniques to fifteen feet. Soil samples will be obtained by compositing each five-foot intervals continuously to the boring completion depth. There will be three samples per boring.

Samples will be collected with a Shelby tube. The soil samples will be screened in the field by head-space analysis with an onsite photoionization detector. To provide consistency in screening between samples, each sample to be screened will be placed in a ziploc bag, and allowed to sit in the sun for a minimum of 20 minutes. The photoionization detector probe will then be inserted into the headspace for measurements.

5.0 SAMPLE TRACKING

5.1 Sample Identification System

Each sample boring location will be identified by an alpha-numeric code as shown in Figure 3.

All sample jars will have a plastic or waterproof paper label attached which will be filled out using waterproof ink. The label will contain the following information:

- Project number
- Site/Project name
- Sample number

- Boring number and depth
- Sampler's name
- Date and time the sample was collected
- Sample description
- Preservatives
- Parameters for analysis

5.2 Field Documentation

All field observations and information pertinent to sampling will be recorded (in ink) in a bound field log notebook with consecutively numbered pages. In addition, photographs will be taken of field operators, items of interest, etc. A log of these photographs will be kept in the field notebook. Sketches of sample, boring and well locations will also be made in the field log notebook. Documentation should be sufficient to reconstruct each sampling or drilling event without relying on the collector's memory. Entries in the field log notebook will include the following (if applicable):

- Location of sampling/drilling activity and address
- Purpose of sampling/drilling activity
- Number and approximate volume of samples taken
- Description of sampling point
- Date and time of sample collection or drilling event
- Sample and boring identification number(s)
- Sample distribution (e.g., to chemical laboratory)
- Sample preservation
- Drilling procedures
- Any field measurements made, such as photoionization detector readings
- Weather conditions
- Other pertinent field observations

Each shallow soil boring shall be lithologically logged by visual classification (using the Unified Soils Classification Method). These logs shall be recorded on a boring log form, such as the one included in Appendix A. In addition, photographs will be taken of field operators, items of interest, etc. A log of the photograph will be kept in the field notebook.

6.0 DECONTAMINATION AND CROSS-CONTAMINATION CONTROL

6.1 General

- Sample jars and bottles will be kept in limited access areas or locked storage until they are used.
- Latex gloves shall be worn during all sampling activities and changed between sampling events.
- Clean sampling equipment shall be wrapped in aluminum foil prior to use.
- Clean sheets of plastic shall be laid out in the sampling area and all equipment shall be placed on these sheets. This plastic shall be discarded after each use.
- Equipment refueling shall only be performed in designated areas. These areas should be a significant distance away from any sampling points.
- A special zone shall be set up for decontamination activities. This zone should be located a significant distance away from all sample points. Within this zone a bermed and lined area shall be constructed for decontamination of the drilling rig and associated equipment.
- All wash water, soil cuttings, discarded gloves, etc., shall be contained onsite in steel 55-gallon drums for subsequent disposal by Cedar Chemical.

6.2 Frequencies and Procedures

All equipment used to collect soil samples will be decontaminated between sample collection locations. Decontamination of this equipment will be accomplished by the following procedure:

1. Cleaning with steam
2. Washing in a detergent solution (Alconox)
3. Triple rinsing with clean deionized water

Equipment used to drill soil borings will be decontaminated using Alconox soap and steam cleaning prior to and immediately after use. An alternative to decontamination of equipment within the same boring (between sample intervals) will be to utilize new augers, stems, etc., for each sampling interval, thereby requiring decontamination between boring locations only.

7.0 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

7.1 QA/QC Sample Types

To attain the project QA/QC objectives in terms of accuracy, precision, completeness, comparability and representativeness, QA/QC samples shall be collected and sent to the Cedar Chemical analytical laboratories for analysis. QA/QC samples collected in the field will consist of field duplicates and rinsates.

7.2 Collection of QA/QC Samples

Field duplicate samples will be collected by filling an extra jar with sample from the same sample from which a laboratory sample was collected.

Rinsate samples will be collected for all matrices. These samples will be collected by running laboratory-supplied, organic-free deionized water through all sampling and compositing equipment and collecting this water in a sample jar.

7.3 Frequency of QA/QC Sample Collection

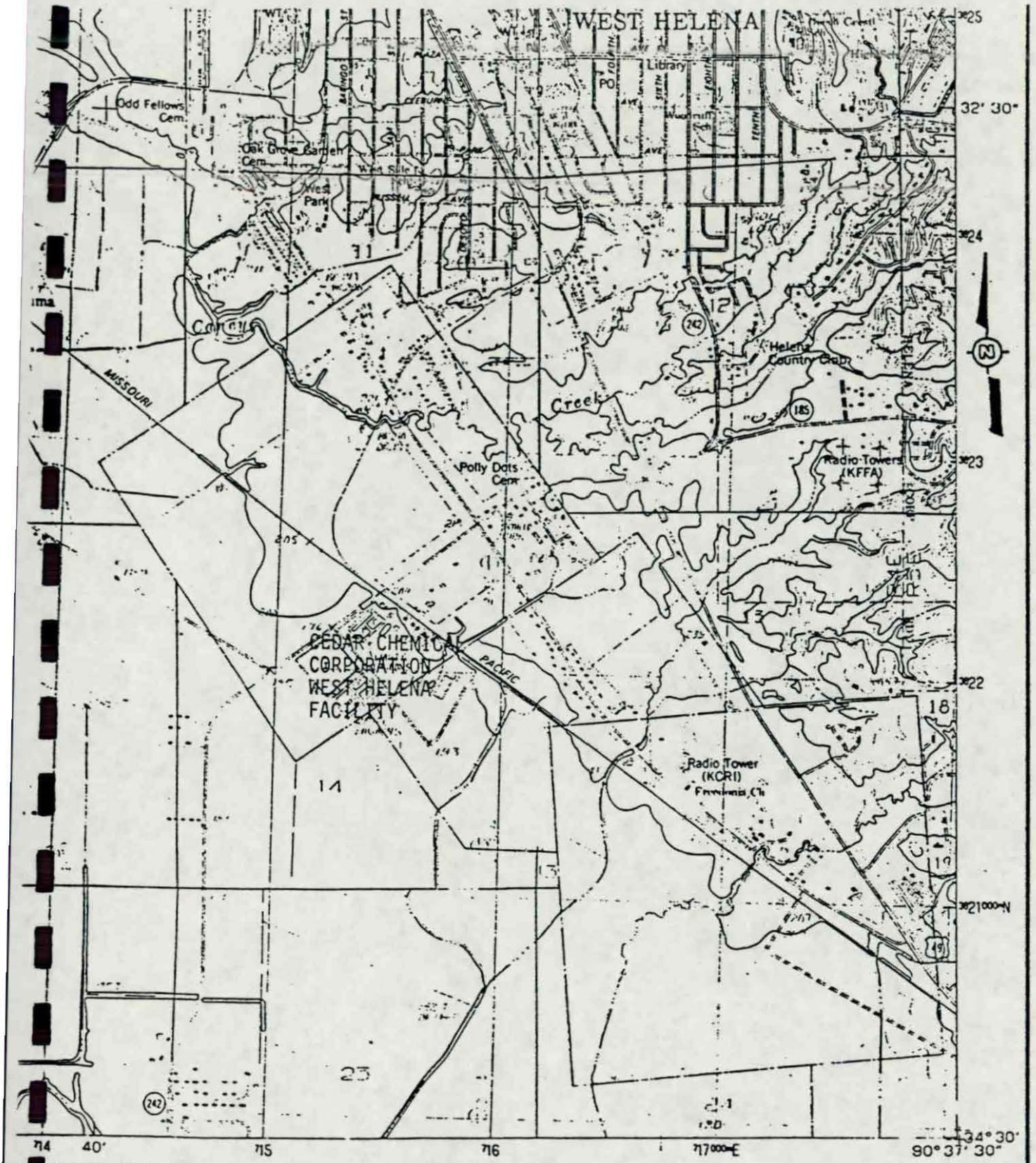
One field duplicate will be collected for every 20 field samples. Rinsate samples will be collected at a frequency of one sample for all decontamination events, per matrices.

8.0 IMPLEMENTATION

The sampling and analysis plan described herein can be initiated within one week after authorization to proceed.

FIGURE 1

SITE LOCATION

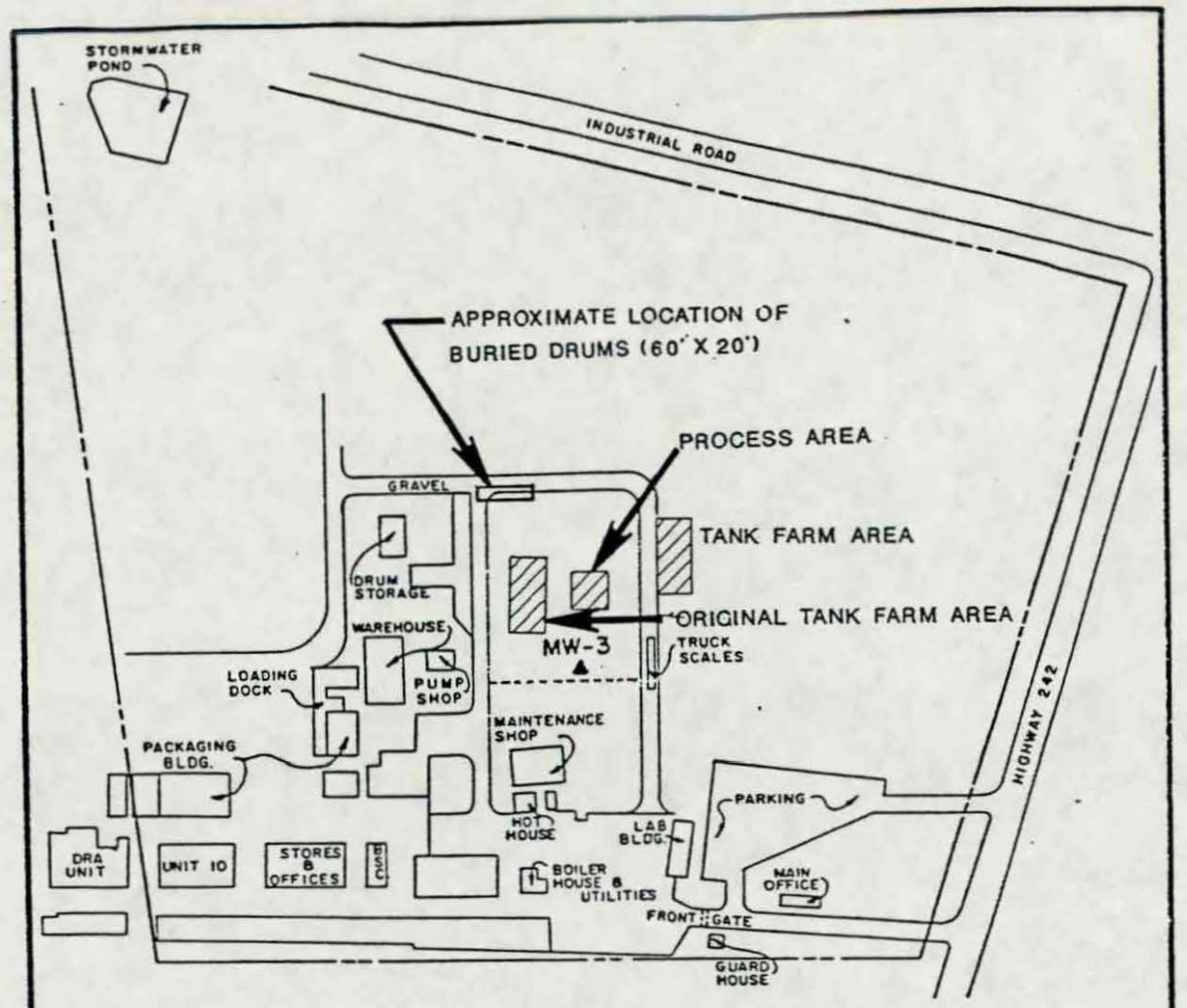


SOURCE: U.S.G.S. 7.5 MINUTE QUADRANGLE MAP, WEST HELENA, ARKANSAS

CEDAR CHEMICAL COMPANY WEST HELENA, ARKANSAS	**Woodward-Clyde Consultants** Consulting Engineers, Geologists and Environmental Scientists Baton Rouge, Louisiana	SITE LOCATION	FILE NO. 90B550C
	SCALE: 1:24000 / DRAWN BY: J.B. / CHKD. BY: FAA / DATE: 4/18/90 / DATE:		FIG. NO. 1

FIGURE 2

SITE MAP



SITE MAP

CEDAR CHEMICAL COMPANY

WEST HELENA, ARKANSAS

N

SOURCE:

GRUBBS, GARNER & HOSKYN, INC.

