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Final Plan

Work Plan
Dechlorination Treatability Study

Vertac Site
Jacksonville, Arkansas

Prepared For:

Hercules Incorporated
Wilmington, Delaware

Final Plan

Work Plan
Dechlorination Treatability Study

WORK PLAN
DECHLORINATION TREATABILITY STUDY
VERTAC SITE
JACKSONVILLE, ARKANSAS

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TABLE OF CONTENTS

TABLE OF CONTENTS

(Continued)

TABLE OF CONTENTS

(Continued)

TABLE OF CONTENTS

(Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

FINAL WORK PLAN
DECHLORINATION TREATABILITY STUDY
VERTAC SITE
JACKSONVILLE, ARKANSAS

1.0 INTRODUCTION AND PROJECT DESCRIPTION

Canonie Environmental Services Corp. (Canonie) prepared this final work plan on behalf of Hercules, Incorporated (Hercules) for the execution of a treatability study of the SoilTech Anaerobic Thermal Processor (ATP) technology and Base Catalyzed Decomposition (BCD) technology on contaminated material from the Vertac Site. The site is located in northwestern Jacksonville, Pulaski County, Arkansas. The site is approximately 15 miles northeast of Little Rock. The location of the site is shown on Figure 1. The site history and description provided below is solely based on information obtained from the Vertac Site Remedial Investigation and Focused Feasibility Study for Operable Unit I, Final March 1991, prepared by Roy F. Weston, Inc. (Weston).

1.1 Site History

The first facilities on the site were constructed by the U.S. Government in the 1930s and 1940s. These facilities were part of a munitions complex that extended beyond the present site boundaries. Little is known about government operations that occurred on land that is now part of the site. In 1948, the Reasor-Hill Company (Reasor-Hill) purchased the property and converted the operations to manufacture insecticides such as DDT, aldrin, dieldrin, and toxaphene. During the 1950s, Reasor-Hill manufactured herbicides such as 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), and 2,4,5-trichlorophenoxypropionic acid (2,4,5-TP), which is also called Silvex. Drums of organic material were stacked in an open field immediately southwest of the production area, and untreated process water was discharged from the western end of the plant to Rocky Branch Creek.

Hercules Powder Company purchased the Reasor-Hill property and plant in 1961 and continued to manufacture and formulate herbicides. The drums that were in the open area southwest of the central process area were buried in what is now referred to as the Reasor-Hill Landfill. From 1964 to 1968, Hercules produced all of the herbicide Agent Orange, a 2,4,5-T/2,4-D mixture, that the U.S. Government demanded it produce. Hercules discontinued operations at the site in 1971.

From 1971 to 1976, Hercules leased the plant site to Transvaal, Inc. (Transvaal), a predecessor company of Vertac. Transvaal resumed production of 2,4-D and intermittently produced 2,4,5-T. Organic materials from these manufacturing processes were stored and then buried on-site in what is now referred to as the North Landfill. Transvaal purchased the property and plant from Hercules in 1976. In 1978, Transvaal underwent a Chapter XI bankruptcy reorganization, and ownership of the site was transferred from Transvaal to the new company, Vertac Chemical Corporation (Vertac), which is the present owner. Vertac operated the plant until 1986. On January 31, 1987, Vertac abandoned the site. The U.S. Environmental Protection Agency (EPA) and Hercules took over management of the site. This management has included the maintenance and overpacking of nearly 29,000 drums of organic material by EPA. Hercules has maintained treatment of ground water collected in french drains, which were constructed downgradient of the landfills, and surface water runoff collected in ditches that drain to sumps.

Currently, there are no manufacturing operations at the site. At the time operations were shut down, Vertac "mothballed" the plant. Mothballing involved flushing process lines and draining many of the process vessels. Continuing activities at the site include operation of the water treatment plant by Hercules. The water treatment plant treats surface water runoff and ground water by phase separation followed by adsorption through granular activated carbon. A series of drainage ditches and sumps, which surround the central process area, collect surface runoff and pumps it to the water treatment plant. A french drain system that runs along the western and

creek. Land in the northern parts of the site has also not been used for manufacture and is generally upslope from the central process area.

1.2.2 Operation Areas

The central process area is separated into 11 sub-areas according to where operations took place while the plant was active (Figure 2). The sub-areas and their former uses included:

- Maintenance Area - Used for equipment repairs and storage of equipment, parts, and some process raw materials.
- Formulations Area - Used for the storage of raw and finished product (large warehouse and some process vessels).
- Former Chlorination Plant Area - Used in the manufacturing of 2,4-D.
- Existing Chlorination Plant Area - Built in the early 1980s and replaced the former chlorination plant.
- Esterification Plant - Used to add alcohols to increase the solubility of the herbicide in water.
- Dalapon (1,1,1-trichloroproprionic acid) Production Area - Used in the manufacturing of Dalapon.
- Recycle Liquor Storage Area - Currently used to store drums generated by ongoing site activities.

southern sides of the burial and process area is designed to intercept ground water downgradient of the landfills and transport the ground water to the water treatment plant. The treated effluent is discharged to a publicly owned treatment works.

1.2 Site Description

1.2.1 Property

Land comprising the site consists of two parcels (Parcel 1 and Parcel 2) that were acquired at different times (Figure 2). Parcel 1, which contains the central process area, is approximately 93 acres and has been in nearly continuous industrial use since before the government subdivided the property of the former munitions complex. Parcel 2, which is approximately 100 additional acres to the north, was purchased by Vertac in 1978. In 1979, the 2,4,5-T waste storage shed was built under an environmental compliance order. The storage shed was built adjacent to the Regina Paint Building, which today is believed to contain the empty Vertac 2,4,5-T waste drums. Parcel 2 does not contain production facilities and is currently used by the EPA for drum storage in newly constructed warehouse buildings. An incinerator being constructed under contract to ADPC&E is located in the northwestern portion of Parcel 2. The central process area is wholly enclosed within a chain-link fence that surrounds most of Parcels 1 and 2. Access to the central process is restricted to two security-monitored gates.

Topographically, the land has moderate relief, sloping from about 310 feet above mean sea level (MSL) in the north to approximately 260 feet near the southwestern corner. The central process area is located on a flat-topped, south plunging topographic nose bounded by Rocky Branch Creek on the west and Marshall Road on the east. Land on the west side of Rocky Branch Creek has not been used for manufacture or disposal and is generally isolated from the central process area by the

- Recovery Plant - Used in the treatment of process wastes. 2,4-D wastes were recovered and drums containing 2,4-D wastes were washed.

- 2,4,5-T Production Area - Used in the manufacturing of 2,4,5-T.

- Wastewater Treatment Plant - Formerly used to treat process wastewater, and currently used to treat ground water and surface water from the central process area.

- Acid Plant - Chlorophenols were reacted with acetic and monochloroacetic acid to form phenoxyacetic acid herbicides.

1.3 Description of Site Materials Subject to Treatability Testing

Site material subject to treatability testing includes surface soil from the Vertac Site central process area and spent carbon generated from the site water treatment plant used to treat surface water runoff and ground water.

For this treatability study, surface soil was collected from a location within the former chlorination plant site and a location next to the boiler house. The sampling locations are shown on Figure 2. The spent carbon was collected from a bulk storage container and several 55-gallon drums stored at the site.

1.4 Treatability Study Work Plan Format

The subsequent sections of this treatability study work plan pertain to the use of SoilTech's bench-scale thermal desorption unit and Wright State University's (WSU's)

bench-scale BCD Reactor in determining the applicability of full-scale treatment to treat the impacted material. The format has been prepared in accordance with the "Guide for Conducting Treatability Studies Under CERCLA," EPA/540/R-92/013A, May 1992.

2.0 TECHNOLOGY DESCRIPTION

2.1 Description of the SoilTech ATP Unit

The ATP technology was originally conceived as a means to perform primary refining of tar sands and oil shales to crude oil in the early 1970s. UMATAC Industrial Processes (UMATAC) developed and tested the technology over a period of more than 15 years with funding from the Alberta Oil Sands Technology Research Authority (AOSTRA). In 1988, Canonie entered into an exclusive license agreement to utilize the technology for waste treatment in the United States. Together, Canonie and UMATAC formed SoilTech and are equal partners in its ownership. The technology, now known as the SoilTech ATP technology, is described below.

2.1.1 ATP Technology Overview

The central element of the ATP technology is the ATP processor. The processor resembles a rotary kiln from its exterior. However, inside the processor are three physically distinct zones and four zones of distinctly different physical processes. The four zones are as follows:

1. Preheat zone;
2. Reaction zone;
3. Combustion zone;
4. Cooling zone.

Figure 3 is a schematic cross section of the ATP processor which depicts each of the four zones.

Low-temperature volatiles such as water and light organics are distilled in the preheat zone at temperatures up to about 600°F. Oils and other heavy volatiles are distilled

in the retort zone at temperatures typically in the range of 900°F to 1,150°F under anaerobic (oxygen-depleted) conditions. The anaerobic condition in the retort zone is maintained by sand seals located between the preheat zone and the retort zone, and between the retort zone and the combustion zone. Water, oil, and noncondensable gases issue from this section. The vaporized water and organic products are removed from the processor, and then condensed and separated in the vapor train equipment. Noncondensable gases are recycled back to the ATP burners to reclaim the noncondensable gases' energy value in the combustion process.

In the retort zone, some thermal cracking and coking of organic materials usually occur, creating lighter organic gases and a coke (char) deposit on the mineral solids. The coke will burn in the combustion zone at 1,300°F to 1,400°F and will provide part of the process's heat requirements. Part of the hot sand in the combustion zone continuously recycles back to the reaction zone to provide the primary heat source for the roughly 600°F feed entering from the preheat zone. The remaining sand leaving the combustion zone is cooled for discharge, heating the incoming solids or sludge in the preheat zone by thermal conduction through the annular wall. A simplified flow diagram of the entire process is illustrated on Figure 4.

2.1.2 Hazardous Waste Treatment

When treating hazardous wastes and sludges, the SoilTech ATP unit concentrates the hazardous components in the oil and/or water products. Hydrocarbons in general and significantly high-boiling-point organics (such as polynuclear aromatics) and heavy, halogenated hydrocarbons [such as polychlorinated biphenyls (PCBs)] are removed from the solids in the preheat and retort zones. Consequently, the coked solids can be burned in the combustion zone without creating air emissions problems. The resulting cleaned solids can be delisted and backfilled or otherwise disposed of as nonhazardous waste.

2.1.3 Thermal Desorption

Test work and commercial Superfund remediation work conducted on PCB-contaminated sands and sludges demonstrated that solids are efficiently cleaned to very low residual levels. The PCBs removed from wastes are recovered in the condensed oil product, without being converted to more hazardous materials such as dioxins and dibenzofurans. In a commercial project, the oil concentrate can then be shipped off-site for disposal or incineration, which was the procedure used at the Waukegan Harbor Superfund Site. This thermal treatment gives significant advantages in process reliability and overall economics compared to wholesale incineration of oily sludges and soils.

2.1.4 Dehalogenation (Dechlorination)

In some cases, halo-organic compounds such as PCBs can be totally destroyed on-site by integrating dechlorination with the ATP system. The SoilTech ATP unit provides the heat, retention time, and mixing characteristics required to make dechlorination reactions work. The commercial cleanup performed at Wide Beach indicated that over 85 percent of the PCBs entering the unit were destroyed by dechlorination in their first pass. The remaining 15 percent of the PCBs were thermally desorbed from the soil, condensed, and mixed with dechlorination chemicals, and then recycled to the feed end of the unit. This "recycle to extinction" technique resulted in total on-site destruction of PCBs at the Wide Beach Site. A flowsheet showing the SoilTech ATP process operating in a conceptual dechlorination mode with BCD treatment is presented on Figure 5.

2.2 SoilTech Treatability Testing Capabilities

2.2.1 Introduction

The SoilTech ATP bench-scale test protocol has been developed to evaluate the treatability of contaminated soils using the commercial-scale SoilTech ATP technology.

Over 2,000 bench-scale tests have been conducted on a wide variety of contaminated material. As such, strict procedures and protocols as specified in the final Quality Assurance Project Plan (QAPP) have been developed and are rigorously applied. This section summarizes the test equipment, general operating conditions, and testing sequence. Variations in this well-established testing procedure are easily implemented, as needed.

2.2.2 Bench-Scale Test Unit

The bench-scale ATP test unit, or batch retort, shown on Figure 6 is the principal hardware used to simulate operating conditions of the ATP at full scale. A process diagram of the bench-scale ATP test unit is shown on Figure 7.

The bench-scale test unit applies discrete temperature conditions as they would exist in the full-scale processor. As a first step, a ramp run will be conducted for each source sample. For a ramp test, the treatment temperature will be gradually "ramped" to give approximate boiling range data for the moisture and organic fractions of the test sample. This process roughly brackets the conditions at which complete contaminant volatilization and pyrolysis occur, and also targets the probable best true conditions at which the full-scale ATP unit would operate. For safety reasons, the "ramp runs" are also necessary when conducting tests on waste samples with high moisture or volatile matter. By conducting ramp runs, laboratory technicians can better anticipate the requirements and high-temperature phase of test runs. The ramp

tests are concluded when the ATP bed temperature reaches 1,200°F and there is no additional formation of liquid condensate.

After the ramp runs, multiple fixed-temperature or "retort" batch runs are conducted. These runs better simulate the rapid temperature rise and impact of mixing that the solids/sludges would undergo in the ATP's retort (reaction) zone at full scale. The resulting water and oil condensates also closely resemble the vapor train products of the commercial ATP unit.

Solids passing through the retort zone typically gain a coating of coke. Thus the term "coked" product applies to the solids from the ramp and retort runs. Analysis of the solids following the retort batch runs will verify the absence of contamination before combustion in the combustion zone of the full-scale ATP Unit. This step is important because it demonstrates that distillation (or desorption) is the prime driving force of waste decontamination. Thus, the technology does not rely on combustion of hazardous organics to meet cleanup targets.

The coked solids are then oxidized in the batch test processor to simulate the total combustion of the coked, decontaminated solids. The combusted solids are equivalent to the final treated solids in the condition in which they exit the full-scale ATP unit. The combusted solids will be analyzed for metals, semivolatiles, and herbicides leachability with the Toxicity Characteristic Leaching Procedure (TCLP). Historically, combusted solids have always passed TCLP criteria for organic compounds and only rarely failed for metal leachability. This step thus indicates whether or not treated solids can be backfilled or landfilled without stabilization.

2.3 Description of BCD Process

The BCD technology was developed by the EPA's Risk Reduction Engineering Laboratory (RREL) in Cincinnati, Ohio, as a method for base-catalyzed decomposition of halogenated and non-halogenated organic contaminant compounds contained in a contaminated medium. The process was developed to provide a superior alternative to the APEG chemical treatment process. During the 1980s the APEG dechlorination process was developed to treat oils contaminated with PCBs. After evaluating the results of APEG field tests on PCB-contaminated soil, laboratory studies were initiated to investigate alternatives to the APEG process. The objectives applied in developing an alternative process included:

1. Treatment procedures should be amendable to continuous processing.

2. The process should be capable of treating soil agglomerates larger than 0.5 inch diameter.

3. Less expensive sodium hydroxide should be used rather than the potassium hydroxide used previously.

4. Polyethylene glycol should be eliminated from the process.

5. The treatment time period should be reduced.

6. Other non-halogenated organic components of the waste should be removed, if possible from the matrix during processing.

7. The reagent utilized should more effectively treat compounds with high degrees of halogenation.

8. The reagents used should be non-hazardous, and the waste stream resulting from the process should be sufficiently clean to permit disposal as non-hazardous materials.

Laboratory tests conducted by the EPA showed that most of the above treatment objectives could be satisfied by catalytic transfer hydrogenation, in which an organic reagent serves as a hydrogen donor in the presence of a base in the treatment mixture. This process has been designated BCD.

2.3.1 BCD Technology Overview

The catalytic transfer hydrogenation reaction, which the BCD process is based on, involves the transfer of hydrogen for the removal of halogens from a target contaminant compound. The catalytic transfer hydrogenation reaction can be represented by the simplified equation:

$$\text{Acceptor} + \text{Donor-H} \xrightarrow{\text{Catalyst}} \text{Donor} + \text{Acceptor-H}$$

Laboratory experiments conducted by EPA's RREL confirmed that a chemical reaction involving hydrogen transfer could remove halogens from a variety of compounds. Based on these results, further tests were conducted to identify optimum conditions for dehalogenation which included investigating three variables: temperature, base-catalyst and hydrogen donor concentrations. Tests demonstrated the importance of the base in catalyzing dechlorination hydrogenation and the acceleration of the reaction based on higher hydrogen donor quantities.

2.4 BCD Treatability Testing Capabilities

2.4.1 Introduction

The BCD process has been extensively tested at the bench scale, by Dr. Thomas O. Tiernan, using WSU's Laboratory located in Dayton, Ohio. At the WSU Laboratory, the BCD process has been employed to treat high levels of PCBs in liquid formulations and in PCB-saturated wood and paper matrices from transformers. In these instances, 2 g of sodium hydroxide were added to the reaction vessel for each gram of PCB. Hydrogen needed for the dechlorination was provided by low cost #5 or #6 fuel oil. The proprietary catalyst was added to the reactor in an amount equivalent to 1 percent by weight of the waste, and the mixture was heated to 340°C. For liquid mixtures, the concentration of Aroclor 1260 in the treated residual products was reduced to non-detectable levels within a period of two hours. PCB-contaminated wood and paper wastes were typically heated for six hours to reduce the concentration of Aroclor 1260 to a non-detectable level.

As part of a study to determine the effects of other variables on the efficiency of the BCD process, a series of laboratory experiments were conducted to treat a 2,4-D/2,4,5-T herbicide formulation which contained 33.4 mg/g of 2,3,7,8-TCDD. The ratio of the quantity of a high boiling oil added along with other reagents to the liquid herbicide was 1:1, 2:1, and 3:1 in three separate treatments. In the first reaction test, 10 ml of the high-boiling oil, 10 ml of the liquid herbicide, 8 g of sodium hydroxide and 2 g of catalyst were mixed and tested. In the second and third reactions, 20 ml and 30 ml, respectively, of the high boiling oil were added to the treatment vessel along with the other reagents in the same amounts as for the first reaction. Each of these mixtures was heated for three hours at 320 to 360°C, after which the residue remaining in the reactor and the distillate collected during the reaction were analyzed. Each of the three reactions reduced the concentration of 2,3,7,8-TCDD in the residual treated mixtures to a non-detectable concentration, as

shown in Table 1. The concentrations of 2,3,7,8-TCDD found in the volatile distillates from each of these reactions are also shown in Table 1. Clearly, increasing the quantity of high-boiling oil in the reaction mixture results in a decrease in the amount of 2,3,7,8-TCDD which is found in the distillate.

Presumably, increasing the quantity of oil increases the quantity of the hydrogen donor and accelerates the dechlorination reaction, thereby reducing the quantity of TCDD in the distillate. In addition, the larger quantity of oil may retain the TCDD in the heated reaction mixture better, so that other rate limiting reactions have a better opportunity to dechlorinate the molecule.

Previous treatment tests conducted in the WSU Laboratory with vermiculite which contained 2,4,-D, 2,4,5-T, and Silvex demonstrated that a somewhat different version of the BCD process effectively dechlorinates all of these herbicides. Combining 20 g of the contaminated vermiculite with 10 g of sodium bicarbonate and heating the mixture for 6 hours at 340 to 350°C reduced the concentration of the herbicides by 98 to 99 percent. This treatment also reduced the concentration of 2,3,7,8-TCDD in the vermiculite by 99.986 percent. A modification of the vermiculite treatment procedure was subsequently used to treat pentachlorophenol (PCP)-contaminated soil. In the latter test, a 50 g soil sample was combined with 13 g of sodium bicarbonate and 0.5 g of a catalyst. Initially the soil contained 94 ppm of PCP. After heating the mixture for two hours at 320 to 340°C the PCP could not be detected in the treated product at a detection limit of 3 ppm. The treatment of the contaminated soil using the BCD process resulted in a reduction of the PCP concentration by greater than 96 percent.

During the BCD reaction in an open reactor, water and other volatile components which are driven from the reaction mixture are collected, extracted, and then dechlorinated in a separate treatment sequence. In order to simplify the design of the process, experiments have recently been conducted using a high-pressure sealed

reactor. This type of batch reactor completely contains the volatile components and the entire treatment occurs in a single step. These experiments were conducted with a one-liter, high-pressure Hastelloy C reactor. Vermiculite was mixed with liquid herbicide to give a sample which contained 10.5 mg/g of 2,4-D, 33 mg/g of 2,4,5-T and 8.0 mg/g of Silvex. A 15 g portion of the highly contaminated vermiculite was combined with 300 g of sodium bicarbonate in the pressure reactor. The mixture was treated for 9 hours at 340 to 350°C and reached a maximum pressure of 2,210 psi. None of the three herbicides could be detected in the treated sample and the concentrations of 2,4-D, 2,4,5-T and Silvex were reduced by >99.983 percent, >99.995 percent, and >99.978 percent, respectively. Additional studies employing the high-pressure reactor are currently underway.

The results of several different laboratory BCD experiments are summarized in Table 2. It is evident that the BCD process can effectively treat a variety of complex matrices and is effective for several classes of halogenated pollutants.

