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WORK PLAN
FOR
PESTICIDE INVESTIGATION
AT
NAVAL WEAPONS STATION - EARLE
COLTS NECK, NEW JERSEY

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1.0 INTRODUCTION/ PROJECT OBJECTIVES

Foster Wheeler Environmental Corporation (Foster Wheeler Environmental) has been contracted by the Northern Division, Naval Facilities Engineering Command (NORDIV) to further delineate pesticide contamination at the former pesticide shop at the Naval Weapons Station (NWS) Earle located in Colts Neck, NJ. This Work Plan is being submitted to satisfy the pre-construction submittal requirements included in paragraph 1.2.1, Pre- and Post-Construction Documentation of the Statement of Services for Delivery Order No. 0017, under Remedial Action Contract No. N62472-94-D-0398.

Project objectives, include utilizing direct-push methods to collect soil samples and groundwater samples for the laboratory analyses of pesticides.

2.0 PROJECT LOCATION AND DESCRIPTION

NWS-Earle is located in east-central Monmouth County in the town of Colts Neck, New Jersey. Building S-186 (Old Pesticide Shop) is located on the Mainside portion of the base, north of the intersection of Esperance and Macassar Roads. The building served as the former base pesticide shop, but is no longer in service. Apparently, containers and spraying containers were periodically rinsed out and some of the wastewaters were dumped outside the building.

2.1 PREVIOUS INVESTIGATIONS

Surface and subsurface soil samples were collected during investigation efforts in January and April 1998. The soil samples were analyzed for chlorinated organic pesticides by SW-846 Method 8081A. Chlordane and 4,4'-DDT were the most frequently detected pesticides found in the soil samples. Chlordane was found in 20 out of 23 surface soil samples; and 4,4' DDT was found in 13 of 23 surface soil samples. The laboratory analyses of soil samples collected in the area around the pesticide shop revealed chlordane (up to 200 ppm); 4,4' DDD (up to 1.5 ppm); 4,4' DDE (up to 1 ppm); and 4,4' DDT (up to 12 ppm). Figure 1 depicts the soil sample locations. Appendix A contains the Delineation Sampling and Analysis Report from the Old Pesticide Shop. Soils at the site are fine grained sands with some silt and minor pebbles.

2.2 SITE CONDITIONS

The Former Pesticide Shop is located in a grassy wooded area between Building C-54 and Building C-23. The shop consists of small brick building (25 ft. x 12 ft.) with a 15 ft. x 8 ft. concrete pad on the northwest side of the building. The Former Pesticide Shop sits atop a small knoll, which slopes to the northwest and north. An in-ground former septic leach tank is reportedly located to the north of the building. The site is bounded to the east by a paved parking area, to the northwest by Building C-54, to the south by the ROICC Office, and to the north by a fenced storage yard associated with Building C-54.

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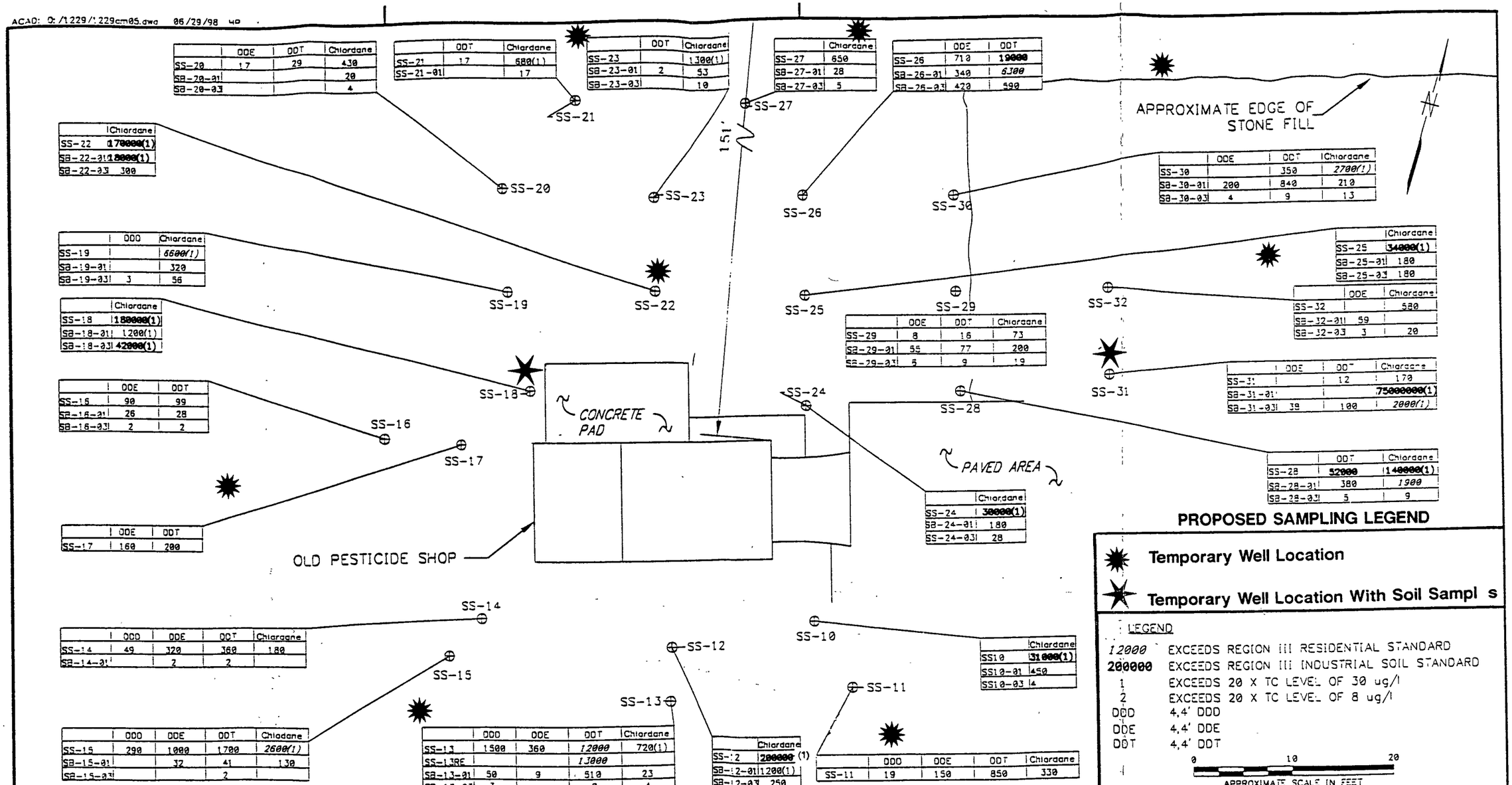


	ODE	ODT	Chlordane
SS-20	17	29	430
SB-20-01			20
SB-20-03			4

	ODT	Chlordane
SS-21	17	680(1)
SS-21-01		17

	ODT	Chlordane
SS-23		1300(1)
SB-23-01	2	53
SB-23-03		10

	Chlordane
SS-27	650
SB-27-01	28
SB-27-03	5

	ODE	ODT
SS-26	710	19000
SB-26-01	340	6300
SB-26-03	420	590

	Chlordane
SS-22	170000(1)
SB-22-01	18000(1)
SB-22-03	300

	ODE	ODT	Chlordane
SS-30		350	2700(1)
SB-30-01	200	840	210
SB-30-03	4	9	13

	DDD	Chlordane
SS-19		6600(1)
SB-19-01		320
SB-19-03	3	56

	Chlordane
SS-25	34000(1)
SB-25-01	180
SB-25-03	180

	Chlordane
SS-18	180000(1)
SB-18-01	1200(1)
SB-18-03	42000(1)

	ODE	Chlordane
SS-32		580
SB-32-01	59	
SB-32-03	3	20

	ODE	ODT	Chlordane
SS-29	8	16	73
SB-29-01	55	77	200
SB-29-03	5	9	19

	ODE	ODT	Chlordane
SS-31		12	170
SB-31-01			75000000(1)
SB-31-03	39	100	2000(1)

	ODE	ODT
SS-16	90	99
SB-16-01	26	28
SB-16-03	2	2

	ODT	Chlordane
SS-28	52000	140000(1)
SB-28-01	380	1900
SB-28-03	5	9

	Chlordane
SS-24	30000(1)
SB-24-01	180
SS-24-03	28

	ODE	ODT
SS-17	160	200

	DDD	ODE	ODT	Chlordane
SS-14	49	320	360	180
SB-14-01		2	2	

	Chlordane
SS10	31000(1)
SS10-01	450
SS10-03	4

	DDD	ODE	ODT	Chlordane
SS-15	290	1000	1700	2600(1)
SB-15-01		32	41	130
SB-15-03			2	

	DDD	ODE	ODT	Chlordane
SS-13	1500	360	12000	720(1)
SS-13RE			13000	
SB-13-01	50	9	510	23
SB-13-03	3		8	4

	Chlordane
SS-12	200000 (1)
SB-12-01	1200(1)
SB-12-03	250

	DDD	ODE	ODT	Chlordane
SS-11	19	150	850	330

PROPOSED SAMPLING LEGEND

- Temporary Well Location
- Temporary Well Location With Soil Sampl s

LEGEND

12000	EXCEEDS REGION III RESIDENTIAL STANDARD
200000	EXCEEDS REGION III INDUSTRIAL SOIL STANDARD
1	EXCEEDS 20 X TC LEVEL OF 30 ug/l
2	EXCEEDS 20 X TC LEVEL OF 8 ug/l
DDD	4,4' DDD
DDE	4,4' DDE
DDT	4,4' DDT

0 10 20
APPROXIMATE SCALE IN FEET

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY HJP DATE 6/29/98
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

Brown & Root Environmental

DELINEATION SAMPLING POINTS
OLD PESTICIDE SHOP SAMPLING -CTO 154
NWS EARLE
COLTS NECK, NEW JERSEY

CONTRACT NO. 1229
OWNER NO. ----
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 1
REV. 0

FORM CADD NO. SOUTH_3H.DGN - REV 0 - 02/11/97

2.2.2 Groundwater

There are no monitoring wells in the immediate area to determine depth to groundwater and groundwater flow direction. Based on topography, and monitoring wells located approximately 0.25 miles downgradient of the pesticide shop, the shallow groundwater is expected to be encountered at a depth of 10 to 15 feet below grade and flow toward the north.

3.0 SCOPE OF WORK

The objectives of the this effort are to mobilize a Geoprobe rig and the necessary equipment to collect soil samples, and groundwater samples. A hydropunch attachment on the geoprobe shall be used to obtain groundwater samples for the laboratory analysis of pesticides.

3.1 TASK 1 - PROJECT PLANNING/MANAGEMENT

Project Planning/Management activities include the preparation of pre-construction submittals, coordinating utility requirements, mobilization to the site, and providing Home Office support functions during the estimated period of performance. The subtasks involved in Project Planning/Management are described below.

3.1.1 Subtask 1A - Pre-Construction Submittals

Foster Wheeler Environmental will prepare and submit the following pre-construction documents to the Navy:

Work Plan
The Work Plan presents Foster Wheeler Environmental's approach to executing the project, including the site description, statement of work, procurement approach, field procedures, materials, transportation and disposal data, and sampling and analytical requirements.

Health and Safety Plan (HASP)
An existing HASP for previous drilling work at NWS-Earle will be used for this effort. Foster Wheeler Environmental has prepared an Activity Hazard Analysis (AHA) for this specific task, included in Appendix B.

3.1.2 Subtask 1B - Mobilization

Mobilization will consist of contacting appropriate Navy personnel at NWS Earle to arrange for contractor passes, and to coordinate support requirements for the geoprobe work. A utility survey shall be conducted to determine all utility lines in the area.

Subsurface utilities shall be located by NWS-Earle Public Works personnel. A dig permit shall be obtained prior to any geoprobe work.

3.1.3 Subtask 1C - Home Office Support

Foster Wheeler Environmental's Langhorne, Pennsylvania office will provide home office support for the project duration. Home office support includes the preparation of the required monthly progress, financial and technical reports.

3.2 TASK 2 - PERMIT PREPARATION/SUBMISSION

In accordance to NJDEP, no drilling or well permits are required since the Geoprobe borings will be less than 25 feet in depth, and the hydropunch samples will not remain in the ground for more than 48 hours.

3.3 TASK 3 - COLLECTION OF SUBSURFACE SOIL SAMPLES

The previous soil investigations at the site collected soil from a maximum depth three feet below grade. Analytical results for several of the soil samples collected from three feet below grade revealed pesticide concentrations exceeding the EPA Soil Clean-Up standards for pesticides. The analytical results of subsurface soil sample SB-18-03 (collected three feet below grade), revealed chlordane at a concentration of 42,000 ug/kg, which is above the Region III Residential Standard. SB-18 was collected on the western side of the concrete pad associated with the former pesticide shop. The analytical results for subsurface soil sample SB-31-03(also collected three feet below grade), revealed chlordane at a concentration of 2,000 ug/kg, which is above the Region III Industrial Standard. SB-31 was collected on the northern edge of the paved area, located east of the former pesticide shop.

Subsurface soil samples shall be collected and analyzed for pesticides at the former SB-18 and SB-31 locations during the installation of the temporary monitoring wells to further evaluate the vertical profile in these areas. The Geoprobe shall be used to advance a macro-core sampler to a depth of 4 feet below grade at the two locations, and then collect continuous subsurface samples down to the water table, which is anticipated to be between 10 to 15 feet below grade. It is anticipated that a total of three (4'-6', 6'-8', 8'-10') subsurface soil samples will be collected at each of the two boring locations. Once the approximate depth to the water table is established, hydropunch samples shall be obtained at each boring location.

The Sampling and Analysis Plan in Section 4.0 details the analytical methods and sample frequency.

3.4 TASK 4 - COLLECTION OF GROUNDWATER SAMPLES USING A HYDROPUNCH

A hydropunch shall be advanced with the geoprobe in order to collect groundwater samples for the laboratory analyses for pesticides. In addition to the two soil sample locations, hydropunch samples shall be collected at approximately 8 other locations (Figure 1). Hydropunch sampling provides a faster, less costly method of groundwater sampling, with less environmental impact than well installation. Hydropunch is not intended to replace the need for monitoring wells, however it does facilitate a quicker initial screening of groundwater.

The exact collection depth of the hydropunch sample below grade shall be determined by the depth of the water table and input from the Site Geologist. No soil samples shall be obtained from the additional 8 borings used for installation of the temporary wells.

Section 5.0 details the collection methodology for using the hydropunch for groundwater sampling.

To ensure that there is no cross contamination between soil sampling intervals and the Geoprobe boring locations, the outer steel casing and the drive rods shall be decontaminate between each boring using the following procedure:

1. Laboratory grade detergent (Alconox, etc.) and tap water rinse;
2. Distilled water rinse;
3. Methanol rinse;
4. Total air dry;
5. Distilled water rinse.

4.0 FIELD SAMPLING AND ANALYSIS PLAN

4.1 INTRODUCTION

Foster Wheeler Environmental Corporation (FWENC) is submitting this Sampling and Analysis Plan (SAP) for the Geoprobe work at the Former Pesticide Shop at the Naval Weapons Station (NWS) Earle located in Colts Neck, NJ. The purpose of the sampling is to further delineate the vertical extent of pesticide contamination in previously identified "hotspots", and analyze groundwater in the vicinity of the site to determine if the groundwater has been impacted by pesticides. This work is being performed under Delivery Order No. 0034 to Navy Contract N62472-94-D-0398

The SAP presents the procedures to be followed during the Geoprobe and temporary well installation activities. The SAP specifically addresses the following areas:

- Analytical Requirements

- Responsibilities of Site Personnel
- Sample Analytical Program
- Sample Packing and Shipping
- Documentation
- Field Sampling Program
- Quality Assurance/Quality Control
- Procedures for Field Changes and Corrective Actions

Site-specific Standard Operating Procedures have been included (Section 5) to describe the sampling procedures. Any modifications necessary to these SOPs due to field conditions or other unforeseen situations shall be recorded in the site logbook, documented on the appropriate Field Change Request (FCR) forms by site personnel, and approved by the Project Manager (See Section 4.2).

4.2 PERSONNEL RESPONSIBILITIES

The project team will include the following personnel:

The Senior Project Engineer/Manager (SPEM) has final responsibility for the development of the SAP and management of the project team.

The Project Superintendent (PS) is responsible for assuring that proper collection, packaging, preservation, and shipping of samples is performed in accordance with the SAP. In addition, the PS is responsible for coordinating with the subcontracted laboratory during sample analysis and for reviewing the analytical data received from the laboratory. The PS is health and safety cross trained and shall also function as the Site Health and Safety Officer (SHSO). The SHSO is responsible for the safety of all site personnel as detailed in the site-specific Health and Safety Plan (HASP), presented under separate cover.

