REMOVAL WORK PLAN

Prepared for
Interchem PRP Group
Alton, Iowa
April 1992

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Project Number 91C7315

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1.0
INTRODUCTION

The Interchem Facility (Site) is a former pesticide formulating facility with a 12-year operating history from 1976 to 1988. The Site has been the subject of environmental investigations by the United States Environmental Protection Agency (EPA), which were primarily concerned with identifying the presence or absence of pesticides in soil, concrete, and miscellaneous containers and the distribution of pesticides in the structures (buildings and sheds) at the Site.

An Administrative Order on Consent, Docket Number VII-91-F-0021 (AOC) concerning the Interchem facility was executed between the EPA and the Interchem PRP Group (Group) on June 18, 1991. One of the requirements of the Group in the AOC is to submit a Removal Work Plan (RWP) to address the removal of soil and concrete at the Site found to be contaminated above the action levels defined in the Site Characterization Report (SCR) (WCC, 1992). This RWP was prepared by Woodward-Clyde Consultants (WCC) under contract with the Group to provide technical services for this project and fulfills the requirement of the AOC. This RWP is submitted in accordance with the "Site Characterization, Planning, and Technical Services Work Plan." (Work Plan) (WCC, September, 1991a). The Engineering Evaluation Report (EER) (WCC, November, 1991b), submitted to the EPA provides detailed response action alternatives concerning the Site.

1.1 OBJECTIVES OF THE REMOVAL WORK PLAN

1.1.1 Administrative Order on Consent Objectives

The objectives of this RWP are based on the AOC and the AOC Scope of Work (SOW) and include:

- Describe the removal activities to be conducted at the areas of the Site defined in the SCR. Removal activities include, but are not limited to, the excavation of soil, confirmatory sampling of soil and

analysis for TCL pesticides, followed by placement, compaction and grading of clean backfill into the excavated areas. These activities will be undertaken to bring contaminant concentrations below the action levels defined in the SOW.

- Evaluate whether air monitoring and/or special engineering controls are necessary. This evaluation will be based on the concentration and nature of the contaminants found in the soils and/or concrete and the extent of the proposed removal actions.

- Describe the quality control and quality assurance procedures to be carried out in accordance with EPA protocols, setting forth the procedures to be used to transport all hazardous substances from the Site. These activities will be approved by the EPA.

1.1.2 Additional Objectives

Additional objectives included in this RWP are in response to EPA's comments on the EER. These objectives include:

- Removal, reclamation, and/or disposal of all hazardous materials in the wooden Sheds (Sheds);

- Demolition Disposal of the Sheds;

- Removal, reclamation, and/or disposal of all hazardous materials in the Above Ground Storage Tanks (AGSTs);

- Rinsing the interior of the AGSTs and protective measures against potential explosive conditions.

1.2 REMOVAL WORK PLAN ORGANIZATION

This RWP is divided into eight sections with the information presented in the remaining sections summarized as follows:

- Section 2.0 presents an overview of the Site including its location and historical physical setting, the Group's site characterization studies conducted at the Site, and the nature of the contamination.

- Section 3.0 describes the contaminants of concern found above the action levels and the nature and extent of the removal activities.

- Section 4.0 describes the activities and schedule of work to be undertaken including the removal, transportation, and disposal of soil, concrete, demolition of the Sheds and disposal of the Sheds' contents, and waste liquid in the AGSTs.

- Section 5.0 describes the deliverables to be prepared and submitted to EPA as a part of removal activities.

- Section 6.0 identifies the WCC personnel involved in the removal activities, and their responsibilities.

- Section 7.0 identifies the support services and contractors providing removal, analytical or other services during the removal action.

- Section 8.0 presents a list of references.

It should be noted that this RWP focuses on the Toxaphene Pad, exterior soils, waste liquid in the AGSTs, and the Sheds and their contents.

2.0
BACKGROUND INFORMATION

This section presents a brief overview of the Interchem facility. It includes the Site location, Site history, a summary of activities conducted prior to the AOC, and site characterization activities conducted by the Group.

2.1 SITE LOCATION AND HISTORY

The Interchem Site is located at 101 East Tenth Street in Alton, Iowa, approximately 50 miles northeast of Sioux City, Iowa (Figures 1 and 2). The facilities which were used during the pesticide formulation operations are located on both sides of 1st Avenue between 10th and 11th Streets in the east-central portion of Alton. Also, a small plot of land, including a concrete pad (known as the Toxaphene Pad) located on the south side of East 10th Street, is part of the Site. Three sets of railroad tracks and vacant land are located immediately east and north of the Site, respectively. Mixed commercial and residential districts are located to the north, west, and south.

The Site primarily consists of the Main Building, which housed an office; storage areas for raw materials and finished products; packaging and blending areas; a liquid processing area; and a hazardous waste storage area. The Toxaphene Pad, located adjacent to 1st Avenue and approximately 150 feet south of 10th Street, was formerly part of a warehouse foundation used for storage of formulation products. On the east side of 1st Avenue, west of the railroad tracks, there are seven AGSTs and the Sheds. These Sheds are also referred to as the North and South Sheds, Sheds 13, 14, and 15, and the Red Shed.

The Site is located on three parcels of land. The legal description of these parcels are Lots 2, 3, 4, and 5 in Block 3 in the Auditor's Subdivision and Replat of Block 3; Block 4, original plat, and a strip of land along the railroad tracks running parallel to 1st Avenue. The Site is located in the NE¼ of the SW¼ of Section 2, Township 94 North, Range 44 West.

2.2 PHYSICAL SETTING

2.2.1 Topography and Physiography

The Site is located on the eastern side of Alton, Iowa, in Sioux County, and lies within the Floyd River Valley in northwest Iowa. This region is located within the Dissected Till Plains section of the Central Lowlands Province (Thornburg, 1967). The Floyd River Basin drains approximately 960 square miles of highly dissected, gently rolling topography. The average gradient of the Floyd River is 4 feet per mile from its source in northern O'Brien County to its confluence with the Missouri River in Sioux City, Iowa. The Site is located on the western edge of the Floyd River Valley, one-quarter mile from the river's edge, at an approximate elevation of 1,310 feet.

Three discrete parcels comprise the Site with a total area of 120,000 square feet (2.75 acres). Most of this area is covered by structures or concrete pads. The remaining exposed surfaces were altered during site construction and operation, and probably no natural surface soils exist at this time. It is assumed to be consistent with the regional Floyd River Valley geology.

2.2.2 Shallow Pedology

The surface soils are described as silty clay loams to a depth of 50 inches. Organic matter content is about 4 to 5 percent (USDA, 1990). The sub-soil is a calcareous, silty loam approximately 60 inches thick, underlain by alluvial sands, gravels, and glacial drift. Permeability is moderate, runoff is slow, and the water holding capacity of these soils is high.

2.3 PRIOR EPA SITE INVESTIGATIONS

The Site has been the subject of an EPA investigation (April, 1989) and a site assessment (June, 1989) conducted by EPA's contractor, Ecology and Environment. The April 1989 investigation results were summarized in a memorandum titled "Trip Report to DeNova Industries, Alton, Iowa, May 1989". A "Site Assessment Report" was prepared and submitted to the EPA by Ecology and Environment on September 26,

1989 summarizing the findings of the June 1989 investigation (included with the Work Plan).

The April 1989 investigation resulted in the collection of samples from both inside and outside the Main Building. Concentrations of detected organochlorine pesticides (OCL pesticides) from samples collected from soils outside the Main Building and the concrete from the toxaphene pad are summarized in Table 2-1.

The June 1989 investigation also included the collection of samples from outside the Main Building and were analyzed for OCL pesticides and PCBs. All samples were also scanned using a tentatively identified semi-volatile compound scan. The June 1989 results of detected analytes from samples collected from locations outside the Main Building are summarized in Table 2-2.

Analytical results for samples collected during both April and June 1989 activities reported various concentrations. The semi-volatile scans tentatively identified a number of compounds, the majority of which would be placed in the following categories:

- OCL pesticides;
- Organophosphorus pesticides (OP pesticides); and
- Diluents.

2.4 INTERCHEM GROUP ACTIVITIES

A site characterization field event was conducted by the Group between September 23, and October 13, 1991. These activities included soil sampling, concrete sampling, groundwater monitoring well installation and sampling, and tank investigation and sampling.

2.4.1 Soil

The soil characterization program consisted of the collection and analysis of composite and discrete samples from 0- to 6-inches below ground surface (bgs). The composite

samples consisted of four individual aliquots located equidistant from each other within each designated sampling area. Figure 3 indicates the sampling areas (designated as 5, 6, etc. corresponding to the June 1989 EPA sample area designations), the discrete sample locations, and the aliquot locations for each composite sample.

Composite and discrete soil samples were collected from 29 separate sampling areas on, around and near the Site and analyzed for TCL pesticides and additional pesticides stated in the AOC SOW. In addition, some soil samples were analyzed for volatiles, semivolatiles, and inorganics. Soil samples with total pesticide concentrations above the 10 milligram per kilogram (mg/kg) action level established in the AOC were from 3 of 27 on-site sampling areas (2d, 10c, and 14) as indicated on Figure 3. Tables 2-3, 2-5, and 2-6 summarize the results of the analyses performed on the soil samples. EPA rejected some of this data based on low or absent dibutylchlorendane surrogate recovery levels. The samples rejected by EPA are shown with an asterisk (*). EPA also rejected data for some pesticides from sample splits collected by EPA's representative at the site during sampling activities. Samples from areas not already scheduled for removal were reanalyzed under the March 1990 Contract Laboratory Program statement of work and data packages deliverables were submitted to EPA on April 7, 1992.

2.4.2 Concrete

Composite concrete samples were collected from the top ¼-inch of the Toxaphene Pad and analyzed for TCL pesticides and other pesticides as stated in the AOC SOW. All composite concrete sample results were above the 60 mg/kg action level for total pesticides established in the AOC SOW. The results of the analyses are shown in Table 2-3.

2.4.3 Above Ground Storage Tank

Liquid samples from five of the AGSTs were collected and analyzed for TCL volatile organics by the Group. A summary of the results of the analyses performed on the tank liquids is shown in Table 2-4b. EPA analyzed split samples for total pesticides, TAL inorganic compounds, and semivolatiles.

2.5 PHYSICOCHEMICAL PROPERTIES OF TOXAPHENE

Toxaphene was detected in all of the concrete and a majority of the soil samples; therefore, the following discussion specifically addresses toxaphene. Toxaphene is a mixture of more than 175 chlorinated bicyclic terpenes produced by the chlorination of camphene. Toxaphene is very persistent when released to the environment. Toxaphene is nonionic and slightly soluble (0.55 mg/L at 20 degrees Celsius) in water but is much more soluble in most organic solvents. The vapor pressure for toxaphene is 0.2 to 0.4 mm Hg at 25°C.

When released to the soil environment, toxaphene will persist for long periods (1 to 14 years) and is not expected to leach to groundwater. Biodegradation of toxaphene is enhanced under anaerobic conditions, although not completely. Toxaphene that is volatilized into the atmosphere is not readily degraded by direct photolysis and is likely to be adsorbed to dust particles.

3.0
REMOVAL AREA SELECTION CRITERIA

Total pesticide concentrations in shallow soil samples have exceeded the action level set forth in the AOC of 10 mg/kg of Target Compound List (TCL) pesticides in three sampling areas. These three sampling areas are 2d, 10c, and 14, and are shown in Figure 3. The pesticides of each of the areas is almost entirely toxaphene. Also, the concrete pad exceeds the action level of 60 mg/kg in the upper ¼-inch of concrete. Four removal activities are proposed at the Interchem Site and are discussed in the following Sections.

3.1 SOIL

The known contaminated areas of soil will be removed to bring the TCL Pesticides concentration levels under the action level of 10 mg/kg. Other pesticides were detected in these areas less than the action level including: delta-BHC, endrin, coumaphos, carbaryl, and malathion (see Table 3-1). Volatile organics detected in the soil are provided in Table 3-2, semivolatile organic analysis results are provided in Table 3-3, and inorganic analysis results are provided in Table 3-4. The removal area will extend to the closest adjacent sampling location with total pesticide levels below the action level and will result in the removal of soils from portions of these adjacent areas. In area 2d, excavation will extend to area 2c to the north and area 2e to the east. Excavation in area 14 will extend over to area 15 to the south and up to but not including the concrete drive located to the north.

The areas that will undergo removal activities are shown in Figure 4. The outlines of the areas to be excavated will be marked with flags and the corners surveyed to provide a basis for measurement of excavated soils. Following removal activities, the soil will be transported off the Site and disposed of in a permitted hazardous waste landfill. All of the materials resulting from on-site removal activities which are scheduled for off-site disposal as hazardous waste will be stored, transported and disposed in accordance with appropriate local, state and federal regulations. The applicable regulations include but are not limited to 40 CFR Parts 262 and 268 as amended.Waste characterization

profiling was performed on a composite soil sample to select the landfill for disposal. Results are summarized in Appendix 1. After removal activities, the excavation depths will be measured.

3.2 CONCRETE

The Toxaphene Pad contains toxaphene at levels that exceed the action level for TCL Pesticides. To bring the concentration of TCL Pesticides on the pad below the action level of 60 mg/kg for the upper ¼-inch, the entire concrete pad will be removed from the areas indicated in Figure 4. Other pesticides detected include: lindane, heptachlor epoxide, endrin, and 4,4' DDT (see Table 3-1). The removed concrete will be transported and disposed of in a permitted hazardous waste landfill. Storage, transport and disposal will follow all appropriate local, state and federal regulations as detailed in Section 3.1. Waste characterization profiling was performed on a composite concrete sample to determine the type of landfill necessary for disposal. Results are summarized in Appendix 1.

The corners of the pad will be surveyed to mark the location of the edges of the pad prior to removal activities.

3.3 LIQUID WASTE

During the site characterization field event, the presence and quantity of fluid in the seven AGSTs was estimated. In the five tanks that contained fluid, samples were taken and analyzed for volatile organics (Table 3-2). During removal activities, the liquid will be removed from the tanks with a vacuum truck, and transported off the Site to be recycled and/or disposed. Storage, transport and disposal will follow all appropriate local, state and federal regulations as detailed in Section 3.1. Waste characterization profiling was performed on the waste liquid to determine the disposal method necessary. Results are summarized in Appendix 1.

3.4 SHEDS

The Sheds will be demolished after removal of containers. Storage, transport and disposal will follow all appropriate local, state and federal regulations as detailed in Section 3.1. Waste characterization profiling was performed on wood samples and the contents of the containers to select the disposal facility. Results are summarized in Appendix 1.

4.0
REMOVAL ACTIVITIES

The following sections describe the methods that will be used to remove, transport and dispose soil and concrete identified in Section 3.0, remove the liquid from the five AGSTs, and demolish the shed. In addition, sections covering quality control practices, engineering controls, decontamination procedures, and field documentation will be included to ensure that work will be performed safely and will meet all the requirements set forth in the AOC Scope of Work. The Contractor responsible for performing removal, transportation and disposal activities has been selected at this time. Invitation for Bids (IFB) were issued on February 18, 1991 and the selection process for the Contractor was concluded on March 6, 1992. The IFB and Addendum No. 1 to the IFB are included as Appendixes 2 and 3, respectively.

4.1 CONTRACTOR PROCUREMENT

A contractor specializing in remediation has been selected to conduct the removal action at the Interchem Site. A request for bids for the removal action was sent to three potential contractors on February 18, 1992. Heritage Environmental and Engineering has been selected: their Health and Safety Plans are provided in Attachment 4.

The Contractor's Scope of Work includes, but is not limited to:

- Waste Characterization;
- Mobilization to site;
- Site preparation;
- Securing any construction or demolition permits required from the City of Alton, Iowa;
- Development of health and safety plans;

- Development of decontamination plan;
- Utilities clearance in excavation areas;
- Soil excavation, transportation, and off-site disposal;
- Backfilling, compaction, site grading, and seeding;
- Concrete excavation, transportation, and off-site disposal;
- Storage tank waste liquid removal, transportation, and off-site disposal;
- Sheds demolition, and drummed container removal transportation, and off-site disposal; and
- Final report detailing Contractor work activities.

4.2 SITE PREPARATION

The adequate preparation of the Site prior to the initiation of removal activities will ensure the successful and orderly completion of the work activities. The Site Manager will be the coordinator of all the activities included in this task. The activities to be included are:

- Surveying removal areas prior to removal activities and establish grade stakes at the corners of the removal areas;
- Collection of samples of clean backfill material for chemical analyses;
- Installation of reflective or brightly, colored flags at removal boundary area; and
- Coordination of the removal action with the City of Alton including, but not limited to, obtaining a demolition and/or construction permit, informing the Public Works Department of the schedule and scope of activities, satisfying the requirements of the Street Department.

- Site security during working hours will include site access control to limit the work areas to authorized personnel only. The site will be secured at night, following working hours, by the use of security personnel and flashing lights and barrier tape around open excavation areas.

4.3 SOIL

The estimate of the total volume of soil to be excavated is 100 cubic yards covering approximately 5000 square feet. This volume is based upon excavation to a depth of 6 inches in those three areas identified in Section 3.0: 2d, 10c, and 14 (Figure 4).

Soil excavation will be accomplished using a front loader and/or a backhoe. Verification of the removal areas and the depths to be excavated will be the responsibility of the Site Manager. Surveying will be performed prior to excavation and once again prior to backfilling of soil in the removal areas. This information will document the volume of the excavated material.

Excavated soil will be placed into and transported by a covered truck. Stockpiled soil, if necessary during excavation, will be temporarily placed on polyethylene sheeting prior to placement into a covered truck. Temporary stockpiling may occur, for example, if a transport truck is not currently available on-site. The soil will be covered if it is necessary to stock pile the soil overnight. Excavated soil will be disposed in a RCRA permitted hazardous waste landfill.

Confirmatory sampling will be performed following soil excavation using the sampling methodology outlined in the Quality Assurance Project Plan (QAPP) (WCC, 1991c). Each confirmation soil sample from all of the removal areas will be analyzed for the TCL Pesticides in accordance with the March 1990 CLP statement of work. A full set of CLP deliverables (excluding diskette) will be submitted upon completion of the confirmatory sample analysis. It is anticipated that the data package will be submitted to the EPA for review approximately 13 days following the collection of the final soil confirmatory sample.

Pesticide analysis using method 8080 has been performed on four archived soil samples for the September 1991 site characterization work: SS-2d (composite), SS-2d (discrete), SS-10c (composite) and SS-14 (composite). See Appendix 5 for lab results. The four archive samples, collected from 6-12 inches below ground surface are located below and correspond to the four samples collected from the same location in September/October 1991, which detected TCL pesticides above the action limit of 10 mg/kg. These analyses were used to help gauge the depth of contaminated soil in areas scheduled to be excavated, and are included for information purposes.

These archived samples were analyzed for the purpose of internal information only. This information will aid in the determination of the excavation depth necessary for the three areas associated with the four samples: 2d, 10c, and 14.

A total of five composite soil samples will be collected to a depth of six-inches from below the excavated surface from the three excavated areas: 2d, 10c, and 14. Each composite sample will represent no more than approximately 1,000 square feet. Therefore, one composite sample will be collected from subareas 10c and 14, and three composite samples will be collected from the larger subarea 2d. Each composite sample will be collected from four aliquots from within each subarea. In areas 10c and 2d, one of the four aliquots will be taken from directly below the area from which discrete sample SS-10c and SS-2d were collected. If TCL Pesticides detected are below 10 mg/kg, clean backfill material obtained locally by Heritage will be placed and compacted into the excavated areas and compacted by wheel rolling using the excavation equipment. The excavated areas will be brought back to the original grade upon completion of the grading of the backfilled areas. This will be followed by seeding to re-establish a competent ground cover. Two preliminary samples will be collected and analyzed for TCL Pesticides from a source of clean fill prior to its placement in the excavated soil areas. The backfill will be considered clean if TCL pesticides detections are less than 10 mg/kg.

If confirmatory analysis results indicate that TCL pesticide concentrations are greater than 10 mg/kg, additional soil will be excavated, and confirmatory sampling will be performed again in the same manner as previously described.

4.4 CONCRETE

All eight subareas of the toxaphene pad (C-1 through C-8) will be removed (Figure 4). The present estimate of the concrete material to be removed is approximately 60 cubic yards. This volume is on an estimated slab thickness of 1 foot.

The concrete will be broken apart using a backhoe mounted jackhammer and removed using a combination of the backhoe and a front-end loader. Concrete will be broken into sizes whereby the maximum length on any side is three feet (size requirements of landfills). The Site Manager will observe concrete removal activities. Excavated concrete will be placed into and transported by covered truck and will be disposed of in a RCRA permitted hazardous waste landfill.

Significant cracks in the concrete will be identified, during removal work, in an attempt to determine if they continue throughout the total thickness of the slab and are in contact with the subgrade soil beneath the slab.

Following removal of the concrete pad, soil to a depth of one foot will be excavated from below the pad. This will be followed by the collection of one confirmatory sample of soil from beneath the pad to a depth of six inches below the excavated surface. This sample will be analyzed for TCL pesticides using the 3/90 CLP protocol. A total of four aliquot samples will be collected and composited from underneath cracks in the concrete pad or areas that show visible signs of staining. Sampling will be accomplished using methods detailed in the QAPP for surface soil sampling procedures.

If the TCL pesticide concentrations are less than 10 mg/kg, the area will be seeded with grasses to establish a ground cover. If the concentrations are greater than 10 mg/kg, additional soil will be removed from below the pad and confirmation sampling will be performed as previously described.

4.5 LIQUID WASTE

Seven AGSTs exist currently at the Site numbered consecutively from 4 through 10. These AGSTs vary in height from approximately 10 to 24 feet in height and range in

diameter from 8 to 12 feet. Fluid was noted in five of the AGSTs (Nos. 4, 5, 6, 7, and 8) and ranged in depth from approximately 6 to 12 inches, for a total cumulative volume of approximately 2,000 gallons. All of the waste liquid will be removed from the five AGSTs (Figure 4).

The waste liquid will be removed by a vacuum truck or other means available to remove as much of the waste oil as possible. Following the removal of the liquid waste, four of the five AGSTs will be rinsed once. The remaining AGST (No. 5), contained toxaphene, therefore it will be triple rinsed with a potable water and detergent mixture. Rinsing will be accomplished through the use of a steam cleaner utilizing a high pressure hose. Access for the steam cleaning operation will be via the access hatches located atop the AGSTs. The rinsate will be removed using similar means as for the liquid waste. The waste liquid and rinsate will be transported off-site and recycled and/or disposed.

Prior to removing the liquid in the tanks, a Combustible Gas Indicator (CGI) will be used to check for any potentially explosive atmosphere inside the tanks. If any tank interior indicates 20 percent or greater of the Lower Explosive Limit (LEL) of the tank contents upon removal and rinsing, the atmosphere in the tank will be displaced by adding a sufficient quantity of dry ice. If the tank interior measures less than 20 percent of the LEL with the CGI, it will be remeasured following draining and rinsing. If the 20 percent LEL limit is not exceeded, no further action is necessary. Access hatches on all tanks will be secured after the liquids are removed. Tanks with dry ice added will also be sealed at all visible openings with silicone caulk or its equivalent.

4.6 SHEDS

The wooden structure, known as the Shed, is located on the east side of 1st Avenue, north of 10th Street, across the street from the Main Building. The shed will be demolished after all the containers have been removed (Figure 4). The Shed is divided by a wooden wall into two sections: the South Shed which is empty and the North Shed which contains 174 containers ranging from 30-gallon laboratory pack containers to 85-gallon overpack drums. The floors and walls of both Sheds have been vacuumed of all visible debris.

The approximate dimensions of the Shed (Figure 5) are 100 feet in length by 13 to 18 feet in height by 23 feet in width. The wooden structure is supported by 6 equally spaced concrete footings that run along the 100-foot length of the shed. The shed floor is approximately 1 to 2 feet above grade.

The wood, roof, and concrete footings will be demolished and transported to two different locations. The flooring and a portion of the "stained" walls will be transported to a RCRA permitted hazardous waste landfill. The remaining "clean" walls, concrete footings, and roof will be transported to a local sanitary landfill. The 174 containers will be disposed of by incineration. Determination as to whether this material can be transported to a sanitary landfill has been completed. Waste profile analysis results are included as Appendix 4.

Following the removal of the Shed and its concrete supports, loose debris will be collected from beneath the Shed. Loose debris was vacuumed from the interior of the Shed in October 1991, and therefore, any debris on the ground will be from demolition activities comprised of the Shed materials and supports.

Two composite soil samples will be collected from beneath the North and South Sheds. Four aliquots will also be composited from each of the two areas and analyzed for TCL pesticides. Surface sampling and analyses will follow methods detailed in the QAPP. If TCL Pesticide concentrations are below 10 mg/kg, the area will be seeded to establish a competent ground cover. If TCL pesticide concentrations are greater than 10 mg/kg in either area, a 6-inch layer of soil will be removed and confirmation sampling will be performed as previously described.

4.7 QUALITY ASSURANCE/QUALITY CONTROL MEASURES

All soil, concrete, and tank liquid removal, and shed demolition activities will be performed by qualified contractors following Contractor generated and Group approved Health and Safety Plan (H&S Plan) (WCC, 1991d) and Decontamination plans. The approved Contractor's plans are included as Appendix 3.

Field activities will be observed by a qualified, experienced Site Manager. Confirmatory composite sampling and analysis for toxaphene will be performed by a Group and EPA-approved laboratory following soil excavation and prior to placement of clean fill. Surveying the extent of the excavated areas will be performed prior to and following excavation activities using OSHA trained personnel.

4.8 ENGINEERING CONTROLS

Three work zones will be established to minimize the potential for contaminants to migrate from the Site and to minimize the likelihood of accidents. These work zones are: the exclusion zone, the contamination reduction zone and the support zone.

The exclusion zone is where wastes (containers, contaminated soil, concrete, AGSTs, or the Sheds) are present. All persons entering this zone must wear the appropriate level of personal protection as set forth in the H&S Plan. Entry into the exclusion zone will be limited to authorized personnel only, as determined by the Site Manager. The exclusion zone will be properly demarcated by use of brightly colored tape, warning cones and signs (or their equivalent) to provide adequate warning.

The contamination reduction zone (decon pad) provides a transition between the contaminated and non-contaminated areas of the Site. This zone will also be properly demarcated to differentiate from the support zone, and it is established so that contaminated wastes remain on Site. A minimum of five decon pads will be constructed, one established for personal decontamination located immediately adjacent to each of the four exclusion zones (three soil and one concrete) and one constructed for the decontamination of equipment coming in contact with the soil or concrete.

The final work zone is the support zone which is any area outside of the exclusion and contamination reduction zones. This buffer zone is established so that field operations can be observed from areas outside the immediate work activity.

To further minimize the potential for exposure to the general public, traffic will be rerouted away from the exclusion zones with the cooperation of the City of Alton Street Department. This will be accomplished by restricting traffic on 1st Avenue, south of

10th Street, during concrete removal activities, and north of 10th Street during soil removal activities.

An air monitoring plan has been developed and will be implemented before and during removal activities. The air monitoring plan is included as Appendix 6.

During removal activities, airborne particulates (dust) may be created. Dust suppression therefore, will be accomplished by periodically wetting down the working area with a portable pressurized high capacity spray bottle (or similar means) filled with tap water during soil and concrete removal activities. A moderate amount of water will be applied to temporarily immobilize the dust particles but not enough however, to promote surface runoff conditions. In addition, areas adjacent to all removal areas will be covered with Visqueen (or similar plastic sheeting material) to eliminate and/or minimize the spread of potentially contaminated dust. Personal Protective Equipment including Air Purifying Respirators will be worn when necessary by the personnel at the site.

4.9 DECONTAMINATION PROCEDURES

Decontamination of personnel and equipment will be performed to limit the movement of contaminants off-site and between work areas. Personnel decontamination protocol is discussed in the H&S Plan. All sampling equipment coming in contact with soils, concrete, and groundwater will be decontaminated prior to each sampling, between sampling locations, between boring intervals, and at completion of the work. This will minimize the potential for cross-contamination.

Decontamination of equipment will occur at the exclusion zone of the intrusive activities and at a main decontamination station. Small sampling and field equipment will be cleaned at the exclusion zone, while a central decontamination station will be established for cleaning of other larger items.

Small equipment such as hand augers and bailers will be decontaminated using the procedures outlined in the QAPP.

Decontaminated equipment will be stored on clean polyethylene sheeting or wrapped in aluminum foil or plastic bags between uses. Following decontamination, the sampling equipment will not be allowed to touch the ground surface prior to use.

Large equipment will be decontaminated by the Contractor following decontamination plans prepared by the Contractor and approved by the EPA and the Group.

4.10 FIELD DOCUMENTATION

Documentation of field and sample collection activities will include the use of field logbooks, daily activity reports, field sheets, and chain-of-custody forms. Photographs and boring logs also will be used to document field activities. Example forms for field documentation are shown in Figures 6 through 10.

Errors made during field documentation in the logbook, field sheet, sample label, or chain-of-custody will be crossed out with a single strike mark, initialed, and dated.

5.0
SCHEDULE

The anticipated schedule to perform all activities prior, during, and following the field work is as follows:

- Select removal contractor - March 6, 1992.
- Obtain waste characterization analysis results - March 30, 1992.
- Initiate removal activities - April 13, 1992.
- Conclude removal activities - April 27, 1992.
- Complete landfill disposal activities - May 6, 1992.
- Complete all disposal activities - July 1, 1992.

6.0
SUBMITTAL OF DELIVERABLES

Following the conclusion of the removal activities, lab results from the confirmation sampling, manifest, and disposal records will be submitted to the required State and/or Federal agencies. These agencies include but are not limited to the Iowa Department of Natural Resources and the EPA.

7.0
PROJECT PERSONNEL

The Concrete/Soil Removal activities and the final report will be coordinated through WCC's office in Overland Park, Kansas. The WCC project team includes Dr. Dennis Y. Takade, Ph.D., Project Director and Responsible Professional; Mr. Robert F. Skach, P.E., Project Manager; Mr. David C. Convy, Peer Reviewer; Mr. Mark L. Kemner, Quality Assurance Coordinator; Ms. Carla J. Dods, Health and Safety Officer; and Mr. Bret A. Hedenkamp, Site Manager.

8.0
SUPPORT SERVICES

Implementation of the RWP will require contractors to provide special support services. The contractors will conduct such activities as:

- Chemical analysis of soil samples;
- Surveying of sample and removal areas;
- Soil, concrete, container, and AGST liquid waste removal and shed demolition, transport, and disposal activities; and
- Collection of self-generated wastes including decon water, personal protective equipment, and supplies.

Removal activities will be performed by Heritage Environmental and Engineering. Potential contractors have been contacted for chemical analysis, and bids for their laboratory services have been solicited. Upon selection of the contractor, the qualifications of the firm will be submitted to EPA for review.

9.0
REFERENCES

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Woodward-Clyde Consultants (WCC). 1991c. Quality Assurance Project Plan.

Woodward-Clyde Consultants (WCC). 1991d. Health and Safety Plan.

Woodward-Clyde Consultants (WCC). 1992. Site Characterization Report.

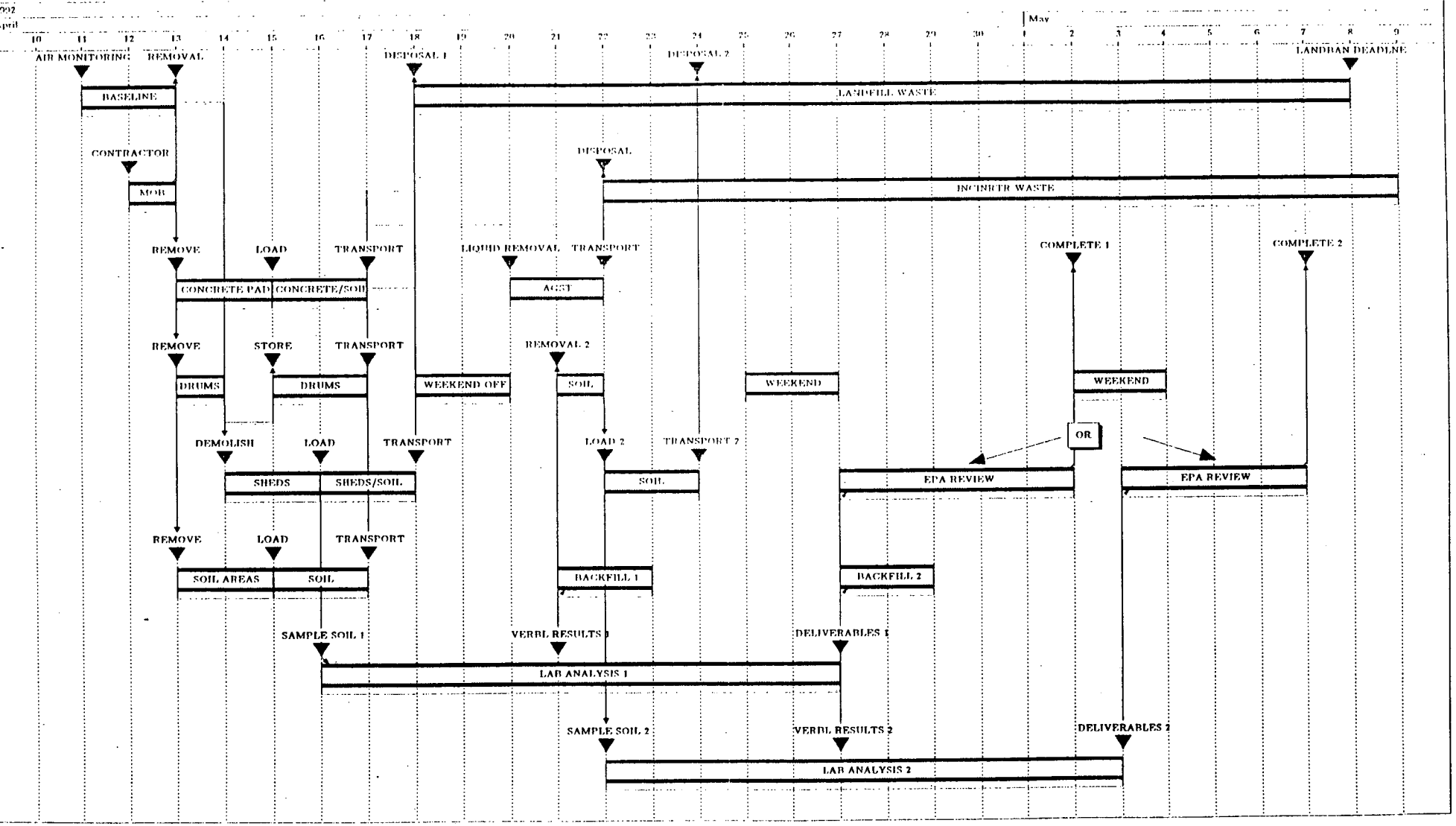
Date: April 7, 1992

INTERCHEM SITE | ALTON, IOWA

WOODWARD-CLYDE CONSULTANTS

REMOVAL ACTIVITIES SCHEDULE

Legend: Critical | Non-Crit | Plan | Early | Late | Summary | Hammock



TABLES

TABLE 2-1

SUMMARY OF ANALYTES DETECTED
APRIL 1989 USEPA INVESTIGATION
RANGE OF RESULTS BY MATRIX
(Concentrations in milligrams per kilogram)

Compound	Soil	Concrete[1]
α-BHC	0.092-1.0	ND
δ-BHC	6.4	ND
γ-BHC (Lindane)	0.072-14.0	3.4
Heptachlor	0.001-0.056	ND
Aldrin	0.02	ND
Endrin Ketone	0.0026-0.015	0.86
Methoxychlor	0.04-1.4	ND
4,4'-DDE	0.0059-0.2	1.8
γ-Chlordane	0.0076	ND
γ-Chlordane	0.017-0.079	0.77

Notes: ND - Not detected
[1] Only one sample collected from Toxaphene Pad.

TABLE 2-2

SUMMARY OF ANALYTES DETECTED
JUNE 1989 USEPA CONTRACTOR INVESTIGATION
RANGE OF RESULTS BY MATRIX
(Concentrations in milligrams per kilogram)

Compound[1]	Soil	Concrete[2]
ß-BHC	68	ND
γ-BHC (Lindane)	0.009-0.3	0.09-0.33
Heptachlor	0.002-0.04	ND
Heptachlor Epoxide	0.002-0.04	ND
Endosulfan I	0.005-0.06	ND
Endosulfan II	0.036	ND
Dieldrin	0.007	ND
Endrin	0.006	ND
Methoxychlor	0.16-1.0	ND
4,4'-DDE	0.004-0.15	0.46
4,4'-DDD	0.006-0.02	0.76
4,4'-DDT	0.006-0.04	ND
α-Chlordane	0.0004-0.023	ND
γ-Chlordane	0.002-0.08	ND
Toxaphene	1.1-38	120-160
PCBs	2.8-7.8	ND
Captan[1]	70	ND
Xylenes	0.08	ND
Fluoranthene[1]	1	ND

Notes: ND = Not detected
1 Only semivolatile tentatively identified compounds are included in this table.
2 Toxaphene Pad

TABLE 3-1(continued)

TOTAL PESTICIDES, VOLATILES & SEMI-VOLATILES DETECTED IN THE REMOVAL AREAS

SAMPLE AREA	SAMPLE DESCRIPTION	DELTA-BHC	LINDANE	HEPTACHLOR EPOXIDE	ENDOSULFAN I	ALDRIN	DIELDRIN	ENDRIN	4,4' - DDT	TOXAPHENE	CARBARYL	MALATHION	COUMAPHOS	METHYLENE CHLORIDE	TOLUENE	XYLENES (TOTAL)
SOIL																
2d	COMPOSITE									200,000			344			
2d	DISCRETE							710		111,000	750	25	104	4		
10c	DISCRETE				71	50	91		800	16,000				4	2	
14	COMPOSITE	33						130		17,000						
CONCRETE																
1	COMPOSITE									220,000	NA	NA	NA			
2	COMPOSITE		11,000	11,000						870,000	NA	NA	NA			
3	COMPOSITE			12,000						2,200,000	NA	NA	NA			
4	COMPOSITE							17,000		4,500,000	NA	NA	NA			
5	COMPOSITE			450						100,000	NA	NA	NA			
6	COMPOSITE								9,300	120,000	NA	NA	NA			
7	COMPOSITE									89,000	NA	NA	NA			
8	COMPOSITE									850,000	NA	NA	NA			
WASTE LI UIDS																
4																1,200,000,000
5	DISCRETE									76,000						
8	DISCRETE															12,000,000

TABLE 3-1(continued)

SAMPLE AREA	2-METHYL NAPHTHALENE	NAPHTHALENE
SOIL		
2d		
2d		
10c		
14		
CONCRETE		
1		
2		
3		
4		
5		
6		
7		
8		
WASTE LI		
4		
5	2,800,000	
8		60,000,000

SAMPLE NUMBER	HAZLETON NUMBER	DESCRIPTION	SEMIVOLATILES AOC SCOPE OF WORK - TABLE 1 (1) Naphthalene	Hexachlorobenzene	Pentachlorophenol	Fluoranthene
SOIL (ug/kg)						
SS-1a	11,000,345	COMPOSITE	220 J			520
SS-1b	11,000,343	DISCRETE	62 J			2,500
SS-1d	11,000,360	COMPOSITE	25 J			1,200
SS-2b	11,000,342	DISCRETE	300 J			1,200
SS-2c	10,909,487	COMPOSITE	19 J			250 J
SS-2d	11,000,344	DISCRETE	26 J	41 J	60 J	400
SS-5	10,909,489	COMPOSITE				1,300
SS-5	10,909,491	DISCRETE				
SS-9	10,909,488	COMPOSITE				130 J
SS-9	10,909,490	DISCRETE	10 J			78 J
SS-10a	11,000,366	COMPOSITE				150 J
SS-10a	11,000,367	DISCRETE				280 J
SS-10c	11,000,368	DISCRETE		690		52 J
SS-12b	11,001,221	DISCRETE				
SS-12b-D	11,001,222	DISCRETE				
BACKGROUND SOIL (ug/kg)						
SS-16	11,001,752	COMPOSITE				700
SS-17	11,001,751	COMPOSITE				300 J
SOIL RINSATES (ug/l)						
SS-12B-R	11,001,228					
SS-17-R	11,001,827					

Notes:
(1) Refer to Table 3-3 for other semivolatiles not detected in any of the samples above the reporting limit.
Units of concentration are reported as micrograms per kilogram (ug/kg) and micrograms per liter (ug/l) in accordance with Hazleton Laboratory report in Appendix B; Units in text are milligrams per kilogram (mg/kg) and milligrams per liter (mg/l).
J = Qualifier indicating that the reported concentration is an estimate.
B = Qualifier indicating that the reported concentration is also detected in the blank sample.
U = Qualifier indicating that the reported concentration is non-detect per Quality Review.

SAMPLE NUMBER	HAZLETON NUMBER	DESCRIPTION	SEMIVOLATILES OTHER SEMIVOLATILES (1) 2-Methyl naphthlene	Acenaph-thylene	Anthracene	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	bis(2-Ethylhexyl) phthalate	Butyl benzyl phthalate
SOIL (ug/kg)												
SS-1a	11,000,345	COMPOSITE	530	31 J	100 J		450	910				
SS-1b	11,000,343	DISCRETE	120 J	130 J	190 J	1,100	1,200	1,200		1,400		
SS-1d	11,000,360	COMPOSITE	39 J	54 J	110 J	670	630	650		780		
SS-2b	11,000,342	DISCRETE	650	100 J	190 J	1,000	1,100	2,000	590			
SS-2c	10,909,487	COMPOSITE	34 J		28 J	120 J	100 J	170 J				
SS-2d	11,000,344	DISCRETE	41 J	24 J		170 J	160 J	360 J		390	46 UJ	
SS-5	10,909,489	COMPOSITE		120 J	110 J	480	630	870		800		
SS-5	10,909,491	DISCRETE										
SS-9	10,909,488	COMPOSITE		9 J		54 J	54 J	100 J				
SS-9	10,909,490	DISCRETE	16 J				30 J	70 J			99 UJ	56 J
SS-10a	11,000,366	COMPOSITE				85 J	87 J	200 J				
SS-10a	11,000,367	DISCRETE		13 J		110 J	140J	280 J			23 UJ	
SS-10c	11,000,368	DISCRETE					22 J					37 J
SS-12b	11,001,221	DISCRETE									23 UJ	
SS-12b-D	11,001,222	DISCRETE										
BACKGROUND SOIL (ug/kg)												
SS-16	11,001,752	COMPOSITE		73 J	130 J	340 J	330 J	1,000	88 J			500 B
SS-17	11,001,751	COMPOSITE			33 J	110 J	110 J	240 J				230 BJ
SOIL RINSATES (ug/l)												
SS-12B-R	11,001,228											
SS-17-R	11,001,827											

Notes:
(1) Refer to Table 3-3 for other semivolatiles not detected in any of the samples above the reporting limit.
Units of concentration are reported as micrograms per kilogram (ug/kg) and micrograms per liter (ug/l) in accordance with Hazleton Laboratory report in Appendix B; Units in text are milligrams per kilogram (mg/kg) and milligrams per liter (mg/l).
J = Qualifier indicating that the reported concentration is an estimate.
B = Qualifier indicating that the reported concentration is also detected in the blank sample.
U = Qualifier indicating that the reported concentration is non-detect per Quality Review.

SAMPLE NUMBER	HAZLETON NUMBER	DESCRIPTION	SEMIVOLATILES OTHER SEMIVOLATILES (1) Chrysene	Di-n-Butyl phthalate	Dibenz(a,h) Anthracene	Dibenzo-furan	Diethyl phthalate	Fluorene	Indeno (1,2,3-cd) Pyrene	Phenanthrene	Pyrene
SOIL (ug/kg)											
SS-1a	11,000,345	COMPOSITE	720	720 B		160 J			270 J	890	830
SS-1b	11,000,343	DISCRETE	1,800	700 B			10 J	88 J		1,700	3,100
SS-1d	11,000,360	COMPOSITE	820	2,300 B				26 J	240 J	610	1,400
SS-2b	11,000,342	DISCRETE	1,500	420 B	260 J	210 J	20 J	79 J	350 J	1,500	1,300
SS-2c	10,909,487	COMPOSITE		2,200 B		14 J				190 J	210 J
SS-2d	11,000,344	DISCRETE		620 B						220 J	320 J
SS-5	10,909,489	COMPOSITE	650	2,700 B				23 J	380 J	630	1,100
SS-5	10,909,491	DISCRETE									
SS-9	10,909,488	COMPOSITE		2,100 B						60 J	95 J
SS-9	10,909,490	DISCRETE	44 J	230 BJ			63 BJ			53 J	77 J
SS-10a	11,000,366	COMPOSITE	120 J	890 B			17 J			100 J	170 J
SS-10a	11,000,367	DISCRETE	150 J	1,100 B			17 J		120 J	150 J	300 J
SS-10c	11,000,368	DISCRETE	44 J	620 B			27 J			27 J	67 J
SS-12b	11,001,221	DISCRETE		3,200 B			9 BJ				9 J
SS-12b-D	11,001,222	DISCRETE		2,900 B							
BACKGROUND SOIL (ug/kg)											
SS-16	11,001,752	COMPOSITE	480	3,800 B				31 J	95 J	480	760
SS-17	11,001,751	COMPOSITE	150 J	3,400 B					54 J	180 J	220 J
SOIL RINSATES (ug/l)											
SS-12B-R	11,001,228			4BJ							
SS-17-R	11,001,827			3 BJ							

Notes:
(1) Refer to Table 3-3 for the other semivolatiles not detected in any of the samples above the reporting limit.
Units of concentration are reported as micrograms per kilogram (mg/kg) and micrograms per liter ug/l) in accordance with Hazleton Laboratory report in Appendix B: Units in text are milligrams per kilogram (mg/kg) and milligrams per liter (ug/l).
J = Qualifier indicating that the reported concentration is an estimate.
B = Qualifier indicating that the reported concentration is also detected in the blank sample.
U = Qualifier indicating that the reported concentration is non-detect per Quality Control Review.