2.4.2 Bench-Scale Test Reactor

The BCD bench-scale treatment tests will be conducted in a heated glass vessel as shown on Figure 8, fitted with a motor-driven stirrer and thermocouples to monitor the temperature of the reaction mixture and the heating mantles. The reactor will also be fitted with a recycling Dean & Stark receiver which will be used to remove water from the reactor and return organic condensate to the treatment flask. A sample may be treated in the reactor either by mixing the waste with the reagents and then heating the mixture or by adding the sample waste to the reactor after the reagents have been heated to the treatment temperature. When a liquid sample is added to the hot reagents, the liquid sample is placed in a syringe, and a syringe pump is used to inject the sample below the liquid level in the reactor. Solid samples are added to the hot reagents through a condenser.

Previous tests of the BCD process have employed treatment temperatures up to 340°C and reaction times up to 8 hours. Following completion of the treatment, the reactor will be cooled and aliquots of the reaction mixture will be removed for analysis. The final design of the equipment required for the test will be determined during consultation with Dr. Charles Rogers of the EPA. It is anticipated that the equipment to be used will be similar to that shown on Figure 8.

3.0 BENCH-SCALE DECHLORINATION TREATABILITY STUDY OBJECTIVES

The objective of the bench-scale treatability study is to provide the necessary information to evaluate the ATP's and BCD's applicability for full-scale operation at the Vertac Site. The specific objectives of this study are to:

1. Determine the effectiveness of both the SoilTech ATP process and the BCD process on the materials subject to treatment;

2. Develop parameters for full-scale treatment operation and residuals management;

3. Establish detailed cost estimates for full-scale treatment;

4. Define operational constraints and/or limitations with specific respect to this site;

5. Identify whether pilot-scale studies are appropriate or advantageous and determine the potential scope, outcome, and costs associated with such studies.

4.0 EXPERIMENTAL TESTING AND PROCEDURES

4.1 Experimental Testing and Procedures for ATP Process

4.1.1 ATP Testing and Analyses

Source samples to be tested by Hazen will be received in 2.0-gallon containers from Weston as stated in Section 6.0. Sample preparation procedures will be site-specific and may involve dewatering, screening, crushing, and/or mixing based on the samples received. All samples will be mixed until homogeneous. The schedule of ATP test runs that will be conducted for each sample is shown in Table 3.

After the source sample material has been prepared, subsamples of the material are obtained and tested for feed analyses. The type of analyses that will be conducted on each source sample and ATP test products are shown in Table 4. All analyses will be conducted using the required EPA test methods and quality assurance/quality control (QA/QC) laboratory procedures as specified in the final QAPP.

4.1.2 Summary of ATP Process Operating Parameters

Several factors may affect the performance of the bench-scale program, and can be grouped into two categories: (1) sample characteristics, and (2) system operating parameters. These factors are important because of their impact in full-scale operation and are discussed below.

4.1.2.1 Sample Characteristics

Feed sample characteristics that may affect either the technical or economic efficiency of the commercial processor in removing contaminants from the sample material include the following:

1. Moisture Content - The commercial processor's design basis is for material with a nominal moisture content of 20 percent or less by weight. Material with a moisture content greater than 20 percent may require added residence time, and conversely, lower moisture contents will require lower residence times. Thus, moisture content impacts the unit processing costs.

2. Contaminant Concentration - The commercial processor is designed to treat material with a nominal total hydrocarbon concentration of 10 percent. As with moisture content, lower or higher organic concentrations may affect the residence times needed to achieve specified decontamination levels. Total hydrocarbon concentrations of less than 10 percent will decrease the required residence time.

3. Boiling Points of Contaminants - Contaminants with low boiling points are more easily removed from the feed material than contaminants with high boiling points.

4. High Clay or Silt Content - High fines content may foul internal system components in the commercial plant which affects maintenance schedules and processing cost, and excessive fines tend to reduce heat transfer efficiency.

All types of feed material can be evaluated, with primary consideration given to the above conditions during the bench-scale program. SoilTech and Canonie will use the results of the bench-scale program and the effectiveness considerations discussed above to determine whether the commercial SoilTech ATP unit is applicable for treating surface soil and spent carbon at the Vertac Site, and to make judgments about factors related to feed preparation, processing rates, product disposal post-treatment, and remediation economics.

4.1.2.2 System Operating Parameters

The choice of operating parameters may also affect the efficiency of the commercial processor in removing contaminants from site-specific material. The primary operating parameters that affect the full-scale process efficiency include the following:

1. Contaminated soil flow rate - The full-scale flow rate of the contaminated soil determines the solids' residence time in the processor. An increased flow rate will also increase the organic and particulate loading in the processor exit gases, and therefore will affect efficiency of the flue gas treatment system.

2. System operating temperatures - Higher-boiling-point contaminants will require sufficient heat transfer to the soil for complete volatilization, resulting in longer residence times and lower throughput rates.

3. Reflux rates - Proper oil reflux to the vapor scrubber and fractionator are required to maintain system equilibrium. Low hydrocarbon content in the waste feed will require adding oil to the feed for proper operation in the vapor train.

Multiple types of operating conditions will be evaluated based on the bench-scale test results.

4.1.3 Bench-Scale ATP Testing Sequence

The test apparatus is arranged so that the following variables can be monitored.

4.1.3.1 Temperature

The processor temperature can be adjusted to suit a particular test (up to 1,300°F). Standard practice is to run an initial charge of a test sample through a "ramp" test, raising the temperature in discrete steps from near ambient temperature until vapor generation is essentially complete. Based on the end-point temperature of the ramp test, additional sample charges for the retort test will be introduced at fixed temperatures. For the retort tests, clean sand is heated in the processor to a predetermined temperature, then a small sample charge is introduced through the pipe cap, and the processor is rotated at a near-constant temperature until vapor generation ceases. The retort provides an indication of residence time for the full-scale system. The retort test also gives products that best resemble full-scale products, because the materials passing through the SoilTech ATP unit also experience sudden, drastic temperature increases and not gradual ramping.

For this treatability study, it is anticipated that retort runs will be conducted at two different temperatures, 1,000°F and 1,100°F, for each source sample. The selection of the above test temperatures are based on the characteristics of the contaminants and experience in bench-scale and full-scale treatment. The final retort temperatures selected will be determined after the ramp run.

4.1.3.2 Charge Size

The processor can hold a maximum charge of approximately 3.6 kilograms (kg), which can be made up of an initial sand charge (simulating the hot sand recycle) and the test feed charge. The run temperature profile and test duration can be altered by changing the ratio of initial sand charge to feed charge. Normally, a 1-kg initial sand charge is used with feed sample size of .5 to 1 kg. Depending on the test purpose, a 3.6-kg feed sample, with no initial recycle charge, can be used. This process would provide a large condensate sample at the expense of a long reaction time.

For this treatability study, a 2 kg charge size of each source sample will be used for the ramp tests. For the retort tests, an initial sand charge of 1 kg will be used with a feed sample size of 1 kg. This simulates a 50-percent hot sand recycle.

4.1.3.3 Rotational Speed

The test reactor speed can be set from 4 to 16 revolutions per minute (rpm), providing variable mixing energy that can be used to influence reaction rate.

For this treatability study, the test reactor speed will be set at 4 rpm which will provide sufficient mixing energy based on assumed material characteristics.

4.1.3.4 Testing Sequence

A retort test sequence is as follows:

1. Weigh feed samples, sand charge, test sample retrieval bowl, hot vapor tube and swivel, and condensate reservoir.

2. Heat the processor to test temperature.

3. Set rotation speed, etc. for test conditions.

4. Add initial 1 kg sand charge, start rotation at 4 rpm, and heat to test temperature (1,000°F or 1,100°F) while the processor is rotating.

5. Purge processor with N_2 for 30 seconds. Ensure that the gas collector bag has been evacuated and the gas meters are at zero.

6. Start recorder and data acquisition systems.

7. Stop processor rotation, add 1 kg feed sample, install, and tighten seal cap.

8. Start processor rotating and record start time.

9. The test duration is anticipated to be approximately 10 minutes.

10. At the end of the test, record the gas meter readings.

11. Discharge the remainder of the gas to the laboratory unit hood through the carbon filters.

12. Collect the coked test sample from the ATP test unit in a clean stainless steel bowl, and weigh.

13. Remove and weigh the condensed liquid collector vessel or trap.

14. Remove and weigh the hot vapor insert tube and swivel to determine what oil or residues remained in the tube and swivel at the end of the run.

15. Prepare necessary samples from collected condensate, and test solids for shipment to specified lab for analyses.

16. Once the tests are completed, complete and check recordings in the log book for each run, including product yields and mass balance closure.

17. Decontaminate lab and all test equipment thoroughly for preparation of next test. This includes stainless steel bowls, condensate trap, gas transfer assembly, and primary and secondary condensers.

4.1.4 BCD Testing

The organic-phase condensate to be tested by WSU will be received from Hazen as specified in Section 6.0 and in the QAPP. The organic condensate will be homogenized and then divided to give three test samples for conducting BCD tests as specified in Table 3.

After the three test samples have been prepared, subsamples are obtained and analyzed for chemicals of concern as specified in Table 4. During each BCD batch test, intermediate treatment samples will be obtained in addition to samples collected from the final reaction mixture. All analyses will be conducted using the required EPA test methods and QA/QC laboratory procedures as specified in the QAPP.

4.1.5 BCD Process Operating Parameters and Testing

4.1.5.1 BCD Process Operating Parameters

The BCD process operating parameters which may affect the performance of the bench-scale tests include treatment temperature, reaction time, and reagent addition.

Previous BCD tests conducted required a treatment temperature of approximately 200°C to 400°C to effect reductive decomposition of the halogenated and non-halogenated organic compounds.

The reaction time or residence period depends upon the concentration of halogenated organic compounds in the organic-phase condensate to be treated. Higher concentrations of halogenated organic compounds will require a longer treatment period.

Reagents required for conducting the BCD tests include a base (sodium hydroxide), a hydrogen donor compound, and additional reagents which will cause the formation of a hydrogen atom from the organic hydrogen donor compound. The high boiling oil which is contained in the organic-phase condensate to be tested will act as a hydrogen donor compound in addition to its use as a carrier of the contaminants from the ATP tests. Dr. Charles Rogers of the EPA will specify the final selection of reagents and quantities used for the BCD tests.

The above process operating parameters are dependent on the characteristics of the feed sample to be treated. This includes type of sample matrix and types of contaminants and concentrations.

4.1.5.2 Bench-Scale BCD Testing

The bench-scale treatment tests will be conducted in a heated glass vessel fitted with a motor-driven stirrer and thermocouples to monitor the temperature of the reaction mixture and the heating mantles. The reactor will also be fitted with a recycling Dean & Stark receiver which will be used to remove water from the reactor and return organic condensate to the treatment flask. A sample may be treated in the reactor either by mixing the test sample with the reagents and then heating the mixture or by adding the test sample to the reactor after the reagents have been heated to the

treatment temperature. When a liquid test sample is added to the hot reagents, the liquid sample is placed in a syringe, and a syringe pump is used to inject the sample below the liquid level in the reactor.

The quantities of reagents and the test parameters will be selected after consultation with Dr. Charles Rogers. Previous tests of the BCD process have employed treatment temperatures up to 340°C and reaction times up to 8 hours. Following completion of the treatment, the reactor will be cooled and aliquots of the reaction mixture will be removed for analysis, in addition to intermediate treatment samples collected from the reactor vessel.

5.0 EQUIPMENT AND MATERIALS

5.1 Bench-Scale ATP Equipment and Materials

5.1.1 ATP Equipment

The waste is manually placed into the testing system, which consists of the following equipment (see Figure 7):

1. Processor

   The processor is a drum 14 inches in diameter and 5 inches long. The drum rotates at speeds of 4 to 16 rpm and is electrically heated. A three-inch-thick insulation layer covers all hot drum surfaces. A four-inch-diameter, threaded-pipe nipple and cap are used for feed and discharge access into the drum.

2. Hot Vapor Condensing System

   Hot vapors produced in the reactor flow through a double-pipe header primary and secondary water-cooled condenser tubes of stainless steel. The condenser normally uses cold water circulation, but hot water can also be used for cooling to minimize trapping oil in the condenser tube. Condensed liquids drain by gravity to a condensate trap.

3. Gas Metering and Sampling System

   Vapors exiting the condenser pass through a filter trap. Liquids may drain back to the condensate collector and, if so, are trapped in the filter. Gases passing the filter are discharged to a plastic gas collector bag

through the wet gas meter. This meter measures the net quantity of noncondensable gases evolved during the test and is equipped to record gas flow at increments of 0.05 cubic feet.

The noncondensable gas stream is finally passed through an adsorbent bed, such as activated carbon. This bed traps residual trace amounts of heavy hydrocarbon to prevent their release. The cleaned gas is then vented through a hood equipped with a high-efficiency particulate (HEPA)/carbon filter.

4. Purge Gas System

A centrally located pipe, passing through the drive assembly, provides a means of injecting purge gas into the reactor before or during a test run. The inlet purge gas (nitrogen for distillation and air for combustion) passes through the dry gas Meter No. 1, then through a rotating seal and into the reactor feed pipe. The emergency rupture system on the purge gas line vents upstream of the carbon filter to ensure that no contaminants are discharged into the atmosphere.

5. Pollution Control System

The processor/combustor is enshrouded by a hood and vent system. The vented air discharges into the laboratory hood, which is equipped with a HEPA/carbon filter. Off-gases from the processor/combustor are passed through a carbon column to remove any residual organic contaminants before discharging the gas into the laboratory hood. In the hood, the off-gas mingles with evacuated air and passes through the HEPA/carbon filter before being discharged to the atmosphere. These

multiple levels of protection are expected to be totally protective against public and personnel exposure.

5.1.2 ATP Process Raw Materials and Chemicals

The standard bench tests use clean sand as the reactor charge, added with or before the source feed sample. The ratio of sand to source sample can vary widely and is used to determine target values for optimum internal recycle of coked sand in the ATP unit. In the full-scale system, the coked sand recycles from the annular region of the ATP unit back into the reaction zone. This recycle affects heat transfer and net throughput rates most strongly, and to a lesser extent, may affect pyrolysis (thermal cracking) behavior and agglomeration of solid fines into larger particles.

Mineral oil will be added to each feed sample at approximately four percent by weight to serve two purposes:

1. The commercial processor requires a minimum amount of hydrocarbon content in the feed material for the proper operation of the vapor train.

2. The mineral oil will act as a carrier for the thermally desorbed contaminants. The resulting organic phase condensate (mineral oil) from the ATP bench-scale tests will be used for the BCD bench-scale testing.

Material Safety Data Sheets (MSDSs) for the sand and mineral oil used in the test is provided in Appendix B. In addition, information concerning the product properties of the mineral oil is provided.

5.2 Bench-Scale BCD Equipment and Materials

5.2.1 BCD Equipment

The primary equipment that will be used for BCD testing is the WSU bench-scale BCD reactor shown on Figure 8. The primary components of the bench-scale reactor include:

1. Reactor Vessel. The reactor vessel is a heated glass vessel fitted with a motor-driven stirrer.

2. Temperature Thermocouples. The thermocouples are used to monitor the temperature of the reaction mixture and the heating mantles.

3. Recycling Dean & Stark Receiver. The Dean & Stark receiver will be used to remove any water from the reactor and return organic condensate to the treatment flask.

4. Liquid Syringe Pump. The syringe pump is used to inject liquid test samples below the liquid level in the reactor.

5.2.2 BCD Process Raw Materials and Chemicals

Raw materials and chemicals required as reagents for the BCD process include a base (sodium hydroxide) and a hydrogen donor compound. A high boiling oil can be used as the hydrogen donor compound. In addition, other reagents which will cause the formation of a free radical hydrogen ion from the organic donor compound are required.

6.0 SAMPLING AND ANALYSIS

6.1 Vertac Site Sample Collection

Three source samples to be tested during the treatability study will be collected from the Vertac Site by Weston, on the behalf of Hercules, according to EPA-approved procedures described in the Vertac Site Phase I RI Report for Operable Unit II.

Source samples collected will include two surface soil samples and one spent carbon sample. Surface soil will be collected from a location within the former chlorination plant site (Grid 419) and a location next to the boiler house (Grid 152). The sampling locations are shown on Figure 2. The spent carbon will be collected from a bulk storage bunker and several 55-gallon drums stored at the site.

Samples collected by Weston will be analyzed for 2,3,7,8-TCDD isomer specific dioxin, after each sample is thoroughly mixed and homogenized. The purpose of the initial sample analysis is to insure that samples collected at the site have a sufficient TCDD concentration for the treatability testing.

Weston will ship the source samples collected in containers provided by Canonie to Hazen. Canonie will provide Weston with three steel coolers, with each cooler containing two 2-gallon plastic containers.

6.2 ATP Testing Sample Collection

Once the samples are received at Hazen, the contents from one plastic container in each cooler will be thoroughly mixed. The second plastic container from each cooler will be properly stored for later use, if necessary. After a thorough mixing, several samples will be taken, placed in a clean stainless-steel bowl, and composited into a sample representing each untreated source sample. Thus, three homogeneous,

individual source samples for the treatability study will be generated. Using a clean stainless-steel or aluminum spatula/scoop, aliquots of the untreated source samples will be transferred to clean glass jars and bottles. The clean glass jars and bottles will be obtained from the analytical laboratory or from certified bottle lots prepared by a supplier using EPA-approved protocol for sample container preparation.

Treated soil (coked solids and combusted solids) will be directly discharged from the treatment unit, at the end of the test run, into a clean tin/stainless-steel bowl. The sample will then be covered by aluminum foil, and allowed to cool. After the treated soil has cooled down, a clean stainless-steel/aluminum spatula will be utilized to obtain a sample of the treated soil into a clean glass jar.

Due to the thermal treatment in the ATP unit, the moisture and other organic compounds in the soil will be removed as vapors from the soil being tested. The condensable fraction of the vapors will be condensed during the test run and collected as condensed oil and condensed water. During a test run, condensed oil and condensed water will be collected continuously in a clean, decontaminated jar. At the end of the test run, the condensed oil and condensed water will be directly transferred from the jar to appropriate glass sample bottles.

Samples collected will be preserved and handled according to the requirements specified in the QAPP.

6.3 BCD Testing Sample Collection

The liquid condensate generated from the ATP tests will be shipped to WSU for analysis and BCD testing. The liquid condensate received will be separated into organic and aqueous fractions. A sample of the aqueous fraction will be obtained for analysis as specified in Table 4 and the organic fraction will be subject to BCD tests.

The organic phase condensate will be homogenized and then divided to give three test samples. The required number of subsamples from each test sample will be removed for analysis. The test samples will then be treated using the BCD process. Three intermediate treatment samples will be obtained from each BCD test for conducting the required chemical analysis as specified in Table 4. The final treated reaction mixture for each BCD test will be homogenized,and three aliquots of the mixture will be removed for analysis. Sampling will be conducted according to WSU BCD testing procedures.

6.4 Sample Transport

Shipment of samples will be completed after collected samples have been properly preserved, sealed, labeled, and documented as required by the QAPP. When shipping from Hazen to WSU, treated samples will be shipped separately from feed samples and liquid condensate samples to insure cross contamination does not occur. Specifically, feed source samples and condensate samples identified in Table 4 will be shipped separately from coked and combusted solids samples.

When shipping is imminent, samples will be placed in a cooler with an amount of ice or other freezing gel packs sufficient to maintain the sample temperature cool. If wet ice is used, the wet ice shall be sealed in a leak-proof sack or container. Each sample shall be surrounded by a packing material, such as foam rubber, vermiculite, or similar media, to cushion the sample containers against breakage and aid in insulating the samples from heat. When the cooler is filled, a chain-of-custody form, identifying each sample in the cooler, shall be enclosed in a Zip-loc™, clear, plastic bag and placed in the cooler just prior to final closure of the cooler. The cooler shall then be sealed with packaging or strapping tape, the overnight shipping label attached to the cooler, and the cooler placed into the custody of the overnight carrier.

6.5 Chemical Analysis

The parameters selected for treatability testing include the critical parameters: 2,3,7,8-TCDD, chlorophenols (2-chlorophenol, 2,4-dichlorophenol, 2,6-dichlorophenol, 2,4,5-trichlorophenol, and 2,4,6-trichlorophenol), tetrachlorobenzene, and herbicides. Specifically, the herbicides to be tested for include 2,4-D, 2,4,5-T, and silvex. TCLP tests will be conducted on the ATP combusted solids for metals, semivolatiles, and herbicides. A list of chemical analyses and testing frequencies are presented in Table 4. In addition to the above chemical analyses, moisture, solids and grain-size tests will also be conducted.

Analysis of 2,3,7,8-TCDD will be conducted using EPA Method 8280, while EPA Method 8270 and EPA Method 8150 will be conducted for SVOCs and chlorinated herbicides, respectively. The TCLP will be conducted using EPA Method 1311. In addition to the analysis of 2,3,7,8-TCDD, PCDD/PCDF compounds identified in Method 8280 will be analyzed for in the ATP combusted solids samples and the organic phase condensate.

7.0 DATA MANAGEMENT

Since the data generated from the bench-scale testing will be used to evaluate SoilTech's ATP unit and BCD technology for full-scale operation, it is pertinent to apply a high level of QA/QC to the data collection as specified in the QAPP. Observations and data will be well documented through the use of logbooks and data collection sheets.

8.0 DATA ANALYSES AND INTERPRETATION

At the completion of the treatability study the analytical results will be evaluated to determine the ability of the ATP technology to effectively treat the impacted soils and the BCD technology to dechlorinate the organic phase condensate. The data will be analyzed to assess precision and completeness as specified in the QAPP in order to ensure that the QA objectives set for this study have been met.

Data will be summarized and relationships between variables will be compared in tabular and graphical formats to determine the optimal operating parameters. A statistical analysis will not be appropriate for this testing since limited data will be collected for each set of parameters.