The Drilling Subcontractor is responsible for supplying all services (including labor), equipment, and material required to perform the drilling, including all maintenance and quality control of such equipment. The drilling subcontractor will be responsible for all required licenses, and clearances. The drilling subcontractor will also be responsible for following decontamination procedures specified in the bid package. Upon completion of work, the drilling subcontractor will be responsible for demobilizing all equipment and restoring the work area to original conditions.

The Laboratory Subcontractor is responsible for supplying all services (including labor), equipment, and material required to perform the analysis of the environmental samples. The laboratory subcontractors are responsible for following all specified methodology protocols, including quality assurance/quality control (QA/QC) requirements. In addition, the laboratory subcontractors are responsible for the proper disposal, including all associated costs, of the environmental samples upon completion of the analytical work.

4.3 FIELD SAMPLING ACTIVITIES

This section addresses the field investigation activities, including:

- Sample Tracking System
- Sample Analytical Requirements
- Sample Packaging and Shipping
- Sample Documentation

4.3.1 SAMPLE TRACKING SYSTEM

The objective of the sample identification system is to provide a framework for developing sample numbers that are unique to that sample and convey information regarding sample type that will enable data users to easily identify sample locations. The sample designation is established in order to integrate the data into the Navy's Geographical Information System (GIS)

The first two number of the sample tracking system shall refer to this site specific location, which in this case is Pesticide Shop (PS). All soil and groundwater sample identifiers shall begin with the letters PS. In order to identify the depth interval of the soil sample, a number shall be used after the boring number. For example PS-SB01-06 would refer to Pesticide Shop, soil boring one, collected from 4 to 6 feet below grade. The groundwater samples shall be identified by the letters GW. For example, PS-GW01-01 would refer to Pesticide Shop groundwater sample, location one. A "D" would be added to the end of the sample nomenclature to indicate a duplicate sample. For the purposes of this sampling effort, the following characters shall be assigned to identify the various matrices:

SB = Soil Boring GW=Groundwater
BL= Blank

A cumulative sampling master log will be maintained as the field program progresses. The samples taken will be referenced to each sampling location in the master log and on a detailed site map.

All location information for the samples will be recorded in the field sampling logbook (Section 4.3.4).

4.3.2 SAMPLE ANALYTICAL REQUIREMENTS

Table 4-1 specifies location, number of samples, matrix, laboratory analyses, and rationale for each sample type. Table 4-2 specifies the laboratory bottleware and the holding times for the samples.

TABLE 4-1
NAVAL WEAPONS STATION-EARLE
DELIVERY ORDER 0034
SAMPLING AND ANALYSIS REQUIREMENTS

Media	*Analyses*	*Frequency*	*Quantity **	*Method*	*Rationale*
Soil	Chlorinated Organic Pesticides	Continuous subsurface soil samples collected from 4 feet below grade to the top of the water table at two locations.	7 *	EPA SW-846 Method 8081A Chlorinated Organic Pesticides	To further delineate the vertical profile in areas with elevated subsurface pesticide concentrations.
Aqueous	Chlorinated Organic Pesticides	Groundwater samples collected from the temporary monitoring wells installed with the geoprobe.	11 *	EPA SW-846 Method 608	To evaluate the effect of pesticide contaminated soils on the underlying groundwater..
Soil	Nitroglycerin Nitrocellulose Nitroguanadine	Surface soil samples in the vicinity of the ROICC Building , as directed by navy personnel	5*	SW846 Method 8332, and adherence to laboratory SOPs for analyses with no EPA SOW.	To evaluate the presence of propellant residuals in the area around the ROICC office.
Soil	Lead	Surface soil samples in the vicinity of the ROICC Building, as directed by Navy personnel.	5*		
Aqueous	Chlorinated Organic Pesticides	Rinsate Blank	1	EPA SW-846 Method 608	To verify proper decontamination procedures were followed.

* Quantities include duplicate samples for quality assurance.

TABLE 4-2
NAVAL WEAPONS STATION-EARLE
DELIVERY ORDER 0034
BOTTLEWARE AND HOLDING TIMES

Media	Analyses	Bottle	Laboratory Holding Times
Aqueous	Chlorinated Organic Pesticides	Two (2) a 1 liter amber bottles	7 days to extraction, 40 days from extraction to laboratory analysis
Soil	Chlorinated Organic Pesticides	One (1) 8 oz. glass jar.	7 days to extraction, 40 days from extraction to laboratory analysis
Soil	Nitroglycerin Nitrocellulose Nitroguanadine	One (1) 8 oz. glass jar.	No set holding times established
Soil	Lead	One (1) 8 oz. glass jar.	6 months to analysis

4.3.3 SAMPLE PACKAGING AND SHIPPING

The objective of the sample packaging and shipping requirements are to maintain sample integrity from the time a sample is collected until it is received at the analytical laboratory. Chain-of-custody (COC) forms, sample labels, custody seals, and other sample documents will be completed to maintain sample integrity. Specific procedures for packaging and shipping of environmental samples are presented below. These procedures were obtained from the NJDEP Field Sampling Procedures Manual.

4.3.3.1 Environmental Samples

Low-concentration samples are defined as environmental samples and should be packaged for shipment as follows:

1. A sample label is attached to the sample bottle. The label should be taped over with clear packing tape to preserve legibility.

2. A picnic cooler (such as a Coleman or other sturdy cooler) is typically used as a shipping container. In preparation for shipping samples, the drain plug is taped shut from the inside and outside, and a large plastic bag is used as a liner for the cooler. Approximately 1 inch of packing material, such as asbestos-free vermiculite, perlite, or styrofoam beads, is placed in the bottom of the liner.

3. The sample bottles are placed in the lined picnic cooler. Cardboard separators, and/or additional packing material, should be placed between the bottles to prevent breakage during shipping.

4. Aqueous samples for low or medium-level analysis must be shipped cooled to 4°C with ice. No ice is used in shipping high-level aqueous samples, or soil samples, or dioxin samples. Ice is not required in shipping soil samples, but may be utilized at the option of the sampler. All cyanide samples, however, must be shipped cooled to 4°C.

5. The lined cooler is filled with packing material (such as asbestos-free vermiculite, perlite, or styrofoam beads), and the large inner liner is taped shut. Sufficient packing materials should be used to prevent sample containers from making contact during shipment.

6. The paperwork being shipped to the laboratory is placed inside a plastic bag. The base is sealed and taped to the inside of the cooler lid. A copy of the COC form should be included in the paperwork sent to the laboratory. The last block on the COC form should indicate the overnight carrier and airbill number. The airbill must be filled out before the samples are handed over to the carrier. The laboratory should

be notified if the shipper suspects that the sample contains any substance for which the laboratory personnel should take safety precautions.

7. The cooler is taped shut with strapping tape (filament-type).

8. At least two signed custody seals are placed on the cooler, one on the front and one on the back.

9. The cooler is handed over to the overnight carrier. A standard airbill is necessary for shipping environmental samples.

4.3.3.2 Hazardous Samples

Medium- and high-concentration samples are defined as hazardous and must be packaged as follows:

1. A sample label is attached to the sample bottle. The label should be taped over with clear packaging tape to preserve legibility.

2. Each sample bottle is placed in a plastic bag, and the bag is sealed. For medium-concentration water samples, each VOA vial is wrapped in a paper towel, and the two vials are placed in one bag. As much air as possible is squeezed from the bags before sealing.

3. Each bottle is placed in a separate paint can, the paint can is filled with vermiculite, and the lid is fixed to the can. The lid must be sealed with metal clips, or with filament or evidence tape; if clips are used, the manufacturer normally recommend six clips.

4. Arrows are placed on the can to indicate which end is up.

5. The outside of each can must contain the proper DOT shipping name and identification number for the sample. The information may be placed on stickers or printed legibly. A liquid sample of an uncertain nature is shipped as a flammable liquid with shipping name "FLAMMABLE LIQUID, N.O.S." and the identification number "UN1993." A solid sample of uncertain nature is shipped as a flammable solid with the shipping name "FLAMMABLE SOLID, N.O.S." and the identification number "UN1325." If the nature of the sample is known, 49 CFR 171-177 is consulted to determine the proper labeling and packaging requirements.

6. The cans are placed upright in a cooler lined with a plastic garbage-type bag, with the drain plug taped shut inside and out. Asbestos-free vermiculite, perlite, or styrofoam is placed in the bottom of the cooler. Two sizes of paint cans are used: half-gallon and gallon. The half-gallon paint cans may be stored on top of each other; however,

one-gallon cans are too high to stack. The cooler is filled with packing material and the plastic liner is taped shut.

7. The paperwork going to the laboratory is placed inside a sealable plastic bag and taped to the inside of the cooler lid. A copy of the COC form must be included in the paperwork sent to the laboratory. The sampler keeps one copy of the COC form. The laboratory should be notified if the sample is suspected of containing any substance for which laboratory personnel should take safety precautions.

8. The cooler is closed and sealed with strapping tape. At least two custody seals are placed on the outside of the cooler (one on the front and one on the back).

9. The following markings are placed on top of the cooler:

    - Proper shipping name (49 CFR 172.301)
    - DOT identification number (49 CFR 172.301)
    - Shipper's or consignee's name and address (49 CFR 172.306)
    - "This End Up" legibly written if shipment contains liquid hazardous materials (49 CFR 172.312)

10. The following labels are required on top of the cooler (49 CFR 172.406e):

    - Appropriate hazard class label (placed next to the proper shipping name)
    - "Cargo Aircraft Only" (if applicable as identified in 49 CFR 172.101)

11. Arrow symbols indicating "This Way Up" should be placed on the cooler in addition to the marking and labels described above.

12. Restricted-article airbills are used for shipment indicating the following:

    - Number of packages or number of coolers.

    - Proper shipping name. If unknown, use FLAMMABLE SOLID, N.O.S. or FLAMMABLE LIQUID, N.O.S.

    - Classification; if unknown, use flammable solid or flammable liquid.

    - Identification number; if unknown, use UN1325 (for flammable solids) or UN1993 (for flammable liquids).

    - Net quantity per package or amount of substance in each cooler.

    - Radioactive materials section (leave blank).

- Passenger or cargo aircraft (cross off the nonapplicable). Up to 25 pounds of flammable solid per cooler can be shipped on a passenger or cargo aircraft. Up to 1 quart of flammable liquid per cooler can be shipped on a passenger aircraft, and up to 10 gallons of flammable liquids per cooler can be shipped on a cargo aircraft).

- Name and title of shipper (printed).

- An emergency telephone number at which the shipper can be reached within 24-48 hours.

- Shipper's signature.

NOTE: The penalties for improper shipment of hazardous materials are severe. A fine of $25,000 and five years imprisonment can be imposed for each violation.

4.3.4 SAMPLE DOCUMENTATION

The following documentation is associated with sample collection and transfer:

- Field Logbooks
- Site Logbooks
- Master Sample Log
- Sample Label
- Chain-of-Custody Form
- Custody Seals
- Shipping Airbill.

5.0 FIELD INVESTIGATION ACTIVITIES

5.1 STANDARD OPERATING PROCEDURES (SOPs)

Technical guidelines used in preparing this SAP were obtained primarily from the following sources:

- June 1988 Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program, NESSA 20.2-047B

- The New Jersey Department of Environmental Protection (NJDEP) Field Sampling Procedures Manual (May 1992)

- The New Jersey Department of Environmental Protection Alternative Groundwater Sampling Technical Guide. Undated

All of the aforementioned guidance documents were consulted in preparation of this SAP to ensure that the procedures presented in this SAP are consistent with each document.

5.2 FIELD INVESTIGATION PROGRAM

The following sections detail the field investigation program. Primary tasks of the program include Mobilization/Demobilization (Section 5.2.1), Subsurface Soil Sampling (Section 5.2.2), and Ground Water Sampling (Section 5.2.3),

5.2.1 Mobilization and Demobilization

Mobilization shall consist of contacting appropriate Navy personnel at NWS Earle to arrange for contractor passes and to coordinate support requirements for the geoprobe investigation.

FWENC shall contact the NWS-Earle Public Works Department to obtain a dig permit and have all utilities marked out prior to advancing the soil borings.

5.2.2 Subsurface Soil Sampling

Objectives

The objectives of collecting subsurface soil samples for laboratory analysis is to vertically delineate the pesticide contamination at two "hotspot" areas that exhibited elevated pesticide concentrations in the subsurface soils (Figure 1). The soils shall also be logged by a geologist in order to better understand the subsurface soil conditions.

Sampling Equipment and Procedures

Subsurface soil samples shall be collected using a dedicated sampling core on the Geoprobe. The samples shall be collected continuously from 4 feet below grade, to the top of the water table. The sample core on the Geoprobe consists of a 2 foot length of acetate sleeve inside a hollow, stainless steel core sampler.

The following method is to be used for subsurface soil sampling:

1. Bring the sampler to the surface and remove the stainless steel drive shoe. Remove the inner acetate sample core. Cut the acetate core in half to expose the soils inside. Describe carefully the recovery (length), composition, structure, consistency, color, condition, etc. of the recovered soil. The soil will be field screened with a HNu/OVA. A representative sample of each recovered two-foot core sample will be placed in the appropriate laboratory sample containers for possible laboratory analysis.

2. Affix labels to the sample jar, and complete chain-of-custody and other required sample data forms. Protect samples against extreme temperature changes and breakage by placing them in sample coolers stored in a protected area.

Sample Analysis

Six (6) soil samples shall be collected and analyzed for pesticides as described in Table 4-1. The samples shall be collected from the Geoprobe borings as depicted in Figure 1. The soil samples shall be collected from 4 feet below grade to the water table in two of the boring locations (4'-6', 6'-8', 8'-10'). The exact depth of sample collection will depend on site conditions and shall be determined by the on-site geologist.

Boring Logs

The lithologic descriptions for all soil borings should be kept in a field logbook and subsequently transferred to a standard borehole log form. The following basic information should be entered on the heading of each log sheet:

- Project name and number
- Boring or well number
- Location (approximate in relation to an identifiable landmark)
- Elevation (approximate at the time)
- Name of drilling contractor
- Drilling method and equipment
- Water level
- Start and finish (time and date)
- Name of geologist

The following technical information is recorded on the logs:

- Depth of sample below surface
- Sample interval
- Sample type and number
- Length of sample recovered
- Standard penetration test (ASTM-D1586) results, if applicable
- Soil description and classification
- Graphic lithologic symbols

In addition to the items listed above, all pertinent observations about drilling rate, equipment operation, or unusual conditions should be noted. Such information might include the following:

- Size of casing used and method of installation
- Rig reactions such as chatter, rod drops, and bouncing

Drilling rate changes
- Changes in fluid color or consistency
- Material changes
  Zones of caving or heaving

Description of soils is based on the Unified Soil Classification System (USCS) as described in ASTM D2487-69(1975) Test Method for Classification of Soils for Engineering Purposes and ASTM D2488-69(1975) Recommended Practice of Description of Soils (Visual-Manual Procedure).

5.2.3 Groundwater Sampling

Objective

The objectives of the groundwater sampling and analysis is to characterize potential pesticide content in the shallow groundwater in the vicinity of the pesticide shop.

Location and Frequency and Analysis

A total of ten (10) groundwater samples, plus a duplicate sample, shall be collected with a hydropunch using direct push (Geoprobe) technology. Figure 1 shows the proposed groundwater sample locations located around the former pesticide shop.

Equipment and Procedures

The hydropunch uses a drive point and a retractable screen interval to collect a groundwater sample from a discrete interval. A lower check valve, with an attached filter screen, is inserted into the bottom of the tool and a lower check valve is placed in the top of the body. A disposable point is inserted into the drive shoe. The tool is pushed into the undisturbed soil to the desired sampling depth. The body of the tool is then pulled back about 2 feet. Soil friction holds the drive cone in place. Once the)-ring seal on the cone is broken, groundwater flows into the open end of the device through the intake screen., past the lower, into the sample chamber, and finally out the upper check valve. When the tool is full, the sample is collected by pulling the tool towards the surface. This increases the hydrostatic pressure within the tool, closing the two check valves. At the surface, the tool is inverted and the sample is decanted through the upper discharge valve and into a sample container.

The following procedures should be followed to ensure the collection of an adequate groundwater sample using a hydropunch:

- The bottom of the hydropunch should be at least 5 feet below the bottom of the water table in order to collect a full sample.