TABLE 3-4 (continued)

			INORGANICS AOC SCOPE OF WORK - TABLE 1 (1)					
SAMPLE NUMBER	HAZLETON NUMBER	DESCRIPTION	Arsenic	Cadmium	Copper	Manganese	Mercury	Zinc
SOIL (mg/kg)								
SS-1a	11,000,345	COMPOSITE	18.40		44.4	611	0.922	375
SS-1b	11,000,343	DISCRETE	10.40	4.17	18.7	611	0.104	2250
SS-1d	11,000,360	COMPOSITE	8.80		27.4	624	0.106	249
SS-2b	11,000,342	DISCRETE	19.30	2.09	22.1	513	0.202	210
SS-2c	10,909,487	COMPOSITE	8.10		15.7	563	0.062	84.1
SS-2d	11,000,344	DISCRETE	7.50	2.31	20.6	747	0.176	1580
SS-5	10,909,489	COMPOSITE	9.90		20.7	977	0.154	106
SS-5	10,909,491	DISCRETE	13.40	2.23	67.2	1060	0.495	963
SS-9	10,909,488	COMPOSITE	6.80		17.3	789	0.085	166
SS-9	10,909,490	DISCRETE	6.70	1.93	18.1	797	0.073J	587
SS-10a	11,000,366	COMPOSITE	9.20		17.3	825	0.117	119
SS-10a	11,000,367	DISCRETE	8.60		16	779	0.143J	133
SS-10c	11,000,368	DISCRETE	6.20		14.8	781	0.055	84.7
SS-12b	11,001,221	DISCRETE	12.00		19.6	1030	0.053	208
SS-12b-D	11,001,222	DISCRETE	10.70		19.8	1030	0.047	156
BACKGROUND								
SOIL (ug/kg)								
SS-16	11,001,752	COMPOSITE	14.60		25.6	770	0.137J	151
SS-17	11,001,751	COMPOSITE	13.10	1.20	20.2	741	0.215	136
SOIL RINSATES (ug/l)								
SS-12BR	11,001,828							
SS-17R	11,001,827		NA	NA	NA	NA	NA	NA

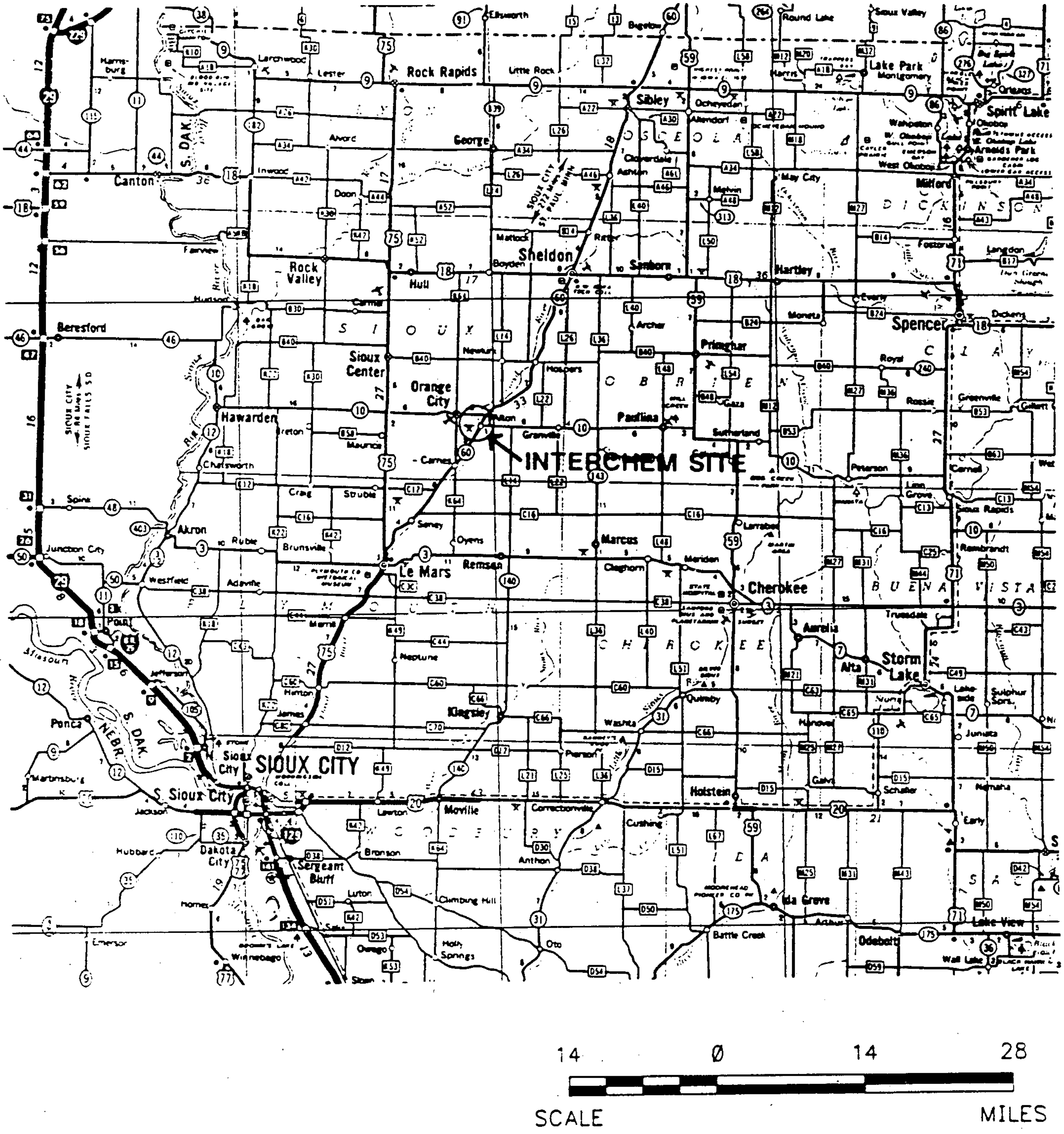
Notes:
NA = Not Analyzed.
(1) Sodium and cyanide were not detected in any of the samples above the reporting limit.
(2) Refer to Table 3-4 for other inorganics not detected in any of the samples above the reporting limit. Units of concentration are reported as micrograms per kilogram (ug/kg) and micrograms per liter (ug/l) in accordance with Hazleton laboratory reports in Appendix B. Units in text are milligrams per kilogram (mg/kg) and milligrams per liter (mg/l).
J = Qualifier indicating that the reported concentration is estimated.

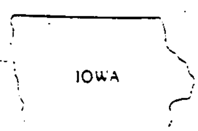
TABLE 3-4 (continued)

			INORGANICS OTHER INORGANICS (2)												
SAMPLE NUMBER	HAZLETON NUMBER	DESCRIPTION	Aluminum	Antimony	Barium	Beryllium	Calcium	Chromium	Cobalt	Iron	Lead	Magnesium	Nickel	Potassium	Selenium	Vanadium
SOIL (mg/kg)																
SS-1a	11,000,345	COMPOSITE	11,000		154	1.15	15,300	18.6	11.6	35,100	121	3,710	27.4	2,460		34.8
SS-1b	11,000,343	DISCRETE	12,100		170		14,100	19.6		22,800	72.6	5,300	18.3	2,250	2.2	35.2
SS-1d	11,000,360	COMPOSITE	21,200		213		82,300	28.1		23,900	62.9	6,760	26.3	4,530	2.4	51
SS-2b	11,000,342	DISCRETE	11,700		244		32,100	16.3		23,200	80.4	4,150	30.3	2,560	2.2	33
SS-2c	10,909,487	COMPOSITE	12,000		161		16,000	17		17,400	48.2	5,360	17.7	2,360	1.2	35.3
SS-2d	11,000,344	DISCRETE	11,000		133		22,100	23.5		29,400	110	5,130	22.7	1,730	1.8	30.7
SS-5	10,909,489	COMPOSITE	22,200		300		25,200	29.5	12.7	26,200	23.6	10,400	29	3,540		61
SS-5	10,909,491	DISCRETE	23,700		287		8,370	30	12.8	26,400	207	4,940	28.2	3,980	1.4	61.6
SS-9	10,909,488	COMPOSITE	18,000		194		13,600	24.4		21,500	35.6	4,680	22.3	3,580	1.4	46.3
SS-9	10,909,490	DISCRETE	19,000		209		10,300	24.9		23,100J	32.1	4,630	22.2	3,430	1.5	48.5
SS-10a	11,000,366	COMPOSITE	16,600		242		10,400	20.3		22,200	38.7	4,210	21.6	3,020	1.3	40
SS-10a	11,000,367	DISCRETE	16100J		196		13,100	21.4		22,100J	41.2	4,480	22.5	3,380	1.4	42.8
SS-10c	11,000,368	DISCRETE	19,500		210		14,700	23.8		23,400	22.4	4,490	22.5	3,510	1.6	47.8
SS-12b	11,001,221	DISCRETE	21,500		272		10,300	27.3	13	26,100	16.6	7,440	29.4	3,250	1.8	60.4
SS-12b-D	11,001,222	DISCRETE	21,100	14	268		9,310	27.2	13.1	26,600	17.1	7,330	31.2	3,000	1.8	60.2
BACKGROUND																
SOIL (ug/kg)																
SS-16	11,001,752	COMPOSITE	14,000		240		27,800	20.5		20,700	162	7,600	17.3	2,800	1.4	38
SS-17	11,001,751	COMPOSITE	16,700		218		25,900	22.1		25,600	85.2	8,020	20.7	3,430	2.2	43.1
SOIL RINSATES (ug/l)																
SS-12BR	11,001,828										3					
SS-17R	11,001,827		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
NA = Not Analyzed.
(1) Sodium and cyanide were not detected in any of the samples above the reporting limit.
(2) Refer to Table 3-4 for other inorganics not detected in any of the samples above the reporting limit. Units of concentration are reported as micrograms per kilogram (ug/kg) and micrograms per liter (ug/l) in accordance with Hazleton laboratory reports in Appendix B; Units in text are milligrams per kilogram (mg/kg) and milligrams per liter (mg/l).
J = Qualifier indicating that the reported concentration is estimated.

FIGURES





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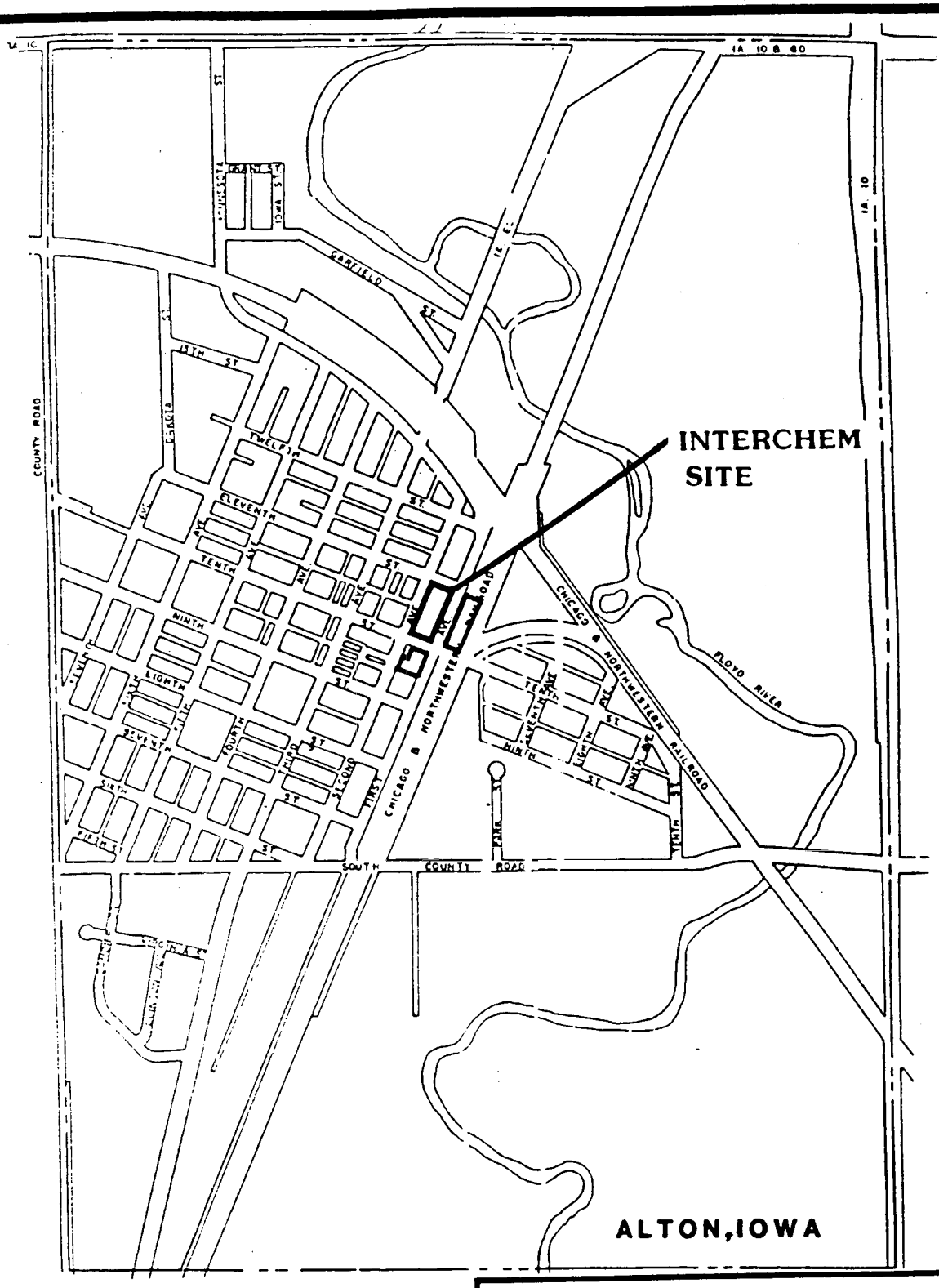
ACAD FILE:

INTERCHEM SITE - ALTON, IOWA

Woodward-Clyde Consultants
Engineers, Geologists, And Environmental Scientists

SITE LOCATION MAP

DRAWN: M.A.L.	DATE: 06/14/91	PROJECT NUMBER	FIG. NO.
CHECKED: B.E.B.	DATE: 06/21/91	91C7315	1



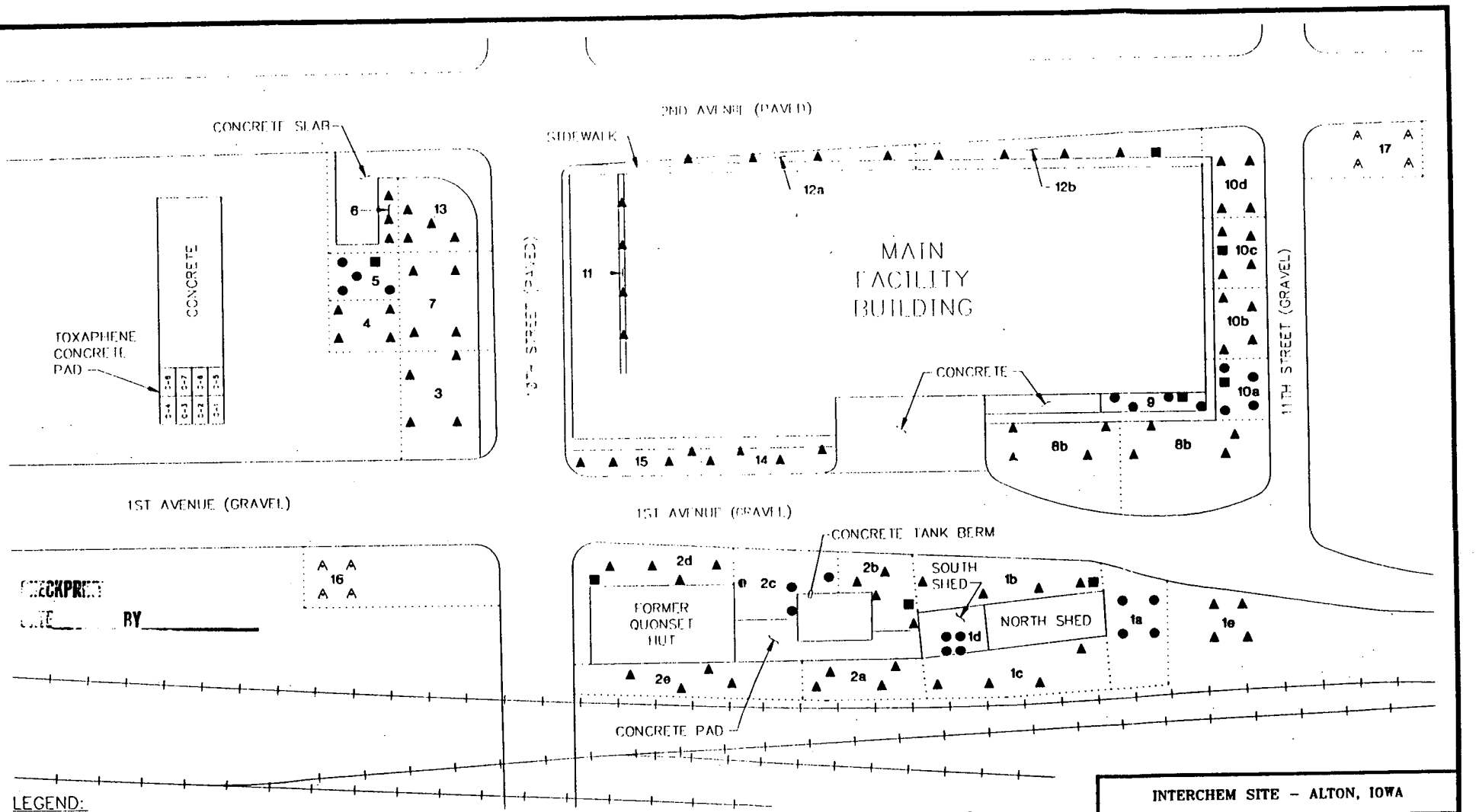
NOT TO SCALE

INTERCHEM SITE – ALTON, IOWA

Woodward–Clyde Consultants
Engineers, Geologists, And Environmental Scientists

LOCATION OF SITE IN ALTON, IOWA

DRAWN: D.D.S.	DATE: 06/03/91	PROJECT NUMBER	FIG. NO.
CHECKED: DCB	DATE: 7/09/91	91C7315	2



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LEGEND:

7	SAMPLING AREA AND NUMBER (SS-7 IS SAMPLE NUMBER IN AREA 7)
▲	COMPOSITE SAMPLE LOCATION
■	DISCRETE SAMPLE LOCATION
●	COMPOSITE SAMPLE LOCATION FOR EXTENDED ANALYSES
▲	BACKGROUND COMPOSITE SAMPLE LOCATION
C-1	CONCRETE SAMPLING SUB AREA

INTERCHEM SITE - ALTON, IOWA

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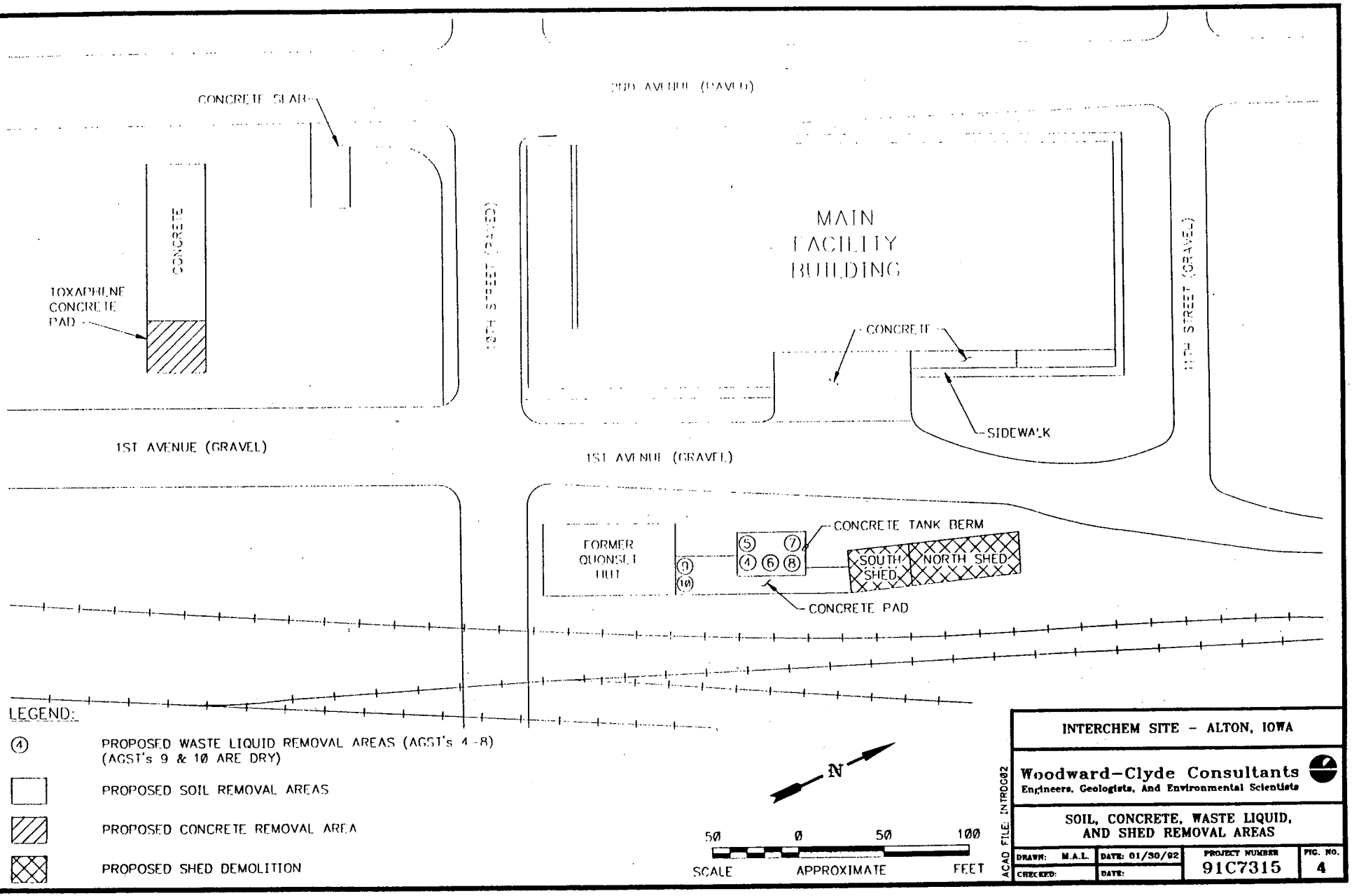
SOIL AND CONCRETE SAMPLING AREAS

DRAWN: M.A.L.	DATE: 12/31/91	PROJECT NUMBER 91C7315	FIG. NO. 3
CHECKED:	DATE:		

ACAD FILE: INTRDG84


2ND AVENUE (PAVED)
CONCRETE SLAB
CONCRETE
TOXAPHENE CONCRETE PAD
15TH STREET (GRAVEL)
MAIN FACILITY BUILDING
CONCRETE
SIDEWALK
11TH STREET (GRAVEL)
1ST AVENUE (GRAVEL)
1ST AVENUE (GRAVEL)
FORMER QUONSET HUT
CONCRETE TANK BERM
SOUTH SHED
NORTH SHED
CONCRETE PAD
LEGEND:
④ PROPOSED WASTE LIQUID REMOVAL AREAS (AGST's 4-8) (AGST's 9 & 10 ARE DRY)
PROPOSED SOIL REMOVAL AREAS
PROPOSED CONCRETE REMOVAL AREA
PROPOSED SHED DEMOLITION
N
50 0 50 100
SCALE APPROXIMATE FEET
INTERCHEM SITE - ALTON, IOWA
Woodward-Clyde Consultants
Engineers, Geologists, And Environmental Scientists
SOIL, CONCRETE, WASTE LIQUID, AND SHED REMOVAL AREAS
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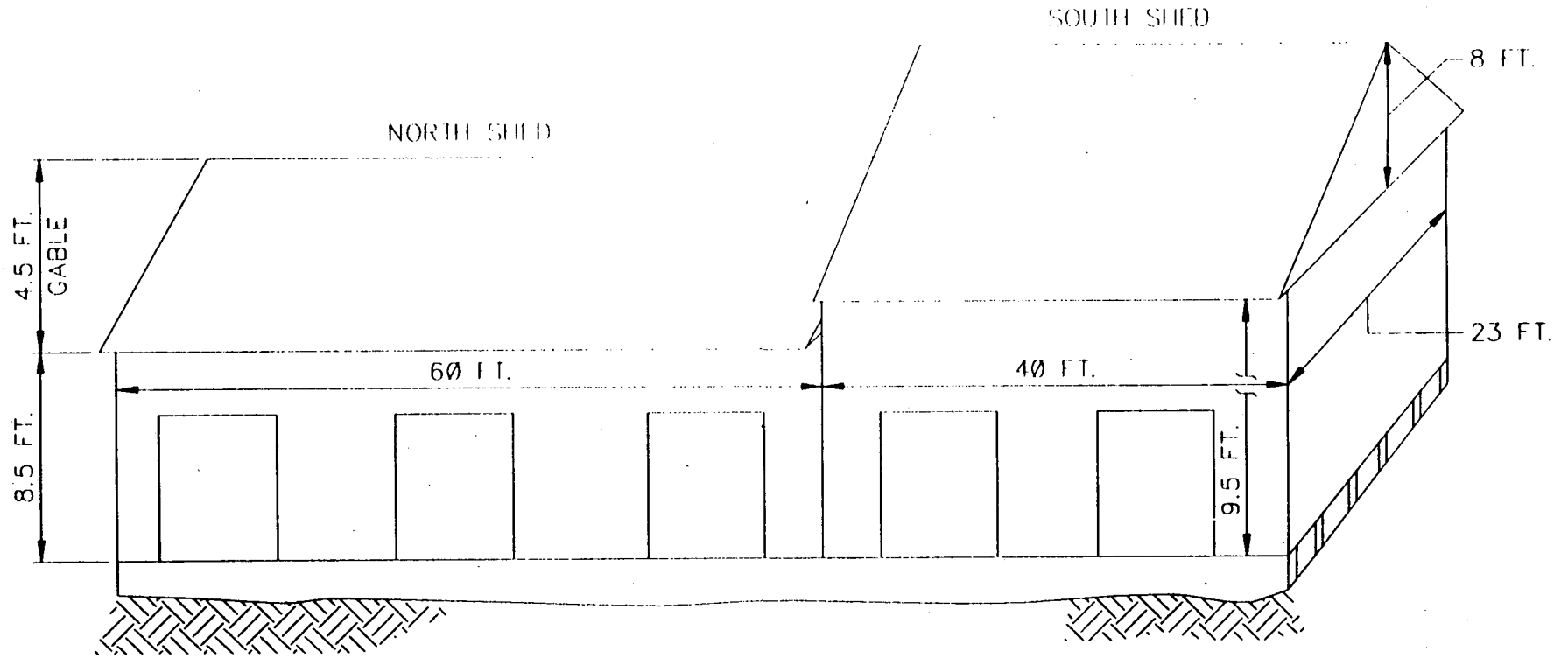
DRAWN: M.A.L. DATE: 01/30/92
CHECKED: DATE:
PROJECT NUMBER 91C7315
FIG. NO. 4



NOT TO SCALE

INTERCHEM SITE – ALTON, IOWA

Woodward–Clyde Consultants
Engineers, Geologists, And Environmental Scientists

SHED DIMENSIONS

DRAWN: M.A.L.	DATE: 02/12/92	PROJECT NUMBER 91C7315	FIG. NO. 5
CHECKED:	DATE:		

ACAD FILE: INTRDG03

M.A.L ACAD R11 c2
1=1
02/27/92 13:41:52

FIGURE NO. 6

WOODWARD-CLYDE CONSULTANTS
P.O. BOX 3777
5055 Antioch Road
Overland Park, Kansas 66203
(913) 432-4242

SOIL SAMPLE COLLECTION FIELD SHEET

SITE NAME: _____ PROJECT NUMBER: _____

SAMPLE NUMBER: _____ PERSONNEL: _____

_____

LOCATION DESCRIPTION: _____

SAMPLE SPLIT (circle one): YES NO : SPLIT SAMPLE NUMBER: _____

SAMPLE DEPTH: _____

COLLECTION: YR: _____ MO: _____ DAY: _____ TIME: _____

SAMPLING METHOD: _____

SOIL DESCRIPTION:

DEPTH: DESCRIPTION:

_____

_____

_____

_____

_____

SAMPLE CONTAINER	PRESERVATIVE	ANALYSIS REQUESTED

NOTES/SKETCH MAP:

FIGURE NO. 7

CHAIN OF CUSTODY RECORD

WOODWARD-CLYDE CONSULTANTS • 5055 ANTIOCH ROAD • OVERLAND PARK, KANSAS 66203 • 913-432-4242

SAMPLER(S)	PROJECT NAME	DATE OF COLLECTION (DAY / MONTH / YEAR)	SHEET ___ of ___

CONTENTS OF SHIPMENT

SAMPLE NUMBER	TYPE OF CONTAINERS: CUBITAINER	BOTTLE	BOTTLE	BOTTLE	VOA SET (2 VIALS EA)	SAMPLED MEDIA: water	soil	sediment	dust	other	RECEIVING LABORATORY REMARKS/OTHER INFORMATION (condition of samples upon receipt, other sample numbers, etc.)
	NUMBERS OF CONTAINERS PER SAMPLE NUMBER										

DESCRIPTION OF SHIPMENT

_____ PIECE(S) CONSISTING OF _____ ICE CHEST(S)

RECEIVING LABORATORY: _____

MODE OF SHIPMENT

_____ COMMERCIAL CARRIER _____

_____ COURIER

_____ SAMPLER CONVEYED (SHIPPING DOCUMENT NUMBER) _____

PERSONNEL CUSTODY RECORD

RELINQUISHED BY (SAMPLER)	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
☐ SEALED ☐ UNSEALED			☐ SEALED ☐ UNSEALED	
RELINQUISHED BY	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
☐ SEALED ☐ UNSEALED			☐ SEALED ☐ UNSEALED	
RELINQUISHED BY	DATE	TIME	RECEIVED BY	REASON FOR CHANGE OF CUSTODY
☐ SEALED ☐ UNSEALED			☐ SEALED ☐ UNSEALED	

FIGURE NO. 8

Woodward-Clyde Consultants
5055 Antioch Road
Overland Park, Kansas 66203
913-432-4242

DAILY FIELD REPORT

Site Name: _____ Proj. No.: _____ Date: _____ Report No.: _____

Description and Location of Work: _____

Sky _____ Temp. (Min./Max.) ____ Precip. _____ Wind spd./dir. ____ Humidity _____

Subcontractor and Area of Responsibility

a. _____

b. _____

c. _____

d. _____

1. Work Performed Today: (Indicate task and description of work performed. Refer to work performed by subcontractors by letter in table above.)

FIGURE NO. 9

TRUCK INVENTORY

WOODWARD-CLYDE CONSULTANTS
5055 ANTIOCH ROAD
OVERLAND PARK, KANSAS 66203
913/432-4242

		EMPTY WEIGHT (LBS)				FULL WEIGHT (LBS)						
TRUCK COMPANY	NUMBER	STEER AXLE	DRIVE AXLE	REAR AXLE	TOTAL WEIGHT	STEER AXLE	DRIVE AXLE	REAR AXLE	TOTAL WEIGHT	NET WEIGHT	TOTAL CAPACITY(cy)	LOADED VOLUME(cy)

Site Name: _____ Number: _____

Contractor: _____ Date: _____

Inspector: _____

TRANSPORT LOG

WOODWARD-CLYDE CONSULTANTS
5055 ANTIOCH ROAD
OVERLAND PARK, KANSAS 66203

Date	Time	Manifest Number	Truck Number	Cubic Yards	Tons	Origin of Material
Totals						

Site Name: _____ Number: _____

Contractor: _____ Date: _____

Inspector: _____

APPENDIXES

APPENDIX A
WASTE PROFILING RESULTS

Date Printed 03/10/92 Chem. Waste Management, Inc. ALT167

WASTE PROFILE Profile #

(_) Check here if this is a Recertification LOCATION OF ORIGINAL CWM Tech Center

GENERAL INFORMATION

1. Generator Name: INTERCEEM PRP GROUP Generator USEPA ID: IAD007495328

2. Generator Address: 101 EAST 10TH Billing Address: HERITAGE REMEDIATION/ENG.
(_) Same
1319 MARQUETTE DRIVE

ALTON IA 51003

3. Technical Contact/Phone: ALAN KALMAR 708/378-1600

ROMEOVILLE IL 60441

4. Alternate Contact/Phone: ROBERT SKACH 913/432-4242 Billing Contact/Phone:

PROPERTIES AND COMPOSITION

5. Process Generating Waste: OFF SPEC, OUTDATED MATERIAL FROM PLANT CLEAN UP

6. Waste Name: ACIDIC SOLUTION

7A. Is this a USEPA hazardous waste (40 CFR Part 261)? Yes (X) No (_)

B. Identify ALL USEPA listed and characteristic waste code numbers (D,F,K,P,U): D002

State Waste Codes:

8. Physical State @ 70F: A. Solid(_) Liquid(X) Both(_) Gas(_) B. Single Layer (X) Multilayer (_) C. Free liq. range 95 to 100%

9A. pH: Range .1 to 2.0 or Not applicable (_) B. Strong Odor (_);describe

10. Liquid Flash Point: < 73F (_) 73-99F (_) 100-139F (_) 140-199F (_) >= 200F (X) N.A. (_) Closed Cup (X) Open Cup (_)

11. CHEMICAL COMPOSITION: List ALL constituents (incl. halogenated organics) present in any concentration and forward analysis

Constituents	Range			Units
ACETIC ACID	0	to	10	%
MALATHION	0	to	10	%
WATER	80	to	90	%
		to		
		to		
		to		
TOTAL COMPOSITION (MUST EQUAL OR EXCEED 100%):			110.000000	

12. OTHER: PCBs if yes, concentration _ ppm, PCBs regulated by 40 CFR 761 (_). Pyrophoric (_) Explosive (_)
Radioactive (_) Benzene if yes, concentration _ ppm. Shock Sensitive (_) Oxidizer (_)
Carcinogen (_) Infectious (_) Other

13. If waste subject to the land ban & meets treatment standards, check here: _ & supply analytical results where applicable.

SHIPPING INFORMATION

14. PACKAGING: Bulk Solid (_) Bulk Liquid (_) Drum (X) Type/Size: 55 GALLON DRUM Other 85 GAL

15. ANTICIPATED ANNUAL VOLUME: 2 Units: DRUMS Shipping Frequency: ONE TIME

Sample Tracking Number: 1007166

SAMPLING INFORMATION

16a. Sample source (drum, lagoon, pond, tank, vat, etc.): DRUM

Date Sampled: 3/02/92 Sampler's Name/Company: ALAN KALMAR HERITAGE REMEDIATION

16b. Generator's Agent Supervising Sampling: 17. (_) No sample required (See instructions.)

GENERATOR'S CERTIFICATION

I hereby certify that all information submitted in this and all attached documents contains true and accurate descriptions of this waste. Any sample submitted is representative as defined in 40 CFR 261 - Appendix I or by using an equivalent method. All relevant information regarding known or suspected hazards in the possession of the generator has been disclosed. I authorize CWM to obtain a sample from any waste shipment for purposes of recertification.

Signature Name and Title Date

TRADE WASTE INCINERATION WASTE PROFILE SHEET ADDENDUM

Waste Origin: 1 Waste Type: B105 WPS# A00289

Mark all that apply:

1. Sampling Method: (If miscellaneous special waste, disregard) I certify that I have obtained a representative sample of the waste described in the Generator's Waste Material Profile Sheet referenced above according to sampling methods specified in SW-846 or equivalent methods. If an equivalent method was used, describe below:

---

2. Lab Pack Certification (if non-Lab Pack disregard): I have read and understand the CWM-TWI Lab Pack Guidelines and certify that these Lab Packs have been packed according to CWM-TWI Lab Pack Guidelines.

3. I certify to the best of my knowledge that this waste does not contain any of the following materials.
If a listed item is present, indicate which of these materials are present by circling and initialing the item on the list.

Trichloro-monofluoro-methane(Freon 11)>1000ppm	*Silver*
Dichlorodifluoro methane(Freon 12)>1000 ppm	*Thorium Compounds*
Tribromomethane(Bromoform)>1000 ppm	*Uranium Compounds*
2,4,5 T or 2,4,5 TP	*Infectious Compounds*
EPA Waste Codes F020-F023,F026,F027 & F028	*Dioxins*
Lead acid or cadmium batteries	*Compressed Gases(excluding aerosol cans)*

4. I certify that this waste has been evaluated for the presence of the following compounds and that any of the following materials, if known to be present in the waste, have been disclosed:

Air Reactives	*Ethyl Ether*	*Water Reactive Constituents*
Malodorous Compounds	*Vermiculite*	*Thermite*

5. I certify that any beryllium present___is or___is not regulated by 40 CFR 61.3.

6. I certify that mercury _____ is or X is not present. If mercury is present then:
I certify that mercury is present as one of the following sub-categories:

- ☐ D009-low mercury(<260mg/l)wastes
- ☐ D009-high(>260mg/l)organic wastes that are not incinerator or RMERC residues
- ☐ P092-any [redacted] provided [redacted] RMERC [redacted]
- ☐ NON-HAS-[redacted](<260mg/l)and is not characteristic for D009
- ☐ K106-low mercury(<260mg/l)wastes
- ☐ P065-any mercury concentration provided waste is not incinerator or RMERC residue
- ☐ U151-low mercury(<260mg/l)wastes

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature Name (Print) Title Date

Date Printed 11 .1 91

Profile #

18. This is a Nonwastewater.

19. If this waste is subject to any California list restrictions enter the letter from below (either A, B.1 or B.2) next to each restriction that is applicable:

___ HOCs, ___ PCBs, ___ Acid, ___ Metals, ___ Cyanides

20. Identify ALL Characteristic and Listed USEPA hazardous waste numbers that apply (as defined by 40 CFR 261). For each waste number, identify the subcategory (as applicable, check none, or write in the description from 40 CFR 268.41, 268.42, and 268.43).

REF #	A. US EPA HAZARDOUS WASTE CODE(S)	B. SUBCATEGORY Enter the subcategory description. If not applicable, simply check none		C. APPLICABLE TREATMENT STANDARDS			D. HOW MUST THE WASTE BE MANAGED? Enter letter from below
				PERFORMANCE-BASED: Check as applicable		SPECIFIED TECHNOLOGY: If applicable enter the 40 CFR 268.42 table 1 treatment code(s)	
		DESCRIPTION	NONE	268.41(a)	268.43(a)	268.42	
1	D002	ACIDS, PH <= 2.0				DEACT	A
2							
3							
4							
5							
6							
7							
8							
9							
10							

Management under the land disposal restrictions:

A. RESTRICTED WASTE REQUIRES TREATMENT

B.1 RESTRICTED WASTE TREATED TO PERFORMANCE STANDARDS

B.2 RESTRICTED WASTES FOR WHICH THE TREATMENT STANDARD IS EXPRESSED AS A SPECIFIED TECHNOLOGY (AND THE WASTE HAS BEEN TREATED BY THAT TECHNOLOGY)

B.3 GOOD FAITH ANALYTICAL CERTIFICATION FOR INCINERATED ORGANICS

C. RESTRICTED WASTE SUBJECT TO A VARIANCE

D. RESTRICTED WASTE CAN BE LAND DISPOSED WITHOUT FURTHER TREATMENT

E. NOT CURRENTLY SUBJECT TO LAND DISPOSAL RESTRICTIONS

21. Is this waste a soil and/or debris? No: X Yes, Soil: _ Yes, Debris: _ Yes, Both: _

22. Specific Gravity Range: .950 to 1.150

23. Indicate the range of each:

			Units		
Cyanides:	≤ 50	to ___	PPM	Type (free, total, amenable, etc.)	TOTAL ___
Cyanides:	_ None	to ___	___	Type (free, total, amenable, etc.)	___
Sulfides:	≤ 3	to ___	PPM	Type	TOTAL ___
Optional Phenolics:	≤ 10	to ___	PPM		

24. Identify the waste color YELLOW

Date Printed 11/10/93

AD0289

Profile #

25. COMPLETE ONLY FOR WASTES INTENDED FOR FUELS OR INCINERATION

	TOTAL	
Beryllium as Be	< 5000	ppm
Potassium as K	< 5000	ppm
Sodium as Na	< 5000	ppm
Bromine as Br	< 1 to 5	%
Chlorine as Cl	< 1 to 5	%
Fluorine as F	< 1 to 5	%
Sulfur as S	< 1 to 5	%

26. RECLAMATION, FUELS or INCINERATION PARAMETERS
(Provide if information is available)

RANGE

A. Heat Value (Btu/lb): 1- 4000

B. Water: 85.00

C. Viscosity (cps): 230 70F _ 100 F _ 150 F

D. Ash: 5.10 %

E. Settleable solids: 4.00 %

F. Vapor Pressure @ STP (mm/Hg): ____

G. Is this waste a pumpable liquid? Yes X No _

H. Can this waste be heated to improve flow? Yes _ No X

I. Is this waste soluble in water? Yes X No _

J. Particle size: Will the solid portion of this waste pass through a 1/8 inch screen? Yes X No _

27. TRANSPORTATION INFORMATION

A. Is this a DOT Hazardous Material? Yes X No _

B. Proper Shipping Name: WASTE ACID LIQUID, N.O.S. (ACETIC ACID, MALATHION)
RQ(D002, MALATHION)

C. Hazard Class: Corrosive Material I.D. NA1760

D. CERCLA Reportable Quantity (RQ) and units (Lb, Kg): 100 Lb

28. SPECIAL HANDLING INFORMATION

_ Material Safety Data Sheets Attached

29. OTHER INFORMATION

ILD 9191677177

30. CHEMICAL WASTE MANAGEMENT CERTIFICATION

Chemical Waste Management, Inc. has all the necessary permits and licenses for the waste that has been characterized and identified by this approved profile.

Date Printed 11 10 91

AD0289

Profile #

1. OTHER HAZARDOUS CONSTITUENTS Indicate if the waste contains any of the following.

METALS	TCLP Information: Check only ONE for each constituent Use units: ppm, mg/l				TCLP Data	TCA or TOTAL Use units: ppm, mg/l, mg/kg or percent			
						California List			
	Less Than	TC Regulated Level	Equal or More	Waste No.	TCLP Actual	Less Than	Regulated Level	Equal or More	Actual
Arsenic as As	X	5.0 mg/l		D004		X	500 mg/l		
Barium as Ba	X	100.0 mg/l		D005					
Cadmium as Cd	X	1.0 mg/l		D006		X	100 mg/l		
Chromium tot Cr	X	5.0 mg/l		D007					
Lead as Pb	X	5.0 mg/l		D008		X	500 mg/l		
Mercury as Hg	X	.2 mg/l		D009		X	20 mg/l		
Selenium as Se	X	1.0 mg/l		D010		X	100 mg/l		
Silver as Ag	X	5.0 mg/l		D011					
Nickel as Ni						X	134 mg/l		
Thallium as Tl						X	130 mg/l		
Chromium Hex						X	500 mg/l		
Antimony									
Beryllium									
Copper									
Vanadium									
Zinc									

32. OTHER HAZARDOUS CONSTITUENTS Indicate if the waste contains any of the following.

ORGANICS	TCLP Information: Check only ONE for each constituent				TCLP Data	TCA or TOTAL Use units: ppm, mg/l or %
	Less Than	Regulated Level	Equal or More	Waste No.	TCLP Analytical Test Results Use units: ppm or mg/l	
Benzene	X	0.5 mg/l		D018		
Carbon Tetrachloride	X	0.5 mg/l		D019		
Chlordane	X	0.03 mg/l		D020		
Chlorobenzene	X	100.0 mg/l		D021		
Chloroform	X	6.0 mg/l		D022		
m-Cresol	X	200 mg/l		D024		
o-Cresol	X	200.0 mg/l		D023		
p-Cresol	X	200.0 mg/l		D025		
Cresol	X	200.0 mg/l		D026		
2,4-D	X	10.0 mg/l		D016		
1,4 Dichlorobenzene	X	7.5 mg/l		D027		
1,2-Dichloroethane	X	0.5 mg/l		D028		
1,1-Dichloroethylene	X	0.7 mg/l		D029		
2,4-Dinitrotoluene	X	0.13 mg/l		D030		
Endrin	X	.02 mg/l		D012		
Heptachlor, & Hydroxide	X	0.008 mg/l		D031		
Hexachloro-1,3 Butadiene	X	0.5 mg/l		D033		
Hexachlorobenzene	X	0.13 mg/l		D032		
Hexachloroethane	X	3.0 mg/l		D034		
Lindane	X	0.4 mg/l		D013		
Methoxychlor	X	10.0 mg/l		D014		
Methyl Ethyl Ketone	X	200.0 mg/l		D035		
Nitrobenzene	X	2.0 mg/l		D036		
Pentachlorophenol	X	100.0 mg/l		D037		
Pyridine	X	5.0 mg/l		D038		
Tetrachloroethylene	X	0.7 mg/l		D039		
Toxaphene	X	0.5 mg/l		D015		
2,4,5-TP Silvex	X	1.0 mg/l		D017		
Trichloroethylene	X	0.5 mg/l		D040		
2,4,5-Trichlorophenol	X	400.0 mg/l		D041		
2,4,6-Trichlorophenol	X	2.0 mg/l		D042		
Vinyl Chloride	X	0.2 mg/l		D043		

Radiological Review of Waste Streams

Procedure No. R-91-2

Amendment to Waste Data Sheet
Radiological Certification

I hereby certify that I have read the Rollins Environmental Services (LA) Inc. Radiological Acceptance Criteria and based upon the definitions and criteria outlined therein, that the following statements are true and correct as regarding the indicated waste stream. I understand and agree that this certification shall be attached to and made a part of the Waste Data Sheet describing the indicated waste; that wastes not meeting the Radiological Acceptance Criteria will be rejected by Rollins; and that wastes sent to Rollins will be subjected to a radiological survey prior to their acceptance.

X INTERCHEM PRP GROUP	IAD007495328	
Customer Name	EPA I.D. Number	Stream Number

The above waste contains special nuclear material in any quantity ? YES ___ NO X

The above waste contains greater than 1/20 of 1 percent, by weight, (0.05 percent) of any source material ? YES ___ NO X

The above waste contains 15 picoCurie/gm or greater activity of Radium-226 or Radium-228 ? YES ___ NO X

Does the above waste contain any radioisotope in a quantity which would require a license to own, possess, transfer, use or dispose of the radioisotope under the regulations of the U.S. Nuclear Regulatory Commission or applicable State laws or regulations ? YES ___ NO X

Has the above waste been generated or stored in a radiation control area ? YES ___ NO X

If the answer to the question immediately above was "YES" please indicate on an attached sheet the radioisotopes present in the control area and what type of radiological screening has been conducted on the waste prior to its release from the radiation control area.

Does the facility generating the above waste manufacture or use any man-made radioisotopes or any radioisotope tracers ? YES ___ NO X

If the answer to the question immediately above was "YES" please indicate on an attached sheet the radioisotopes manufactured or used; whether the above waste could be potentially contaminated with any of the indicated isotopes and why; and what type of radiological screening has been conducted on the waste prior to its release from the generating facility.

Does the waste as containerized exhibit a radioactivity level of 25 microRoentgens/hour or more ? YES ___ NO X

If the answer to the question immediately above was "YES" please indicate on an attached sheet the radioisotopes responsible for the activity level observed.

Certified to this _____ day of _____, 199__ by the duly authorized undersigned representative.

By: _____ _____ _____

Customer Representative | Printed Name | Title

AMENDMENT TO WASTE DATA SHEET
RADIOLOGICAL CERTIFICATION

I hereby certify that I have read the Rollins Environmental Services (NJ) Inc. Radiological Acceptance Criteria and based upon the definitions and criteria outlined therein, that the following statements are true and correct as regarding the indicated waste stream. I understand and agree that this certification shall be attached to and made a part of the Waste Data Sheet describing the indicated waste; that wastes not meeting the Radiological Acceptance Criteria will be rejected by RES (NJ); and that wastes sent to Rollins will be subjected to a radiological survey prior to their acceptance.

X INTERCHEM PRP Group — Company Name

X IAD007495328 — EPA I. D. Number

X — Stream Number

Does above waste contain special nuclear material in any quantity? YES___ NO X

Does above waste contain greater than 1/20 of 1 percent by weight, (0.05 percent) of any source material? YES___ NO X

Does above waste contain 15 picoCurie/gm or greater activity of Radium-226 or Radium-228? YES___ NO X

Does the above waste contain any radioisotope in a quantity which would require a license to own, possess, transfer, use or dispose of the radioisotope under the regulations of the U.S. Nuclear Regulatory Commission or applicable State laws or regulations? YES___ NO X

Has the above waste been generated or stored in a radiation control area? YES___ NO X

If the answers to the question immediately above was "YES" please indicate on an attached sheet the radioisotopes present in the control area and what type of radiological screening has been conducted on the waste prior to its release from the radiation control area.

Does the facility generating the above waste manufacture or use any man-made radioisotopes or any radioisotope tracers? YES___ NO X

If the answer to the question immediately above was "YES" please indicate on an attached sheet the radioisotopes manufactured or used; whether the above waste could be potentially contaminated with any of the indicated isotopes and why; and what type of radiological screening has been conducted on the waste prior to its release from the generating facility.