9.0 HEALTH AND SAFETY PLAN

SoilTech maintains lab space at the Hazen Laboratory in Golden, Colorado for the storage and operation of the ATP bench-scale unit. Hazen personnel operate the unit under SoilTech's direction; thus, the health and safety plan has been supplied by Hazen. The "Laboratory Safety and Chemical Hygiene Plan" and the "Contingency Plan for Hazardous Waste/Hazardous Material Spills" are included in Appendix A.

BCD bench-scale testing will be conducted by WSU with oversight from SoilTech. WSU will follow their Laboratory Health and Safety Plan. In addition, WSU has supplied Canonie with their Standard Operating Procedure for "Safety and Precautions in Handling Chlorodibenzodioxins, Chlorodibenzofurans, Polychlorinated Biphenyls, and Related Toxic Materials," which can be found in Appendix A.

10.0 RESIDUALS MANAGEMENT

Various residuals will be generated as a result of the bench-scale treatability testing. These residuals may consist of, but are not limited to, untreated source samples, treated soil/spent carbon and condensate, and spent analytical samples.

The treatability testing and analytical laboratories will be responsible for the proper handling and shipment of all materials generated back to the Vertac Site in Jacksonville, Arkansas. Shipment of any material back to the Vertac Site must first be approved by Albert J. Lefranc of Hercules at (302) 594-7453. Material shipment must also be coordinated and approved by the Vertac Site Superintendent, Bill Roberts at (501) 982-9481.

Shipment Site Address:
Attn: Bill Roberts
Hercules, Inc.
1907 Hill Road
Jacksonville, Arkansas 72076

11.0 REPORTING REQUIREMENTS

Upon completion of the treatability study, Canonie will submit a draft report including the elements outlined below. After review and comment by Hercules and others, Canonie will prepare a final report incorporating the comments received. The draft report will include:

1. Introduction
   - 1.1 Site Description
   - 1.2 Site Material Description
   - 1.3 Technology Description
2. Treatability Study Approach
   - 2.1 Test Objectives and Rationale
   - 2.2 Experimental Testing and Procedures
   - 2.3 Equipment and Materials
   - 2.4 Sampling and Analysis
   - 2.5 Data Management
   - 2.6 Deviations from the Work Plan
   - 2.7 Quality Assurance
3. Results and Discussion
4. ATP and BCD Full-Scale Treatment and Economic Evaluation
5. Conclusion and Recommendations

References

Appendices

- A Data Summaries

If requested, Canonie will provide a copy of any logbooks, chromatograms, or other data recorded during the study not included in the final report.

12.0 SCHEDULE

The proposed project schedule for the Vertac Site dechlorination treatability study is shown in Table 5. Several proposed milestones which will occur during the duration of this project are identified in the schedule.

According to this proposed schedule, ATP bench-scale testing will begin during the week of October 19, 1992. Preliminary ATP results should be available by November 13, 1992.

At the completion of the ATP bench-scale testing, condensate samples will be sent to WSU for BCD bench-scale testing. Preliminary results for the BCD testing are expected to be available by December 12, 1992.

Upon completion of the treatability study, Canonie expects to submit to Hercules a draft report on December 18, 1992. After review and comment by Hercules, Canonie will prepare a final report to be submitted January 29, 1993.

13.0 MANAGEMENT AND STAFFING

Figure 9 presents the proposed organizational chart for the dechlorination treatability study project.

13.1 Canonie

Canonie as contractor to Hercules, is responsible for performance of the technical activities required for the dechlorination treatability study. Scott R. Smith, P.E., the designated Canonie Contract Project Manager will be responsible for coordination of all activities and overseeing preparation and presentation of all the deliverables to Hercules, including the treatability study final report. Canonie will utilize additional qualified personnel as necessary to insure the treatability study is conducted according to contract terms and requirements specified in this Work Plan and the QAPP.

13.2 SoilTech

Roger Nielson, the designated SoilTech Treatability Study Lab Manager, will be responsible for the execution of the dechlorination treatability study according to the work plan and QAPP. This responsibility includes overseeing the operations of the ATP and BCD treatability study laboratories during the treatability tests. Mr. Nielson will also collect the data generated from the tests and assist in interpreting the data in generating the treatability study report. Mr. Joe Hutton, SoilTech Project Manager, will provide a key role in evaluating the data for assessing full-scale treatment.

13.3 Hazen

Jerome P. Downey, the Hazen Treatability Study Laboratory Project Manager who is an employee of Hazen will be responsible for conducting the actual test runs. This responsibility includes adherence to the testing procedures prescribed in this work

plan, and the adherence to the sampling, sample handling, and shipping procedures prescribed in this QAPP. He will also be responsible for generation and presentation of the equipment test run report to Roger Nielson.

13.4 Wright State University

Dr. Thomas O. Tiernan, WSU Laboratory Manager, will provide overall administrative and technical direction of the BCD bench-scale treatability study and analytical testing conducted for both the ATP and BCD testing. This responsibility includes guidance and supervision of the technical staff, final review of the data obtained, and preparation and final review of reports to be submitted to Roger Nielson.

13.5 Vista

In addition to the WSU analytical laboratory, Vista Laboratory (Vista) will be used to conduct TCLP testing of the combusted solids. Vista will be responsible for the reporting of the analytical results of the TCLP analysis.

TABLE 1

CONCENTRATION OF 2,3,7,8-TCDD IN THE RESIDUES AND DISTILLATES FROM A BCD-TREATED HERBICIDE MIXTURE

Ratio of Herbicide to Oil in the Treatment	Quantity of 2,3,7,8-TCDD in Treated Mixture (ng)	Quantity of 2,3,7,8-TCDD in Distillate (ng)
1:1 Herbicide:Oil	ND (0.05)	1,429
1:2 Herbicide:Oil	ND (0.06)	798
1:3 Herbicide:Oil	ND (0.25)	354

TABLE 2

SUMMARY OF LABORATORY BCD TREATMENT TESTS
WITH VARIOUS HALOGENATED MATERIALS

Treated Contaminant	Matrix	Concentration Prior to Treatment	Treatment Process	Percent Destruction
2,4-D	Vermiculite	10.5 mg/g	$NaHCO_3$ Pressure Reactor	>99.983%
2,4,5-T	Vermiculite	33 mg/g	$NaHCO_3$ Pressure Reactor	>99.995%
Silvex	Vermiculite	8.0 mg/g	$NaHCO_3$ Pressure Reactor	>99.978%
PCP	Soil	94 ug/g	$NaHCO_3$/Carbon Glass Reactor	>96.1%
2378-TCDD	Vermiculite	4.14 ug/g	$NaHCO_3$ Glass Reactor	99.986%
PCB	Liquid (Aroclor 1260)	20,000 ug/g	NNaOH/Fuel Oil/Catalyst Glass Reactor	>99.95%

TABLE 3

SCHEDULE OF BATCH TEST RUNS PER SAMPLE
ATP AND BCD BENCH-SCALE STUDY

Feed Source	Soil Sample 1	Soil Sample 2	Spent Carbon	Condensed Oil
Ramp Runs	1	1	1	--
Retort Runs	2	2	2	--
Combustion Runs (a)	1	1	--	--
BCD Tests (b)	--	--	--	3

Notes:

(a) No combustion run will be performed on the carbon sample.

(b) BCD tests will be conducted on a composite of the oil fraction of the condensates. They will be repeated three times on the composite to verify repeatability.

TABLE 4

SCHEDULE OF ATP AND BCD
BENCH-SCALE TEST CHEMICAL ANALYSES

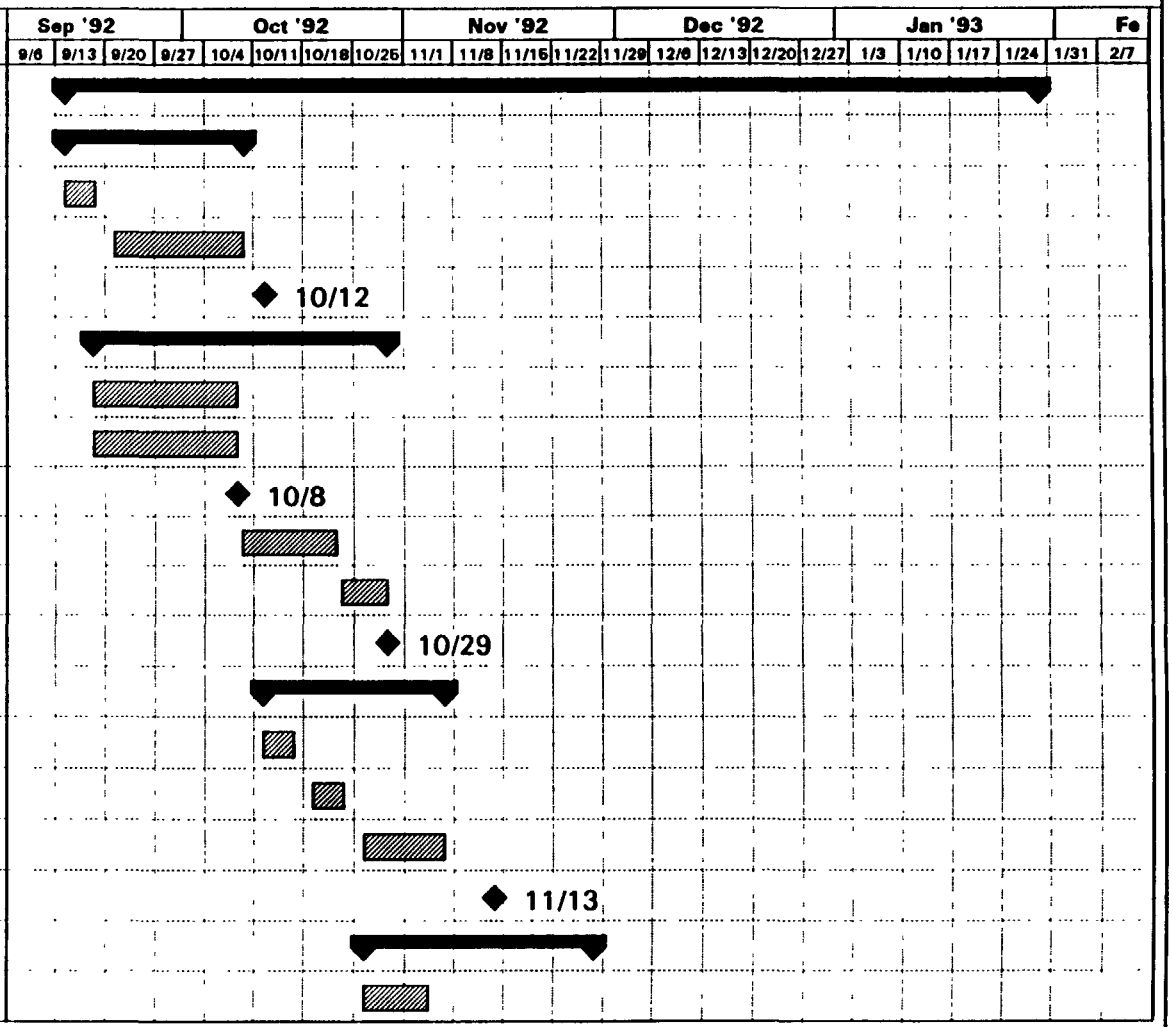
	Source Material	Coked Solids	Combusted Solids (h)	Condensed Water	Condensed Oil	BCD Process Intermediate Oil	BCD Process Post-Treated Oil (h)
No. of Samples	3	6	4	1	3	3	5
Moisture (a)	3	--	--	--	--	--	--
Solids (b)	3	--	--	--	--	--	--
Grain Size (c)	2	4	2	--	--	--	--
2,3,7,8-TCDD (d)	3	6	4	1	3	3	5
Chlorophenols (e)	3	6	4	1	3	3	5
Silvex, 2,4-D and 2,4,5-T (f)	3	6	4	1	3	3	5
TCLP (g)	--	--	2	--	--	--	--

Notes:

(a) Gravimetric method at 105°C for 16 hours.
(b) Gravimetric method at 550°C for 16 hours.
(c) ASTM D422.
(d) EPA Method 8280.
(e) EPA Method 8270.
(f) EPA Method 8150.
(g) Method 1311, TCLP extract will be analyzed for metals, SVOCS, and chlorinated herbicides.
(h) Two samples, a matrix spike sample, and a matrix spike duplicate sample, from the combusted solids and BCD process post-treated oil will be analyzed for 2,3,7,8-TCDD, herbicides, and SVOCs.

Table 5
Project Schedule
Dechlorination Treatability Study

ID	Name	Duration
1	**Treatability Study**	20w
2	**Sample Collection**	4w
3	Site Sample Collection- Weston	1w
4	Sample Analysis- Weston	3w
5	**Sample Shipment To Hazen**	0w
6	**Project Plans**	6w
7	Draft Work Plan	3w
8	Draft QAPP	3w
9	**Submit Draft Plans**	0w
10	Hercules Review	2w
11	Revise Draft Plans	1w
12	**Submit Final Project Plans**	0w
13	**ATP Soil Tests**	4w
14	Sample Preparation	1w
15	Testing	1w
16	Chemical Analysis	2w
17	**Preliminary ATP Results**	0w
18	**BCD Condensate Tests**	5w
19	Sample 1 Test	1.5w



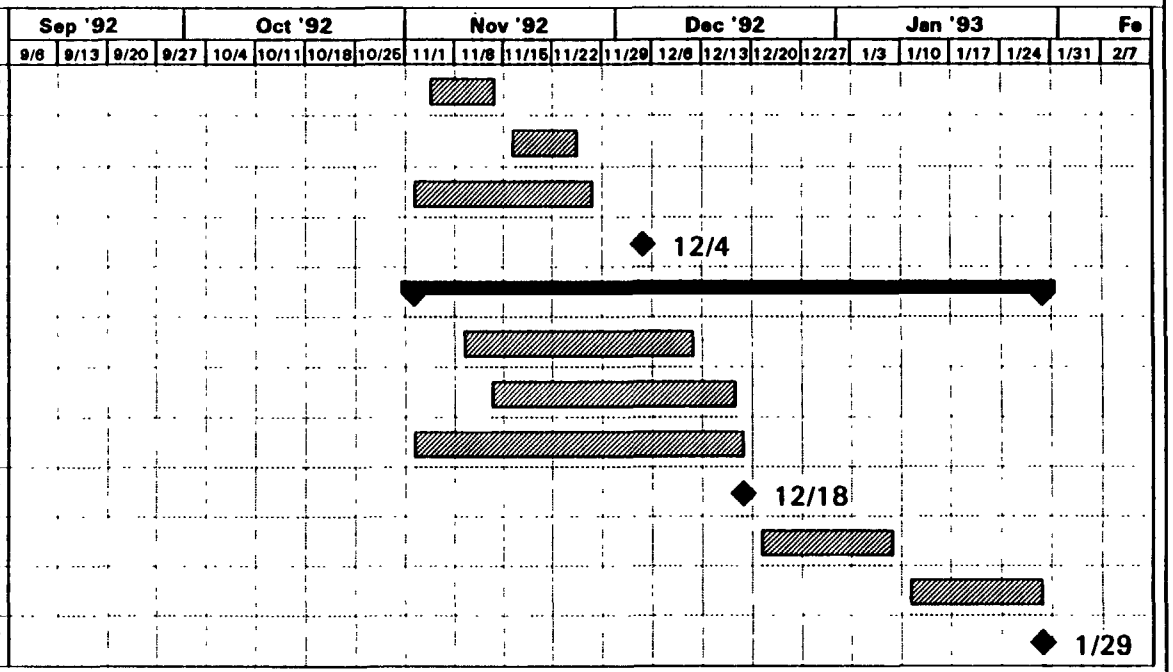
Project: 92-229-01
Date: 10/27/92

Task Milestone ◆ Summary

CanonieEnvironmental

Table 5
Project Schedule
Dechlorination Treatability Study

ID	Name	Duration
20	Sample 2 Test	1.5w
21	Sample 3 Test	1.5w
22	Chemical Analysis	4w
23	**Preliminary BCD Results**	0w
24	**Report**	13w
25	Technical Data Review	5w
26	Engineering/Economic Evaluation	5w
27	Draft Report	7w
28	**Submit Draft Report**	0w
29	Hercules Review	3w
30	Final Report	3w
31	**Submit Final Report**	0w



Project: 92-229-01
Date: 10/27/92

Task Milestone ◆ Summary

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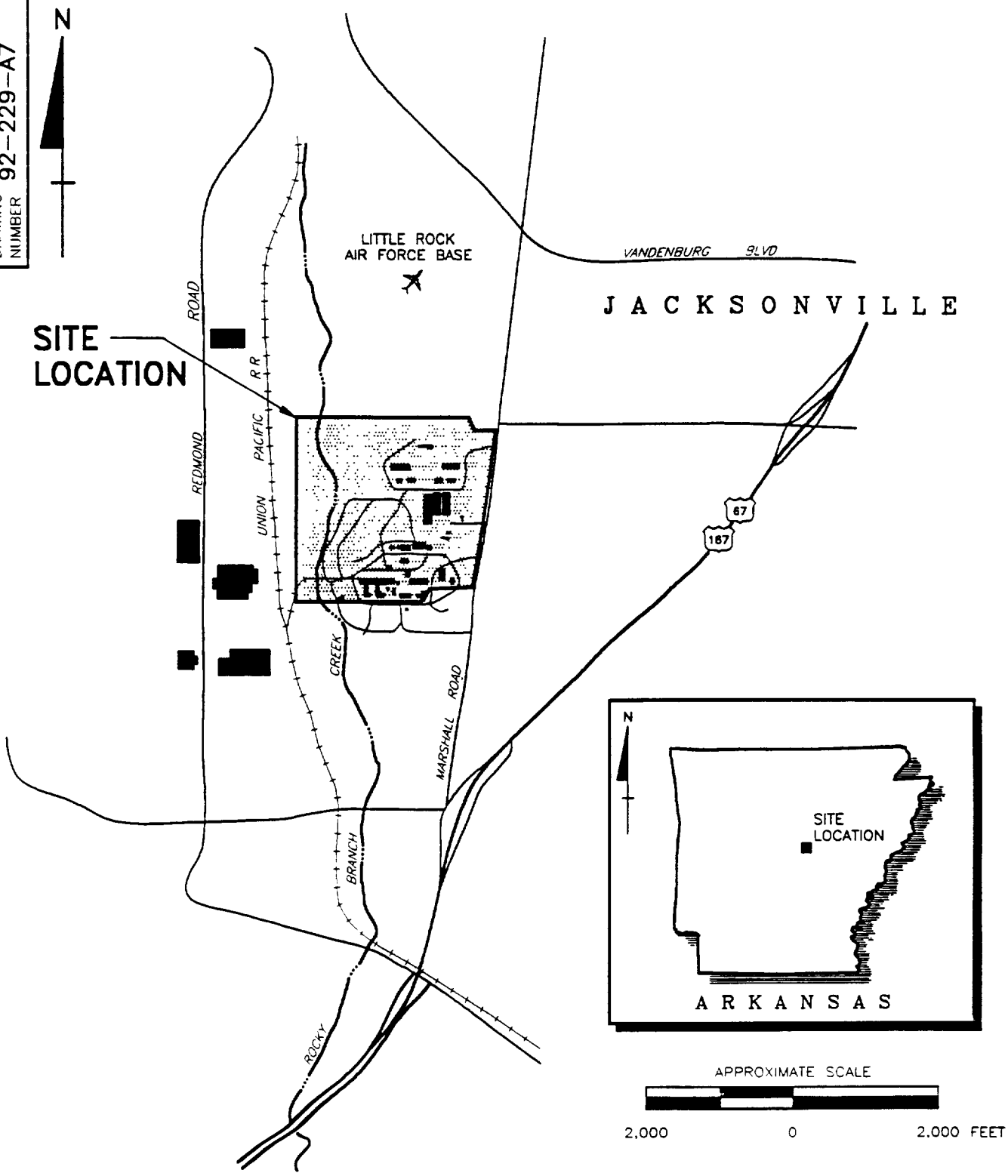

REFERENCES

- WESTON, FIGURE 1-1, SITE LOCATION MAP, VERTAC SITE, JACKSONVILLE, ARKANSAS

SITE LOCATION PLAN
DECHLORINATION TREATABILITY STUDY

PREPARED FOR

HERCULES INCORPORATED

Canonie Environmental

No	DATE	ISSUE / REVISION	DWN. BY	CK'D BY	AP'D BY
2	10-27-92	ISSUED FOR FINAL WORK PLAN	M.A.M	TJF	SRS
1	10-9-92	ISSUED FOR DRAFT WORK PLAN	M.A.M	TJF	SRS