CONSULTING ENGINEERS

FILE: 90B550C

JUNE 1990

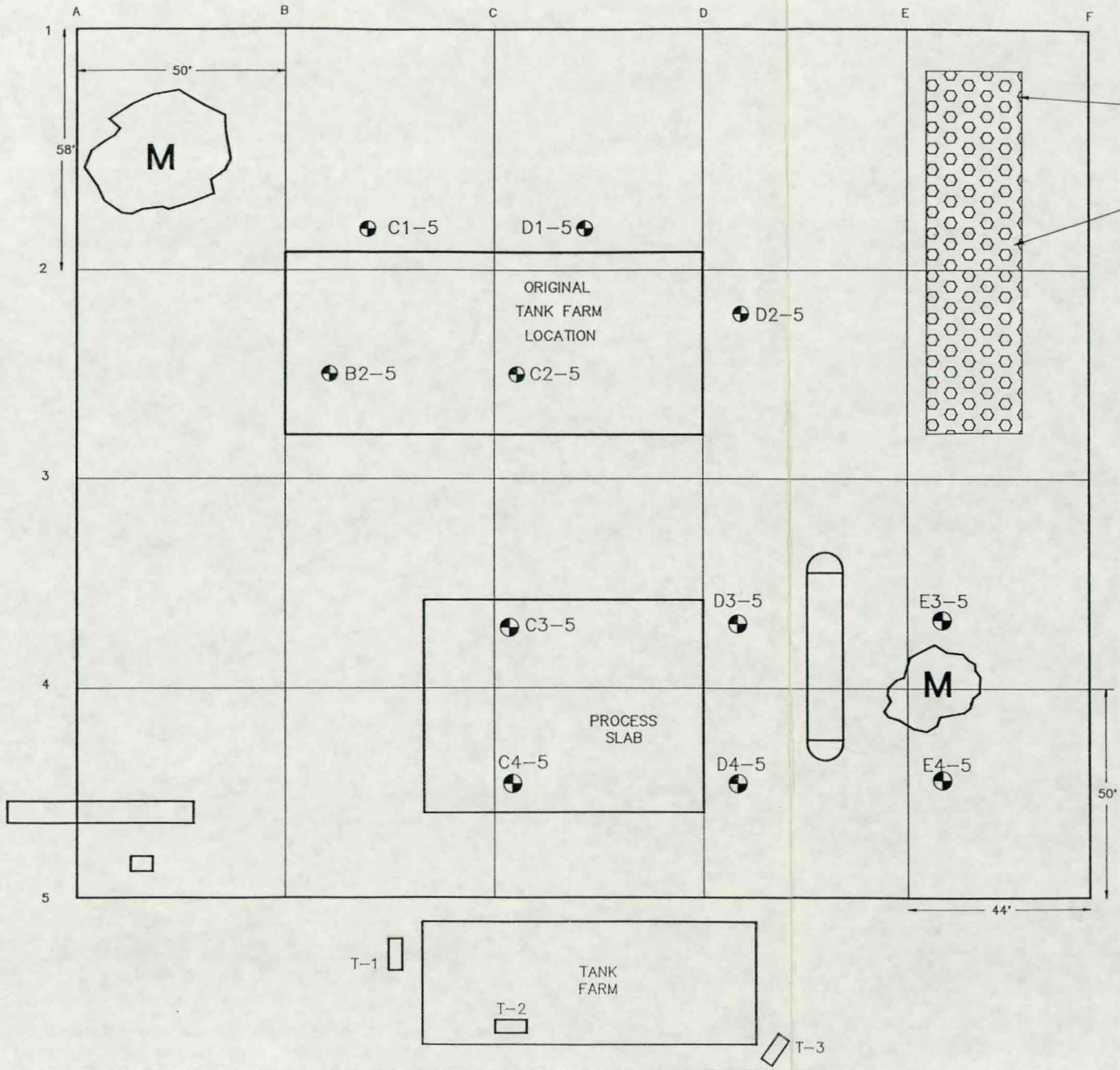
SCALE: 1"=200'

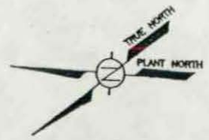
FIGURE 2

FIGURE 2 A

MAGNETIC GRADIENT

CONTOUR MAP





APPROXIMATE LOCATION OF BURIED DRUMS

LEGEND:

- APPROXIMATE LOCATION OF BURIED DRUMS
- T–3 AREA TRENCHED
- M AREA DUG TO LOCATE METAL
- SAMPLE BORINGS
- 50' X 50' GRID (UNLESS OTHERWISE NOTED)

DATE	REVISION	DRWN/CHKD

SITE CHARACTERIZATION AND
DRUM DISPOSAL SOIL SAMPLING
CEDAR CHEMICAL CORPORATION

Woodward-Clyde Consultants
Consulting Engineers, Geologists
and Environmental Scientists
Baton Rouge, Louisiana

CEDAR CHEMICAL CORPORATION
WEST HELENA, ARKANSAS

SCALE:	MADE BY: J.B.	DATE: 4/18/90	FILE NO.
N.T.S.	CHECKED BY:	DATE:	90B550C

SUBSURFACE BORING AND TRENCHING
LOCATION MAP

FIGURE 3

FIGURE 4

BORING LOG FORM

LOG OF BORING

PROJECT

LOCATION

CLIENT

BORING _____
FILE _____
DATE _____
TECHNICIAN _____
APPROVED _____
PAGE _____ of _____

DRY AUGERED

WASH BORED

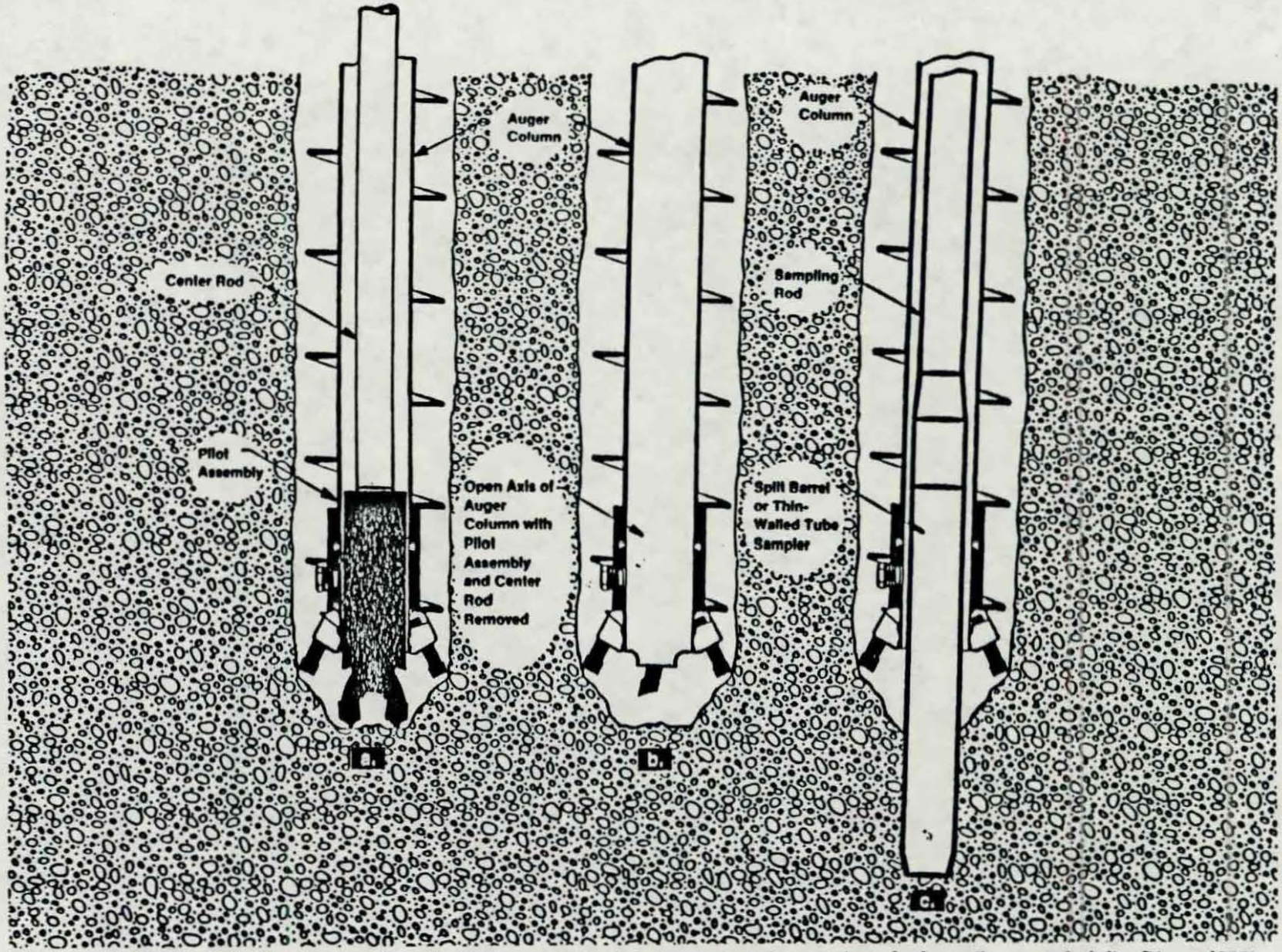
DEPTH (FEET)	SAMPLE	S.P.T. (B/FT) OR PEN. PER. (TSF)	COMPRESSIVE STRENGTH (TSF)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	L.L. (%)	P.I. (%)	DESCRIPTION OF STRATUM

FIGURE 4

WOODWARD-CLYDE CONSULTANTS

FIGURE 5

HOLLOW STEM SAMPLING PROCEDURES



Sequential steps showing borehole advancement with pilot assembly and collection of a formation sample (after Riggs, 1983).