- When driving, carefully measure and mark the rod so you know exactly where the end of the tool is located.

  Ensure the rods do not slide back down while collecting the groundwater sample. If the rods slide back down, the screen will plug with soil.

- Adjust the fill time of the hydropunch tool based on the quantity of sample and the estimated permeability of the formation.

5.3 DECONTAMINATION

The objective of this section is to provide the methodology for the proper decontamination procedures to be used on chemical sampling and field analytical equipment.

In order to assure that chemical analysis results are reflective of the actual concentrations present at sampling locations, chemical sampling and field analysis equipment must be properly decontaminated prior to the field effort, during the sampling program (i.e. between sample points), and at the conclusion of the sampling program. This will minimize the potential for cross-contamination between sample points and the transfer of contamination off-site.

Prior to sampling, equipment will be decontaminated using the following procedures:

1. Potable water rinse.

2. Alconox or Liquinox detergent wash.

3. Scrubbing with a scrub brush may be required if the equipment is heavily contaminated with heavy or extremely viscous compounds (not anticipated).

4. Potable water rinse.

5. Distilled, deionized water rinse.

6. Methanol rinse.

7. Distilled, deionized water rinse.

8. Air dry.

6.0 QA/QC VERIFICATION OF FIELD SAMPLING AND PROCEDURES FOR FIELD CHANGES AND CORRECTIVE ACTION

6.1 QA/QC FIELD AUDITS

Quality assurance and quality control during the sampling program will be performed by the Foster Wheeler Environmental Project Superintendent (PS). The PS will supervise all sampling and documentation and subcontractor operations to ensure that all activities are being performed in accordance with the SAP. The PS will report all findings to the SPEM.

6.2 FIELD CHANGES AND CORRECTIVE ACTIONS

The SPEM or his designee is responsible for all site activities. In this role, the SPEM is required at times to adjust the field program to accommodate site-specific needs. When it becomes necessary to modify a program, the responsible sampling personnel will notify the SPEM of the anticipated changes prior to implementation. Changes will only be acted upon with the SPEM's concurrence. The SPEM will consult with the Navy Technical Representative (NTR) ahead of time for major changes and receive his/her approval. If changes are implemented that are subsequently determined to be unacceptable, the actions taken during the period of deviation will be evaluated to determine the significance of any departure from established program practices.

The changes in the program will be documented on a Change Request Form (CRF), which will be signed by the PS and the SPEM. The CRFs for each change will be numbered sequentially starting with the number "01." A copy of the CRF will be attached to the file copy of the SAP. The SPEM is responsible for controlling, tracking, and implementing the identified changes.

7.0 HEALTH AND SAFETY REQUIREMENTS

An existing, pre-approved Health and Safety Plan (HASP) previously completed for Geoprobe and drilling work at the Base shall be used for general health and safety issues. The Activity Hazard Analysis (AHA) in Appendix B shall be used for the specific hazards associated with this sampling task at the pesticide shop. Appendix C contains the Material Safety Data Sheets (MSDS) for the pesticides likely to be encountered during the investigation.

8.0 WASTE REMOVAL/REGULATORY COMPLIANCE

This section addresses how the various waste streams generated during the former pesticide shop investigation will be handled. These waste streams include decon water, personal protective equipment (PPE), and other investigation derived wastes.

8.1 INVESTIGATION DERIVED WASTES

As part of the Geoprobe work at the former pesticide shop, several investigation derived waste streams will be generated. These include decontamination fluids, PPE, and other miscellaneous debris. These wastes shall be collected, stored separately, and disposed off site at a proper disposal facility. In accordance with NJDEP solid waste and/or Hazardous Waste Regulations, the investigative derived wastes (IDW) shall be disposed of as hazardous. In accordance to the Code of Federal Regulations, any wastes generated from this pesticide shop investigation should be classified as hazardous with a U Code. The pesticide contamination around the former pesticide shop was the result of dumping container residue or discarded chemical products, which constitutes a P or a U waste code. The waste would be transported and disposed of as hazardous for **U036** (chlordane), **U060 (DDD)**, and **U061** (DDT).

8.5 MANIFESTS/SHIPPING PAPERS

Foster Wheeler Environmental shall provide completed waste manifests and/or bills of lading and transport documentation to the Navy for review and signature.

8.6 WASTE TRANSPORT AND DISPOSAL

Foster Wheeler Environmental shall subcontract for waste transport and disposal (T&D) services. The T&D subcontractor shall be competitively procured from the five firms with which Foster Wheeler Environmental has preplaced basic ordering agreements. This assures the Navy that solid and/or hazardous wastes will be sent to an EPA NJDEP-approved facility. All hazardous and solid waste disposal facilities and transporters of the Navy's wastes will be evaluated for regulatory compliance and approved for use in accordance with Foster Wheeler Environmental Corporation Regulatory Compliance Procedures. Approved facilities and transporters will be submitted to the Navy for final approval.

8.7 HAZARDOUS WASTE MANAGEMENT

RCRA regulated hazardous wastes, if present, will be placed into appropriate DOT approved containers for disposal. FWENC will prepare Waste Profiles, Hazardous Waste Manifests, LDR Notification Forms, and other shipping documentation for Navy review and signature prior to off-site disposal. Copies of certified weight tickets, TSDF signed manifests, and all disposal documentation documents will be forwarded to the Navy.

If on-site storage of hazardous wastes is required, the proposed hazardous waste storage area will meet generator requirements for less than 90 day storage of hazardous waste as per 40 CFR 262.34:

- All stored hazardous wastes will be removed from the project site for off-site disposal within 90 days of first being accumulated.

- Each container will be marked with the date on which the accumulation period begins.

- All hazardous waste storage areas will be marked with signs stating "Hazardous Waste."

- For waste containers containing free liquids, the container storage areas will have a containment system capable of collecting and holding spills, leaks and precipitation. The containment system shall have an impervious base underlying the containers, which is free of leaks, gaps or cracks. The containment capacity will be sufficient to contain the entire volume of the largest container or 10% of the entire volume of all of the containers, whichever is largest. Run on into the containment system will be prevented. Spilled or leaked waste and accumulated precipitation will be removed from the containment system in as timely a manner as necessary to prevent overflow of the containment system.

- For waste containers which do not contain free liquids, a secondary containment system will not be provided; however, the storage area will be designed and operated to drain and remove liquid resulting from precipitation or the containers will be elevated and removed from contact with accumulated precipitation.

  Containers holding reactive or ignitable waste will be stored at least 50 feet (15 meters) from the property line.

- Each container of hazardous waste will be marked and labeled in accordance with US DOT requirements under 40 CFR 172.

- Hazardous Waste Containers will meet US DOT requirements under 40 CFR Parts 173, 178, and 179.

- Each container of hazardous waste of 110 gallons or less will be marked in accordance with US DOT requirements under 49 CFR 172.304 with the following:

  HAZARDOUS WASTE-FEDERAL LAW PROHIBITS IMPROPER DISPOSAL. If found contact the nearest police or public safety authority or the Environmental Protection Agency.
  Generator name and Address_____
  Manifest Document Number_____

- Waste will be placed in containers in good condition. If container begins to leak, the contents will be transferred from the defective container into a good container.

- The containers used will be made of or lined with a material that does not react with and is compatible with the waste.

- The containers shall remain closed during storage except when waste is added or removed from the container.

- The containers will not be opened, stored, or handled in a manner which will cause the container to leak.

- The containers will be labeled to accurately identify their contents.

- The storage area and containers will be inspected at least weekly to identify leaks and/or deterioration. Inspection reports will be documented in writing.

- Incompatible wastes will not be placed within the same container or in an unwashed container that previously held an incompatible waste or material.

- A container holding a waste that is incompatible with other wastes or materials will be segregated from the other materials or protected by means of an impermeable dike, wall, berm or other device.

- Upon project closure, all hazardous waste and hazardous waste residues will be removed from the containment system. The containment system will be decontaminated and all wastes will be disposed off-site at a permitted disposal facility.

- Appropriate hazardous training will be provided to site personnel as per 40 CFR 265.16.

- A Contingency Plan will be developed to handle any fire, spill, or emergency and appropriate emergency response equipment (spill cleanup materials, fire protection equipment, communication devices and alarms to notify workers of an emergency are) and will be present as required under 40 CFR 265 Subparts C & D.

9.0 PROJECT MANAGEMENT

The project management team shall be responsible for all technical and administrative aspects of the remediation project.

9.1 PROJECT SCHEDULE

The project schedule is provided as Figure 9-1.

9.1.1 Daily Safety Meetings

Prior to starting work, a daily safety meeting will be conducted by the Foster Wheeler Environmental Health and Safety Officer. All of the day's planned activities will be reviewed, with particular attention focused on PPE and risk. All personnel are required to attend the meeting.

10.0 QUALITY ASSURANCE/QUALITY CONTROL

This Quality Assurance/Quality Control (QA/QC) section describes the organization, inspections, tests, procedures, and documentation necessary to produce a completed project which complies with the governing regulations and the technical statement of work.

10.1 ORGANIZATION AND RESPONSIBILITIES

QA/QC duties are the responsibility of the Senior Project Engineer/Manager (SPEM). He will employ physical inspections, direct measurement, and confirmatory laboratory testing to verify that work is being performed in accordance with the project plans. All subcontractors will conform to and participate in the program described herein as part of a unified team.

Foster Wheeler Environmental will direct and maintain responsibility for the overall QA/QC program and will manage subcontractors in a manner to maintain project requirements. Subcontractors shall be used for drilling, laboratory analysis, and waste disposal.

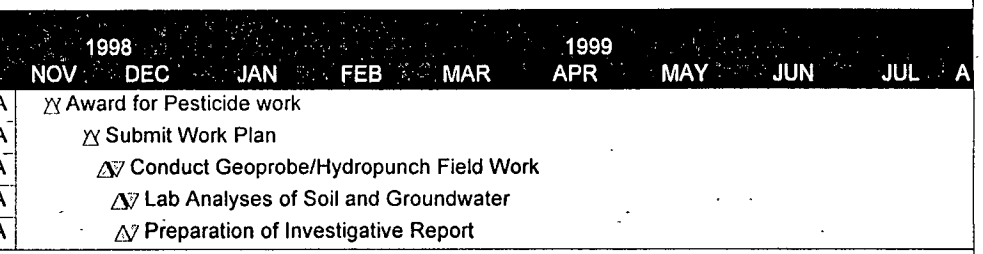
10.2 PROBLEM OR WORK DEFICIENCY MEETINGS

If a major problem or deficiency occurs or is likely to occur, a special meeting to address related issues will be held. The meeting may be attended by the SPEM, Navy Representative(s) and others, as required. Meetings may be conducted at NWS Earle, NORDIV, or by teleconference. The purpose of the meeting will be to define and resolve potential problems or work deficiencies in the following manner:

Naval Weapons Station-Earle

Former Pesticide Shop
Geoprobe Investigation

Act ID	Description	Orig Dur	Rem Dur	Early Start	Early Finish
1000	Award for Pesticide work	1d	0	19NOV98 A	19NOV98 A
1010	Submit Work Plan	1d	0	30NOV98 A	30NOV98 A
1040	Conduct Geoprobe/Hydropunch Field Work	1d	0	04DEC98 A	07DEC98 A
1050	Lab Analyses of Soil and Groundwater	1d	0	08DEC98 A	11DEC98 A
1070	Preparation of Investigative Report	1d	0	09DEC98 A	11DEC98 A



- Early start point
- Early finish point
- Early bar
- Late finish point
- Total float bar
- Progress bar
- Critical bar
- Summary bar
- Progress point
- Critical point
- Summary point
- Start milestone point
- Finish milestone point

FIGURE 9-1
NWS-EARLE
FORMER PESTICIDE SHOP
SCHEDULE OF ACTIVITIES

Date	Revision	Checked	Approved

- Define and discuss the problem or deficiency
- Review alternative solutions, including their effects on schedule and budget
- Implement plan to resolve the problem or deficiency

10.3 SUBMITTALS

The only submittals for this task are the Work Plan, and the Investigation Report, which will detail the collection methods and analytical results of the sampling effort.

10.4 CHANGES

If circumstances develop during the project that make it necessary or advisable to revise the Work Plan in order to accomplish project objectives, a Change Request Form (CRF) will be forwarded to the Navy for approval. Events such as a change in the site conditions or system performance may result in a CRF. Changes may be discussed with the Navy Design Manager telephonically and followed up with a CRF to avoid negative impacts on the project budget.

10.5 DOCUMENTATION

Documentation of operations, record keeping, and as analytical results will be provided to the Navy in the Investigation Report.

10.5.1 Operations Record keeping

All field inspection and testing activities will be documented in a project logbook. The project logbook will be maintained in accordance with the relevant Foster Wheeler Environmental Field Technical Guidelines. The Project Manager will maintain records of quality control operations and activities for subcontractors and suppliers.

APPENDIX A

DELINEATION SAMPLING AND ANALYSIS

OLD PESTICIDE SHOP

NAVAL WEAPONS STATION

EARLE, NEW JERSEY

BACKGROUND AND LOCATION

NWS Earle is located in Monmouth County in east-central New Jersey. It is situated on approximately 11,134 acres, and includes a Mainside area, which is approximately ten miles inland from the Atlantic Ocean at Sandy Hook Bay, and a Waterfront area, which includes an ammunition depot and associated piers. The Mainside and Waterfront areas are linked by a narrow tract of land that serves as a right-of-way for a government road and railroad. The main entrance to NWS Earle is located off State Route 34.

NWS Earle was commissioned as a Naval Ammunition Depot on December 13, 1943, with the primary responsibility of furnishing ammunition to the naval fleet. The station's Ordnance Department coordinates all port services and logistic support for home-ported and visiting ships, conducts safety inspections, supervises ammunition loading for the United States Coast Guard, and provides afloat firefighting capability and standby tug services.

The Mainside area lies in the outer Coastal Plain, approximately ten miles inland from the Atlantic Ocean. The Mainside area is relatively flat, with elevations ranging from approximately 100 to 300 feet above mean sea level (MSL). The most significant topographic relief within the Mainside area is Hominy Hills, a northeast-southwest-trending group of low hills located near the center of the station.

Building S-186 (Old Pesticide Shop) located on the Mainside area, north of the intersection of Esperance and Macassar Roads served as the pesticide shop for the Mainside area. Two soil samples, one surface soil (0-0.5 ft. BGS) and one hand augured subsurface soil (1-2 ft. BGS), were collected north of Building S-186 in August 1995. Pesticides were detected in both of these samples, with the surface soil sample having much higher concentrations (390-140,000 ug/kg) than the subsurface sample (0.13-47 ug/kg). The pesticides detected in both samples included, Heptachlor, Aldrin, Dieldrin, 4,4'-DDD, 4,4'-DDT, alpha-Chlordane, and gamma-Chlordane.

RESULTS OF SCREENING SAMPLING AND ANALYSIS AT THE OLD PESTICIDE SHOP

Screening sampling was conducted at the Old Pesticide Shop on January 29, 1998. The objectives of the screening sampling and analysis (S&A) program was to determine if operations at the building had resulted in releases which had contaminated the building or surrounding area with organochlorine or organophosphorous pesticides.

The sampling was conducted in accordance with a sampling plan developed by Brown & Root Environmental following the New Jersey Department of Environmental Protection (NJDEP) Field Sampling Procedures Manual dated May 1992 and Brown & Root Environmental sampling standard operating procedures (SOPs). The following samples were obtained.

- Four wipe samples of interior wall surfaces from the Old Pesticide Shop
- Four core samples of concrete from the pad located in front of the Old Pesticide Shop
- Nine composite samples of surface soils surrounding the Old Pesticide Shop
- One sediment sample from the septic tank servicing the Old Pesticide Shop

All samples were analyzed for the full suite of Appendix IX Organochlorine Pesticides by EPA method SW-846 8081A and Appendix IX Organophosphorous pesticides by EPA Method SW-846 8141A.

A report on the results of the screening sampling dated March 11, 1998 stated the following conclusions regarding the soil at the Old Pesticides Shop:

The vertical and horizontal xtent of organochlorine pesticide contamination should be further delineated. Additional surface and subsurface soils samples should be collected and analyzed for RCRA Appendix IX organochlorine pesticides. Near subsurface (one foot and three foot) soil samples should be taken to determine if any organochlorine pesticides have migrated to the subsurface. Subsurface samples could be limited to one foot and three foot depths because organochlorine pesticides are generally not mobile in soil. Therefore, little, if any, migration of organochlorine pesticides, found in surface soils, to subsurface soils is expected.