DATE 10-5-92
SCALE AS SHOWN

FIGURE 1

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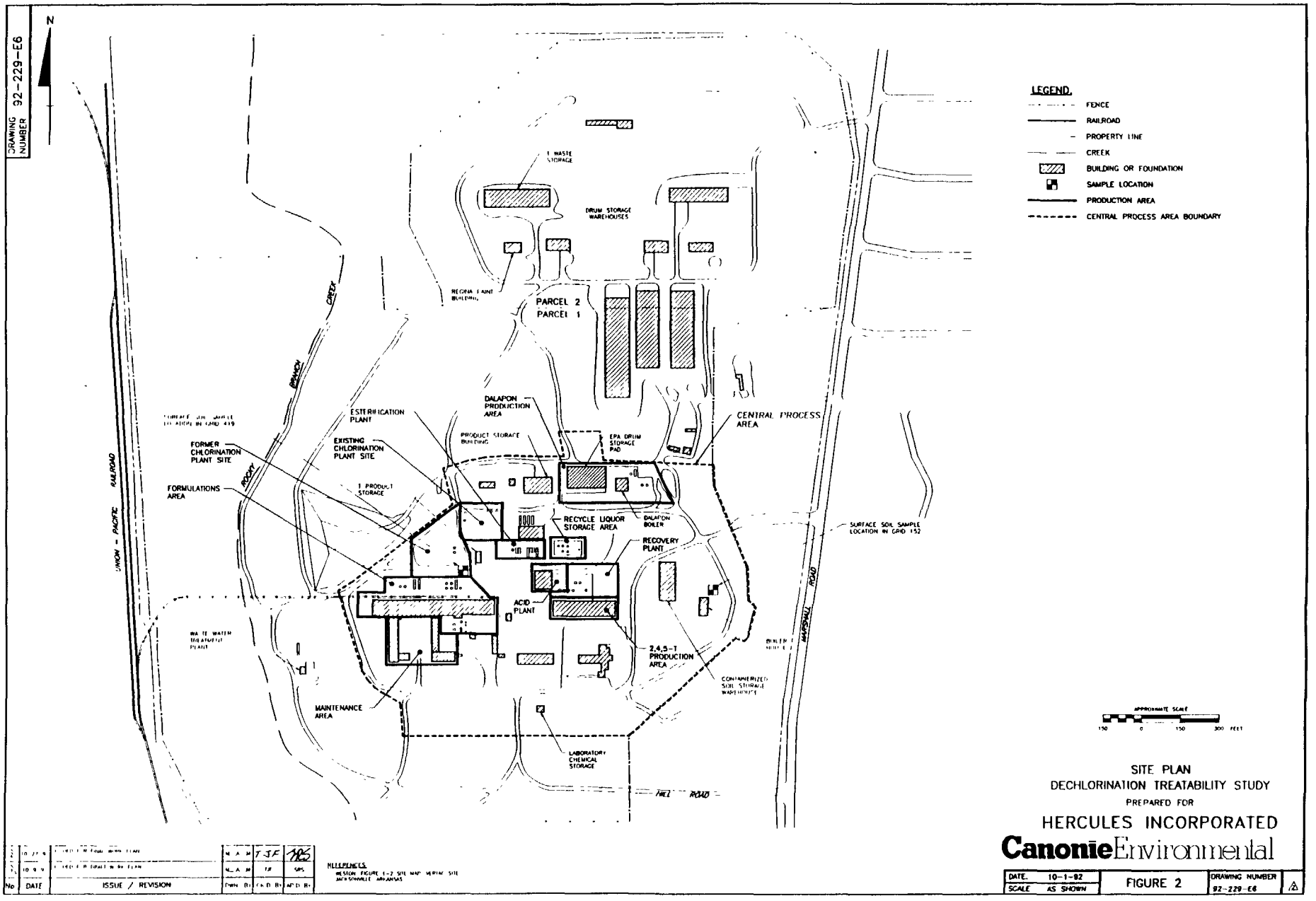
2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N
LEGEND.
FENCE
RAILROAD
PROPERTY LINE
CREEK
BUILDING OR FOUNDATION
SAMPLE LOCATION
PRODUCTION AREA
CENTRAL PROCESS AREA BOUNDARY
PARCEL 2
PARCEL 1
DRUM STORAGE WAREHOUSES
ESTERIFICATION PLANT
DALAPON PRODUCTION AREA
CENTRAL PROCESS AREA
FORMER CHLORINATION PLANT SITE
EXISTING CHLORINATION PLANT SITE
FORMULATIONS AREA
PRODUCT STORAGE BUILDING
EPA DRUM STORAGE PAD
RECYCLE LIQUOR STORAGE AREA
DALAPON BOILER
RECOVERY PLANT
ACID PLANT
2,4,5-T PRODUCTION AREA
MAINTENANCE AREA
LABORATORY CHEMICAL STORAGE
SURFACE SOIL SAMPLE LOCATION IN GRID 152
UNION - PACIFIC RAILROAD
MARSHALL ROAD
APPROXIMATE SCALE
150 0 150 300 FEET
SITE PLAN
DECHLORINATION TREATABILITY STUDY
PREPARED FOR
HERCULES INCORPORATED
CanonieEnvironmental
DATE 10-1-92
SCALE AS SHOWN
FIGURE 2
DRAWING NUMBER 92-229-E6
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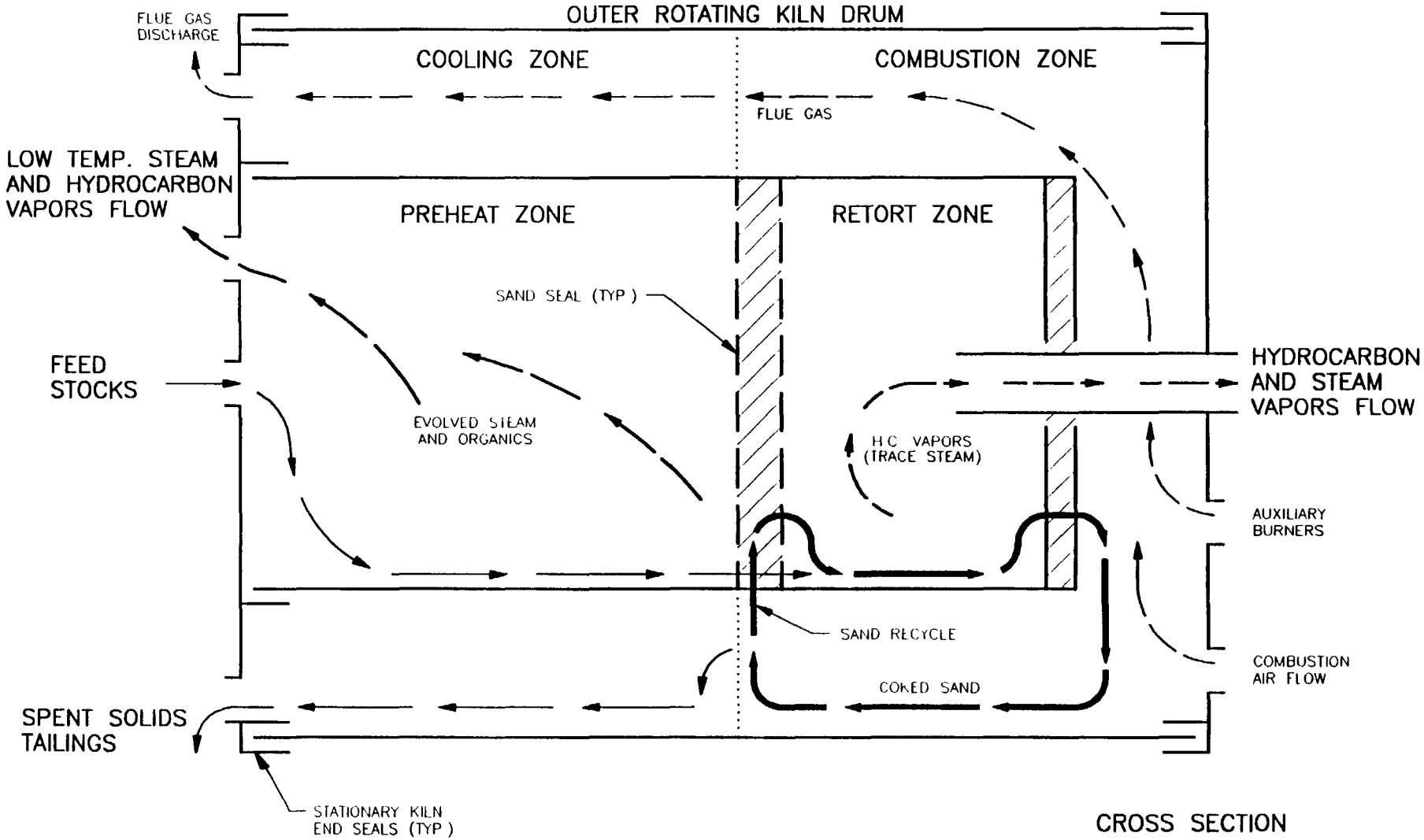
REFERENCES

DRAWING NUMBER 92-229-A2



CROSS SECTION
SOILTECH ATP SYSTEM
DECHLORINATION TREATABILITY STUDY

PREPARED FOR

HERCULES INCORPORATED

Canonie Environmental

No	DATE	ISSUE / REVISION	DWN BY	CK'D BY	AP'D BY
2	10-27-92	ISSUED FOR FINAL WORK PLAN	M_A_M	TJF	SRS
1	10-9-92	ISSUED FOR DRAFT WORK PLAN	M_A_M	TJF	SRS

REFERENCE:
FROM "TACIUK PROCESSOR FOR TREATMENT OF OIL CONTAMINATED WASTES", W TACIUK, R M RITCEY, AOSTRA ANNUAL SPRING CONFERENCE "ADVANCES IN PETROLEUM RECOVERY AND UPGRADING TECHNOLOGY" DATED JUNE, 1987

DATE: 9-24-92	FIGURE 3	DRAWING NUMBER 92-229-A2
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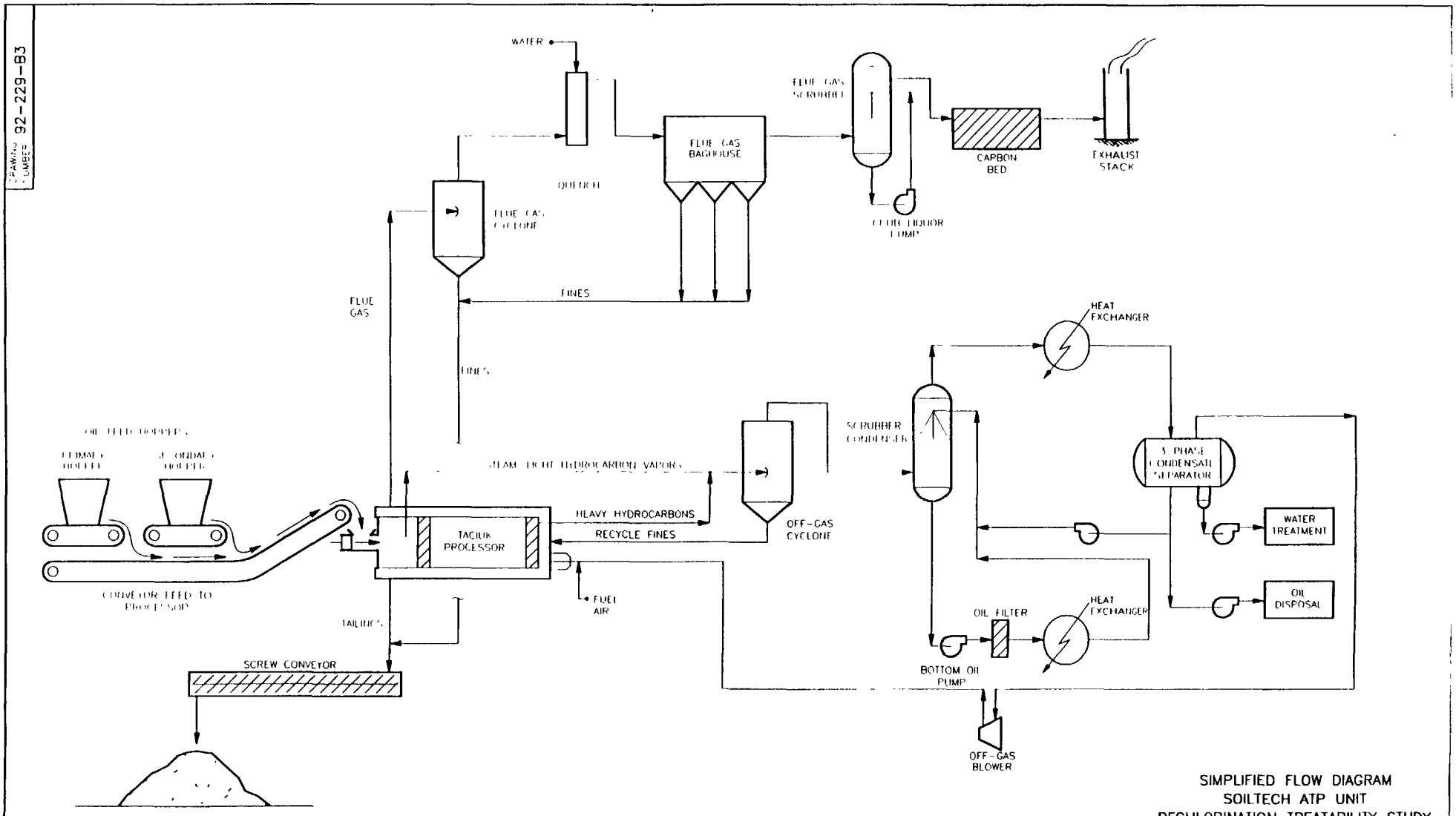


NO.	DATE	ISSUED FOR FINAL WORK PLAN	M A M	TJF	SPS
1	10 9 92	ISSUED FOR DRAFT WORK PLAN	M A M	TJF	SPS
NO.	DATE	ISSUE REVISION	DWN BY	D BY	M D BY

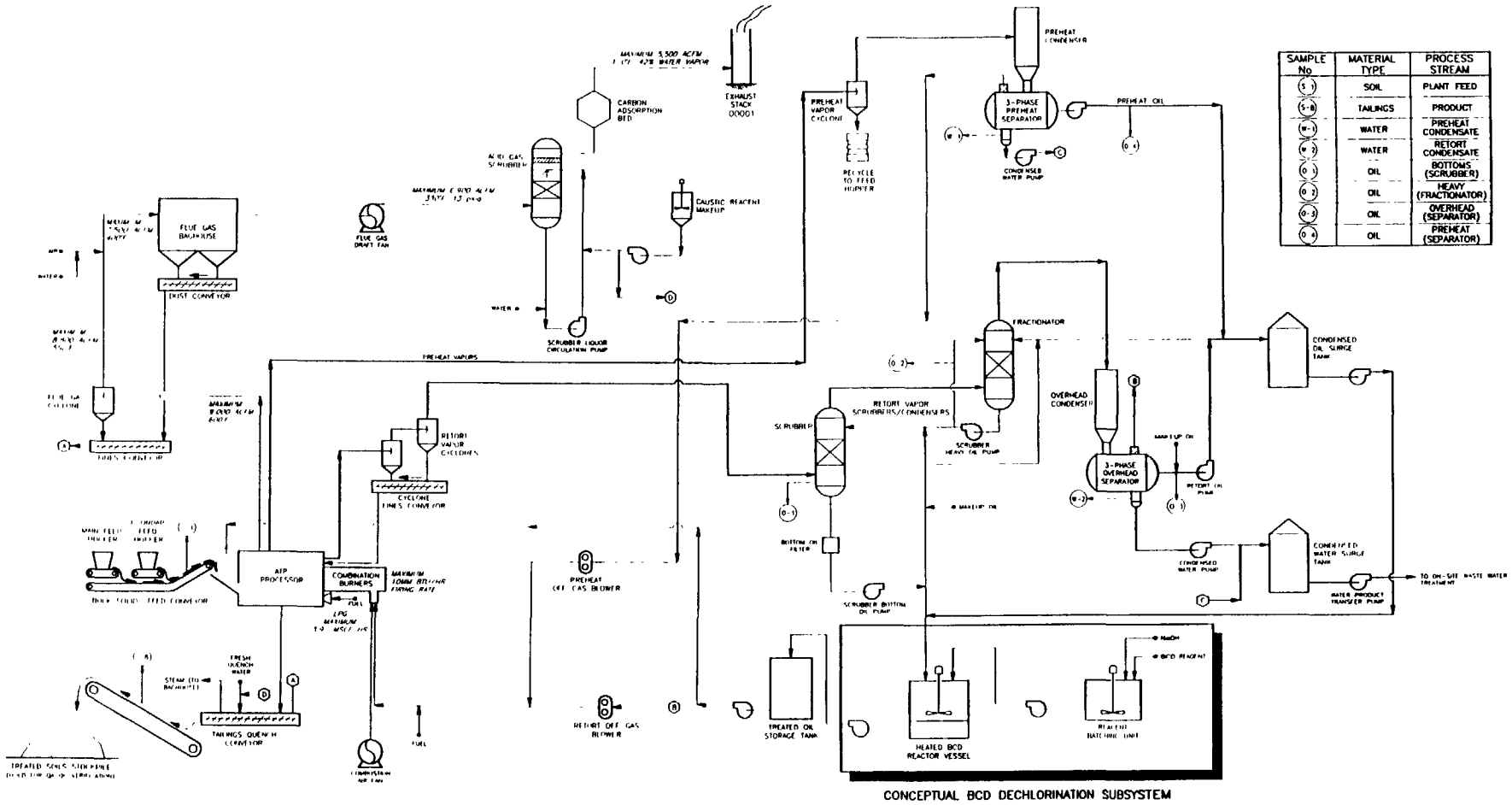
SIMPLIFIED FLOW DIAGRAM
SOILTECH ATP UNIT
DECHLORINATION TREATABILITY STUDY
PREPARED FOR
HERCULES INCORPORATED

Canonie Environmental

DATE 9-24-92	FIGURE 4	DRAWING NUMBER 92-229-B3
SCALE AS SHOWN		

801800

DRAWING NUMBER 92-229-E4



SAMPLE No	MATERIAL TYPE	PROCESS STREAM
S-1	SOIL	PLANT FEED
S-8	TAILINGS	PRODUCT
W-1	WATER	PREHEAT CONDENSATE
W-2	WATER	RETORT CONDENSATE
O-1	OIL	BOTTOMS (SCRUBBER)
O-2	OIL	HEAVY (FRACTIONATOR)
O-3	OIL	OVERHEAD (SEPARATOR)
O-4	OIL	PREHEAT (SEPARATOR)

CONCEPTUAL BCD DECHLORINATION SUBSYSTEM

LEGEND:

(4) MATCH POINTS

SOILTECH ATP UNIT
GENERALIZED SYSTEM FLOW SHEET
WITH DECHLORINATION
DECHLORINATION TREATABILITY STUDY
PREPARED FOR
HERCULES INCORPORATED

CanonieEnvironmental

No	DATE	ISSUE / REVISION	DWN BY	CHD BY	APD BY
2	9-24-92	[illegible]	M A M	TJF	[illegible]
1	10-9-92	[illegible]	M A M	TJF	SRS