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Baton Rouge, Louisiana

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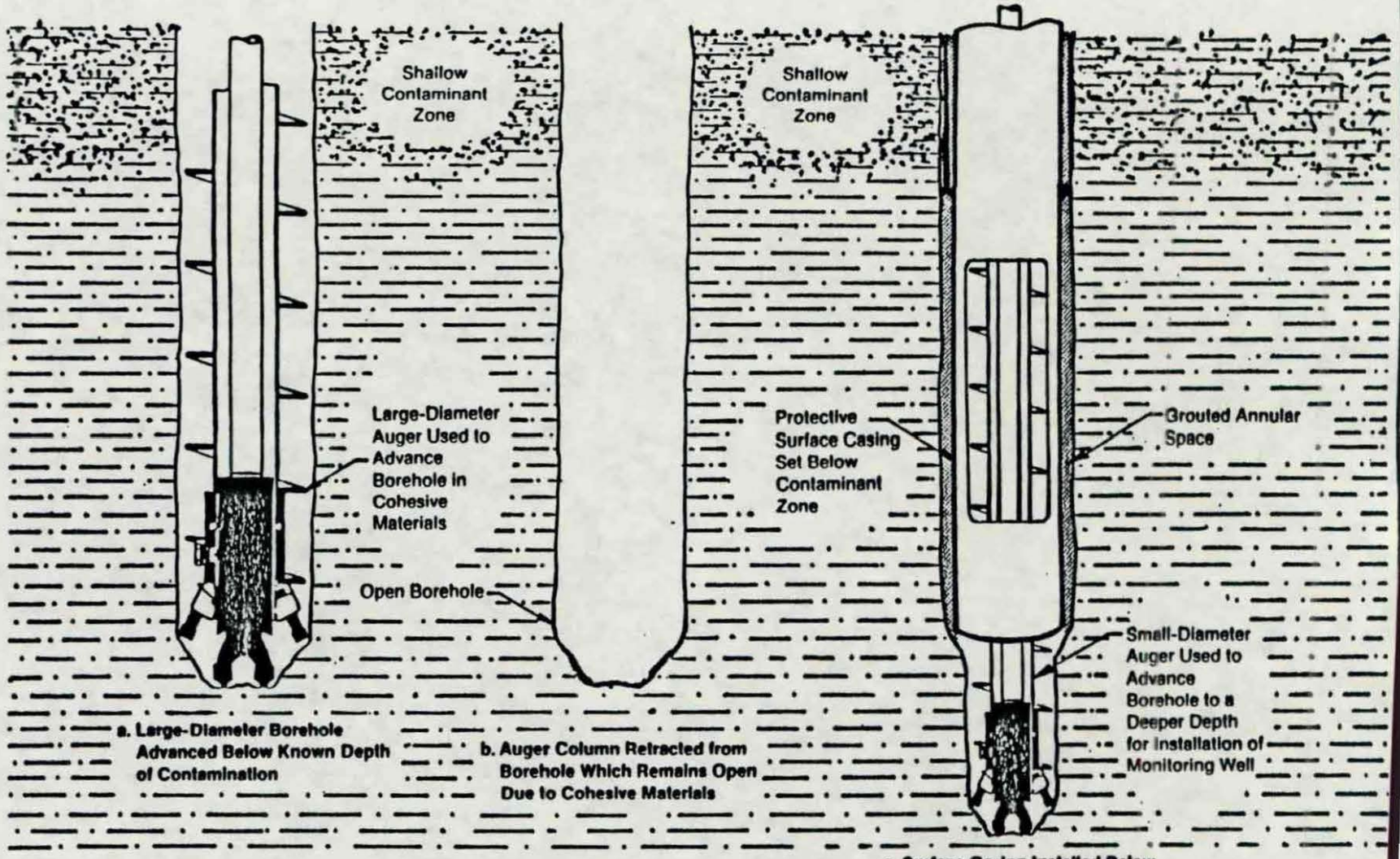
DATE: 11-19-90

HOLLOW STEM SAMPLING PROCEDURES

FIG. NO. 5

FIGURE 6

INSTALLATION OF PROTECTIVE CASING



a. Large-Diameter Borehole Advanced Below Known Depth of Contamination

b. Auger Column Retracted from Borehole Which Remains Open Due to Cohesive Materials

c. Surface Casing Installed Below Known Depth of Contamination with Drilling Continued Using Smaller Diameter Auger

Sequence showing the installation of protective surface casing through a shallow contaminated zone in a cohesive formation.

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Baton Rouge, Louisiana

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DATE:
CHKD. BY: YK
DATE: 4-11-90

INSTALLATION OF PROTECTIVE CASING

FIG. NO. 6

ATTACHMENT 1

HEALTH AND SAFETY PLAN

SITE CHARACTERIZATION AND DRUM DISPOSAL AREA DELINEATION

CEDAR CHEMICAL, WEST HELENA, ARKANSAS

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1	Safety Guidelines for Drilling

1.0 INTRODUCTION

This Health and Safety Plan has been developed to provide the health and safety guidelines which will be required to conduct field activities associated with the site characterization and drum disposal area delineation at the Cedar Chemical facility near West Helena, Arkansas.

All employees of Woodward-Clyde Consultants (WCC) and WCC subcontractors involved in this project are required to abide by the provisions of this plan. They are required to read this plan and sign the attached Compliance Agreement. The information presented in this plan may be used only as guidelines to aid non-WCC employees/subcontractors in preparation of their own task-specific health and safety plans.

Each contractor is responsible for implementation of their company's health and safety plan and compliance with applicable OSHA regulations. The health and safety guidelines and requirements presented are based on a review of available information and an evaluation of potential hazards which may be present during the work tasks anticipated by WCC and their subcontractors. This plan outlines the health and safety procedures and equipment required for activities at this site to minimize the potential for exposures of field personnel.

Work tasks conducted by other contractors may require an additional evaluation of potential hazards. This plan may be modified by the WCC project manager with the approval of the central operating group health and safety officer in response to additional information obtained regarding the potential hazards to field investigative personnel.

All WCC employees, visitors, and their subcontractors, while on the jobsite, are required to comply with the provisions of this manual. Cedar Chemical's standard

procedures which may constitute a part of this manual as an Addendum must also be complied with by all WCC employees, visitors and subcontractors.

2.0 SITE BACKGROUND

2.1 Site Location

The Cedar Chemical Company facility is located by the intersection of Arkansas Highway 242 and Industrial Park Road near West Helena, Arkansas. A drum burial area that has been uncovered is located about 500 feet east of the main office building.

2.2 Site History

During construction activities for the purpose of plant expansion, buried drums were uncovered. The drums were 6 to 12 feet below ground surface. Eight drums were removed upon unearthing. The drums have been analyzed and determined to contain DNBP. It has been determined that the drums were buried around 1972 when the plant manufactured DNBP and was operated by Ansul Corporation. DNBP or 2 (sec butyl) 4,6 dinitrophenol is no longer in use as a pesticide. It is still used as a diamine inhibitor in industrial processes, e.g., to deter polymerization of styrene in industrial processes.

2.3 Site Description

The drum burial area is approximately 15 feet from north to south and 60 feet from east to west and located in the southeast corner of the construction area for plant expansion.

3.0 KEY PERSONNEL

The following is a description of job responsibilities for this project:

3.1 Project Manager - Richard D. Karkkainen (504) 291-1873

For this project, the project manager has the following responsibilities:

- To see that the project is executed in accordance with the work plan and to safeguard the interests of Cedar Chemical.
- To see that the project is performed in a manner consistent with the WCC QA/QC program and health and safety program.
- To have an approved Health and Safety Plan prepared and properly implemented for this project.
- To provide the central operating group health and safety officer with project information related to health and safety matters and development of the Health and Safety Plan.
- To implement the Health and Safety Plan.
- To insure compliance with the Health and Safety Plan by WCC and contractor personnel.
- To coordinate with the central operating group health and safety officer on health and safety matters.

The project manager has the authority to take the following actions:

- To determine matters relating to schedule, cost and personnel assignments on hazardous waste management projects.
- To temporarily suspend field activities, if the health and safety of personnel are endangered, pending further consideration by the central operating group health and safety officer or operating group health and safety officer.

- To temporarily suspend an individual from field activities for infractions of the Health and Safety Plan, pending further consideration by the central operating group health and safety officer or operating group health and safety officer.

3.2 Health and Safety Officer - F. Robert Siener (504) 293-9785

The health and safety officer has the following responsibilities:

- To interface with the project manager as may be required in matters of health and safety.
- To develop a Health and Safety Plan for the project and to submit it to the corporate health and safety officer for approval.
- To appoint or approve a site safety officer to assist in implementing the Health and Safety Plan.
- To monitor compliance with the approved Health and Safety Plan.
- To assist the project manager in seeing that proper health and safety equipment is available for the project.
- To approve personnel to work on this site with regard to medical examinations and health and safety training.

The health and safety officer has the authority to take the following actions:

- To suspend work or otherwise limit exposures to personnel, if a health and safety plan appears to be unsuitable or inadequate.
- To direct personnel to change work practices, if they are deemed to be hazardous to health and safety of personnel.
- To remove personnel from the project, if their actions or condition endangers their health and safety or the health and safety of co-workers.

3.3 Site Safety Officer - To be selected at site

The site safety officer has the following responsibilities:

- To direct health and safety activities onsite.
- To report safety-related incidents or accidents to the project manager and central operating group health and safety officer.
- To assist the project manager in all aspects of implementing the Health and Safety Plan.
- To maintain health and safety equipment onsite, as specified in the Health and Safety Plan.
- To perform health and safety activities onsite, as specified in the Health and Safety Plan, and report results to the project manager and the central operating group health and safety officer.
- To limit access to the site to authorized personnel.

The site safety officer has the authority to take the following actions:

- To temporarily suspend field activities, if health and safety of personnel are endangered, pending further consideration by the central operating group health and safety officer or operating group health and safety officer.
- To temporarily suspend an individual from field activities for infractions of the Health and Safety Plan, pending further consideration by the central operating group health and safety officer.
- To suspend work and notify Cedar Chemical security of unauthorized personnel entry into the site.

4.0 SCOPE OF SOIL SAMPLING

4.1 Summary

The sampling activities outlined in this sampling plan are designed to characterize soils at the construction site, to supplement the magnetometer survey in locating additional buried drums, and to characterize soils in the area of the drum disposal site (s) in order to delineate the boundaries of that site. Soil samples will be collected by compositing 5-foot soil boring intervals down the ground water as outlined in Section 4.0. Data collected during this study will be used to delineate the horizontal and vertical distribution of DNBP and additional compounds which may be found in the drum disposal area (s). These compounds will include Dichloroanalin and Orthodichlorobenzene.

4.2 Site Characterization

A 50-foot grid will be outlined on the construction area as permitted by field conditions, using a tape measure and fluorescent orange paint. This grid will serve as a sample location guide for the placement of 12 boring locations inside the proposed construction site (see Figure 3).

Prior to the commencement of drilling activities at the site, a magnetometer survey will be employed as described in Section 2.0. The results of this survey will be overlain with the 50-foot grid outline and used to select final sample locations.