RESULTS OF DELINEATION SOIL SAMPLING AT OLD PESTICIDE SHOP

Sampling of surface and subsurface soils was conducted at the Old Pesticide Shop on April 21 and 22, 1998. Twenty-three soil locations at the Old Pesticide Shop were sampled at three different depths (surface, and one- and three-feet below ground surface). Attachment 1 contains the report of field sampling activities. All samples were analyzed for chlorinated organic pesticides by SW 846 8081A. Table 1 contains a summary of all positive detections. Included in Table 1 is a comparison to Region III industrial and residential soil standards for pesticides. Information is also included in Table 1 on concentrations of chlordane and heptachlor, which if completely leached, could result in the soil being classified as hazardous waste for disposal purposes.

Chlordane and 4,4'-DDT were the most prevalent pesticides found. Chlordane was found in 20 out of 23 surface soil samples. In eight 8 samples the Region III risk based standard for chlordane in industrial soil was exceeded. One surface soil sample exceeded the Region III chlordane standard for residential soil but was below the industrial standard. Chlordane concentrations decreased with depth. At the 1-foot and 3-foot levels, only 1 sample exceeded Region III industrial soil standards.

4,4'-DDT was found in 13 of 23 surface soil samples. In two surface soil samples the Region III industrial soil standard for 4,4'-DDT was exceeded. Concentrations in the subsurface soils did not exceed the Region III industrial standard.

4,4'-DDD and 4,4'-DDE were detected in several surface soil samples but in all cases in concentrations were well below the Region III industrial soil standards. Both compounds were found to a lesser extent in subsurface soils.

Beta-BHC was found in one surface sample at a low concentration (4 ug/kg) and was not detected in the subsurface. Heptachlor epoxide was found in two surface and one subsurface soil sample at low concentrations relative to the concentrations of other detected organochlorine pesticides.

Figure 1 shows the location of each of the 23 sampling points and the positive results for each of the three soil depths sampled at each point for 4,4'-DDD, 4,4-DDE, 4,4'-DDT and chlordane, the four most prevalent pesticides. Attachment 2 contains the analytical data summary.

TABLE 1

SUMMARY OF POSITIVE PESTICIDE DETECTIONS
OLD PESTICIDE SHOP
NWS EARLE
EARLE, NEW JERSEY

SAMPLE ID	4,4'-DDD	4,4'-DDE	4,4'-DDT	CHLORDANE	BETA-BHC	HEPTACHLOR EPOXIDE
Soil Residential	**2700**	**1900**	**1900**	**1800[1]**		**140**
Soil Industrial	**24000**	**17000**	**17000**	**16000[1]**		**1300[2]**
RB-DATE						
SS-10				31000[1]		
SS-10-DUP				31000[1]		
SB-10-01				450		
SB-10-03				4		
SS-11	19	150	850	330		
SB -11-01						
SB-11-03						
SS-12				200000[1]		
SB-12-01				1200[1]		
SB-12-03				250		
SS-13	1500	360	12000	720[1]		
SB-13-01	50	9	510	23		
SB-13-03	3		8	4		
SS-14	49	320	360	180		
SB-14-01		2	2		4	
SB-14-01 DUP		3	3			
SB-14-03						
SS-15	290	1000	1700	2600[1]		
SB-15-01		32	41	130		
SB-15-03			2			
SS-16		90	99			
SB-16-01		26	28			
SB-16-03		2	2			
SS-17		160	200			
SB-17-01						
SB-17-03						
SS-18				180000[1]		
SB-18-01				1200[1]		
SB-18-03				42000[1]		
SB-18-03 DUP				25000[1]		
SS-19				6600[1]		
SB-19-01				320		
SB-19-03	3			56		3
SS-20		17	29	430		6
SB-20-01				20		
SB-20-03				4		
SS-21			17	680[1]		24
SB-21-01				17		
SB-21-03						
SB-21-03 DUP				14		
SS-22				17000[1]		
SB-22-01				18000[1]		
SB-22-03				300		
SS-23				1300[1]		

TABLE 1

SUMMARY OF POSITIVE PESTICIDE DETECTIONS
OLD PESTICIDE SHOP
NWS EARLE
EARLE, NEW JERSEY

SAMPLE ID	4,4'-DDD	4,4'-DDE	4,4'-DDT	CHLORDANE	BETA-BHC	HEPTACHLOR EPOXIDE
Soil Residential	2700	1900	1900	1800(1)		140
Soil Industrial	24000	17000	17000	16000(1)		1300(2)
SB-23-01			2	53		
SB-23-03				10		
SS-24				30000(1)		
SS-24 DUP				32000(1)		
SB-24-01				180		
SB-24-03				28		2
SS-25				24000(1)		
SB-25-01				180		
SB-25-01 DUP				120		
SB-25-03				180		
SS-26		710	19000			
SS-26RE			20000			
SB-26-01		340	6300			
SB-26-03		420	590			
SS-27				650		
SB-27-01				28		
SB-27-03				5		
SS-28			52000	140000(1)		
SB-28-01			380	1900		
SB-28-03			5	9		
SS-29		8	16	73		
SB-29-01		55	77	200		
SB-29-03		6	9	19		
SB-29-03 DUP		15	35	77		
SS-30			350	2700(1)		
SB-30-01		200	840	210		
SB-30-03		4	9	13		
SS-31			12	170		
SB-31-01				2000000(1)		
SB-31-03		38	100	2000(1)		
SS-32				580		
SB-32-01	58	59				
SB-32-03		3		20		

All results in micrograms/kilogram (ug/kg)

= Exceeds Region III residential soil standard

= Exceeds Region III industrial soil standard

1 - Exceeds 20 X TC level of 30 ug/l

2 - Exceeds 20 X TC level of 8 ug/l

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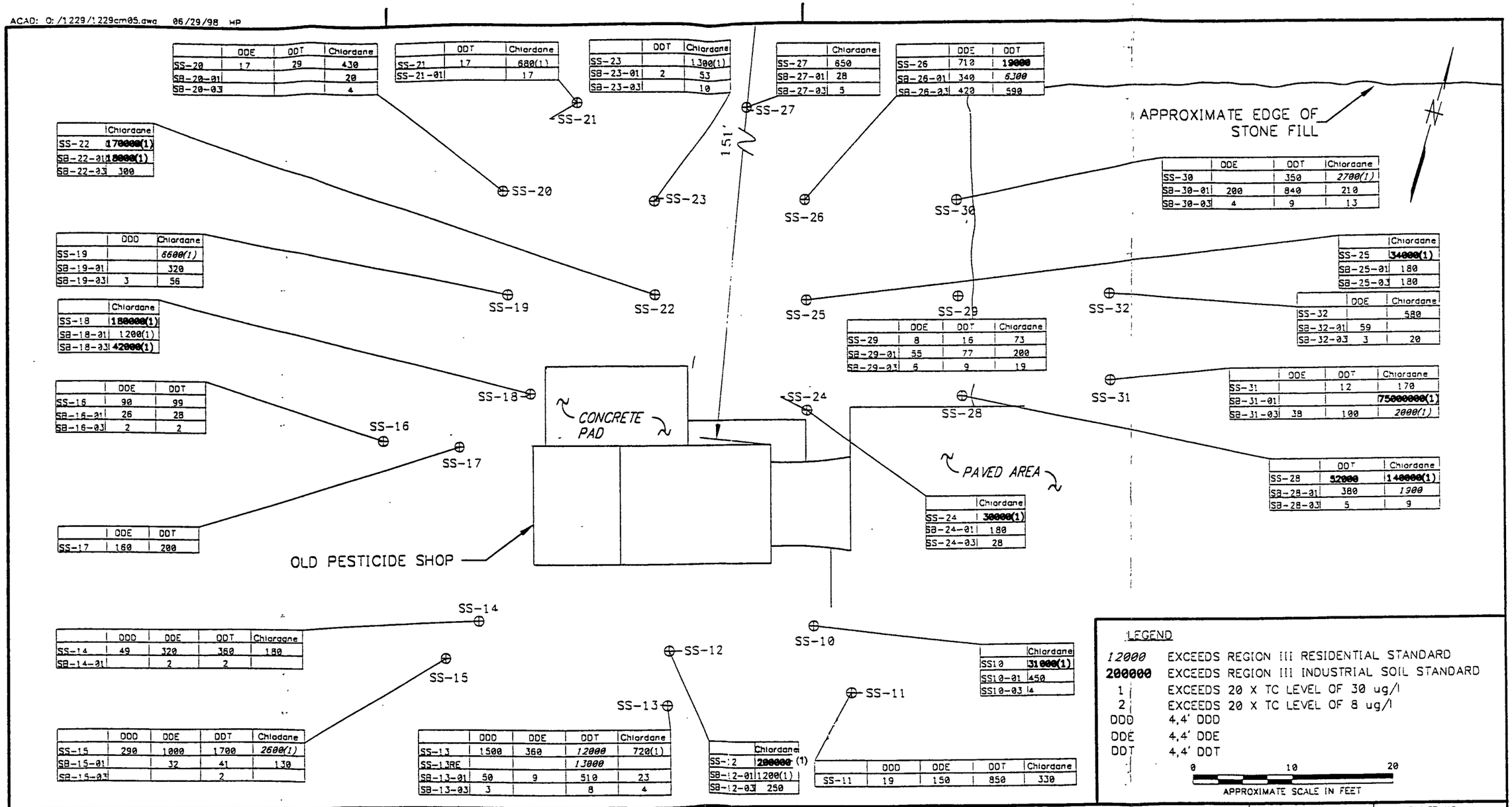

	DDE	DDT	Chlordane
SS-20	17	29	430
SB-20-01			20
SB-20-03			4

	DDT	Chlordane
SS-21	17	680(1)
SS-21-01		17

	DDT	Chlordane
SS-23		1300(1)
SB-23-01	2	53
SB-23-03		10

	Chlordane
SS-27	650
SB-27-01	28
SB-27-03	5

	DDE	DDT
SS-26	710	19000
SB-26-01	340	6300
SB-26-03	420	590

	Chlordane
SS-22	170000(1)
SB-22-01	18000(1)
SB-22-03	300

	DDE	DDT	Chlordane
SS-30		350	2700(1)
SB-30-01	200	840	210
SB-30-03	4	9	13

	DDD	Chlordane
SS-19		6600(1)
SB-19-01		320
SB-19-03	3	56

	Chlordane
SS-25	34000(1)
SB-25-01	180
SB-25-03	180

	Chlordane
SS-18	180000(1)
SB-18-01	1200(1)
SB-18-03	42000(1)

	DDE	Chlordane
SS-32		580
SB-32-01	59	
SB-32-03	3	20

	DDE	DDT	Chlordane
SS-29	8	16	73
SB-29-01	55	77	200
SB-29-03	6	9	19

	DDE	DDT
SS-16	90	99
SB-16-01	26	28
SB-16-03	2	2

	DDE	DDT	Chlordane
SS-31		12	170
SB-31-01			75000000(1)
SB-31-03	38	100	2000(1)

	DDT	Chlordane
SS-28	52000	140000(1)
SB-28-01	380	1900
SB-28-03	5	9

	Chlordane
SS-24	30000(1)
SB-24-01	180
SS-24-03	28

	DDE	DDT
SS-17	160	200

	DDD	DDE	DDT	Chlordane
SS-14	49	320	360	180
SB-14-01		2	2	

	Chlordane
SS10	31000(1)
SS10-01	450
SS10-03	4

	DDD	DDE	DDT	Chlordane
SS-15	290	1000	1700	2600(1)
SB-15-01		32	41	130
SB-15-03			2	

	DDD	DDE	DDT	Chlordane
SS-13	1500	360	12000	720(1)
SS-13RE			13000	
SB-13-01	50	9	510	23
SB-13-03	3		8	4

	Chlordane
SS-12	200000 (1)
SB-12-01	1200(1)
SB-12-03	250

	DDD	DDE	DDT	Chlordane
SS-11	19	150	850	330

LEGEND

12000	EXCEEDS REGION III RESIDENTIAL STANDARD
200000	EXCEEDS REGION III INDUSTRIAL SOIL STANDARD
1	EXCEEDS 20 X TC LEVEL OF 30 ug/l
2	EXCEEDS 20 X TC LEVEL OF 8 ug/l
DDD	4,4' DDD
DDE	4,4' DDE
DDT	4,4' DDT

0 10 20

APPROXIMATE SCALE IN FEET

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY HJP DATE 6/29/98

CHECKED BY DATE

COST/SCHED-AREA

SCALE AS NOTED

Brown & Root Environmental

DELINEATION SAMPLING POINTS
OLD PESTICIDE SHOP SAMPLING -CTO 154
NWS EARLE
COLTS NECK, NEW JERSEY

CONTRACT NO. 1229

OWNER NO. ----

APPROVED BY DATE

APPROVED BY DATE

DRAWING NO. FIGURE 1

REV. 0

FORM CADD NO. SOUTH_BM.DGN - REV 0 - 02/11/97

ATTACHMENT 1

FIELD TRIP REPORT

FIELD TRIP REPORT

FOR

DELINEATION SAMPLING at the OLD PESTICIDE SHOP and SCREENING SAMPLING at the OLD PRECIOUS METALS RECOVERY FACILITY at NWS EARLE

Prepared by

Brown & Root Environmental

May 1998

1.0 OLD PESTICIDE SHOP

1.1 Introduction

The primary objective of the additional sampling at the Old Pesticide Shop was to further delineate the contamination found during the screening sampling and analysis. In order to accomplish this objective additional sampling and analysis for chlorinated pesticides was conducted. The additional sampling consisted of collecting surface and subsurface soils, surrounding the building, at 23 different locations and from three depths (surface, one foot below ground surface, and three feet below ground surface). All samples were analyzed for chlorinated pesticides. The results of the additional sampling and analysis will be used as the basis for determining the potential extent of pesticide contamination.

1.2 Surface soil sampling

On April 20 and 21, 1998, 25 surface soil samples (including two duplicates) were collected at the Old Pesticide Shop. The locations were based upon the previous sampling event results and were selected in the field. The locations were spaced evenly at 7.5-foot by 15 to 20-foot spaces throughout the southern side of the site and 10 foot by 15 foot spaces throughout the northern side of the site.

The soil samples were collected according to NJDEP Field Sampling Procedures Manual dated May 1992 and B&R Environmental SOP SA-1.3. Stainless steel trowels were used to obtain the samples and were decontaminated with Liquidnox, water, methanol, and deionized water between sample locations. The soil samples were placed directly into laboratory supplied 8-ounce jars and stored on ice. All surface soil samples were analyzed for chlorinated pesticides at RECRA Lab Net in University Park, Illinois.

The surface soils generally consisted of grayish-dark brown silty fine grained sand with some organics. No elevated Photo Ionization Detector (PID) readings were observed or noted in the surface soils.

1.3 Subsurface soil sampling

On April 20 and 21, 1998, 25 subsurface soil samples (including two duplicates) were collected from a depth of 1-foot below ground surface (bgs) and 26 subsurface soil samples (including three duplicates) were collected from a depth of 3-feet bgs at the Old Pesticide Shop. The location of each subsurface soil sample corresponded with the same location as the surface soil sample.

A stainless steel hand auger and trowel were used to obtain the samples and were decontaminated with Liquidnox, water, methanol, and deionized water between sample locations. The soil samples were placed directly into laboratory supplied 8-ounce jars and stored on ice. All subsurface soil samples were analyzed for chlorinated pesticides at RECRA Lab Net in University Park, Illinois.

The subsurface soils at 1-foot bgs generally consisted of a dark grayish brown to grayish tan silty fine grained sand or an olive green clayey fine grained sand with some silt. Elevated PID readings were observed and noted at locations 25, 26, 28, and 29. These PID readings ranged between 1.0 PPM to 6.0 PPM. There were sweet aromatic odors observed at these same locations.

The subsurface soils at 3-feet bgs generally consisted of tan, orange-tan, or grayish brown silty fine grained sand with some subround pebbles. Elevated PID readings were observed and noted at locations 25, 26, and 29. These PID readings ranged between 1.2 PPM and 10.8 PPM. There were sweet aromatic odors observed at these same locations.

The hand auger soil borings were backfilled with the soil cuttings that were removed from each location.