DATE	9-24-92	FIGURE 5	DRAWING NUMBER 92-229 E4
SCALE	NONE		

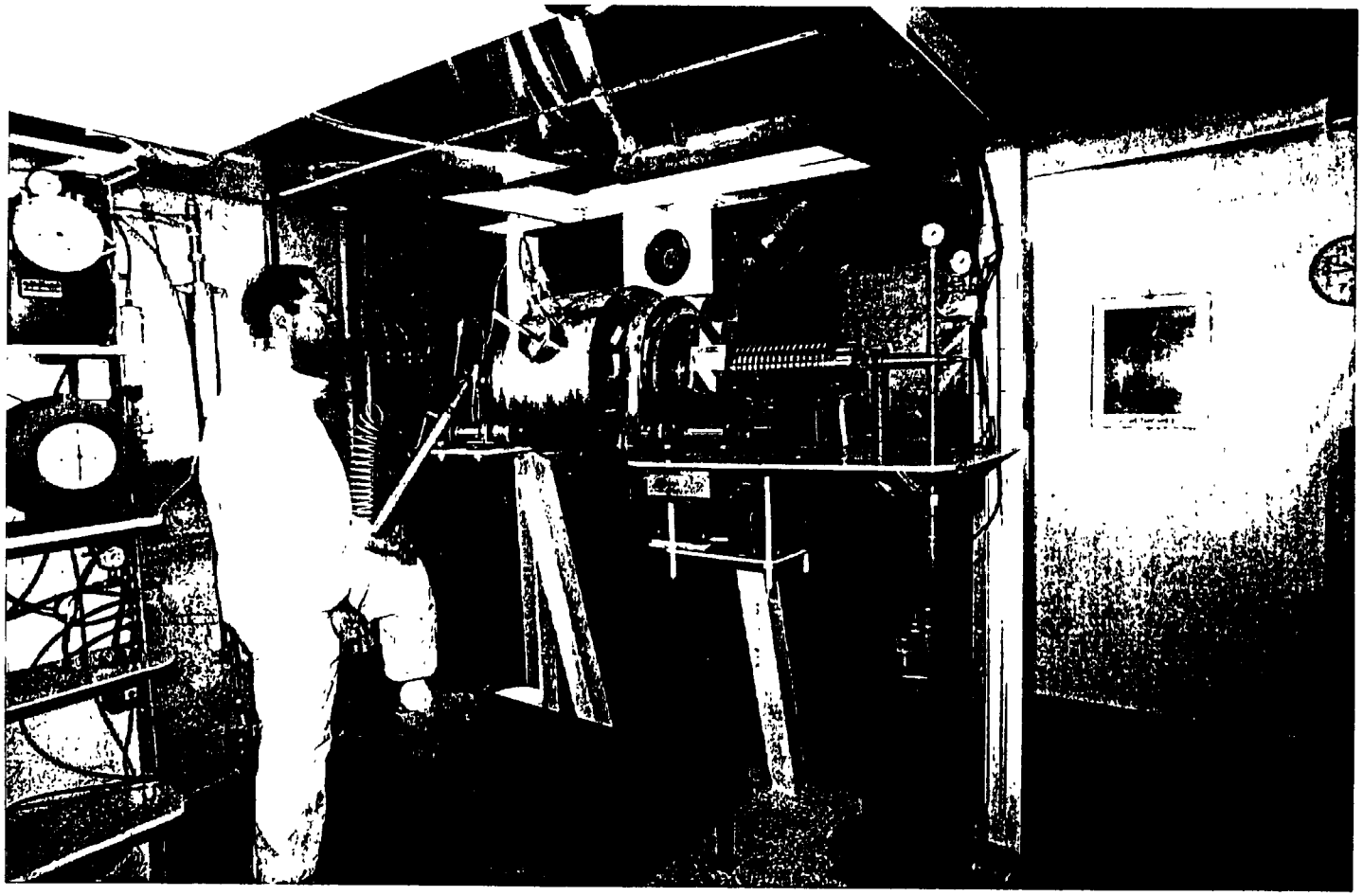
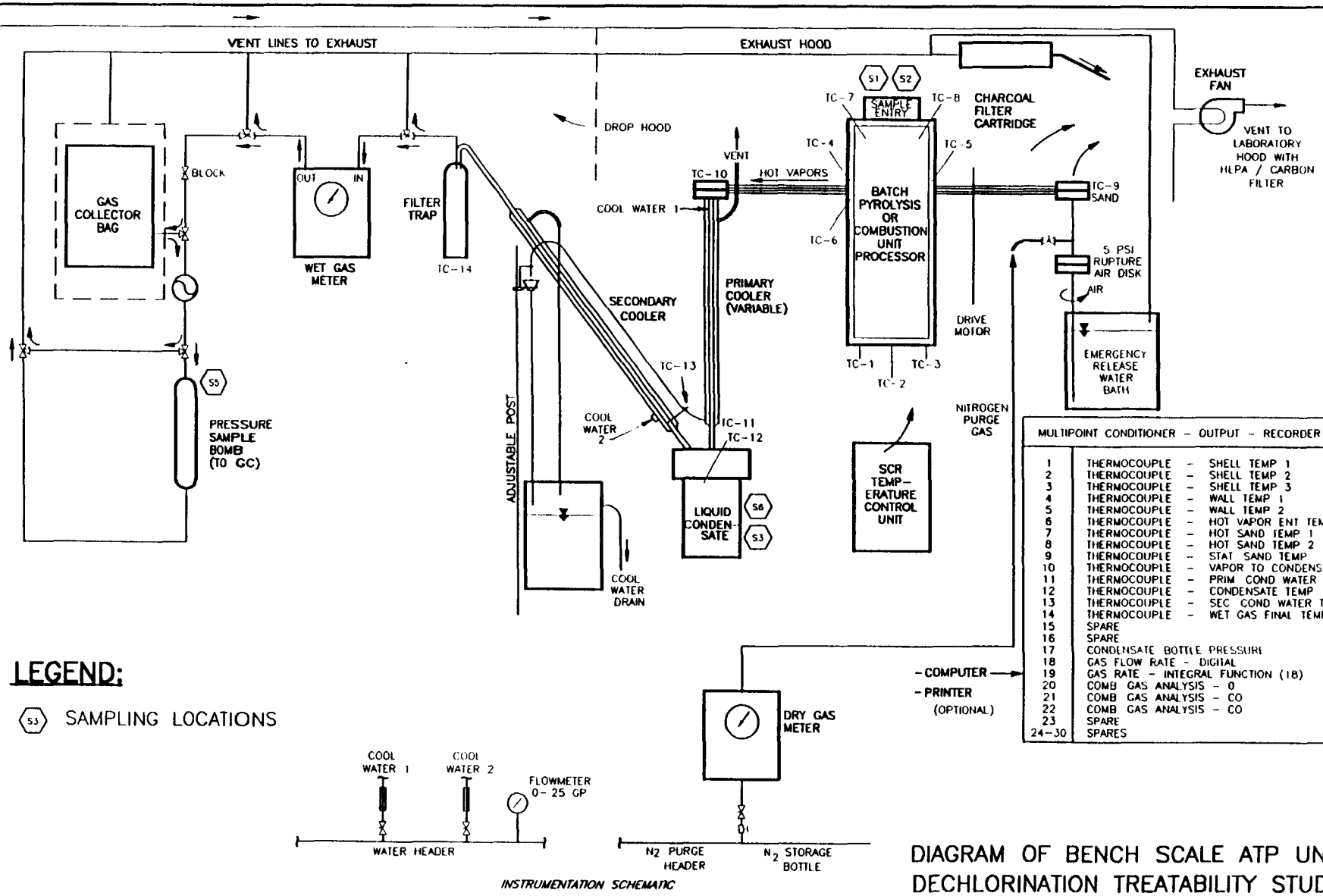


FIGURE 6
SoilTech ATP
Bench Scale Test Unit

DRAWING NUMBER 92-229-A1



MULTIPOINT CONDITIONER - OUTPUT - RECORDER	
1	THERMOCOUPLE - SHELL TEMP 1
2	THERMOCOUPLE - SHELL TEMP 2
3	THERMOCOUPLE - SHELL TEMP 3
4	THERMOCOUPLE - WALL TEMP 1
5	THERMOCOUPLE - WALL TEMP 2
6	THERMOCOUPLE - HOT VAPOR ENT TEMP
7	THERMOCOUPLE - HOT SAND TEMP 1
8	THERMOCOUPLE - HOT SAND TEMP 2
9	THERMOCOUPLE - STAT SAND TEMP
10	THERMOCOUPLE - VAPOR TO CONDENSER
11	THERMOCOUPLE - PRIM COND WATER TEMP
12	THERMOCOUPLE - CONDENSATE TEMP
13	THERMOCOUPLE - SEC COND WATER TEMP
14	THERMOCOUPLE - WET GAS FINAL TEMP
15	SPARE
16	SPARE
17	CONDENSATE BOTTLE PRESSURE
18	GAS FLOW RATE - DIGITAL
19	GAS RATE - INTEGRAL FUNCTION (18)
20	COMB GAS ANALYSIS - O
21	COMB GAS ANALYSIS - CO
22	COMB GAS ANALYSIS - CO
23	SPARE
24-30	SPARES

LEGEND:

(S3) SAMPLING LOCATIONS

INSTRUMENTATION SCHEMATIC

No	DATE	ISSUE / REVISION	DWN BY	CK'D BY	AP'D BY
3	10-27-92	ISSUED FOR FINAL WORK PLAN	M_A_M	TJF	SRS
2	10-9-92	ISSUED FOR DRAFT WORK PLAN	M_A_M	TJF	SRS
1	8-14-92	ISSUED FOR PROPOSAL	GWB	TJF	TJF

DIAGRAM OF BENCH SCALE ATP UNIT DECHLORINATION TREATABILITY STUDY

PREPARED FOR

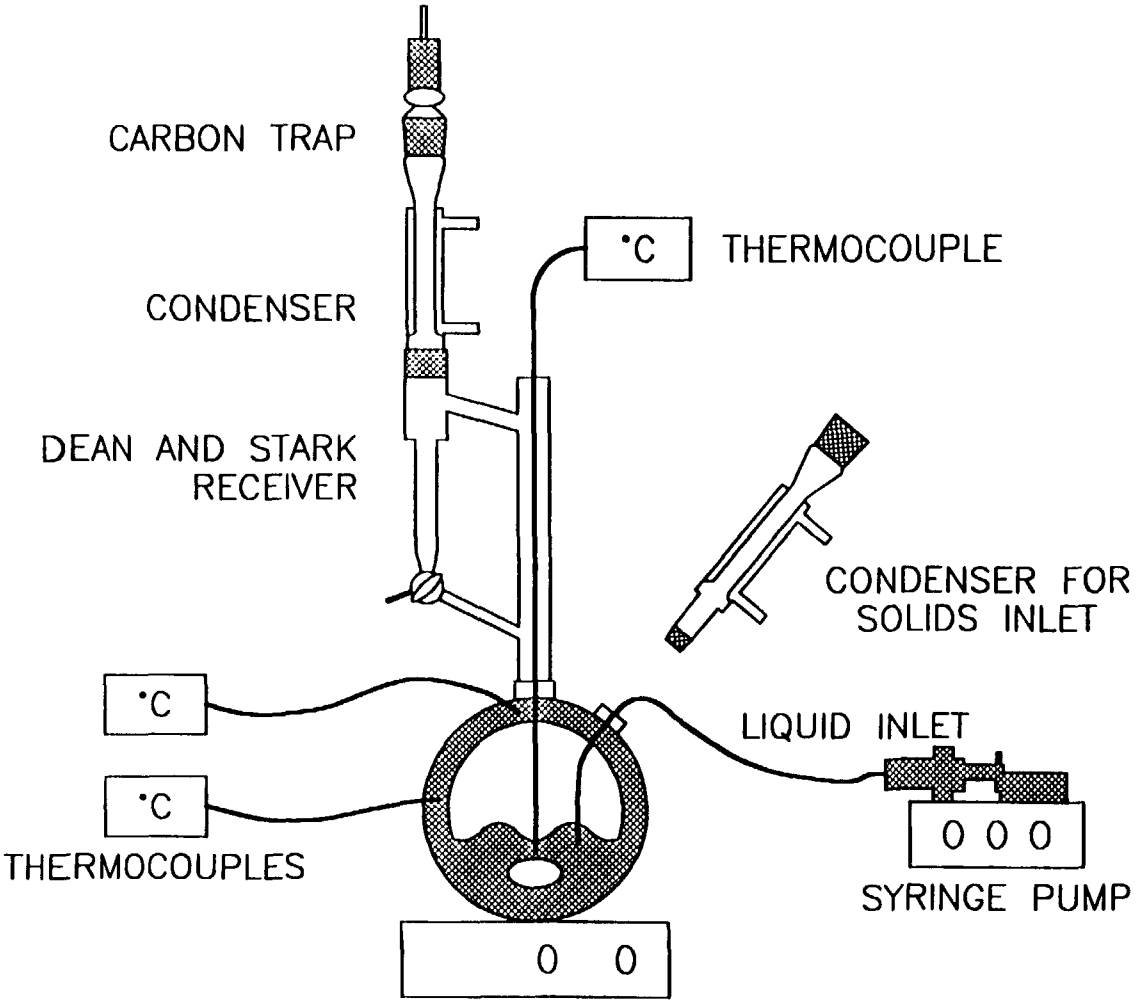
HERCULES INCORPORATED

Canonie Environmental

008110

DATE 8-14-92	FIGURE 7	DRAWING NUMBER 92-229-A1
SCALE NONE		

DRAWING NUMBER 92-229-A8



WRIGHT STATE UNIVERSITY
BCD BENCH SCALE REACTOR
DECHLORINATION TREATABILITY STUDY

PREPARED FOR

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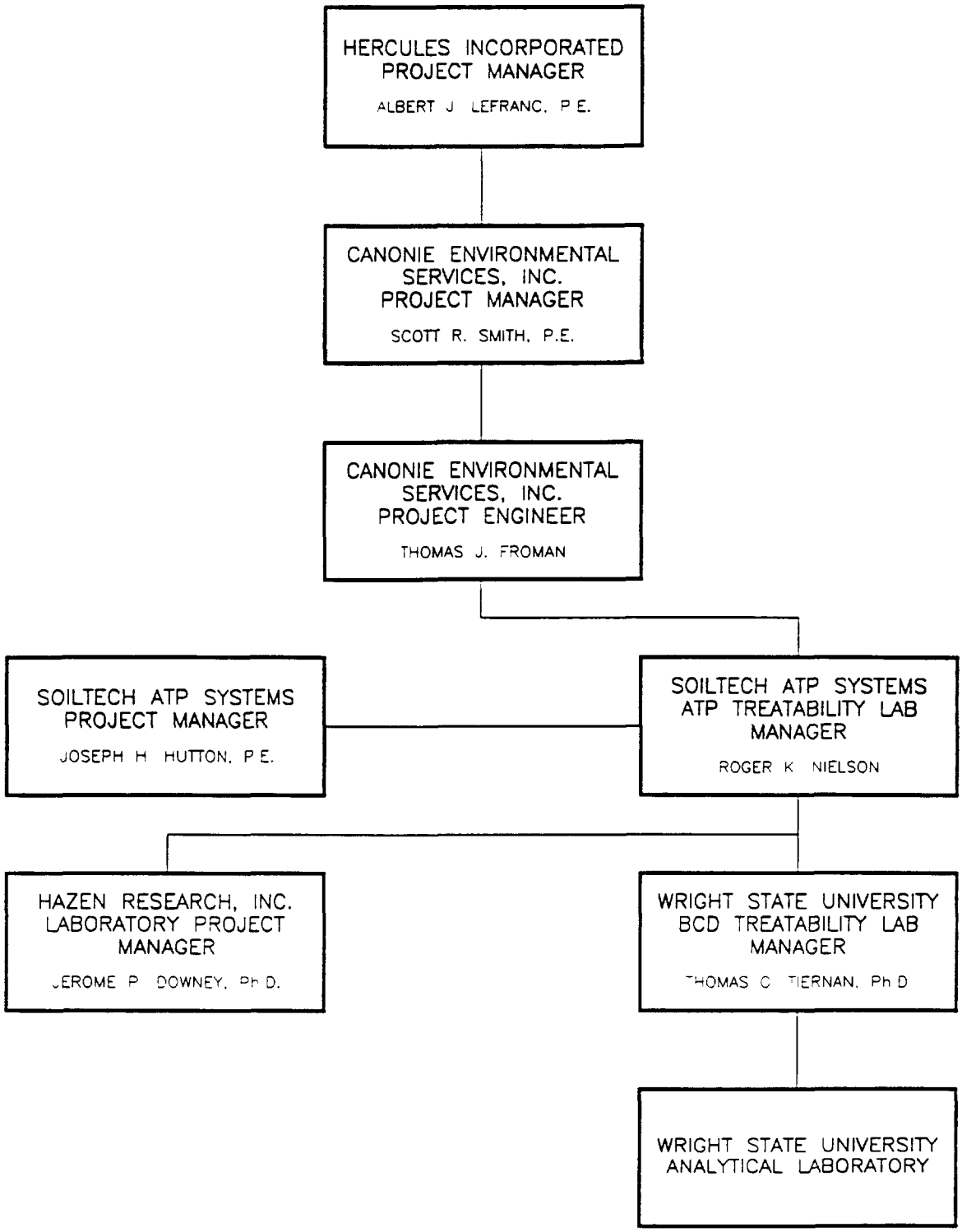
No	DATE	ISSUE / REVISION	DWN BY	CK'D BY	AP'D BY
2	10-27-92	ISSUED FOR FINAL WORK PLAN	M_A_M	TJF	SRS
1	10-9-92	ISSUED FOR DRAFT WORK PLAN	M_A_M	TJF	SRS

008111

DATE: 10-6-92	FIGURE 8	DRAWING NUMBER 92-229-A8
SCALE: NONE		

DRAWING NUMBER 92-229-A5

008112



ORGANIZATION CHART
DECHLORINATION TREATABILITY STUDY

PREPARED FOR

HERCULES INCORPORATED

Canonie Environmental

No	DATE	ISSUE / REVISION	DWN BY	CK'D BY	AP'D BY
2	10-27-92	ISSUED FOR FINAL WORK PLAN	MAM	TJF	SRS
1	10-9-92	ISSUED FOR DRAFT WORK PLAN	MAM	TJF	SRS

DATE 9-24-92
SCALE: NONE

FIGURE 9

DRAWING NUMBER 92-229-A5

2

APPENDIX A

HAZEN LABORATORY SAFETY AND CHEMICAL HYGIENE PLAN AND CONTINGENCY PLAN FOR HAZARDOUS WASTE/HAZARDOUS MATERIAL SPILLS AND WRIGHT STATE UNIVERSITY S.O.P. T1.A.2.1

LABORATORY SAFETY AND CHEMICAL HYGIENE PLAN

10.1 INTRODUCTION

Effective January 31, 1991, the U.S. Occupational Safety and Health Administration (OSHA), in 29 CFR 1910.1450, has enacted safety standards applicable to laboratories that work with hazardous chemicals. The new OSHA regulations require Hazen:

1. To designate a Chemical Hygiene Officer (CHO).
2. To develop a Chemical Hygiene Plan that establishes procedures for working with hazardous chemicals.
3. To provide Material Safety Data Sheets and other safety reference materials.
4. To provide employee safety and health training and information.
5. To provide methods of control for hazardous chemicals, including personal protective equipment and engineering controls.
6. To provide medical monitoring to employees exposed to hazardous chemicals.

This document is prepared in order to comply with this new OSHA regulation.

10.2 LABORATORY SAFETY PROCEDURES

Research and analytical laboratories provide a potential for the occurrence of serious injuries and accidents. Materials may be encountered which are toxic, corrosive, flammable, explosive, noxious, or suffocating. Some equipment is operated under extremes of pressure, temperature, voltage, and flow. When handled improperly, these materials and equipment may cause an accident. Personnel in contact with such hazardous materials and equipment must be knowledgeable in the procedures for their safe manipulation, and also must know how to respond properly should an accident occur.

When performing any job in the laboratory, one must be aware of the possibility of an accident and take all necessary precautions to prevent an accident from occurring. It is the responsibility of each employee using chemicals and laboratory equipment to be aware of the potential danger. Each person who uses and handles chemicals must be familiar with their dangerous properties and with the safety section on "Chemicals and Reagents".

10.3 GENERAL LABORATORY SAFETY

1. Follow recognized safety procedures concerning protective equipment, housekeeping, and the handling of hazardous chemicals and equipment.

2. Prior to performing test work, think through all reactants, intermediates, and products in terms of toxicity, flammability, and reactivity hazards.

3. Perform only authorized experiments. Supervisors who are responsible for experimental programs must train others working in the area about the chemicals being used and the possible hazards involved.

4. When performing an unknown reaction, always start with small quantities of material to determine reaction characteristics.

5. Appropriate protective gear must be worn at all times. At a minimum, safety glasses must be worn at all times in laboratories.

6. Rubber gloves, and a rubber or plastic apron or lab coat, are to be worn while handling acids, caustics, or heated liquids.

7. Heat-protective gloves are to be used for handling hot objects and working with furnaces.

8. Eating or drinking in laboratory areas is prohibited.

9. At no time is a person to perform hazardous laboratory work assignments while alone in the building. See the "Lone Worker Rule" in Section 1.

10. Do not leave potentially dangerous experiments unattended or overnight.

11. Never apply mouth suction to a pipette.

12. Avoid filling a burette above eye level.

13. All fuming, evaporating, and operations involving flammable, toxic, or explosive materials must be conducted in a hood.

14. Exercise caution when opening stock bottles of concentrated liquid reagents or bottles of liquids having high vapor pressure. It may be necessary to cool such containers prior to opening.

15. All cylinders of compressed gases must be tied down securely to prevent tipping over or falling. Cylinders must be transported only in the cylinder cart and be chained to the cart with the protective valve cover capped tightly.

16. Persons working with radioactive materials or equipment which generate ionizing radiation must be aware of the dangers and the special precautions involved.

17. Employees who may often be subjected to ionizing radiation which could reach potentially dangerous levels must wear the appropriate monitoring device, such as a pocket dosimeter or film badge.

18. Radiation shields and other safety devices on x-ray equipment must be kept in a place to protect against possible exposure.

19. Areas in which x-ray or other forms of radiation and radioactive materials are used should always be marked with radiation warning signs. Unauthorized persons must avoid areas and materials marked with the radiation or radioactive symbol.

20. No one may work with an unshielded radioactive source without the proper Nuclear Regulatory Commission (NRC) license.

21. Persons using laboratory autoclaves must be familiar with or instructed in the operation of these potentially dangerous pieces of equipment.

10.4 GENERAL PROCEDURES FOR ALL CHEMICALS

1. Regardless of what chemical is being used, minimize all chemical exposure. In general, avoid skin contact with all chemicals.

2. Do not underestimate the risk associated with any chemical. Exposure even to chemicals considered nonhazardous should be minimized. Always assume that any mixture of chemicals is more toxic than its components and that all chemicals of unknown toxicity are toxic.

3. A good way to prevent exposure to airborne substances is to prevent their escape into the working atmosphere by working in hoods or using other ventilation devices.

4. Specific chemical Permissible Exposure Limits (PEL) from OSHA and Threshold Limit Values (TLV) from ACGIH should never be exceeded. These values are available in references kept in the work area. If you suspect that a PEL or TLV is approached, warn the other personnel in the area.

5. When working with known hazardous chemicals, utilize the appropriate safety equipment such as gloves, splash shields, rubber aprons, respirators, etc., to reduce the risk of exposure.

6. Educate yourself about the hazards of the chemicals you use. If you are working with a new chemical, use the information resources available or seek answers from the CHO.

7. Eating and drinking are prohibited in any area where hazardous chemicals are in use.

8. All hazardous chemicals must be clearly labelled on each container. If a hazardous chemical is transferred to a new container, the new container must be immediately labelled.

9. Comprehensive Material Safety Data Sheets (MSDS) are kept in alphabetical files located in the lobby of Building 9. If information on a specific hazardous chemical cannot be found in the MSDS files, contact the Chemical Hygiene Officer (CHO) for other MSDS resources.

10.5 PROCEDURES FOR EXTREMELY HAZARDOUS CHEMICALS

Extremely hazardous chemicals are defined as chemicals that are known or suspected carcinogens, reproductive toxins, and substances having a high degree of acute toxicity. Normally, laboratory procedures, performed at Hazen do not use chemicals in this category. Before initiating any use of an extremely hazardous chemical, the Chemical Hygiene Officer (CHO) must be notified. The CHO will designate an isolated area where the work will be performed, the personal protective equipment needed, the containment devices required, the decontamination procedures and waste disposal procedures.