Does the waste as containerized exhibit a radioactivity level of 25 microRoentgens/hour or more? YES___ NO X

If the answer to the question immediately above was "YES" please indicate on an attached sheet the radioisotopes responsible for the activity level observed.

Certified to this ____ day of _____, 1992 by the duly authorized undersigned representative.

By: _____ _____

TRADE WASTE INCINERATION WASTE PROFILE SHEET ADDENDUM

Waste Origin: 1 Waste Type: B319 WPS# AD0288

Mark all that apply:

1. Sampling Method: (If miscellaneous special waste, disregard) I certify that I have obtained a representative sample of the waste described in the Generator's Waste Material Profile Sheet referenced above according to sampling methods specified in SW-846 or equivalent methods. If an equivalent method was used, describe below:

---

2. Lab Pack Certification (if non-Lab Pack disregard): I have read and understand the CWM-TWI Lab Pack Guidelines and certify that these Lab Packs have been packed according to CWM-TWI Lab Pack Guidelines.

3. I certify to the best of my knowledge that this waste does not contain any of the following materials.
If a listed item is present, indicate which of these materials are present by circling and initialing the item on the list.

Trichloro-monofluoro-methane(Freon 11)>1000ppm	*Silvex*
Dichlorodifluoro methane(Freon 12)>1000 ppm	*Thorium Compounds*
Tribromomethane(Bromoform)>1000 ppm	*Uranium Compounds*
2,4,5 T or 2,4,5 TP	*Infectious Compounds*
EPA Waste Codes F020-F023,F026,F027 & F028	*Dioxins*
Lead acid or cadmium batteries	*Compressed Gases(excluding aerosol cans)*

4. I certify that this waste has been evaluated for the presence of the following compounds and that any of the following materials, if known to be present in the waste, have been disclosed.

Air Reactives	*Ethyl Ether*	*Water Reactive Constituents*
Malodorous Compounds	*Vermiculite*	*Thermite*

5. I certify that any beryllium present___is or___is not regulated by 40 CFR 61.3.

6. I certify that mercury _____ is or X is not present. If mercury is present then:
I certify that mercury is present as one of the following sub-categories:

- ☐ D009-low mercury(<260mg/l)wastes
- ☐ D009-high(>260mg/l)organic wastes that are not incinerator or RMERC residues
- ☐ P092-any mercury concentration provided waste is not incinerator or RMERC residue
- ☐ K106-low mercury(<260mg/l)wastes
- ☐ P065-any mercury concentration provided waste is not incinerator or RMERC residue
- ☐ U151-low mercury(<260mg/l)wastes
- ☐ NON-HAZ-contains low mercury(<260mg/l)and is not characteristic for D009

I certify under penalty of law that this document and all attachments were prepared under a direction or supervision in accordance with a system designed to assure that qualified personne properly gather and evaluate the information submitted. Based on my inquiry of the person o persons who manage the system, or those persons directly responsible for gathering the information the information submitted is, to the best of my knowledge and belief, true, accurate, and complete I am aware that there are significant penalties for submitting false information, including th possibility of fine and imprisonment for knowing violations.

X

Signature Name (Print) Title Date

Date Printed 03/11/92 Chemical Waste Management, Inc. AD0288

WASTE PROFILE Profile #

( ) Check here if this is a Recertification LOCATION OF ORIGINAL CWM Tech Center

GENERAL INFORMATION

1. Generator Name: INTERCHEM PRP GROUP Generator USEPA ID: IAD007495328

2. Generator Address: 101 EAST 10TH Billing Address: HERITAGE REMEDIATION/ENG.
(_) Same
1319 MARQUETTE DRIVE

ALTON IA 51003

3. Technical Contact/Phone: ALAN KALMAR 708/378-1600

4. Alternate Contact/Phone:

ROMEOVILLE IL 60441

Billing Contact/Phone: DAVID WHEELER 708/378-1600

PROPERTIES AND COMPOSITION

5. Process Generating Waste: OFF SPEC, OUT DATED MATERIAL FROM PLANT CLEAN UP

6. Waste Name: DRY INSECTICIDES

7A. Is this a USEPA hazardous waste (40 CFR Part 261)? Yes (X) No (_)

B. Identify ALL USEPA listed and characteristic waste code numbers (D,F,K,P,U): D014 P108 U247

State Waste Codes:

8. Physical State @ 70F: A. Solid(X) Liquid(_) Both(_) Gas(_) B. Single Layer (X) Multilayer (_) C. Free liq. range ___ to ___%

9A. pH: Range 4.0 to 9.0 or Not applicable (_) B. Strong Odor (_);describe

10. Liquid Flash Point: < 73F (_) 73-99F (_) 100-139F (_) 140-199F (_) >= 200F (X) N.A. (_) Closed Cup (_) Open Cup (X)

11. CHEMICAL COMPOSITION: List ALL constituents (incl. halogenated organics) present in any concentration and forward analysis

Constituents	Range		Units
ROTENONE	0	to 1	%
PHOSPHOROTHIOATE	0	to 1	%
STRYCHNINE	0	to 0.5	%
METHOXYCHLOR	0	to 1	%
INERTS: CLAY, TALC, DYES	99	to 100	%
		to	
TOTAL COMPOSITION (MUST EQUAL OR EXCEED 100%):		103.500000	

12. OTHER: PCBs if yes, concentration _____ ppm, PCBs regulated by 40 CFR 761 (_). Pyrophoric (_) Explosive (_) Radioactive (_) Benzene if yes, concentration _____ ppm. Shock Sensitive (_) Oxidizer (_) Carcinogen (_) Infectious (_) Other

13. If waste subject to the land ban & meets treatment standards, check here: _ & supply analytical results where applicable.

SHIPPING INFORMATION

14. PACKAGING: Bulk Solid (_) Bulk Liquid (_) Drum (X) Type/Size: MIXED SIZE DRUMS Other 16, 55, 85 GAL.

15. ANTICIPATED ANNUAL VOLUME: 135 Units: DRUMS Shipping Frequency: ONE TIME

SAMPLING INFORMATION Sample Tracking Number: 1007169

16a. Sample source (drum, lagoon, pond, tank, vat, etc.): DRUM

Date Sampled: 3/02/92 Sampler's Name/Company: ALAN KALMAR HERITAGE REMEDIATION

16b. Generator's Agent Supervising Sampling: 17. (_) No sample required (See instructions.)

GENERATOR'S CERTIFICATION

I hereby certify that all information submitted in this and all attached documents contains true and accurate descriptions of this waste. Any sample submitted is representative as defined in 40 CFR 261 - Appendix I or by using an equivalent method. All relevant information regarding known or suspected hazards in the possession of the generator has been disclosed. I authorize CWM to obtain a sample from any waste shipment for purposes of recertification.

X _____ _____ _____

Signature Name and Title Date

18. This is a Nonwastewater.

19. If this waste is subject to any California list restrictions enter the letter from below (either A, B.1 or B.2) next to each restriction that is applicable:

___ HOCs, ___ PCBs, ___ Acid, ___ Metals, ___ Cyanides

20. Identify ALL Characteristic and Listed USEPA hazardous waste numbers that apply (as defined by 40 CFR 261). For each waste number, identify the subcategory (as applicable, check none, or write in the description from 40 CFR 268.41, 268.42, and 268.43).

REF #	A. US EPA HAZARDOUS WASTE CODE(S)	B. SUBCATEGORY Enter the subcategory description. If not applicable, simply check none		C. APPLICABLE TREATMENT STANDARDS			D. HOW MUST THE WASTE BE MANAGED? Enter letter from below
				PERFORMANCE-BASED: Check as applicable		SPECIFIED TECHNOLOGY: If applicable enter the 40 CFR 268.42 table 1 treatment code(s)	
		DESCRIPTION	NONE	268.41(a)	268.43(a)	268.42	
1	D014		X		X		A
2	P108		X			INCIN	A
3	U247		X		X		A
4							
5							
6							
7							
8							
9							
10							

Management under the land disposal restrictions:

A. RESTRICTED WASTE REQUIRES TREATMENT

B.1 RESTRICTED WASTE TREATED TO PERFORMANCE STANDARDS

B.2 RESTRICTED WASTES FOR WHICH THE TREATMENT STANDARD IS EXPRESSED AS A SPECIFIED TECHNOLOGY (AND THE WASTE HAS BEEN TREATED BY THAT TECHNOLOGY)

B.3 GOOD FAITH ANALYTICAL CERTIFICATION FOR INCINERATED ORGANICS

C. RESTRICTED WASTE SUBJECT TO A VARIANCE

D. RESTRICTED WASTE CAN BE LAND DISPOSED WITHOUT FURTHER TREATMENT

E. NOT CURRENTLY SUBJECT TO LAND DISPOSAL RESTRICTIONS

21. Is this waste a soil and/or debris? No: X Yes, Soil: _ Yes, Debris: _ Yes, Both: _

22. Specific Gravity Range: _____ to _____

23. Indicate the range of each: Units

Cyanides: ≤ 50 to _____ PPM Type (free, total, amenable, etc.) TOTAL

Cyanides: _ None to _____ _____ Type (free, total, amenable, etc.) _____

Sulfides: ≤ 3 to _____ PPM Type TOTAL

Optional Phenolics: ≤ 10 to _____ PPM

24. Identify the waste color GREY, BLACK, PURPLE, RED

Date Printed 03/10/92

AD0166

Profile #

25. COMPLETE ONLY FOR WASTES INTENDED FOR FUELS OR INCINERATION

	TOTAL	
Beryllium as Be	< 5000	ppm
Potassium as K	< 5000	ppm
Sodium as Na	< 5000	ppm
Bromine as Br	< 1 to 5	%
Chlorine as Cl	< 1 to 5	%
Fluorine as F	< 1 to 5	%
Sulfur as S	< 1	%

26. RECLAMATION, FUELS or INCINERATION PARAMETERS (Provide if information is available)

RANGE

A. Heat Value (Btu/lb): 1- 4000

B. Water: _____

C. Viscosity (cps): ____@____F _ 100 F _ 150 F

D. Ash: 66.80 %

E. Settleable solids: 100.00 %

F. Vapor Pressure @ STP (mm/Hg): ____

G. Is this waste a pumpable liquid? Yes _ No X

H. Can this waste be heated to improve flow? Yes _ No X

I. Is this waste soluble in water? Yes X No _

J. Particle size: Will the solid portion of this waste pass through a 1/8 inch screen? Yes _ No X

27. TRANSPORTATION INFORMATION

A. Is this a DOT Hazardous Material? Yes X No _

B. Proper Shipping Name: HAZARDOUS WASTE SOLID, N.O.S.
(STRYCHNINE, METHOXYCHLOR) RQ(D014)

C. Hazard Class: ORM-E I.D. NA9189

D. CERCLA Reportable Quantity (RQ) and units (Lb, Kg): 1 Lb

28. SPECIAL HANDLING INFORMATION

_ Material Safety Data Sheets Attached

29. OTHER INFORMATION

IL# 9191677177

30. CHEMICAL WASTE MANAGEMENT CERTIFICATION

Chemical Waste Management, Inc. has all the necessary permits and licenses for the waste that has been characterized and identified by this approved profile.

31. OTHER HAZARDOUS CONSTITUENTS Indicate if the waste contains any of the following.

METALS	TCLP Information: Check only ONE for each constituent Use units: ppm, mg/l				TCLP Data	TCA or TOTAL Use units: ppm, mg/l, mg/kg or percent			
						California List			
	Less Than	TC Regulated Level	Equal or More	Waste No.	TCLP Actual	Less Than	Regulated Level	Equal or More	Actual
Arsenic as As	X	5.0 mg/l		D004		X	500 mg/l		
Barium as Ba	X	100.0 mg/l		D005					
Cadmium as Cd	X	1.0 mg/l		D006		X	100 mg/l		
Chromium tot Cr	X	5.0 mg/l		D007					
Lead as Pb	X	5.0 mg/l		D008		X	500 mg/l		
Mercury as Hg	X	.2 mg/l		D009		X	20 mg/l		
Selenium as Se	X	1.0 mg/l		D010		X	100 mg/l		
Silver as Ag	X	5.0 mg/l		D011					
Nickel as Ni						X	134 mg/l		
Thallium as Tl						X	130 mg/l		
Chromium Hex						X	500 mg/l		
Antimony									
Beryllium									
Copper									
Vanadium									
Zinc									

32. OTHER HAZARDOUS CONSTITUENTS Indicate if the waste contains any of the following.

ORGANICS	TCLP Information: Check only ONE for each constituent				TCLP Data	TCA or TOTAL Use units: ppm, mg/l or %
	Less Than	Regulated Level	Equal or More	Waste No.	TCLP Analytical Test Results Use units: ppm or mg/l	
Benzene	X	0.5 mg/l		D018		
Carbon Tetrachloride	X	0.5 mg/l		D019		
Chlordane	X	0.03 mg/l		D020		
Chlorobenzene	X	100.0 mg/l		D021		
Chloroform	X	6.0 mg/l		D022		
m-Cresol	X	200 mg/l		D024		
o-Cresol	X	200.0 mg/l		D023		
p-Cresol	X	200.0 mg/l		D025		
Cresol	X	200.0 mg/l		D026		
2,4-D	X	10.0 mg/l		D016		
1,4 Dichlorobenzene	X	7.5 mg/l		D027		
1,2-Dichloroethane	X	0.5 mg/l		D028		
1,1-Dichloroethylene	X	0.7 mg/l		D029		
2,4-Dinitrotoluene	X	0.13 mg/l		D030		
Endrin	X	.02 mg/l		D012		
Heptachlor, & Hydroxide	X	0.008 mg/l		D031		
Hexachloro-1,3 Butadiene	X	0.5 mg/l		D033		
Hexachlorobenzene	X	0.13 mg/l		D032		
Hexachloroethane	X	3.0 mg/l		D034		
Lindane	X	0.4 mg/l		D013		
Methoxychlor		10.0 mg/l	X	D014		
Methyl Ethyl Ketone	X	200.0 mg/l		D035		
Nitrobenzene	X	2.0 mg/l		D036		
Pentachlorophenol	X	100.0 mg/l		D037		
Pyridine	X	5.0 mg/l		D038		
Tetrachloroethylene	X	0.7 mg/l		D039		
Toxaphene	X	0.5 mg/l		D015		
2,4,5-TP Silvex	X	1.0 mg/l		D017		
Trichloroethylene	X	0.5 mg/l		D040		
2,4,5-Trichlorophenol	X	400.0 mg/l		D041		
2,4,6-Trichlorophenol	X	2.0 mg/l		D042		
Vinyl Chloride	X	0.2 mg/l		D043		

APPENDIX B
INVITATION FOR BID

INVITATION FOR BID

■■■■■■ CONTRACTING SERVICES FOR WASTE MANAGEMENT

Prepared for
Interchem PRP Group
Alton, Iowa
February 1992

Woodward-Clyde

Woodward-Clyde Consultants
5055 Antioch Road
P.O. Box 3777
Overland Park, Kansas 66203-0777

INVITATION FOR BID

CONTRACTING SERVICES FOR WASTE MANAGEMENT

Prepared for
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P.O. Box 3777
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Project Number 91C7315

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1.0
INTRODUCTION

The purpose of this document is to set forth requirements and work items for prospective Contractors interested and capable of performing soil, concrete, liquid, drummed containers, and wood removal and disposal in the vicinity of a former pesticide formulating facility. The Interchem Facility (Site) is located in Alton, Iowa and was a former dry and liquid pesticide formulation facility from the period of 1976 to 1988. The Site currently is under an EPA Administrative Order on Consent.

Four concurrent removal activities are proposed for the site including the removal of soil, concrete, waste oil, and a wooden structure (Shed) and its drummed containers located inside. A Detailed Scope of Work is presented in Section 3.0.

Work will be contracted directly by the Interchem PRP Group (the Group) with Woodward-Clyde Consultants (WCC) acting as their representative.

2.0
SITE DESCRIPTION

The Site is located at 101 East Tenth Street in Alton, Iowa, approximately 50 miles northeast of Sioux City, Iowa (Figures 1 and 2). The facilities which were used for the pesticide formulation operations are located on both sides of 1st Avenue between 10th and 11th Streets in the east-central portion of Alton. A small plot of land including a concrete pad, located on the south side of East 10th Street, is part of the Site. Three sets of railroad tracks and vacant land are located immediately east and north of the Site, respectively. Mixed commercial and residential districts are located to the north, west, and south.

3.0
SCOPE OF WORK

The Contractor will perform the Scope of Work outlined below. The removal action in the field will be directed by WCC on behalf of the Group.

The Scope of Services for WCC in support of the removal action program includes:

- Sampling of clean backfill;
- Coordination and documentation of Removal Action; and
- Coordination of Site surveying.

General analytical laboratory services and survey work are to be provided by an independent laboratory under contract to the Group. Documentation of all field activities and work progress will be completed by WCC.

The Contractor's Scope of Work includes, but is not limited to:

- Waste Characterization;
- Mobilization to site;
- Site preparation;
- Securing any construction or demolition permits required from the City of Alton, Iowa;
- Development of health and safety plans;
- Development of decontamination plan;
- Utilities clearance in excavation areas;
- Soil excavation, transportation, and off-site disposal;
- Backfilling, compaction, site grading, and seeding;

- Concrete excavation, transportation, and off-site disposal;
- Storage tank waste liquid removal, transportation, and off-site disposal;
- Shed demolition, and drummed container removal transportation, and off-site disposal; and
- Final report detailing Contractor work activities.

3.1 MOBILIZATION/DEMOBILIZATION

The Contractor will mobilize all equipment, personnel, and materials necessary to complete all activities described in this Scope of Work. The cost for mobilization and demobilization will be given as a lump sum and will be completed according to the schedule described in Section 4.0.

3.2 SITE PREPARATION

The following Site preparation activities will be completed by the Contractor prior to initiating soil excavation.

3.2.1 Designation and Establishment of Removal and Loading Areas

Removal and loading areas will be located so as to limit the potential for the spread of contaminated soil, concrete, and/or storage tank waste liquids at the Site. Excavated media will be placed in waste haulers which will be located as close as possible to the removal areas, thereby minimizing the potential for waste spillage.

3.2.2 Location and Construction of Decontamination Area

Personnel and equipment decontamination facilities will be provided at the Site by the Contractor. The Contractor will be responsible for proper disposal of the decontamination facilities upon completion of the field activities. The Contractor will provide a plan detailing the location and construction of decontamination areas and the disposal of Contractor generated wastes and decontamination fluids.

3.2.3 Location of Underground Utilities

Prior to beginning excavation, public utilities (water, electric, gas, telephone, etc.) will be contacted by the Contractor to determine the presence of lines in the excavation areas. Excavation shall not begin until utilities are identified and moved (if necessary).

3.3 SOIL EXCAVATION, TRANSPORTATION, AND OFF-SITE DISPOSAL

Figure 3 shows the three soil areas to be excavated. All areas will be excavated to an initial depth of 6, 12, or 18 inches (for an estimated 50, 100, or 150 in-place cubic yards, respectively). The excavated soil will be transported, and disposed in a RCRA-permitted disposal facility. The RCRA-permitted disposal facility, selected by the Contractor, will be approved by the Group and the USEPA prior to commencement of removal activities.

Laboratory analyses were conducted on soil samples collected during field investigations in September and October, 1991. The results indicate total pesticide concentrations less than 200 mg/kg in the soil. Toxaphene is the primary pesticide detected in the soil. In addition, coumaphos, endrin, and delta BHC have been found to a much lesser extent in the soil.

After completing the excavation to a depth selected by the Group and WCC, (6, 12, or 18 inches) confirmation samples will be collected by WCC. The samples will be analyzed for toxaphene with results obtained within approximately 48 hours. Excavation will not take place during this period of time; however, other tasks including, but not limited to, concrete and waste liquid removal, may be performed during this period. If the results of these confirmation samples warrant, the area(s) will be excavated an additional 6 inches. This process will be repeated until confirmation analysis results of toxaphene are less than 10 mg/kg.

Dust control measures will be implemented during the entire excavation effort to limit and, where possible, eliminate particulate emissions from the soil excavation areas. The excavation area will be periodically sprayed with clean water (as necessary) to reduce dust emissions generated from truck traffic and excavation.

Prior to beginning soil excavation activities, one source of clean backfill material will be located by the Contractor. Two samples of the material will be collected by WCC from the material and submitted for analysis for toxaphene. The backfill material shall not contain any detectable quantities of toxaphene in order to qualify for placement in the soil excavation areas. Backfill of clean soil will be placed in 6-inch lifts and compacted by wheel rolling with the decontaminated excavation equipment. Seeding of the area will follow compaction to promote stabilization of the soil.

3.4 CONCRETE EXCAVATION, TRANSPORTATION, AND OFF-SITE DISPOSAL

A concrete pad (toxaphene pad) is shown in Figure 3. The estimated volume to be removed is approximately 60 cubic yards based upon estimated concrete pad dimensions of 30 by 40 feet by 1 foot thick. The concrete pad will be broken into pieces less than 3 feet on any side to allow acceptance into an RCRA-permitted disposal facility. The Contractor-selected disposal facility will be approved by the Group and the USEPA prior to commencement of removal activities.

Toxaphene is the primary pesticide detected in the concrete. Toxaphene was detected at a maximum concentration of 4,500 mg/kg in the upper 1/4 inch of the concrete. Other pesticides, (detected at concentrations less than 17 mg/kg) included 4,4'-DDT, endrin, heptachlor epoxide, and lindane.

3.5 ABOVE GROUND STORAGE TANK WASTE LIQUID REMOVAL, TRANSPORTATION, AND OFF-SITE DISPOSAL

Seven above ground storage tanks (AGST) are shown in Figure 3. Five AGSTs (4, 5, 6, 7, and 8) contain waste liquid and range in height from approximately 15 to 25 feet and range in diameter from approximately 8 to 12 feet. The height of the waste liquids varies between approximately 6 to 10 inches with an estimated total waste liquid volume of approximately 2,000 gallons (see Table 1). Entry hatches 30 inches in diameter are located on top four of the five AGSTs of concern and a 4-inch diameter opening is on the other AGST. Waste liquid shall be removed from the AGST using the best available method, removing as much of the liquid as possible. Following removal of the

The waste liquid and rinsate shall be removed off-site and delivered to a Contractor-selected reclamation/disposal facility which shall be approved by the Group and the USEPA prior to commencement of removal activities. Results of laboratory analysis from the October 1991 field investigations are included in Table 1. Limited initial "fingerprinting" data on a composite sample from the five AGSTs is provided in Appendix A.

3.6 SHED DEMOLITION, DRUM REMOVAL, TRANSPORTATION, AND OFF-SITE DISPOSAL

The wooden structure known as the Shed is shown in Figure 4 with approximate dimensions. It is composed of wooden walls, floors, and roof trusses, a composite shingle roof, and six concrete supports running the length of the building. The Shed is subdivided into two separate buildings: the North Shed and the South Shed.

The Shed roof and 75 percent of the walls shall be disposed in a sanitary landfill and the flooring and 25 percent of the walls shall be disposed in a hazardous waste landfill. The concrete supports (approximately 50 cubic yards) shall be disposed in a sanitary landfill.

There are 174 containers ranging in size from 30-gallon lab pack containers to 85-gallon overpack drums located in the North Shed (see Table 2). These drums will be removed prior to Shed demolition. These containers will be disposed of in a RCRA-permitted disposal facility selected by the Contractor and approved by the Group and the USEPA. Initial "fingerprinting" data on grab samples collected from 169 of the containers located in the North Shed. (The nine lab packs were not sampled.) Those results are labeled S-1 through S-100 and N-1 through N-69 and are included in Appendix A.

3.7 QUALIFICATIONS

The Contractor shall employ properly trained personnel in the management of hazardous waste as required by federal and state regulations. Documentation of Health and Safety training shall be provided for all on-site workers prior to the start of field activities. Only licensed, competent drivers shall be employed for the transportation of

the wastes under the Department of Transportation regulations. The Contractor is responsible for and shall provide documentation detailing the transportation, sale, treatment and/or disposal of removed wastes at permitted facilities.

3.8 NOTIFICATIONS

The following notification requirements shall apply:

- The Contractor shall notify the WCC Site engineer immediately if anyone without protective gear is exposed to a hazardous substance while performing activities under the Scope of Work or if any unexpected hazard is encountered.
- The Contractor shall notify WCC of any anticipated or unanticipated temporary work stoppages.
- The Contractor shall notify WCC of any accidents or emergencies.

3.9 SUBMITTALS

All of the Contractor's personnel who will be performing this Work shall follow the health and safety protocol described in Section 3.12. The Contractor shall submit plans for compliance with these protocols with the proposal.

The Contractor shall provide documentation of the permit status of all disposal facilities prior to initiating field activities. In addition, documents shall be submitted for approval by the Group including the following:

- Preparation of the manifest forms and shipping documents for all wastes;
- Verification of compliance of all disposal facilities with Sections 3004 and 3005 of the Solid Waste Disposal Act and all applicable state requirements;
- Any recycling or reclamation treatment operations performed on the waste;

- Certification of disposal of waste or waste residues at permitted facilities;
- Site Survey Results (described in Section 3.13 and a scaled map indicating excavated areas on the Site.
- A Health and Safety Plan; and
- A Decontamination Plan.

3.10 SITE RESTORATION

Immediately upon completion of the removal activities, the Contractor shall remove all of the Contractor's equipment and supplies from the Site.

The Contractor shall be responsible for preserving, protecting and preventing damage to all property, public and private. Any property damage resulting directly or indirectly from the Contractor's operations shall be restored, at the Contractor's expense, to an equivalent condition to that existing before the damage was done.

3.11 EQUIPMENT AND MATERIALS

The Contractor shall supply all utilities, equipment, and materials (hereinafter referred to as equipment) required to sample, clean, load, transport and dispose of the waste materials. Equipment shall include, but is not limited to, items needed for: personnel protection, managing unanticipated leaks and spills of wastes and decontamination supplies. Clean water must be provided by the Contractor for all personnel and equipment decontamination purposes. All waste generated during field activities shall be containerized and disposed of by the Contractor at the conclusion of the removal activity. All discarded personnel protection equipment and decontamination wastes must be handled and disposed as hazardous wastes.

3.12 HEALTH AND SAFETY PROTOCOL

3.12.1 General

The work to be carried out under these specifications is at a former pesticide formulation facility. Hazardous materials (including pesticides) are known to be containerized in drums in the North Shed. The nature of the materials which may be encountered during waste removal at the Site requires the use of personal protective equipment and procedures intended to minimize worker exposure to known or suspected site hazards.

The Contractor shall develop, implement and maintain a Site-Specific Health and Safety Plan with the appropriate level of worker safety equipment and procedures prior to and during performance of the work. The Contractor is responsible for compliance with all applicable OSHA regulations.

Use of the protective equipment, as well as the site-specific procedures, requires personnel who are trained and medically approved for conducting the tasks described herein. The Contractor shall provide written certification that personnel meet the regulations and guidelines referenced for performing the work described in this IFB.

3.12.2 Health and Safety Plan

The Contractor's Site-Specific Health and Safety Plan shall be consistent with the requirements of the Occupational Safety and Health Administration (OSHA) standards and regulations contained in Title 29, Code of Federal Regulations, Parts 1910 and 1926 (29 CFR 1910 and 1926).

The Contractor shall defend, indemnify, and hold harmless the Group, its contractors, and subcontractors for any claim, liability, damage, or loss that arises in connection with the performance of its work. Should any safety related factor, hazard, or condition become evident during the performance of work at this Site, it shall be the Contractor's responsibility to bring it to the attention of the Group.

3.12.3 Training

The Contractor is responsible for providing to its personnel training in health and safety procedures, as well as protective equipment use. The Contractor shall submit a statement verifying compliance with employee right-to-know and training provisions of OSHA Safety and Health Standards (29 CFR 1910). All personnel shall possess at least the minimum qualifications for hazardous waste site work as defined in 29 CFR Part 1910.120.

3.12.4 Miscellaneous

The Contractor shall be required to routinely maintain all protective clothing and equipment necessary for his personnel.

Air quality monitoring for volatile organic compounds shall be the responsibility of the Contractor.

No eating, drinking, smoking or chewing shall be allowed in exclusion work zone areas or outside these areas prior to personnel decontamination. It shall be the responsibility of the Contractor to ensure that health and safety requirements are implemented for his/her personnel.

3.13 SITE SURVEY

Before initiating Site activities, important Site features will be located by a professional surveyor. These features will include the horizontal and vertical limits of the areas to be excavated. After removal activities, the horizontal and vertical limits of the excavated areas will be established to measure in-place removal volumes for both soil and concrete.

4.0
SCHEDULE

The tentative schedule for completing this Scope of Work is summarized below:

- Receive analytical results of soil and concrete characterization sampling - April 6, 1992;
- Contractor mobilize to Site - April 13, 1992;
- Complete Site work - May 1, 1992; and
- Submit final report detailing Contractor Site activities - June 5, 1992.

The above schedule is based upon dependent activities and may be adjusted by the Group according to actual completion dates of prior tasks.

TABLES

TABLE 1

ABOVE GROUND STORAGE TANK DETAILS

Tank Number[1]	Estimated Fluid Volume (Gallons)	Estimated Tank Diameter (ft)	Estimated Tank Height (ft)	Estimated Analytical Results (milligrams/kilogram)
4	350	11.0	18	Ethylbenzene = 230,000
5	220	8.0	16	Xylenes (total) = 1,200,000 Toxaphene = 76 2-Methylnaphthalene = 2,800 Zineb/Manzeb = 200
6	450	10.5	18	Methylene Chloride = 320
7	390	10.0	13	
8	380	10.5	24	Xylenes (total) = 12,000/660[2] Naphthalenes = 60,000

Notes:

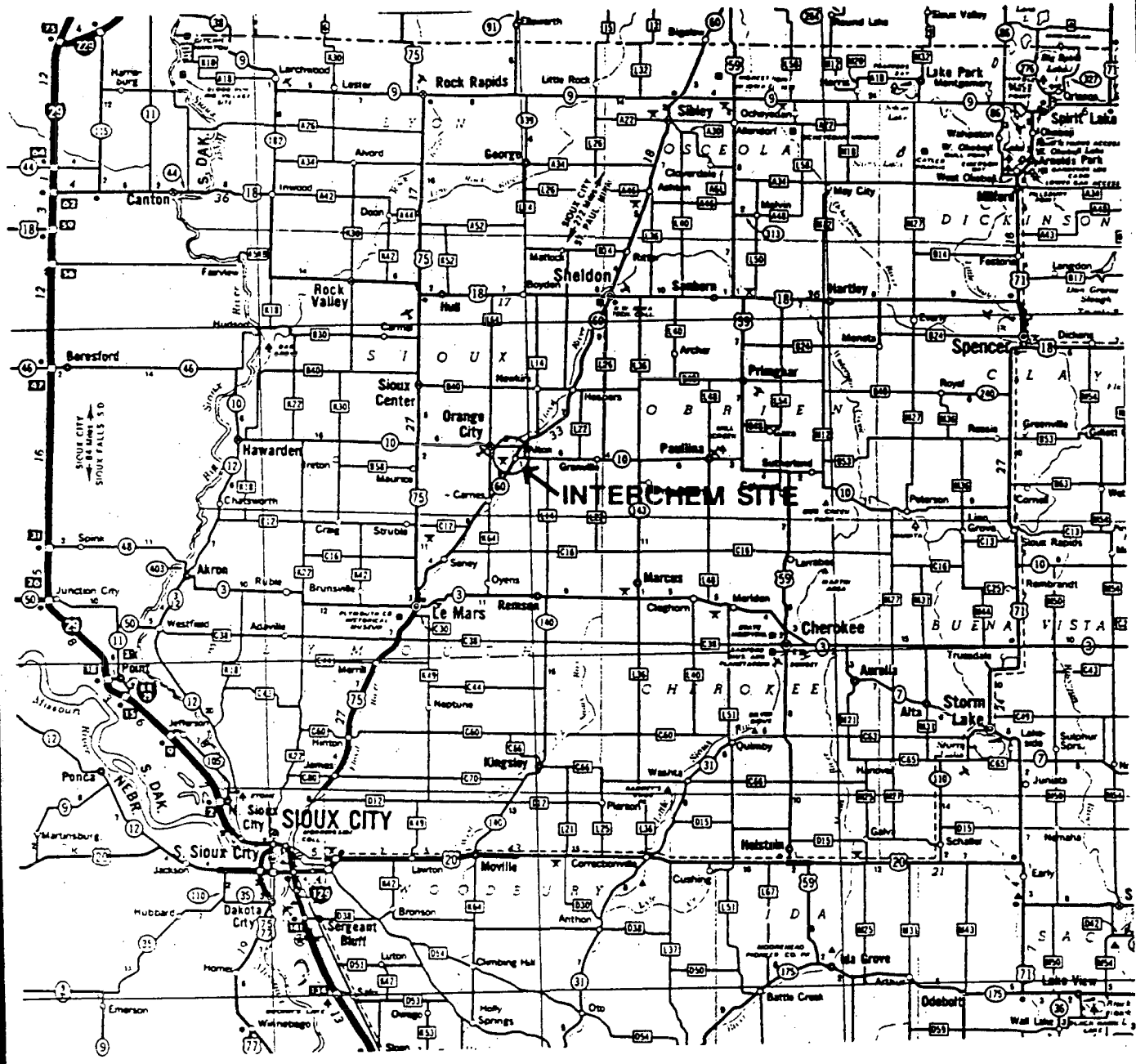
1 Tank numbers marked on tank.

2 Split sample analysis results.
Tank fluids appear to be oil/water and diesel/water mixtures.

TABLE 2
INVENTORY OF MATERIALS IN NORTH SHED

Label Description	Container Size/Type	Quantity	Notes
Unknown	85-gallon	48	Overpack containers
Cythion (Malathion) Green Label	55-gallon steel	20	Six of the 20 drums contain some water
Cythion (Malathion) Blue Label	55-gallon steel	34	One full of unknown product
Unknown	55-gallon steel	63	Unknown solids
Unknown	30-gallon steel	9	Lab packed containers
Total Containers		**174**	

FIGURES



14 0 14 28

SCALE MILES

IOWA

N

ACAD FILE:

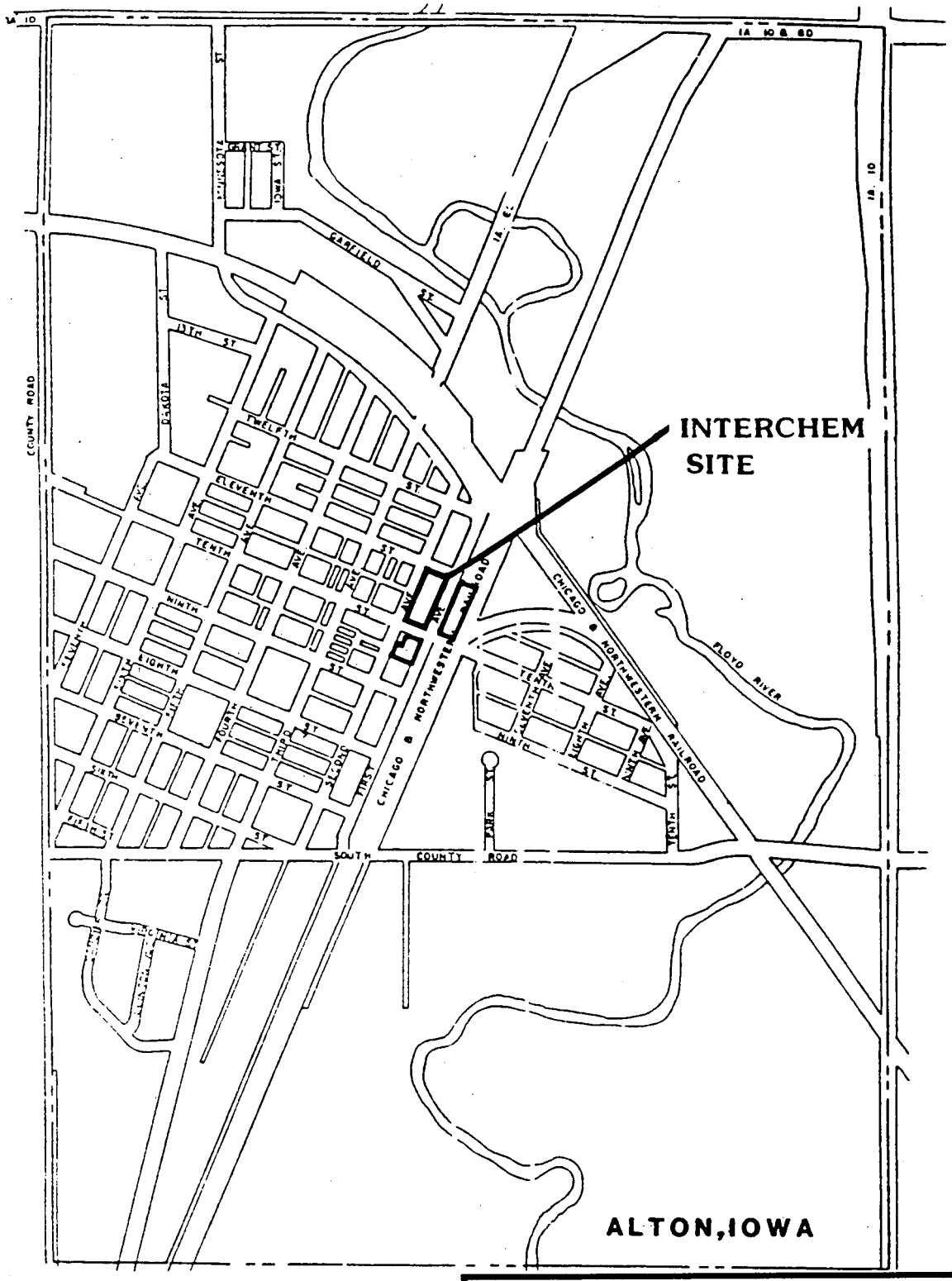
INTERCHEM SITE - ALTON, IOWA

Woodward-Clyde Consultants

Engineers, Geologists, And Environmental Scientists

SITE LOCATION MAP

DRAWN: M.A.L.	DATE: 06/14/91	PROJECT NUMBER 91C7315	FIG. NO. 1
CHECKED: B.t.B.	DATE: 06/21/91		



NOT TO SCALE

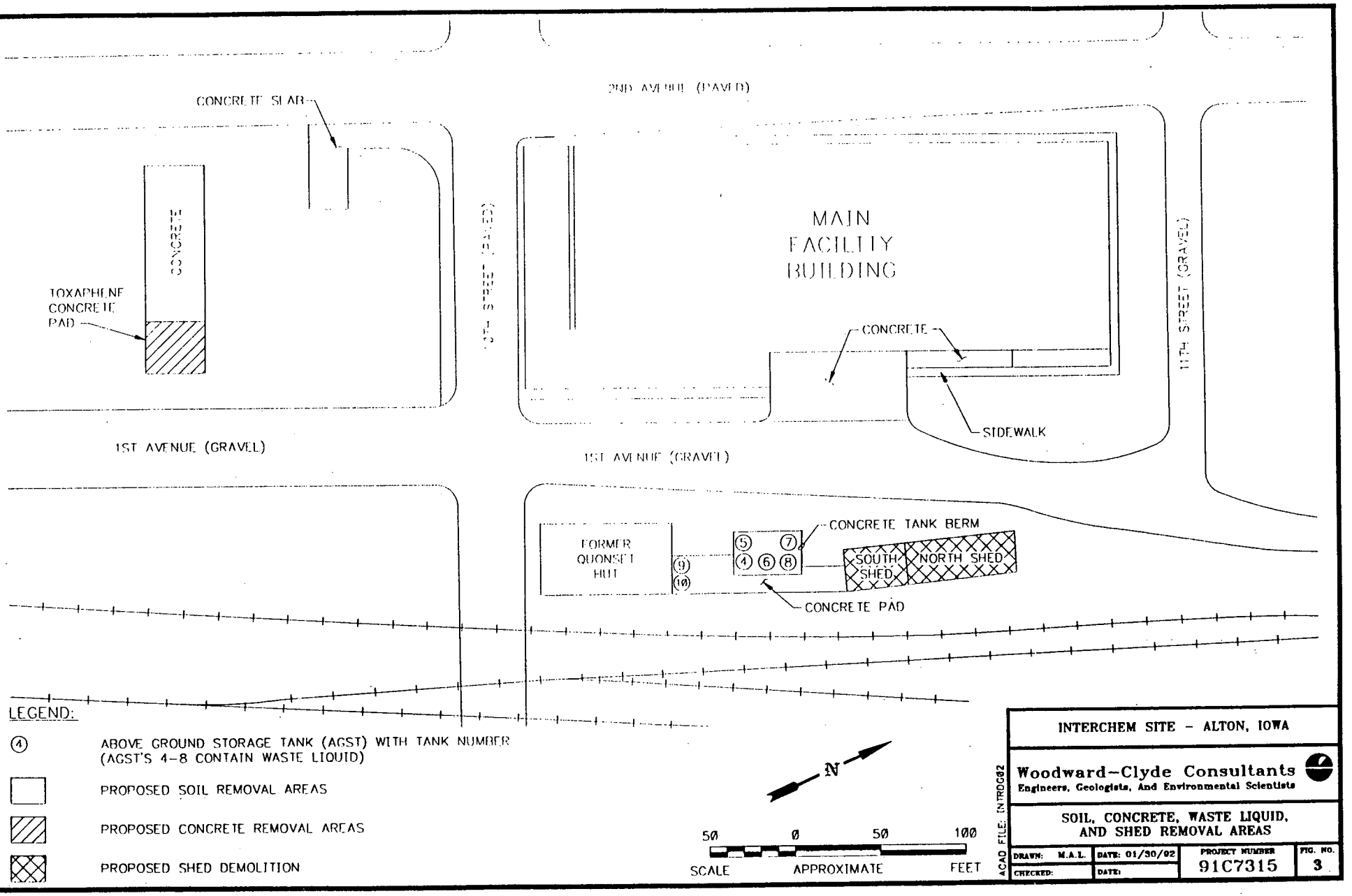
N

INTERCHEM SITE - ALTON, IOWA

Woodward-Clyde Consultants
Engineers, Geologists, And Environmental Scientists

LOCATION OF SITE IN ALTON, IOWA

DRAWN: D.D.S.	DATE: 06/03/91	PROJECT NUMBER 91C7315	FIG. NO. 2
CHECKED: [illegible]	DATE: 7/09/91		



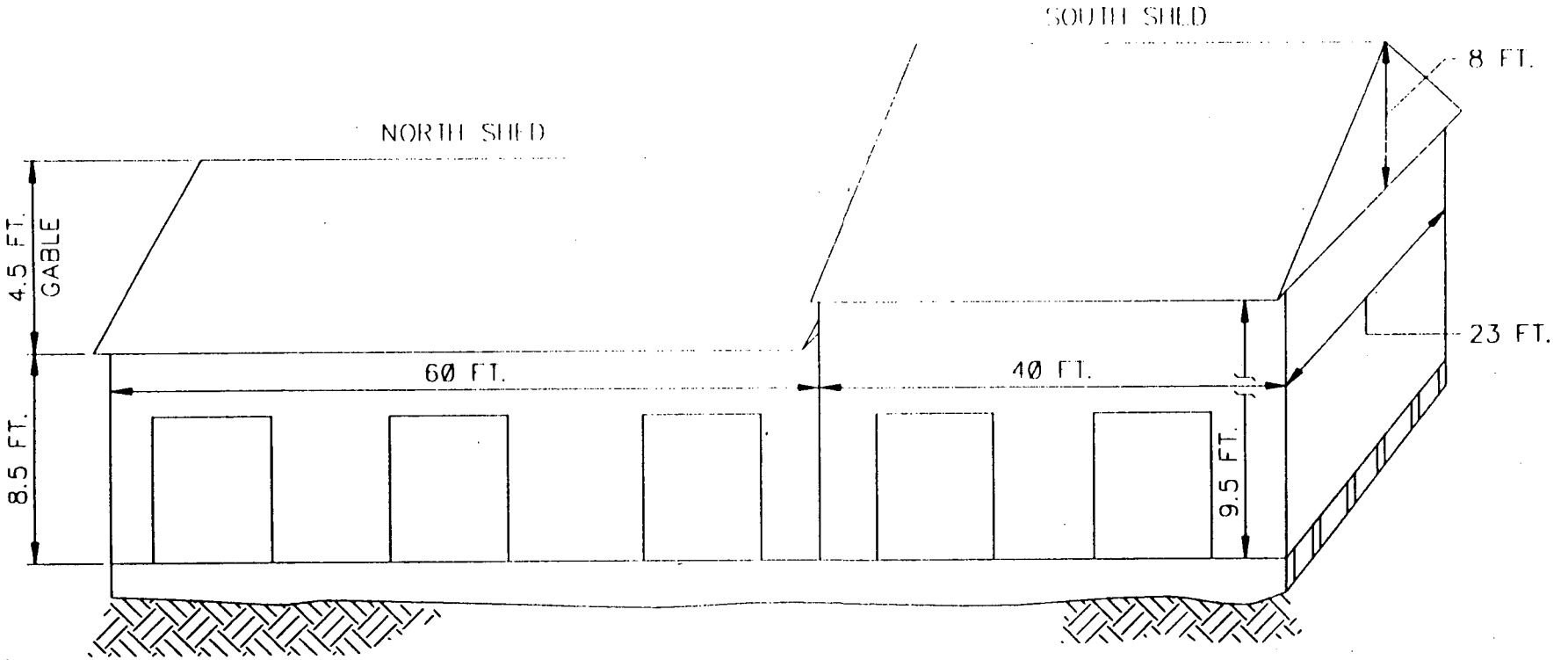
INTERCHEM SITE - ALTON, IOWA

Woodward-Clyde Consultants
Engineers, Geologists, And Environmental Scientists

SOIL, CONCRETE, WASTE LIQUID, AND SHED REMOVAL AREAS

DRAWN: M.A.L.	DATE: 01/30/92	PROJECT NUMBER 91C7315	FIG. NO. 3
CHECKED:	DATE:		

ACAD FILE: INTRDC02



NOT TO SCALE

INTERCHEM SITE – ALTON, IOWA

Woodward–Clyde Consultants
Engineers, Geologists, And Environmental Scientists

SHED DIMENSIONS

DRAWN: M.A.L.	DATE: 02/12/92	PROJECT NUMBER	DWG. NO.
CHECKED:	DATE:	91C7315	4

ACAD FILE: INTRDG03

2/17/92 14:12:48

APPENDIXES

APPENDIX A
FINGERPRINT DATA OF AGST WASTE LIQUID AND NORTH SHED CONTAINERS

WASTESTREAM PROFILE

WASTE DESCRIPTION / COMMON NAME	PRODUCT	PRODUCT TYPE
FUEL OIL/WATER	Z	WASTE OIL BULK
PROCESS GENERATING	**COLOR**	**PHYSICAL STATE AT 70°F**
PLANT CLEANOUT	NONE	LIQUID

HAZARD TYPE	EPA HAZARD CODES
NON-HAZARDOUS	NO HAZARD CODES SPECIFIED
DOT HAZARD CLASS	**EPA REPORTING NAME**
COMBUSTIBLE	

DOT DESCRIPTION

WASTE OIL, NOS (FUEL OIL, WATER)
COMBUSTIBLE LIQUID, NA1270

UPON LABORATORY ANALYSIS OF A REPRESENTATIVE SAMPLE, THE FOLLOWING MAJOR CONSTITUENTS WERE EVALUATED:

PARAMETER	RESULT	UNIT	DET. LIMIT	ALLOWABLE RANGE
API GRAVITY @ 60 F	7.429	LBS/GAL		
CYANIDE SCREEN	NEG			
FLASH POINT	155	DEGREES F		
HEAT OF COMBUSTION	13711	BTU/LB		
PCB	BDL			
PERCENT SOLIDS	0.2	PERCENT		
PH OF AQUEOUS PHASE	8			
REID VAPOR PRESSURE @ 70 F IN PSI	0.1			
SULFIDE SCREEN	NEG			
TOTAL ARSENIC	BDL	MG/KG	2.50	
TOTAL CADMIUM	BDL	MG/KG	0.40	
TOTAL CHROMIUM	BDL	MG/KG	1.0	
TOTAL LEAD	BDL	MG/KG	4.0	
TX	BDL		1000	
W	29	PERCENT		

LABORATORY WASTE UNKNOWNS
FINGERPRINT ANALYSIS REPORT

DATE: _____

GENERATOR: INTERCHEM

HR/E JOB #: 9104203

LOCATION: ALTON, IA.