These final sample locations will be determined in the field and will be consistent with the original 50-foot grid design pictured in Figure 3. No grid sample locations will be eliminated unless magnetometer survey results reveal the presence of buried drums within 5 to 10 feet of the sample location. Sample locations will be flagged with flag material bearing the boring location identification. Soil boring operations will take

place at these final designated sample locations. No drilling operations will take place within 20 feet of delineated drum disposal perimeters.

The soil samples will be analyzed for DNBP by Cedar Chemical. The results will be plotted on Figure 3 while the drilling rig is on site. In the event that concentrations of DNBP greater than 80 ppm are found, additional boring locations will be chosen to pinpoint, to the extent possible, the source of the DNBP to ascertain if there are buried drums which were not discovered earlier by the magnetometer survey.

4.3 Drum Disposal Sites

One drum disposal area has been identified at the Cedar Chemical site. A magnetometer survey will be employed to delineate the perimeter of this buried disposal site (see Section 2.0).

Soil samples will be collected from the area outlying the drum disposal area. Samples will be collected 20 feet outside the estimated perimeter using procedures outlined in Section 4.0. Samples will be collected from locations pictured in Figure 3. Any drum burial areas which are delineated as a result of the magnetometer survey will be sampled in this same manner: one centerline boring set back 20 feet from delineation site. These identified drum disposal sites will be excavated following provisions to be outlined in a separate work plan. This plan will include sampling at selected locations in the areas beneath the drums, as well as a closure report.

5.0 HAZARD EVALUATION

Chemical Hazards

- o Inhalation of low concentrations of organic vapors and particulate
- o Skin and eye contact with organic contaminants
- o Ingestion of organic contaminants

Physical Hazards

- o Heat stress
- o Noise

Biological Hazards

- o Mosquitos, snakes and fire ants

5.1 Chemical Hazards

Personnel may be exposed to chemical hazards through three routes of exposure: inhalation, skin and eye contact and ingestion.

Inhalation exposures may be present during the work activities. Substances listed in this section indicate allowable exposure limits for inhalation. These limits are intended as guidelines and should not be construed as fine lines between safe and unsafe conditions. Efforts will be made to keep concentrations as low as possible. These guidelines are concentrations of contaminants that most workers can be exposed to for a 40-hour work week on a permanent basis with out significant health effects.

The Permissible Exposure Limit (PEL) represents the standards promulgated by the Occupational Safety and Health Administration. The PELs may be promulgated for 8-hour time weighted averages (TWA) or short-term exposure limits (STEL).

Threshold Limit Values (TLV) are guidelines recommended by the American Conference of Governmental Industrial Hygienists (ACGIH). TLVs may be recommended for TWA or STEL exposures.

Concentrations which are Immediately Dangerous to Life and Health (IDLH) represent the maximum level from which one could escape within 30 minutes without any impairing symptoms or irreversible health effects. IDLHs are not available for some contaminants and are not recommended for chemicals which are potential carcinogens.

Skin and eye contact with chemical hazards can cause serious burns, rashes or irritations. In addition, skin contact may increase internal body exposure through absorption. Chemicals with known skin contact hazards are indicated after the chemical name. All field personnel should report any skin or eye contact symptoms to their site safety officer and be treated as soon as possible by a physician.

Ingestion of chemical hazards will be controlled on this site by prohibiting any eating, smoking, or drinking in the immediate work area and by requiring all field personnel who become exposed to contaminants to decontaminate themselves upon leaving the work area.

The hazards present at the site have been identified by Cedar Chemical Corporation as Kerosine, Dichloroaniline, o-Dichlorobenzene, and DNBP, a pesticide no longer in agricultural use but with some use in industrial processes.

Table 5-1 and Appendix 3 lists specific chemical hazards of the aforementioned compounds.

TABLE 5-1

CONTAMINANTS POTENTIALLY PRESENT SUBSURFACE ENVIRONMENT

Chemical Name	Description	Exposure Limits	Hazard/Effects of Exposure
Dinoseb or Dinitrobutylphenol (DNBP)	Reddish-brown liquid, or Yellow to brown solid pungent, organic acid odor	ACGIH-TLV 0.3 mg/m^3 or 30 ppb	Poisonous, toxic, readily absorbed by skin. Possible fire risk. Strong irritant.
Kerosine (Burner Fuel)	Pale Yellow or water-white, mobile, oily liquid; mild petroleum odor	NIOSH recommended 10 Hr TWA 100 mg/m^3 or 14 ppm	High vapor concentration or liquid contact can irritate eyes. Prolonged or repeated contact with skin can cause defatting, irritation and dermatitis.
Dichlorobenzene	Colorless liquid with aromatic odor.	OSHA-PEL 50 ppm (ceiling) Skin hazard	Liquid is irritating to skin and eyes and harmful if swallowed.
Dichloroaniline (DCA)	Light brown or amber-colored needle-like	For Aniline: OSHA-PEL 5 ppm IDLA - 100 ppm AGGIA+TLV - 2 ppm	High toxicity via oral route. 3,4-DCA offends the eyes.

Potential hazards may be minimized by protecting against exposures to contaminated soils by utilizing appropriate personal protective equipment. Personal protective equipment to protect the body against contact with known or anticipated chemical hazards has been divided into four categories by the EPA (i.e., Level A., B, C and D) according to the degree of protection afforded.

Human exposure to dinoseb and other contaminants are expected to be low due to the physical characteristics of the contaminants, their expected concentrations in the soils and the work activities associated with the project. Dinoseb may be present in the liquid form or on contaminated soil particulates. Due to the low vapor pressure of dinoseb (mm Hg at 151°C) and the fact that pure liquid is not likely to be encountered, vapor concentrations are not expected to be significant. Soil particles contaminated with dinoseb may present a hazard, however, work activities are not expected to generate significant concentrations of dust.

Personnel performing the magnetometer survey will use regular Tyvek and no respiratory protection. Sampler exposure to potentially contaminated soil will occur only at the sampler's hands which will be gloved.

Field activities for the subsurface investigation activities have been grouped by the levels of protection required and listed in Table 5-2.

TABLE 5-2

WORK ACTIVITIES ASSOCIATED WITH LEVELS OF PROTECTION

Soil Boring Activities Near Suspected Drum Disposal Area

Personnel/Activity	PPE Level
Drill crew performing soil borings within 20 feet of delineated drum disposal area or within 20 feet of positive magnatometer readings suspected of being buried drums.	Level C with Polycoated Tyvek or equivalent and organic vapor/particulate air-purifying respiration
Decontamination	Modified Level D with Polycoated Tyvek or equivalent
All others	Level D

All Other Soil Borings

Personnel/Activity	PPE Level
Drill crew performing all other soil borings	Modified Level D with Polycoated Tyvek or equivalent
Decontamination	Modified Level D with Polycoated Tyvek or equivalent
All others	Level D

5.2 Physical Hazards

Personnel should be cognizant of the fact that when protective equipment such as respirators, gloves, and protective clothing are worn, visibility, hearing, and manual dexterity are impaired. Personnel involved in drum handling activities should be aware

of hazards associated with working around heavy equipment.

o Heat Stress

Protective equipment required for some activities, including coveralls and respirators, places a physical strain on the wearer. Heat exhaustion and heat stroke are possible, especially during warm weather. The risk of heat illness is especially high for workers wearing chemical protective clothing. The body temperature is normally maintained in a safe range by evaporative cooling. Humidity, air movement and air temperature all affect the sweat evaporation rate and resultant cooling. Impervious suits greatly reduce the potential for perspiration to evaporate.

The normal heat stress index involves use of an index that incorporates dry bulb air temperature, wet bulb air temperature (which is influenced by humidity and air movement) and radiant heat. The index used is referred to as WBGT. The Threshold Limit Values for heat stress are based on the formula:

WBGT = 0.7 natural wet bulb + 0.2 globe temperature + 0.1 dry bulb temperature

The TLV limits are based on a combination of work load, WBGT temperature in degrees centigrade and the work/rest regimen. The values may be seen in Table 5-3.

The WBGT index specifically is for workers in normal clothes and must not be applied directly for workers in impervious suits. The chemically protective suits are estimated to add between 6° and 11° C to the WBGT index (AIHA Journal, May 1987). The use of personal cooling devices (ice vests, etc.) for employees not working in environmentally controlled (air conditioned) areas will be a main heat stress reduction technique and will make the WBGT table more applicable to the anticipated work conditions.

If in the opinion of the Health and Safety Officer heat stress monitoring is appropriate, it will be performed. The high heat and humidity which may be present at this project may require WBGT monitoring whenever the ambient temperature exceeds 70° F or 21° C. The instrument used will be a Reuter-Stokes RSS-212 Portable Heat Stress Monitor or equivalent.

Heat stress testing (as stated in Appendix 1, the heat stress casualty prevention plan) for site employees wearing impermeable clothing may begin when the WBGT temperature reaches 75° F or 24° C. The TLV WBGT schedule for work/rest is the recommended standard. The Site Safety Officer will evaluate the results of heat stress testing provided (heart rates, oral temperature, body weight change) to determine if rest period modifications are required. Fluids will be provided on site in order to maintain body fluid levels of the field personnel. Where feasible, worker rotation into positions of less heat stress should be done to limit worker fatigue. All rest areas will be environmentally controlled (approximately 76° F).

TABLE 5-3

PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUES
(VALUES ARE GIVEN IN ° C WBGT)

Work/Rest Regimen	Work Load		
	Light*	Moderate**	Heavy***
Continuous work	30.0	26.7	25.0
75% Work - 25% Rest, each hour	30.6	28.0	25.9
50% Work - 50% Rest, each hour	31.4	29.4	27.9
25% Work - 75% Rest, each hour	32.2	31.1	30.0

* Light work	Sitting or standing to control machines, performing light hand or arm work (up to 200 Kcal/hr or 800 Btu/hr)
** Moderate work	Walking about with moderate lifting and pushing (200 to 350 Kcal/hr or 800 to 1400 Btu/hr)
*** Heavy work	Pick and shovel work (350 to 500 Kcal/hr or 1400 to 2000 Btu/hr)

o Noise

Noise hazards may be present from process equipment, maintenance activities or heavy equipment operations. Personnel exposed to noise levels in excess of permissible noise exposures as defined by 29 CFR 1910.95 shall be protected. Where feasible, administrative or engineering controls shall be utilized. If control measures are not effective and until controls are implemented, personnel shall wear approved personal protective equipment in the form of ear plugs or muffs.

Personnel who are exposed to a time weighted average of greater than 85dBA shall be required to participate in a hearing conservation program as defined by 29CFR 1910.95.

5.3 Biological Hazards

Mosquitoes, fire ants and snakes have been identified as biological hazards. Care should be taken not to move through tall grass or around vegetative deadfall without

inspecting placement of feet. Ant hills could be encountered or snakes as well. A First Aid Kit will be available to administer to insect bites or snake bites.

6.0 GENERAL HEALTH AND SAFETY REQUIREMENTS

6.1 Medical Examination

All personnel working on site must take an annual medical examination as part of a medical surveillance program as required in CFR 29 Part 1910. Contractors involved in hazardous field activities shall provide for medical examinations for their employees. Physicians opinions on all workers will be submitted to the Site Safety Officer prior to starting work. Personnel with jobs of short duration (2 to 4 hours) who are fully escorted may be exempted from the physician's opinion requirements at the discretion of the Site Safety Officer and the WCC project manager.