10.6 CHEMICAL SAFETY

Hazen uses many types of chemicals. Many of these substances present little hazard; others are extremely hazardous and must be carefully and rigidly controlled at all times. Chemicals present different problems in storage, handling, use, and control. Some explode when heated, react with water, heat spontaneously, decompose into hazardous substances, or cause ignition on contact with combustible materials. It is essential that the properties of each chemical you work with be known and understood. Always check with your supervisor prior to using any chemical that you are not familiar with. Material safety data sheets are available for all chemicals used at Hazen.

Toxic chemicals are hazardous substances which, if eaten, inhaled, or absorbed through the skin, even in small quantities, may endanger health.

Corrosive chemicals can cause severe skin irritation or burns if used incorrectly. If these material enter the eyes, they can cause blindness.

Always wear eye, face, and hand protection when using chemicals. Keep chemical containers closed when not in use, and use them only when under ventilated hoods or in well-ventilated areas.

Appropriate personal protection equipment, such as safety goggles, face shields, gloves, aprons, and respirators, must be worn when handling hazardous materials. Requirements of a specific project will indicate what protective equipment is required for your specific task.

Because of the large number of projects using cyanides at Hazen, employees should be particularly familiar with the proper handling, storage, and usage of these chemicals.

10.7 FLAMMABLE LIQUIDS

1. Flammable liquids do not, in the strict sense of the word, burn; their vapors burn. The temperature at which just enough vapor is given off to form an ignitable mixture with air is called the "flash point". Liquids commonly termed "volatile", such as acetone, toluene, ethers, and alcohols, give off vapors in ignitable quantities at ordinary room temperatures.

2. Every vapor or gas that will burn can also explode when mixed with air in the right proportions.

3. When flammable vapors are present, there is both a fire and explosive hazard. These vapors will collect above the surface of the liquid in a container, spill over the edge, and be carried by air currents. The vapors will rise if lighter than air, and fall if heavier than air. They will continuously mix with the air. The degree of danger depends largely on the kind of liquid, presence of ignition source, and the concentration of vapors in the air.

4. You must be aware of the hazards of flammable liquids, and you must take positive measures to eliminate the risk of injury. All these substances can be managed safely if they are stored, handled, mixed, and poured according to the following safety procedures.

Handling Flammable Liquids

1. Always wear the required protective equipment. Some flammable liquids can be irritating to the skin and eyes, and may be toxic if inhaled in sufficient quantities.

2. Open flames and smoking are prohibited in all areas where flammable liquids are stored, handled, or used.

3. Use only under ventilated hoods or in adequately ventilated areas.

4. Avoid contact with the skin.

Pouring and Mixing Flammable Liquids

1. Avoid mixing flammable liquids with other liquids or chemicals unless specifically stated in your operating procedures.

2. Make certain your containers are grounded and connected to each other to prevent static discharge. A static spark will occur between two containers of different electrical potential. This can be prevented by grounding one container and electrically connecting the two containers with a conductor.

3. Transfer flammable liquids only under ventilated hoods or in a well-ventilated area.

Storage of Flammable Liquids

1. Do not store flammable liquids in open containers.

2. Quantities of flammable liquids in excess of one pint should be stored in approved safety cans or flammable-liquid lockers.

3. Mark all containers with their contents and hazards, using approved warning labels.

4. Keep only minimum amounts required at your work station.

5. Reserve supplies of flammable liquids stored in buildings must be in approved flammable-liquid storage cabinets.

10.8 HOUSEKEEPING

1. Each worker is responsible for keeping his or her work area neat and orderly. All workers using community areas such as hoods, ovens, and balances should share responsibility for keeping them clean.

2. Laboratory benches and aisles should not be used as storage areas, but should be cleared upon completion of each experiment or job.

3. Reagent spills must be cleaned up immediately to avoid possible chemical burns, poisoning, or the possibility of dangerous reactions with other materials.

4. Place rags, waste paper, and broken glass in the proper receptacle for disposal.

5. Fire extinguishers, safety showers, and eye wash fountain areas are to be kept clear and readily accessible.

6. Waste chemicals must be properly labeled as to contents. Acids and/or wash solvents or volatiles must be kept in separate safety containers for disposal or neutralization. For specific information, contact the CHO.

10.9 USE OF GLASSWARE

1. Do not use broken, cracked, chipped, or badly scratched glassware.

2. Do not handle broken glass with bare hands; use gloves, or sweep it up. Fine glass particles should be picked up with wet paper towels.

3. The ends of all glass tubing and rods should be fire polished before using.

4. Protect hands with gloves or towel when making a glass-to-rubber connection, or when inserting glass tubing into a stopper. Lubricate the tubing with water, glycerine, or stopcock grease.

5. The correct technique for cutting and shaping glass tubing and rods must be observed. Get instruction if necessary.

6. Extra protective care must be taken when attempting to remove frozen stoppers or freeing frozen ground-glass joints.

7. When heating glass vessels on a hot plate or over a burner, protect them from breakage, due to excess localized heat, by using asbestos pads or asbestos-centered wire gauze.

8. All glassware should be emptied and rinsed before being set aside for cleaning, particularly if they contain toxic or highly reactive materials.

9. Thick-walled glass apparatus should never be heated, or should be provided with metal gauze mantles.

10. Vacuum desiccators, Dewar flasks, vacuum distillation apparatus, etc., should be provided with metal gauze mantles.

11. Apply vacuum only to glassware made for such services (e.g., desiccators and filter flasks).

12. Be sure vacuum filter crucibles cannot slip through holders and that stoppers on Buchner funnels are not too small for the filter flasks.

13. Do not subject glassware under vacuum to mechanical shock.

14. Always wrap glass Dewar flasks with tape before use.

15. Do not stopper glass flasks containing hot, condensable vapors.

16. Relieve vacuum in all parts of system before opening apparatus.

17. When distilling, make sure system is vented and watch for plugging in the condenser.

18. Use boiling chips for stirring to prevent bumping when boiling liquids.

19. Use heating mantle or hot plate when possible, rather than a burner.

10.10 CHEMICALS AND REAGENTS

Chemicals and reagents are widely used in the laboratories and pilot plants. Many of them, alone or in certain combinations with others, can result in a serious accident if carelessly stored, handled, or used. This sections deals with some of the basic concepts for safe storage and handling of chemicals and reagents which are used often. It also gives general information regarding certain dangerous chemical combinations to avoid. No attempt is made herein to discuss all of the possible chemicals which may be used. There are few hard-and-fast rules in chemistry, and an overall understanding of chemistry must be applied to each specific situation.

Storage and Handling of Chemicals

1. Generally, heavy items or large containers should be stored on or as near the floor as possible, with smaller items and containers on the upper shelves.

2. Large storage shelves should have ridges in the front to reduce danger of chemical spillage.

3. Chemicals which might react together to produce dangerous fumes, fire, or explosion must not be stored in the same location.

4. Volatile liquids must be kept away from heat sources, sunlight, and electrical switches.

5. Large containers of liquid chemicals should be provided with a protective covering of sufficient strength to prevent damage to the containers.

6. Glass containers should be surrounded with shock-absorbing material for stockroom storage or transport.

7. Oxidizing materials, such as nitrates, peroxides, and chlorates, should be stored in a dry area, apart from organic material.

8. Care must be taken to be certain that all chemicals are compatible with the material of construction of the containers in which they are handled. For example, hydrofluoric acid is not to be handled in glass equipment.

9. Acids should never be stored with solvents, caustics, or cyanides.

10. Bulk hydrogen or hydrogen sulfide must be stored in separate fenced-off areas. There must be at least two exits on opposite sides of such enclosures.

11. Drums which are mounted horizontally should be securely braced to prevent rolling. Sand should be placed under the taps to absorb drippings.

12. Under no circumstances should gas cylinders be rolled, dragged, bounced, or jostled. Cylinders of chlorine or hydrogen sulfide larger than 75 pounds should be handled by at least two persons.

13. Gas cylinders must be transported only in cylinder carts, securely fastened, and with the valve cap in place.

14. Immediately after cylinders are positioned for use, they should be clamped or chained securely.

15. Manual transporting of large reagent containers should be eliminated wherever possible.

16. All containers must be labeled plainly. A receptacle should never be filled with material other than that indicated on the label. Containers should be labeled before filling.

17. If exact information is not received with shipment of new or unfamiliar types and potencies of chemicals for special work, request the manufacturer to furnish their recommendations before proceeding with laboratory use, or see the CHO for more information.

18. When diluting acid, always pour the acid into water. Never pour water into acid.

19. Always flush the outside of acid bottles before opening them. Don't lay the stopper on any surface where the next person may rest his hand or arm. Keep acid bottles stoppered tightly, and flush and dry them before replacement on the reagent shelf. Make certain that no spillage remains on tables, floor, or bottle.

20. Handle solvents in exhaust hoods or well-ventilated areas, and keep the solvent supply in the laboratory at a minimum.

21. Keep flammable solvents in safety or proper storage bottle in an approved solvent cabinet.

22. When handling toxic gases such as chlorine, hydrogen sulfide or hydrogen cyanide, always keep a gas mask having an absorbent specific for the gas being used, or a self-contained breathing apparatus, close at hand for immediate use.

23. Never carry open containers of dangerous chemicals from place to place. Containers should always be covered or sealed when not in use.

24. When unloading reagents from a tank truck in the pilot plant areas, wear a rubber jacket, rubber gloves, and a face shield in addition to the usually safety gear.

25. Two men must be present during connecting of and disconnecting of unloading lines or whenever a line or piece of equipment is opened that carries toxic liquids or gases.

26. Double-check valving before starting flow when unloading a tank truck or transferring liquids through pipes. Always open valves slowly.

10.11 DISPOSAL OF WASTE CHEMICALS

1. Each person using laboratory reagents is expected to know the proper methods of disposing of waste chemicals safely and legally. If you have any questions, contact the CHO.

2. Small quantities of acids or alkalies may be disposed of by slowly pouring into a stream of water, and flushing down the drain with a large quantity of water.

3. Solvents which are immiscible with water and highly volatile liquids, are to be poured into drums set aside for this purpose. These drums are located at the west side of Building 1. If drums are not clearly labeled, contact the Safety Manager.

4. Alkali metal residues must be allowed to react completely in butyl alcohol before disposition. Such residues should never be disposed of by reaction with water.

5. Cyanides and other extremely poisonous materials must not be put in the drain, but placed in proper containers for disposal by the Safety Manager.

6. Peroxides may be disposed of by dissolving in large quantities of water and then reducing. Oxidizing chemicals in general should be reduced before disposal.

7. Under no circumstances should amines, phosphorus compounds, or any other highly reactive compound be placed in a common waste disposal container.

8. Any unusual or special disposal problems should be referred to the Safety Engineer.

9. All persons disposing of wastes of any kind must wear the proper protective clothing, such as gloves and safety glasses.

10. Waste chemicals must be properly labeled as to contents for disposal.

10.12 EXPLOSION HAZARDS

Explosions result from reactions that proceed rapidly and liberate heat or large volumes of gas or both. Listed below are atomic groupings that characterize explosive compounds:

Amine oxide	
Azide	Chlorate
Diazo	Diazonium
Fulminate	N-Haloamine
Hydroperoxide	Hypohalite
Nitrate	Nitrite
Nitro	Nitroso
Ozonide	Peracide
Perchlorate	Permanganate
Peroxide	

10.13 INCOMPATIBLE SUBSTANCES

DO NOT CONTACT THESE:	WITH THESE:
Alkaline and alkaline earth metals, such as sodium, potassium, cesium, lithium, magnesium, calcium, aluminum.	Carbon dioxide, carbon tetrachloride and other chlorinated hydrocarbons (also refrain from using water and dry chemicals on fires with these materials)
Acetic acid	Chromic acid, nitric acid, hydroxyl containing compounds, ethylene glycol, perchloric acid, peroxides, and permanganates
Acetone	Concentrated sulfuric and nitric acid mixtures
Acetylene	Fluorine, bromine, chlorine, copper, silver mercury, and their compounds
Ammonia, anhydrous	Mercury, halogen, calcium hypochlorite hydrogen fluoride
Ammonium nitrate	Acids, metal powders, flammable fluids, chlorates, nitrates, sulphur, and finely divided organics or combustibles
Aniline	Nitric acid, hydrogen peroxide
Bromine	Ammonia, acetylene, butadiene, butane and other petrol gases, hydrogen, sodium carbide, turpentine, benzene, and finely divided metals
Calcium carbide	Water (see acetylene)
Carbon, activated	Calcium hypochlorite
Copper	Acetylene, hydrogen peroxide
Chlorates	Ammonium salts, acids, metal powders, sulphur, finely divided organics or combustibles, carbon
Chromic acid	Acetic acid, naphthalene, camphor, alcohol, glycerine, turpentine, other flammable liquids, organic solvents

DO NOT CONTACT THESE:	WITH THESE:
Chlorine	Ammonia, acetylene, butadiene, benzene and other petroleum fractions, hydrogen, sodium carbide, turpentine, and finely divided powdered metals
Cumene hydroperoxide	Acids (organic and mineral)
Fluorine	Isolate from everything
Hydrocyanic acid	Nitric and other acids
Potassium and sodium cyanides	Acids
Hydrogen peroxide	Copper, chromium, iron, most metals or their respective salts, flammable fluids and other combustible materials, aniline, and nitromethane
Hydrofluoric acid, anhydrous (hydrogen fluoride)	Ammonia, aqueous and anhydrous
Hydrogen sulfide	Nitric acid, oxidizing gases
Hydrocarbons, general	Fluorine, chlorine, bromine, chromic acid, sodium peroxide, nitric acid
Iodine	Acetylene, ammonia, hydrogen
Mercury	Acetylene, ammonia, hydrogen
Nitric acid, concentrated	Acetic, chromic, and hydrocyanic acids, aniline, carbon, hydrogen sulfide, flammable media, fluids or gases and nitritable substances (i.e., glycerine)
Oxygen	Oils, grease, hydrogen, flammable liquids, solids, and gases
Oxalic acid	Silver, mercury

DO NOT CONTACT THESE:	WITH THESE:
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, and all organics
Phosphorus and phosphorus compounds	Air, oxygen
Potassium chlorate	Acids
Potassium permanganate	Glycerine, ethylene glycol, benzaldehyde, sulfuric acid
Sodium nitrate	Ammonium nitrate and other ammonium salts
Sodium peroxide	Any oxidizable substances, for instance methanol, glacial acetic acid, acetic anhydride benzaldehyde, carbon disulfide, glycerine, ethylene glycol, ethyl acetate, furfural, etc.
Sulfuric acid	Chlorates, perchlorate, permanganates
Sodium cyanide	Acids
Potassium cyanide	Acids
Cyanide-containing compounds	Acids

CONTINGENCY PLAN FOR HAZARDOUS WASTE/HAZARDOUS MATERIALS SPILLS

April 2, 1992

These procedures are to be implemented immediately once it has been determined that a spill or unplanned release of hazardous waste or hazardous material has occurred. The listed procedures must be strictly adhered to.

1. ASSESS THE SITUATION

If you do not believe that the spill can be safely contained using available HRI personnel, notify the Fairmount Fire Protection District at 911 immediately. Fairmount is our designated emergency response authority and will notify the Jefferson County Sheriff's Department and other agencies as needed. Your report must include the following:

a. Your name and the telephone number you are calling from (279-4501 or appropriate 'night number').

b. Name and address of affected facility (Hazen Research, 4601 Indiana Street, Golden, 80403).

c. Time and type of incident, e.g.,spill, release, fire, explosion.

d. Chemical name and quantity involved.

e. Number and extent of injuries, if any.

f. The possible hazards to human health or the environment.

As soon as it is practical, contact one of the following HRI personnel:

Steve Flaniken
Emergency Coordinator
7767 Gunsight Pass
Littleton, CO
890-6456 (pager)
478-1898 (24-hr Emergency)

Wayne Carter
Operations Services Department Manager
6737 Xenon Drive
Arvada, CO
424-1654 (home)

Barry Hansen
Senior Vice President
5816 S. Lupine Drive
Littleton, CO
730-0426 (home)

Paul Snoddy
Asst. Emergency Coordinator
1202 Leroy Drive
Northglenn, CO
452-2928 (home)

Emergency response authorities and regulatory agencies are contacted by dialing 911.

Prior to the arrival of the Emergency Coordinator, you must be the acting coordinator. This means you must assess the situation considering both direct and indirect effects of the incident. Gas clouds, vapor plumes, and fire water runoff are all effects that must be considered when planning containment and control of the incident.

If you determine that evacuation of off-site areas is necessary, coordinate those efforts with the Fairmount Fire Department Incident Commander. If evacuation of plant buildings is required, inform the occupants of the endangered buildings. Alwaysmove evacuated personnel upwind from the incident.

2. REMEDIAL ACTION

During an emergency, the emergency coordinator must take all reasonable measures necessary to ensure that fires, explosions, and releases do not occur, recur, or spread to other hazardous wastes and materials. These measures include stopping processes and operations, collecting and containing released waste, and removing or isolating containers. It must be understood that these remedial measures are of a higher priority than <u>any</u> pilot plant, laboratory, or process work.

If operations are stopped, the Emergency Coordinator must monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment when this is appropriate.

Special precautions must be taken to keep spilled material from entering the Wannamaker Ditch or leaving the property. Absorbents, spill pillows, and diking materials are described in Attachment B. If material from ore piles is to be used to form a dike, care must be taken to avoid having a reaction (sulfide ores with acids, for example).

Once the release has been contained, the waste and contaminated spill control materials must be stabilized.

3. NOTIFICATION OF REGULATORY AGENCIES

Any spill of a "Reportable Quantity" (RQ) of any chemical not contained within four walls and a ceiling must be reported immediately to the National Response Center (NRC). (Note: See Attachment E for the list of chemicals with RQs.) In addition, the NRC must also be immediately notified in the event that any release due to a fire, explosion or other cause can threaten human health or the environment outside of the facility, or if a spill enters the Wannamaker Ditch or other surface waters. The person discovering the spill or release is responsible for NRC notification.

National Response Center 1-800-424-8802

Give the following information:

a. Name and address: Hazen Research, Inc.
4601 Indiana Street
Jefferson County
Golden, Colorado 80403

b. EPA Generator ID Number: COD 048 742 175

c. Date, time, and type of incident, i.e., fire, explosion, etc.

d. Estimate quantity and type of chemical involved in the incident.

e. Extent and number of injuries, if any.

In addition to NRC notification, the Fairmount Fire Protection District (911) and the Colorado Department of Health (377-6326) should be notified as soon as possible. Spills of hazardous materials that enter the sewer system must also be reported to the following:

North Table Mountain	279-2854
Metro Wastewater (days)	289-5941
Metro Wastewater (nights)	289-5949

Other that the emergency response notifications required above, all reports to regulatory agencies will be done by a company officer.

April 2, 1992

ATTACHMENT A

LIST OF EMERGENCY EQUIPMENT

1. Portable fire extinguishers (ABC type) are located at hazardous waste holding areas and in each building.

2. Self-contained breathing apparatus are maintained in the warehouse.

3. Air contaminant gas and vapor detector tubes are available from the Safety Engineer's office in Building 1.

4. Various spill control equipment, located in black and yellow barrels next to the hazardous waste holding area, the warehouse, and Building 11.

5. Communication equipment. Telephones are located in all buildings.

6. Eighty-five-gallon overpack drums.

April 2, 1992

ATTACHMENT B

SPILL CONTAINMENT AND CONTROL EQUIPMENT

MATERIAL	LOCATION
Dicalite/Dicasorb sorbent for organic liquids.	Fire shed east of Building 7.
Diamond Shamrock spill pillows for organic liquids.	Spill Control Area in Building 14.
J. T. Baker spill kits for small quantities of cyanides, mercury, solvents, caustics, and acids.	Spill Control Area in Building 14.
Vermiculite and Diatomaceous Earth	Spill Control Area in Building 14.
Silica sand	Buildings 14 and 2.
Lime	East of Building 2.

Eighty-five-gallonoverpack recovery drums are stocked behind the warehouse with the rest of the barrel inventory.