2.0 Old Precious Metals Recovery Facility

2.1 Introduction

The primary objective of the sampling at the Precious Metals Recovery Facility was to determine if operations had resulted in contamination of the building interior or exterior structures, of the soil immediately surrounding the building, or of the drainage ditch located east and south of the building complex. In order to accomplish this objective a screening sampling and analysis for Target Analyte List Metals was conducted. The screening sampling consisted of wipe

ATTACHMENT 2

PESTICIDE SHOP

DELINEATION SAMPLING ANALYTICAL DATA

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04346

SAMPLE NUMBER:	186-DUP-01			186-DUP-02			186-SB-10-01			186-SB-10-03		
SAMPLE DATE:	04/20/98			04/20/98			04/20/98			04/20/98		
LABORATORY ID:	9804G346-004			9804G346-014			9804G346-002			9804G346-003		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	87 8 %			89 4 %			85 2 %			91 1 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	1900	U		1 8	U		38	U		1 8	U	
4,4'-DDE	1900	U		2 9			38	U		1.8	U	
4,4'-DDT	1200	J		2 5			38	U		1 8	U	
ALDRIN	940	U		0 90	U		19	U		0 90	U	
ALPHA-BHC	940	U		0 90	U		19	U		0.90	U	
BETA-BHC	940	U		0 90	U		19	U		0 90	U	
CHLORDANE	31000			3 6	U		450			3 6		
DELTA-BHC	940	U		0 90	U		19	U		0 90	U	
DIELDRIN	1900	U		1 8	U		38	U		1 8	U	
ENDOSULFAN I	940	U		0 90	U		19	U		0 90	U	
ENDOSULFAN II	1900	U		1 8	U		38	U		1 8	U	
ENDOSULFAN SULFATE	1900	U		1 8	U		38	U		1 8	U	
ENDRIN	1900	U		1 8	U		38	U		1 8	U	
ENDRIN ALDEHYDE	1900	U		1.8	U		38	U		1 8	U	
ENDRIN KETONE	1900	U		1 8	U		38	U		1 8	U	
GAMMA-BHC (LINDANE)	940	U		0 90	U		19	U		0 90	U	
HEPTACHLOR	940	U		0 90	U		19	U		0 90	U	
HEPTACHLOR EPOXIDE	940	U		0.90	U		19	U		0 90	U	
METHOXYCHLOR	9400	U		9 0	U		190	U		9 0	U	
TOXAPHENE	19000	U		18	U		380	U		18	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04346

SAMPLE NUMBER:	186-SB-11-01			186-SB-11-03			186-SB-12-01			186-SB-12-03		
SAMPLE DATE:	04/20/98			04/20/98			04/20/98			04/20/98		
LABORATORY ID.	9804G346-007			9804G346-005			9804G346-009			9804G346-010		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	90 1 %			92 9 %			89 0 %			94 8 %		
UNITS.	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	1 8	U		1 8	U		93	U		17	U	
4,4'-DDE	1 8	U		1.8	U		93	U		17	U	
4,4'-DDT	1 8	U		1.8	U		93	U		17	U	
ALDRIN	0 92	U		0 88	U		46	U		8 7	U	
ALPHA-BHC	0.92	U		0 88	U		46	U		8 7	U	
BETA-BHC	0 92	U		0 88	U		46	U		8 7	U	
CHLORDANE	3 7	U		3 5	U		1200			250		
DELTA-BHC	0 92	U		0 88	U		46	U		8.7	U	
DIELDRIN	1 8	U		1 8	U		93	U		17	U	
ENDOSULFAN I	0.92	U		0 88	U		46	U		8 7	U	
ENDOSULFAN II	1 8	U		1.8	U		93	U		17	U	
ENDOSULFAN SULFATE	1.8	U		1.8	U		93	U		17	U	
ENDRIN	1 8	U		1 8	U		93	U		17	U	
ENDRIN ALDEHYDE	1.8	U		1 8	U		93	U		17	U	
ENDRIN KETONE	1 8	U		1 8	U		93	U		17	U	
GAMMA-BHC (LINDANE)	0 92	U		0 88	U		46	U		8.7	U	
HEPTACHLOR	0 92	U		0 88	U		46	U		8 7	U	
HEPTACHLOR EPOXIDE	0 92	U		0 88	U		46	U		8.7	U	
METHOXYCHLOR	9 2	U		8 8	U		460	U		87	U	
TOXAPHENE	18	U		18	U		930	U		170	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04346

SAMPLE NUMBER:	186-SB-13-01			186-SB-13-01RE			186-SB-13-03			186-SB-14-01		
SAMPLE DATE:	04/20/98			04/20/98			04/20/98			04/20/98		
LABORATORY ID:	9804G346-012			9804G346-012			9804G346-013			9804G346-016		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	90 9 %			90 9 %			93 5 %			91 9 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	50			18	U		3 2			1 8	U	
4,4'-DDE	9 0			18	U		1 8	U		1 8		
4,4'-DDT	510			500			7 8			1 8		
ALDRIN	4 5	U		9 0	U		0 88	U		0 90	U	
ALPHA-BHC	4 5	U		9 0	U		0 88	U		0 90	U	
BETA-BHC	4 5	U		9 0	U		0 88	U		3 6		
CHLORDANE	23			36	U		4 4			3 6	U	
DELTA-BHC	4 5	U		9 0	U		0 88	U		0 90	U	
DIELDRIN	9 0	U		18	U		1 8	U		1 8	U	
ENDOSULFAN I	4 5	U		9 0	U		0 88	U		0 90	U	
ENDOSULFAN II	9 0	U		18	U		1 8	U		1 8	U	
ENDOSULFAN SULFATE	9 0	U		18	U		1 8	U		1 8	U	
ENDRIN	9 0	U		18	U		1 8	U		1 8	U	
ENDRIN ALDEHYDE	9 0	U		18	U		1 8	U		1 8	U	
ENDRIN KETONE	9 0	U		18	U		1 8	U		1 8	U	
GAMMA-BHC (LINDANE)	4.5	U		9 0	U		0 88	U		0 90	U	
HEPTACHLOR	4 5	U		9 0	U		0 88	U		0 90	U	
HEPTACHLOR EPOXIDE	4 5	U		9 0	U		0 88	U		0 90	U	
METHOXYCHLOR	45	U		90	U		8 8	U		9 0	U	
TOXAPHENE	90	U		180	U		18	U		18	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04346

SAMPLE NUMBER.	186-SB-14-03			186-SB-15-01			186-SB-15-03			186-SS-10		
SAMPLE DATE.	04/20/98			04/20/98			04/20/98			04/20/98		
LABORATORY ID:	9804G346-017			9804G346-019			9804G346-020			9804G346-001		
QC_TYPE.	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	92 9 %			89.7 %			94 6 %			90 2 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	1 8	U		18	U		1 8	U		1800	U	
4,4'-DDE	1.8	U		32			1 4	J		1800	U	
4,4'-DDT	1 8	U		41			2 1			1800	U	
ALDRIN	0 89	U		9 2	U		0 88	U		910	U	
ALPHA-BHC	0 89	U		9 2	U		0 88	U		910	U	
BETA-BHC	0 89	U		9 2	U		0 88	U		910	U	
CHLORDANE	3 6	U		130			3 5	U		31000		
DELTA-BHC	0 89	U		9 2	U		0 88	U		910	U	
DIELDRIN	1.8	U		18	U		1 8	U		1800	U	
ENDOSULFAN I	0 89	U		9 2	U		0 88	U		910	U	
ENDOSULFAN II	1.8	U		18	U		1 8	U		1800	U	
ENDOSULFAN SULFATE	1 8	U		18	U		1 8	U		1800	U	
ENDRIN	1.8	U		18	U		1 8	U		1800	U	
ENDRIN ALDEHYDE	1.8	U		18	U		1 8	U		1800	U	
ENDRIN KETONE	1 8	U		18	U		1 8	U		1800	U	
GAMMA-BHC (LINDANE)	0 89	U		9 2	U		0 88	U		910	U	
HEPTACHLOR	0 89	U		9 2	U		0 88	U		910	U	
HEPTACHLOR EPOXIDE	0 89	U		9 2	U		0 88	U		910	U	
METHOXYCHLOR	8 9	U		92	U		8 8	U		9100	U	
TOXAPHENE	18	U		180	U		18	U		18000	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04346

SAMPLE NUMBER:	186-SS-11			186-SS-12			186-SS-13			186-SS-13RE		
SAMPLE DATE:	04/20/98			04/20/98			04/20/98			04/20/98		
LABORATORY ID.	9804G346-006			9804G346-008			9804G346-011			9804G346-011		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	91 4 %			89 3 %			92.3 %			92 3 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	19			18000	U		1500			890	U	
4,4'-DDE	150			18000	U		360			890	U	
4,4'-DDT	850			18000	U		12000			13000		
ALDRIN	18	U		9100	U		89	U		450	U	
ALPHA-BHC	18	U		9100	U		89	U		450	U	
BETA-BHC	18	U		9100	U		89	U		450	U	
CHLORDANE	330			200000			720			1800	U	
DELTA-BHC	18	U		9100	U		89	U		450	U	
DIELDRIN	36	U		18000	U		180	U		890	U	
ENDOSULFAN I	18	U		9100	U		89	U		450	U	
ENDOSULFAN II	36	U		18000	U		180	U		890	U	
ENDOSULFAN SULFATE	36	U		18000	U		180	U		890	U	
ENDRIN	36	U		18000	U		180	U		890	U	
ENDRIN ALDEHYDE	36	U		18000	U		180	U		890	U	
ENDRIN KETONE	36	U		18000	U		180	U		890	U	
GAMMA-BHC (LINDANE)	18	U		9100	U		89	U		450	U	
HEPTACHLOR	18	U		9100	U		89	U		450	U	
HEPTACHLOR EPOXIDE	18	U		9100	U		89	U		450	U	
METHOXYCHLOR	180	U		91000	U		890	U		4500	U	
TOXAPHENE	360	U		180000	U		1800	U		8900	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04346

SAMPLE NUMBER:	186-SS-14			186-SS-15			/ /			/ /		
SAMPLE DATE:	04/20/98			04/20/98								
LABORATORY ID:	9804G346-015			9804G346-018								
QC_TYPE:	NORMAL			NORMAL								
% SOLIDS:	84 1 %			78 8 %			100 0 %			100 0 %		
UNITS:	UG/KG			UG/KG								
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	49			290								
4,4'-DDE	320			1000								
4,4'-DDT	360			1700								
ALDRIN	9 8	U		100	U							
ALPHA-BHC	9 8	U		100	U							
BETA-BHC	9 8	U		100	U							
CHLORDANE	180			2600								
DELTA-BHC	9 8	U		100	U							
DIELDRIN	20	U		210	U							
ENDOSULFAN I	9 8	U		100	U							
ENDOSULFAN II	20	U		210	U							
ENDOSULFAN SULFATE	20	U		210	U							
ENDRIN	20	U		210	U							
ENDRIN ALDEHYDE	20	U		210	U							
ENDRIN KETONE	20	U		210	U							
GAMMA-BHC (LINDANE)	9 8	U		100	U							
HEPTACHLOR	9 8	U		100	U							
HEPTACHLOR EPOXIDE	9 8	U		100	U							
METHOXYCHLOR	98	U		1000	U							
TOXAPHENE	200	U		2100	U							

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04347

SAMPLE NUMBER:	186-DUP-03			186-SB-16-01			186-SB-16-03			186-SB-17-01		
SAMPLE DATE:	04/20/98			04/20/98			04/20/98			04/20/98		
LABORATORY ID:	9804G347-007			9804G347-002			9804G347-003			9804G347-005		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	91.5 %			83 9 %			93 0 %			92 5 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	1800	U		1 9	U		1 8	U		1 8	U	
4,4'-DDE	1800	U		26			1.8			1 8	U	
4,4'-DDT	1800	U		28			1 8			1.8	U	
ALDRIN	900	U		0 97	U		0 88	U		0 89	U	
ALPHA-BHC	900	U		0 97	U		0 88	U		0 89	U	
BETA-BHC	900	U		0 97	U		0 88	U		0 89	U	
CHLORDANE	25000			3 9	U		3 5	U		3 6	U	
DELTA-BHC	900	U		0 97	U		0 88	U		0 89	U	
DIELDRIN	1800	U		1 9	U		1.8	U		1 8	U	
ENDOSULFAN I	900	U		0 97	U		0 88	U		0 89	U	
ENDOSULFAN II	1800	U		1 9	U		1 8	U		1 8	U	
ENDOSULFAN SULFATE	1800	U		1 9	U		1 8	U		1 8	U	
ENDRIN	1800	U		1 9	U		1 8	U		1 8	U	
ENDRIN ALDEHYDE	1800	U		1 9	U		1 8	U		1 8	U	
ENDRIN KETONE	1800	U		1 9	U		1 8	U		1 8	U	
GAMMA-BHC (LINDANE)	900	U		0 97	U		0 88	U		0 89	U	
HEPTACHLOR	900	U		0 97	U		0 88	U		0 89	U	
HEPTACHLOR EPOXIDE	900	U		0 97	U		0 88	U		0 89	U	
METHOXYCHLOR	9000	U		9 7	U		8 8	U		8.9	U	
TOXAPHENE	18000	U		19	U		18	U		18	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04347

SAMPLE NUMBER:	186-SB-17-03			186-SB-18-01			186-SB-18-03			186-SB-19-01		
SAMPLE DATE:	04/20/98			04/20/98			04/20/98			04/20/98		
LABORATORY ID:	9804G347-006			9804G347-009			9804G347-010			9804G347-012		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	90 8 %			90 2 %			88.1 %			94 7 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	1 8	U		90	U		940	U		8 7	U	
4,4'-DDE	1 8	U		90	U		940	U		8.7	U	
4,4'-DDT	1 8	U		90	U		940	U		8 7	U	
ALDRIN	0 91	U		45	U		470	U		4 4	U	
ALPHA-BHC	0 91	U		45	U		470	U		4.4	U	
BETA-BHC	0 91	U		45	U		470	U		4.4	U	
CHLORDANE	3 6	U		1200			42000			320		
DELTA-BHC	0 91	U		45	U		470	U		4.4	U	
DIELDRIN	1.8	U		90	U		940	U		8 7	U	
ENDOSULFAN I	0 91	U		45	U		470	U		4 4	U	
ENDOSULFAN II	1 8	U		90	U		940	U		8 7	U	
ENDOSULFAN SULFATE	1 8	U		90	U		940	U		8 7	U	
ENDRIN	1.8	U		90	U		940	U		8 7	U	
ENDRIN ALDEHYDE	1 8	U		90	U		940	U		8 7	U	
ENDRIN KETONE	1 8	U		90	U		940	U		8 7	U	
GAMMA-BHC (LINDANE)	0 91	U		45	U		470	U		4 4	U	
HEPTACHLOR	0 91	U		45	U		470	U		4.4	U	
HEPTACHLOR EPOXIDE	0 91	U		45	U		470	U		4 4	U	
METHOXYCHLOR	9.1	U		450	U		4700	U		44	U	
TOXAPHENE	18	U		900	U		9400	U		87	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04347

SAMPLE NUMBER:	186-SB-19-03			186-SB-20-01			186-SB-20-03			186-SB-21-01		
SAMPLE DATE:	04/20/98			04/21/98			04/21/98			04/21/98		
LABORATORY ID:	9804G347-013			9804G347-016			9804G347-017			9804G347-019		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	92 5 %			94 8 %			93 0 %			94.3 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	1 8	U		1 7	U		1 8	U		1 7	U	
4,4'-DDE	1.8	U		1 7	U		1 8	U		1.7	U	
4,4'-DDT	1.1	J		1.7	U		1 8	U		1.7	U	
ALDRIN	0 88	U		0 85	U		0 88	U		0 87	U	
ALPHA-BHC	0 88	U		0 85	U		0 88	U		0 87	U	
BETA-BHC	0 88	U		0 85	U		0 88	U		0 87	U	
CHLORDANE	56			20			3 5	U		17		
DELTA-BHC	0 88	U		0 85	U		0 88	U		0 87	U	
DIELDRIN	1 8	U		1 7	U		1 8	U		1.7	U	
ENDOSULFAN I	0 88	U		0 85	U		0 88	U		0 87	U	
ENDOSULFAN II	1.8	U		1.7	U		1 8	U		1.7	U	
ENDOSULFAN SULFATE	1.8	U		1.7	U		1 8	U		1 7	U	
ENDRIN	1.8	U		1.7	U		1.8	U		1 7	U	
ENDRIN ALDEHYDE	1.8	U		1 7	U		1 8	U		1 7	U	
ENDRIN KETONE	1 8	U		1 7	U		1 8	U		1 7	U	
GAMMA-BHC (LINDANE)	0 88	U		0 85	U		0 88	U		0 87	U	
HEPTACHLOR	0 88	U		0 85	U		0 88	U		0 87	U	
HEPTACHLOR EPOXIDE	3 2			0 85	U		0 88	U		0 87	U	
METHOXYCHLOR	8 8	U		8 5	U		8 8	U		8 7	U	
TOXAPHENE	18	U		17	U		18	U		17	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04347