CONTACT: Robert SKACH

TELEPHONE: _____

INV.#	GENERIC NAME/DESCRIPTION	FLASH PT.	Cl^-	PEROX	H_2O RX (SOL) (RXN)	pH	CN^-	S^{-2}	ACID RX
N-1	BROWN LOW VISC. OPAQUE LIQUID	>200°F	—	—	(+)(-)	4	—	—	—
N-2	BROWN LOW VISC. TRANSLUCENT LIQUID	>200°F	—	—	(+)(-)	6	—	—	—
N-3	〃	>200°F	—	—	(+)(-)	4	—	—	—
N-4	Brown Low Visc Opaque Lq.	> 200°F	—	—	(+)(-)	7	—	—	—
N-5	Brown Low Visc. Opaque Lq.	> 200°F	—	—	(+)(-)	4	—	—	—
N-6	Brown Low Visc Opaque Lq. w/Brown precp.	100-200°F	(Neg)	—	(+)(-)	3	—	—	+
N-7	Brown Low Visc Translucent Liquid	>200°F	(-)	—	(+)(-)	3	—	—	+
N-8	Clear Low Visc Transparent Liquid	> 200°F	—	—	(+)(-)	4	—	—	—
N-9	White fine Powder	>200°F	(-)	—	(+)(-)	3	—	—	—
N-10	Clear Low Visc Transparent Liquid	>200°F	—	—	(+)(-)	6	—	—	—
N-11	Brown Low Visc Opaque Liq.	> 200°F	—	—	(+)(-)	6	—	—	—
N-12	Brown Low Visc Opaque Lq. w/Brown precp.	100-200°F	—	—	(+)(-)	4	—	—	—
N-13	Brown fine Powder	> 200°F	—	—	(+)(-)	6	—	—	—
N-14	Brown Chunky Solid	> 200°F	—	—	(-)(-)	6	—	—	—
N-15	Brown Low Visc. Opaque Liquid	> 200°F	—	—	(+)(-)	4	—	—	—
N-16	Brn med Visc. Opaque Liquid	100-200°F	—	—	(+)(-)	7	—	—	—
N-17	Tan Low Visc opaque Liq.	> 200°F	(-)	—	(+)(-)	3	—	—	—
N-18	Clear Low Visc Transparent Liquid	> 200°F	—	—	(+)(-)	5	—	—	—
N-19	Tan Low Visc Opaque Liq.	> 200°F	—	—	(+)(-)	5	—	—	—
N-20	~~Brn Pwd~~ Brown Chunky Solid	> 200°F	—	—	(-)(-)	6	(-)	—	—
N-21	Grey fine Powder	> 200°F	—	—	(-)(-)	6	—	—	—
N-22	Brown Rock-Like solid	> 200°F	—	—	(-)(-)	6	—	—	—
N-23	Clear Low Visc Transparent Liquid	> 200°F	—	—	(+)(-)	6	—	—	—

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INV.#	GENERIC NAME/DESCRIPTION	FLASH PT.	Cl^-	PEROX	H_2O RX	^2H	CN^-	S^{-2}	ACID RX
N-24	Brown Soil like Solid	> 200 °F	—	—	(-)(-)	6	—	—	—
N-25	grey fine powder Solid	> 200 °F	—	—	(-)(-)	6	—	—	—
N-26	Brown Chunky Solid	> 200 °F	-	—	(-)(-)	6	—	—	—
N-27	Brown Low Viscosity opaque Liquid	> 200 °F	—	—	(+)(-)	5	—	—	—
28	〃	〃	〃	〃	(+)(-)	〃	〃	〃	〃
N-29	Clear Low Visc Translucent Liq w/ white flakes	> 200 °F		—	(+)(-)	1	—	—	(-)
N-30	Tan Granular ~~Powder~~ Solid	> 200 °F	—	—	(-)(-)	6	—	—	—
N-31	Tan Granular Solid	> 200 °F	—	—	(-)(-)	6	—	—	—
N-32	grey fine powder	> 200 °F	—	—	(-)(-)	7	—	—	—
N-33	Clear Low Viscosity transparent Liquid	> 200 °F	—	—	(+)(-)	1	—	—	(+)
N-34	〃	> 200 °F	—	—	(+)(-)	4	—	—	—
N-35	Tan Low Visc Translucent Liquid	> 200 °F	—	—	(+)(-)	5	—	—	—
N-36		> 200 °F	—	—	(+)(-)	4	—	—	—
N-37					( )( )				
N-38					( )( )				
N-39					( )( )				
N-40					( )( )				
N-41					( )( )				
N-42					( )( )				
N-43					( )( )				
N-44	〃	〃	〃	〃	( )( )	〃	〃	〃	〃
N-45	White fine Powder	> 200 °F	—	—	(+)(-)	6	—	—	—
N-46	〃	〃	—	—	〃	6	—	—	—

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INV.#	GENERIC NAME/DESCRIPTION	FLASH PT.	Cl^-	PEROX	H_2O RX	pH	CN^-	S^{-2}	ACID RX
N-47	Whit fine Powder	> 200°F	—	—	(+)(-)	6	—	—	—
N-48	Tan Rock-Like Solid	> 200°F	—	—	(+)(-)	6	—	—	—
N-49	White fine Powder	> 200°F	—	—	(+)(-)	6	—	—	—
N-50	〃	〃	〃	〃	〃	〃	〃	〃	〃
N-51	〃	〃	〃	〃	〃	〃	〃	〃	〃
N-52	Pink fine Powder	> 200°F	—	—	(+)(-)	6	—	—	—
N-53	Grey Rock Like Solid	> 200°F	—	—	(+)(-)	8	—	—	—
N-54	Fusha ~~Powder~~ fine Powder	> 200°F	—	—	(+)(-)	6	—	—	—
N-55	Brown fine Powder	> 200°F	—	—	(+)(-)	8	—	—	—
N-56	White fine Powder	> 200°F	—	—	(+)(-)	6	—	—	—
N-57	Corn mixed w/tan chunk solids	> 200°F	—	—	(-)(-)	6	—	—	—
N-58	White fine powder	> 200°F	—	—	(+)(-)	6	—	—	—
N-59	Black fine Powder	> 200°F	—	—	(-)(-)	6	—	—	—
N-60	White Salt-Like Solid	> 200°F	—	—	(+)(-)	4	—	—	—
N-61	Grey fine Powder	> 200°F	—	—	(-)(-)	6	—	—	—
N-62	Tan fine Powder	> 200°F	—	—	(-)(-)	6	—	—	—
N-63	Grey fine ~~SD~~ Powder	> 200°F	—	—	(-)(-)	6	—	—	—
N-64	Grey fine Powder	> 200°F	—	—	(-)(-)	6	—	—	—
N-65	Tan Granular Powder	> 200°F	—	—	(-)(-)	6	—	—	—
N-66	Brown Soil like solid floor-sweepings	> 200°F	—	—	(-)(-)	6	—	—	—
N-67	〃	〃	〃	〃	〃	〃	〃	〃	〃
N-68	~~PPE~~ PPE Contaminated w/above	> 200°F	—	—	(-)(-)	6	—	—	—
N-69	〃	〃	〃	〃	〃	〃	〃	〃	〃

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INV.#	GENERIC NAME/DESCRIPTION	FLASH PT.	Cl^-	PEROX	H_2O RX	pH	CN^-	S^{-2}	ACID RX
S-1	Grey fine Powder	> 200°F	–	–	(–)(–)	6	–	–	–
S-2	↓	↓	↓	↓	↓	↓	↓	↓	↓
S-3	Grey Rock-Like Solid	> 200°F	–	–	(–)(–)	6	–	–	–
S-4	White fine Powder	> 200°F	–	–	(–)(–)	7	–	–	–
S-5	Brown Rock like Solid	> 200°F	–	–	(+)(–)	6	–	–	–
S-6	Brown Powder like Solid	> 200°F	–	–	(–)(–)	6	–	–	–
S-7	Brown Dirt-Like Solid	> 200°F	–	–	(–)(●)	6	–	–	–
S-8	White/grey fine Powder	> 200°F	–	–	(–)(–)	6	–	–	–
S-9	Brown fine Powder Clumpy	> 200°F	–	–	(–)(–)	6	–	–	–
S-10	Grey Powder like Solid	> 200°F	–	–	(–)(–)	6	–	–	–
S-11	Brown fine Powder	> 200°F	–	–	(–)(–)	6	–	–	–
S-12	Brown Coarse Solid	> 200°F	–	–	(–)(–)	6	–	–	–
S-13	grey fine Powder	> 200°F	–	–	(–)(–)	6	–	–	–
S-14	Brown fine Powder	> 200°F	–	–	(–)(–)	6	–	–	–
S-15	Brown Coarse Solid	> 200°F	–	–	(–)(–)	6	–	–	–
S-16	Brown Coarse Sol.	> 200°F	–	–	(–)(–)	6	–	–	–
S-17	Tan Coarse Sol. d	> 200°F	–	–	(–)(–)	6	–	–	–
S-18	Brown Clay-Like Solid	> 200°F	–	–	(+)(–)	6	–	–	–
S-19	Tan fine Powder	> 200°F	–	–	(–)(–)	6	–	–	–
S-20	Tan fine Powder	> 200°F	–	–	(–)(●)	6	–	–	–
S-21	Brown Clay Like Solid	> 200°F	–	–	(+)(–)	6	–	–	–
S-22	Brown Clay Like Solid	> 200°F	–	–	(+)(–)	6	–	–	–
S-23	Grey fine Powder	> 200°F	–	–	(–)(–)	6	–	–	–

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INV. #	GENERIC NAME/DESCRIPTION	FLASH PT.	Cl^-	PEROX	H_2O RX	pH	CN^-	S^{-2}	ACID RX
S-24	Brown Clay Like Solid	> 200°F	—	—	(+)(-)	6	—	—	—
S-25	grey fine powder	> 200°F	—	—	(-)(-)	6	—	—	—
S-26	grey fine powder	> 200°F	—	—	(-)(-)	6	—	—	—
S-27	~~Brown Grey-Tan~~ Tan Fine Powder	> 200°F	—	—	(-)(-)	6	—	—	—
S-28	Brown Rock-Like Solid	> 200°F	—	—	(-)(-)	6	—	—	—
S-29	Brown Clay-Like Solid	> 200°F	—	—	(-)(-)	6	—	—	—
S-30	Tan fine Powder	> 200°F	—	—	(-)(-)	6	—	—	—
S-31	"	> 200°F	—	—	(-)(-)	6	—	—	—
S-32	Broken glass / cardboard Contam. w/ pesticides	> 200°F	—	—	(-)(-)	6	—	—	—
S-33	Tan fine powder	> 200°F	—	—	(-)(-)	6	—	—	—
S-34	Grey fine Powder	> 200°F	—	—	(-)(-)	6	—	—	—
S-35	Tan Fine Powder	> 200°F	—	—	(-)(-)	6	—	—	—
S-36	Rust flake material	> 200°F	—	—	(-)(-)	6	—	—	—
S-37	Brown clay-Like Solid	> 200°F	—	—	(+)(-)	6	—	—	—
S-38	Brown Coarse Solid	> 200°F	—	—	(-)(-)	6	—	—	—
S-39	grey fine powder	> 200°F	—	—	(-)(-)	6	—	—	—
S-40	"	> 200°F	—	—	(-)(-)	6	—	—	—
S-41	Grey fine Powder	> 200°F	—	—	(-)(-)	6	—	—	—
S-42	Brown soil like Solid	> 200°F	—	—	(-)(-)	6	—	—	—
S-43	Brown fine powder	> 200°F	—	—	(-)(-)	6	—	—	—
S-44	Brown Powdery like Solid	> 200°F	—	—	(-)(-)	6	—	—	—
S-45	grey fine Powder	> 200°F	—	—	(-)(-)	6	—	—	—
S-46	"	> 200°F	—	—	(-)(-)	6	—	—	—

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INV.#	GENERIC NAME/DESCRIPTION	FLASH PT.	Cl^-	PEROX	H_2O RX	pH	CN^-	S^{-2}	ACID RX
S-47	Grey flake like material	>200 °F	—	—	(—)(—)	6	—	—	—
S-48	Brown soil-like solid	>200 °F	—	—	(-)(-)	6	-	-	—
S-49	Tan granular solid	>200 °F	—	—	(-)(-)	6	—	—	—
S-50	↓	>200 °F	—	—	(-)(-)	6	-	-	—
S-51	Grey fine powder	>200 °F	—	—	(-)(-)	6	-	-	—
S-52	Tan granular solid	>200 °F	—	-	(-)(-)	6	-	-	—
S-53	Tan granular solid	>200 °F	—	-	(-)(-)	6	-	-	—
S-54	Brown soil-like solid	>200 °F	-	—	(-)(-)	6	-	-	—
S-55	Brown granular solid	>200 °F	—	-	(-)(-)	10	(-)	-	—
S-56	Brown coarse solid	>200 °F	—	—.	(-)(-)	6	—	-	—
S-57	Tan clay like material	>200 °F	-	—	(-)(-)	6	-	-	—
S-58	↓	>200 °F	-	-	(-)(-)	6	-	-	-
S-59	↓	>200 °F	—	—	(-)(-)	6	-	-	—
S-60	grey to Brown Powder like solid	>200 °F	—	—	(+)(-)	6	-	-	—
S-61	↓	↓	↓	↓	(+)(-)	↓	↓	↓	↓
S-62	↓	↓	↓	↓	(+)(-)	↓	↓	↓	↓
S-63	↓	↓	↓	↓	(+)(-)	↓	↓	↓	↓
S-64	↓	↓	↓	↓	↓	↓	↓	↓	↓
S-65	↓	↓	↓	↓	↓	↓	↓	↓	↓
S-66	↓	↓	↓	↓	↓	↓	↓	↓	↓
S-67	↓	↓	↓	↓	↓	↓	↓	↓	↓
S-68	↓	↓	↓	↓	↓	↓	↓	↓	↓
S-69	↓	↓	↓	↓	↓	↓	↓	↓	↓

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INV.#	GENERIC NAME/DESCRIPTION	FLASH PT.	Cl^-	PEROX	H_2O RX	H_2	CN^-	S^{-2}	ACID RX
S-70	GREY to BROWN POWDER LIKE SOLID	>200°F	—	—	(+) (-)	6	—	—	—
S-71									
S-72									
S-73									
S-74									
S-75									
S-76									
S-77									
S-78									
S-79									
S-80									
S-81									
S-82									
S-83									
S-84									
S-85									
S-86									
S-87									
S-88									
S-89									
S-90									
S-91									
S-92									

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LOCATION: ALTON, IA.

CONTACT: Robert SKACH

TELEPHONE: _____

INV.#	GENERIC NAME/DESCRIPTION	FLASH PT.	Cl^-	PEROX	H_2O RX	$_2^H$	CN^-	S^{-2}	ACID RX
S-93	grey to brown powder like solid	>200°F	—	—	(+)(-)	6	—	—	—
S-94									
S-95									
S-96									
S-97									
S-98	PPE cont. w/ water pesticides								
S-99									
S-100									

BID SHEET
FOR
SUBCONTRACTING WASTE MANAGEMENT SERVICES
AT
THE INTERCHEM SITE
ALTON, IOWA

The undersigned declares that the only person or parties interested in this Bid as principals are as stated: that the Bid is made without any collusion with other persons, firms, or corporations; that the Invitation for Bid (IFB) has been carefully examined; that the bidder is informed fully in regard to all conditions pertaining to the work and the place where it is to be done, and from them, the undersigned makes this Bid. The Bid price shall cover all expenses incurred in performing the work required under the IFB including, but not limited to:

- All labor, equipment, and materials required;
- Transportation of personnel and equipment;
- Required bonds and licenses;
- Per diem and all other services and items required to satisfactorily complete the project; and
- Final report detailing work activities.

All bids shall remain good for at least 90 days after receipt of the bids. Bids are due to WCC on February 28, 1992.

All bidders are required to submit proof of insurance coverage (Certificate of Insurance) with this Bid.

If a Notice of Award, accompanied by unsigned copies of the Contract and all other applicable Contract Documents, is delivered to the undersigned within 10 working days after the actual date the Bids are due, the undersigned will, within five working days after the date of receipt of such notification, execute and return all copies of the Contract and all other applicable Contract Documents. This shall include proof of insurance.

The undersigned hereby agrees that the Contract Time shall commence upon the effective date of the Contract and that the scope of work will be completed within a schedule agreed upon by the Group and the undersigned.

The undersigned acknowledges receipt of the following addenda:

_____

_____

_____

In accordance with the above understanding, the undersigned proposes to perform and complete the Work in its entirety in the manner and under the conditions required, at the prices listed on this Bid Sheet.

In addition to a completed Bid Sheet, the undersigned hereby certifies that the following information is attached and acknowledges that these items must be included for the proposal to be considered responsive:

- The names of the subcontractor's personnel assigned to supervise the field work and summaries of their qualifications and experience.
- A schedule indicating the estimated duration for completion of the scope of work.

All of the work covered under the IFB will be charged at the following unit prices. The unit prices will be provided individually for labor, equipment, expenses, fuel, per diem, site preparation, excavation, loading, transport, and disposal required to complete the Scope of Work in the IFB.

Any quantities of soil, concrete, etc. greater than the estimates provided on the Bid Sheet will be billed at the unit prices provided by the Contractor. The Interchem PRP Group (the Group) may also delete one or more of the tasks or a portion of the quantities of the tasks listed on the Bid Sheet at no expense to the Group.

Item Description	Unit Price	Estimated Quantity	Total Cost
1. <u>Excavation of Soil and Related Activities</u> a. Excavation and backfilling to a 6-inch depth, loading, transport, and disposal in a RCRA-permitted hazardous waste landfill.		50 in-place yds^3	

Item Description	Unit Price	Estimated Quantity	Total Cost
b. Excavation and backfilling to a 12-inch depth, loading, transport, and disposal in a RCRA-permitted hazardous waste landfill.		100 in-place yds^3	
c. Excavation and backfilling to an 18-inch depth, loading, transport, and disposal in a RCRA-permitted hazardous waste landfill.		150 in-place yds^3	
2. Excavation of Concrete and Related Activities Excavation, loading, transport, and disposal of the concrete slab (estimated at 12 inches thick) and debris.		60 in-place yds^3	
3. Removal of Storage Tank Waste Liquids and Related Activities a. Removal, loading, transport, and disposal of waste liquid.		2,000 gallons	
b. Removal, loading, transport, and disposal of rinsate.		250 gallons	
4. Shed Demolition and Related Activities a. Demolition of shed.		lump sum	
b. Transportation and disposal of: 1) Shed roof and portion of walls to a sanitary landfill.		lump sum	
2) Shed flooring and portion of walls to a RCRA-permitted hazardous waste landfill.		lump sum	
3) Concrete supports to a sanitary landfill.		50 in-place yds^3	
c. Removal and disposal of drummed containers.		9, 30-gallon lab pack 117, 55-gallon steel 48, 85-gallon steel	
5. Mobilization/Demobilization		lump sum	

Item Description	Unit Price	Estimated Quantity	Total Cost
6. Preparation of a report on field activities.		lump sum	
7. Standby time		one day	
8. Surveying		lump sum	

APPROVAL AND ACCEPTANCE:

_____ _____

(Company Name) (Representative)

INTERCHEM PRP GROUP

Waste Management Contract

CONTRACTOR INTERCHEM PRP GROUP AGREEMENT

THIS AGREEMENT made and entered into this ____ day of _____, 1992, by and between Interchem PRP Group and _____.

WITNESSETH

In consideration of the promises and the mutual covenants and agreements contained herein and for other valuable considerations, the parties hereto agree as follows:

1. STATEMENT OF WORK. The Contractor shall perform the characterization, excavation, transportation, disposal and decontamination of waste in accordance with the Invitation for Bids attached hereto as Exhibit A. The work shall be performed on the real property located at Interchem Site (the "Site"). The Contractor shall provide all the labor, materials, equipment, and services required to perform the work. The Contractor shall perform transportation and disposal of all waste from the Site in accordance with all applicable laws and regulations and the specification contained in the Invitation for Bid.

The work shall be performed in accordance with, and the rights and obligations of the parties shall be governed by the additional terms and conditions set forth herein, which terms and conditions together with all Exhibits thereto are incorporated herein by reference.

2. TIME OF COMMENCEMENT AND COMPLETION. The work shall be started on April 13, 1992, and shall be pursued until completion on or before May 6, 1992, or as otherwise mutually agreed by the Interchem PRP Group and Contractor.

3. **CONSIDERATION PAYMENT.** The Interchem PRP Group shall pay Contractor for performance of the work and shall pay for performance of the Scope of Work described in the Invitation for Bids based on actual quantities of material in accordance with the Bid Sheet (Exhibit B).

4. **SAFE, WORKMANLIKE PRACTICES.** Contractor shall take all necessary safety precautions with respect to the work. Contractor shall perform all work in a safe manner in compliance with all applicable laws and regulations. In the event of an accident, including but not limited to Contractor's employees, and/or facilities, equipment, and spillage, Contractor shall promptly notify the Interchem PRP Group and provide a written report describing the incident, names of all parties involved, date, time, and location of incident.

A. Contractor is aware of hazards present at the Interchem Site which may be associated with working with hazardous materials or waste.

B. Contractor shall use best management practices to prevent any spills or releases to the environmental and shall be responsible for any necessary spill cleanup.

C. Contractor shall prevent any incompatible waste, that is generated during performance of work, from being combined in any way.

5. **RESPONSIBILITIES OF CONTRACTOR (GENERAL).**

A. Contractor shall:

(1) Obtain any license to do business or other permit or license required to perform the work and comply with all applicable environmental laws in the performance of the work.

(2) Perform the work in compliance with the terms and conditions of the Agreement, and with the standards normally followed by those performing work of the type performed hereunder in the same or similar locality of the Site; and

(3) Provide adequate personnel, equipment, and materials required to perform the work, which equipment and materials will be maintained in good working order throughout the performance of the work.

B. Contractor shall take all necessary safety precautions with respect to the work.

C. In an emergency threatening injury to persons or damage to property, where it is impracticable for Contractor to obtain prior authorization from the Interchem PRP Group, Contractor may in its discretion take such actions as it deems appropriate to prevent threatened injury or damage. Any such actions taken by Contractor shall be deemed included in the work.

D. Contractor shall be responsible for performing its duties under this Agreement and agrees to hold harmless and defend the Interchem PRP Group from and against any and all losses, liabilities and costs (including but not limited to attorneys' fees) which the Interchem PRP Group may incur, become responsible for or pay out as a result of death or bodily injury to any person, or destruction or damage to any property, caused by any negligent act or omission of Contractor or its employees, in the performance of this Agreement.

6. **RESPONSIBILITIES OF THE INTERCHEM PRP GROUP.**

A. The Interchem PRP Group shall provide the Contractor the following information:

(1) Map of the Site; building sketch and/or building outlines;

(2) MSDSs as requested by Contractor to the extent MSDSs are available;

(3) Tour of Site prior to Contractor's preparation of proposal and during the course of work at the Interchem PRP Group's convenience;

(4) Approximate dimensions of areas to be excavated;

and

(5) Approximate quantities of material to be disposed.

B. The Interchem PRP Group shall also provide Contractor, or its employees and subcontractors access to the Site.

7. **CONFIDENTIAL INFORMATION.** It is understood that all services to be performed by Contractor pursuant to this Agreement and all written and oral surveys, data, reports, recommendations, or other documents or information generated by Contractor or received from the Interchem PRP Group in performance of this Agreement are confidential and Contractor shall prevent disclosure of such materials except to the Interchem PRP Group. Contractor shall not use any such confidential information unless prior written consent is obtained form the Interchem PRP Group. Should Contractor be requested to disclose such materials by any person, whether by court process or otherwise, it shall promptly notify the Interchem PRP Group. Should the Interchem PRP Group receive any trade or business secrets of Contractor or techniques and procedures of Contractor which Contractor designates as confidential, it shall treat such materials as confidential and shall prevent their disclosure. Should the Interchem PRP Group be requested to disclose such materials by any person, whether by court process or otherwise, it shall promptly notify Contractor, who shall be responsible for protecting the confidentiality of such materials in the manner Contractor deems appropriate. Contractor shall not name or otherwise identify or refer to the Interchem PRP Group as a representative client for any purposes without obtaining the written consent of the Interchem PRP Group.

In performing the work, Contractor shall provide the Interchem PRP Group with certain proposals, reports or all required or other similar information. Such proposals, reports, other information shall become property of the Interchem PRP Group.

8. **TERMINATION OF AGREEMENT.** Either party may terminate this Agreement upon the occurrence of any material breach by the other party to this Agreement by giving written notice of such breach to the breaching party. This Agreement will terminate after the receipt of such notice unless the breaching party has cured such

breach to the other party's satisfaction. All outstanding invoices or monies due for work performed through the termination shall be due and payable as of the termination date. All obligations arising prior to termination and all rights and obligations of the parties shall survive any termination of this Agreement.

9. **DELAYS AND EXTENSION OF TIME.** If Contractor is delayed at any time in the progress of the work by a negligent or willful act of the Interchem PRP Group, by any act of another contractor of the Interchem PRP Group, by adverse weather conditions not reasonably anticipated, unavoidable casualties, or any other cause beyond Contractor's control or by delay authorized by the Interchem PRP Group, the time for completion of the work shall be extended for a time equal to the time of such delay. Such causes beyond Contractor's control shall include, acts of God, acts of war, riots, fire, explosion, accident or flood, embargo, sabotage, governmental law, ordinance, rule, regulation, order or actions, injunction, or restraining order.

Contractor shall be responsible for completing the project on a timely basis and in accordance with schedule referenced in the Scope of Work. Any change in schedule must be agreed to by the Interchem PRP Group. Any additional costs in disposing of materials after the Land Ban deadline of May 8, 1992, as a result of any delay caused by the Contractor except for such delays arising from any negligent or willful act of the Interchem PRP Group or its other Contractors, shall be borne by the Contractor.

10. **INSURANCE.** Contractor shall at its sole cost and expense secure and maintain throughout the full period of this Agreement, insurance coverage for Contractor's obligations and for claims under applicable Worker's Compensation Act and for bodily injury, death, or property damage as may arise from the performance of the work as described below:

A. Worker's Compensation Insurance including occupational disease as required by all applicable laws, including employer's liability. Such policy shall include a waiver of subrogation in favor of the Interchem PRP Group.

B. Comprehensive Auto and General Liability Insurance endorsed to include broad form contractual coverage with policy limits of at least $1,000,000 combined single limit per occurrence for bodily injury and property damage. Such policy shall name the Interchem PRP Group as an additional insured, and include a waiver of subrogation in favor of the Interchem PRP Group.

Insurance coverage shall in no way limit the indemnification obligations under this Agreement. Waiver of approval of any insurance shall in no event by construed as a waiver of indemnity obligation assumed under this Agreement or any obligation which may arise by operation of law. Proof of insurance shall be furnished upon request. Contractor prior to commencing the work hereunder shall deliver to the Interchem PRP Group a Certificate evidencing the foregoing insurance,

(1) naming the Interchem PRP Group and its consultant, Woodward-Clyde Consultants, as additional Insureds and

(2) containing a clause requiring 30 day written notice to the Interchem PRP Group in the event of cancellation or material change.

11. **INDEMNITY.** The Contractor agrees to indemnify, defend, and hold harmless the Interchem PRP Group, its members, officers, employees, agents, and representatives from and against all claims, liability, damages, loss or expense, including claims, liability, damages, loss or expense in connection with this Agreement, including, but not limited to claims of employees of the Contractors, claims arising out of injury, death or property damage, direct, and/or consequential, to any person or entity.

12. **NOTICE.** Any notice to be given under this Agreement shall be in writing and shall be deemed given and received when delivered in person or deposited in the United States mail, certified mail with proper postage prepaid, addressed to the

appropriate party at the address below. Mr. James B. Shapiro, General Counsel, Weil, Gotshal & Manges, 1615 L Street, N.W., Suite 700, Washington, D.C. 20036.

13. LAW TO APPLY. The validity, interpretation, and performance of this Agreement shall be governed by and construed in accordance with the laws of the State of Iowa.

14. NO WAIVER. No waiver by either party of any default by the other party in the performance of any provision of the Agreement shall operate as or be construed as a waiver of any future detail, whether like or different character.

15. CAPTIONS AND HEADINGS. The captions and headings throughout this Agreement are for convenience and reference only and the words contained therein shall in no way be held or deemed to define, limit, describe, explain, modify, amplify, or add to the interpretation, construction or meaning of any provision of, or scope or intent of, this Agreement nor in any way affect this Agreement.

16. SEVERABILITY. If any provision of this Agreement, or application thereof to any person or circumstance, shall be any extent be invalid, the remainder of this Agreement or the application of such provision to person or circumstances other than those as to which it is held invalid, shall not be affected thereby and each provision of the Agreement shall be valued and enforced to the fullest extent permitted by law.

17. REFERENCES. Contractor shall provide the Interchem PRP Group with three (3) references for projects they have previously performed which are of a similar nature, scope, and magnitude of the Interchem PRP Group's.

18. ENTIRE AGREEMENT. This Agreement, including the Exhibits hereto which are incorporated herein by reference, represents the entire understanding and

agreement between the parties hereto relating to the work and supersedes any and all prior agreements, whether written or oral, that may exist between the parties regarding the same. No Amendment or modification to this Agreement or any waiver of any provision hereof shall be effective unless in writing signed by the party so to be bound thereby.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed by their duly authorized representatives as of ___ day of _____, 1992.

THE INTERCHEM PRP GROUP	CONTRACTOR
_____	_____
By	By
_____	_____
Title	Title
_____	_____
Witness	Witness

APPENDIX C
INVITATION FOR BID ADDENDUM NO. 1

ADDENDUM NO. 1

Date: February 19, 1992
Owner: Interchem PRP Group, Loveland, Colorado

The following paragraph replaces Section 3.5 of the February 19, 1992 Invitation for Bid.

3.5 ABOVE GROUND STORAGE TANK WASTE LIQUID REMOVAL, TRANSPORTATION, AND OFF-SITE DISPOSAL

Seven above ground storage tanks (AGST) are shown in Figure 3. Five AGSTs (4, 5, 6, 7, and 8) contain waste liquid and range in height from approximately 15 to 25 feet and range in diameter from approximately 8 to 12 feet. The height of the waste liquids varies between approximately 6 to 10 inches with an estimated total waste liquid volume of approximately 2,000 gallons (see Table 1). Entry hatches 30 inches in diameter are located on top of four of the five AGSTs of concern and a 4-inch diameter opening is on the other AGST. Waste liquid shall be removed from the AGSTs using the best available method, removing all free liquids. Following removal of the liquids, the tanks will be rinsed with potable water (or other liquid selected by the Contractor) and removed for disposal with the waste liquid.

Each bidder shall acknowledge receipt of this addendum by affixing his/her signature below, by noting this addendum on his/her Bid Sheet, and by attaching this addendum to his/her Bid.

Acknowledgement

The undersigned acknowledges receipt of this addendum and the Bid submitted is in accordance with information, instructions, and stipulations set forth herein.

Bidder: _____

By: _____

Date: _____

APPENDIX D
CONTRACTORS HEALTH AND SAFETY PLANS

HERITAGE REMEDIATION/ENGINEERING, INC.

1319 Marquette Dr.
Romeoville, IL 60441
Phone: 708/378-1600
FAX: 708/378-2200

HEALTH AND SAFETY PLAN

This health and safety plan is designed to establish line responsibilities, personal protection guidelines, air monitoring protocol, specify operating procedures, decontamination procedures, and emergency procedures that may be necessary during the clean-up/disposal activities.

CLIENT: Interchem PRP Group
Weil, Gotshal and Manges
1615 L Street, N.W.
Washington, D.C. 20036

TELEPHONE NUMBER:
(913) 432-4242
Robert Skach

FACILITY: Interchem Site
101 East Tenth Street
Alton, Iowa

FACILITY TELEPHONE NUMBER:

N/A

PROJECT MANAGER: Alan Kalmar **HR/E PROJECT NUMBER:** 9104203

SITE ASSESSMENT: [X] COMPLETE [ ] PRELIMINARY

DESCRIPTION OF SITE PROCESSES AND OPERATIONS:

Pesticide Formulation process and storage

PROJECT OBJECTIVES Container handling, waste removal, transportation and disposal of waste materials located in wood storage shed, soil excavation, transportation off-site disposal, backfilling, compaction, site grading and seeding, concrete excavation, transportation, and off-site disposal, storage tank waste liquid removal, transportation and off-site disposal, shed demolition transportation and off-site disposal.

PROPOSED DATE(S) OF WORK: Week of April 13, 1992.

HEALTH AND SAFETY PLAN PREPARED BY: Alan E. Kalmar, CHMM

TITLE: Technical Services Manager

REVIEW AND APPROVALS

PROJECT DIRECTOR: _____ **DATE:** _____
(Signature)

PROJECT MANAGER: _____ **DATE:** _____
(Signature)

HEALTH/SAFETY MANAGER: _____ **DATE:** 4/9/92
(Signature)

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A. EMERGENCY PROCEDURES

1. EMERGENCY RESPONSE CONTACTS:

AGENCY/FACILITY NAME	PHONE NUMBER	RESPONSE TIME
Ambulance:	911	minutes (2-5)
Fire Department:	(712) 756-4449	minutes (2-5)
Police Department:	(712) 737-3307	minutes (2-5)
Hospital: Orange City Municipal Hospital	(712) 737-4984	minutes (Approx 5)
State Emergency Response:	(913) 236-3778	N/A
National Response Center:	1-800-424-8802 1-202-462-2657	N/A
Chemtrec	1-800-424-9300	N/A
Poison Control Center:	(409)765-1420	N/A
Utilities:		
Electric/Gas	(712)756-4314	N/A
Water	same	N/A
Sewer	same	N/A
Office: HR/E	(708)378-1600	N/A

2. **EMERGENCY ROUTES:** (See Attached map)

Hospital: Leave site, proceed north on state Highway 60 to State Highway 10. Turn west and go 3 miles to the Orange City Municipal Hospital. (estimated distance: Approx 5 miles)

3. **THE FOLLOWING EMPLOYEES ARE TRAINED IN FIRST AID AND/OR CPR:**

Employee	First Aid	CPR
Pete Zajec	X	X
Tom Ganze	X	X

4. **EMERGENCY EQUIPMENT AVAILABLE:**

The following emergency equipment (indicated by a check mark) is available on site:

	Communications Equipment	LOCATION EXTENSION
[ ]	Public Telephones	
[ ]	Private Telephones	
[X]	Mobile Telephones	HR/E Vehicles
[ ]	Two-way Radios	
[X]	Air Horn	Safety Station
[X]	Rope Tugs	
[X]	Hand Signals	

	Medical Equipment	LOCATION
[X]	First Aid Kits	Safety Station
[ ]	Stretcher/Backboard	
[X]	Eyewash/Shower	Safety Station
[ ]	Oxygen	
[ ]	Other	

	Fire Fighting Equipment	LOCATION
[X]	Fire Extinguishers	Safety Station
[ ]	Other	

	Spill or Leak Equipment	LOCATION
[X]	Absorbent Boom/Pad	
[X]	Dry Adsorbents	HR/E Vehicles
[X]	Tools	HR/E Vehicles
[ ]	Other	

- Other Related Documents

[X] Confined Space Entry Policy & Procedures
[ ] Lock Out/Tag Out Policy & Procedures
[ ] Asbestos Handling Policy & Procedures
[X] Spill Containment Policy & Procedures
[ ] Pipe Breaking Policy & Procedures
[X] Excavation Guidelines

5. COMMUNICATION PROCEDURES:

A communication system will be established in order for personnel to communicate with each other on-site, as well as off-site.

Hand signals, airhorn and two way radios may be utilized to communicate between exclusion zone operators and support zone personnel. Emergency hand and audible signals which can be used in the event of an emergency include:

- Clutching throat - personal distress

A phone system will be available to communicate to off-site locations.

6. EMERGENCY PROCEDURES:

The following standard emergency procedures will be used by on-site personnel. The Project Manager shall be notified of any on-site emergencies and will be responsible for ensuring that appropriate procedures are followed.

a. Personal Injury: Upon notification of an injury, all site personnel will lend assistance to remove the injured from the work area, if necessary. The Project Manager will determine the extent of injury and determine first aid measures necessary. Contact should be made for an ambulance to transport injured to a medical facility (if required). If injured person is contaminated with hazardous materials,

decontamination will take place to the extent possible. If the cause of the injury does not affect the performance of other site personnel, normal operations may resume. If there is risk to others, all site personnel will move from the work area until further instruction is given. Activities will cease until the risk is removed or reduced.

b. Personal Protective Equipment Failure: If a site worker should experience a failure or alteration of protective equipment that affects the protection factor, that person and his/her buddy shall immediately leave the working area. Re-entry shall not be permitted until the equipment has been repaired or replaced.

c. Other Equipment Failure: If any of the equipment on-site fails to operate properly, the Project Team Leaders will be notified. They will determine the effect of this failure on continuing operations. If the failure effects the safety of personnel or prevents completion of the work plan tasks, all personnel will leave the area until the situation is evaluated and appropriate actions performed.

d. Fire/Explosion: Upon notification of a serious fire or explosion, the Alton Fire Department will be contacted at once. A serious fire is considered to be one that is beyond the incipient stage. All personnel shall move to a safe distance from the involved area. The Project Manager or his designee shall direct fire equipment arriving at the scene to the appropriate area. Personnel will attempt to extinguish small or incipient stage fires.

e. Spills or Leaks: In the event of a spill or a leak, employees will:

(1) Locate the source of the spillage and stop the flow if it can be done safely.

(2) Begin containment and recovery of the spilled materials.

(3) Arrange for clean-up of the area.

f. Weather Emergencies: In the event of heavy weather, the Project Manager or a site supervisor will oversee the securing of the site, materials and equipment in order to prevent the loss or migration of hazardous materials from the site and to prevent public access to the site.

g. Evacuation Routes: The following evacuation routes have been established for this site (SEE ATTACHED MAP). Evacuation should be conducted immediately, without regard for equipment, under conditions of extreme emergency.

h. In All Situations: When an on-site emergency results in evacuation, personnel shall not re-enter until:

(1) The conditions resulting in the emergency have been corrected.

(2) The hazards have been reassessed.

(3) The Site Safety Plan has been reviewed.

(4) Site personnel have been briefed on any changes in the Site Safety Plan.

i. General Chemical First Aid Procedures

(1) INHALATION

- Remove victim to fresh air

NOTE: DO NOT ENTER CONFINED SPACE OR SPILL AREA WITHOUT PROPER PROTECTION

- Give artificial respiration if person is not breathing
- Get medical attention

(2) EYE CONTACT

- Flush immediately with large amounts of water for at least 15 minutes, while holding eyelids open
- Get medical attention promptly after flushing eyes with water

NOTE: Flushing for 30 minutes is recommended if contact with strong alkalies occurs (caustic soda - sodium hydroxide)

(3) SKIN CONTACT

- Flush affected area with large amounts of water while removing contaminated clothing
- Flush for 15 minutes if contact with concentrated chemical
- If irritation persists, get medical attention
- Wash contaminated clothing before reuse

(4) INGESTION

- The decision whether to induce vomiting is chemical-specific
- Do not induce vomiting without first contacting the MSDS Poison Control Center or local emergency room for instructions. The MSDS may have specific instructions
- In some cases, vomiting will cause additional damage, so the use of an antidote is sometimes appropriate
- If vomiting occurs uncontrollably, keep head below hips to prevent vomit from getting into lungs
- Never induce vomiting or give anything by mouth to an unconscious person
- Get medical attention as soon as possible

B. SITE ASSESSMENT

1. **FACILITY DESCRIPTION**
(describe current and past uses of the site, age, condition, etc.):

Site is currently inactive, formerly used as a pesticide formulation and storage facility. Shed to be demolished is approximately 20(+) years old and building is structurally unsound. Above ground storage tanks are in good condition and pose no unusual situation. Concrete pad to be excavated is in area well accessible to complete necessary activities.

2. **UNUSUAL FEATURES:**
(containers, building, dikes, power lines, terrain, degree of contamination, etc.):

AGST dike walls, power lines by railroad tracks, road running through site activities.

3. **STATUS:** [ ] Active [X] Inactive

4. **HISTORY:**

Wood shed, where clean-up activity is taking place, was once used as a material and residue storage area.

C. SITE CHARACTERIZATION: (See attached site map)

- SITE SECURITY: Fencing or other security means will be implemented upon initiation of project start-up. Work zones will be established on-site. All site personnel will be required to sign a log-in and log-out sheet. Unauthorized personnel will be restricted from access. Necessary and authorized visitors will be allowed on-site only if accompanied by the project manager or his designee. Only properly trained personnel will be permitted in the exclusion zone.

- IDENTIFY WORK ZONES (hot, warm, cold areas): The attached map identifies the appropriate work zones. Work zones may be changed only at the discretion of the project manager and the industrial hygienist.

  The exclusion (hot) zone is that area where contaminated materials are present and the potential for worker exposure exists. The hot zone will be demarcated with the use of red barrier tape or red flags. Activities conducted in this zone will include sediment solidification, landfill construction, excavation and truck loading.

  The contamination reduction (warm) zone is that area that separates the exclusion and support zones. Activities conducted within this zone include decontamination of work equipment and personal protective equipment.

  The remaining areas of the site are considered the support (cold) zone. These areas include the worker locker rooms, offices, and break areas. Contaminated equipment will not be allowed into this area without first going through the warm zone. Eating, smoking and drinking will be allowed only within the break area, or project management/support office trailers.

- SITE ENTRY/EXIT PROCEDURES:

  Entry to site will be provided by Woodward and Clyde Consultants Representative.

D. HAZARD ASSESSMENT

1. EXISTING FEATURES

[X] Tanks (aboveground)
Size 5X 20K
Size ____ ____

[ ] Tanks (below ground)
Size ____ ____
Size ____ ____

[X] Containers
Type various
Quantity 174

[X] Drums
17 E Number X ____
17 H Number X ____

[ ] Lagoon(s), pit(s), pond(s)

[ ] Unusual Hazards (i.e. neighboring facilities, public and private properties)

2. PHYSICAL & BIOLOGICAL HAZARDS

[ ] Heat
[ ] Cold
[ ] Radiation
[ ] Confined Space Entry
[ ] Noise
[ ] Poisonous Plants

3. KNOWN SUBSTANCES ON-SITE

[ ] Acids strong
[X] Acids weak
[ ] Asbestos
[ ] Caustics strong
[ ] Caustics weak
[ ] Cyanides
[ ] Dyes/Inks
[ ] Halogenated Gases/Solvents
[ ] Metals
[X] Pesticides
[ ] Phenol/Cresol
[ ] Pickling Liquors
[ ] Pigments
[ ] PCBs
[ ] Oils/Greases
[X] Oily Waste
[X] Solvents
[X] Sludges
[ ] Other

4. HEALTH HAZARD OF POTENTIAL CONTAMINANTS ENCOUNTERED

Contaminant	TLV	IDLH	Primary Route Of Entry	Symptoms	Target Organs	Amount

See Attached

ARE MSDSs AVAILABLE? [X] YES [ ] NO (ATTACH AVAILABLE MSDSs)

5. DESCRIPTION OF EXPECTED HAZARDS TO PERSONNEL ON-SITE:

HAZARDOUS ACTIVITY	MEANS OF PROTECTION
- Shed Demolition	Level C/D
- Pesticide Storage area drum management	Protection utilizing pesticide respirator cartridges.
- Excavation	Level D
- Tank Cleaning/Liquid Stripping	Level B/C

6. DESCRIPTION OF POTENTIAL HAZARDS TO THE PUBLIC AND ENVIRONMENT:

Hazard to the public or environment are not anticipated due to activities at Interchem. However, on-site characteristics will be conducted daily by the project manager and addressed, as needed.

The work site areas will be secured and adequately demarcated. Only authorized personnel will be permitted to enter the work site.

The decontamination area will be defined to ensure protection of environment. All contaminated decontamination water and sediment from decontamination of personnel, equipment and vehicles will be collected.

7. **ENVIRONMENTAL AND PERSONNEL MONITORING:**

The following equipment must be used to monitor conditions at the specified intervals (circle applicable interval). N/A

EQUIPMENT NEEDED	FREQUENCY OF USE
[X] LEL 0_2 Monitor	continuous / hourly / daily / other ____
[ ] LEL / 0_2 / H_2S Monitor	continuous / hourly / daily / other ____
[ ] HNu	continuous / hourly / daily / other ____
[ ] OVA	continuous / hourly / daily / other ____
[ ] TIP II/Microtip	continuous / hourly / daily / other ____
[ ] Hand-held Aerosol Monitor (HAM)	continuous / hourly / daily / other ____
[ ] Aerosol Monitor	continuous / hourly / daily / other ____
[ ] H_2S Monitor	continuous / hourly / daily / other ____
[ ] HCN Monitor	continuous / hourly / daily / other ____
[ ] Radiation Meter	continuous / hourly / daily / other ____
[ ] Detector Tubes	continuous / hourly / daily / other ____

List Type: .

[ ] Heat Stress Monitor	continuous / hourly / daily / other ____
[ ] Other: _____	continuous / hourly / daily / other ____
[ ] Other: _____	continuous / hourly / daily / other ____

[ ] Long Term Ambient / Personnel Monitoring (samples require lab analysis)

[ ] SKC/Gilian Pumps

[ ] Charcoal Tubes	[ ] PVC Filters
[ ] Silica Gel Tubes	[ ] MCEF Filters
[ ] Orbo Tubes	[ ] Impingers (Soln: ____)

Describe Specific Long Term Monitoring Procedures:

8. **EQUIPMENT CALIBRATION:** Equipment is calibrated and documented on a weekly basis.

9. MEDICAL SURVEILLANCE

All HR/E employees are included in HR/E's Medical Surveillance program. This program involves medical monitoring prior to employment, on an annual basis and at termination of employment. Details of HR/E's Medical Surveillance Program are outlined below. If additional medical surveillance procedures are necessary for this project, they are outlined below.

Medical Monitoring Plan

All employees whose job requires them to;

a. Enter the hazardous waste site;

b. Otherwise come in contact with hazardous materials (e.g., contaminated equipment, laboratory samples);

c. Perform physical activities more strenuous than normal; must be included in a medical surveillance program. This program should involve medical monitoring prior to employment, on an annual basis and at termination of employment as specified by 29 CFR 1910.134 and 29 CFR 1910.120.

All employees involved in hazardous waste activities must be medically fit to wear respiratory protection as required in (OSHA Respiratory Protection Standard 29 CFR 1910.134) and Hazardous Waste and Emergency Response Operations Standard (HAZWOPER) (29 CFR 1910.120). All on-site personnel must provide certification to assure medical fitness with OSHA respiratory protection protocol and respiratory fit-testing (qualitative or quantitative).

In addition, all on-site personnel must be actively involved in a comprehensive medical surveillance program as required in HAZWOPER Standard (29 CFR 1910.120) to ensure physical capabilities.