6.2 Safety Training Documentation

Once operations have begun, all personnel working on site will supply certificate or equivalent attesting to completing 40 hours of required training per OSHA 1910.120. Site supervisors will be required to supply a certificate indicating that an additional 8 hours of training has been completed. Escorted visitors may be allowed in the restricted area without 40 hours training at the discretion of the Site Safety Officer and the WCC project supervisor.

6.3 Compliance Agreement

The Site Safety officer shall hold meetings with all field personnel before work commences. During the meeting, the plan shall be reviewed and discussed and questions answered. Signed Compliance Agreement Forms and Safety Orientation Forms shall be filed by the Site Safety Officer. Individuals refusing to sign the form will not be allowed to work on the site.

6.4 Site Entry Notification

Cedar Chemical Corporation, contractors, and subcontractors shall provide a written list of their employees who will be entering the site for approval prior to actually entering the site. All other personnel must inform the WCC Project Manager or his representative before entering the site; appropriate escorting will be provided. Cedar Chemical personnel may be on site whenever work is performed. Personnel must be in visual contact with each other or carry two-way radios during all field activities.

If any unidentified potential hazards are discovered during any field work, the Project Manager or his designated representative will be called for further instructions.

6.5 Site Safety Meetings

During field operations, daily safety meetings will be held by the Site Safety Officer to review and plan the specific health and safety aspects of scheduled work for that day.

6.6 Prohibitions

- Smoking, eating, drinking, chewing gum or tobacco, storing food or food containers shall not be permitted on the work site. Good personal hygiene should be practiced by field personnel to avoid ingestion of contaminants or spread of contaminated materials.
- Ignition of flammable liquids within, on, or through improvised heating devices or space heaters
- Approach or entry into areas or spaces where toxic or explosive concentrations of gases or dust may exist without proper equipment available to enable safe entry.
- Conducting on site operations within waste handling zone without back up personnel in the non-contaminated staging area.

6.7 Incident Reporting

Any incident or accident involving personnel on site will require that an Incident/Accident Report be filed. Situations, no matter how minor, covered by this policy include but are not limited to fires, explosions, illnesses, injuries, and automobile accidents. These reports must be sent to the employee's Health and Safety Representative. Worker's Compensation Insurance reports should be filed within 48 hours of each accident or illness which results from work related activities and requires medical attention. See Appendix 2 for an example of Hazardous Waste Incident Report. Use this form in case of an accident or incident.

6.8 Project Safety Log

Project logs will be used to record the names, entry and exit dates and times of all personnel and of project site visitors; accidents, injuries, and illnesses; incidences of safety infractions by field personnel; air quality and personal exposure monitoring data; and other information related to safety matters. All accidents, illnesses or other incidences shall be reported immediately to the Site Safety Officer and the WCC Project Manager or his representative.

6.9 Safety Equipment Required

Potential hazards from contaminants may be minimized by protecting against exposures to toxic materials by utilizing appropriate personal protective equipment. Personal protective equipment to protect the body against contact with known or anticipated chemical hazards has been divided into four categories by U. S. EPA (i.e., Level A, B, C and D) according to the degree of protection afforded.

All personnel engaged in activity at the site will employ the following basic personnel protective equipment:

- Safety glasses
- Hard hat

- Boots with steel toes
- Chemical splash goggles

Personnel shall wear the first three items at all times except in designated locations, and shall have the goggles readily available at all times.

Because of the possibility that respiratory protection may be necessary, all subcontractors and their employees must submit documentation indicating that proper fit has been demonstrated for specific models of air-purifying respirators.

Level A protection should be worn when the highest level of respiratory, skin and eye protection is needed. The protective equipment for Level A include:

- Pressure-demand, self-contained breathing apparatus (SCBA), approved by the Mine Safety and Health Administration (MSHA) and National Institute of Occupational Safety and Health (NIOSH)
- Fully encapsulating chemical-resistant suit
- Gloves (outer), chemical-resistant; viton, nitrile, PVC or neoprene
- Boots, chemical-resistant
- 2-way, intrinsically-safe radio

Level B protection should be employed when the highest level of respiratory protection is needed but a lesser level of skin protection is required. The equipment for Level B protection includes:

- Pressure-demand (self-contained) breathing apparatus (SCBA) or pressure-demand supplied air respirator with escape SCBA (including 5 minute bottle)(MSHA/NIOSH approved)
- Chemical-resistant clothing with hood; disposable Tyvek Saranex
- Gloves (outer), chemical-resistant; viton, nitrile, PVC or neoprene
- Boots, chemical-resistant
- 2-way, intrinsically-safe radio

Level C protection is selected when the types of airborne substance(s) are known, the concentration(s) is measured and the criteria for using air purifying respirators are met. Level C protective equipment include:

- Full-face or half-face, air purifying, cartridge-equipped (organic vapor/acid gas and particulate) respirator (MSHA/NIOSH approved)
- Chemical-resistant clothing; such as disposable polycoated Tyvek
- Face shield, if half-face respirators are used
- Gloves (outer), chemical-resistant; viton, nitrile, PVC or neoprene
- Boots, chemical-resistant;

Modified Level D provides for dermal protection, but no respiratory protection.

- Chemical-resistant clothing; such as polycoated Tyvek
- Gloves, chemical-resistant; viton, nitrile, PVC or neoprene
- Face shields where splash hazards are present
- Boots, chemical-resistant
- Safety glasses with side shields
- Hard hat

Level D protection includes:

- Chemical-resistant clothing; such as disposable Tyvek
- Gloves, chemical resistant; viton, nitrile, PVC or neoprene
- Boots, chemical resistant

The protection levels which have been selected are based on the hazard evaluation (Section 5.0) and may be revised based on field measurements during field activities.

Therefore all subcontractors and their employees must provide the documentation of the following:

- Annual medical examination with favorable physician's opinion for hazardous waste work
- OSHA 40-hour training for hazardous waste work activities
- Annual 8-hour refresher training for hazardous waste work activities as applicable
- Air-purifying respirator fit-test

6.10 Work Zones

To minimize the movement of contaminants from the site to uncontaminated areas, three work zones will be set up after the site assessment and prior to the removal action and sampling of drums. The three work zones will include the following:

Zone 1:	Exclusion Zone
Zone 2:	Contamination Reduction Zone
Zone 3:	Support Zone

The exclusion zone is the zone where contamination does or could occur. The exclusion zone will be defined initially by a 20-foot area around the drums. Air monitoring and observation by the site safety officer will determine the extent of the zones. All persons entering this zone must wear the level of protection set forth in Section 5.0, Hazard Evaluation. These levels of protection guidelines are based on the different types of field activities.

Between the exclusion zone and support zone is the personnel contamination reduction zone (CRZ) which provides a transition zone between the contaminated and clean areas of the site. This zone will be located directly outside of the exclusion zone and will be defined as a 10-foot zone directly outside the exclusion zone.

The support zone will be an uncontaminated area from which operations will be directed. It is essential that contamination from the site be kept out of this area. Included in this area will be a storage area for decontaminated clothing, personal protective equipment and some personal clothing, such as shoes.

6.11 Equipment Decontamination

The equipment decontamination procedure will be conducted using a steam cleaner. Decontamination will be done prior to project site arrival. Decontamination will take place in the field by washing directly above drums or temporary decon area set up by the subcontractor in the BSC area (See Figure 2). Decontamination fluids will be collected in drums and disposed by Cedar Chemical.

Decontamination facilities must be adequate in size to handle the largest piece of contaminated equipment, for example, the blade of a bulldozer.

6.12 Personnel Decontamination

All personnel will be required to undergo decontamination when leaving the exclusion zone.

The following steps must be taken for decontamination of personnel:

- Deposit equipment that needs to be decontaminated on plastic drop cloths.
- Wash suits, boots and outer gloves with long handled brushes in No. 3 wash tub containing detergent water.
- Rinse suits, boots and outer gloves with long handled brushes in a No. 3 wash tub containing clear water or use a sprayer to rinse off boots and gloves if one is available.

Coveralls should be removed by turning the clothing inside out. A general sequence of doffing procedures is outlined below. The extent of washing required, or modifications to the sequence, may be specified as appropriate.

Steps in decontamination will be as follows:

- Wash and rinse outer protective coverall
- Wash work gloves and boots
- Remove outer protective clothing
- Rinse respirator
- Wash hands and face

Any contaminated protective clothing will be properly disposed of in sealable containers. Provisions for emergency decontamination will be available in the construction zone. For example, clean water will be provided for decontamination of personnel (to rinse work gloves and boots, etc.), in the event of an emergency situation. Potable water must be used for personal decontamination. Personnel decontamination will take place in the field. Decontamination fluids will be placed in drums provided by Cedar Chemical.

7.0 LABORATORY CONSIDERATIONS

7.1 Field Sampling

WCC will conduct field sampling as required by the work plan. Additional information regarding field sampling considerations may be presented in an Addendum to this plan.

8.0 PERSONAL PROTECTIVE EQUIPMENT

This section outlines the general usage guidelines for personal protective equipment.

8.1 Head Protection

Hard hats must be worn by all personnel working onsite.

8.2 Eye Protection

Safety glasses must be worn by all personnel performing activities at all times. Safety goggles will be carried by all personnel at all times and worn as necessary. An eyewash station will be set up by the site safety officer prior to commencing field activities and should be placed so that it could be used quickly in an emergency. Faceshields will be worn by all personnel in Level C not protected by full face respirators when splash hazards are present.

8.3 Skin Protection

Chemically-resistant coveralls are required and gloves must be worn by all personnel engaged in waste-related activities at the site. Where hoods are required,they can be either attached to, or separate from, the coveralls. Used disposable items may be re-used after decontamination provided they are not torn or breeched and show no signs of fabric contamination. Disposable items will be disposed of in a designated sealable container after each use or when they become worn or punctured. Non-disposable items will be decontaminated after each use and disposed of in a designated sealable container when they become worn or punctured.

8.4 Foot Wear

Chemically resistant boots will be worn by field personnel engaged in all field activities at the site.

8.5 Respiratory Protection

For work zones requiring Level A or B protection, the following NIOSH-approved equipment will be provided: pressure-demand, full-face piece, self-contained breathing apparatus (SCBA), or pressure-demand supplied air respirator with escape SCBA (in-line, 5 minute bottle) must be used by all personnel engaged in Level A or B work activities at the site. After use, all respiratory protective equipment must be taken to the decontamination and repair station. No facial hair will be allowed that will interfere with mask fit.

For Level C work, the following protective equipment will be provided: respirators, full-face or half-face mask, with organic vapor/acid gas and dust air purifying cartridges must be worn by all personnel engaged in all activities in the affected area. All personnel must be fit-tested for the specific brand of respirator to be used. The Contractors shall be responsible for fit testing their employees and shall provide proper records of the fit tests to the Site Safety Officer. A respirator which has not been successfully fit-tested cannot be used by an individual on the project. To ensure a proper fit, no facial hair will be allowed that will interfere with mask operation. Air purifying respirators will be used only if the following conditions are met:

- The oxygen content of the air is greater than 19.5 percent
- Concentrations of air contaminants are known and monitored.
- Most of the contaminants of concern all have good warning properties (i.e., odor threshold below TLV value).
- The protection factor is adequate and TLVs are not exceeded
- If concentrations of air contaminants exceed IDLH value, personnel must immediately evacuate.
- Cartridges are changed daily or whenever breakthrough occurs, whichever occurs first.
- Each person has been fit-tested for the specific brand and size of respirator used.
- The respirator is MSHA and NIOSH approved.