SAMPLE NUMBER:	186-SB-21-03			186-SS-16			186-SS-17			186-SS-18		
SAMPLE DATE:	04/21/98			04/20/98			04/20/98			04/20/98		
LABORATORY ID:	9804G347-020			9804G347-001			9804G347-004			9804G347-008		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	93.1 %			81.1 %			88.4 %			90.7 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	1.8	U		10	U		18	U		1800	U	
4,4'-DDE	1.8	U		90			160			1800	U	
4,4'-DDT	1.8	U		99			200			1800	U	
ALDRIN	0.88	U		5.1	U		9.3	U		920	U	
ALPHA-BHC	0.88	U		5.1	U		9.3	U		920	U	
BETA-BHC	0.88	U		5.1	U		9.3	U		920	U	
CHLORDANE	3.5	U		20	U		37	U		180000		
DELTA-BHC	0.88	U		5.1	U		9.3	U		920	U	
DIELDRIN	1.8	U		10	U		18	U		1800	U	
ENDOSULFAN I	0.88	U		5.1	U		9.3	U		920	U	
ENDOSULFAN II	1.8	U		10	U		18	U		1800	U	
ENDOSULFAN SULFATE	1.8	U		10	U		18	U		1800	U	
ENDRIN	1.8	U		10	U		18	U		1800	U	
ENDRIN ALDEHYDE	1.8	U		10	U		18	U		1800	U	
ENDRIN KETONE	1.8	U		10	U		18	U		1800	U	
GAMMA-BHC (LINDANE)	0.88	U		5.1	U		9.3	U		920	U	
HEPTACHLOR	0.88	U		5.1	U		9.3	U		920	U	
HEPTACHLOR EPOXIDE	0.88	U		5.1	U		9.3	U		920	U	
METHOXYCHLOR	8.8	U		51	U		93	U		9200	U	
TOXAPHENE	18	U		100	U		180	U		18000	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04347

SAMPLE NUMBER:	186-SS-19			186-SS-20			186-SS-21			/ /		
SAMPLE DATE:	04/20/98			04/21/98			04/21/98					
LABORATORY ID	9804G347-011			9804G347-015			9804G347-018					
QC_TYPE:	NORMAL			NORMAL			NORMAL					
% SOLIDS:	91 5 %			92.1 %			93 7 %			100 0 %		
UNITS:	UG/KG			UG/KG			UG/KG					
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	900	U		18	U		17	U				
4,4'-DDE	900	U		17			17	U				
4,4'-DDT	900	U		29			17					
ALDRIN	450	U		9 0	U		8 7	U				
ALPHA-BHC	450	U		9 0	U		8 7	U				
BETA-BHC	450	U		9 0	U		8 7	U				
CHLORDANE	6600			430			680					
DELTA-BHC	450	U		9 0	U		8 7	U				
DIELDRIN	900	U		18	U		17	U				
ENDOSULFAN I	450	U		9 0	U		8 7	U				
ENDOSULFAN II	900	U		18	U		17	U				
ENDOSULFAN SULFATE	900	U		18	U		17	U				
ENDRIN	900	U		18	U		17	U				
ENDRIN ALDEHYDE	900	U		18	U		17	U				
ENDRIN KETONE	900	U		18	U		17	U				
GAMMA-BHC (LINDANE)	450	U		9 0	U		8 7	U				
HEPTACHLOR	450	U		9 0	U		8 7	U				
HEPTACHLOR EPOXIDE	450	U		6 1			24					
METHOXYCHLOR	4500	U		90	U		87	U				
TOXAPHENE	9000	U		180	U		170	U				

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04376

SAMPLE NUMBER:	186-DUP-04			186-DUP-05			186-DUP-06			186-SB-22-01		
SAMPLE DATE:	04/21/98			04/21/98			04/21/98			04/21/98		
LABORATORY ID:	9804G376-001			9804G376-007			9804G376-017			9804G376-003		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	92 6 %			90 8 %			92.9 %			93 4 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	1 8	U		1800	U		18	U		880	U	
4,4'-DDE	1 8	U		1800	U		18	U		880	U	
4,4'-DDT	1 8	U		1800	U		18	U		880	U	
ALDRIN	0 88	U		910	U		8 8	U		440	U	
ALPHA-BHC	0 88	U		910	U		8 8	U		440	U	
BETA-BHC	0 88	U		910	U		8 8	U		440	U	
CHLORDANE	14			32000			120			18000		
DELTA-BHC	0 88	U		910	U		8 8	U		440	U	
DIELDRIN	1 8	U		1800	U		18	U		880	U	
ENDOSULFAN I	0 88	U		910	U		8 8	U		440	U	
ENDOSULFAN II	1.8	U		1800	U		18	U		880	U	
ENDOSULFAN SULFATE	1 8	U		1800	U		18	U		880	U	
ENDRIN	1 8	U		1800	U		18	U		880	U	
ENDRIN ALDEHYDE	1 8	U		1800	U		18	U		880	U	
ENDRIN KETONE	1.8	U		1800	U		18	U		880	U	
GAMMA-BHC (LINDANE)	0 88	U		910	U		8 8	U		440	U	
HEPTACHLOR	0 88	U		910	U		8 8	U		440	U	
HEPTACHLOR EPOXIDE	0 88	U		910	U		8 8	U		440	U	
METHOXYCHLOR	8 8	U		9100	U		88	U		4400	U	
TOXAPHENE	18	U		18000	U		180	U		8800	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04376

SAMPLE NUMBER.	186-SB-22-03			186-SB-23-01			186-SB-23-03			186-SB-24-01		
SAMPLE DATE:	04/21/98			04/21/98			04/21/98			04/21/98		
LABORATORY ID.	9804G376-004			9804G376-012			9804G376-013			9804G376-014		
QC_TYPE.	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	93.6 %			94 0 %			91.5 %			93 0 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	35	U		1 7	U		1 8	U		18	U	
4,4'-DDE	35	U		1 7	U		1 8	U		18	U	
4,4'-DDT	35	U		1 8			1.4	J		18	U	
ALDRIN	17	U		0 87	U		0 90	U		8 8	U	
ALPHA-BHC	17	U		0 87	U		0 90	U		8 8	U	
BETA-BHC	17	U		0 87	U		0 90	U		8 8	U	
CHLORDANE	300			53			9 7			180		
DELTA-BHC	17	U		0 87	U		0 90	U		8 8	U	
DIELDRIN	35	U		1 7	U		1 8	U		18	U	
ENDOSULFAN I	17	U		0 87	U		0 90	U		8 8	U	
ENDOSULFAN II	35	U		1 7	U		1 8	U		18	U	
ENDOSULFAN SULFATE	35	U		1 7	U		1 8	U		18	U	
ENDRIN	35	U		1.7	U		1 8	U		18	U	
ENDRIN ALDEHYDE	35	U		1 7	U		1 8	U		18	U	
ENDRIN KETONE	35	U		1.7	U		1 8	U		18	U	
GAMMA-BHC (LINDANE)	17	U		0 87	U		0 90	U		8 8	U	
HEPTACHLOR	17	U		0 87	U		0 90	U		8 8	U	
HEPTACHLOR EPOXIDE	17	U		0 87	U		0 90	U		8 8	U	
METHOXYCHLOR	170	U		8 7	U		9 0	U		88	U	
TOXAPHENE	350	U		17	U		18	U		180	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04376

SAMPLE NUMBER:	186-SB-24-03			186-SB-25-01			186-SB-25-03			186-SB-26-01		
SAMPLE DATE:	04/21/98			04/21/98			04/21/98			04/21/98		
LABORATORY ID:	9804G376-015			9804G376-016			9804G376-018			9804G376-019		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	87.3 %			92.2 %			88.7 %			92.1 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	1 9	U		18	U		19	U		180	U	
4,4'-DDE	1 9	U		18	U		19	U		340		
4,4'-DDT	1 9	U		18	U		19	U		6300		
ALDRIN	0 95	U		8 9	U		9 3	U		89	U	
ALPHA-BHC	0 95	U		8 9	U		9 3	U		89	U	
BETA-BHC	0 95	U		8 9	U		9 3	U		89	U	
CHLORDANE	28			180			180			360	U	
DELTA-BHC	0 95	U		8 9	U		9 3	U		89	U	
DIELDRIN	1 9	U		18	U		19	U		180	U	
ENDOSULFAN I	0 95	U		8 9	U		9 3	U		89	U	
ENDOSULFAN II	1.9	U		18	U		19	U		180	U	
ENDOSULFAN SULFATE	1.9	U		18	U		19	U		180	U	
ENDRIN	1 9	U		18	U		19	U		180	U	
ENDRIN ALDEHYDE	1 9	U		18	U		19	U		180	U	
ENDRIN KETONE	1 9	U		18	U		19	U		180	U	
GAMMA-BHC (LINDANE)	0 95	U		8 9	U		9 3	U		89	U	
HEPTACHLOR	0.95	U		8 9	U		9 3	U		89	U	
HEPTACHLOR EPOXIDE	1.5			8 9	U		9 3	U		89	U	
METHOXYCHLOR	9 5	U		89	U		93	U		890	U	
TOXAPHENE	19	U		180	U		190	U		1800	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04376

SAMPLE NUMBER:	186-SB-26-01RE			186-SB-26-03			186-SB-26-03RE			186-SS-22		
SAMPLE DATE:	04/21/98			04/21/98			04/21/98			04/21/98		
LABORATORY ID	9804G376-019			9804G376-020			9804G376-020			9804G376-002		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS.	92 1 %			88 8 %			88 8 %			92 2 %		
UNITS.	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	360	U		18	U		37	U		18000	U	
4,4'-DDE	360	U		420			37	U		18000	U	
4,4'-DDT	6500			590			570			18000	U	
ALDRIN	180	U		9 2	U		18	U		8900	U	
ALPHA-BHC	180	U		9 2	U		18	U		8900	U	
BETA-BHC	180	U		9 2	U		18	U		8900	U	
CHLORDANE	710	U		37	U		73	U		170000		
DELTA-BHC	180	U		9 2	U		18	U		8900	U	
DIELDRIN	360	U		18	U		37	U		18000	U	
ENDOSULFAN I	180	U		9 2	U		18	U		8900	U	
ENDOSULFAN II	360	U		18	U		37	U		18000	U	
ENDOSULFAN SULFATE	360	U		18	U		37	U		18000	U	
ENDRIN	360	U		18	U		37	U		18000	U	
ENDRIN ALDEHYDE	360	U		18	U		37	U		18000	U	
ENDRIN KETONE	360	U		18	U		37	U		18000	U	
GAMMA-BHC (LINDANE)	180	U		9 2	U		18	U		8900	U	
HEPTACHLOR	180	U		9 2	U		18	U		8900	U	
HEPTACHLOR EPOXIDE	180	U		9 2	U		18	U		8900	U	
METHOXYCHLOR	1800	U		92	U		180	U		89000	U	
TOXAPHENE	3600	U		180	U		370	U		180000	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04376

SAMPLE NUMBER:	186-SS-23			186-SS-24			186-SS-25			186-SS-26		
SAMPLE DATE:	04/21/98			04/21/98			04/21/98			04/21/98		
LABORATORY ID:	9804G376-005			9804G376-006			9804G376-008			9804G376-009		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	83 2 %			90 5 %			87.4 %			91 0 %		
UNITS:	UG/KG			UG/KG			UG/KG			UG/KG		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	98	U		1800	U		9500	U		180	U	
4,4'-DDE	98	U		1800	U		9500	U		710		
4,4'-DDT	98	U		1800	U		9500	U		19000		
ALDRIN	49	U		910	U		4700	U		90	U	
ALPHA-BHC	49	U		910	U		4700	U		90	U	
BETA-BHC	49	U		910	U		4700	U		90	U	
CHLORDANE	1300			30000			34000			360	U	
DELTA-BHC	49	U		910	U		4700	U		90	U	
DIELDRIN	98	U		1800	U		9500	U		180	U	
ENDOSULFAN I	49	U		910	U		4700	U		90	U	
ENDOSULFAN II	98	U		1800	U		9500	U		180	U	
ENDOSULFAN SULFATE	98	U		1800	U		9500	U		180	U	
ENDRIN	98	U		1800	U		9500	U		180	U	
ENDRIN ALDEHYDE	98	U		1800	U		9500	U		180	U	
ENDRIN KETONE	98	U		1800	U		9500	U		180	U	
GAMMA-BHC (LINDANE)	49	U		910	U		4700	U		90	U	
HEPTACHLOR	49	U		910	U		4700	U		90	U	
HEPTACHLOR EPOXIDE	49	U		910	U		4700	U		90	U	
METHOXYCHLOR	490	U		9100	U		47000	U		900	U	
TOXAPHENE	980	U		18000	U		95000	U		1800	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04376

SAMPLE NUMBER.	186-SS-26RE			186-SS-27			186-SS-28			/ /		
SAMPLE DATE:	04/21/98			04/21/98			04/21/98					
LABORATORY ID.	9804G376-009			9804G376-010			9804G376-011					
QC_TYPE:	NORMAL			NORMAL			NORMAL					
% SOLIDS:	91.0 %			91 9 %			85 0 %			100 0 %		
UNITS:	UG/KG			UG/KG			UG/KG					
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	900	U		90	U		20000	U				
4,4'-DDE	900	U		90	U		20000	U				
4,4'-DDT	20000			90	U		52000					
ALDRIN	450	U		45	U		9800	U				
ALPHA-BHC	450	U		45	U		9800	U				
BETA-BHC	450	U		45	U		9800	U				
CHLORDANE	1800	U		650			140000					
DELTA-BHC	450	U		45	U		9800	U				
DIELDRIN	900	U		90	U		20000	U				
ENDOSULFAN I	450	U		45	U		9800	U				
ENDOSULFAN II	900	U		90	U		20000	U				
ENDOSULFAN SULFATE	900	U		90	U		20000	U				
ENDRIN	900	U		90	U		20000	U				
ENDRIN ALDEHYDE	900	U		90	U		20000	U				
ENDRIN KETONE	900	U		90	U		20000	U				
GAMMA-BHC (LINDANE)	450	U		45	U		9800	U				
HEPTACHLOR	450	U		45	U		9800	U				
HEPTACHLOR EPOXIDE	450	U		45	U		9800	U				
METHOXYCHLOR	4500	U		450	U		98000	U				
TOXAPHENE	9000	U		900	U		200000	U				

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04377

SAMPLE NUMBER:	186-DUP-07			186-SB-27-01			186-SB-27-03			186-SB-28-01		
SAMPLE DATE:	04/21/98			04/21/98			04/21/98			04/21/98		
LABORATORY ID	9804G377-008			9804G377-001			9804G377-002			9804G377-003		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS.	90 5 %			94.4 %			89 2 %			91 6 %		
UNITS:	%			%			%			%		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	9 2	U		1 7	U		1 8	U		180	U	
4,4'-DDE	15			1.7	U		1.8	U		180	U	
4,4'-DDT	35			1.7	U		1 8	U		380		
ALDRIN	4 6	U		0 86	U		0 93	U		89	U	
ALPHA-BHC	4 6	U		0 86	U		0 93	U		89	U	
BETA-BHC	4.6	U		0 86	U		0 93	U		89	U	
CHLORDANE	77			28			5 4			1900		
DELTA-BHC	4 6	U		0 86	U		0 93	U		89	U	
DIELDRIN	9.2	U		1.7	U		1 8	U		180	U	
ENDOSULFAN I	4 6	U		0 86	U		0 93	U		89	U	
ENDOSULFAN II	9 2	U		1 7	U		1.8	U		180	U	
ENDOSULFAN SULFATE	9 2	U		1.7	U		1 8	U		180	U	
ENDRIN	9 2	U		1.7	U		1 8	U		180	U	
ENDRIN ALDEHYDE	9 2	U		1 7	U		1 8	U		180	U	
ENDRIN KETONE	9 2	U		1 7	U		1 8	U		180	U	
GAMMA-BHC (LINDANE)	4.6	U		0 86	U		0 93	U		89	U	
HEPTACHLOR	4 6	U		0 86	U		0 93	U		89	U	
HEPTACHLOR EPOXIDE	4 6	U		0 86	U		0 93	U		89	U	
METHOXYCHLOR	46	U		8 6	U		9 3	U		890	U	
TOXAPHENE	92	U		17	U		18	U		1800	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04377