The HR/E medical surveillance program includes the following examinations:

a. Physical Examination - During this physical examination the physician considers the individual's capability to wear respiratory protection. Pulmonary function, cardiovascular status and weight carrying capacities is evaluated. Ability to detect odors is also be included. A licensed Occupational Physician performs the examination. The physician provides a written certification that each employee is medically fit to wear respiratory protection. Additional testing protocol include:

b. Audiogram

c. Wellness blood profile - including complete blood count (CBC), SMAC-24, coronary risk profile.

d. Spirometry

e. Urine for heavy metals

f. Blood lead with ZPP (Zinc Protoporphren)

g. Respirator certification (by examining physician)

h. Red blood cell (RBC) cholinesterase

i. Serum PCB

j. Titmus and Snellen Vision Screen

k. Electrocardiogram - resting

l. Chest x-ray

m. Methemoglobin

n. Urinalysis

o. Physician's written medical opinion

p. Liver enzymes (if needed)

Special Considerations

a. Certain prescription drugs may effect an individual's ability to work in temperature extreme conditions. The physician should note special limited capabilities under these conditions.

b. The purpose of the site safety and health plan is to prevent worker exposure. Biological monitoring activities measure the amount of a specific chemical or its metabolite which is excreted from the body. Examples include phenol monitoring in urine for benzene exposures, lead in blood, chlorinated hydrocarbon solvents in exhaled breath, etc.

c. Due to work proposed at the site concentrations of contaminants, additional biological monitoring parameters, beyond the comprehensive medical surveillance program, should not be necessary.

E. PERSONAL PROTECTIVE EQUIPMENT

1. **PROTECTIVE EQUIPMENT LEVEL NECESSARY FOR ON-SITE ACTIVITIES** (check all that apply).

[ ] LEVEL A [X] LEVEL B [X] LEVEL C [X] LEVEL D

PERMITTED MODIFICATIONS: Any and all activity within Hot Area will require a minimum Level D protection. Level B protection will be used for confined space entry, unless a downgrade is possible only after atmosphere is found sufficient to support the downgrade.

2. **PROTECTIVE EQUIPMENT NEEDED** (check all that apply):

RESPIRATORY PROTECTION

Supplied Air Respirators

[ ] SCBA

[ ] Airline W/Escape SCBA

[X] Airline

Air Purifying Respirators

[X] Full Face Air Purifying Respirator

[ ] Half Face Air Purifying Respirator

Cartridges (MSA)

[ ] GMD - Ammonia/ Methylamine TC-23C-43

[ ] GMC - Organic Vapor/Acid Gases TC-23C-47

[ ] GMA - Organic Vapor TC-23C-40

[ ] Metallic Mercury Vapor/Chlorine TC-23C-629

[ ] GMB-H Acid Gases/Particulates TC-23C-150

[ ] GMA-F Organic Vapor/Dust & Mist TC-23C-151

[ ] GMC-H Organic Vapor/Acid Gases/ Particulates TC-23C-153

[ ] Type H Dusts/Fumes/Mists TC-21C-135

[X] GMP - Pesticides, Organic Vapor, Paint mists, dusts, mists TC-23C-79

[ ] GMB - Acid Gases/Formaldehyde TC-23C-41

4. PERSONAL PROTECTION LEVELS FOR DESIGNATED AREAS:

Based on a preliminary evaluation of the potential hazards, the following levels of personal protection have been designated for the applicable work areas or tasks:

LOCATION	TASK	PROTECTION LEVEL (LEVEL A,B,C,D)	PERMITTED MODIFICATION
Concrete/Soil	Excavation	Level D	N/A
Storage Shed	Demolition	Level C	Level D
Storage Shed	Drum Management	Level D	N/A
AGST's	Cleaning	Level B	Level C
AGST's	Liquid Removal	Level C	Level D with Tyvek

NO CHANGES TO THE SPECIFIED LEVEL OF PROTECTION SHALL BE MADE WITHOUT THE APPROVAL OF THE PROJECT MANAGER OR SAFETY/HEALTH OFFICER.

5. PROTECTIVE EQUIPMENT LEVELS:

The following is a brief description of the personal protective equipment which may be required during various phases of the project. Although there is some flexibility to custom fit the actual items of protective equipment to the real-life situation, in general the levels of protection are defined as follows.

a. LEVEL A - The highest level of protection used when:

(1) Unknown chemicals are involved and there is high risk for chemical release.

(2) Chemical concentrations are known to be above safe levels (IDLH atmospheres).

(3) Extremely hazardous substances are present or suspected.

(4) Chemicals and/or vapor and mists are destructive to tissue.

(5) Oxygen deficient atmospheres or confined space conditions.

b. LEVEL B - The second highest level of protection used when:

(1) Concentrations of chemicals in the air are IDLH or above the protection factor provided by a APR with full-face mask.

(2) Oxygen deficient atmospheres or confined space conditions.

(3) Vapor absorption or contact with skin not critical.

c. LEVEL C - An intermediate level of chemical protection used when:

(1) Air concentrations of chemical are potentially above or known to be above ACGIH TWA-TLVs and APR will provide adequate protection

(2) Non-IDLH atmospheres

(3) Chemicals are not destructive to skin

d. LEVEL D - Minimum level of chemical protection used when:

(1) No concentrations of chemicals in excess of ACGIH TWA-TLV's

(2) No hazardous effect from skin contact or inhalation

Minimum OSHA-recommended Requirements for Worker Protective Levels

Protection Level	Equipment
Level A	(1) Pressure-demand, full-face SCBA[1] or pressure-demand air-supplied respirator with escape SCBA
	(2) Fully encapsulating, chemical-resistant suit
	(3) Inner and outer chemical-resistant gloves
	(4) Chemical-resistant safety boots
	(5) Hard hat
Level B	(1) Pressure-demand, full-face SCBA or pressure-demand air-supplied respirator with escape SCBA
	(2) Chemical-resistant clothing (overalls and long-sleeved jacket; hooded one- or two-piece chemical splash suit; disposable chemical-resistant one-piece suit)
	(3) Inner and outer chemical-resistant gloves
	(4) Chemical-resistant safety boots
	(5) Hard hat
Level C	(1) Full-faced, air-purifying, canister-equipped respirator
	(2) Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one- or two-piece chemical splash suit; disposal chemical-resistant one-piece suit)
	(3) Inner and outer chemical-resistant gloves
	(4) Chemical-resistant safety boots
	(5) Hard hat
	(6) Safety glasses, goggles, or face shield as necessary
Level D	(1) Safety boots
	(2) Safety glasses or splash goggles
	(3) Hard hat
	(4) Gloves as necessary
	(5) Standard work uniform or coveralls

[1]SCBA = Self-contained breathing apparatus

F. DECONTAMINATION PROCEDURE

1. DETAIL DECONTAMINATION METHOD AND PROCEDURE:

All sampling material, equipment, and non-disposal materials shall be decontaminated as follows:

- Earthen materials will be scraped and removed from the equipment
- Equipment will be washed with a non-phosphate detergent solution.
- Equipment will be water rinsed, then rinsed.
- Equipment will be water rinsed.

2. DECONTAMINATION EQUIPMENT NEEDED:

[X] Disposable protective clothing/equipment
[X] Water

[X] Low pressure [ ] High pressure

[ ] Deionized Water
[ ] Steam
[ ] Detergent/Water
[ ] Compressed air
[ ] Scrub brushes/scrapers/sponges
[ ] Chemical detoxification

[ ] Acids [ ] Bases [ ] Solvents

[X] Containers (buckets, wading pools)
[ ] Hoses

3. **SEGREGATION, DECONTAMINATION AND DISPOSAL:**

[ ] LEVEL A - Segregated equipment drop, boot cover and glove wash, boot cover and glove rinse, tape removal, boot cover removal, outer glove removal, suit/safety hat removal, SCBA backpack removal, inner glove removal, inner clothing removal, field wash, redress.

[X] LEVEL B - Segregated equipment drop, boot cover and glove wash, boot cover and glove rinse, tape removal, boot cover removal, outer glove removal, safety boot removal, SCBA backpack/airline removal, facepiece removal, inner glove removal, inner clothing removal, field wash, redress.

[X] LEVEL C - Segregated equipment drop, boot cover and glove wash, boot cover and glove rinse, tape removal, boot cover removal, outer glove removal, safety boot removal, splash suit removal, facepiece removal, inner glove removal, inner clothing removal, field wash, redress.

[X] LEVEL D - Segregated equipment drop, boot and glove wash, boot and glove rinse.

4. **DECONTAMINATION PROCEDURE MODIFICATION**
(personnel surfaces, materials, instruments equipment, etc):

5. **DISPOSAL PROCEDURES**
(contaminated equipment, supplies, disposable washwater):

All items shall be disposed in a manner agreeable to both representatives of Interchem and representatives of Heritage Remediation/Engineering, Inc. (HR/E), and in accordance with Federal, State and Local regulations.

Used PPE will be placed in containers, sealed, labeled and accumulated adjacent to the decontamination area. Any reusable PPE that is damaged beyond repair or that cannot be properly decontaminated will be contained in the same manner. Discharged PPE containers will remain closed except when adding to the contents. Once a used PPE container becomes full, it will be disposed of at permitted off-site hazardous waste treatment or disposal facility.

G. ORGANIZATION / COORDINATION

6. **PERSONNEL ON-SITE:**

a. Division or Project Manager(s): Karl Kofoid

b. Supervisors: Tom Ganze

c. Health/Safety Coordinator: Alan E. Kalmar

d. Laborers/Technicians: To be announced.

e. Sub-Contractors: N/A

7. **PERSONNEL DUTIES:**

a. Project Manager(s) will be responsible for :

(1) Overall project management activities;

(2) Ensuring scope of services completed as specified in proposal;

(3) Supervising activities to ensure all applicable legal and safety requirements are met.

b. Supervisors will be responsible for:

(1) On-site supervision of activities;

(2) Supervision of laborers and technicians;

(3) Ensuring that all procedures (security, health and safety, decontamination and emergency) are followed.

c. Health/Safety Coordinator will be responsible for:

(1) On-site health and safety surveillance to ensure compliance with established health, safety and environmental protection procedures;

(2) Performance of all on-site air monitoring activities and surveillance of environmental conditions;

(3) Providing first aid and CPR when necessary; and

(4) Maintaining all personal, ambient and environmental surveillance logs.

d. Laborers/Technicians will be responsible for actual labor and performance of site activities necessary to complete project.

e. Sub-Contractor's Duties:

8. INFORMATION AND TRAINING:

- All site personnel will read the above Site Safety and Health Plan and are familiar with its provisions.

- All personnel entering exclusion zone will be properly trained in accordance with OSHA Hazardous Waste Worker and Emergency Response (29 CFR 1910.120).

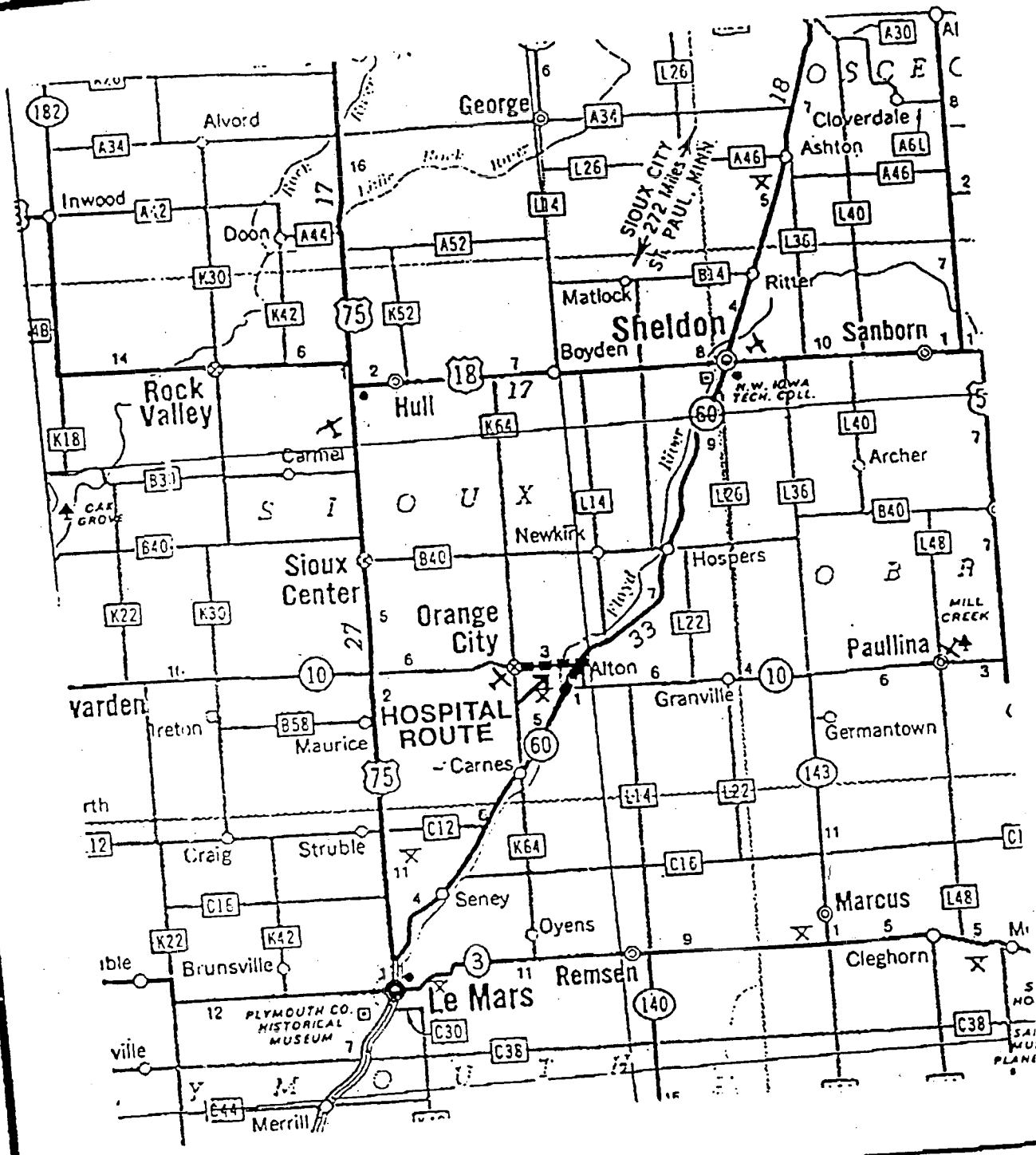
- All personnel involved in excavation activities will be properly trained in the OSHA Excavation Standard (29 CFR 1926.650).

- Only adequately trained equipment operators will be utilized on all activities.

DATE	NAME	SIGNATURE

Information Training Conducted At: _____

Date / Time: _____ Project Manager: _____
(Signature)



INTERCHEM / DENOVA PESTICIDE COMPANY
ALTON, IOWA

Woodward-Clyde Consultants
Engineers, Geologists, And Environmental Scientists

ROUTE TO HOSPITAL MAP

DRAWN: DDS	DATE: 4-16-91	PROJECT NUMBER 91C7315	FIG. NO. 3
CHECKED: CJD	DATE: 4-16-91		

TABLE 4-1

MATERIALS IDENTIFIED AT THE INTERCHEM FACILITY

Compound	Maximum Concentration in Soil (mg/kg)
Lindane	0.33
Heptachlor	0.036
Heptachlor epoxide	0.040
Endosulfan I	0.060
Dieldrin	0.007
Endrin	0.006
Toxaphene	38
Methoxychlor	1.0
4,4-DDE	0.46
4,4-DDT	0.042
4,4-DDD	0.76
a-Chlordane	0.023
g-Chlordane	0.057
PCB 1248	8.7
PCB 1254	2.8

4.0
HAZARD ASSESSMENT

4.1 CHEMICAL HAZARDS

Previous field investigations performed at the Interchem site and historical records indicate the presence of chlorinated pesticides and organophosphate pesticides present on the property. Soil sampling has also indicated the presence of contaminants in this media. Although all routes of exposure may present potential risk to field personnel, it is anticipated that ingestion, dermal contact, and inhalation of contaminated particulates, vapors, or liquids pose the greatest hazard. Every effort should be made to avoid skin contact with waste materials, contaminated water, or soil. Soil sampling will be conducted during the sampling event in order to evaluate the presence of pesticides across the property.

Personal protective clothing and air monitoring have been specified in this safety plan to reduce the risk of potential exposure through these routes.

Relevant information for the contaminants of concern is detailed below. Table 4-3 provides a summary of the important health information and Material Safety Data Sheets (MSDS) are included in Attachment 2.

Chlordane is a thick, amber liquid with a chlorine-like odor. Exposure to chlordane will primarily target the central nervous system, eyes, lungs, liver, kidneys, and skin. Symptoms of acute, high level exposure may include the following: blurred vision, confusion, ataxia, delirium, cough, abdominal pain, nausea, vomiting, tremor, and convulsions. (PEL: 0.5 mg/m^3; IDLH: 500 mg/m^3)

Heptachlor/Heptachlor epoxide is a light tan, waxy solid with an odor like camphor. Exposure will primarily affect the central nervous system and liver. Symptoms of acute exposure may include tremors, convulsions, and liver damage. (PEL: 0.5 mg/m^3; IDLH: 100 mg/m^3)

Dieldrin is a colorless to light tan solid with a mild chemical odor. Exposures will primarily target the central nervous system, liver, kidneys, and skin. Symptoms of acute exposure may include headache; dizziness; nausea and vomiting; convulsions; coma. NIOSH recommends treating dieldrin as a potential human carcinogen. (PEL: 0.25 mg/m^3)

Ethylbenzene exerts an aromatic odor. Exposure to ethylbenzene targets the eyes, skin, central nervous system, and upper respiratory system. Symptoms of exposure include eye and mucous membrane irritation; headaches; dermatitis; narcosis and coma. (TLV: 100 ppm; IDLH: 2000 ppm)

Xylene is a group of isomers often associated with the presence of benzene and toluene. It was used as a carrier for several pesticide compounds. Exposure to xylene targets the skin and eyes, central nervous system, liver, kidneys, blood, and gastrointestinal tract. Symptoms of exposure include irritated eyes, nose, throat; abdominal pain, nausea, vomiting; dizziness, excitement, drowsiness, staggered gait, incoordination; and dermatitis. (TLV: 100 ppm; STEL: 200 ppm; IDLH: 10,000 ppm)

Toluene is a constituent of various petroleum products and wastes with a benzene-like odor. Exposure to toluene targets the central nervous system, skin, liver and kidneys. Symptoms of exposure include fatigue and weakness; confusion, dizziness, euphoria; headaches; dilated pupils; nervousness; insomnia; dermatitis; photosensitivity. (TLV: 100 ppm; STEL: 300 ppm; IDLH: 2000 ppm)

Endrin is a colorless to tan solid with a mild chemical odor. Endrin is incompatible with strong oxidizers and acids. Exposure to endrin targets the central nervous system and liver. Symptoms of exposure include epileptiform convulsions, stupor, dizziness, abdominal discomfort, nausea, vomiting, and aggressive confusion. (TLV: 0.1 mg/m^3; IDLH: 200 mg/m^3)

Lindane (hexachlorocyclohexane) is a colorless solid with a musty odor. Lindane has no known hazardous incompatibilities. Lindane is a commercial mixture of isomers of 1,2,3,4,5,6-hexachlorocyclohexane, an insecticide. Lindane exposure targets the eyes, central nervous system, blood, liver, kidneys and skin. Symptoms of lindane exposure

includes irritated eyes, nose and throat, headaches, nausea, convulsions, respiratory problems, skin irritation, and muscle spasms. (TLV: 0.5 mg/m^3; IDLH: 1000 mg/m^3)

DDT is a colorless crystal or white to slightly off-white powder. DDT is incompatible with strong oxidizing materials. DDT exposure targets the central nervous system, kidneys, liver, and skin. Symptoms of DDT exposure include paralysis of the tongue, lips, face; tremors, dizziness, convulsions; vomiting; and eye irritation. (TLV: 1 mg/m^3)

Toxaphene is a yellow, waxy solid with a pine odor. Toxaphene exposure targets the central nervous system, liver, skin, and kidneys. Symptoms of toxaphene exposure include excitement and epileptiform convulsions. (TLV: 0.5 mg/m^3)

Parathion and Methyl Parathion are crystalline substances soluble in most organic solvents. Special precautions are necessary to prevent inhalation and skin contamination. Acute effects of exposure include anorexia, nausea, vomiting, diarrhea, excessive salivation, pupillary constriction, bronchoconstriction, muscle twitching, convulsions, coma, and respiratory failure. (TLV: 0.1 mg/m^3; IDLH: 20 mg/m^3)

Endosulfan is a brown, crystalline mixture of two isomers. It is toxic by ingestion, inhalation, and skin absorption and used as an insecticide. (PEL: 0.1 mg/m^3)

Methoxychlor is a colorless to light yellow, crystalline material with a slight fruity odor. Methoxychlor is insoluble in water, incompatible with alkaline materials, and is used as an insecticide. (PEL: 10 mg/m^3 total dust)

Polychlorinated biphenyl (PCB) is a colorless, highly toxic compound containing two benzene nuclei with two or more substituent chlorine atoms. PCBs have low vapor pressures, therefore, dermal contact and inhalation/ingestion of contaminated particulates are the primary exposure routes.

Diazinon is a colorless liquid, slightly soluble in water; freely soluble in petroleum solvents, alcohol, and ketones. It is toxic by ingestion, inhalation, and skin absorption. (PEL: 0.1 mg/m^3)

Diphacinone is a yellow, odorless, crystalline powder which is practically insoluble in water. It is a hazard in that it prevents blood clotting.

Maneb is a fungicide for foliage, and is described as a brown powder and partially soluble in water. Maneb is the generic name for manganese ethylene-bisdithio carbamate.

Captan is a white to cream powder practically insoluble in water. Captan is a reaction product of tetrahydrophthalamide and trichloromethylmercaptan and is an irritant. Inhalation of dusts or mists should be avoided.

Trichlorfon is a systemic insecticide, a white crystalline solid, and is soluble in water. Trichlorfon is a cholinesterase inhibitor and can be absorbed by skin.

Dimethoate is a white solid, moderately soluble in water, and is a cholinesterase inhibitor.

Strychnine is a hard, white crystal or powder with a bitter taste and is slightly soluble in water. Strychnine is toxic by ingestion and inhalation. (PEL: 0.15 mg/m^3)

Coumaphos is a crystal insecticide which is insoluble in water. Coumaphos is a cholinesterase inhibitor.

Rotenone is a white, odorless crystal, insoluble in water. Rotenone is toxic by ingestion and overexposure can be fatal.

Carbaryl is a solid and is insoluble in water. Carbaryl is toxic by ingestion, inhalation, and skin absorption, and is a reversible cholinesterase inhibitor.

Pyrethrum is a natural insecticide obtained by extractions of chrysanthemum flowers. Pyrethrum is non-volatile, slightly soluble in water, and toxic by ingestion and inhalation.

Piperonyl Butoxide is a light brown liquid with a mild odor and is insoluble in water. It is used as a synergist in insecticides in combination with pyrethrum in oil solutions.

Fuel Oil was sometimes used as a carrier for pesticides. There a various fuel oil (i.e., No. 1 and No. 2) usually characterized as a light amber liquid with a mild petroleum odor. Inhalation of vapors or mist irritates the respiratory system. Other symptoms of exposure include nausea, vomiting, dizziness, headache, stupor, or convulsions or loss of consciousness. Skin exposure to fuel oils is irritating and can result in dermatitis. (PEL: 5 mg/m^3)

Kerosene solvent is a white, oily liquid with a mild petroleum odor. Routes of exposure include inhalation of vapors, mists or fumes, and skin contact. Symptoms of exposure include irritation to the respiratory tract, skin, and eyes, headache, dizziness, nausea, stupor, inebriation, convulsions, unconsciousness (high concentrations), and dermatitis. Should kerosene be ingested symptoms include irritation to mouth, throat, and G.I. tract, blurred vision, vomiting, dilated pupils, and diarrhea. (Exposure limit: 100 mg/m^3 or 14 ppm, 10-hour TWA)

4.2 PHYSICAL HAZARDS

The activities to be performed under the provisions of this plan involve the potential exposure to large machinery, particularly drilling and drum handling equipment. The vegetation and terrain may pose additional physical hazards. Personnel should be aware that the protective equipment worn may limit manual dexterity, hearing, visibility, and may increase the difficulty of performing some tasks.

Personnel protective equipment places an additional strain on the wearer when performing work that requires physical activity. Heat exhaustion or heat stroke are possible, especially during warm weather. Heat exhaustion may produce symptoms such as nausea, headache, weakness, dizziness, or extreme perspiration. Heat stroke, a critical situation, is characterized by a sudden lack of perspiration, dry and red skin. This condition requires immediate medical attention. All field personnel shall be monitored prior to entering and after leaving the work area for signs of heat stress if air temperatures become excessive. All personnel should be cognizant of the physical condition of themselves and their fellow workers. A detailed description and treatment of heat stress is included as a part of Attachment 3.

Known underground facilities, structures, and utilities will have been located from available record information prior to initiating intrusive work. The locations must be considered as being approximate. Be aware and always suspect the existence of underground utilities such as electrical, power, gas, petroleum, telephone, sewer, and water.

Special precaution must be taken when operating machinery (i.e., drill rig) in the vicinity of overhead electrical power lines. Contact with electricity can shock, burn, and result in death. All overhead electrical power lines are to be considered energized and dangerous. Walk completely around the machine before beginning work at a site in the vicinity of power lines. Determine what the minimum distance from any point on the machine to the nearest power line will be when operating. Do not raise a mast or boom, or operate the machine if this distance is less than 20 feet.

Extra precaution must be taken when climbing onto tanks to collect samples. If necessary, safety harnesses with a safety line will be worn during sampling activities. Any detached ladders used for access will be secured at the proper angle. A standby person will be present to assist with emergencies. Personnel will not enter tanks to collect samples; therefore, confined space entry procedures are not necessary at this time.

Personnel should be cognizant of wind directions and attempt to coordinate field activities and gasoline powered equipment so that exhaust fumes are located downwind from work areas.

4.3 BIOLOGICAL HAZARDS

Assume that all animals are potentially dangerous. A person who is bitten by an animal may become infected by tetanus or rabies. Warm-blooded animals, such as dogs, cats, bats, rats, and squirrels can transmit rabies. Rabies can be transmitted when the saliva from an infected animal contacts an open wound (even a scratch) or any normal body opening, such as the mouth or eye.

Snakes may be present on the site. Avoid any contact with snakes and notify the SSO immediately if a suspected poisonous snake is found in a work area. Some forms of vegetation can pose hazards such as poison ivy or thorned plants. Avoid unnecessary contact with suspect vegetation.

4.4 HAZARD EVALUATION

The hazards associated with the Interchem site includes the inhalation, ingestion, and dermal contact of contaminated particulates and liquids, working around heavy machinery, drum handling, and heat stress from conducting physically taxing activities, such as hand auguring, during excessively warm weather. The overall hazard evaluation is moderate due to the large number of contaminants previously detected at the site and the physical hazards. Handling and sampling drums and tank sampling pose a high hazard to personnel. The compounds of concern do pose a skin absorption hazard.

TABLE 4-2

OTHER MATERIALS SUSPECTED TO BE STORED AT THE INTERCHEM FACILITY

Diazinon
Diphacinone
Maneb
Captan
Dipel
Xylene
Trichlorfon
Dimethoate
Terrazan
Bromanide
Strychnine
Coumaphos
Permethrin
Rotenone
Carbaryl
Pyrethrum
Piperonyl Butoxide
Trichloronate
Kerosene
Fuel Oil

Note: These materials are associated with the pesticides, herbicides, insecticides, fungicides, and rodenticides remaining at the site. These materials, as well as those in Table 4-1, may be stored at the site in various steel drums, fiber drums, pails, and plastic bags.

TABLE - 3
CONTAMINANT HEALTH AND SAFETY INFORMATION

Compound	PEL/TLV	IDLH	Warning Concentration	Ionization Potential (eV)	LEL %	UEL %	Vapor Pressure (mmHg)
Dieldrin	0.25 mg/m^3	Ca	0.041 ppm	NA	NA	NA	Low
Endrin	0.1 mg/m^3	200 mg/m^3	(skin)	NA	NA	NA	Low
Lindane	0.5 mg/m^3	1000 mg/m^3	3.90 mg/m^3	NA	NA	NA	9.4 x 10^{-6}
DDT, DDE, DDD	1 mg/m^3	Ca	2.9 mg/m^3	NA	NA	NA	Low
Chlordane	0.5 mg/m^3	500 mg/m^3	odorless				0.00001
Toxaphene	0.5 mg/m^3		0.0052 ppm				0.0003
Heptachlor	0.5 mg/m^3	100 mg/m^3	0.02 ppm				6 x 10^{-6}
Aldrin	0.25 mg/m^3	Ca	(skin)				0.05
Naphthalene	10 ppm	500 ppm	0.003 ppm	8.14	0.9	5.9	1
1,2,4-trichlorobenzene	5 ppm			9.06	2.2	9.2	1.2
1,2-dichlorobenzene	50 ppm	1700 ppm	2-50 ppm	8.94	2.5	NA	0.4
1,4-dichlorobenzene	75 ppm	1000 ppm	15-30 ppm				
Methyl parathion	0.2 mg/m^3		(skin)				0.0004
Parathion	0.1 mg/m^3	20 mg/m^3	0.48 mg/m^3				0.00004
Malathion	15 mg/m^3	5000 mg/m^3	10 mg/m^3				0.002
Diazinon	0.1 mg/m^3		(skin)				7/9/9
Xylenes (o-,p-,m-)	100 ppm	1000 ppm	0.5 ppm	8.576	1.1	6-7	7.1
Ethyl benzene	100 ppm	2000 ppm	0.25 ppm	8.76	1.0	6.7	22
Toluene	200 ppm	2000 ppm	0.17 ppm	8.82	1.3	7.1	Very low
Methoxychlor	10 mg/m^3	7500 mg/m^3		NA	NA	NA	0.001
Polychlorinated Biphenyl (PCB)	0.001 mg/m^3	10 mg/m^3	NA	NA	NA	NA	
Endosulfan	0.1 mg/m^3						
Strychnine	0.15 mg/m^3						
Rotenone	5.0 mg/m^3						
Carbaryl	5.0 mg/m^3						
Pyrethrum	5.0 mg/m^3				0.6-1	7.5-?	5
Fuel Oil	5.0 mg/m^3		0.082 ppm		0.9	6	5
Kerosene	14 ppm		0.082-1 ppm				

Notes: Ca = Carcinogen
NA = Not available
NE = None established
(skin) = Potential contribution to overall exposure by skin absorption (airborne or dermal contact).

7.0

EMERGENCY RESPONSE

7.1 SITE EMERGENCIES

In the event that an emergency situation arises such as an injury, illness, or fire, the appropriate immediate response must be taken by the first person to recognize the situation. The appropriate emergency contact will be notified immediately. In the case of injury or illness, the proper emergency first-aid care will be rendered by a trained person. If the injury or illness is from exposure to a hazardous substance, rapid identification of that substance should be attempted. This information must be provided to the medical personnel.

First-aid equipment and an emergency eyewash will be available at the area of field work. Personnel will be notified as to their whereabouts during the initial safety briefing session.

A list of emergency contacts is provided in Section 7.2. A copy of the emergency telephone numbers, directions and route map to the nearest hospital will be clearly posted at the work area and in vehicles. See Section 7.2 and Figure 5/4 for this information. The WCC Project Manager and Health and Safety Officer will be notified of any accident, injury, or illness. Operating Procedure HS-502, Incident Reporting, will be followed in the event of an emergency.

Material Safety Data Sheets (MSDS) are provided in Appendix C for the compounds of concern. The MSDS details first aid procedures to follow in the event an exposure occurs.

Personnel should also be aware of the possibility for the occurrence of severe weather such as tornado, thunderstorms, hail, or high winds. Necessary precautions or response, directed by the SSO, will be taken in the event of severe weather.

29CFR1926, Subpart P - EXCAVATIONS

1926.650 Scope, application and definitions

A. Scope and application - applies to all open excavations including trenches.

B. Definitions:

Accepted engineering practices
Aluminum hydraulic shoring
Bell-bottom pier hole
Benching
Cave-In
Competent Person
Cross braces
Excavation
Face or sides
Failure
Hazardous Atmosphere
Kick Out
Protective system
Ramp
Registered Professional Engineer
Sheeting
Shield - Shield system
Shoring - Shoring system
Sloping - Sloping system
Stable rock
Structural ramp
Support system
Tabulated data
Trench
Trench box, shield
Uprights
Wales

1926.651 General Requirements

A. Surface encumbrances that are hazards must be removed or supported to safeguard employees

B. Underground installations

1. Location of utility installations shall be determined prior to opening an excavation.

2. Utility companies to be contacted within customary response times. Where unable to locate, may proceed with caution using detection equipment.

3. When approaching location of underground installation, exact location to be determined by safe and acceptable means.

4. While excavation is open, underground installations to be supported.

C. Access and Egress

1. Structural Ramps
   i. Designed by competent person qualified in structure design.
   ii. Where constructed of structural members, they must be connected together.
   iii. Must be of uniform thickness.
   iv. Cleats used to connect runway to bottom, must be attached so to prevent tripping.
   v. Ramps must have cleats or treat to prevent slipping.

2. Means of Egress from trench excavations. - Stairway, ladder, ramp, etc. must be located in trenches more than 4 feet deep, every 25 feet laterally.

D. Exposure to vehicle traffic - shall be provided with and wear warning vests of reflector or high-visibility material.

E. Exposure to falling loads - No employee permitted under loads by lifting or digging equipment. Employees must stand away from vehicles being loaded. Operators may remain in cabs of vehicle being loaded provided properly equipped.

F. Warning system for Mobile equipment - Barricades, stop logs, etc. must be provided where operator does not have clear and direct view of excavation.

G. Hazardous atmospheres

1. Testing and controls
   i. where oxygen deficiency or hazardous atmosphere could reasonably exist, the atmosphere of excavation shall be tested where excavation is more than 4 feet deep, before employees enter.
   ii. adequate precautions of respiratory protection and ventilation shall be taken where oxygen deficiency exist.
   iii. adequate precautions of ventilation to be taken where flammable atmosphere of 20% LEL.
   iv. when controls used to reduce contaminants, testing must be conducted often to ensure safety.

2. Emergency Rescue Equipment
   i. Breathing apparatus, safety harness and line or basket stretcher shall be available where hazardous conditions exist and be attended when in use.
   ii. Employees entering bell-bottom pier holes must wear harness with separate line attached.

H. Protection from hazards associated with water accumulations
1. Employees must not work where water has accumulated unless special shield systems, water removal system, or harness and lifeline used.

2. If water is controlled by removal equipment, such equipment shall be monitored by competent person.

3. If excavation interrupts natural drainage, diversion ditch or dike to be used to prevent surface water from entering excavation. Where excavations catch rain runoff, inspection is required.

I. Stability of Adjacent Structures
1. Where stability is endangered by excavation, support systems must be provided.

2. Excavation below foundation not permitted except
i. support system provided.
ii. in stable rock.
iii. registered professional engineer determines excavation is removed from danger for the structure.
iv. registered professional engineer determines, no danger to employees.

3. Sidewalks and pavements are not to be undermined unless support system installed.

J. Protection of employees from loose rock or soil
1. Adequate protection to employees from falling or rolling rock or soil using sealing or installation of protective barricades to stop and contain falling material.

2. Employees protected from excavated material by placing spoil pile at least 2 feet from edge of excavation or use retaining device.

K. Inspections
1. Daily inspections of excavation, adjacent areas and protective systems to be made by a competent person. Inspection to be made prior to start of work, as needed throughout shift, also after every rainstorm.

2. Where competent person inspection determines that hazard exists, employees shall be removed until precautions taken to ensure safety.

L. Fall Protection
1. Where employees cross over excavations, walkways with standard guardrails must be provided.

2. Adequate barrier physical protection shall be provided at all remote excavations. Upon completion of exploratory well operations, such shall be backfilled.

1926.652 Requirements for Protective Systems

A. Protection of Employees in excavations
1. Each employee to be protected from cave-in by protective system except when
   i. excavations entirely in stable rock.
   ii. excavations less than 5 feet and examination by competent person provides no indication of potential cave in.

2. Protective Systems to have capacity to withstand all loads without fail.

B. Design of sloping and benching systems
1. Option 1 - Allowable configurations and slopes.
   i. sloped not steeper than 1.5 horizontal to 1 vertical (34 degrees from horizontal)
   ii. configuration to be for Type C soil in Appendix B.

2. Option 2 - Determine slopes and configurations using Appendices A and B - maximum allow.

3. Option 3 - Designs using other tabulated data
   i. selected and in accordance with tabulated data and charts
   ii. written form, including
      a. Identification of parameters affecting selection
      b. Identification of limitations of use of data
      c. Explanatory information
   iii. copy of tabulated data identifying registered professional engineer to be on jobsite

4. Option 4 - Design by a registered professional engineer
   i. Sloping and benching systems not using options 1, 2, or 3 must be approved by registered professional engineer.
   ii. Designs in written form containing
      a. Magnitude of slopes determined to be safe.
      b. Configurations determined to be safe.
      c. Identity of Registered Professional Engineer.
   iii. Copy of design to remain at jobsite while slope being constructed.

C. Design of Support, Shield, other Protective Systems

1. Option 1 - Designs using Appendices A, C and D - Timber shoring in trenches determined by conditions and requirements of Appendices A and C. Aluminum Hydraulic shoring by (c)(z) but if tabulated data cannot be utilized, designs in accordance with appendix D.

2. Option 2 - Designs using Manufacturer's Tabulated Data
   i. Support systems designed from Manufacturer's tabulated data to be in accordance with all specifications, limitations, recommendations issued by Manufacturer.
   ii. Deviation from manufacturers specifications allowed only with written approval from manufacturer.
   iii. Manufacturer specifications, recommendation, limitations and written deviation approvals must be on jobsite.

3. Option 3 - Designs using other tabulated data
   i. Designs must be in accordance with the tabulated data, tables and charts.
   ii. Must be in written form containing:
      a. Identification of Parameters
      b. Identification of Limits on Use of data
      c. Explanatory information
   iii. copy of tabulated data identifying registered professional engineer to be maintained at job site.

4. Option 4 - Designs by a Registered Professional Engineer.
   i. Support systems not utilizing options 1, 2, or 3 must be approved by a Registered Professional Engineer.
   ii. Designs must be in written form.
      a. plan indicating sizes, types, configurations
      b. identity of Registered Professional Engineer.

D. Materials and Equipment

1. Must be free of defects and damage.

2. Manufactured materials to be used and maintained per Manufacturer's recommendations and in manner to prevent employee exposures.

3. Damages to Manufactured materials to be inspected by competent person for suitability for continued use - where unable to determine, damaged equipment to be inspected by Registered Professional Engineer.

E. Installation and Removal of Support

1. General

i. Members of support systems must be securely connected together to prevent sliding, falling, kickout, other failure.

ii. Support systems installed and removed in manner to protect employees from cave-ins structural collapse, or from being struck by support system.

iii. Individual members of support system not to be subjected to loads in excess of those for their design.

iv. Before temporary removal of individual members, additional precautions shall be taken to ensure safety of employees.

v. Removals shall begin at bottom of excavation, releasing members slowly to note indication of failure of remaining members.

vi. Backfilling shall progress together with removal of support systems.

2. Additional requirements for support systems for trench excavations.

i. Excavation of material may go 2 feet below support system provided system is designed to resist forces for entire depth and no indication of loss of soil

ii. Installation of support system to be closely coordinated with excavation of trenches.

F. Sloping and benching systems - employees shall not be permitted to work on the face of slope or benched excavation at levels above other employees except where adequately protected.

G. Shield systems

1. General

i. Not to be subjected to loads greater than those system designed for.

ii. To be installed so that lateral movement is restricted, should a lateral load be suddenly applied.

iii. Employees to be protected from cave-in by entering or exiting areas protected by shield.

iv. Employees not allowed to be in shield when shield is installed, removed, or moved vertically.

2. Additional requirements - excavation of earth material below bottom of shield allowed to not more than 2 feet only if shield designed to resist forces calculated for the full depth of shield and no indications of possible loss of soil from behind bottom of shield.

Appendix A

Soil Classifications

Appendix B

Sloping and Benching

Appendix C

Timber Shoring for Trenches

Appendix D

Aluminum Hydraulic Shoring for Trenches

Appendix E

Alternatives to Timber Shoring

Appendix F

Selection of Protective Systems

CONFINED SPACE ENTRY PROCEDURES

1. Purpose

The purpose of the HR/E Confined Space Entry procedures is to provide guidance, documentation, and to reduce the risk of injury that may be presented by confined space structures and their environments.

2. Scope

The Heritage Remediation/Engineering, Inc. Confined Space Entry Permit program and requirements apply to all Heritage Remediation/Engineering, Inc. personnel and all HR/E contractor and subcontractor personnel working at:

A. All Heritage Remediation/Engineering, Inc. properties including division offices, shop and maintenance areas and yards.

B. All HR/E project sites.

Individual customers (including other HERITAGE Companies) may also have their own Confined Space Entry Permit requirements of which their requirements shall also be met in addition to those listed herein.

3. Definitions

A. Permit-Required Confined Space - a tank, vessel, silo, hopper, vault, pit, diked area, or any other enclosed space that has limited access and/or egress, that is not designed for normal occupancy by employees, and has one or more of the following:

(1) A potentially hazardous atmosphere or other recognized safety or health hazard.

(2) The potential for engulfment by particulate matter or liquid.

(3) Is listed in Appendix A.

B. Immediately Dangerous to Life or Health (IDLH) - describes a hazardous atmosphere that can cause serious injury or death within a short time or serious delayed effects to exposed employees. IDLH atmospheres include, but are not limited to, oxygen deficient, explosive, toxic, and/or flammable atmospheres.

C. Acceptable Atmosphere - shall be tested and monitored to contain all of the following:

(1) Oxygen levels of 19.5% to 22%.

(2) Flammable levels are less than 10% of the lower explosive limit (LEL) or lower flammable limit (LFL).

(3) Air toxicity and contaminants less than the established permissible exposure limits (PELs) and the short term exposure limits (STELs).

4. Procedure

A. Prior to any entry of a work space, the project manager, project engineer, and supervisor shall review the definition of a Permit-Required Confined Space to determine if the work involves such a confined space, if the work space is listed on the designated confined space listing in Appendix A of this procedure, or if the work space is labeled as a permit required confined space.

B. Confined Space Evaluation - An evaluation of the confined space shall be done to determine the potential chemical, mechanical, atmospheric, and other hazards that may exist in the confined space.

C. Obtaining Safe Work Permit - When it has been determined that a work task involves a confined space and entry into such confined space is to be performed, a Safe Work Permit shall be obtained and completed with the project supervisor's signature. Where outside contractors shall be entering the confined space, the safe work permit shall be completed by both contractor supervisor and the HR/E project supervisor.

D. The Safe Work Permit used shall be the permit form approved by the Heritage Environmental Services Corporate Safety Director and the HR/E Corporate Safety Manager. The permit will be consistent with the HERITAGE Safe Work Policy and Procedures and shall record:

(1) Environmental Conditions
(2) Required Precautions
(3) Personal Protective Equipment Needed for Entry
(4) Environmental Conditions Tested and Results
(5) Person Authorizing Entry
(6) Names of the Entry Safety Attendants
(7) Names of Employees Performing the Entry

E. Identification of Contents - All known contents of the space shall be listed on the safe work permit. Such content list shall include all load, cargoes, and/or product contained in the space since the last cleaning and purging or the last three products, whichever is less.

F. Required Equipment for Entry - The following safety equipment is required to be used for all Confined Space entries:

(1) Safety belt or harness with lifeline
(2) Explosion proof lighting
(3) Continuous air monitoring equipment

(4) Personal protective equipment and respiratory protective equipment as required by the project scope and safety plan

(a) Where the confined space atmosphere is determined to be within the acceptable limits, full face air purifying respirators with appropriate cartridges shall be worn during entry, where appropriate based on the confined space contents.

(b) Where a potentially hazardous atmosphere could be introduced into the confined space, all entrants shall use supplied air airline respirator equipment with 5-minute escape units or have it immediately available.

(c) Where unknown contaminants may exist in the confined space, the contaminant level cannot be determined, a potential IDLH atmosphere exists, and/or an emergency rescue is being performed, self-contained or airline supplied air respirators with escape breathing units must be used.

(5) Continuous fresh air ventilation. Such ventilation shall be positive pressure where possible.

G. Rescue Equipment - The following rescue equipment must be immediately available at the entrance to the confined space and within reach of the safety attendant:

(1) Explosion proof flashlights with spare batteries
(2) First aid kit with knife
(3) Mechanical Retrieval Equipment
(4) Alarm
(5) Roll of duck tape
(6) Tool box with tools

(7) Personal Protective Clothing of a type at least equal to or greater than the chemical resistance of that worn by the entrants to be worn by the rescuer with another set available for a second rescuer.

(8) Positive pressure supplied air breathing equipment in a ready-to-use state that is not part of any supplied air breathing equipment that is being used by the original entrant.

H. Blanking/Blinding - Before entry, all pipes and lines (including fill and drain pipes) that are connected to the confined space shall be disconnected or blanked/blinded, and this action is to be verified on the safe work permit.

If entry must be made and a disconnection or blanking/blinding is physically impossible, the procedure requires all of the following actions:

(1) Isolating the confined space as rigorously as possible.

(2) Assessing the risks present and potential.

(3) Approval by the project manager who will assume the risks.

I. Lock-out/Tag-out - All electrical and mechanical equipment in permit-required confined spaces must be locked-out and tagged if its inadvertent energizing could create a hazard. All mechanical equipment shall be blocked in addition to the electrical lock-out. The lock-out shall comply with the HERITAGE Lock-out Policy and the HR/E Lock-Out/Tag-Out Procedures.

J. Cleaning and Ventilation - Permit-required confined spaces are to be cleaned and decontaminated to the extent that is consistent to the hazard posed by the materials contained. Prior to and during the entry, continuous ventilation of fresh air shall be accomplished into the confined space.

K. Atmospheric Testing - Permit-required confined spaces must be monitored and tested for oxygen content, flammable limit, and toxic contaminants before and during the entry. Such testing shall be done prior to ventilation beginning.

If such atmosphere is not acceptable for entry, ventilation shall continue without entry until retesting of the atmosphere shows acceptable limits after the ventilation has been stopped for a period of 15 minutes. Atmospheric testing shall be done at all levels and distances within the confined space as practical. The project supervisor shall be responsible for such atmospheric testing and continuous monitoring during the entry and for the documentation of such test results before entry and at 15-minute intervals during the entry. The confined space atmosphere must be reventilated and tested by the same procedures should the work be interrupted as for a lunch break.

L. Assessing the Sources of Contaminated Atmospheres - If atmospheric tests or knowledge of likely contaminants of a confined space indicate that it contains a contaminated or unacceptable atmosphere, the project supervisor authorizing the permit must determine:

(1) The cause or source of the atmospheric contamination.
(2) Whether the source or cause of the contamination will contribute to a changing condition in the confined space during an entry.
(3) The precautions required to be taken.

M. Conditions Prohibiting Entry - Except under certain remedial work with special approvals by management or during an emergency rescue, no entry is made into a confined space containing an unacceptable atmosphere. Under no circumstances shall an entry be made or approved where explosive or flammable vapors or gases exist at a level of 20% or more of the lower flammable limit.

N. Permissible Entry Under Prohibiting Conditions - Where no feasible alternative exists, entry may be made with the recommendation of the project manager to and with the division directors approval. Such recommendation by the project manager shall first assure:

(1) That the entry is necessary

(2) The atmosphere has been properly ventilated for an extraordinary amount of time

(3) That the risks presented are satisfactorily addressed as to lack of alternatives

(4) That the LEL does not exceed 20%

Entry under prohibiting conditions may also be permitted to perform an emergency rescue. Any emergency rescue shall be followed by a complete full written report and investigation into the incident.