9.0 AIR QUALITY MONITORING DURING SITE CHARACTERIZATION

The primary goal of onsite air quality monitoring will be compliance with the specified contaminant action levels. The secondary goal will be documentation of personal exposures as required by OSHA 1910.120.

9.1 Responsibility/Authority

The Site Safety Officer (SSO) is responsible for implementation of the air monitoring program. The SSO must insure adequate instrumentation availability, proper calibration, proper field measurement techniques and recording of instrument response in the safety log book.

When action levels are exceeded, the SSO will communicate the required actions to the WCC project manager. In an emergency situation, the SSO may directly initiate an area evacuation.

Personal air monitoring results are required by OSHA to be communicated to the workers potentially exposed. A system of providing air sample results to workers will be coordinated.

9.2 Air Monitoring Zones

Air monitoring will be the key factor in determining the size of the Level B, C and D exclusion zones. Two separate sets of action levels have been developed. One set of action levels summarized in Table 9-1 is for work areas within the Level B zone. A second set of action levels summarized in Table 9-2 represents maximum levels in the C and D zones at the perimeter of the Level B zone. If these perimeter action levels are exceeded, the Level B exclusion zone will be expanded.

9.3 Air Quality Monitoring Instrumentation

The HNu PI 101 Photoionization Meter equipped with a 10.2 eV probe will be used to detect trace concentrations of certain organic gases and a few inorganic gases in the air. The HNu is most sensitive to aromatic hydrocarbons, aliphatic amines, and unsaturated chlorinated hydrocarbons. Carbonyl and unsaturated hydrocarbons, sulfides, ammonia, and the heavier paraffins (C_5 - C_7) can also be detected, but with a lesser degree of sensitivity. Methane, ethane and other light paraffins are not detected by the HNu.

A Flame Ionization Detector (FID) or Organic Vapor Analyzer may be utilized in lieu of a HNu with similar effect.

Dust concentrations in the construction area will be monitored if deemed necessary by the SSO with a GCA Mini Ram or equivalent instrument. Response to particulate fugitive dust concentrations will be as follows:

TABLE 9-1
AIR MONITORING ACTION LEVELS FOR LEVEL B WORK AREAS

SOIL BORING ACTIVITIES NEAR SUSPECTED DRUM DISPOSAL AREA

Instrument	Instrument Reading	Action Taken
HNu PI 101 with 10.2 eV Probe or Organic Vapor Analyzer	50 - 250 ppm	Continue Working
	>250 ppm	Evacuate Area

SOIL REMOVAL AND SOIL SAMPLING

Instrument	Instrument Reading	Action Taken
HNu PI 101 with 10.2 eV Probe or Organic Vapor Analyzer	50 - 250 ppm	Continue Working
	>250 ppm	Evacuate Area

RESPONSE LEVEL 1

Name	Action Concentration	Field Actions
Particulates	1 mg/m³	o Wear Level C Protection o Continue work and monitoring in immediate area o Take action to suppress dust - Spray exposed areas with water

RESPONSE LEVEL II

Name	Action Concentration	Field Actions
Particulates	10 mg/m³	o Suspend work activities o Take action to suppress dust as above in Response Level I o Move area personnel upwind of source o Resume work when action concentration is no longer exceeded in immediate area

TABLE 9-2

AIR MONITORING ACTION LEVELS FOR LEVEL C AND D WORK AREAS*

SOIL BORING ACTIVITIES NEAR SUSPECTED DRUM DISPOSAL AREA

Instrument	Instrument Reading	Action Taken
HNu PI 101 with 10.2 eV Probe	Background - 50 ppm	Level C Evacuate Area or Implement Level B Work Zone Requirement
	>50 ppm	

ALL OTHER SOIL BORINGS

Instrument	Instrument Reading	Action Taken
HNu PI 101 with 10.2 eV Probe	Background - 10 ppm	Level D
	10 - 50 ppm	Continue Working Upgrade to Level C
	>50 ppm	Evacuate Area or Level B

* These levels must not be exceeded at edge of Level B work zones.

10.0 EMERGENCIES/ACCIDENTS

There is risk associated with injury resulting from contact with the drums and operation of heavy equipment. All personnel should be aware that the protective apparel (Level C, D) limits visibility, hearing, and manual dexterity. In addition, the protective equipment places a physical strain on the wearer, especially in warm weather.

Any illness, injury or accident occurring onsite must be attended to immediately. The WCC site supervisor shall implement the following procedures where and when appropriate.

- The WCC site supervisor should stop site work and determine appropriate actions.
- Decontaminate and move any affected personnel to safety from the immediate hazard.
- Determine the nature of the emergency and the type of assistance needed, for example fire equipment, or medical help.

- Contact the West Helena Fire Department, West Helena Municipal Police or hospital emergency ambulance service if emergency assistance is needed.
- Report the incident to the Cedar Chemical representative and to the site safety officer.
- Complete a WCC-Hazardous Waste Incident Report, using Form HS-502 (Appendix 2).
- Develop procedures to prevent a reoccurrence of the illness, injury or accident and submit the procedures to the WCC Project Manager and project health and safety officer.

Emergency telephone numbers:

Helena Regional Medical Center	338-5900
Emergency Ambulance Service	572-9227
West Helena Fire Department	572-7911
West Helena Municipal Police Department	572-3441

11.0 HEALTH AND SAFETY MANUAL APPROVAL

Richard D. Karkkainen
WCC Project Manager

Date

Francis R. Siener, Jr., C. I. H.
Baton Rouge Health and Safety Officer

5/25/90
Date

Phil Jones, C. I. H.
WCC Corporate Health and Safety Officer

5/25/90
Date

12.0 HEALTH AND SAFETY PLAN COMPLIANCE AGREEMENT

I, _____ (print name), have reviewed a copy of the Health and Safety Plan for the Site Characterization and Drum Disposal at Cedar Chemical Corporation (90B550C-1). I understand it and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project for violating any of the safety requirements specified in the plan.

Signed:

_____ _____
(Signature) (Date)

Firm: _____

APPENDIX 1

HEAT STRESS CASUALTY PREVENTION PLAN (ADVISORY IN THE UNPLANNED EVENT THAT LEVEL B PROTECTION IS NECESSARY)

APPENDIX 1

HEAT STRESS CASUALTY PREVENTION PLAN

Due to the increase in ambient air temperatures and the effects of protective outer wear decreasing body ventilation, there exists an increase in the potential for injury, specifically, heat casualties. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and the prevention of heat stress casualties.

A. IDENTIFICATION AND TREATMENT

1) Heat Exhaustion

a) Symptoms: Usually begins with muscular weakness, dizziness, nausea, and staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, his skin is clammy, and he may perspire profusely. The pulse is weak and fast, his breathing is shallow. He may faint unless he lies down. This may pass, but sometimes it remains and death could occur

b) First Aid: Immediately remove the victim to the Personnel Decontamination Reduction Zone in a shady or cool area with good air circulation. Remove all protective outer wear. Call a physician. Treat the victim for shock. (Make him lie down, raise his feet 6 to 12 inches and keep him warm but loosen all clothing.) If the victim is conscious, it may be helpful to give him sips of a salt water solution (1 teaspoon of salt to 1 glass of water). Transport victim to a medical facility as soon as possible.

2) Heat Stroke

a) Symptoms: This is the most serious of heat casualties due to the fact that the body excessively overheats. Body temperatures often are between 107° - 110°F. First there is often pain in the head, dizziness, nausea, oppression, and the skin is dry, red and hot. Unconsciousness follows quickly and death is imminent if exposure continues. The attack will usually occur suddenly.

b) First Aid: Immediately evacuate the victim to a cool and shady area in the Personnel Decontamination Reduction Zone. Remove all protective outer wear and all personal clothing. Lay him on his back with the head and shoulders slightly elevated. It is imperative that the body temperature be lowered immediately. This can be accomplished by applying cold wet towels, ice bags, etc., to the head. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place him in a tub of cool water. The main objective is to cool him without chilling him. Give no stimulants. Transport the victim to a medical facility as soon as possible.

B. PREVENTION OF HEAT STRESS

1) One of the major causes of heat casualties is the depletion of body fluids. On the site there will be plenty of fluids available. Personnel should replace water and salts loss from sweating. Salts can be replaced by either a 0.1 percent salt solution, more heavily salted foods, or commercial mixes such as Gatorade. The commercial mixes are advised for personnel on low sodium diets.

2) A work schedule should be established so that the majority of the work day will be during the morning hours of the day before ambient air temperature levels reach their highs.

3) A work/rest guideline will be implemented for personnel required to wear Level B protection. This guideline is as follows:

Ambient Temperatures	Maximum Wearing Time
Above 90°F	1/2 hour
80°-90°F	1 hour
70°-80°F	2 hours
60°-70°F	3 hours

A sufficient period will be allowed for personnel to "cool down." This may require shifts of workers during operations.

C. HEAT STRESS MONITORING

For monitoring the body's recuperative ability to excess heat, one or more of the following techniques should be used as a screening mechanism. Monitoring of personnel wearing protective clothing should commence when the ambient temperature is 70 degrees Fahrenheit or above. Frequency of monitoring should increase as the ambient temperature increases or if slow recovery rates are indicated. When temperatures exceed 80 degree Fahrenheit, workers must be monitored for heat stress after every work period.

- Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33 percent), while the

length of the rest period stays the same. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle should be shortened by 33 percent.

- Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99 degree Fahrenheit. If it does, the next work period should be shortened by 10 minutes (or 33 percent), while the length of the rest period stays the same. However, if the OT exceeds 99.7 degrees Fahrenheit at the beginning of the next period, the following work cycle should be further shortened by 33 percent. OT should be measured again at the end of the rest period to make sure that it has dropped below 99 degree Fahrenheit.

Body fluids should be maintained at a consistent level during the work day. This requires replacement of salt lost in sweat as well.