SAMPLE NUMBER:	186-SB-28-03			186-SB-29-01			186-SB-29-03			186-SB-30-01		
SAMPLE DATE:	04/21/98			04/21/98			04/21/98			04/21/98		
LABORATORY ID.	9804G377-004			9804G377-006			9804G377-007			9804G377-010		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	94 5 %			89 7 %			92 3 %			89 7 %		
UNITS.	%			%			%			%		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	1 8	U		3 6	U		1 8	U		91	U	
4,4'-DDE	1.8	U		55			5 7			200		
4,4'-DDT	4 9			77			8 6			840		
ALDRIN	0 88	U		1 8	U		0 90	U		45	U	
ALPHA-BHC	0 88	U		1 8	U		0 90	U		45	U	
BETA-BHC	0 88	U		1 8	U		0 90	U		45	U	
CHLORDANE	8.9			200			19			210		
DELTA-BHC	0 88	U		1 8	U		0 90	U		45	U	
DIELDRIN	1 8	U		3 6	U		1 8	U		91	U	
ENDOSULFAN I	0 88	U		1 8	U		0 90	U		45	U	
ENDOSULFAN II	1 8	U		3 6	U		1 8	U		91	U	
ENDOSULFAN SULFATE	1.8	U		3 6	U		1 8	U		91	U	
ENDRIN	1.8	U		3 6	U		1 8	U		91	U	
ENDRIN ALDEHYDE	1 8	U		3 6	U		1 8	U		91	U	
ENDRIN KETONE	1.8	U		3 6	U		1.8	U		91	U	
GAMMA-BHC (LINDANE)	0 88	U		1.8	U		0 90	U		45	U	
HEPTACHLOR	0 88	U		1 8	U		0 90	U		45	U	
HEPTACHLOR EPOXIDE	0 88	U		1 8	U		0 90	U		45	U	
METHOXYCHLOR	8 8	U		18	U		9 0	U		450	U	
TOXAPHENE	18	U		36	U		18	U		910	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04377

SAMPLE NUMBER:	186-SB-30-03			186-SB-31-01			186-SB-31-03			186-SB-32-01		
SAMPLE DATE:	04/21/98			04/21/98			04/21/98			04/21/98		
LABORATORY ID.	9804G377-011			9804G377-013			9804G377-014			9804G377-016		
QC_TYPE.	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	93 0 %			56 8 %			91.8 %			88 6 %		
UNITS:	%			%			%			%		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	1 8	U		2900000	U		36	U		58		
4,4'-DDE	3 9			2900000	U		38			59		
4,4'-DDT	8.6			2900000	U		100			35	J	
ALDRIN	0 89	U		1400000	U		18	U		19	U	
ALPHA-BHC	0 89	U		1400000	U		18	U		19	U	
BETA-BHC	0 89	U		1400000	U		18	U		19	U	
CHLORDANE	13			75000000			2000			75	U	
DELTA-BHC	0 89	U		1400000	U		18	U		19	U	
DIELDRIN	1 8	U		2900000	U		36	U		37	U	
ENDOSULFAN I	0 89	U		1400000	U		18	U		19	U	
ENDOSULFAN II	1 8	U		2900000	U		36	U		37	U	
ENDOSULFAN SULFATE	1 8	U		2900000	U		36	U		37	U	
ENDRIN	1.8	U		2900000	U		36	U		37	U	
ENDRIN ALDEHYDE	1 8	U		2900000	U		36	U		37	U	
ENDRIN KETONE	1 8	U		2900000	U		36	U		37	U	
GAMMA-BHC (LINDANE)	0.89	U		1400000	U		18	U		19	U	
HEPTACHLOR	0 89	U		1400000	U		18	U		19	U	
HEPTACHLOR EPOXIDE	0 89	U		1400000	U		18	U		19	U	
METHOXYCHLOR	8 9	U		14000000	U		180	U		190	U	
TOXAPHENE	18	U		29000000	U		360	U		370	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04377

SAMPLE NUMBER:	186-SB-32-03			186-SS-29			186-SS-30			186-SS-31		
SAMPLE DATE:	04/21/98			04/21/98			04/21/98			04/21/98		
LABORATORY ID:	9804G377-017			9804G377-005			9804G377-009			9804G377-012		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	96 5 %			91 3 %			93 1 %			93 9 %		
UNITS:	%			%			%			%		
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	1 7	U		1 8	U		180	U		8 8	U	
4,4'-DDE	3 4			7 8			150	J		8 8	U	
4,4'-DDT	1.7	U		16			350			12		
ALDRIN	0 85	U		0 88	U		88	U		4 4	U	
ALPHA-BHC	0 85	U		0 88	U		88	U		4 4	U	
BETA-BHC	0 85	U		0 88	U		88	U		4 4	U	
CHLORDANE	20			73			2700			170		
DELTA-BHC	0 85	U		0 88	U		88	U		4.4	U	
DIELDRIN	1 7	U		1 8	U		180	U		8 8	U	
ENDOSULFAN I	0 85	U		0 88	U		88	U		4 4	U	
ENDOSULFAN II	1 7	U		1 8	U		180	U		8 8	U	
ENDOSULFAN SULFATE	1.7	U		1 8	U		180	U		8 8	U	
ENDRIN	1.7	U		1 8	U		180	U		8 8	U	
ENDRIN ALDEHYDE	1 7	U		1.8	U		180	U		8 8	U	
ENDRIN KETONE	1 7	U		1 8	U		180	U		8 8	U	
GAMMA-BHC (LINDANE)	0 85	U		0 88	U		88	U		4 4	U	
HEPTACHLOR	0 85	U		0 88	U		88	U		4 4	U	
HEPTACHLOR EPOXIDE	0 85	U		0 88	U		88	U		4 4	U	
METHOXYCHLOR	8 5	U		8 8	U		880	U		44	U	
TOXAPHENE	17	U		18	U		1800	U		88	U	

CTO154 - NWS EARLE
SOIL DATA
RECRA LABNET - CHICAGO
SDG: U04377

SAMPLE NUMBER:	186-SS-32			/ /			/ /			/ /		
SAMPLE DATE:	04/21/98											
LABORATORY ID:	9804G377-015											
QC_TYPE:	NORMAL											
% SOLIDS:	94.4 %			100 0 %			100 0 %			100.0 %		
UNITS:	%											
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
PESTICIDES/PCBs												
4,4'-DDD	17	U										
4,4'-DDE	17	U										
4,4'-DDT	17	U										
ALDRIN	8.7	U										
ALPHA-BHC	8.7	U										
BETA-BHC	8.7	U										
CHLORDANE	580											
DELTA-BHC	8.7	U										
DIELDRIN	17	U										
ENDOSULFAN I	8.7	U										
ENDOSULFAN II	17	U										
ENDOSULFAN SULFATE	17	U										
ENDRIN	17	U										
ENDRIN ALDEHYDE	17	U										
ENDRIN KETONE	17	U										
GAMMA-BHC (LINDANE)	8 7	U										
HEPTACHLOR	8.7	U										
HEPTACHLOR EPOXIDE	8.7	U										
METHOXYCHLOR	87	U										
TOXAPHENE	170	U										

APPENDIX B

ACTIVITY HAZARD ANALYSIS

Site: Naval Weapons Station., Earle

Location: Colts Neck, NJ

Activity: Soil Boring and Sampling using Geo-Probe

11/09/98

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	5. Struck by, pedestrian exposure to work area/EZ hazards	5. Delineate work area by placing caution tape at bay door entrances, and other work areas prior to start of work; keep base personnel a minimum of 50 ft from work area; when mobilizing to sample point, assist driver to location by guiding with hand signals; stay in drivers line of sight when vehicle is backing up
	6. Tip over	6. Equipment shall be set-up on stable ground and maintained level. Cribbing will be used when necessary; outriggers Geo-Probe shall be extended per the manufacturer's specification when drilling
	7. Dermal and inhalation exposure to site contaminants	7. Initial Level of Protection shall be Modified Level D with polytyvek. Upgrades of LOP shall be determined by SHSO based on real time air monitoring, site conditions, and professional judgement. Use .25 mg/m^3 as the dust Level C upgrade. Use pesticide filter cartridges approved by NIOSH
	8. Back Injuries	8. Instruct workers in proper lifting techniques (balance body, spread feet apart, bend at knees, do not lift over 50 lbs. at one time); Position drum so that drum can be handled easily when moving to different work area; use drum dolly or other mechanical means when moving drums to prevent back injuries; use team lifting(handling) in lieu of mechanical means; instruct workers on avoiding back injuries via proper lifting techniques, and other methods for avoiding back injuries
	9. Cuts to hands	9. ***Kevlar gloves must be used when handling material with sharp edges.*** Additional PPE will be assigned by SHSO or SS as required by activity
	10. Medical Emergencies, minor injuries, situations requiring emergency response services	10. Keep first-aid kit, 10 lb. ABC type fire extinguisher, and ANSI approved eye-wash in close proximity to work area; keep phone numbers of emergency services in close proximity and review hospital route during safety briefing prior to work; keep cellular phone charged and in work area for emergency communication; keep MSDS for all materials with other emergency information (phone #'s, medical data, etc)
	11. Fire	11. Smoking and open flames are not permitted. All equipment shall be equipped with 10-lb. ABC type fire extinguishers. 10-lb. ABC type fire extinguishers shall be readily available.

ACTIVITY HAZARD ANALYSIS

Site: Naval Weapons Station., Earle
Activity: Soil Boring and Sampling using Geo-Probe

Location: Colts Neck, NJ
11/09/98

Equipment To Be Used	Inspection Requirements	Training Requirements
Geo-Probe	Initial inspection will be conducted prior to use.	Qualified Operator for Geo-probe is Required
Fire Extinguishers	Monthly inspections will be performed.	Personnel will be given instructions on proper use of fire extinguishers.
Dust Monitor	Pre and Post calibrations/system checks will be performed daily.	Proficiency training for users will be given.
Modified Level D PPE and Level C PPE	An initial inspection of each lot of PPE will be performed. Users will inspect prior to donning PPE.	Personnel will be given training on proper donning and doffing procedures.
First Aid Kits	Daily safety and weekly inspections will be performed.	Personnel with first aid and CPR will be identified.
Spill Control Materials	Daily safety inspections of spill control materials will be conducted.	Personnel will be given training on how to respond to spilled materials.
Chains, Slings or Ropes	Inspections prior to each use will be conducted.	Personnel will be trained on proper use of chains, slings and ropes.
Lock out/Tag out equipment	Initial inspection will be conducted prior to use.	Proficiency training for users will be given.

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Section 1 - Chemical Product and Company Identification

Product/Chemical Name: DDD
Chemical Formula: $(ClC_6H_4)_2CHCHCl_2$
CAS No.: 72-54-8
Synonyms: benzene, 1,1'-(2,2-dichloroethylidene) bis (4-chlorobenzene); 1,1-dichloro-2,2-bis (*p*-chlorophenyl) ethane; dichlorodiphenyldichloroethane; Dilene; Rothane; TDE; tetrachlorodiphenylethane
Derivation: DDD is no longer produced or sold commercially in the USA. Prepared by chlorination of ethanol and subsequent condensation with chlorobenzene. DDD also occurs naturally as a degradation product of DDT.
General Use: Formerly used as a pesticide (dusts, emulsions, and wettable powders) for control of leaf rollers and other insects.
Vendors: Consult the latest *Chemical Week Buyers' Guide.* (73)

Section 2 - Composition / Information on Ingredients

Ingredient, ca >90 % wt (*p, p'* isomer)
Trace Impurities: ≤ 10% *o, p'* isomer

OSHA PEL	NIOSH REL	DFG (Germany) MAK
None established	None established	None established

ACGIH TLV
None established

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

DDD exists as odorless, colorless crystals. It is irritating to the skin, eyes, and respiratory tract. Systemic toxicity is similar to that caused by DDT (*Genium MSDS* #155), but to a slightly lesser extent. The central nervous system and liver appear to be most affected. Skin absorption can occur. Although combustible, DDD does not burn readily. Banned from US production because of its ability to bioconcentrate and its persistency in the environment.

Wilson Risk Scale
R 1
I –
S 2*
K 1
*Skin absorption

HMIS
H 2*
F 1
R 0
* Chronic effects
PPE†
†Sec. 8

Potential Health Effects

Primary Entry Routes: Inhalation, ingestion, skin absorption.
Target Organs: Eyes, skin, respiratory tract, central nervous system, liver.
Acute Effects
Inhalation: Symptoms include irritation of the respiratory tract, nausea, vomiting, and excitement followed by lethargy (general tiredness). Exposure to DDD appears to result in less severe symptoms than exposure to its higher analogue, DDT.
Eye: Contact causes minor irritation.
Skin: Contact causes minor irritation. Absorption can cause systemic effects.
Ingestion: Ingestion causes CNS effects (see inhalation). The estimated fatal dose is 5g/kg.
Medical Conditions Aggravated by Long-Term Exposure: Liver disorders.
Chronic Effects: Repeated exposure can lead to liver damage and atrophy (deterioration) of the adrenal cortex.
Carcinogenicity: Listed by IARC (Class 2B carcinogen, possibly carcinogenic in humans) and the EPA (Class B2 carcinogen, inadequate human and adequate animal data) as a carcinogen. Although the NTP reports DDD to have produced cancer in animals, it has only given a formal designation to DDT.
Other: In general, exposure to organochlorine pesticides have been indicated in spontaneous abortions and premature delivery.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air and support breathing as needed.
Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water. Consult an ophthalmologist if pain or irritation persist.
Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water followed by a soap and water wash. Consult a physician if pain or irritation persist.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Vomiting may be spontaneous.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Treatment is symptomatic and supportive.

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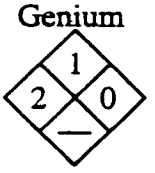
Section 5 - Fire-Fighting Measures

Genium



Flash Point: None reported. DDD is combustible, but does not ignite readily.
Autoignition Temperature: None reported.
LEL: None reported.
UEL: None reported.
Flammability Classification: Combustible solid
Extinguishing Media: Use dry chemical, carbon dioxide, regular foam, or water spray.
Unusual Fire or Explosion Hazards: None reported.
Hazardous Combustion Products: Include chlorine and hydrogen chloride gas.
Fire-Fighting Instructions: Do not release runoff from fire control methods to sewers or waterways.
Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind.
Small Spills: Carefully scoop or vacuum (with appropriate filter) and place in suitable container for disposal.
Large Spills: Flush spill with water to containment area. Absorb with activated carbon. Do not release into sewers or waterways.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Wear appropriate PPE to prevent inhalation, eye contact, and skin absorption.
Storage Requirements: Store in a cool, dry, well-ventilated area away from alkalis.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Since DDD is no longer produced in the USA, engineering controls are not normally applicable. However, when DDD is encountered through analysis and disposal procedures, it is important that processes are enclosed to prevent dispersion of DDD dusts or contaminated (DDD) soil through the work area.
Ventilation: Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Administrative Controls: Consider preplacement and periodic medical exams of all workers potentially exposed to DDD. Emphasis should be placed on liver function.
Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.
Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.
Safety Stations: Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.
C ntaminated Equipment: Separate contaminated work clothes from street clothes. Launder before reuse or plan for disposal. Remove DDD from your shoes and clean personal protective equipment.
C mments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after potential exposure to DDD, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance and Odor: Odorless, colorless crystals
Vapor Pressure: 10.2×10^{-7} mm Hg at 86 °F (30 °C)
F rmula Weight: 320.05
Density (H_2O=1, at 4 °C): 1.385 g/cm^3
Water Solubility: 0.005 ppm
Other Solubilities: Soluble in organic solvents
Boiling Point: 379.4 °F (193 °C) at 1 mm Hg
Melting Point: 228.2 to 230 °F (109 to 110 °C)
Octanol/Water Partition Coefficient: log Kow = 6.02

Section 10 - Stability and Reactivity

Stability: DDD is stable at room temperature in closed containers under normal storage and handling conditions.
Polymerization: Hazardous polymerization does not occur.
Chemical Incompatibilities: Alkalis.
C nditions to Avoid: Exposure to ignition sources and alkalis.
Hazardous Decomposition Products: Thermal oxidative decomposition of DDD can produce chlorine gas.

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Section 11- Toxicological Information

Toxicity Data:*

Acute Dermal Effects:
Rabbit, skin, LD_{50}: 1200 mg/kg caused primary irritation, excitement and convulsions or effect on seizure threshold, and death in 50% of test animals.

Mutagenicity:
Mouse embryo: 28,400 nmol/L caused oncogenic transformation.

Acute Oral Effects:
Rat, oral, LD_{50}: 113 mg/kg

Tumorigenicity:
Rat, oral: 54 g/kg/78 continuous weeks caused thyroid tumors.