April 2, 1992

ATTACHMENT C

LIST OF SAFETY EQUIPMENT

ITEM	LOCATION
Dry chemical fire extinguishers	All buildings
Wheeled dry chemical fire extinguisher	East of Building 7
AFFF foam fire extinguishers	Buildings 11 and 14
Halon fire extinguishers	Building 1 and Ranch House
Biopack 60 self-contained breathing apparatus	Building 14 or where needed
Robertshaw 5-minute escape capsules	Upstairs in Buildings 14.
Cannister, cartridge, and air line respirators	Upstairs in Building 14
Neoprene, PVC, Tyvek, and Saranex suits	Upstairs in Building 14
Gloves	Building 14
Hard hats	Buildings 1 and 14
Safety glasses	Buildings 1 and 11
Trauma kit	Buildings 1 and 11
Resuscitator	Buildings 11
Radiological survey equipment	Buildings 1, 2, and 11
Draeger pumps and tubes	Buildings 1, 5, and 12
Carbon monoxide, hydrogen sulfide, oxygen deficiency, and explosimeter monitors	Building 8 (Fire Assay)

April 2, 1992

ATTACHMENT D

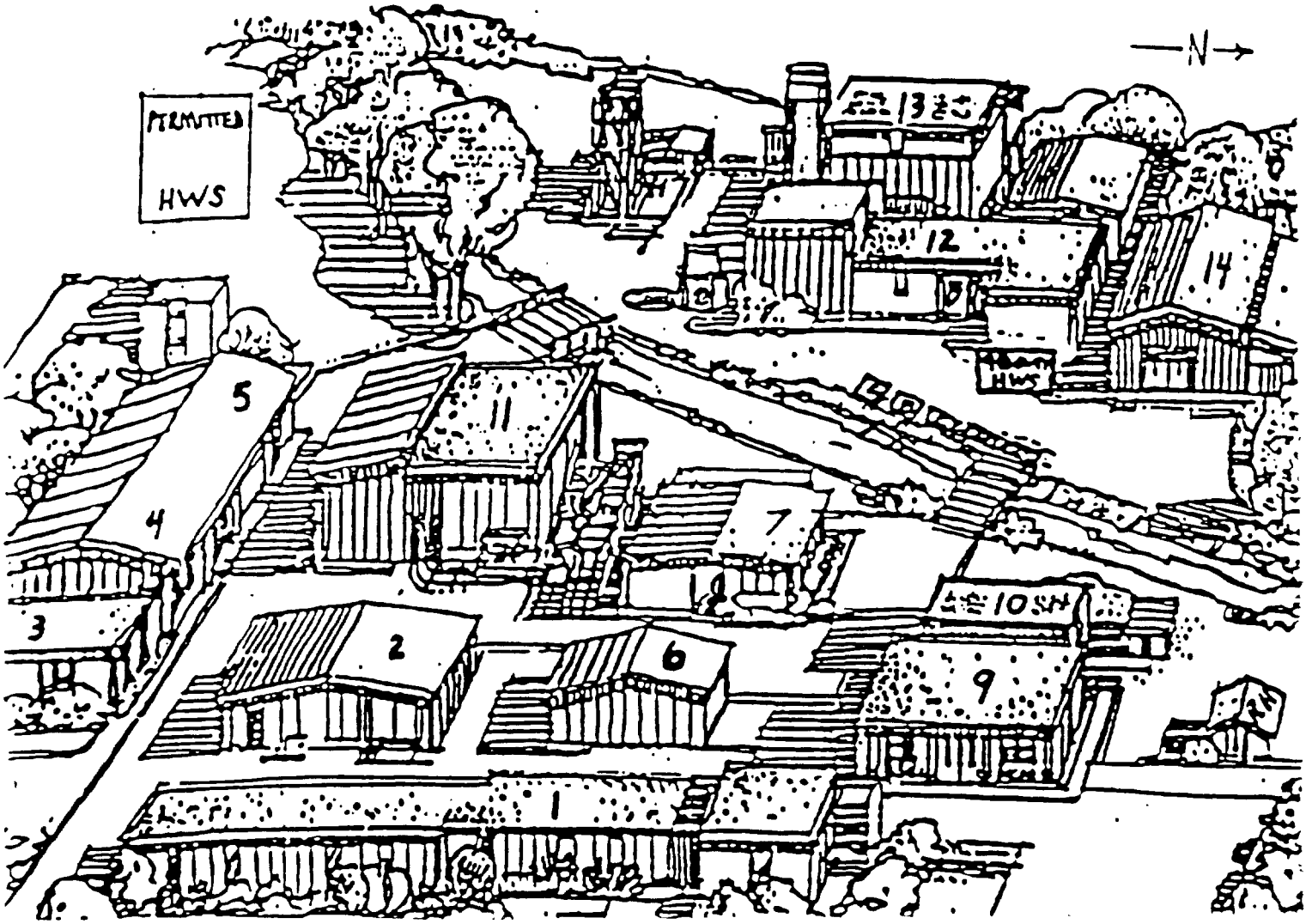
HAZARDOUS WASTE STORAGE AREAS

There are two main hazardous waste storage areas on the property. One is designated as the storage area for samples from permitted hazardous waste projects. The other storage area is designated as the 90-day temporary storage area for facility-generated hazardous wastes.

The storage area for permitted hazardous waste is located on the southwest portion of the property, west of Building 5 and south of the Wannamaker Ditch. On the above property map, this area is identified as 'Permitted HWS'. The hazardous waste storage area for permitted waste is a bermed concrete pad, surrounded by a six foot chain-link fence. The pad is designed for forklift access.

The 90-day temporary hazardous waste storage area is located due east of Building 12. On the above property map, this area is identified as '90 Day HWS'. The hazardous waste storage area for facility generated waste is a concrete pad, surrounded by a four-foot concrete wall. The pad is designed for forklift access.

There is one additional hazardous waste storage area located outside of the main laboratory on the west side of Building a. This area is used for accumulation of waste solvents used in laboratory procedures. No more than one 55-gallon drum is stored in this location. When that drum becomes full, it is transferred to the 90-day hazardous waste storage pad to await final disposal.



April 2, 1992

ATTACHMENT E

LIST OF REPORTABLE QUANTITIES (RQs) FOR CHEMICALS RELEASED TO THE ENVIRONMENT

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES

A-25

(Note: All Comments/Notes Are Located at the End of This Table)

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory RQ	Statutory Code †	Statutory RCRA Waste Number	Final RQ Category	Final RQ Pounds (Kg)
Acenaphthene	83329		1*	2		B	100 (45.4)
Acenaphthylene	208968		1*	2		D	5000 (2270)
Acetaldehyde	75070	Ethanal	1000	1,4	U001	C	1000 (454)
Acetaldehyde, chloro-	107200	Chloroacetaldehyde	1*	4	P023	C	1000 (454)
Acetaldehyde, trichloro-	75876	Chloral	1*	4	U034	D	5000 (2270)
Acetamide, N-(aminothioxomethyl)-	591082	1-Acetyl-2-thiourea	1*	4	P002	C	1000 (454)
Acetamide, N-(4-ethoxyphenyl)-	62442	Phenacetin	1*	4	U187	B	100 (45.4)
Acetamide, 2-fluoro-	640197	Fluoroacetamide	1*	4	P057	B	100 (45.4)
Acetamide, N-9H-fluoren-2-yl-	53963	2-Acetylaminofluorene	1*	4	U005	X	1 (0.454)
Acetic acid	64197		1000	1		D	5000 (2270)
Acetic acid (2,4-dichlorophenoxy)-	94757	2,4-D Acid 2,4-D, salts and esters	100	1,4	U240	B	100 (45.4)
Acetic acid, lead(2+) salt	301042	Lead acetate	5000	1,4	U144		*
Acetic acid, thallium(1+) salt	563688	Thallium(I) acetate	1*	4	U214	B	100 (45.4)
Acetic acid, (2,4,5-trichlorophenoxy)-	93765	2,4,5-T 2,4,5-T acid	100	1,4	U232	C	1000 (454)
Acetic acid, ethyl ester	141786	Ethyl acetate	1*	4	U112	D	5000 (2270)
Acetic acid, fluoro-, sodium salt	62748	Fluoroacetic acid, sodium salt	1*	4	P058	A	10 (4.54)
Acetic anhydride	108247		1000	1		D	5000 (2270)
Acetone	67641	2-Propanone	1*	4	U002	D	5000 (2270)
Acetone cyanohydrin	75866	Propanenitrile, 2-hydroxy-2-methyl- 2-Methyllactonitrile	10	1,4	P069	A	10 (4.54)
Acetonitrile	75058		1*	4	U003	D	5000 (2270)
Acetophenone	98862	Ethanone, 1-phenyl-	1*	4	U004	D	5000 (2270)
2-Acetylaminofluorene	53963	Acetamide, N-9H-fluoren-2-yl-	1*	4	U005	X	1 (0.454)
Acetyl bromide	506967		5000	1		D	5000 (2270)
Acetyl chloride	75365		5000	1,4	U006	D	5000 (2270)
1-Acetyl-2-thiourea	591082	Acetamide, N-(aminothioxomethyl)-	1*	4	P002	C	1000 (454)
Acrolein	107028	2-Propenal	1	1,2,4	P003	X	1 (0.454)
Acrylamide	79061	2-Propenamide	1*	4	U007	D	5000 (2270)
Acrylic acid	79107	2-Propenoic acid	1*	4	U008	D	5000 (2270)
Acrylonitrile	107131	2-Propenenitrile	100	1,2,4	U009	B	100 (45.4)
Adipic acid	124049		5000	1		D	5000 (2270)
Aldicarb	116063	Propanal, 2-methyl-2-(methylthio)-, O- ((methylamino)carbonyl)oxime	1*	4	P070	X	1 (0.454)
Aldrin	309002	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10- hexachloro-1,4,4a,5,8,8a-hexahydro-, (1alpha, 4alpha,4abeta,5alpha,8alpha,8abeta)-	1	1,2,4	P004	X	1 (0.454)
Allyl alcohol	107186	2-Propen-1-ol	100	1,4	P005	B	100 (45.4)
Allyl chloride	107051		1000	1		C	1000 (454)

Aluminum phosphide	20859738		1*	4	P006	B	100 (45.4)
Aluminum sulfate	10043013		5000	1		D	5000 (2270)
5-(Aminomethyl)-3-isoxazolol	2763964	Muscimol 3(2H)-Isoxazolone, 5-(aminomethyl)-	1*	4	P007	C	1000 (454)
4-Aminopyridine	504245	4-Pyridinamine	1*	4	P008	C	1000 (454)
Amitrole	61825	1H-1,2,4-Triazol-3-amine	1*	4	U011	A	10 (4.54)
Ammonia	7664417		100	1		B	100 (45.4)
Ammonium acetate	631618		5000	1		D	5000 (2270)
Ammonium benzoate	1863634		5000	1		D	5000 (2270)
Ammonium bicarbonate	1066337		5000	1		D	5000 (2270)
Ammonium bichromate	7789095		1000	1		A	10 (4.54)
Ammonium bifluoride	1341497		5000	1		B	100 (45.4)
Ammonium bisulfite	10192300		5000	1		D	5000 (2270)
Ammonium carbamate	1111780		5000	1		D	5000 (2270)
Ammonium carbonate	506876		5000	1		D	5000 (2270)
Ammonium chloride	12125029		5000	1		D	5000 (2270)
Ammonium chromate	7788989		1000	1		A	10 (4.54)
Ammonium citrate dibasic	3012655		5000	1		D	5000 (2270)
Ammonium fluoborate	13826830		5000	1		D	5000 (2270)
Ammonium fluoride	12125018		5000	1		B	100 (45.4)
Ammonium hydroxide	1336216		1000	1		C	1000 (454)
Ammonium oxalate	6009707 5972736 14258492		5000	1		D	5000 (2270)
Ammonium picrate	131748	Phenol, 2,4,6-trinitro-, ammonium salt	1*	4	P009	A	10 (4.54)
Ammonium silicofluoride	16919190		1000	1		C	1000 (454)
Ammonium sulfamate	7773060		5000	1		D	5000 (2270)
Ammonium sulfide	12135761		5000	1		B	100 (45.4)
Ammonium sulfite	10196040		5000	1		D	5000 (2270)
Ammonium tartrate	14307436 3164292		5000	1		D	5000 (2270)
Ammonium thiocyanate	1762954		5000	1		D	5000 (2270)
Ammonium vanadate	7803556	Vanadic acid, ammonium salt	1*	4	P119	C	1000 (454)
Amyl acetate	628637		1000	1		D	5000 (2270)
iso-Amyl acetate	123922						
sec-Amyl acetate	626380						
tert-Amyl acetate	625161						
Aniline	62533	Benzenamine	1000	1,4	U012	D	5000 (2270)
Anthracene	120127		1*	2		D	5000 (2270)
Antimony ††	7440360		1*	2		D	5000 (2270)
ANTIMONY AND COMPOUNDS	N.A.		1*	2			**
Antimony pentachloride	7647189		1000	1		C	1000 (454)
Antimony potassium tartrate	28300745		1000	1		B	100 (45.4)
Antimony tribromide	7789619		1000	1		C	1000 (454)
Antimony trichloride	10025919		1000	1		C	1000 (454)
Antimony trifluoride	7783564		1000	1		C	1000 (454)
Antimony trioxide	1309644		5000	1		C	1000 (454)
Argentate(1-), bis(cyano-C)-, potassium	506616	Potassium silver cyanide	1*	4	P099	X	1 (0.454)
Aroclor 1016	12674112	POLYCHLORINATED BIPHENYLS (PCBs)	10	1,2		X	1 (0.454)
Aroclor 1221	11104282	POLYCHLORINATED BIPHENYLS (PCBs)	10	1,2		X	1 (0.454)
Aroclor 1232	11141165	POLYCHLORINATED BIPHENYLS (PCBs)	10	1,2		X	1 (0.454)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

(Note: All Comments/Notes Are Located at the End of This Table)