Good hygienic standards must be maintained by frequent change of clothing and daily showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

APPENDIX 2

FORM HS-502
HAZARDOUS WASTE INCIDENT REPORT

APPENDIX 2

FORM HS-502
HAZARDOUS WASTE INCIDENT REPORT

DATE _____ PROJECT LOCATION _____ BUSINESS UNIT _____

DESCRIPTION OF INCIDENT, INCLUDING INJURIES, PROPERTY DAMAGE AND EMERGENCY ACTION TAKEN AND PERSONNEL INVOLVED (use additional sheets if needed):

_____

_____

_____

_____

_____

_____

_____

WITNESS OF INCIDENT:

_____

_____

_____

POSSIBLE OR KNOWN CAUSES:

_____

_____

_____

_____

_____ Reporter

_____ Business Unit Safety Officer

_____ Project Manager

_____ Corporate Health & Safety Officer

APPENDIX 3

MATERIAL SAFETY DATA SHEETS

MATERIAL SAFETY DATA SHEET
Equivalent to OSHA form 174

ODUCT NAME: TECHNICAL DINOSEB DATE: 08/15/86 PAGE 1
PA REG. NO.: 56077-3

ECTION I

---

nufacturer's Name: Cedar Chemical Corporation
5100 Poplar Ave. 24th Floor
Memphis, TN 38137
ergency Phone Number: 1-800-424-9300
formation Phone Number: 1-601-636-1231
repared by: M. S. Bernard

ECTION II HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

INGREDIENT	OSHA PEL	ACGIH TLV	PERCENT
nosab	n/d	0.5mg/m³	95.00
Dinoseb (2-sec-butyl-4,6-dinitrophenol)			
CAS # 88-85-7			
mpurities	n/d	n/d	5.00

ECTION III PHYSICAL/CHEMICAL CHARACTERISTICS

---

iling Point(°F)	above 212	Specific Gravity	1.258
apor Pressure(mm Hg.)	below 1	Melting Point(°F)	90
apor Density(Air=1)	n/a	Evaporation Rate	n/d

olubility in Water: 0.0052g/100ml
ppearance and Odor: Brown solid, organic acid odor

ECTION IV FIRE AND EXPLOSION HAZARD DATA

---

lash Point(Method Used): 350.6°F TCC
lammable Limits: LEL- n/d UEL- n/d
xtinguishing Media:
Water Fog, Foam, Alcohol Foam, CO_2, and Dry Chemical

ONTINUED ON PAGE 2

ecial Fire Fighting Procedures:
Self-Contained air supply. Confine water used in fire fighting.

usual Fire and Explosion Hazards:
Noxious fumes may form. Material undergoes rapid exothermic decomposition at 190°C. Vapors may ignite.

ECTION V REACTIVITY DATA

---

ability: Stable in normal use and storage.
onditions to Avoid: Heating above 100°C. Product undergoes rapid exothermic decomposition at 190°C. Avoid ignition sources.
compatibility: Strong Bases and Strong Oxidizers
azardous Decomposition or Byproducts: Oxides of Nitrogen
azardous Polymerization: Will not occur. No known conditions to avoid.

ICTION VI HEALTH HAZARD DATA

---

oute(s) of Entry: Inhalation: Moderate Toxicity
Skin: Readily Absorbed
Ingestion: Highly Toxic

ealth Hazards (Acute and Chronic):
Oral Ingestion: High Single Dose Oral Toxicity. LD_{50} for Rats 25 mg/kg. May be fatal if swallowed.
Eye Contact: May cause severe irritation and corneal injury. Corneal injury should heal in 1-2 weeks.
Skin Contact: May cause slight irritation or mild burn. Colors the skin yellow.
Skin Absorption: Readily absorbed through skin, high toxicity. LD_{50} rabbits 80mg/kg.
Inhalation: May be irritating. Cedar industrial guide for Dinoseb is 0.3 mg/m³.

arcinogenicity: NTP: Negative
IARC Monographs: Negative
OSHA Regulated: Negative.

igns and Symptoms of Exposure:
Fatigue, sweating, thirst, and fever. Increased metabolic rate.

edical Conditions Generally Aggravated by Exposure:
Liver and kidney problems may be aggravated by extreme exposure.

mergency and First Aid Procedures:

Oral Ingestion: Toxic by ingestion. Induce vomiting and seek medical help immediately.

Eye Contact: Flush immediately with continuous irrigation with flowing water for at least thirty minutes. Seek medical consultation immediately.

Skin Contact: Immediately flush skin with plenty of water for at least fifteen minutes while removing contaminated clothing. Consult physician. Wash clothing before reuse.

Inhalation: Remove to fresh air if effects occur. Consult physician.

ote to Physician:

Eyes: Stain for evidence of corneal injury. If cornea is burned. instill antibiotic steroid preparation frequently. Consult ophthalmologist. May cause temporary injury.

Overexposure: Treat for symptoms. No specific antidote. Human effects not established.

SECTION VII PRECAUTIONS FOR SAFE HANDLING AND USE

teps to Be Taken in Case Material Is Released or Spilled:

Use proper safety equipment. Absorb spill with absorbant inert material such as oil-dry. Dike area for large spills. Keep out of streams and water supplies.

aste Disposal Method:

Dispose of in non-crop area away from water supplies or in an approved landfill in accordance with State, Federal, and local regulations.

Precautions to Be Taken in Handling and Storing:

Do not get on skin, on clothing, or in eyes. Keep out of reach of children.

Other Precautions:

Do not breathe spray mists. Keep away from heat or flame.

SECTION VIII CONTROL MEASURES

Respiratory Protection:

None normally needed. During spraying use organic vapor respirator.

Ventilation: Required to control level of dinoseb.

Protective Gloves: Impervious rubber gloves

Eye Protection: Chemical workers' goggles

Other Protective Clothing or Equipment: Rubber boots and apron and body-covering clothing.

Work/Hygenic Practices: Shower after handling.

THE INFORMATION HEREIN IS SUPPLIED IN GOOD FAITH, BUT NO WARRANTY, EXPLICITE OR IMPLIED, IS MADE.

MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION
1145 CATALYN STREET
SCHENECTADY, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

NO. 488

KEROSINE BURNER FUEL

DATE November 1982

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: KEROSINE BURNER FUEL*
DESCRIPTION: Refined petroleum middle distilate consisting of hydrocarbons having ∿10-16 carbon atoms for use in burners and wick-fed lamps.
OTHER DESIGNATIONS: Kerosene Burner Fuel, Coal Oil, Range Oil, ASTM D3699, CAS #008 008 206.
MANUFACTURER: Available from many suppliers.

*The spelling "kerosine" is preferred by ASTM and ACS. See also Kerosene Solvent, MSDS #387

SECTION II. INGREDIENTS AND HAZARDS

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Hydrocarbon Mixtures (variable) consisting of paraffins (mainly), naphthenes, olefins & aromatics	>98	No TLV Established*
Total Sulfur Content, max.		
Kerosine No. 1-K Low Sulfur Grade ----------	0.04	
Kerosine No. 2-K Regular Grade ----------	0.30	
(Flue connection required for burners for 2-K use.)		
Mercaptan Sulfur, max.	30 ppm	Rat, Oral LDLo 28 g/kg
*Exposure limits depend on components (variable); get supplier recommendation for product. NIOSH (1977) recommended 10-hr TWA of 100 mg/m^3 or about 14 ppm for kerosene with b.p. 347-617 F.		

SECTION III. PHYSICAL DATA

Boiling range, deg C at 1 atm ---- 175-300
Vapor pressure at 20 C, mm Hg ---- ca 5
Vapor density (Air=1) ---------- ca 4.5
Solubility in water ---------- insoluble

Specific gravity (H_2O=1) -- ca 0.8
Freezing point, deg C --- below -30
Viscosity at 40 C, cSt ---- 1.0-1.9

Appearance & Odor: Pale yellow or water-white, mobile, oily liquid; mild petroleum odor.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits in Air	Lower	Upper
100F (min) (CC)	>410F	Volume %	ca 0.8	ca 6

Extinguishing Media: Dry chemical, carbon dioxide, foam, water spray or fog. Use a smothering technique for extinguishing fire. A forced stream of water could scatter flames of burning kerosine. Flammable vapors will be emitted from heated liquid.
Use a water spray (Caution!) to cool fire-exposed containers to prevent violent rupture. Water runoff to sewer may carry combustible kerosine and create a fire or explosion hazard.
Firefighters should use self-contained breathing apparatus and protective clothing.

SECTION V. REACTIVITY DATA

This material is stable in closed containers at room temperature under normal storage and handling conditions. It does not polymerize. Heating greatly increases the flammability hazard of this OSHA Class II combustible liquid.
Kerosine is incompatible with strong oxidizing agents.
Thermal-oxidative degradation can yield partial oxidation products, hydrocarbons, carbon monoxide and dioxide, and small amounts of sulfur dioxide (depending on sulfur content).

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SECTION VI. HEALTH HAZARD INFORMATION

TLV None Established (See Sect II)

Inhalation of excessive vapor or mist is irritating to respiratory passages and can lead to headache, dizziness, nausea, stupor, convulsions or loss of consciousness, depending on concentration and time of exposure.
High vapor concentration or liquid contact can irritate eyes.
Prolonged or repeated contact with skin can cause defatting, irritation and dermatitis.
Ingestion of kerosine can be irritating to the mouth, throat, and digestive tract.
Aspiration into the lungs may cause hemorrhaging, pulmonary edema, and chemical pneumonitis. FIRST AID:
Eye Contact: Flush thoroughly with running water for 15 min. including under eyelids.
Skin Contact: Remove contaminated clothing. Wash affected area with soap and water.
Inhalation: Remove to fresh air. Restore and/or support breathing as required.
Ingestion: Contact physician! Aspiration hazard! Do not induce vomiting. If spontaneous vomiting occurs, hold the victim's head lower than hips to help prevent pulmonary aspiration.
Seek medical assistance for further treatment, observation and support after first aid.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

Notify safety personnel of large leaks or spills. Remove sources of heat or ignition. Provide optimum explosion-proof ventilation. Clean up personnel need protection against liquid contact and vapor or mist inhalation. Contain spill and collect liquid. Do not flush to sewer or surface water. Use absorbent material (sand, vermiculite) to pick up small spills and residues promptly to reduce fire or vapor hazard. Use non-sparking tools.
DISPOSAL: May be disposed of through a licensed waste disposal company, or by controlled incineration or absorbed material can be buried in an approved landfill. Follow Federal, State, and Local regulations.

SECTION VIII. SPECIAL PROTECTION INFORMATION

Provide general and local exhaust ventilation especially if heated or misted as needed to keep mist and vapors at a low level. Provide approved organic mist and vapor respiratory apparatus for nonroutine or emergency use.
Wear protective rubber gloves to prevent repeated or prolonged contact & safety glasses if splashing of liquid may occur. Additional protective clothing may be required depending on working conditions. Launder work clothes at least weekly and when contaminated before reuse.
Eyewash stations and washing facilities should be available to areas of use and handling.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Store in closed containers in a well-ventilated area away from sources of heat, ignition, and strong oxidizing agents. Protect containers from physical damage. Outdoor or detached storage preferred for large amounts. Use of non-sparking tools and explosion-proof electrical services may be desirable. Ground and bond containers to prevent static sparks. No smoking in areas of use. Storage conditions must meet requirements for an OSHA Class II Combustible Liquid.
Avoid prolonged or repeated skin contact and breathing of vapors or mists.
Follow good hygienic practice in the use of this material. Do not put oily rags into pockets. Wash hands and exposed skin frequently during work day.
DOT Classification: COMBUSTIBLE LIQUID. I.D. NO. UN 1223
DATA SOURCE(S) CODE: 4-11,14,26,34,37,39,48,49

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APPROVALS: MIS/CRD J.M. Nielsen
INDUST. HYGIENE/SAFETY 9-24-82
MEDICAL REVIEW: 3 October 1982

ATTACHMENT 1
SAFETY GUIDELINES
FOR DRILLING

SAFETY GUIDELINES FOR DRILLING

Drill rig maintenance and safety is the responsibility of the drill rig operator. The following is provided as a general guideline for safe drilling practices on site.

OFF-ROAD MOVEMENT OF DRILL RIGS

The following safety guidelines relate to off-road movement:

Before moving a drill rig, first walk the route of travel, inspecting for depressions, slumps, gulleys, ruts and similar obstacles.

Always check the brakes of a drill rig carrier before traveling, particularly on rough, uneven or hilly ground.