* See NIOSH, *RTECS* (KI0700000), for additional toxicity data.

Section 12 - Ecological Information

Ecotoxicity: Japanese quail, LC_{50} = 3165 ppm ; mallard duck, LC_{50} = 4814 ppm; rainbow trout, LC_{50} = 70 µg/L/96 hr.
Environmental Transport: If released to soil, DDD will absorb strongly with very little leaching to groundwater. In water, DDD will absorb strongly to sediment and bioconcentrate in aquatic animals. Hydrolysis is not appreciable; est. half-life is 570 days (pH 9) and 190 days (pH 5). Evaporation will be slow; est. half-life from a model river 1 m deep, flowing 1 m/sec with a wind velocity of 3 m/sec is 1.82 days.
Environmental Degradation: Biodegrades very slowly.
Soil Absorption/Mobility: Absorbs strongly to soil, sediment, and particulates.

Section 13 - Disposal Considerations

Disposal: DDD is a potential candidate for rotary kiln incineration. Activated carbon can be used to remove most DDD from wastewater (to levels < 1 mg/L). Contact a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
Container Cleaning and Disposal: Triple rinse containers before disposal or shipment to scrap metal facility.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Organochlorine pesticides, solid toxic, n.o.s.
Shipping Symbols: –
Hazard Class: 6.1
ID No.: UN2761
Packing Group: III
Label: Keep Away From Food
Special Provisions (172.102): –

Packaging Authorizations
a) Exceptions: 173.153
b) Non-bulk Packaging: 173.213
c) Bulk Packaging: 173.240

Quantity Limitations
a) Passenger, Aircraft, or Railcar: 100 kg
b) Cargo Aircraft Only: 200 kg

Vessel Stowage Requirements
a) Vessel Stowage: A
b) Other: 40

Section 15 - Regulatory Information

EPA Regulations:
Listed as a RCRA Hazardous Waste (40 CFR 261.33): U060
Listed as a CERCLA Hazardous Substance (40 CFR 302.4) per RCRA, Sec. 3001, CWA, Sec. 311 (b)(4), and CWA, Sec. 307(a).
CERCLA Reportable Quantity (RQ), 1 lb (0.454 kg)
SARA Toxic Chemical (40 CFR 372.65): Not listed
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed
OSHA Regulations:
Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A): Not listed

Section 16 - Other Information

References: 73, 103, 124, 184, 189, 197, 198
Prepared By ..... M Gannon, BA
Industrial Hygiene Review ..... DJ Wilson, CIH
Medical Review ..... T Thoburn, MD, MPH

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Chlordane **MSDS No. 877**

Date of Preparation: 10/93 Errata: 10/95

Section 1 - Chemical Product and Company Identification

Product/Chemical Name: Chlordane
Chemical Formula: $C_{10}H_6Cl_8$
CAS No.: 57-74-9 (pure), 12789-03-6 (technical)
Synonyms: Chlor Kil; Chlortox; dichlorochlordene; Dowchlor; NCI-C00099; Octachlor; octachlorodihydrodicyclopentadiene; 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methanoindene; octachloro-4,7-methanohydroindane; octachloro-4,7-methanotetrahydroindane; Topichlor 20; Velsicol 1068.
Derivation: By Diels-Alder addition of hexachlorocyclopentadiene to cyclopentadiene, followed by reaction with chlorine. Pure chlordane is a solid but in its commercial form it is mixed with a variety of solvents, namely deodorized kerosine. Typical concentrations are 2 to 80% chlordane.
General Use: Chlordane was used as an insecticide until its ban by the EPA in 1988. Its primary use was for termites, but was also effective on insects such as ants, cutworms, rose beetles, and grubs. A single application would provide termite protection for > 26 yr.
Vendors: Consult the latest *Chemical Week Buyers' Guide.* (73)

Section 2 - Composition / Information on Ingredients

Chlordane, 60 to 75% vol (technical grade, alpha and gamma isomers).
Impurities: Because chlordane is found in solution, there is a mixture (25 to 40%) of ~ 26 organochlorine compounds, including heptachlor (4 to 10%), nonachlor, Diels-Alder adduct of cyclopentadiene and pentachlorocyclopentadiene, hexachlorocyclopentadiene, and octachlorocyclopentene.

OSHA PEL
8-hr TWA: 0.5 mg/m^3(skin)

ACGIH TLV
TWA: 0.5 mg/m^3(skin)

NIOSH REL
10-hr TWA: 0.5 mg/m^3(skin)

IDLH Level
Ca. 500 mg/m^3

DFG (Germany) MAK
TWA: 0.5 mg/m^3(skin)
Category III: substances with systemic effects
Onset of Effect: > 2 hr
Half-life: > shift length (strongly cumulative)

Peak Exposure Limit: 5 mg/m^3, 30 min. average value, 1/shift

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Chlordane is an organochlorine insecticide. It is a solid or a colorless to amber, viscous liquid with a pungent, chlorine odor. It was banned in 1988 by the EPA because of its toxicity and persistency and bioconcentration in the environment. Inhalation does not appear to be a significant problem at normal use levels, but high concentrations would produce effects. However, skin absorption and ingestion of even small amounts can adversely affect the central nervous system, liver, and kidneys. Numerous deaths have been associated with exposure to chlordane. The pure compound is noncombustible, but because it was produced as a solution, its flammability is dependent on the solvent used.

Wilson Risk Scale
R 1
I 3
S 2*
K 0
*Skin absorption

HMIS
H 2
F 1†
R 0

† Varies depending on the solvent(s) present. Doesn't burn when pure.
PPE‡
‡Sec. 8

Potential Health Effects

Primary Entry Routes: Skin absorption, ingestion, inhalation.
Target Organs: Skin, liver, kidneys, blood, central nervous system, respiratory system.
Acute Effects
Inhalation: Acute toxic exposures via inhalation would cause symptoms similar to those via ingestion.
Eye: Contact can be irritating.
Skin: Contact may produce irritation. This appears to have been more common prior to 1951 when a greater proportion of hexachlorocyclopentadiene was added. Chlordane can be absorbed through the skin in concentrations high enough to cause death. In one case, an accidental application caused death via respiratory failure within 40 minutes post exposure. (See ingestion symptoms)
Ingestion: Chlordane primarily affects the CNS by increasing excitability. Symptoms include confusion, agitation, tremor, incoordination, delirium, convulsions ranging from myoclonic jerking to violent seizures, and coma. Liver (enlargement) and kidney damage (no urine output due to degeneration of kidney tubules) is possible. Blood dyscrasias (imbalance in blood components) are common. Death is possible from respiratory or kidney failure.

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Section 12 - Ecological Information

Ecotoxicity: Goldfish, TLm = 0.5 ppm/96 hr; bluegill, LC_{50} = 57 to 74.8 µg/L/96 hr; brown trout, LC_{50} = 11.1 µg/L/96 hr; mallard duck, LD_{50} = 858 ppm; pheasant, LD_{50} = 430 ppm.
Bioconcentration: Pinfish (*Lagodon rhomboides*), 96 hr BCF = 6227; frogs (*Xenopus laevis*), 96 hr BCF = 108
Environmental Degradation: Chlordane is not very mobile in soil and is not likely to leach. The degradation rate is estimated at 4.05 to 28.33%/yr with a mean half-life of 3.3 yr. It can volatilize from the surface (especially if soil is moist). In water, chlordane is not expected to hydrolyze oxidize, or undergo direct photolysis. It volatilizes with an estimated half-life of 7.3 to 7.9 hr from a river 1 m deep, glowing 1 m/sec, with a wind velocity of 3 m/sec at 73.4 °F (23 °C). In air, chlordane will react in the vapor phase with photochemically produced hydroxyl radicals with an estimated half-life of 6.2 hr.

Section 13 - Disposal Considerations

Disposal: Chlordane is a good candidate for liquid injection incineration or rotary kiln incineration. Although chlordane is decomposed by alkalis, the basic objection to this treatment is time. It could take several days to weeks to ensure complete hydrolysis. If spilled in water at > 10 ppm, apply activated carbon at 10 X spilled amount. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
Container Cleaning and Disposal: Triple rinse containers and dispose of rinse water as you would other chlordane waste. If possible, return to supplier for reuse or if this is not in accordance with 49 CFR 173.28, puncture container and either ship to scrap metal facility for recycling or send to landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Organochlorine pesticides liquid, flammable, toxic, n.o.s. flash point less than 23 °C*
Shipping Symbols: –
Hazard Class: 3
ID No.: UN2762
Packing Group: II
Label: Flammable liquid, Poison
Special Provisions (172.102): –

Packaging Authorizations
a) Exceptions: None
b) Non-bulk Packaging: 173.202
c) Bulk Packaging: 173.243

Quantity Limitations
a) Passenger, Aircraft, or Railcar: 1 L
b) Cargo Aircraft Only: 60 L

Vessel Stowage Requirements
a) Vessel Stowage: B
b) Other: –

* Depending on the flash points of the solvent involved, if greater than 73 °F (23 °C), the UN No. will be 2995.

Section 15 - Regulatory Information

EPA Regulations:
Listed as a RCRA Hazardous Waste Number (40 CFR 261.33): U036
RCRA Hazardous Waste Classification (40 CFR 261.33): Not classified
Listed as a CERCLA Hazardous Substance (40 CFR 302.4) per CWA, Sec. 311 (b)(4)
CERCLA Reportable Quantity (RQ), 1 lb (0.454 kg)
SARA 311/312 Codes: 1, 2
Listed as a SARA Toxic Chemical (40 CFR 372.65)
Listed as a SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Threshold Planning Quantity (TPQ): 1,000 lb
OSHA Regulations:
Listed as a Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A)

Section 16 - Other Information

References: 73, 103, 124, 126, 127, 132, 133, 136, 148, 153, 168, 183, 186

Prepared By ..... M Gannon, BA
Industrial Hygiene Review ..... DJ Wilson, CIH
Medical Review ..... J Brent, MD, PhD

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Carcinogenicity: Chlordane is listed by the following agencies in regard to carcinogenicity: EPA-B2 (Probable human carcinogen, sufficient animal and insufficient human evidence), IARC-2B (Possible human carcinogen, limited human evidence in absence of sufficient animal evidence), DFG MAK-B (Justifiably suspected as having carcinogenic potential), and NIOSH-X (Carcinogen defined without further categorization). In animal studies there is numerous evidence that chlordane is cancerous in mice, but these studies have not been reproduced in other animal species.

Medical Conditions Aggravated by Long-Term Exposure: Liver and kidney disorders.

Chronic Effects: Because chlordane is retained in fat cells, chronic toxicity is a problem. A survey of homeowners who had their homes treated for termites with chlordane reported symptoms such as sinusitis, bronchitis, migraine, asthma, neuritis and neuralgia (pain with or without nerve degeneration, respectively) and ovarian and uterine diseases. However, it cannot be determined which and how many of these effects were due solely to exposure to chlordane.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. *Gently* lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 min. *Do not* scrub! Consult a physician immediately.

Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. *Do not* scrub because this will increase absorption risk. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting (most effective if done within 30 min. of ingestion).

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Chlordane's metabolites oxychlordane and heptachlor epoxide are indicators useful for biological monitoring. Dialysis, exchange transfusion, and hemoperfusion are ineffective. Oral administration of cholestyramine may enhance excretion.

Special Precautions/Procedures: Do not administer adrenergic amines which may further increase myocardial irritability and produce refractory ventricular arrhythmias. For seizures: Diazepam IV bolus - 5 to 10 mg, repeated every 15 min. PRN up to 30 mg. If seizures cannot be controlled or recur, administer phenytoin or phenobarbital.

Section 5 - Fire Fighting Measures

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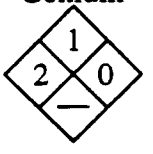

Flash Point: 225°F (107.2 °C), in kerosine solvent. Flash point may be <100 °F (37.8 °C) depending on solvent. Pure chlordane is a noncombustible solid.

Flash Point Method: OC

Autoignition Temperature: 410°F (210°C) in kerosine solvent

LEL: 0.7% v/v (kerosine solvent)

UEL: 5% v/v (kerosine solvent)

Flammability Classification: Class IIIB Combustible liquid (in kerosine solvent).

Extinguishing Media: Use dry chemical, carbon dioxide, water spray, or alcohol-resistant foam.

Unusual Fire or Explosion Hazards: Container may explode in heat of fire. Vapors may travel to ignition source and flash back. Chlordane solutions pose a vapor explosion hazard indoors, outdoors, and in sewers.

Hazardous Combustion Products: Include chlorine, hydrogen chloride, phosgene, and carbon oxide gases.

Fire-Fighting Instructions: If possible without risk, move container from fire area. Apply cooling water to container sides until well after fire is out. Stay away from ends of tanks. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. Do not release runoff from fire control methods to sewers or waterways.

Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing is not effective for fires involving chlordane.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off all ignition sources. Cleanup personnel should protect against exposure.

Small Spills: Take up with earth, sand, vermiculite, or other absorbent, noncombustible material.

Large Spills

Containment: For large spills, dike far ahead of liquid spill for later disposal. Do not release into sewers or waterways.

Cleanup: Mop any residue with a mild alkali solution (will release the chlorine).

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Use non-sparking tools to open containers.

Storage Requirements: Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (Sec. 10). Containers should be aluminum, aluminum clad, or high-bake phenolic enamel-lined metal.

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Section 8 - Exposure Controls / Personal Protection

Engineering Controls: To prevent static sparks, electrically bond and ground all equipment used with and around chlordane.
Ventilation: Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Administrative Controls: Consider preplacement and periodic medical exams of exposed workers with emphasis on the skin, liver, kidneys, blood, CNS and respiratory system.
Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For any detectable levels, use a SCBA or supplied-air respirator (with auxiliary SCBA) with a full facepiece and operated in pressure-demand or other positive pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.
Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Teflon has a breakthrough time of > 4 hr and is a suitable material for PPE. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy.
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Physical and Chemical Properties

Physical State: Solid (pure), liquid (technical)
Appearance and Odor: Colorless to amber, viscous liquid with a pungent, chlorine odor.
Odor Threshold: 5×10^{-4} ppm
Vapor Pressure: 0.00001 mm Hg at 77 °F (25 °C)
Formula Weight: 409.8
Specific Gravity (H_2O=1, at 4 °C): 1.56 at 25 °C (77 °F)
Water Solubility : 9 µg/L at 77 °F (25 °C)
Octanol/Water Partition Coefficient: log Kow = 2.78
Other Solubilities: Soluble in aliphatic and aromatic hydrocarbons including deodorized kerosine. Decomposes in alkalis.
Boiling Point: 347 °F (175 °C) at 2 mm Hg
Melting Point: 203 to 204.8 °F (95 to 96 °C), *pure* solid
Viscosity: 69 P at 77 °F (25 °C)
Refraction Index: 1.56 to 1.57 at 77 °F (25 °C)
Surface Tension: 25 dyne/cm at 68 °F (20 °C)

Section 10 - Stability and Reactivity

Stability: Chlordane is stable at room temperature in closed containers under normal storage and handling conditions.
Polymerization: Hazardous polymerization does not occur.
Chemical Incompatibilities: Include oxidizers and alkalis. Corrosive to iron and zinc. Attacks some forms of plastics, rubber, and coatings.
C nditions to Avoid: Exposure to heat, ignition sources, and incompatibles.
Hazardous Decomposition Products: Thermal oxidative decomposition of chlordane can produce toxic chlorine, phosgene, hydrogen chloride, and carbon oxide gases.

Section 11- Toxicological Information

Toxicity Data:*

Acute Inhalation Effects:
Cat, inhalation, LC_{50}: 100 mg/m^3/4 hr caused somnolence, excitement and convulsions or effect on seizure threshold.
Carcinogenicity: Mouse, oral: 2020 mg/kg given for 80 continuous weeks caused liver tumors.
Mutagenicity: Human, lymphocyte cell: 10 µmol/L caused mutation.
Teratogenicity: Mouse, oral: 152 mg/kg given for 1 to 19 days of pregnancy caused developmental abnormalities of the immune and reticuloendothelial systems.
Acute Oral Effects:
Man, oral, TD_{Lo}: 3071 µg/kg produced coma, difficulty breathing, and nausea or vomiting.
Human, oral, LD_{Lo}: 29 mg/kg caused fatty liver degeneration.
Human, skin, LD_{Lo}: 428 mg/kg caused tremor, ataxia, and convulsions or effect on seizure threshold.
Rat, oral, LD_{50}: 200 mg/kg

* See NIOSH, *RTECS* (PB9800000), for additional toxicity data.

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