O. Attendants - At all times during a confined space entry, a safety-watch attendant and one other project personnel for every three entry personnel must be in attendance outside the confined space. The safety-watch attendant must be properly trained, equipped and continuously present at the confined space entrance. At no time shall the safety-watch attendant participate in any entry activities or other project work while the entry is in progress. The names of the designated safety-watch and other attendants shall be listed on the safe work permit.

All attendants and entry personnel must be trained and drilled in confined space entry and safe work permit procedures during their initial 40-hour training and annually during refresher training.

The safety-watch must be in continuous visual contact with entry personnel. Where visual contact is impossible, such as in a tanker trailer, contact shall be by a tugline or by radio communications. When an emergency is detected by the safety-watch, help shall be summoned by the safety-watch using the alarm or emergency airhorn.

P. Rescue - At the time of an emergency including confined space entrants, the safety watch and attendants shall make an evaluation of the possible causes

of the emergency and take appropriate measures to provide additional or upgraded protective equipment, ventilation, etc. to adequately protect the rescuer(s).

During any confined space entry, harnesses and lifeline shall be worn and lifelines and mechanical retrieval equipment shall be available. Where lifeline attachment during the entry presents a greater risk or hazard, then the release of the lifeline may be authorized. Where mechanical retrieval equipment is not feasible to be used, such as on a tanker-trailer, an used, an effective alternative must be provided and approved by the project manager and division director. The manager and director may waive the requirement for harnesses and lifelines and approve the alternative used.

Self contained breathing apparatus or airline respirators with escape breathing units must be worn by rescuers during emergency rescue.

APPENDIX A

List of named Permit-Required Confined Spaces:

1. Underground storage tanks and vaults
2. Aboveground storage tanks
3. Silos
4. Rail tank cars
5. Truck and trailer tankers
6. Hopper cars and trailers
7. Subsurface excavations of 4 feet or more in depth

HERITAGE

HERITAGE REMEDIATION/ENGINEERING, INC.

CONFINED SPACE ENTRY PERMIT

JOB NO.: _____ DATE: _____

CUSTOMER: _____

LOCATION: _____

VESSEL/TANK #: _____ SIZE: _____

CONFINED SPACE CONTENTS: _____

_____

ENTRY TIME: _____ EXIT TIME: _____

EXPIRATION TIME: _____

Reason for Entry: _____

LABOR (Must be quelified for Confined Space Work)

NAME
Safety Team

HAZARDS EXPECTED:

(identify materials, check all that apply)

Flammable Materials _____ FP _____

Corrosive Materials _____ pH _____

Reactive Materials _____

Toxic Materials _____ IDLH _____

Oxygen Deficiency _____ Hot Work _____

Pressure Systems _____ Non-Sparking Tools/Lights _____

Agitators _____ Floor Drains _____

Other _____

ATMOSPHERIC GAS TEST:

Test Equipment Used: _____ ID# _____

Field check performed? _____ Calibration Date: _____

Time	%O2	%LEL	Conc.(ppm)*	Location

*Toxic Materials only (Specify test method): _____

Tests performed by: _____ Verified by: _____

VENTILATION REQUIREMENTS: (See Reverse Side)

RESPIRATORY PROTECTION REQUIREMENTS: (See Reverse Side)

_____ Air Purifying/Egress Combo-Cartridge Type

_____ Supplied Air/Egress Combo

_____ None. Explain _____

ISOLATION CHECK LIST:

Piping blanked or disconnected? _____

Mechanical equipment locked out, blocked and tagged? _____

Electrical equipment locked out and tagged? _____

Entry ways blocked open and posted? _____

PERSONNEL SAFETY CHECKLIST

Harness/Lifeline _____

Protective Clothing _____

Emergency Escape Plan _____

Safety Observer Properly Equipped _____

Emergency Services Alerted _____

Fire Protection(Specify) _____

Eye Protection _____

Hard Hat _____

Foot Protection _____

Explosion Proof Lights _____

Spark Proof Tools _____

WARNING SIGNS: (check all that apply)

Confined Space Entry by Permit Only _____ No Hot Work _____

Respiratory Protection Required _____ Hot Work Permitted _____

Protective Clothing Required _____ No Entry _____

Comments: _____

I have made all tests, inspections and safety checks required by the Heritage Remediation/Engineering, Inc. Confined Space Procedure, before issuing this permit, and I understand their meanings and limitations.

Signed _____ Date _____
(Work Supervisor)

I have reviewed all the test results and safety precautions identified above and certify that all requirements have been met.

Copy 1 - Supervisor/File
Copy 2 - Customer
Copy 3 - Post at Entry

CONFINED SPACE PERMIT INSTRUCTIONS

LOCATION: Customer name-facility locations.

VESSEL ID: Vessel identification number, letter, or description.

REASON FOR ENTRY: Description of work to be performed.

EMPLOYEES PERFORMING WORK:

- Employees to work as "buddy teams" (list buddies on same line)
- Identify supervisor
- Safety team consists of one observer and a runner or supervisor
- Identify non-HR/E employees (Obtain evidence of qualifications)

HAZARDS EXPECTED:

- Persons issuing permit must identify hazardous materials anticipated, Flash point, pH, and/or TLV as applicable
- Identify known work hazards

ATMOSPHERIC GAS TEST:

- Tests must be documented and verified

Ventilation requirements (to be printed on reverse side of permit)

- Ventilation is recommended for all confined space work and ventilation equipment should be compatible with the atmosphere inside and outside the vessel
- Ventilation is required when:
  a) % 02 is greater than 23% or
  b) % 02 is less than 16% or
  c) % LEL is greater than 10%
- When % LEL is greater than 50% ventilation should proceed with extreme caution. All ignition sources should be removed and all unnecessary personnel evacuated
- When % 02 is greater than 25% all flammable material should be removed from the area

ISOLATION CHECKLIST:

- Person issuing permit must inspect and verify that isolation precautions are observed
- Valve lockouts on piping are not permitted in place of blanking
- Tagging should identify the HR/E employee as responsible for placement and removal of lockout locks and warning against operation
- Entryways must be posted "Entry by permit only"

RESPIRATORY REQUIREMENTS:

- Respiratory protection is always recommended when entering a confined space and there is any possibility of oxygen deficiency or exposures to toxic gases, vapors, or fumes. Provisions should always be made for emergency escape and rescue
- Respiratory protection is required whenever
  a) % 02 is less than 19.5% (supplied air/egress combo)
  b) % Concentration of toxic materials is greater than the TLV for that material.
     If the concentration is less than 50% of the IDLH, air purifying cartridges plus an egress system is permitted.
     If the concentration is greater than 50% of the IDLH, only supplied air with an egress system is permitted.

PERSONNEL SAFETY CHECKLIST:

- The person issuing the permit must verify that all of the personnel safety equipment and precautions have been completed.

SIGN OFFS -

- The person issuing the permit must attest that he has completed all tests and safety checks before issuing the permit. The supervisor receiving the permit must attest that he understands what is required for entry and will implement the necessary precautions.

CONFINED SPACE RESCUE PROCEDURES

1. Purpose

The purpose of the HR/E Confined Space Rescue Procedures is to establish guidelines for the safe and efficient rescue of personnel who have become disabled in a confined space. The intent of the procedures is to reduce the risk of injury to rescue personnel called upon to perform the Confined Space Rescue by ensuring their safety concerning the confined space structure and the environment to be entered.

2. Scope

The Heritage Remediation/Engineering, Inc. Confined Space Rescue procedures and requirements apply to all Heritage Remediation/Engineering, Inc. personnel and all HR/E contractor and subcontractor personnel working at:

A. All Heritage Remediation/Engineering, Inc. properties including division offices, shop and maintenance areas and yards.

B. All HR/E project sites.

Individual customers (including other HERITAGE Companies) may also have their own Confined Space Entry Permit and Rescue requirements of which their requirements shall also be met in addition to those listed herein.

3. Definitions

A. Confined Space Entrants - Any person who enters a confined space with intent to work. This person must be properly equipped and trained. that is

B. Safety Attendant - A person who is continuously present at, but does not enter the confined space. The Safety Attendant must be in constant communication with all entrants, be ready to summon aid, and participate in confined space rescue, if needed.

C. Rescue Person - Any person who enters a confined space with the intent to assist a disabled confined space entrant.

4. Procedure

A. Prior to any commencing any work involving entry into confined spaces, the requirements of the HR/E Confined Space Entry Procedures must be met.

B. Prior to entry of personnel into a confined space, Supervisors shall provide for the potential rescue situation by:

(1) requirements outlined in the Project Health and Safety Plan,

(2) requirements of these procedures, and

(3) any other appropriate measures deemed necessary.

C. Supervisors shall ensure that the following rescue equipment is immediately available outside the confined space entryway and that such equipment is ready for use and in good condition:

(1) Harnesses, Belts, and Lifelines: - During any vertical Confined Space Rescue, full body harness and lifeline shall be worn by all rescuers. Safety belts may be used in place of safety harnesses during horizontal confined space rescue. If they are not used, an effective alternative must be provided for and approved by the Division Director, or his/her designee, and available to be used during a rescue.

(2) Mechanical Retrieval Equipment - During any vertical Confined Space Rescue, a mechanical retrieval device must be used. If conditions exist that limit the use of such devices, an effective alternative must be provided and approved by the Division Director of his/her designee, prior to the initial entry into the confined space.

(3) Emergency Equipment - In case of equipment failure during Confined Space Entry/Rescue, the following equipment shall be immediately outside of the confined space: explosion proof flashlights, first aid kit, channel lock pliers, 10 inch adjustable wrench, 8 inch screwdriver, safety wipes, lens defogger, knife, roll of electrical tape, tyvek coveralls, gloves, spare flashlight batteries, roll of duct tape, and alarm.

(4) Breathing Equipment - Self contained breathing apparatus (SCBA) or air line respirators with escape breathing apparatus (EBA) shall be used during emergency rescue and available for each rescuer. Rescue air line respirators must be used with a different source of breathing air than the original entrants.

(5) Monitoring Equipment - During Confined Space Rescue, atmospheric monitoring equipment shall be used to determine existing conditions that may be life threatening to the safety of the rescuers, (i.e., explosive vapors or gases). The atmosphere shall be monitored continuously during emergency rescue.

(6) Explosion Proof Lighting - In confined spaces where lighting is inadequate, explosion proof lighting shall be used.

D. Upon the awareness of the Safety Attendant that the Confined Space Entrant has become disabled the Confined Space shall not be entered under any circumstances until the following procedures have occurred in order:

(1) The safety attendant activates the emergency alarm device to summon additional assistance.

(2) The safety attendant shall wear appropriate personal protective equipment and supplied air equipment.

(3) Additional personnel arrive who can assume the responsibilities as the safety attendant.

(4) An evaluation made of the situation to provide for the timely rescue and the safety of the rescuers addressed before rescue procedures are initiated.

E. Upon the awareness of any personnel of anyone possibly disabled in a confined space, no entry into that confined space shall be made until the requirements of "D" above are met. Notification of emergency assistance may need to be done via telephone, radio, or other means. In any event, rescue shall not commence until assistance and safety rescue equipment are in place.

F. Training and Drills - All Confined Space Rescuers shall be trained and drilled to establish and maintain competence in their duties periodically or as needed.

G. Accident Investigation - If the Confined Space Rescue procedures are ever activated, a formal accident investigation shall be performed to ascertain the cause of the incident (Refer to HERITAGE's Accident Investigation Policy). This investigation shall be conducted immediately after the incident and the appropriate Division Director, the HERITAGE Corporate Safety Director, and the HR/E Corporate Safety Manager shall be notified within 24 hours of occurrence.

H. Equipment Inspection - Rescue equipment shall be cleaned, recharged, inspected and returned to proper storage immediately after use. Routine equipment inspections shall be performed and documented at least weekly to ensure equipment integrity.

DECONTAMINATION PROCEDURES AND GUIDELINES

1) Never enter a clean-up site or use personal protective equipment without knowing what hazards are present and how you will exit and decontaminate.

2) Be sure you understand emergency exist and decontamination procedures before you enter a clean-up site.

3) Avoid contact with hazardous materials as much as possible. Minimize splashing, stirring up dust, etc.

4) Don't continue working with broken, torn or damaged protective equipment.

5) Don't cut slits in coveralls to access your pockets.

6) Report any indication of breakthrough of respirators, gloves, coveralls to your supervisor and change equipment as instructed.

7) Follow decontamination procedures exactly as instructed.

8) Handle contaminated tools, instruments, or equipment with care. Make sure they are decontaminated properly or discarded appropriately.

9) Make sure you wash thoroughly before eating, drinking or smoking. Never eat, drink or smoke in a contaminated area.

10) Wash or shower before going home.

11) Change clothes and leave dirty work clothes in the laundry bin.

RECOMMENDED SUPPLIES FOR DECONTAMINATION OF PERSONNEL, CLOTHING, AND EQUIPMENT

* Drop cloth(s) (plastic or other suitable material) for heavily contaminated equipment and outer protective clothing such as overboots, second pair of gloves, monitoring equipment, drum wrenches, etc.

* Disposal collection container(s) (drums or suitable lined trash cans) for disposable clothing and heavily contaminated personal protective clothing or equipment to be discarded.

* Lined box with absorbents for wiping or rinsing off gross contaminants and liquid contaminants.

* Wash tub(s) of sufficient size to enable workers to place booted foot in and wash off contaminants. (Without drain or with drain connected to collection tank or appropriate treatment system.)

* Rinse tub(s) of sufficient size to enable workers to place booted foot in and hold the solution used to rinse the wash solutions and contaminants after washing (without drain or with drain connected to collection tank or appropriate treatment system).

* Wash solutions selected to wash off and reduce the hazards associated with the contaminated wash and rinse solutions.

* Rinse solution to remove contaminants and contaminated wash solutions.

* Long-handled, soft-bristle brushes to help wash and rinse off contaminants.

Source: "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities", NIOSH, OSHA, USCG, EPA, October 1985.

* Lockers and cabinets for storage of decontaminated clothing and equipment.

* Storage containers for contaminated wash and rinse solutions.

* Plastic sheeting, sealed pads with drains, or other appropriate method for containing and collecting contaminated wash and rinse water spilled during decontamination.

* Shower facilities for full body wash or, at a minimum, personal wash sinks (with drains connected to collection tank or appropriate treatment system).

* Soap or wash solution, wash cloths, and towels.

* Clean clothing and personal item storage lockers and/or closets.

* Containers for gross contamination involving removal of wastes and contaminated soils caught in tires, and the underside of vehicles or equipment.

* Pads for collection of contaminated wash and rinse solutions with drains (or pumps) connected to storage tanks or approved treatment system.

* Shovels, rods, and long handled brushes for dislodging and cleaning and wastes and contaminated soils caught in tires, and the underside of vehicles or equipment.

* Pressurized sprayer(s) for washing and rinsing (particularly hard-to-reach areas).

* Spray booths, curtains, or enclosures to contain splashes from pressurized sprays used to dislodge materials and clean hard-to-reach areas.

* Long-handled brushes for general cleaning of exterior.

Source: "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities", NIOSH, OSHA, USCG, EPA, October 1985.

* Wash solutions with the contaminated wash and rinse solutions.

* Rinse solution to remove contaminants and contaminated wash solutions.

* Wash and rinse buckets for use in decontamination of operator areas inside the vehicle and equipment.

* Brooms and brushes for cleaning operator areas inside the vehicles and equipment.

* Containers for storage and/or disposal of contaminated rinse and wash solutions damaged or heavily contaminated parts and equipment to be discarded.

Source: "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities", NIOSH, OSHA, USCG, EPA, October 1985.

DECONTAMINATION SOLUTIONS

1. Alkaline - Multipurpose

5% sodium carbonate (Na_2CO_3)

5% trisodium phosphate (Na_3PO_4)

Mix 4 lbs per 10 gallons of water

Available at most hardware stores

Useful for: Inorganic Acids
Metal Processing Wastes
Solvents, TCE, Phenols
Organic Compounds
Oils, Fuels, Toluene, PCBs

2. Acidic

Dilute hydrochloric acid (HCl)

Mix 1 pint HCl into 10 gallons water with wooden or plastic stirrer.

Available at hardware and swimming pool stores

Useful for: Inorganic bases
Alkali
Caustic Wastes
Amines, Hydrazines

3. Sanitizing

10% calcium hypochlorite ($Ca(C10_2)_2$)

Mix 8 lbs per 10 gallons of water in clean plastic pails labelled "oxidizer"

Available at swimming pool supply stores

Useful for: Etiological (biological) waste
heavy metals (lead, mercury, etc.)
Pesticides, PCBs
Chlorinated phenols

4. Organic solvents

alcohol, ethers, straight chain alkanes (hexane)
petroleum products (kerosene, diesel fuel)

Useful for: Non-polar compounds (water insoluble)
organic compounds
#6 oil, tar, asphalt emulsions
paint compounds

5. General purpose rinse

5% trisodium phosphate (Na_3PO_4)

Mix 4 lbs per 10 gallons water available at hardware and janitor supply

Useful for: pre rinse
oily wastes not contaminated with pesticides

DECONTAMINATION PROCEDURES

I. Purpose

One of the major concerns and most difficult problems associated with emergency spill response and hazardous material clean-ups is the prevention of the spread of contamination, and the exposure of personnel during, and after, the removal of their personal protective equipment. It is very important that HR/E employees and supervisors be aware of the hazards associated with the materials at the clean-up and recognize the consequences of a failure to properly decontaminate. In particular, they should realize that failure to decontaminate will result in their own re-exposure to the material but without protective equipment, and can lead to an exposure of their family members and other innocent people. Such an exposure could lead to illness or injury. In addition, failure to decontaminate fully or properly spreads contamination to previously clean areas which will then require further expenditure of time and money to clean those areas.

II. References

29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response".

NIOSH, OSHA, EPA, USCG; "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities".

ACGIH, "Guidelines for the Selection of Chemical Protective Clothing".

III. Responsibility

Responsibility for the requirement and enforcement of proper decontamination shall rest with the project manager. The project manager, based on site characterization, client requirements, etc., must provide for adequate decontamination facilities,

decontamination plan, set up, and enforcement that all employees must proceed through decontamination prior to leaving the work site. Technical Services shall assist the Project Manager in prescribing proper decontamination solutions and methods appropriate to the hazards determined from the site characterization.

It shall be the responsibility of all employees to conduct and perform proper decontamination of themselves, their work buddies, their equipment, and their vehicles. Further, all employees have the responsibility to determine that decontamination procedures are in place prior to their entering an "exclusion zone" and not entering such zone until decontamination procedures are in place.

IV. Requirements

A. People and equipment at waste sites can become contaminated in a number of ways.

- Contact with gases, vapors, dusts or mists in the air.
- Contact with liquids or solids by accidental splashing or contact.
- Incidental contact with contaminated surfaces, soil, water, debris, etc. which the worker cannot avoid while working, handling materials, tools or equipment, or traversing the site. Any part of the body may become contaminated while on site, and this is the reason protective equipment is used to cover the employee very completely. Particular attention is paid to the hands and feet because they usually have the most direct and frequent contact with contaminants.

Even though protective equipment is used, employees should avoid contact with contaminated materials. However, this is not always possible. Proper decontamination is, therefore, absolutely essential. It is not simply cleaning-up after a job is completed. It is a meticulous and conscientious procedure to ensure that all contamination is contained, isolated and removed from personnel, equipment and site surfaces.

To be effective, a decontamination plan needs to be developed prior to entry. It is too late to make a plan after personnel and equipment have become contaminated. No one should ever enter a hazardous material site without proper personal protection and knowing how they will exit and decontaminate safely. It is also important that a decontamination plan include procedures for emergencies such as fires, explosions, accidental spills or releases, and injured or ill personnel.

B. PRE-ENTRY PLANNING

Prior to entering a site, information about the site, the materials, and the anticipated clean-up methods should be assembled and utilized to make up an initial decontamination plan. The information should include:

1. Information on the materials or wastes on site.

    a. Physical state, concentrations, characteristics.
    b. Health and safety hazards.
    c. Appropriate levels and types of personal protective equipment.
    d. Methods by which contamination may be spread.
    e. Location of materials on site.
    f. Amounts of materials on site.

2. Information on the site itself.

    a. General layout, location of landmarks and features.
    b. Access for vehicles and personnel, including: workers, spectators, press, etc.
    c. Extent of contamination and probable hazard zones.
    d. Communication facilities and emergency services available.

3. Appropriate clean-up procedures to contain, isolate, treat or remove the contaminant.

This information can then be used to establish a site entry/exit/decontamination plan.

It is very important that the clean-up site be secured as soon as possible to prevent unauthorized entry and the spread of contamination by unauthorized personnel. The first aspect of securing the site is to determine an exclusion or "hot" zone to which only authorized personnel wearing proper protective equipment are permitted to enter. This zone will consist of all known locations of the contaminant materials. The perimeter of the exclusion zone should be clearly and conspicuously defined with barriers and warning signs. Barriers can consist of any physical obstacle which prevents or hinders entry and provides a visible definition of the boundary of the zone. Examples include walls, fences, banner tape, ropes, etc. Warning signs must be posed on all sides or entries stating entry is not permitted or is restricted to authorized personnel only. The perimeter of the exclusion zone must be far enough away from the contaminant or source that a worker can remove his protective equipment without fear of becoming contaminated by contact with the material or by inhalation or skin absorption of gases, vapors, mists or dusts. In some cases the exclusion zone may be very large (i.e., there is risk of explosion) and in other cases it may be very small (i.e., low fire, explosion, reactivity or toxicity hazardous). In any case, it is important that the exclusion zone be clearly defined.

Definition of the exclusion zone can be made through the use of visual inspections for location of contaminants or real time monitoring equipment (i.e. detector tubes, organic vapor analyzers, or other atmospheric test equipment). It is always preferable to oversize the exclusion zone rather than

undersize it. Oversizing adds an extra buffer zone and protection to unprotected personnel outside of the zone.

Once the exclusion zone has been defined entrances and exits to the exclusion zone should be established. Preferably there will be only one entrance and exit to the exclusion zone, but emergency exits should also be planned. The entrance/exit should be established at an upwind location in outdoor situations. For indoor clean-ups and entrance/exit will be determined by the nature and location of the materials. The closest entrance may not be appropriate.

The entrance/exit to the exclusion zone will actually be a buffer zone and contamination reduction corridor for the employees who enter the exclusion zone. The area outside the contamination reduction zone is the support zone where a command post is established, materials and equipment are stages, employees dress for entrance to the exclusion zone, and the closest point at which non-protected personnel should be permitted. The buffer zone around the exclusion zone provides additional protection against unauthorized entry into the contaminated area and should be posted with signs warning of danger and prohibited entry. t sites where spectators may be present, this is absolutely the closest they should be allowed to the scene, and a police line should be established much further away if possible.

The entrance to a site should be limited to a single access point whenever possible. This permits better control of the site. Adjacent to this entrance may be an entrance/exit for heavy equipment, if necessary.

The exit from the site should be adjacent to the entrance and serves as the decontamination corridor for employees. Decontamination consists of several steps and specific procedures for reducing the contamination levels so that employee can safely remove personal protective equipment and leave the site.

The width of the contamination buffer zone will be determined by the length of the contamination reduction corridor which may be up to seventy five feet long and fifteen feet wide. Whenever possible the corridor should be a straight-line path and it should be conspicuously marked.

The exclusion zone is the far end/entry into the contamination reduction corridor and the near end/exit of the corridor is at a personnel shower/wash/redress station in the support zone. The number of decontamination stations will be dependent on the level of protection required for the material or situation. No one should enter the contamination reduction zone unless they are fully protected to enter the exclusion zone, and no one should exit the contamination reduction zone wearing or carrying any protective equipment which has been in the exclusion zone.

C. CRITERIA FOR DECONTAMINATION

Decontamination plans are of necessity, site and material specific. Therefore plans will need to be modified to fit each individual situation depending upon a number of factors.

1) Type of contaminant-some materials are extremely toxic and will require more thorough decontamination than relatively harmless materials. This will mean more steps in decontamination, very close attention to details in the decontamination procedures, and a carefully inspection to ensure decontamination is complete.

2) Amount of contamination-as the amount of contamination increases, so does the amount of decontamination. More contamination means greater opportunity for contact or exposure via inhalation or permeation of protective clothing.

3) Level of Protection-the more protective equipment and higher the level of protection means more decontamination. In particular, at higher levels of protection, less equipment and clothing is disposable due to costs. Level of protection is directly related to the type of contaminant.

4. Work function-different workers will require differences in decontamination based on their particular jobs. Laborers may be highly contaminated while a heavy equipment operator less so.

5. Location of contaminant-when contaminants are in or near the breathing zone of the worker, special care in decontamination is needed. Contaminants must be thoroughly removed and the use of cleaners should be carefully considered.

6. Reason for Leaving Site-if a worker is leaving the exclusion zone to pick-up or drop-off tools and equipment and will immediately return to the hot zone, only gross decontamination needs to be done. Changing air-purifying cartridges or SCBA bottles requires more, and leaving for break, lunch or end of day requires a complete decontamination.

D. DECONTAMINATION OF PERSONNEL

Workers who enter the exclusion zone will undoubtedly become contaminated. Just entering the exclusion zone means that one should assume that boots, gloves and outer garments have been exposed to the hazardous material on site and are to be regarded as contaminated. Decontamination will then be a function of the six items just cited above.

It will always be easier to set up a contamination reduction corridor for sites where an extended clean-up program will take place, but it is also important to follow good decontamination procedures for emergency spills. HR/E routinely disposes of many chemical protective garments, therefore some of the wash and rinse steps can be eliminated with disposal into an appropriate container substituted in its stead. Other modifications may be necessary as a situation dictates.

It should be noted that all decontamination procedures end with a field wash or shower. This is a very important and essential feature to prevent accidental contact, inhalation of ingestion of contaminants by the employee when he is unprotected. Employees at minimum, should thoroughly wash their hands, forearms, and face before taking a break, having lunch or going home. As soon as possible thereafter, the employee should shower and thoroughly scrub their body with soap and water. Solvents should not be used to clean the skin. At spill sites, where water may not be available, waterless hand-cleaners may be used for field washes.

It is important that all employees be familiar with decontamination procedures for the site before entering the exclusion zone. They should understand that failure to decontaminate may have serious consequences for their health and will create additional (and expensive) clean-up work.

E. DECONTAMINATION IN EMERGENCIES

At anytime during work at a site, an emergency can arise. It could be a fire, explosion or uncontrolled reaction of materials or it could be a medical emergency involving one or more of the workers. In either case, emergency exiting and decontamination procedures should be established before entering the site.

In the event of a physical hazard (i.e. fire or explosion) escape routes should be planned. Ideally exit would be via the contamination reduction corridor, however exits which will remove employees from danger must be provided and a path to the contamination reduction corridor determined. A warning system should also be established. If an employee were to exit he should have received instructions regarding gross decontamination procedures (i.e. removal of outer garments,) how to return to the contamination reduction corridor, reporting to his supervisor, and final decontamination procedures.

In a medical emergency two problems are immediately present, decontamination and medical treatment. what is to be done for each is dependent upon the type and severity of emergency. Medical emergencies can be

1. Physical injuries - this included falls, sprains, simple and compound fractures, punctures, cuts, and abrasions.

2. Heat Stress - heat fatigue to heat stroke.

3. Chemical Exposure - this includes simple exposure with no immediate apparent effects to severe symptoms or damage due to tissue contact or inhalation.

When the situation is not life threatening (i.e. a sprain, simple exposure, heat fatigue, minor cut) full decontamination procedures should be followed, appropriate first aid administered, and the employee sent for medical treatment. As the severity of the injury or illness complex. If the contaminant is highly toxic, some decontamination is necessary and it needs to be balanced against the risk to the employee from the injury. Stripping in most situations and the victim wrapped in a clean blanket for transport. The medical team

at the trauma unit should be appraised of the worker's exposure and possible contamination so that they can take appropriate precautions.

Some emergencies may occur within the exclusions zone which may be handled prior to any decontamination. Chemical exposure for the eyes is a typical example. In order to protect the eyes, irrigation with water is essential. Therefore, eyewash solutions should be kept close at hand in the contamination reduction zone, or in the exclusion zone, if the risk of exposure is likely. Irrigation can be performed immediately and decontamination performed after the emergency is stabilized.

F. EQUIPMENT DECONTAMINATION

All equipment used in the exclusion zone should be decontaminated also. some items, such as monitoring equipment, may only require a simple exterior cleaning. Other items, such as hand tools or heavy equipment, will require extensive cleaning. Still other items, such as ropes, hoses, slings, or safety harness, may be too contaminated to be satisfactorily cleaned and should be discarded. The same criteria as used with personnel, should be used to determine the level of decontamination. In addition, absorption or permeation of materials should be given consideration. While metals are relatively impervious to most contaminants, wood plastics, fabric and rubber are not. Therefore different cleaning procedures will be use for different pieces of equipment.

1. Sampling equipment-many pieces of sampling equipment are chosen as disposable items and no effort should be expended trying to decontaminate them. However, it is important to identify those items prior to entry. Other pieces of equipment, such as survey instruments, should be cleaned to remove visible contamination and further decontamination procedures determined by Technical Services. When

taking sampling instruments into the exclusion zone, it is advisable to cover them as much as practical to reduce possible contamination and decontamination requirements.

2. Tools-metal tools or tool parts are usually relatively easy to clean with detergent and water or an appropriate solvent. In some cases, steel wool or sandpaper may also be useful. The problem arises with wooden, plastic or rubber handles. These materials may absorb the material and may be difficult to impossible to clean. Furthermore the handles may desorb the material later, off site, in the unprotected hand of an unsuspecting worker. When the materials in the exclusion zone are highly toxic, the wooden, plastic, or rubber type handle should be either discarded at the end of the job or it should be completely covered with tape which can later be removed and discarded. Wherein doubt, discard the handle or tool if necessary. All tools should be carefully and completely cleaned, with special attention paid to cleaning in corners, hinges, and other tiny crevices where contaminants may accumulate.

3. Heavy Equipment/Vehicles-heavy equipment and vehicles that must be used in the exclusion zone, must be thoroughly decontaminated before leaving the site. Gross contamination can be removed from tracks or tires with stiff brooms or brushes. This is then followed by a high pressure detergent and water wash of all exposed parts including the under carriage, the inside of open cabs, scoops or buckets, dump boxes, etc. Wash water should be recovered and disposed of properly. Wipe tests should be made to ensure the equipment is clean.

4. Personal Protective Equipment-disposable protective equipment should be discarded as a waste (i.e. contaminated debris.) Equipment such as SCBA's, some boots or protective clothing, air lines, and respirator face

pieces will need to be decontaminated. All gross contamination should be removed by scraping, brushing or washing and rinsing. Attention should be paid to cleaning small crevices, seams, folds, etc. Fine decontamination requirements for equipment will be determined by Technical Services based on the material, the amount of exposure, the permeability of the equipment, and likelihood of worker exposure upon reuse after decontamination. After equipment has been thoroughly decontaminated, personal protective equipment must be sanitized to remove residual bacteria, body oil, or perspiration.

G. DECONTAMINATION PERSONNEL

In general, employees who will be doing or assisting in the decontamination of other personnel or equipment will require personal protective equipment also. Their level of protection will be dependent upon several factors; the type of contaminant and possible exposure/health hazards, amount of contamination on workers or equipment to be decontaminated, the amount of concentration of contaminants brought into the contamination reduction corridor, and the likelihood of their own exposure to hazardous materials. As the level of protection in the exclusion zone goes up, the level of protection in the decontamination zone will probably also go up.

H. TESTING OF THE EFFECTIVENESS OF DECONTAMINATION

Decontamination methods very in their effectiveness for removing different substances. The effectiveness of any decontamination method should be assessed at the beginning of a program and periodically throughout the lifetime of the program. If contaminated materials are not being removed or are penetrating protective clothing, the decontamination program must be revised. The following methods may be useful in assessing the effectiveness of decontamination.

Visual Observation

There is no reliable test to immediately determine how effective decontamination is. In some cases, effectiveness can be estimated by visual observation.

- Natural light. Discolorations, stains, corrosive effects, visible dirt, or alterations in clothing fabric may indicate that contaminants have not been removed. However, not all contaminants leave visible traces; many contaminants can permeate clothing and are not easily observed.

- Ultraviolet light. Certain contaminants, such as polycyclic aromatic hydrocarbons, which are common in many refined oils and solvent wastes, fluoresce an can be visually detected when exposed to ultraviolet light. Ultraviolet light can be used to observe contamination of skin, clothing, and equipment; however, certain areas of the skin may fluoresce naturally, thereby introducing an uncertainty into the test [2,3,4]. In addition, use of ultraviolet light can increase the risk of skin cancer and eye damage; therefore, a qualified health professional should assess the benefits and risks associated with ultraviolet light prior to its use at a waste site.

Wipe Sampling

Wipe testing provides after-the-fact information on the effectiveness of decontamination. In this procedure, a dry or wet cloth, glass fiber filter paper, or swab is wiped over the surface of the potentially contaminated object and then analyzed in a laboratory. Both the inner and outer surface of protective clothing should be tested. Skin may also be tested using wipe samples.

Cleaning Solution Analysis

Another way to test the effectiveness of decontamination procedures is to analyze for contaminants left in the cleaning solutions. Elevated levels of contaminants in the final rinse solution may suggest that additional cleaning and rinsing are needed.

Testing for Permeation

Testing for the presence of permeated chemical contaminants requires that pieces of the protective garments be sent to a laboratory for analysis.

I. Summary

Proper decontamination of personnel and equipment is one of the most important phases in a clean-up. It reflects upon the professionalism of Heritage Remediation/engineering and its employees. It is also a very crucial procedure since careless or improper decontamination provides opportunities for exposure of an employee, his family and friends, and other unsuspected persons who may come in contact with him, or with tools or equipment used on a site. It also is an opportunity for contamination to be spread or tracked into clean areas. Not properly decontaminating leaves a job unfinished.

V. General Information & Layouts

A. Decontamination Procedures and Guidelines
B. Recommended Supplies - Personnel Decontamination
C. Recommended Supplies - Equipment Decontamination
D. Decontamination Solutions
E. Contamination - Reduction Zone Layout
F. Minimum Decontamination Layout
G. Extensive Decontamination Layout

APPENDIX F
AIR MONITORING PLAN

AMBIENT AIR MONITORING PROGRAM WORK PLAN

1.0 INTRODUCTION

This work plan describes the ambient air monitoring to be performed during soil and concrete removal activities at the Interchem Site located in Alton, Iowa. The purpose of the monitoring program is to evaluate selected pesticide concentrations in ambient air adjacent to the facility resulting from excavation and removal of contaminated soils and concrete. Monitored concentrations will be compared to health-risk based acceptable ambient air concentrations for pesticides to determine if adjacent off-site (boundary) hazards may exist as a result of removal activities.

This work plan was prepared to provide field personnel with site-specific methods for the collection of air quality data prior to and during soil excavation.

This work plan includes a discussion of:

- Sampling parameters and collection methods
- Sampling locations and frequency
- Sampling procedures
- Quality Assurance/Quality Control (QA/QC)
- Sample analysis

2.0
HEALTH-RISK BASED ACCEPTABLE AIR IMPACTS

The health-risk based acceptable ambient air concentrations were calculated based on EPA-established toxicity factors, EPA reasonable risk levels, and reasonable maximum estimates of potential boundary exposures. The calculations assumed that a person is exposed at the boundary for 8 hours per day for 7 days of earth-moving activities, and inhales 20 m^3 of air per day. These health-risk based acceptable ambient air concentrations are presented along with sampling detection limits in Table 1.

3.0
SAMPLING PLAN

3.1 SAMPLE PARAMETERS AND COLLECTION METHODS

Two methods will be utilized to monitor ambient air impacts resulting from soil excavation at the site. Integrated ambient air samples will be collected for toxaphene using EPA method TO-10 and real-time ambient air concentrations of Total Suspended Particulate (TSP) concentrations will monitored with a hand held aerosol monitor (Miniram).

Toxaphene was selected for analysis based on results of a soil sampling program conducted at the site. Method TO-10 (low volume polyurethane foam) (puf) was chosen because it offers significant logistical advantages over high volume sampling methods while still providing adequate detection limits. The toxaphene samples will be collected on (puf) cylinders mounted in glass cartridges. The puf plugs will be shipped pre-cleaned from the manufacturer. The sample method is included in Attachment A. A known volume of air will be drawn through the sample media using Gilian Model HFS 513 or equivalent portable air sampling pumps. These pumps operate on rechargeable batteries for periods of up to 16 hours and are continuously self-adjusting to compensate for variation in load to maintain a constant flow rate. They may be equipped with self-timers to allow semi-automatic operation.

A miniram will be placed at the downwind fenceline representing the closes public access to the site to monitor real-time Total Suspended Particulate (TSP) concentrations during excavation. Miniram measurements will be taken downwind of excavation activities four to five times daily and any time visible dust is observed. Observed concentrations and locations will be recorded in the field logbook. Miniram readings above 7.5 ug/m^3 during concrete removal and 175 ug/m^3 during soil removal indicate that toxaphene concentrations may be approaching the acceptable health-risk based levels and that dust suppression measures should be put into effect to reduce the particulate emissions down to acceptable levels. The observed miniram concentrations will be compared to coinciding puf sample results to verify the correlation between TSP

concentrations and toxaphene concentrations. The miniram action levels are based on the highest concentrations in the concrete (4,500 mg/kg) and soil (200 mg/kg) and conservatively assume that all detected dust is inhalable.

A portable meteorological station will be installed on-site before sampling activities begin. The station will be located in an area free of obstruction to wind flow and representative of the sampling area. The station will monitor wind speed, wind direction, barometric pressure, and temperature and record the values as one hour averages.

3.2 SAMPLING LOCATIONS AND FREQUENCY

Baseline samples will be collected to determine existing ambient air concentrations adjacent to the facility. These samples will be collected at three locations on the fenceline surrounding the facility on two separate days prior to excavation of contaminated soils.

During excavation activities, samplers will be placed with one located upwind of each removal excavation activity site area, and two samplers will be placed downwind at each general removal area. Baseline and excavation samples will be collected at a height of approximately 1.5 m (5 feet) and 1.5 m (5 feet) away from any obstruction. Sample locations will be selected such that there are no obstructions between the sampler and work activities whenever possible. Sampling will occur each day during excavation activities. These activities are anticipated to last approximately 8 hours per day.

Due to the small size and estimated start direction of excavation at location 10c, only a miniram will be used to monitor dust levels in real time.

3.3 SAMPLING PROCEDURES

The puf samplers will be located on the boundaries as close to the excavation activities as possible while still providing for coverage of the entire excavation area or areas should wind directions vary. Should wind directions change during the sample day the

samplers will be left in their original locations to sample through the end of the sample day. Changes in wind direction will be noted in the field logbook.

Pump flow rates will be checked and adjusted using a primary standard bubble flow meter. Sample pumps will be preset to 2 liters per minute (LPM) for toxaphene samples to approximate the correct flow. The precleaned sample cartridges (puf) will arrive at the site wrapped in aluminum foil and placed in shipping containers. The cartridges should be handled only with latex or precleaned gloves. The cleaned sample cartridges will be removed from the shipping containers and aluminum foil and attached to sampling pump with flexible tubing. The aluminum foil will be returned to the shipping container for later use. As excavation activities begin, the pumps will be started and the flow rates set to 2 LPM for toxaphene samples. The flow rates will be checked approximately every two hours during the day and adjusted if they vary by more than 15 percent from the target flow rate.

At the end of the work day, the pumps will be shut off. The cartridges will then be wrapped in the original aluminum foil and placed in the shipping containers. Each container should be sealed and labeled prior to shipment to the laboratory. Toxaphene samples should be shipped to the laboratory in a cooler preserved on blue ice or regular ice. If regular ice is used care should be taken to ensure that the samples do not become contaminated with water from melting ice during shipment.

All sampling activities will be recorded in a field logbook. Daily entries to the logbook should include:

- Sampling personnel
- Meteorological conditions (high winds, precipitation, etc.)
- Uncorrected barometric pressure
- Excavation activities
- Sampling locations
- Other on-site and off-site conditions that may affect air impacts

Sample designation, start and stop times, locations, and flow rates will be recorded on flow rate check sheets filled out for each sample collected. An example sheet is included as Attachment B.

3.4 QUALITY ASSURANCE/QUALITY CONTROL

Flow rates for all samples will be set at the beginning of each sample period using a primary standard bubble flow meter. Flow rates will be checked and recorded on flow rate check sheets approximately every two hours during sampling, and corrected if the flow rates vary by more than 15 percent from the target value. The flow rates recorded on the check sheets will be averaged and used to determine the sample volume. Sample volumes will be corrected to standard temperature and pressure conditions.

A field QA/QC sample collection program will be performed to ensure the validity of the laboratory analysis, sample collection, and to check for contamination of sample media in the field and during sample shipment.

Duplicate samples will be collected at a rate of one duplicate sample per 10 samples collected. Duplicate samples will be collected by placing a second sample pump and puf cartridge at a sampling location and collecting the sample in the same manner as the primary sample. Analysis of duplicate samples will provide an indication of sampling and laboratory accuracy.

Field blanks will be collected at the same rate as for the duplicate sampling described above. Field blanks will be collected by exposing (no flow) the sample media to ambient air at a sample location for three minutes. In addition, a trip blank will be submitted with samples on the first day of baseline sampling and near the end of the program. Analysis of field and trip blanks will indicate whether the sample media have been contaminated during preparation, sampling, or shipment. All QA/QC samples will be given a unique sample designation and will not be identified as QA/QC samples to the analytical laboratory.

Samples will be shipped to the analytical laboratories under chain-of-custody. The analytical laboratories will follow all QA/QC procedures described in methods TO-10.

3.5 SAMPLE ANALYSIS

Samples will be analyzed by ENSECO Rocky Mountain Analytical Laboratories (RMA) of Arvada, Colorado. All samples will be submitted for standard turnaround analysis.

4.0
DATA VALIDATION AND EVALUATION

The validity of the laboratory analysis will be evaluated using the results of the field QA/QC sampling program. In general, results of duplicate analysis shall be within 100 percent of the primary sample, while blank values should be below the laboratory detection limit. Spike recovery values shall meet laboratory requirements and requirements specified in Method TO-10.

If the analytical results do not meet the above requirements, the field logbook and meteorological data will be reviewed to determine possible causes and the analytical results may be qualified or deemed invalid, as necessary.

The ambient concentrations measured at the fenceline of the facility will be evaluated based on meteorological data collected at the on-site meteorological station. For sample days where drastic changes in wind direction were observed during sampling the wind speed and frequency that each sampler was down wind will be evaluated to determine actual fenceline impacts during that sampling period.

TABLE 1

Acceptable Health-Risk Based
Ambient Air Concentrations and
Sample Detection Limits

Compound	Acceptable Health-Risk Based Ambient Air Concentration (ug/m3)	Laboratory Detection Limit (ug/sample)	Sample volume (m3)	Sample Detection Limit (ug/m3)
Toxaphene	11.65	1.000	0.9	1.04
Respirable Dust	5000a			

a OSHA Permisible Exposure Limit

1.5

ATTACHMENT A
SAMPLE METHOD

METHOD TO10

METHOD FOR THE DETERMINATION OF ORGANOCHLORINE PESTICIDES IN AMBIENT AIR USING LOW VOLUME POLYURETHANE FOAM (PUF) SAMPLING WITH GAS CHROMATOGRAPHY/ELECTRON CAPTURE DETECTOR (GC/ECD)

1. Scope

1.1 This document describes a method for sampling and analysis of a variety of organochlorine pesticides in ambient air. The procedure is based on the adsorption of chemicals from ambient air on polyurethane foam (PUF) using a low volume sampler.

1.2 The low volume PUF sampling procedure is applicable to multicomponent atmospheres containing organochlorine pesticide concentrations from 0.01 to 50 ug/m^3 over 4- to 24-hour sampling periods. The detection limit will depend on the nature of the analyte and the length of the sampling period.

1.3 Specific compounds for which the method has been employed are listed in Table 1. The analysis methodology described in this document is currently employed by laboratories using EPA Method 608. The sampling methodology has been formulated to meet the needs of pesticide sampling in ambient air.

2. Applicable Documents

2.1 ASTM Standards

D1356 - Definitions of Terms Related to Atmospheric Sampling and Analysis.

D1605-60 - Standard Recommended Practices for Sampling Atmospheres for Analysis of Gases and Vapors.

E260 - Recommended Practice for General Gas Chromatography Procedures.

E355 - Practice for Gas Chromatography Terms and Relationships.

2.2 EPA Documents

2.2.1 Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, EPA-600/4-84-041, U.S. Environmental Protection Agency, Research Triangle Park, NC, April 1984.

2.2.2 Manual of Analytical Methods for Determination of Pesticides in Humans and Environmental Standards, EPA-600/8-80-038, U.S. Environmental Protection Agency, Research Triangle Park, NC, July 1982.

2.2.3 "Test Method 608, Organochlorine Pesticides and PCBs," in EPA-600/4-82-057, U. S. Environmental Protection Agency, Cincinnati, Ohio, July 1982.

2.2.4 R. G. Lewis, ASTM draft report on standard practice for sampling and analysis pesticides and polychlorinated biphenyls in indoor atmospheres, U. S. Environmental Protection Agency, Research Triangle Park, NC, June 1987.

3. Summary of Method

3.1 A low volume (1 to 5 L/minute) sampler is used to collect vapors on a sorbent cartridge containing PUF. Airborne particles may also be collected, but the sampling efficiency is not known.

3.2 Pesticides are extracted from the sorbent cartridge with 5% diethyl ether in hexane and determined by gas-liquid chromatography coupled with an electron capture detector (ECD). For some organochlorine pesticides, high performance liquid chromatography (HPLC) coupled with an ultraviolet (UV) detector or electrochemical detector may be preferable. This method describes the use of an electron capture detector.

3.3 Interferences resulting from analytes having similar retention times during gas-liquid chromatography are resolved by improving the resolution or separation, such as by changing the chromatographic column or operating parameters, or by fractionating the sample by column chromatography.

3.4 Sampling procedure is also applicable to other pesticides which may be determined by gas-liquid chromatography coupled with a nitrogen-phosphorus detector (NPD), flame photometric detector (FPD), Hall electrolytic conductivity detector (HECD), or a mass spectrometer (MS).

4. Significance

4.1 Pesticide usage and environmental distribution are common to rural and urban areas of the United States. The application of pesticides can cause adverse health effects to humans by contaminating soil, water, air, plants, and animal life.

4.2 Many pesticides exhibit bioaccumulative, chronic health effects; therefore, monitoring the presence of these compounds in ambient air is of great importance.

4.3 Use of a portable, low volume PUF sampling system allows the user flexibility in locating the apparatus. The user can place the apparatus in a stationary or mobile location. The portable sampling apparatus may be positioned in a vertical or horizontal stationary location (if necessary, accompanied with supporting structure). Mobile positioning of the system can be accomplished by attaching the apparatus to a person to test air in the individual's breathing zone. Moreover, the PUF cartridge used in this method provides for successful collection of most pesticides.

5. Definitions

Definitions used in this document and in any user-prepared Standard Operating Procedures (SOPs) should be consistent with ASTM D1356, D1605-60, E260, and E355. All abbreviations and symbols are defined within this document at point of use.

5.1 Sampling efficiency (SE) - ability of the sampling medium to trap vapors of interest. %SE is the percentage of the analyte of interest collected and retained by the sampling medium when it is introduced as a vapor in air or nitrogen into the air sampler and the sampler is operated under normal conditions for a period of time equal to or greater than that required for the intended use.

5.2 Retention efficiency (RE) - ability of sampling medium to retain a compound added (spiked) to it in liquid solution.

5.2.1 Static retention efficiency - ability of the sampling medium to retain the solution spike when the sampling cartridge is stored under clean, quiescent conditions for the duration of the test period.