Discharge all passengers before moving a drill rig on rough or hilly terrain.

Engage the front axle (for 4x4, 6x6, etc., vehicles or carriers) when traveling off highway on hilly terrain.

Use caution when traveling side-hill. Conservatively evaluate side-hill capability of drill rigs, because the arbitrary addition of drilling tools may raise the center of mass. When possible, travel directly uphill or downhill.

Attempt to cross obstacles such as small logs and small erosion channel or ditches squarely, not at an angle.

Use the assistance of someone on the ground as a guide when lateral or overhead clearance is close.

After the drill rig has been moved to a new drilling site, set all brakes and/or locks. When grades are steep, block the wheels.

Never travel off-road with the mast (derrick) of the drill rig in the raised or partially raised position.

Tie down loads on the drill rig and support trucks during transport.

OVERHEAD AND BURIED UTILITIES

The use of a drill rig near electrical power lines and other utilities requires that special precautions be taken by both supervisors and members of the exploration crew. Electricity can shock, it can burn, and it can cause death.

Overhead and buried utilities should be located, noted and emphasized on all boring location plans and boring assignment sheets.

Before raising the drill rig mast (derrick) on a site in the vicinity of power lines, walk completely around the drill rig. Determine what the minimum distance from any point on the drill rig to the nearest power line will be when the mast is raised and/or being raised. Do not raise the mast or operate the drill rig if this distance is less than 20 feet.

Keep in mind that both hoist lines and overhead power lines can be moved toward each other by the wind.

CLEARING THE WORK AREA

Prior to drilling, adequate site cleaning and leveling should be performed to accommodate the drill rig and supplies and provide a safe working area. Drilling

should not be commenced when tree limbs, unstable ground or site obstructions cause unsafe tool handling conditions.

NOTE: In coordination with the drilling crew, the SSO will review the precautions taken to insure that the drill rig is leveled and stabilized.

HOUSEKEEPING ON AND AROUND THE DRILL RIG

The first requirement for safe field operations is that the drilling crew safety supervisor understand and fulfills the responsibility for maintenance and "housekeeping" on and around the drill rig.

Suitable storage locations should be provided for all tools, materials and supplies so that they can be conveniently and safely handled without hitting or falling on a member of the drill crew or a visitor.

Avoid storing or transporting tools, materials or supplies within or on the mast (derrick) of the drill rig.

Pipe, drill rods, bits casing, augers and similar drilling tools should be stacked in orderly fashon on racks or sills to prevent spreading, rolling or sliding.

Penetration or other driving hammers should be placed at a safe location on the ground or be secured to prevent movement when not in use.

Work areas, platforms, walkways, scaffolding and other accessways should be kept free of materials, obstructions and substances such as ice, excess grease or oil that could cause a surface to become slick or otherwise hazardous.

Keep all controls, control linkages, warning and operation lights and lenses free of oil, grease and/or ice.

Do not store gasoline in any portable container other than a non-sparking, red container with a flame arrester in the fill spout and having the word "gasoline" easily visible.

SAFE USE OF HAND TOOLS

There are almost an infinite number of hand tools that can be used on or around a drill rig. "Use the tool for its intended purpose" is the most important rule. The following are a few specific and some general suggestions which apply to safe use of several hand tools that are often used on and around drill rigs.

When a tool becomes damaged, either repair it before using it again or get rid of it.

When using a hammer, any kind of hammer for any purpose, wear safety glasses and require all others near you to wear safety glasses.

When using a chisel, any kind of chisel, for any purpose, wear safety glasses and require all others around you to wear safety glasses.

Keep all tools cleaned and orderly stored when not in use.

Replace hook and heel jaws when they become visibly worn.

When breaking tool joints on the ground or on a drilling platform, position your hands so that your fingers will not be smashed between the wrench

handle and the ground or the platform, should the wrench slip or the joint suddenly let go.

SAFE USE OF WIRE LINE HOISTS, WIRE ROPE AND HOISTING HARDWARE

The use of wire line hoists, wire rope, and hoisting hardware should be as stipulated by the American Iron and Steel Institute's Wire RPE Users Manual.

All wire ropes and fittings should be visually inspected during use and thoroughly inspected at least once a week for: abrasion, broken wires, wear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage from heat, improper weeving, jamming, crushing, bird caging, kinking, core protrusion, and damage to lifting hardware and any other feature that would lead to failure. Wire ropes should be replaced when inspection indicates excessive damage according to the wire rope users manual.

If a ball-bearing type hoisting swivel is used to hoist drill rods, swivel bearings should be inspected and lubricated daily to assure that the swivel freely rotates under load.

If a rod slipping device is used to hoist drill rods, do not drill through or rotate drill rods through the slipping device, do not hoist more than 1 foot (0.3m) of the drill rod column above the top of the mast (derrick), do not hoist a rod column with loose tool joints and do not make up, tighten or loosen tool joints while the rod column is being supported by a slipping device. If drill rods should slip back into the borehole, do not attempt to brake the fall of the rods with your hands.

Most sheaves on drill rigs are stationary with a single part line. The number of parts of line should not ever be increased without first consulting with the manufacturer of the drill rig. Wire ropes must be properly matched with each sheave.

The following procedures and precautions must be understood and implemented for safe use of wire ropes and rigging hardware.

Use tool handling hoists only for vertical lifting of tools (except when angle hole drilling). Do not use tool handling hoists to pull on objects away from the drill rig; however drills may be moved using the main hoist as the wire rope is spooled through proper sheaves according to the manufacturer's recommendations.

When stuck tools or similar loads cannot be raised with a hoist, disconnect and hoist line and connect the stuck tools directly to the feed mechanism of the drill. Do not use hydraulic leveling jacks for added pull to the hoist line or the feed mechanism of the drill.

When attempting to free a mired vehicle or drill rig carrier, only use a winch on the front or rear of the vehicle or drill rig carrier and stay as far as possible from the wire rope. Do not attempt to use tool hoists to free a mired vehicle or drill rig carrier.

Minimize shock loading of a wire rope - apply loads smoothly and steadily.

- Protect wire rope from sharp corners or edges.
- Replace faulty guides and rollers.
- Replace worn sheaves or worn sheave bearings.
- Replace damaged safety latches on safety hooks before using.
- Know the safe working load of the equipment and tackle being used. Never exceed this limit.

- Clutches and brakes of hoists should be periodically inspected and tested.
- Know and do not exceed the rated capacity of hooks, rings, links, swivels, shackles and other lifting aids.
- Always wear gloves when handling wire ropes.
- Do not guide wire ropes on hoist drums with your hands.
- Following the installation of a new wire rope, first lift a light load to allow the wire rope to adjust.
- Never carry out any hoisting operations when the weather conditions are such that hazards to personnel, the public or property are created.
- Never leave a load suspended in the air when the hoist is unattended.
- Keep your hands away from hoists, wire rope, hoisting hooks, sheaves and pinch points as slack is being taken up and when the load is being hoisted.
- Never hoist the load over the head, body or feet of any personnel.

SAFE USE OF AUGERS

The following general procedures should be used when advancing a boring with continuous flight or hollow-stem augers:

- Prepare to start an auger boring with the drill rig level, the clutch or hydraulic rotation control disengaged, the transmission in low gear and the engine running at low RPM.

- The operator and tool handler should establish a system of responsibility for the series of various activities required for auger drilling, such as connecting and disconnecting auger sections, and inserting and removing the auger fork. The operator must assure that the tool handler is well away from the auger column and that the auger fork is removed before starting rotation.

- Only use the manufacturer's recommended method of securing the auger to the power coupling. Do not touch the coupling or the auger with your hands, a wrench or any other tools during rotation.

- Whenever possible, use tool hoists to handle auger sections.

- Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.

- Never allow feet to get under the auger section that is being hoisted.

- When rotating augers, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason whatever.

- Never use your hands or feet to move cuttings away from the auger.

- Augers should be cleaned only when the drill rig is in neutral and the augers are stopped from rotating.

SAFETY DURING ROTARY AND CORE DRILLING

Rotary drilling tools should be safety checked prior to drilling:

- Water swivels and hoisting plugs should be lubricated and checked for "frozen" bearings before use.

- Drill rod chuck jaws should be checked periodically and replaced when necessary.

- The capacities of hoists and sheaves should be checked against the anticipated weight to the drill rod string plus other expected hoisting loads. All cables should be inspected daily.

Special precautions that should be taken for safe rotary or core drilling involve chucking, joint break, hoisting and lowering of drill rods:

- Drill rods should not be braked during lowering into the hole with drill rod chuck jaws.

- Drill rods should not be held or lowered into the hole with pipe wrenches.

- If a string of drill rods are accidently or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.

- In the event of a plugged bit or other circulation blockage, the high pressure in the piping and hose between the pump and the obstruction should be relieved or bled down before breaking the first tool joint.

- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use your hands to clean drilling fluids from drill rods.

- If work must progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough surface, fitted cover panels of adequate strength to hold drill rig personnel.

- Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.

- All hydraulic lines should be periodically inspected for integrity and replaced as needed.

START UP

All drill rig personnel and visitors should be instructed to "stand clear" of the drill rig immediately prior to and during starting of an engine.

Make sure all gear boxes are in neutral, all hoist levers are disengaged, all hydraulic levers are in the correct nonactuating positions, and the cathead rope is not on the cathead before starting a drill rig engine.

SAFETY DURING DRILLING OPERATIONS

Safety requires the attention and cooperation of every worker and site visitor.

Do not drive the drill rig from hole to hole with the mast (derrick) in the raised position.

Before raising the mast (derrick), look up to check for overhead obstructions. (Refer to Section 5.2 on overhead and buried utilities.)

Before raising the mast (derrick), all drill rig personnel and visitors (with the exception of the operator) should be cleared from the areas immediately to the rear and the sides of the mast. All drill rig personnel and visitors should be informed that the mast is being raised prior to raising it.

Before the mast (derrick) of a drill rig is raised and drilling is commenced, the drill rig must be first leveled and stabilized with leveling jacks and/or solid cribbing. The drill rig should be releveled if it settles after initial set up. Lower the mast (derrick) only when leveling jacks are down and do not raise the leveling jack pads until the mast (derrick) is lowered completely.

Before starting drilling operations, secure and/or lock the mast (derrick) if required according to the drill manufacturer's recommendations.

The operator of a drill rig should only operate a drill rig from the position of the controls. The operator should shut down the drill engine before leaving the vicinity of the drill.

Do not consume alcoholic beverages or other depressants or chemical stimulants prior to starting work on a drill rig or while on the job.
Watch for slippery ground when mounting dismounting from the platform.

All unattended boreholes must be adequately covered or otherwise protected to prevent drill rig personnel, site visitors, or animals from stepping or falling into the hole. All open boreholes should be covered, protected, or backfilled adequately and according to local or state regulations on completion of the drilling project.

"Horsing around" within the vicinity of the drill rig and tool and supply storage areas should never be allowed, even when the drill rig is shut down.

Be careful when lifting heavy objects.

Before lifting a relatively heavy object, approach the object by bending at the knees, keeping your back vertical and unarched while obtaining a firm footing. Grasp the object firmly with both hands and stand slowly and squarely while keeping your back vertical and unarched. In other words, perform the lifting with the muscles in your legs, not with the muscles in your lower back.

Drilling operations should be terminated during an electrical storm.