5.2.2 Dynamic retention efficiency - ability of the sampling medium to retain the solution spike when air or nitrogen is drawn through the sampling cartridge under normal operating conditions for the duration of the test period. The dynamic RE is normally equal to or less than the SE.

5.3 Retention time (RT) - time to elute a specific chemical from a chromatographic column. For a specific carrier gas flow rate, RT is measured from the time the chemical is injected into the gas stream until it appears at the detector.

5.4 Relative retention time (RRT) - a ratio of RTs for two chemicals for the same chromatographic column and carrier gas flow rate, where the denominator represents a reference chemical.

6. Interferences

6.1 Any gas or liquid chromatographic separation of complex mixtures of organic chemicals is subject to serious interference problems due to coelution of two or more compounds. The use of capillary or narrowbore columns with superior resolution and/or two or more columns of different polarity will frequently eliminate these problems.

6.2 The electron capture detector responds to a wide variety of organic compounds. It is likely that such compounds will be encountered as interferences during GC/ECD analysis. The NPD, FPD, and HECD detectors are element specific, but are still subject to interferences. UV detectors for HPLC are nearly universal, and the electrochemical detector may also respond to a variety of chemicals. Mass spectrometric analyses will generally provide positive identification of specific compounds.

6.3 Certain organochlorine pesticides (e.g., chlordane) are complex mixtures of individual compounds that can make difficult accurate quantification of a particular formulation in a multiple component mixture. Polychlorinated biphenyls (PCBs) may interfere with the determination of pesticides.

6.4 Contamination of glassware and sampling apparatus with traces of pesticides can be a major source of error, particularly at lower analyte concentrations. Careful attention to cleaning and handling procedures is required during all steps of sampling and analysis to minimize this source of error.

6.5 The general approaches listed below should be followed to minimize interferences.

6.5.1 Polar compounds, including certain pesticides (e.g., organophosphorus and carbamate classes), can be removed by column chromatography on alumina. This sample clean-up will permit analysis of most organochlorine pesticides.

6.5.2 PCBs may be separated from other organochlorine pesticides by column chromatography on silicic acid.

6.5.3 Many pesticides can be fractionated into groups by column chromatography on Florisil (Floridin Corp.).

7. Apparatus

7.1 Continuous-flow sampling pump (Figure 1) - (DuPont Alpha-1 Air Sampler, E.I. DuPont de Nemours & Co., Inc., Wilimington, DE, 19898, or equivalent).

7.2 Sampling cartridge (Figure 2) - constructed from a 20 mm (i.d.) x 10 cm borosilicate glass tube drawn down to a 7 mm (o.d.) open connection for attachment to the pump via Tygon tubing (Norton Co., P.O. Box 350, Akron, OH, 44309, or equivalent). The cartridge can be fabricated inexpensively from glass by Kontes (P.O. Box 729, Vineland, NJ, 08360), or equivalent.

7.3 Sorbent, polyurethane foam (PUF) - cut into a cylinder, 22 mm in diameter and 7.6 cm long, fitted under slight compression inside the cartridge. The PUF should be of the polyether type, (density No. 3014 or 0.0225 g/cm^3) used for furniture upholstery, pillows, and mattresses; it may be obtained from Olympic Products Co. (Greensboro, NC), or equivalent source. The PUF cylinders (plugs) should be slightly larger in diameter than the internal diameter of the cartridge. They may be cut by one of the following means:

- With a high-speed cutting tool, such as a motorized cork borer. Distilled water should be used to lubricate the cutting tool.
- With a hot wire cutter. Care should be exercised to prevent thermal degradation of the foam.
- With scissors, while plugs are compressed between the 22 mm circular templates.

Alternatively, pre-extracted PUF plugs and glass cartridges may be obtained commercially (Supelco, Inc., Supelco Park, Bellefonte, PA, 16823, No. 2-0557, or equivalent).

7.4 Gas chromatograph (GC) with an electron capture detector (ECD) and either an isothermally controlled or temperature-programmed heating oven. The analytical system should be complete with all required accessories including syringes, analytical columns, gases, detector, and strip chart recorder. A data system is recommended for measuring peak heights. Consult EPA Method 608 for additional specifications.

7.5 Gas chromatographic column, such as 4- or 2-mm (i.d.) x 183 cm borosilicate glass packed with 1.5% SP-2250 (Supelco, Inc.)/1.95% SP-2401 (Supelco, Inc.) on 100/120 mesh Supelcoport (Supelco, Inc.), 4% SE-30 (General Electric, 50 Fordham Rd., Wilmington, MA, 01887, or equivalent)/6% OV-210 (Ohio Valley Specialty Chemical, 115 Industry Rd., Marietta, OH, 45750, or equivalent) on 100/200 mesh Gas Chrom Q (Alltec Assoc., Applied Science Labs, 2051 Waukegan Rd, Deerfield, IL, 60015, or equivalent), 3% OV-101 (Ohio Valley Specialty Chemical) on UltraBond (Ultra Scientific, 1 Main St., Hope, RI, 02831, or equivalent) and 3% OV-1 (Ohio Valley Specialty Chemical) on 80/100 mesh Chromosorb WHP (Manville, Filtration, and Materials, P.O. Box 5108, Denver CO, 80271, or equivalent). Capillary GC column, such as 0.32 mm (i.d.) x 30 m DB-5 (J&W Scientific, 3871 Security Park Dr., Rancho Cordova, CA, 95670, or equivalent) with 0.25 um film thickness. HPLC column, such as 4.6 mm x 25 cm Zorbax SIL (DuPont Co., Concord Plaza, Wilmington, DE, 19898, or equivalent) or u-Bondapak C-18 (Millipore Corp., 80 Ashby Rd., Bedfore, MA, 01730, or equivalent).

7.6 Microsyringes - 5 uL volume or other appropriate sizes.

8. Reagents and Materials

[Note: For a detailed listing of various other items required for extract preparation, cleanup, and analysis, consult U.S. Method 608 which is provided in Appendix A of Method TO-4 in the Compendium.]

8.1 Round bottom flasks, 500 mL, ⅋ 24/40 joints.

8.2 Soxhlet extractors, 300 mL, with reflux condensers.

8.3 Kuderna-Danish concentrator apparatus, 500 mL, with Snyder columns.

8.4 Graduated concentrator tubes, 10 mL, with ⅋ 19/22 stoppers (Kontes, P.O. Box 729, Vineland, NJ, 08360, Cat. No. K-570050, size 1025, or equivalent).

8.5 Graduated concentrator tubes, 1 mL, with ⅋ 14/20 stoppers (Kontes, Vineland, NJ, Cat. No. K-570050, size 0124, or equivalent).

8.6 TFE fluorocarbon tape, 1/2 in.

8.7 Filter tubes, size 40 mm (i.d.) x 80 mm, (Corning Glass Works, Science Products, Houghton Park, AB-1, Corning, NY, 14831, Cat. No. 9480, or equivalent).

8.8 Serum vials, 1 mL and 5 mL, fitted with caps lined with TFE fluorocarbon.

8.9 Pasteur pipettes, 9 in.

8.10 Glass wool fired at 500°C.

8.11 Boiling chips fired at 500°C.

8.12 Forceps, stainless steel, 12 in.

8.13 Gloves, latex or precleaned (5% ether/hexane Soxhlet extracted) cotton.

8.14 Steam bath.

8.15 Heating mantles, 500 mL.

8.16 Analytical evaporator, nitrogen blow-down (N-Evap®, Organomation Assoc., P.O. Box 159, South Berlin, MA, 01549, or equivalent).

8.17 Acetone, pesticide quality.

8.18 n-Hexane, pesticide quality.

8.19 Diethyl ether preserved with 2% ethanol (Mallinckrodt, Inc., Science Products Division, P.O. Box 5840, St. Louis, MO, 63134, Cat. No. 0850, or equivalent).

8.20 Sodium sulfate, anhydrous analytical grade.

8.21 Alumina, activity grade IV, 100/200 mesh.

8.22 Glass chromatographic column (2 mm i.d. x 15 cm long).

8.23 Soxhlet extraction system, including Soxhlet extractors (500 and 300 mL), variable voltage transformers, and cooling water source.

8.24 Vacuum oven connected to water aspirator.

8.25 Die.

8.26 Ice chest.

8.27 Silicic acid, pesticide quality.

8.28 Octachloronaphthalene (OCN), research grade, (Ultra Scientific, Inc., 1 Main St., Hope, RI, 02831, or equivalent).

8.29 Florisil (Floridin Corp.).

9. Assembly and Calibration of Sampling System

9.1 Description of Sampling Apparatus

9.1.1 The entire sampling system is diagrammed in Figure 1. This apparatus was developed to operate at a rate of 1-5 L/minute and is used by U.S. EPA for low volume sampling of ambient air. The method writeup presents the use of this device.

9.1.2 The sampling module (Figure 2) consists of a glass sampling cartridge in which the PUF plug is retained.

9.2 Calibration of Sampling System

9.2.1 Air flow through the sampling system is calibrated by the assembly shown in Figure 3. The air sampler must be calibrated in the laboratory before and after each sample collection period, using the procedure described below.

9.2.2 For accurate calibration, attach the sampling cartridge in-line during calibration. Vinyl bubble tubing (Fisher Scientific, 711 Forbes Ave., Pittsburgh, PA, 15219, Cat. No. 14-170-132, or equivalent) or other means (e.g., rubber stopper or glass joint) may be used to connect the large end of the cartridge to the calibration system. Refer to ASTM Standard Practice D3686, Annex A2 or Standard Practice D4185, Annex A1 for procedures to calibrate small volume air pumps.

10. Preparation of Sampling (PUF) Cartridges

10.1 The PUF adsorbent is white and yellows upon exposure to light.

10.2 For initial cleanup and quality assurance purposes, the PUF plug is placed in a Soxhlet extractor and extracted with acetone for 14 to 24 hours at 4 to 6 cycles per hour (If commercially pre-extracted PUF plugs are used, extraction with acetone is not required.). This procedure is followed by a 16-hour Soxhlet extraction with 5% diethyl ether in n-hexane. When cartridges are reused, 5% ether in n-hexane can be used as the cleanup solvent.

10.3 The extracted PUF is placed in a vacuum oven connected to a water aspirator and dried at room temperature for 2 to 4 hours (until no solvent odor is detected). The clean PUF is placed in labeled glass sampling cartridges using gloves and forceps. The cartridges are wrapped with hexane-rinsed aluminum foil and placed in glass jars fitted with TFE fluorocarbon-lined caps. The foil wrapping may also be marked for identification using a blunt probe.

10.4 At least one assembled cartridge from each batch should be analyzed as a laboratory blank before any samples are analyzed. A blank level of <10 ng/plug for single component compounds is considered to be acceptable. For multiple component mixtures, the blank level should be <100 ng/plug.

11. Sampling

11.1 After the sampling system has been assembled and calibrated as per Section 9, it can be used to collect air samples as described below.

11.2 The prepared sample cartridges should be used within 30 days of loading and should be handled only with latex or precleaned cotton gloves.

11.3 The clean sample cartridge is carefully removed from the aluminum foil wrapping (the foil is returned to jars for later use) and attached to the pump with flexible tubing. The sampling assembly is positioned with the intake downward or horizontally. The sampler is located in an unobstructed area at least 30 cm

from any obstacle to air flow. The PUF cartridge intake is positioned 1 to 2 m above ground level. Cartridge height above ground is recorded on the Sampling Data Form shown in Figure 4.

11.4 After the PUF cartridge is correctly inserted and positioned, the power switch is turned on and the sampling begins. The elapsed time meter is activated and the start time is recorded. The pumps are checked during the sampling process and any abnormal conditions discovered are recorded on the data sheet. Ambient temperatures and barometric pressures are measured and recorded periodically during the sampling procedure.

11.5 At the end of the desired sampling period, the power is turned off and the PUF cartridges are wrapped with the original aluminum foil and placed in sealed, labeled containers for transport back to the laboratory. At least one field blank is returned to the laboratory with each group of samples. A field blank is treated exactly like a sample except that no air is drawn through the cartridge. Samples are stored at -10°C or below until analyzed.

12. Sample Preparation, Cleanup, and Analysis

[Note: Sample preparation should be preformed under a properly ventilated hood.]

12.1 Sample Preparation

12.1.1 All samples should be extracted within 1 week after collection.

12.1.2 All glassware is washed with a suitable detergent; rinsed with deionized water, acetone, and hexane; rinsed again with deionized water; and fired in an oven (450°C).

12.1.3 Sample extraction efficiency is determined by spiking the samples with a known solution. Octachloronaphthalene (OCN) is an appropriate standard to use for pesticide analysis using GC/ECD techniques. The spiking solution is prepared by dissolving 10 mg of OCN in 10 mL of 10% acetone in n-hexane, followed by serial dilution with n-hexane to achieve a final concentration of 1 ug/mL.

12.1.4 The extracting solution (5% ether/hexane) is prepared by mixing 1900 mL of freshly opened hexane and 100 mL of freshly opened ethyl ether (preserved with ethanol) to a flask.

12.1.5 All clean glassware, forceps, and other equipment to be used are placed on rinsed (5% ether/hexane) aluminum foil until use. The forceps are also rinsed with 5% ether/hexane. The condensing towers are rinsed with 5% ether/hexane and 300 mL are added to a 500 mL round bottom boiling flask.

12.1.6 Using precleaned (e.g., 5% ether/hexane Soxhlet extracted) cotton gloves, the PUF cartridges are removed from the sealed container and the PUF is placed into a 300 mL Soxhlet extractor using prerinsed forceps.

12.1.7 Before extraction begins, 100 uL of the OCN solution are added directly to the top of the PUF plug. Addition of the standard demonstrates extraction efficiency of the Soxhlet procedure. [Note: Incorporating a known concentration of the solution onto the sample provides a quality assurance check to determine recovery efficiency of the extraction and analytical processes.]

12.1.8 The Soxhlet extractor is then connected to the 500 mL boiling flask and condenser. The glass joints of the assembly are wet with 5% ether/hexane to ensure a tight seal between the fittings. If necessary, the PUF plug can be adjusted using forceps to wedge it midway along the length of the siphon. The above procedure should be followed for all samples, with the inclusion of a blank control sample.

12.1.9 The water flow to the condenser towers of the Soxhlet extraction assembly is checked and the heating unit is turned on. As the samples boil, the Soxhlet extractors are inspected to ensure that they are filling and siphoning properly (4 to 6 cycles/hour). Samples should cycle for a minimum of 16 hours.

12.1.10 At the end of the extracting process, the heating units are turned off and the samples are cooled to room temperature.

12.1.11 The extracts are concentrated to a 5 mL solution using a Kuderna-Danish (K-D) apparatus. The K-D is set up and assembled with concentrator tubes. This assembly is rinsed. The lower end of the filter tube is packed with glass wool and filled with sodium sulfate to a depth of 40 mm. The filter tube is placed in the neck of the K-D. The Soxhlet extractors and boiling flasks are carefully removed from the condenser towers and the remaining solvent is drained into each boiling flask. Sample extract is carefully poured through the filter tube into the K-D. Each boiling flask is rinsed three times by swirling hexane along the sides. Once the sample has drained, the filter tube is rinsed down with hexane. Each Synder column is attached to the K-D and rinsed to wet the joint for a tight seal. The complete K-D apparatus is placed on a steam bath and the sample is evaporated to approximately 5 mL. The sample is removed from the steam bath and allowed to cool. Each Synder column is rinsed with a minimum of hexane. Sample volume is adjusted to 10 mL in a concentrator tube, which is then closed with a glass stopper and sealed with TFE fluorocarbon tape. Alternatively, the sample may be quantitatively transferred (with concentrator tube rinsing) to prescored vials and brought up to final volume. Concentrated extracts are stored at -10°C until analyzed. Analysis should occur no later than two weeks after sample extraction.

12.2 Sample Cleanup

12.2.1 If only organochlorine pesticides are sought, an alumina cleanup procedure is appropriate. Before cleanup, the sample extract is carefully reduced to 1 mL using a gentle stream of clean nitrogen.

12.2.2 A glass chromatographic column (2 mm i.d. x 15 cm long) is packed with alumina, activity grade IV, and rinsed with approximately 20 mL of n-hexane. The concentrated sample

extract is placed on the column and eluted with 10 mL of n-hexane at a rate of 0.5 mL/minute. The eluate volume is adjusted to exactly 10 mL and analyzed as per 12.3.

12.2.3 If other pesticides are sought, alternate cleanup procedures may be required (e.g., Florisil). EPA Method 608 identifies appropriate cleanup procedures.

12.3 Sample Analysis

12.3.1 Organochlorine pesticides and many nonchlorinated pesticides are responsive to electron capture detection (Table 1). Most of these compounds can be determined at concentrations of 1 to 50 ng/mL by GC/ECD.

12.3.2 An appropriate GC column is selected for analysis of the extract. (For example, 4 mm i.d. x 183 cm glass, packed with 1.5% SP-2250/1.95% SP-2401 on 100/120 mesh Supelport, 200°C isothermal, with 5% methane/95% argon carrier gas at 65 to 85 mL/min). A chromatogram showing a mixture containing single component pesticides determined by GC/ECD using a packed column is shown in Figure 5. A table of corresponding chromatographic characteristics follows in Figure 6.

12.3.3 A standard solution is prepared from reference materials of known purity. Standards of organochlorine pesticides may be obtained from the National Bureau of Standards and from the U.S. EPA.

12.3.4 Stock standard solutions (1.00 ug/uL) are prepared by dissolving approximately 10 milligrams of pure material in isooctane and diluting to volume in a 10 mL volumetric flask. Larger volumes can be used at the convenience of the analyst. If compound purity is certified at 96% or greater, the weight can be used without correction to calculate the concentration of the stock standard. Commerically prepared stock standards may be used at any concentration if they are certified by the manufacturer or an independent source.

12.3.5 The prepared stock standard solutions are transferred to Teflon-sealed screw-capped bottles and stored at -10°C for no longer than six months. The standard solutions

or evaporation (especially before preparing calibration standards from them). [Note: Quality control check standards used to determine accuracy of the calibration standards are available from the U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio 45268.]

12.3.6 The standard solutions of the various compounds of interest are used to determine relative retention times (RRTs) to an internal standard such as p,p'-DDE, aldrin, or OCN.

12.3.7 Before analysis, the GC column is made sensitive to the pesticide samples by injecting a standard pesticide solution ten (10) times more concentrated than the stock standard solution. Detector linearity is then determined by injecting standard solutions of three different concentrations that bracket the required range of analyses.

12.3.8 The GC system is calibrated daily with a minimum of three injections of calibrated standards. Consult EPA Method 608, Section 7 for a detailed procedure to calibrate the gas chromatograph.

12.3.9 If refrigerated, the sample extract is removed from the cooling unit and allowed to warm to room temperature. The sample extract is injected into the GC for analysis in an aliquot of approximately 2-6 uL using the solvent-flush technique (Ref. D3687, 8.1.4.3-8.1.4.5). The actual volume injected is recorded to the nearest 0.05 uL. After GC injection, the sample's response from the strip chart is analyzed by measuring peak heights or determining peak areas. Ideally, the peak heights should be 20 to 80% of full scale deflection. Using injections of 2 to 6 uL of each calibration standard, the peak height or area responses are tabulated against the mass injected (injections of 2, 4, and 6 uL are recommended). If the response (peak height or area) exceeds the linear range of detection, the extract is diluted and reanalyzed.

12.3.10 Pesticide mixtures are quantified by comparison of the total heights or areas of GC peaks with the corresponding peaks in the best-matching standard. If both PCBs and organochlorine pesticides are present in the same sample, column chromatographic separation on silicic acid is used before GC analysis, according to ASTM Standards, Vol. 14.01. If polar compounds that interfere with GC/ECD analysis are present, column chromatographic cleanup on alumina (activity grade IV) is used as per Section 12.2.2.

12.3.11 For confirmation, a second GC column is used such as 4% SE-30/6% OV-210 on 100/200 mesh Gas Chrom Q or 3% OV-1 on 80/100 mesh Chromosorb WHP. For improved resolution, a capillary column is used such as 0.32 mm (i.d.) x 30 m DB-5 with 0.25 um film thickness.

12.3.12 A chromatogram of a mixture containing single component pesticides determined by GC/ECD using a capillary column is shown in Figure 7. A table of the corresponding chromatographic characteristics follows in Figure 8.

12.3.13 Class separation and improved specificity can be achieved by column chromatographic separation on Florisil as per EPA Method 608. For improved specificity, a Hall electrolytic conductivity detector operated in the reductive mode may be substituted for the electron capture detector. Limits of detection will be reduced by at least an order of magnitude, however.

13. GC Calibration

Appropriate calibration procedures are identified in EPA Method 608, Section 7.

14. Calculations

14.1 The concentration of the analyte in the extract solution is taken from a standard curve where peak height or area is plotted linearly against concentration in nanograms per milliliter (ng/mL). If the detector response is known to be linear, a single point is used as a calculation constant.

14.2 From the standard curve, determine the ng of analyte standard

14.3 Determine if the field blank is contaminated. Blank levels should not exceed 10 ng/sample for organochlorine pesticides or 100 ng/sample for other pesticides. If the blank has been contaminated, the sampling series must be held suspect.

14.4 Quantity of the compound in the sample (A) is calculated using the following equation:

$$A = 1000 \left(\frac{A_s \times V_e}{V_i} \right)$$

where:

A = total amount of analyte in the sample (ng).

A_s = calculated amount of material (ng) injected onto the chromatograph based on calibration curve for injected standards.

V_e = final volume of extract (mL).

V_i = volume of extract injected (uL).

1000 = factor for converting microliters to milliliters.

14.5 The extraction efficiency (EE) is determined from the recovery of octachloronaphthalene (OCN) spike as follows:

$$EE(\%) = \frac{S}{S_a} \times 100$$

where:

S = amount of spike (ng) recovered.

S_a = amount of spike (ng) added to plug.

14.6 The total amount of nanograms found in the sample is corrected for extraction efficiency and laboratory blank as follows:

$$A_c = \frac{A - A_0}{EE\ (\%)}$$

where:

A_c = corrected amount of analyte in sample (ng).

A_0 = amount of analyte in blank (ng).

14.7 The total volume of air sampled under ambient conditions is determined using the following equation:

$$V_a = \frac{\sum_{i=1}^{n} (T_i \times F_i)}{1000\ L/m^3}$$

where:

V_a = total volume of air sampled (m^3).
T_i = length of sampling segment (min) between flow checks.
F_i = average flow (L/min) during sampling segment.

14.8 Tne air volume is corrected to 25° and 760 mm Hg (STP) as follows:

$$V_s = V_a \left(\frac{P_b - P_w}{760\ mm\ Hg}\right) \cdot \left(\frac{298\ K}{t_A}\right)$$

where:

V_s = volume of air (m^3) at standard conditions.
V_a = total volume of air sampled (m^3).
P_b = average ambient barometric pressure (mm Hg).
P_w = vapor pressure of water (mm Hg) at calibration temperature.
t_A = average ambient temperature (K).

14.9 If the proper criteria for a sample have been met, concentration of the compound in a cubic meter of air is calculated as follows:

$$ng/m^3 = \frac{A_c}{V_s} \times \frac{100}{SE(\%)}$$

where:

SE = sampling efficiency as determined by the procedure outlined in Section 15.

If it is desired to convert the air concentration value to parts per trillion (wt/wt) in dry air at STP, the following conversion is used:

$$ppt = 1.205\ ng/m^3$$

The air concentration is converted to parts per trillion (v/v) in air at STP as follows:

$$pptv = 24.45 \left(\frac{ng/m^3}{MW}\right)$$

where:

MW = molecular weight of the compound of interest.

15. Sampling and Retention Efficiencies

15.1 Before using this procedure, the user should determine the sampling efficiency for the compound of interest. The sampling efficiencies shown in Tables 2 and 3 were determined for approximately 1 m^3 of air at about 25°C, sampled at 3.8 L/min. Sampling efficiencies for the pesticides shown in Table 4 are for 24 hours at 3.8 L/min and 25°C. For compounds not listed, longer sampling times, different flow rates, or other air temperatures, the following procedure may be used to determine sampling efficiencies.

15.2 SE is determined by a modified impinger assembly attached to the sampler pump (Figure 9). Clean PUF is placed in the pre-filter location and the inlet is attached to a nitrogen line. [Note: Nitrogen should be used instead of air to prevent oxidation of the compounds under test. The oxidation would not necessarily reflect what may be encountered during actual sampling and may give misleading sampling efficiencies.] PUF plugs (22 mm x 7.6 cm) are placed in the primary and secondary traps and are attached to the pump.

15.3 A standard solution of the compound of interest is prepared in a volatile solvent (e.g., hexane, pentane, or benzene). A small, accurately measured volume (e.g., 1 mL) of the standard solution is placed into the modified midget impinger. The sampler pump is set at the rate to be used in field application and then activated. Nitrogen is drawn through the assembly for a period of time equal to or exceeding that intended for field application. After the desired sampling test period, the PUF plugs are removed and analyzed separately as per Section 12.3.

15.4 The impinger is rinsed with hexane or another suitable solvent and quantitatively transferred to a volumetric flask or concentrator tube for analysis.

15.5 The sampling efficiency (SE) is determined using the following equation:

$$\% \text{ SE} = \frac{W_1}{W_o - W_r} \times 100$$

where:

W_1 = amount of compound extracted from the primary trap (ng).
W_o = original amount of compound added to the impinger (ng).
W_r = residue left in the impinger at the end of the test (ng)

15.6 If material is found in the secondary trap, it is an indication that breakthrough has occurred. The addition of the amount found in the secondary trap, W_2, to W_1, will provide an indication of the overall sampling efficiency of a tandem-trap sampling system. The sum of W_1, W_2 (if any), and W_r must equal (approximately $\pm$ 10%) W_o or the test is invalid.

15.7 If the compound of interest is not sufficiently volatile to vaporize at room temperature, the impinger may be heated in a water bath or other suitable heater to a maximum of 50°C to aid volatilization. If the compound of interest cannot be vaporized at 50°C or without thermal degradation, dynamic retention efficiency (RE_d) may be used to estimate sampling efficiency. Dynamic retention efficiency is determined in the manner described in 15.8. Table 5 lists those organochlorine pesticides which dynamic retention efficiencies have been determined.

15.8 A pair of PUF plugs is spiked by slow, dropwise addition of the standard solution to one end of each plug. No more than 0.5 to 1 mL of solution should be used. Amounts added to each plug should be as nearly the same as possible. The plugs are allowed to dry for 2 hours in a clean, protected place (e.g., dessicator). One spiked plug is placed in the primary trap so that the spiked end is at the intake and one clean unspiked plug is placed in the secondary trap. The other spiked plug is wrapped in hexane-rinsed aluminum foil and stored in a clean place for the duration of the test (this is the static control plug, Section 15.9). Prefiltered nitrogen or ambient air is drawn through the assembly as per Section 15.3. [Note: Impinger may be discarded.] Each PUF [illegible] analyzed separately as per

15.9 % RE_d is calculated as follows:

$$\% \ RE_d = \frac{W_1}{W_0} \times 100$$

where:

W_1 = amount of compound (ng) recovered from primary plug.
W_0 = amount of compound (ng) added to primary plug.

If a residue, W_2, is found on the secondary plug, breakthrough has occurred. The sum of $W_1 + W_2$ must equal W_0, within 25% or the test is invalid. For most compounds tested by this procedure, % RE_d values are generally less than % SE values determined per Section 15.1. The purpose of the static RE_d determination is to establish any loss or gain of analyte unrelated to the flow of nitrogen or air through the PUF plug.

16. Performance Criteria and Quality Assurance

This section summarizes required quality assurance (QA) measures and provides guidance concerning performance criteria that should be achieved within each laboratory.

16.1 Standard Operating Procedures (SOPs)

16.1.1 Users should generate SOPs describing the following activities accomplished in their laboratory: (1) assembly, calibration, and operation of the sampling system, with make and model of equipment used; (2) preparation, purification, storage, and handling of sampling cartridges, (3) assembly, calibration, and operation of the GC/ECD system, with make and model of equipment used; and (4) all aspects of data recording and processing, including lists of computer hardware and software used.

16.1.2 SOPs should provide specific stepwise instructions and should be readily available to, and understood by, the laboratory personnel conducting the work.

16.2 Process, Field, and Solvent Blanks

16.2.1 One PUF cartridge from each batch of approximately twenty should be analyzed, without shipment to the field, for the compounds of interest to serve as a process blank.

16.2.2 During each sampling episode, at least one PUF cartridge should be shipped to the field and returned, without drawing air through the sampler, to serve as a field blank.

16.2.3 Before each sampling episode, one PUF plug from each batch of approximately twenty should be spiked with a known amount of the standard solution. The spiked plug will remain in a sealed container and will not be used during the sampling peroid. The spiked plug is extracted and analyzed with the other samples. This field spike acts as a quality assurance check to determine matrix spike recoveries and to indicate sample degradation.

16.2.4 During the analysis of each batch of samples, at least one solvent process blank (all steps conducted but no PUF cartridge included) should be carried through the procedure and analyzed.

16.2.5 Blank levels should not exceed 10 ng/sample for single components or 100 ng/sample for multiple component mixtures (e.g., for organochlorine pesticides).

16.3 Sampling Efficiency and Spike Recovery

16.3.1 Before using the method for sample analysis, each laboratory must determine its sampling efficiency for the component of interest as per Section 15.

16.3.2 The PUF in the sampler is replaced with a hexane-extracted PUF. The PUF is spiked with a microgram level of compounds of interest by dropwise addition of hexane solutions of the compounds. The solvent is allowed to evaporate.

16.3.3 The sampling system is activated and set at the desired sampling flow rate. The sample flow is monitored for 24 hours.

16.3.4 The PUF cartridge is then removed and analyzed as per Section 12.3.

16.3.5 A second sample, unspiked, is collected over the same time period to account for any background levels of components in the ambient air matrix.

16.3.6 In general, analytical recoveries and collection efficiencies of 75% are considered to be acceptable method performance.

16.3.7 Replicate (at least triplicate) determinations of collection efficiency should be made. Relative standard deviations for these replicate determinations of ±15% or less are considered acceptable performance.

16.3.8 Blind spiked samples should be included with sample sets periodically as a check on analytical performance.

16.4 Method Precision and Accuracy

16.4.1 Several different parameters involved in both the sampling and analysis steps of this method collectively determine the accuracy with which each compound is detected. As the volume of air sampled is increased, the sensitivity of detection increases proportionately within limits set by (a) the retention efficiency for each specific component trapped on the polyurethane foam plug, and (b) the background interference associated with the analysis of each specific component at a given site sampled. The accuracy of detection of samples recovered by extraction depends on (a) the inherent response of the particular GC detector used in the determinative step, and (b) the extent to which the sample is concentrated for analysis. It is the responsibility of the analyst(s) performing the sampling and analysis steps to adjust parameters so that the required detection limits can be obtained.

16.4.2 The reproducibility of this method has been determined to range from ±5 to ±30% (measured as the relative standard deviation) when replicate sampling cartridges are used (N>5). Sample recoveries for individual compounds generally fall within the range of 90 to 110%, but recoveries ranging from 75 to 115% are considered acceptable. PUF alone may give lower recoveries for more volatile compounds (e.g., those with saturation vapor pressures $>10^{-3}$ mm Hg). In those cases, another sorbent or a combination of PUF and Tenax GC should be employed.

16.5 Method Safety

This procedure may involve hazardous materials, operations, and equipment. This method does not purport to address all of the safety problems associated with its use. It is the users responsibility to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to the implementation of this procedure. This should be part of the users SOP manual.

TABLE 1. PESTICIDES DETERMINED BY
GAS CHROMATOGRAPHY/ELECTRON CAPTURE DETECTOR (GC/ECD)

Aldrin	Folpet
BHC (α - and β-Hexa-chlorocyclohexanes)	Heptachlor
Captan	Heptachlor epoxide
Chlordane, technical	Hexachlorobenzene
Chlorothalonil	Lindane (γ-BHC)
Chlorpyrifos	Methoxychlor
2,4,-D esters	Mexacarbate
p,p,-DDT	Mirex
p,p,-DDE	trans-Nonachlor
Dieldrin	Oxychlordane
Dichlorvos (DDVP)	Pentachlorobenzene
Dicofol	Pentachlorophenol
Endrin	Ronnel
Endrin aldehyde	2,4,5-Trichlorophenol

TABLE 2. SAMPLING EFFICIENCIES FOR SOME ORGANOCHLORINE PESTICIDES

Compound	Quantity Introduced, ug	Air Volume, m^3	Sampling Efficiency, % mean	RSD	n
α-Hexachlorocyclohexane (α-BHC)	0.005	0.9	115	8	6
γ-Hexachlorocyclohexane (Lindane)	0.05-1.0	0.9	91.5	8	5
Hexachlorobenzene †	0.5, 1.0	0.9	94.5	8	5
Chlordane, technical	0.2	0.9	84.0	11	8
p,p'-DDT	0.6, 1.2	0.9	97.5	21	12
p,p'-DDE	0.2, 0.4	0.9	102	11	12
Mirex	0.6, 1.2	0.9	85.9	22	7
Pentachlorobenzene †	1.0	0.9	94	12	5
Pentachlorophenol	1.0	0.9	107	16	5
2,4,5-Trichlorophenol †	1.0	0.9	108	3	5
2,4-D Esters:					
isopropyl	0.5	3.6	92.0	5	12
butyl	0.5	3.6	82.0	10	11
isobutyl	0.5	3.6	79.0	20	12
isooctyl	0.5	3.6	>80*	--	--

* Not vaporized. Value base on %RE = 81.0 (RSD = 10%, n = 6).

† Semivolatile organochlorine pesticides.

TABLE 3. SAMPLING EFFICIENCIES FOR ORGANOPHOSPHORUS PESTICIDES

Compound	Quantity Introduced,[b] ug	Sampling Efficiency, % mean	RSD	n
Dichlorvos (DDVP)	0.2	72.0	13	2
Ronnel	0.2	106	8	12
Chlorpyrifos	0.2	108	9	12
Diazinon[a]	1.0	84.0	18	18
Methyl parathion[a]	0.6	80.0	19	18
Ethyl parathion[a]	0.3	75.9	15	18
Malathion[a]	0.3	100[c]	--	--

a Analyzed by gas chromatography with nitrogen phosphorus detector or flame photometric detector.

b Air volume = 0.9 m^3.

c Decomposed in generator; value based on %RE = 101 (RDS = 7, n = 4).

TABLE 4. EXTRACTION AND 24-HOUR SAMPLING EFFICIENCIES FOR VARIOUS PESTICIDES AND RELATED COMPOUNDS

Compound	Extraction Efficiency, *% mean	RSD	Sampling Efficiency, † %, at 10 ng/m^3 mean	RSD	100 ng/m^3 mean	RSD	1000 ng/m^3 mean	RSD
Chlorpyrifos	83.3	11.5	83.7	18.0	92.7	15.1	83.7	18.0
Pentachlorophenol	84.0	22.6	66.7	42.2	52.3	36.2	66.7	42.2
Chlordane	95.0	7.1	96.0	1.4	74.0	8.5	96.0	1.4
Lindane	96.0	6.9	91.7	11.6	93.0	2.6	91.7	11.6
DDVP	88.3	20.2	51.0	53.7	106.0	1.4	51.0	53.7
2,4-D methyl ester	--	--	75.3	6.8	58.0	23.6	75.3	6.8
Heptachlor	99.0	1.7	97.3	13.6	103.0	17.3	97.3	13.6
Aldrin	97.7	4.0	90.7	5.5	94.0	2.6	90.7	5.5
Dieldrin	95.0	7.0	82.7	7.6	85.0	11.5	82.7	7.6
Ronnel	80.3	19.5	74.7	12.1	60.7	15.5	74.7	12.2
Diazinon	72.0	21.8	63.7	18.9	41.3	26.6	63.7	19.9
trans-Nonachlor	97.7	4.0	96.7	4.2	101.7	15.3	96.7	4.2
Oxychlordane	100.0	0.0	95.3	9.5	94.3	1.2	95.3	9.5
α-BHC	98.0	3.5	86.7	13.7	97.0	18.2	86.7	13.7
Chlorothalonil	90.3	8.4	76.7	6.1	70.3	6.5	76.7	6.1
Heptachlor epoxide	100.0	0.0	95.3	5.5	97.7	14.2	95.3	5.5

* Mean values for one spike at 550 ng/plug and two spikes at 5500 ng/plug.
† Mean values for three determinations.

Table 5. EXTRACTION AND 24-HOUR SAMPLING EFFICIENCIES FOR VARIOUS PESTICIDES AND RELATED COMPOUNDS

Compound	Extraction Efficiency, *% mean	RSD	Retention Efficiency, † %, at 10 ng/m^3 mean	RSD	100 ng/m^3 mean	RSD	1000 ng/m^3 mean	RSD
Dicofol	57.0	8.5	38.0	25.9	65.0	8.7	69.0	--
Captan	73.0	12.7	56.0	--	45.5	64.3	84.3	16.3
Methoxychlor	65.5	4.9	--	--	--	--	78.5	2.1
Folpet	86.7	11.7	--	--	78.0	--	93.0	--

* Mean Values for one spike at 550 ng/plug and two spikes at 5500 ng/plug.
† Mean Values for generally three determinations.

T010-29

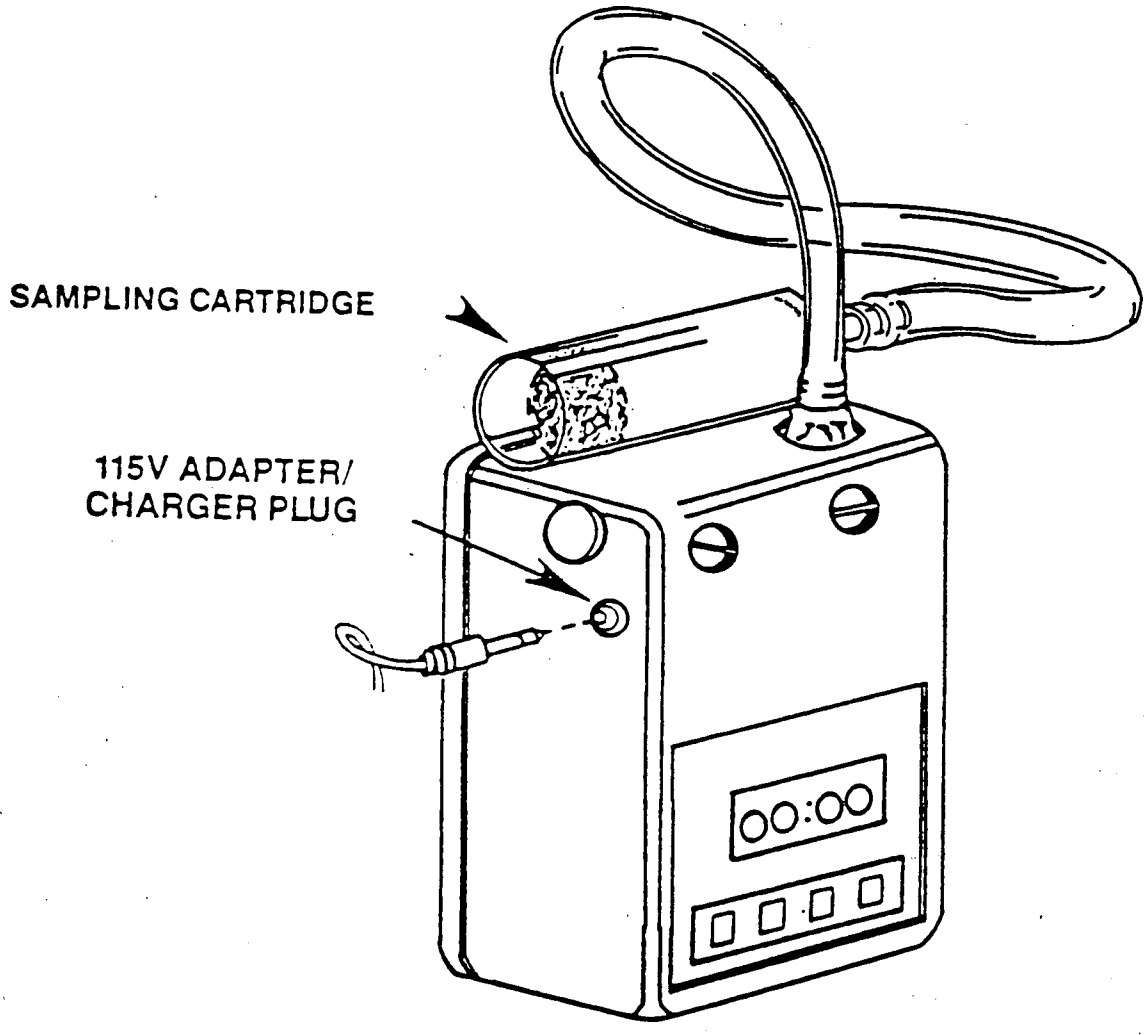


FIGURE 1. LOW VOLUME AIR SAMPLER

FIGURE 2. POLYURETHANE FOAM (PUF) SAMPLING CARTRIDGE

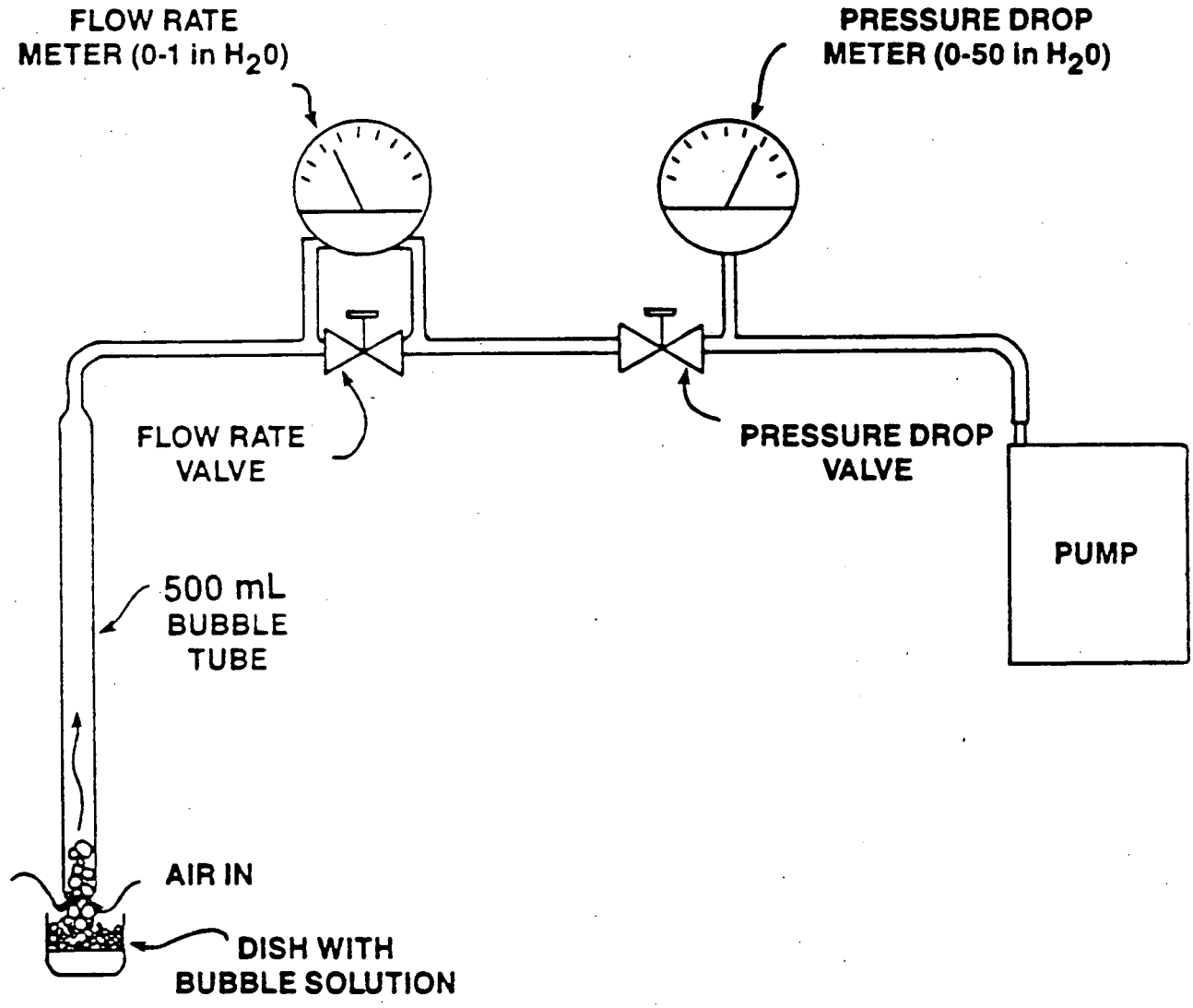


FIGURE 3. CALIBRATION ASSEMBLY FOR AIR SAMPLER PUMP

Site _____ Date _____ Performed by _____

Sampler S/N	Sampling Location I.D.	Height above Ground	PUF Cart. No.	Sampling Period Start	Sampling Period Stop	Sampling Time min.		Pump Timer hr. min.	Low flow Indication Yes	Low flow Indication No	Comments

Checked by _____

Date _____

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FIGURE 4. LOW VOLUME PESTICIDE SAMPLING DATA FORM

OPERATING CONDITIONS

Column Type:	1.5% SP 2250/1.95% SP 2401, ¼" glass.
Temperature:	200°C isothermal.
Detector:	Electron Capture.
Carrier Gas:	5% Methane/95% Argon.
Flow Rate:	65 to 85 mL/min.

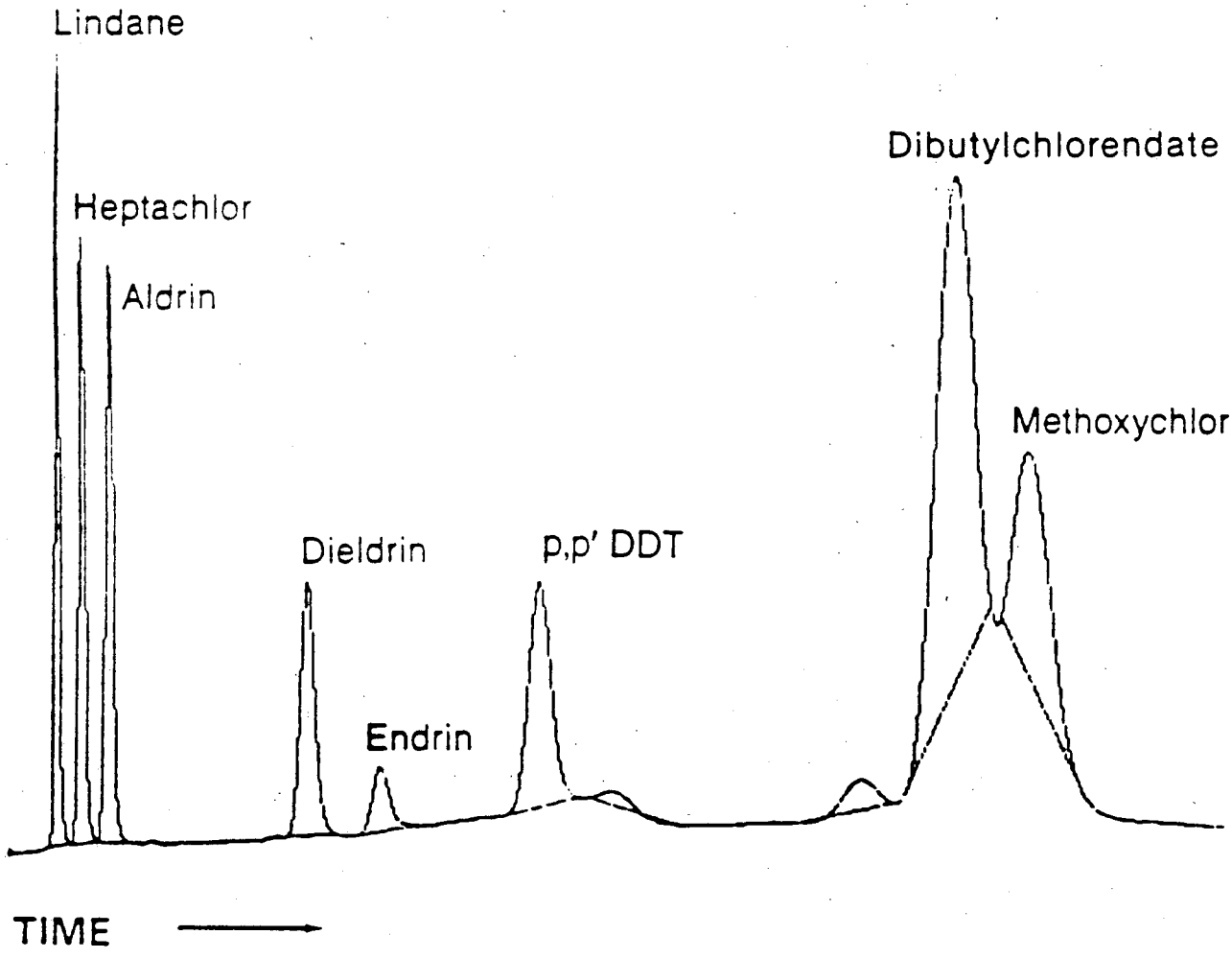


FIGURE 5. CHROMATOGRAM SHOWING A MIXTURE OF SINGLE COMPONENT PESTICIDES DETERMINED BY GC/ECD USING A PACKED COLUMN

EXTERNAL STANDARD TABLE
SINGLE COMPONENT PESTICIDE MIXTURE (5uL) ON
A PACKED COLUMN

RETENTION TIME	COMPOUND NAME	CONCENTRATION IN PG ON COLUMN	AREA/ HEIGHT
2.77	gamma-BHC (Lindane)	500	8.2
3.37	Heptachlor	500	10.4
4.03	Aldrin	500	12.0
8.90	Dieldrin	500	24.7
10.72	Endrin	500	30.2
14.63	p,p'-DDT	500	39.0
24.87	Dibutylchlorendate*	2500	61.4
26.82	Methoxychlor	2500	57.5

* Internal standard used for earlier pesticide detection.

FIGURE 6. CHROMATOGRAPHIC CHARACTERISTICS OF THE SINGLE COMPONENT PESTICIDE MIXTURE DETERMINED BY GC/ECD USING A PACKED COLUMN

OPERATING CONDITIONS

Column Type:	DB-5 0.32 capillary, 0.25 um film thickness
Column Temperature Program:	90°C (4 min)/16°C per min to 154°C/4°C per min to 270°C.
Detector:	Electron Capture
Carrier Gas:	Helium at 1 mL/min.
Make Up Gas:	5% Methane/95% Argon at 60 mL/min.

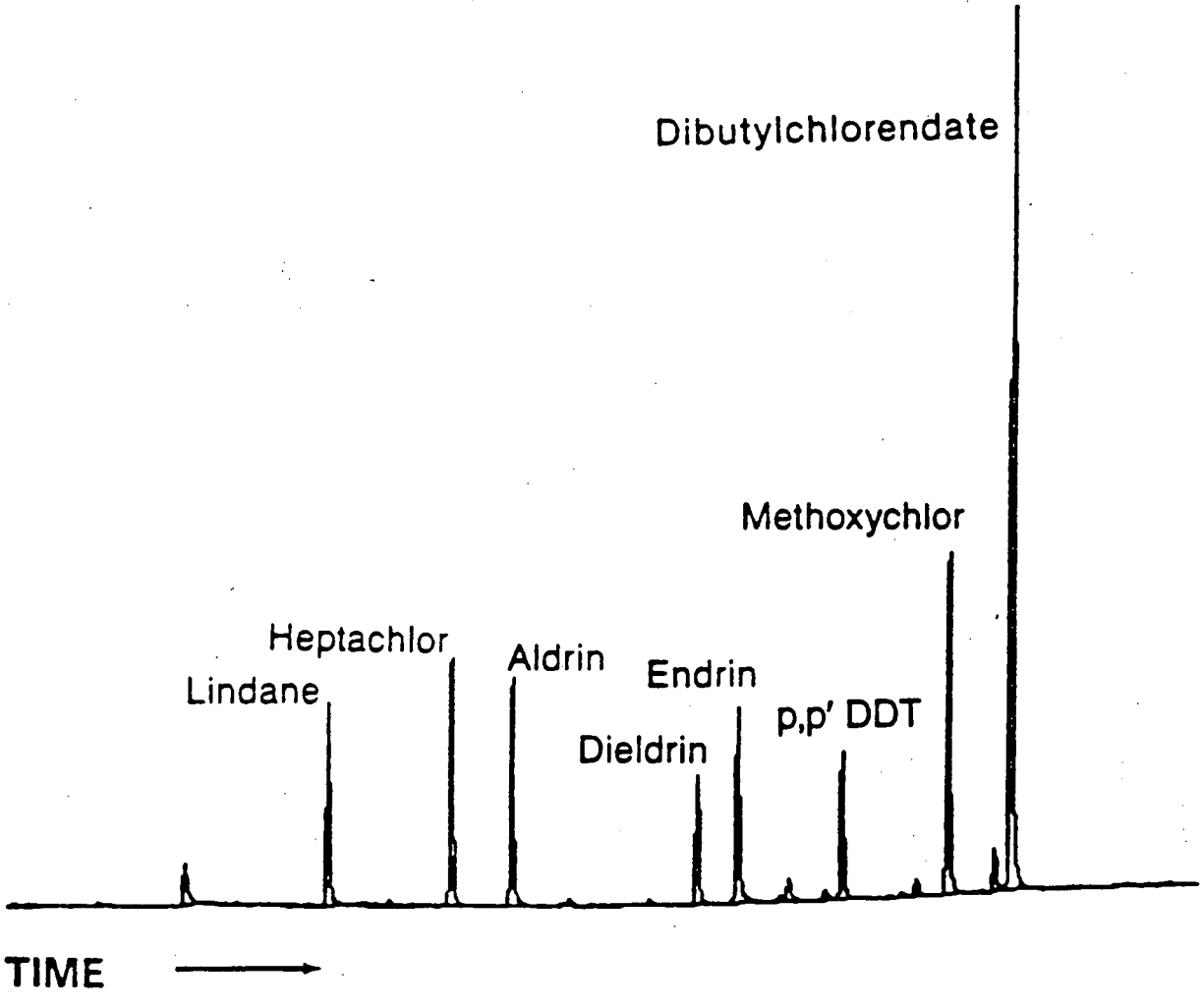


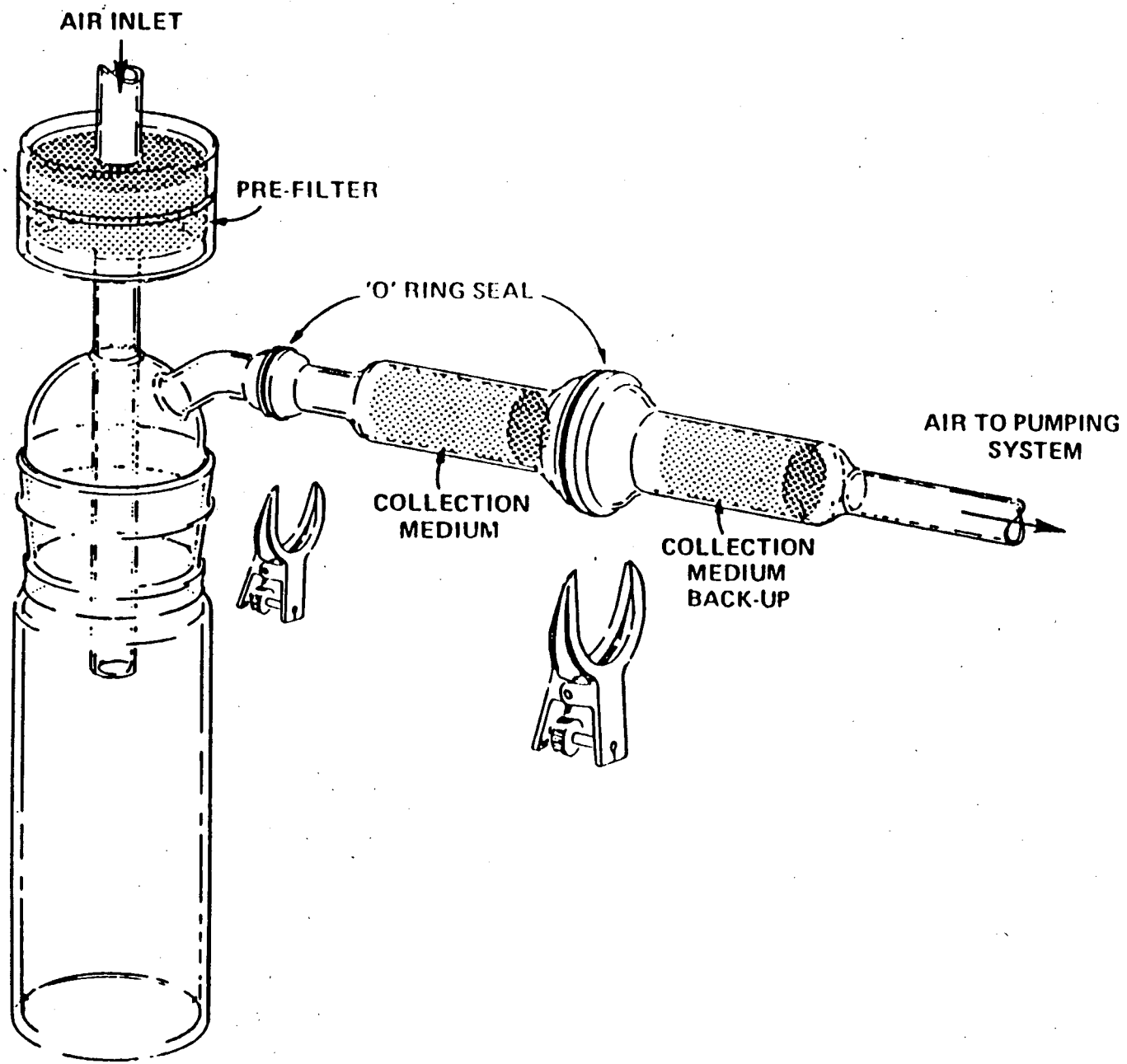
FIGURE 7. CHROMATOGRAM SHOWING A MIXTURE OF SINGLE COMPONENT PESTICIDES DETERMINED BY GC/ECD USING A CAPILLARY COLUMN

EXTERNAL STANDARD TABLE
SINGLE COMPONENT PESTICIDE MIXTURE (2uL) ON
ON A CAPILLARY COLUMN

RETENTION TIME	COMPOUND NAME	CONCENTRATION IN PG ON COLUMN	AREA/ HEIGHT
14.28	gamma-BHC (Lindane)	200	5.2
17.41	Heptachlor	200	5.3
18.96	Aldrin	200	5.4
23.63	Dieldrin	200	5.8
24.63	Endrin	200	6.3
27.24	p,p'-DDT	200	5.6
29.92	Methoxychlor	1000	5.5
31.49	Dibutylchlorendate*	1000	5.4

* Internal standard used for earlier pesticide detection.

FIGURE 8. CHROMATOGRAPHIC CHARACTERISTICS OF THE SINGLE COMPONENT PESTICIDE MIXTURE DETERMINED BY GC/ECD USING A CAPILLARY COLUMN



T010-37

FIGURE 9. APPARATUS FOR DETERMINING SAMPLING EFFICIENCIES

NUISANCE DUST, RESPIRABLE

METHOD: 0600
ISSUED: 2/15/84

FORMULA: The respirable fraction of the dust mass, as specified by the American Conference of Governmental Industrial Hygienists [1]

OSHA: 5 mg/m³
NIOSH: no standard
ACGIH: 5 mg/m³

PROPERTIES: Penetrates the non-ciliated portions of the lung; quartz less than 1%

SYNONYMS: boron oxide (CAS #1303-86-2) and nuisance dusts [2], including alumina (CAS #1344-28-1), calcium carbonate (CAS #1317-65-3), cellulose (paper fiber; CAS #9004-34-6), glycerin mist (CAS #56-81-5), limestone (CAS #1317-65-3), etc.

SAMPLING

SAMPLER: CYCLONE + FILTER
(10-mm Dorr-Oliver cyclone + tared 5-µm PVC membrane)

FLOW RATE: 1.7 L/min

VOL-MIN: 75 L @ 5 mg/m³
-MAX: 1000 L @ 5 mg/m³

SHIPMENT: routine

SAMPLE STABILITY: indefinitely

BLANKS: 2 to 10 field blanks per set

ACCURACY

RANGE STUDIED: 0.5 to 10 mg/m³ (lab and field)

BIAS: depends on dust size distributions [3]

OVERALL PRECISION (s_r): 0.043 to 0.145 (lab); 0.144 to 0.227 (field) [4]

MEASUREMENT

TECHNIQUE: GRAVIMETRIC (FILTER WEIGHING)

ANALYTE: mass of respirable dust fraction

BALANCE: 0.01 mg sensitivity or better; use same balance before and after sample collection

CALIBRATION: National Bureau of Standards Class M weights

RANGE: 0.3 to 2 mg per sample

ESTIMATED LOD: 0.2 mg per sample

PRECISION: 68 µg with 0.01-mg sensitivity balance [5]

APPLICABILITY: The method measures the mass concentration of any non-volatile respirable dust. Besides inert dusts [1], the method is recommended for respirable coal dust, which has an OSHA PEL = 2.4 mg/m³. The method may be biased where the respirable fraction is defined by the British Medical Research Council's criteria or the MRE horizontal elutriator [4].

INTERFERENCES: Larger than respirable particles (over 10 µm) have been found in some cases by microscopic analysis of cyclone filters. Over-sized particles in the sample are known to be caused by inverting the cyclone assembly. Heavy dust loadings, charged particles, fibers and water-saturated dusts also interfere with the cyclone's size-selective properties.

OTHER METHODS: This method is based on and replaces Sampling Data Sheet #29.02 [6].

EQUIPMENT:

1. Sampler:
   a. Filter: 37-mm diameter, 5.0-μm pore size, polyvinyl chloride filter or equivalent hydrophobic membrane filter supported with backup pad in a two-piece, 37-mm cassette filter holder held together by tape or cellulose shrink band.
   b. Cyclone: 10-mm Dorr-Oliver nylon cyclone.
   c. Sampling head holder: this holder must keep the cassette, cyclone and coupler together rigidly so that air enters only at the cyclone inlet.
2. Personal sampling pump, 1.7 L/min ± 5%, with flexible connecting tubing.
   NOTE: Pulsation in the pump flow must be within ± 20% of the mean flow.
3. Balance, analytical, with sensitivity of at least 0.01 mg. A more sensitive balance will be necessary for substances with PEL's below 1 mg/m^3.
4. Static neutralizer, e.g., Po-210; replace nine months after the production date.
5. Environmental chamber for balance, e.g., 20 °C ± 0.3 °C and 50% ± 5% RH.
6. Vacuum desiccator.

SPECIAL PRECAUTIONS: None.

PREPARATION OF SAMPLERS BEFORE SAMPLING:

1. Dry filters and backup pads under vacuum in the vacuum desiccator for at least 15 min.
2. Release the vacuum, remove the desiccator cover, and equilibrate the filters in the environmental chamber for at least 1 hr.
3. Number the backup pads with a ballpoint pen and place them, numbered side down, in filter cassette bottom sections.
4. Weigh the filters in the environmental chamber. Record the filter tare weight, W_1 (mg).
   a. Zero the balance before each weighing;
   b. Handle the filter with forceps (nylon forceps if further analyses will be done); and
   c. Pass the filter over an antistatic radiation source. Repeat this step if filter does not release easily from the forceps or if filter attracts balance pan. Static electricity can cause erroneous weight readings.
5. Place the weighed filters on top of the backup pads in the filter cassette bottom sections and allow to stand an additional 8 to 16 hrs in the environmental chamber.
6. Reweigh the filters. If this tare weight differs by more than 0.01 mg from the first tare weight obtained in step 4 above, discard the filter.
   NOTE: Insert a rod through the outlet hole of the filter cassette bottom section to raise the backup pad and filter so that the filter can be grasped with forceps.
7. Assemble the filters in the filter cassettes and close firmly so that leakage around the filter will not occur. Place a plug in each opening of the filter cassette. Place a cellulose shrink band around the filter cassette, allow to dry, and mark with the same number as the backup pad.
8. Remove the cyclone's grit cap and vortex finder before use and inspect the cyclone interior. If the inside is visibly scored, discard this cyclone since the dust separation characteristics of the cyclone might be altered. Clean the interior of the cyclone to prevent reentrainment of large particles.
9. Assemble the sampler head. Check alignment of filter holder and cyclone in the sampling head to prevent leakage.

SAMPLING:

10. Calibrate each personal sampling pump to 1.7 L/min with a representative sampler in line.
11. Sample at 1.7 L/min for 45 min to 8 hrs (76 to 816 L). Do not exceed 5 mg dust loading on the filter.
    NOTE: Do not allow the sampler assembly to be inverted at any time. Turning the cyclone to anything more than a horizontal orientation may deposit over-sized material from the cyclone body onto the filter.

SAMPLE PREPARATION:

12. Wipe dust from the external surface of the filter cassette with a moist paper towel to minimize contamination. Discard the paper towel.
13. Remove the top and bottom plugs from the filter cassette. Place the filter cassettes in a vacuum desiccator under vacuum for at least 15 min, followed by equilibration for at least 1 hr in the environmental chamber.
14. Remove the filter cassette band, pry open the filter cassette, and remove the filter by inserting a rod in the outlet hole of the filter cassette. Handle the filters very gently by the edge to avoid loss of dust.
    NOTE: If the filter sticks to the underside of the cassette top, very gently lift away by using the dull side of a scalpel blade. This must be done carefully or the filter will tear.

CALIBRATION AND QUALITY CONTROL:

15. Zero the microbalance before all weighings. Use the same microbalance for weighing filters before and after sample collection. Calibrate the balance with National Bureau of Standards Class M weights.
16. Take two to four replicate samples for every batch of field samples for quality assurance on the sampling procedures. The set of replicate samples should be exposed to the same dust environment, either in a laboratory dust chamber [7] or in the field [8]. The quality control samples must be taken with the same equipment, procedures and personnel used in the routine field samples. Calculate precision from these replicates and record s_r on control charts. Take corrective action when the precision is out of control [7].

MEASUREMENT:

17. Weigh each filter, including field blanks. Record this post-sampling weight, W_2 (mg), beside its corresponding tare weight. Record anything remarkable about a filter (e.g., visible particles, overloaded, leakage, wet, torn, etc.).

CALCULATIONS:

18. Calculate the concentration of respirable nuisance dust, C (mg/m^3), in the air volume sampled, V (L):

$$C = \frac{(W_2 - W_1) + B}{V} \cdot 10^3, \ mg/m^3$$

where: W_1 = tare weight of filter before sampling (mg)
W_2 = post-sampling weight of sample-containing filter (mg)
B = mean change in field blank filter weights between tare and post-sampling (mg) (+ or -).

EVALUATION OF METHOD:

1. Bias. In respirable dust measurements, the bias in a sample is calculated relative to the appropriate respirable dust criterion. The theory for calculating bias is developed by Bartley and Breuer [3]. For this method, the bias, therefore, depends on the ACGIH criterion for respirable dust, the cyclone's penetration curve at 1.7 L/min flow rate, and the size distribution of the ambient dust. Based on the cyclone's penetration curves for non-pulsating flow measured with a monodisperse aerosol by Caplan, Doemeny and Sorenson [9], the bias in this method is shown in Figure 1.

   For dust size distributions in the shaded region, the bias in this method lies within the $\pm$ 0.10 criterion established by NIOSH for method validation. Bias larger than $\pm$ 0.10 would, therefore, be expected for many workplace aerosols, especially those with small mass median diameters. However, bias within $\pm$ 0.20 would be expected for dusts with geometric standard deviations greater than 2.0, which is the case in most workplaces.

   Bias can also be caused in a cyclone by the pulsation of the personal sampling pump. Bartley, et al. [10] showed that cyclone samples with pulsating flow can have negative bias as large as -0.22 relative to samples with steady flow. The magnitude of the bias depends on the amplitude of the pulsation at the cyclone aperture and the dust size distribution. For pumps with instantaneous flow rates within 20% of the mean, the pulsation bias is less than -0.02 for most dust size distributions encountered in the workplace.

   Electric charges on the dust and the cyclone will also cause bias. Briant and Moss [11] have found electrostatic biases as large as -50%, and show that cyclones made with graphite-filled nylon eliminate the problem.

2. Precision. In a recent review [4], the overall cyclone precision is shown to be most sensitive to two factors: the analytical precision and the sampling procedures, particularly the quality control system used in the maintenance and calibration of samplers. Theoretically, the variance for the overall precision is the sum of the variances from the sampling and analysis. The analytical variance depends on the dust loading on the filter. For the dust loading in an 8-hr sample above 1.5 mg/m^3, Bowman, et al. [4] find that the empirically determined sampling error dominates this analytical error.

   Because of the effects of the environment, precision estimates for dust samplers are much more variable than those reported for gas and vapor sampling. In laboratory tests with 0.01 mg sensitivity balances, the overall precision of a single respirable dust sample has relative standard deviations (s_r) from 0.043 to 0.145 over concentrations ranging from 0.5 to 5 mg/m^3. In the laboratory studies where the dust concentrations in the test chamber are more carefully controlled, the estimated s_r is less than 0.091, which is the target precision value for a bias equal to $\pm$ 0.10 in the NIOSH validation criteria.

   In the field tests with 0.01 mg sensitivity balances, precision estimates range from 0.144 to 0.227 over concentrations ranging from 1 to 10 mg/m^3. Whether the larger s_r values in field tests are due to sampler performance or to more inhomogeneous dust concentrations in the field tests cannot be determined from existing data.

REFERENCES:
[1] TLVs - Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment with Intended Changes for 1983-84, 38, ACGIH, Cincinnati, OH (1983).
[2] Ibid, Appendix D, 52.
[3] Bartley, D. L. and G. M. Breuer. Analysis and Optimization of the Performance of the 10-mm Cyclone, Am. Ind. Hyg. Assoc. J., 43, 520-528 (1982).
[4] Bowman, J. D., D. L. Bartley, G. M. Breuer and S. A. Shulman. The Accuracy of Sampling Respirable Coal Mine Dust, Draft NIOSH report (1983).
[5] Parobeck, P., T. F. Tomb, H. Ku and J. Cameron. Measurement Assurance Program for the Weighings of Respirable Coal Mine Dust Samples, J. Qual. Tech., 13, 157 (1981).
[6] NIOSH Manual of Sampling Data Sheets, U.S. Department of Health, Education, and Welfare, Publ. (NIOSH) 77-159 (1977).
[7] Bowman, J. D., D. L. Bartley, G. M. Breuer, L. J. Doemeny and D. J. Murdock. Accuracy Criteria Recommended for the Certification of Gravimetric Coal Mine Dust Personal Samplers, NIOSH report (in press, 1983).
[8] Breslin, J. A., S. J. Page and R. A. Jankowski. Precision of Personal Sampling of Respirable Dust in Coal Mines, U.S. Bureau of Mines Report of Investigations #8740 (1983).
[9] Caplan, K. J., L. J. Doemeny and S. Sorenson. Evaluation of Coal Mine Dust Personal Sampler Performance, Final Report, NIOSH Contract No. PH CPE-r-70-0036 (1973).
[10] Bartley, D. L., G. M. Breuer, P. A. Baron and J. D. Bowman. Pump Fluctuations and Their Effect on Cyclone Performance, submitted to the Am. Ind. Hyg. Assoc. J. (1983).
[11] Briant, J. K. and O. R. Moss. The Influence of Electrostatic Charge on the Performance of 10-mm Nylon Cyclones, American Industrial Hygiene Conference (1983).

METHOD WRITTEN BY: Joseph Bowman, Ph.D., CIH, NIOSH/DPSE.

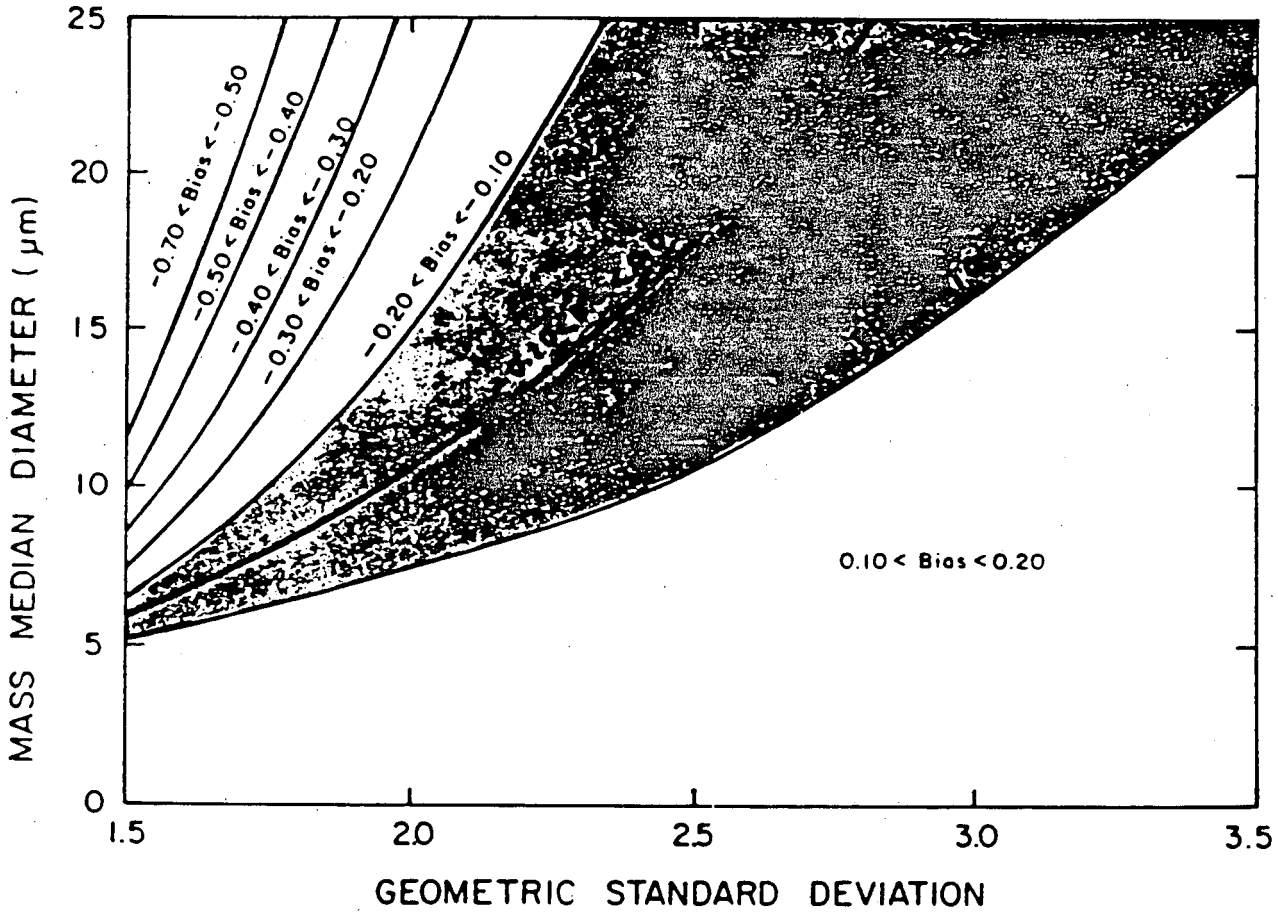


Figure 1. Bias in respirable dust determination.

ATTACHMENT B

FLOW RATE CHECK SHEET

FLOW RATE CHECK SHEETS

PROJECT:

SITE:

LOCATION:

SAMPLE LOCATION:

SAMPLE TYPE:

DATE SAMPLED:

PUMP MODEL NO:

TIME SAMPLED:

PUMP SERIAL NO:

OPERATOR:

CALIBRATED FLOW RATE:

SAMPLE NO:

START TIME:

STOP TIME:

	Time	Calibrated Flow Rate	Flowmeter Reading	Ambient Temperature	Barometric Pressure	Relative Humidity	Comments
1							
2							
3							
4							
5							

Notes:

APPENDIX E
ANALYTICAL RESULTS FOR ARCHIVE SAMPLES

Enseco
A Corning Company

Carbamate & Urea Pesticides, HPLC

Method 632 Modified for Soil

Client Name: Weil, Gotshal and Manges
Client ID: SS-2D, 6"-12"DISCRETE
Lab ID: 021479-0004-SA
Matrix: SOIL
Authorized: 11 MAR 92

Sampled: 26 SEP 91
Prepared: 19 MAR 92

Received: 11 MAR 92
Analyzed: 20 MAR 92

Parameter	Result	Wet wt. Units	Reporting Limit
Carbaryl (Sevin)	ND	ug/kg	800

ND = Not detected
NA = Not applicable

Reported By: Debra Henderer

Approved By: Trish DellaCroce

Enseco
A Corning Company

Chlorinated Pesticides and PCB's
Target Compound List (TCL)
Method 8080

Client Name: Weil, Gotshal and Manges
Client ID: SS-10C, 6"-12"
Lab ID: 021479-0001-SA
Matrix: SOIL
Authorized: 11 MAR 92

Sampled: 30 SEP 91
Prepared: 13 MAR 92

Received: 11 MAR 92
Analyzed: 20 MAR 92

Parameter	Result	Wet wt. Units	Reporting Limit
Aldrin	ND	ug/kg	8.5
alpha-BHC	ND	ug/kg	8.5
beta-BHC	ND	ug/kg	8.5
delta-BHC	ND	ug/kg	8.5
gamma-BHC (Lindane)	ND	ug/kg	8.5
alpha-Chlordane	ND	ug/kg	8.5
gamma-Chlordane	ND	ug/kg	8.5
4,4'-DDD	ND	ug/kg	16
4,4'-DDE	ND	ug/kg	16
4,4'-DDT	ND	ug/kg	16
Dieldrin	ND	ug/kg	16
Endosulfan I	ND	ug/kg	8.5
Endosulfan II	ND	ug/kg	16
Endosulfan sulfate	ND	ug/kg	16
Endrin	ND	ug/kg	16
Endrin ketone	ND	ug/kg	16
Heptachlor	ND	ug/kg	8.5
Heptachlor epoxide	ND	ug/kg	8.5
Methoxychlor	ND	ug/kg	85
Toxaphene	1300	ug/kg	850
Surrogate	**Recovery**		
Dibutyl chlorendate	97	%	

ND = Not detected
NA = Not applicable

Reported By: Janet Kelly

Approved By: Jim Workman

Enseco
A Corning Company

Chlorinated Pesticides and PCB's
Target Compound List (TCL)
Method 8080

Client Name: Weil, Gotshal and Manges
Client ID: SS-14, 6"-12"
Lab ID: 021479-0002-SA
Matrix: SOIL
Authorized: 11 MAR 92

Sampled: 26 SEP 91
Prepared: 13 MAR 92

Received: 11 MAR 92
Analyzed: 20 MAR 92

Parameter	Result	Wet wt. Units	Reporting Limit
Aldrin	ND	ug/kg	1.7
alpha-BHC	ND	ug/kg	1.7
beta-BHC	ND	ug/kg	1.7
delta-BHC	ND	ug/kg	1.7
gamma-BHC (Lindane)	ND	ug/kg	1.7
alpha-Chlordane	ND	ug/kg	1.7
gamma-Chlordane	ND	ug/kg	1.7
4,4'-DDD	ND	ug/kg	3.3
4,4'-DDE	ND	ug/kg	3.3
4,4'-DDT	ND	ug/kg	3.3
Dieldrin	ND	ug/kg	3.3
Endosulfan I	ND	ug/kg	1.7
Endosulfan II	ND	ug/kg	3.3
Endosulfan sulfate	ND	ug/kg	3.3
Endrin	ND	ug/kg	3.3
Endrin ketone	ND	ug/kg	3.3
Heptachlor	ND	ug/kg	1.7
Heptachlor epoxide	ND	ug/kg	1.7
Methoxychlor	ND	ug/kg	17
Toxaphene	190	ug/kg	170
Surrogate	**Recovery**		
Dibutyl chlorendate	87	%	

ND = Not detected
NA = Not applicable

Reported By: Janet Kelly

Approved By: Jim Workman

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Chlorinated Pesticides and PCB's
Target Compound List (TCL)
Method 8080

Client Name: Weil, Gotshal and Manges
Client ID: SS-2D, 6"-12"COMPOSITE
Lab ID: 021479-0003-SA
Matrix: SOIL
Authorized: 11 MAR 92

Sampled: 26 SEP 91
Prepared: 13 MAR 92

Received: 11 MAR 92
Analyzed: 20 MAR 92

Parameter	Result	Wet wt. Units	Reporting Limit
Aldrin	ND	ug/kg	170
alpha-BHC	ND	ug/kg	170
beta-BHC	ND	ug/kg	170
delta-BHC	ND	ug/kg	170
gamma-BHC (Lindane)	ND	ug/kg	170
alpha-Chlordane	ND	ug/kg	170
gamma-Chlordane	ND	ug/kg	170
4,4'-DDD	ND	ug/kg	330
4,4'-DDE	ND	ug/kg	330
4,4'-DDT	ND	ug/kg	330
Dieldrin	ND	ug/kg	330
Endosulfan I	ND	ug/kg	170
Endosulfan II	ND	ug/kg	330
Endosulfan sulfate	ND	ug/kg	330
Endrin	ND	ug/kg	330
Endrin ketone	ND	ug/kg	330
Heptachlor	ND	ug/kg	170
Heptachlor epoxide	ND	ug/kg	170
Methoxychlor	ND	ug/kg	1700
Toxaphene	34000	ug/kg	17000
Surrogate	**Recovery**		
Dibutyl chlorendate	ND	%	

ND = Not detected
NA = Not applicable

Reported By: Janet Kelly

Approved By: Jim Workman

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Chlorinated Pesticides and PCB's
Target Compound List (TCL)
Method 8080

Client Name: Weil, Gotshal and Manges
Client ID: SS-2D, 6"-12"DISCRETE
Lab ID: 021479-0004-SA
Matrix: SOIL
Authorized: 11 MAR 92

Sampled: 26 SEP 91
Prepared: 13 MAR 92

Received: 11 MAR 92
Analyzed: 20 MAR 92

Parameter	Result	Wet wt. Units	Reporting Limit
Aldrin	ND	ug/kg	1.7
alpha-BHC	ND	ug/kg	1.7
beta-BHC	ND	ug/kg	1.7
delta-BHC	ND	ug/kg	1.7
gamma-BHC (Lindane)	ND	ug/kg	1.7
alpha-Chlordane	ND	ug/kg	1.7
gamma-Chlordane	ND	ug/kg	1.7
4,4'-DDD	ND	ug/kg	3.3
4,4'-DDE	ND	ug/kg	3.3
4,4'-DDT	ND	ug/kg	3.3
Dieldrin	ND	ug/kg	3.3
Endosulfan I	ND	ug/kg	1.7
Endosulfan II	ND	ug/kg	3.3
Endosulfan sulfate	ND	ug/kg	3.3
Endrin	ND	ug/kg	3.3
Endrin ketone	ND	ug/kg	3.3
Heptachlor	ND	ug/kg	1.7
Heptachlor epoxide	ND	ug/kg	1.7
Methoxychlor	ND	ug/kg	17
Toxaphene	520	ug/kg	170
Surrogate	**Recovery**		
Dibutyl chlorendate	90	%	

ND = Not detected
NA = Not applicable

Reported By: Janet Kelly

Approved By: Jim Workman

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Organophosphorus Pesticides
SW-846 List
Method 8141

Client Name: Weil, Gotshal and Manges
Client ID: SS-2D, 6"-12"COMPOSITE
Lab ID: 021479-0003-SA
Matrix: SOIL
Authorized: 11 MAR 92

Sampled: 26 SEP 91
Prepared: 19 MAR 92

Received: 11 MAR 92
Analyzed: 26 MAR 92

Parameter	Result	Wet wt. Units	Reporting Limit
Coumaphos	56	ug/kg	17
Diazinon	ND	ug/kg	8.3
Dichlorvos (Vapona)	ND	ug/kg	17
Dimethoate	ND	ug/kg	17
Malathion	ND	ug/kg	42
Surrogate	**Recovery**		
Chlormefos	84	%	
Ethyl Pirimifos	93	%	

ND = Not detected
NA = Not applicable

Reported By: Mike Goetz

Approved By: Jim Workman

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Organophosphorus Pesticides
SW-846 List
Method 8141

Client Name: Weil, Gotshal and Manges
Client ID: SS-2D, 6"-12"DISCRETE
Lab ID: 021479-0004-SA
Matrix: SOIL Sampled: 26 SEP 91 Received: 11 MAR 92
Authorized: 11 MAR 92 Prepared: 19 MAR 92 Analyzed: 26 MAR 92

Parameter	Result	Wet wt. Units	Reporting Limit
Coumaphos	ND	ug/kg	17
Diazinon	ND	ug/kg	8.3
Dichlorvos (Vapona)	ND	ug/kg	17
Dimethoate	ND	ug/kg	17
Malathion	ND	ug/kg	42
Surrogate	**Recovery**		
Chlormefos	68	%	
Ethyl Pirimifos	88	%	

ND = Not detected
NA = Not applicable

Reported By: Mike Goetz

Approved By: Jim Workman

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DUPLICATE CONTROL SAMPLE REPORT
Organics by Chromatography

Analyte	Concentration Spiked	Measured DCS1	Measured DCS2	AVG	Accuracy Average(%) DCS	Accuracy Limits	Precision (RPD) DCS	Precision Limit
Category: 632-S Matrix: SOIL QC Lot: 13 MAR 92-A Concentration Units: ug/kg								
Carbaryl (Sevin)	1665	1490	1530	1510	91	59-116	2.6	63

ND = Not detected
NC = Not calculated, calculation not applicable
NA = Not applicable

Calculations are performed before rounding to avoid round-off errors in calculated results.

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METHOD BLANK REPORT
Organics by Chromatography

Analyte	Result	Units	Reporting Limit
Test: 632-S Matrix: SOIL QC Lot: 13 MAR 92-A QC Run: 13 MAR 92-A			
Carbaryl (Sevin)	ND	ug/kg	500

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MATRIX SPECIFIC QC
ASSIGNMENT REPORT
Organics by Chromatography

QC SAMPLE TYPE	TEST	LABORATORY SAMPLE NUMBER	QC LOT
MATRIX SPIKE DUPLICATE	632-S	021479-0004-SD	13 MAR 92-A
MATRIX SPIKE	632-S	021479-0004-MS	13 MAR 92-A

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MATRIX SPIKE / MATRIX SPIKE DUPLICATE REPORT
Organics by Chromatography

Analyte	Sample	Concentration Matrix Spike	Matrix Spike Dup	Spiked MS	Spiked MSD	%Recovery MS	%Recovery MSD	% RPD
Test: 632-S Matrix SOIL Sample: 021479-0004 Units: ug/kg								
Carbaryl (Sevin)	ND	1800	1800	1700	1700	106	106	0

ND = Not detected
NC = Not calculated, calculation not applicable

All calculations are performed before rounding to avoid round-off errors in calculated results.

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DUPLICATE CONTROL SAMPLE REPORT
Semivolatile Organics by GC

Analyte	Concentration Spiked	Measured DCS1	Measured DCS2	AVG	Accuracy Average(%) DCS	Limits	Precision (RPD) DCS	Limit
Category: 8080-S Matrix: SOIL QC Lot: 13 MAR 92-4A Concentration Units: ug/kg								
gamma-BHC (Lindane)	26.7	22.3	26.0	24.2	90	41-125	15	12
Heptachlor	26.7	24.3	27.9	26.1	98	53-125	14	12
Aldrin	26.7	23.3	27.1	25.2	94	52-121	15	14
Dieldrin	66.7	53.5	62.1	57.8	87	47-115	15	12
Endrin	66.7	57.4	66.7	62.0	93	52-124	15	13
4,4'-DDT	66.7	62.3	72.9	67.6	101	37-135	16	15
Category: 8140-S Matrix: SOIL QC Lot: 19 MAR 92-A Concentration Units: ug/kg								
Diazinon	33	31.7	35.1	33.4	101	40-119	10	[illegible]
Malathion	33	28.0	31.4	29.7	90	64-124	11	29
Ethyl parathion	33	32.1	32.9	32.5	98	55-123	2.5	2[illegible]
Ethion	33	30.4	31.6	31.0	94	60-125	3.9	2[illegible]
Phorate	33	28.0	29.0	28.5	86	20-160	3.5	2[illegible]
Methyl parathion	33	29.7	32.4	31.0	94	66-121	8.7	27

Calculations are performed before rounding to avoid round-off errors in calculated results.

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SINGLE CONTROL SAMPLE REPORT
Semivolatile Organics by GC

Analyte	Concentration Spiked	Measured	Accuracy(%) SCS	Limits
Category: 8080-S Matrix: SOIL QC Lot: 13 MAR 92-4A QC Run: 13 MAR 92-4A Concentration Units: ug/kg				
Dibutyl chlorendate	67.0	73.5	110	33-155
Category: 8140-S Matrix: SOIL QC Lot: 19 MAR 92-A QC Run: 19 MAR 92-A Concentration Units: ug/kg				
Chlormefos	66.7	43.4	65	50-150
Ethyl Pirimifos	66.7	61.3	92	50-150

Calculations are performed before rounding to avoid round-off errors in calculated results.

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METHOD BLANK REPORT
Semivolatile Organics by GC

Analyte	Result	Units	Reporting Limit
Test: 8080CPL-TCL-S Matrix: SOIL QC Lot: 13 MAR 92-4A QC Run: 13 MAR 92-4A			
Aldrin	ND	ug/kg	1.7
alpha-BHC	ND	ug/kg	1.7
beta-BHC	ND	ug/kg	1.7
delta-BHC	ND	ug/kg	1.7
gamma-BHC (Lindane)	ND	ug/kg	1.7
alpha-Chlordane	ND	ug/kg	1.7
gamma-Chlordane	ND	ug/kg	1.7
4,4'-DDD	ND	ug/kg	3.3
4,4'-DDE	ND	ug/kg	3.3
4,4'-DDT	ND	ug/kg	3.3
Dieldrin	ND	ug/kg	3.3
Endosulfan I	ND	ug/kg	1.7
Endosulfan II	ND	ug/kg	3.3
Endosulfan sulfate	ND	ug/kg	3.3
Endrin	ND	ug/kg	3.3
Endrin ketone	ND	ug/kg	3.3
Heptachlor	ND	ug/kg	1.7
Heptachlor epoxide	ND	ug/kg	1.7
Methoxychlor	ND	ug/kg	17
Toxaphene	ND	ug/kg	170
Test: 8080CPL-TCL-S Matrix: SOIL QC Lot: 13 MAR 92-4A QC Run: 13 MAR 92-4A			
Aldrin	ND	ug/kg	1.7
alpha-BHC	ND	ug/kg	1.7
beta-BHC	ND	ug/kg	1.7
delta-BHC	ND	ug/kg	1.7
gamma-BHC (Lindane)	ND	ug/kg	1.7
alpha-Chlordane	ND	ug/kg	1.7
gamma-Chlordane	ND	ug/kg	1.7
4,4'-DDD	ND	ug/kg	3.3
4,4'-DDE	ND	ug/kg	3.3
4,4'-DDT	ND	ug/kg	3.3
Dieldrin	ND	ug/kg	3.3
Endosulfan I	ND	ug/kg	1.7
Endosulfan II	ND	ug/kg	3.3
Endosulfan sulfate	ND	ug/kg	3.3
Endrin	ND	ug/kg	3.3

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METHOD BLANK REPORT
Semivolatile Organics by GC (cont.)

Analyte	Result	Units	Reporting Limit
Test: 8080CPL-TCL-S			
Matrix: SOIL			
QC Lot: 13 MAR 92-4A QC Run: 13 MAR 92-4A			
Endrin ketone	ND	ug/kg	3.3
Heptachlor	ND	ug/kg	1.7
Heptachlor epoxide	ND	ug/kg	1.7
Methoxychlor	ND	ug/kg	17
Toxaphene	ND	ug/kg	170
Test: 8140-S			
Matrix: SOIL			
QC Lot: 19 MAR 92-A QC Run: 19 MAR 92-A			
Coumaphos	ND	ug/kg	17
Diazinon	ND	ug/kg	8.3
Dichlorvos (Vapona)	ND	ug/kg	17
Dimethoate	ND	ug/kg	17
Malathion	ND	ug/kg	42
Test: 8080CPL-TCL-S			
Matrix: SOIL			
QC Lot: 13 MAR 92-4A QC Run: 13 MAR 92-4A			
Aldrin	ND	ug/kg	1.7
alpha-BHC	ND	ug/kg	1.7
beta-BHC	ND	ug/kg	1.7
delta-BHC	ND	ug/kg	1.7
gamma-BHC (Lindane)	ND	ug/kg	1.7
alpha-Chlordane	ND	ug/kg	1.7
gamma-Chlordane	ND	ug/kg	1.7
4,4'-DDD	ND	ug/kg	3.3
4,4'-DDE	ND	ug/kg	3.3
4,4'-DDT	ND	ug/kg	3.3
Dieldrin	ND	ug/kg	3.3
Endosulfan I	ND	ug/kg	1.7
Endosulfan II	ND	ug/kg	3.3
Endosulfan sulfate	ND	ug/kg	3.3
Endrin	ND	ug/kg	3.3
Endrin ketone	ND	ug/kg	3.3
Heptachlor	ND	ug/kg	1.7
Heptachlor epoxide	ND	ug/kg	1.7
Methoxychlor	ND	ug/kg	17

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METHOD BLANK REPORT
Semivolatile Organics by GC (cont.)

Analyte	Result	Units	Reporting Limit
Test: 8080CPL-TCL-S Matrix: SOIL QC Lot: 13 MAR 92-4A QC Run: 13 MAR 92-4A			
Toxaphene	ND	ug/kg	170
Test: 8140-S Matrix: SOIL QC Lot: 19 MAR 92-A QC Run: 19 MAR 92-A			
Coumaphos	ND	ug/kg	17
Diazinon	ND	ug/kg	8.3
Dichlorvos (Vapona)	ND	ug/kg	17
Dimethoate	ND	ug/kg	17
Malathion	ND	ug/kg	42

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MATRIX SPIKE / MATRIX SPIKE DUPLICATE REPORT
Semivolatile Organics by GC

Analyte	Sample	Concentration Matrix Spike	Matrix Spike Dup	Spiked MS	Spiked MSD	%Recovery MS	%Recovery MSD	% RPD
Test: 8080CPL-TCL-S Matrix SOIL Sample: 021479-0004 Units: ug/kg								
Aldrin	ND	36	32	27	27	135	121	11
gamma-BHC (Lindane)	ND	28	26	27	27	104	99	5
4,4'-DDT	ND	78	80	67	67	117	120	3
Dieldrin	ND	56	56	67	67	84	83	1
Endrin	ND	97	97	67	67	144	146	1
Heptachlor	ND	21	21	27	27	79	78	2
Test: 8140-S Matrix SOIL Sample: 021479-0004 Units: ug/kg								
Diazinon	ND	30	28	33	33	90	84	7
Malathion	ND	34	33	33	33	104	100	4

ND = Not detected
NC = Not calculated, calculation not applicable

All calculations are performed before rounding to avoid round-off errors in calculated results.