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory RQ	Statutory Code †	Statutory RCRA Waste Number	Final RQ Category	Final RQ Pounds (Kg)
Aroclor 1242	53469219	POLYCHLORINATED BIPHENYLS (PCBs)	10	1,2		X	1 (0.454)
Aroclor 1248	12672296	POLYCHLORINATED BIPHENYLS (PCBs)	10	1,2		X	1 (0.454)
Aroclor 1254	11097691	POLYCHLORINATED BIPHENYLS (PCBs)	10	1,2		X	1 (0.454)
Aroclor 1260	11096825	POLYCHLORINATED BIPHENYLS (PCBs)	10	1,2		X	1 (0.454)
Arsenic [T]	7440382		1*	2,3		X	1 (0.454)
Arsenic acid	1327522	Arsenic acid H3AsO4	1*	4	P010	X	1 (0.454)
	7778394						
Arsenic acid H3AsO4	1327522	Arsenic acid	1*	4	P010	X	1 (0.454)
	7778394						
ARSENIC AND COMPOUNDS	N.A.		1*	2			..
Arsenic disulfide	1303328		5000	1		X	1 (0.454)
Arsenic oxide As2O3	1327533	Arsenic trioxide	5000	1,4	P012	X	1 (0.454)
Arsenic oxide As2O5	1303282	Arsenic pentoxide	5000	1,4	P011	X	1 (0.454)
Arsenic pentoxide	1303282	Arsenic oxide As2O5	5000	1,4	P011	X	1 (0.454)
Arsenic trichloride	7784341		5000	1		X	1 (0.454)
Arsenic trioxide	1327533	Arsenic oxide As2O3	5000	1,4	P012	X	1 (0.454)
Arsenic trisulfide	1303339		5000	1		X	1 (0.454)
Arsine, diethyl-	692422	Diethylarsine	1*	4	P038	X	1 (0.454)
Arsinic acid, dimethyl-	75605	Cacodylic acid	1*	4	U136	X	1 (0.454)
Arsonous dichloride, phenyl-	696286	Dichlorophenylarsine	1*	4	P036	X	1 (0.454)
Asbestos [T]	1332214		1*	2,3		X	1 (0.454)
Auramine	492808	Benzenamine, 4,4'-carbonimidoylbis- (N,N-dimethyl-	1*	4	U014	B	100 (45.4)
Azaserine	115026	L-Serine, diazoacetate (ester)	1*	4	U015	X	1 (0.454)
Azinphos	151564	Ethylenimine	1*	4	P054	X	1 (0.454)
Aziridine, 2-methyl-	75558	1,2-Propylenimine	1*	4	P067	X	1 (0.454)
Azirino[2',3',3,4]pyrrolo[1,2-a]indole-4,7-dione,6-amino-8-[[(aminocarbonyl)oxy]methyl]-1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5-methyl-,[1aS-(1aalpha, 8beta, 8aalpha, 8balpha)]-	50077	Mitomycin C	1*	4	U010	A	10 (4.54)
Barium cyanide	542621		10	1,4	P013	A	10 (4.54)
Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-	56495	3-Methylcholanthrene	1*	4	U157	A	10 (4.54)
Benz[c]acridine	225514		1*	4	U016	B	100 (45.4)
Benzal chloride	98873	Benzene, dichloromethyl-	1*	4	U017	D	5000 (2270)
Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-	23950585	Pronamide	1*	4	U192	D	5000 (2270)
Benz[a]anthracene	56553	Benzo[a]anthracene 1,2-Benzanthracene	1*	2,4	U018	A	10 (4.54)
1,2-Benzanthracene	56553	Benz[a]anthracene Benzo[a]anthracene	1*	2,4	U018	A	10 (4.54)
Benz[a]anthracene, 7,12-dimethyl-	57976	7,12-Dimethylbenz[a]anthracene	1*	4	U094	X	1 (0.454)
Benzenamine	62533	Aniline	1000	1,4	U012	D	5000 (2270)
Benzenamine, 4,4'-carbonimidoylbis- (N,N-dimethyl-	492808	Auramine	1*	4	U014	B	100 (45.4)
Benzenamine, 4-chloro-	106478	p-Chloroaniline	1*	4	P024	C	1000 (454)
Benzenamine, 4-chloro-2-methyl-, hydrochloride	3165933	4-Chloro-o-toluidine, hydrochloride	1*	4	U049	B	100 (45.4)
Benzenamine, N,N-dimethyl-4-(phenylazo)-	60117	p-Dimethylaminoazobenzene	1*	4	U093	A	10 (4.54)
Benzenamine, 2-methyl-	95534	o-Toluidine	1*	4	U328	B	100 (45.4)
Benzenamine, 4-methyl-	106490	p-Toluidine	1*	4	U353	B	100 (45.4)
Benzenamine, 4,4'-methylenebis(2-chloro-	101144	4,4'-Methylenebis(2-chloroaniline)	1*	4	U158	A	10 (4.54)
Benzenamine, 2-methyl-, hydrochloride	636215	o-Toluidine hydrochloride	1*	4	U222	B	100 (45.4)
Benzenamine, 2-methyl-5-nitro-	99558	5-Nitro-o-toluidine	1*	4	U181	B	100 (45.4)
Benzenamine, 4-nitro-	100016	p-Nitroaniline	1*	4	P077	D	5000 (2270)
Benzene	71432		1000	2,3,4	U109	A	10 (4.54)
Benzeneacetic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy-, ethyl ester	510156	Chlorobenzilate	1*	4	U038	A	10 (4.54)
Benzene, 1-bromo-4-phenoxy-	101553	4-Bromophenyl phenyl ether	1*	2,4	U030	B	100 (45.4)
Benzenebutanoic acid, 4-[bis(2-chloroethyl)amino]-	305033	Chlorambucil	1*	4	U035	A	10 (4.54)
Benzene, chloro-	108907	Chlorobenzene	100	1,2,4	U037	B	100 (45.4)
Benzene, chloromethyl-	100447	Benzyl chloride	100	1,4	P028	B	100 (45.4)
Benzenediamine, ar-methyl-	95807	Toluenediamine	1*	4	U221	A	10 (4.54)
	496720						
	823405						
1,2-Benzenedicarboxylic acid, dioctyl ester	117840	Di-n-octyl phthalate	1*	2,4	U107	D	5000 (2270)
1,2-Benzenedicarboxylic acid, [bis(2-ethylhexyl)]-ester	117817	Bis (2-ethylhexyl)phthalate Diethylhexyl phthalate	1*	2,4	U028	B	100 (45.4)
1,2-Benzenedicarboxylic acid, dibutyl ester	84742	Di-n-butyl phthalate Dibutyl phthalate n-Butyl phthalate	100	1,2,4	U069	A	10 (4.54)
1,2-Benzenedicarboxylic acid, diethyl ester	84662	Diethyl phthalate	1*	2,4	U088	C	1000 (454)
1,2-Benzenedicarboxylic acid, dimethyl ester	131113	Dimethyl phthalate	1*	2,4	U102	D	5000 (2270)
Benzene, 1,2-dichloro-	95501	o-Dichlorobenzene 1,2-Dichlorobenzene	100	1,2,4	U070	B	100 (45.4)
Benzene, 1,3-dichloro-	541731	m-Dichlorobenzene 1,3-Dichlorobenzene	1*	2,4	U071	B	100 (45.4)
Benzene, 1,4-dichloro-	106467	p-Dichlorobenzene 1,4-Dichlorobenzene	100	1,2,4	U072	B	100 (45.4)
Benzene, 1,1'-(2,2-dichloroethylidene)bis[4-chloro-	72548	DDD TDE 4,4' DDD	1	1,2,4	U060	X	1 (0.454)
Benzene, dichloromethyl-	98873	Benzal chloride	1*	4	U017	D	5000 (2270)
Benzene, 1,3-diisocyanatomethyl-	584849	Toluene diisocyanate	1*	4	U223	B	100 (45.4)
	91087						
	26471625						
Benzene, dimethyl-	1330207	Xylene (mixed)	1000	1,4	U239	C	1000 (454)
m-Benzene, dimethyl-	108383	m-Xylene					
o-Benzene, dimethyl-	95476	o-Xylene					
p-Benzene, dimethyl-	106423	p-Xylene					
1,3-Benzenediol	108463	Resorcinol	1000	1,4	U201	D	5000 (2270)
1,2-Benzenediol, 4-[1-hydroxy-2-(methylamino)ethyl]-	51434	Epinephrine	1*	4	P042	C	1000 (454)
Benzeneethanamine, alpha,alpha-dimethyl-	122098	alpha,alpha-Dimethylphenethylamine	1*	4	P046	D	5000 (2270)
Benzene, hexachloro-	118741	Hexachlorobenzene	1*	2,4	U127	A	10 (4.54)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory RQ	Statutory Code †	Statutory RCRA Waste Number	Final RQ Category	Final RQ Pounds (Kg)
Benzene, hydroxy-	108952	Phenol	1000	1,2,4	U188	C	1000 (454)
Benzene, methyl-	108883	Toluene	1000	1,2,4	U220	C	1000 (454)
Benzene, 2-methyl-1,3-dinitro-	606202	2,6-Dinitrotoluene	1000	1,2,4	U106	B	100 (45.4)
Benzene, 1-methyl-2,4-dinitro-	121142	2,4-Dinitrotoluene	1000	1,2,4	U105	A	10 (4.54)
Benzene, 1-methylethyl-	98828	Cumene	1*	4	U055	D	5000 (2270)
Benzene, nitro-	98953	Nitrobenzene	1000	1,2,4	U169	C	1000 (454)
Benzene, pentachloro-	608935	Pentachlorobenzene	1*	4	U183	A	10 (4.54)
Benzene, pentachloronitro-	82688	Pentachloronitrobenzene (PCNB)	1*	4	U185	B	100 (45.4)
Benzenesulfonic acid chloride	98099	Benzenesulfonyl chloride	1*	4	U020	B	100 (45.4)
Benzenesulfonyl chloride	98099	Benzenesulfonic acid chloride	1*	4	U020	B	100 (45.4)
Benzene, 1,2,4,5-tetrachloro-	95943	1,2,4,5-Tetrachlorobenzene	1*	4	U207	D	5000 (2270)
Benzenethiol	108985	Thiophenol	1*	4	P014	B	100 (45.4)
Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4-chloro-	50293	DDT 4,4'-DDT	1	1,2,4	U061	X	1 (0.454)
Benzene, 1,1'-(2,2,2-trichloroethylidene) bis[4-methoxy-	72435	Methoxychlor	1	1,4	U247	X	1 (0.454)
Benzene, (trichloromethyl)-	98077	Benzotrichloride	1*	4	U023	A	10 (4.54)
Benzene, 1,3,5-trinitro-	99354	1,3,5-Trinitrobenzene	1*	4	U234	A	10 (4.54)
Benzidine	92875	(1,1'-Biphenyl)-4,4'-diamine	1*	2,4	U021	X	1 (0.454)
1,2-Benzisothiazol-3(2H)-one, 1,1-dioxide	81072	Saccharin and salts	1*	4	U202	B	100 (45.4)
Benzo[a]anthracene	56553	Benz[a]anthracene 1,2-Benzanthracene	1*	2,4	U018	A	10 (4.54)
Benzo[b]fluoranthene	205992		1*	2		X	1 (0.454)
Benzo[k]fluoranthene	207089		1*	2		D	5000 (2270)
Benzo[j,k]fluorene	206440	Fluoranthene	1*	2,4	U120	B	100 (45.4)
1,3-Benzodioxole 5-(1-propenyl)-	120581	Isosafrole	1*	4	U141	B	100 (45.4)
1,3-Benzodioxole 5-(2-propenyl)-	94597	Safrole	1*	4	U203	B	100 (45.4)
1,3-Benzodioxole, 5-propyl-	94586	Dihydrosafrole	1*	4	U090	A	10 (4.54)
Benzoic acid	65850		5000	1		D	5000 (2270)
Benzonitrile	100470		1000	1		D	5000 (2270)
Benzo [ret]anthracene	189559	Dibenz[a,j]pyrene	1*	4	U064	A	10 (4.54)
Benzo[ghi]perylene	191242		1*	2		D	5000 (2270)
2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenyl-butyl)- & salts, when present at concentrations greater than 0.3%	81812	Warfarin, & salts, when present at concentrations greater than 0.3%	1*	4	P001	B	100 (45.4)
Benzo[a]pyrene	50328	3,4-Benzopyrene	1*	2,4	U022	X	1 (0.454)
3,4-Benzopyrene	50328	Benzo[a]pyrene	1*	2,4	U022	X	1 (0.454)
p-Benzoquinone	106514	2,5-Cyclohexadiene-1,4-dione	1*	4	U197	A	10 (4.54)
Benzotrichloride	98077	Benzene, (trichloromethyl)-	1*	4	U023	A	10 (4.54)
Benzoyl chloride	98884		1000	1		C	1000 (454)
1,2-Benzphenanthrene	218019	Chrysene	1*	2,4	U050	B	100 (45.4)
Benzyl chloride	100447	Benzene, (chloromethyl)-	100	1,4	P028	B	100 (45.4)
Beryllium ††	7440417	Beryllium dust ††	1*	2,3,4	P015	A	10 (4.54)
BERYLLIUM AND COMPOUNDS	N.A.		1*	2			**
Beryllium chloride	7787475		5000	1		X	1 (0.454)
Beryllium dust ††	7440417	Beryllium ††	1*	2,3,4	P015	A	10 (4.54)
Beryllium fluoride	7787497		5000	1		X	1 (0.454)
Beryllium nitrate	13597994 7787555		5000	1		X	1 (0.454)
alpha—BHC	319846		1*	2		A	10 (4.54)
beta—BHC	319857		1*	2		X	1 (0.454)
delta—BHC	319868		1*	2		X	1 (0.454)
gamma—BHC	58899	Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1alpha, 2alpha,3beta,4alpha,5alpha,6beta)- Hexachlorocyclohexane (gamma isomer) Lindane	1	1,2,4	U129	X	1 (0.454)
2,2'-Bioxirane	1464535	1,2,3,4-Diepoxybutane	1*	4	U085	A	10 (4.54)
(1,1'-Biphenyl)-4,4'-diamine	92875	Benzidine	1*	2,4	U021	X	1 (0.454)
[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dichloro-	91941	3,3'-Dichlorobenzidine	1*	2,4	U073	X	1 (0.454)
[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethoxy-	119904	3,3'-Dimethoxybenzidine	1*	4	U091	B	100 (45.4)
[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethyl-	119937	3,3'-Dimethylbenzidine	1*	4	U095	A	10 (4.54)
Bis (2-chloroethyl) ether	111444	Dichloroethyl ether Ethane,1,1'-oxybis(2-chloro-	1*	2,4	U025	A	10 (4.54)
Bis(2-chloroethoxy) methane	111911	Dichloromethoxy ethane Ethane, 1,1'-[methylenebis(oxy)]bis(2-chloro-	1*	2,4	U024	C	1000 (454)
Bis (2-ethylhexyl)phthalate	117817	Diethylhexyl phthalate 1,2-Benzenedicarboxylic acid, [bis(2-ethylhexyl)] ester	1*	2,4	U028	B	100 (45.4)
Bromoacetone	598312	2-Propanone, 1-bromo-	1*	4	P017	C	1000 (454)
Bromoform	75252	Methane, tribromo-	1*	2,4	U225	B	100 (45.4)
4-Bromophenyl phenyl ether	101553	Benzene, 1-bromo-4-phenoxy-	1*	2,4	U030	B	100 (45.4)
Brucine	357573	Strychnidin-10-one, 2,3-dimethoxy-	1*	4	P018	B	100 (45.4)
1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	87683	Hexachlorobutadiene	1*	2,4	U128	X	1 (0.454)
1-Butanamine, N-butyl-N-nitroso-	924163	N-Nitrosodi-n-butylamine	1*	4	U172	A	10 (4.54)
1-Butanol	71363	n-Butyl alcohol	1*	4	U031	D	5000 (2270)
2-Butanone	78933	Methyl ethyl ketone (MEK)	1*	4	U159	D	5000 (2270)
2-Butanone peroxide	1338234	Methyl ethyl ketone peroxide	1*	4	U160	A	10 (4.54)
2-Butanone, 3,3-dimethyl-1-(methylthio)-, O[(methylamino)carbonyl] oxime.	39196184	Thiofanox	1*	4	P045	B	100 (45.4)
2-Butenal	123739 4170303	Crotonaldehyde	100	1,4	U053	B	100 (45.4)
2-Butene, 1,4-dichloro-	764410	1,4-Dichloro-2-butene	1*	4	U074	X	1 (0.454)
2-Butenoic acid, 2-methyl-, 7[[2,3-dihydroxy-2-(1-methoxyethyl)-3-methyl-1-oxobutoxy]methyl]-2,3,5,7a-tetrahydro-1H-pyrrolizin-1-yl ester, [1S-[1alpha(Z),7(2S*,3R*),7aalpha]]-	303344	Lasiocarpine	1*	4	U143	A	10 (4.54)
Butyl acetate	123864		5000	1		D	5000 (2270)
iso-Butyl acetate	110190						
sec-Butyl acetate	105464						
tert-Butyl acetate	540885						
n-Butyl alcohol	71363	1-Butanol	1*	4	U031	D	5000 (2270)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory			Final RQ	
			RQ	Code †	RCRA Waste Number	Category	Pounds (Kg)
Butylamine	109739		1000	1		C	1000 (454)
iso-Butylamine	78819						
sec-Butylamine	513496						
	13952846						
tert-Butylamine	75649						
Butyl benzyl phthalate	85687		1*	2		B	100 (45.4)
n-Butyl phthalate	84742	Di-n-butyl phthalate Dibutyl phthalate 1,2-Benzenedicarboxylic acid, dibutyl ester	100	1,2,4	U069	A	10 (4.54)
Butyric acid	107926		5000	1		D	5000 (2270)
iso-Butyric acid	79312						
Cacodylic acid	75605	Arsenic acid, dimethyl-	1*	4	U136	X	1 (0.454)
Cadmium (†)	7440439		1*	2		A	10 (4.54)
Cadmium acetate	543908		100	1		A	10 (4.54)
CADMIUM AND COMPOUNDS	N.A.		1*	2			**
Cadmium bromide	7789426		100	1		A	10 (4.54)
Cadmium chloride	10108642		100	1		A	10 (4.54)
Calcium arsenate	7778441		1000	1		X	1 (0.454)
Calcium arsenite	52740166		1000	1		X	1 (0.454)
Calcium carbide	75207		5000	1		A	10 (4.54)
Calcium chromate	13765190	Chromic acid H2CrO4 calcium salt	1000	1,4	U032	A	10 (4.54)
Calcium cyanide	592018	Calcium cyanide Ca(CN)2	10	1,4	P021	A	10 (4.54)
Calcium cyanide Ca(CN)2	592018	Calcium cyanide	10	1,4	P021	A	10 (4.54)
Calcium dodecylbenzenesulfonate	26264062		1000	1		C	1000 (454)
Calcium hypochlorite	7778543		100	1		A	10 (4.54)
Camphene, octachloro-	8001352	Toxaphene	1	1,2,4	P123	X	1 (0.454)
Captan	133062		10	1		A	10 (4.54)
Carbamic acid, ethyl ester	51796	Ethyl carbamate (urethane)	1*	4	U238	B	100 (45.4)
Carbamic acid, methylnitroso-, ethyl ester	615532	N-Nitroso-N-methylurethane	1*	4	U178	X	1 (0.454)
Carbamic chloride, dimethyl-	79447	Dimethylcarbamoyl chloride	1*	4	U097	X	1 (0.454)
Carbamodithioic acid, 1,2-ethanediylbis-, salts & esters	111546	Ethylenebisdithiocarbamic acid, salts & esters	1*	4	U114	D	5000 (2270)
Carbamothioic acid, bis(1-methylethyl)-, S-(2,3-dichloro-2-propenyl) ester	2303164	Diallate	1*	4	U062	B	100 (45.4)
Carbaryl	63252		100	1		B	100 (45.4)
Carbofuran	1563662		10	1		A	10 (4.54)
Carbon disulfide	75150		5000	1,4	P022	B	100 (45.4)
Carbon oxyfluoride	353504	Carbonic difluoride	1*	4	U033	C	1000 (454)
Carbon tetrachloride	56235	Methane, tetrachloro-	5000	1,2,4	U211	A	10 (4.54)
Carbonic acid, dithallium(1+) salt	6533739	Thallium(I) carbonate	1*	4	U215	B	100 (45.4)
Carbonic dichloride	75445	Phosgene	5000	1,4	P095	A	10 (4.54)
Carbonic difluoride	353504	Carbon oxyfluoride	1*	4	U033	C	1000 (454)
Carbonochloridic acid, methyl ester	79221	Methyl chlorocarbonate Methyl chloroformate	1*	4	U156	C	1000 (454)
Chloral	75876	Acetaldehyde, trichloro-	1*	4	U034	D	5000 (2270)
Chlorambucil	305033	Benzenebutanoic acid, 4-[bis(2-chloroethyl)amino]-	1*	4	U035	A	10 (4.54)
Chlordane	57749	Chlordane, alpha & gamma isomers Chlordane, technical 4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-	1	1,2,4	U036	X	1 (0.454)
CHLORDANE (TECHNICAL MIXTURE AND METABOLITES)	N.A.		1*	2			**
Chlordane, alpha & gamma isomers	57749	Chlordane	1	1,2,4	U036	X	1 (0.454)
Chlordane, technical	57749	Chlordane Chlordane, technical 4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-	1	1,2,4	U036	X	1 (0.454)
CHLORINATED BENZENES	N.A.	Chlordane, alpha & gamma isomers 4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-	1*	2			**
CHLORINATED ETHANES	N.A.		1*	2			**
CHLORINATED NAPHTHALENE	N.A.		1*	2			**
CHLORINATED PHENOLS	N.A.		10	1		A	10 (4.54)
Chlorine	7782505		1*	4	U026	B	100 (45.4)
Chlornaphazine	494031	Naphthalenamine, N,N'-bis(2-chloroethyl)-	1*	4	P023	C	1000 (454)
Chloroacetaldehyde	107200	Acetaldehyde, chloro-	1*	2			**
CHLOROALKYL ETHERS	N.A.		1*	4	P024	C	1000 (454)
p-Chloroaniline	106478	Benzenamine, 4-chloro-	100	1,2,4	U037	B	100 (45.4)
Chlorobenzene	108907	Benzene, chloro-	1*	4	U038	A	10 (4.54)
Chlorobenzilate	510156	Benzeneacetic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy-, ethyl ester	1*	2,4	U039	D	5000 (2270)
4-Chloro-m-cresol	59507	p-Chloro-m-cresol Phenol, 4-chloro-3-methyl-	1*	2,4	U039	D	5000 (2270)
p-Chloro-m-cresol	59507	Phenol, 4-chloro-3-methyl- 4-Chloro-m-cresol	1*	2		B	100 (45.4)
Chlorodibromomethane	124481		1*	2		B	100 (45.4)
Chloroethane	75003		1*	2,4	U042	C	1000 (454)
2-Chloroethyl vinyl ether	110758	Ethene, 2-chloroethoxy-	5000	1,2,4	U044	A	10 (4.54)
Chloroform	67663	Methane, trichloro-	1*	4	U046	A	10 (4.54)
Chloromethyl methyl ether	107302	Methane, chloromethoxy-	1*	2,4	U047	D	5000 (2270)
beta-Chloronaphthalene	91587	Naphthalene, 2-chloro- 2-Chloronaphthalene	1*	2,4	U047	D	5000 (2270)
2-Chloronaphthalene	91587	beta-Chloronaphthalene Naphthalene, 2-chloro-	1*	2,4	U048	B	100 (45.4)
2-Chlorophenol	95578	o-Chlorophenol Phenol, 2-chloro-	1*	2,4	U048	B	100 (45.4)
o-Chlorophenol	95578	Phenol, 2-chloro- 2-Chlorophenol	1*	2		D	5000 (2270)
4-Chlorophenyl phenyl ether	7005723						

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory RQ	Statutory Code †	Statutory RCRA Waste Number	Final RQ Category	Final RQ Pounds (Kg)
1-(o-Chlorophenyl)thiourea	5344821	Thiourea, (2-chlorophenyl)-	1*	4	P026	B	100 (45.4)
3-Chloropropionitrile	542767	Propanenitrile, 3-chloro-	1*	4	P027	C	1000 (454)
Chlorosulfonic acid	7790945		1000	1		C	1000 (454)
4-Chloro-o-toluidine, hydrochloride	3165933	Benzenamine, 4-chloro-2-methyl-, hydrochloride	1*	4	U049	B	100 (45.4)
Chlorpyrifos	2921882		1	1		X	1 (0.454)
Chromic acetate	1066304		1000	1		C	1000 (454)
Chromic acid	11115745		1000	1		A	10 (4.54)
	7738945						
Chromic acid H2CrO4, calcium salt	13765190	Calcium chromate	1000	1,4	U032	A	10 (4.54)
Chromic sulfate	10101538		1000	1		C	1000 (454)
Chromium ††	7440473		1*	2		D	5000 (2270)
CHROMIUM AND COMPOUNDS	N.A.		1*	2			**
Chromous chloride	10049055		1000	1		C	1000 (454)
Chrysene	218019	1,2 Benzphenanthrene	1*	2,4	U050	B	100 (45.4)
Cobaltous bromide	7789437		1000	1		C	1000 (454)
Cobaltous formate	544183		1000	1		C	1000 (454)
Cobaltous sulfamate	14017415		1000	1		C	1000 (454)
Coke Oven Emissions	N.A.		1*	3		X	1 (0.454)
Copper cyanide CuCN	544923	Copper cyanide	1*	4	P029	A	10 (4.54)
Copper ††	7440508		1*	2		D	5000 (2270)
COPPER AND COMPOUNDS	N.A.		1*	2			**
Copper cyanide	544923	Copper cyanide CuCN	1*	4	P029	A	10 (4.54)
Coumaphos	56724		10	1		A	10 (4.54)
Creosote	8001589		1*	4	U051	X	1 (0.454)
Cresol(s)	1319773	Cresylic acid Phenol, methyl-	1000	1,4	U052	C	1000 (454)
m-Cresol	108394	m-Cresylic acid					
o-Cresol	95487	o-Cresylic acid					
p-Cresol	106445	p-Cresylic acid					
Cresylic acid	1319773	Cresol(s) Phenol, methyl-	1000	1,4	U052	C	1000 (454)
m-Cresol	108394	m-Cresylic acid					
o-Cresol	95487	o-Cresylic acid					
p-Cresol	106445	p-Cresylic acid					
Crotonaldehyde	123739	2-Butenal	100	1,4	U053	B	100 (45.4)
	4170303						
Cumene	98828	Benzene, 1-methylethyl-	1*	4	U055	D	5000 (2270)
Cupric acetate	142712		100	1		B	100 (45.4)
Cupric acetoarsenite	12002038		100	1		X	1 (0.454)
Cupric chloride	7447394		10	1		A	10 (4.54)
Cupric nitrate	3251238		100	1		B	100 (45.4)
Cupric oxalate	5893663		100	1		B	100 (45.4)
Cupric sulfate	7758987		10	1		A	10 (4.54)
Cupric sulfate, ammoniated	10380297		100	1		B	100 (45.4)
Cupric tartrate	815827		100	1		B	100 (45.4)
CYANIDES	N.A.		1*	2			**
Cyanides (soluble salts and complexes) not elsewhere specified	57125		1*	4	P030	A	10 (4.54)
Cyanogen	460195	Ethanedinitrile	1*	4	P031	B	100 (45.4)
Cyanogen bromide	506683	Cyanogen bromide (CN)Br	1*	4	U246	C	1000 (454)
Cyanogen bromide (CN)Br	506683	Cyanogen bromide	1*	4	U246	C	1000 (454)
Cyanogen chloride	506774	Cyanogen chloride (CN)Cl	10	1,4	P033	A	10 (4.54)
Cyanogen chloride (CN)Cl	506774	Cyanogen chloride	10	1,4	P033	A	10 (4.54)
2,5-Cyclohexadiene-1,4-dione	106514	p-Benzoquinone	1*	4	U197	A	10 (4.54)
Cyclohexane	110827	Benzene, hexahydro-	1000	1,4	U056	C	1000 (454)
Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1alpha,2alpha,3beta,4alpha,5alpha,6beta)-	58899	gamma—BHC Hexachlorocyclohexane (gamma isomer) Lindane	1	1,2,4	U129	X	1 (0.454)
Cyclohexanone	108941		1*	4	U057	D	5000 (2270)
2-Cyclohexyl-4,6-dinitrophenol	131895	Phenol, 2-cyclohexyl-4,6-dinitro-	1*	4	P034	B	100 (45.4)
1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-	77474	Hexachlorocyclopentadiene	1	1,2,4	U130	A	10 (4.54)
Cyclophosphamide	50180	2H-1,3,2-Oxazaphosphorin-2-amine, N,N-bis(2-chloroethyl)tetrahydro-, 2-oxide	1*	4	U058	A	10 (4.54)
2,4-D Acid	94757	Acetic acid (2,4-dichlorophenoxy)-2,4-D, salts and esters	100	1,4	U240	B	100 (45.4)
2,4-D Ester	94111		100	1		B	100 (45.4)
	94791						
	94804						
	1320189						
	1928387						
	1928616						
	1929733						
	2971382						
	25168267						
	53467111						
2,4-D, salts and esters	94757	Acetic acid (2,4-dichlorophenoxy)-2,4-D Acid	100	1,4	U240	B	100 (45.4)
Daunomycin	20830813	5,12-Naphthacenedione, 8-acetyl-10-[(3-amino-2,3,6-trideoxy-alpha-L-lyxo-hexo-pyranosyl)oxy]-7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-, (8S-cis)-	1*	4	U059	A	10 (4.54)
DDD	72548	Benzene, 1,1'-(2,2-dichloroethylidene)bis[4-chloro- TDE 4,4' DDD	1	1,2,4	U060	X	1 (0.454)
4,4' DDD	72548	Benzene, 1,1'-(2,2-dichloroethylidene)bis[4-chloro- DDD TDE	1	1,2,4	U060	X	1 (0.454)
DDE	72559	4,4' DDE	1*	2		X	1 (0.454)
4,4' DDE	72559	DDE	1*	2		X	1 (0.454)
	50293	Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4-chloro-	1	1,2,4	U061	X	1 (0.454)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

(Notes: All Comments/Notes Are Located at the End of This Table)

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory RQ	Statutory Code †	Statutory RCRA Waste Number	Final RQ Category	Final RQ Pounds (Kg)
4,4'-DDT	50293	Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4-chloro- DDT	1	1,2,4	U061	X	1 (0.454)
DDT AND METABOLITES	N.A.		1*	2			**
Diallate	2303164	Carbamothioic acid, bis(1-methylethyl)-, S-(2,3-dichloro-2-propenyl) ester	1*	4	U062	B	100 (45.4)
Diazinon	333415		1	1		X	1 (0.454)
Dibenz[a,h]anthracene	53703	Dibenzo[a,h]anthracene 1,2:5,6-Dibenzanthracene	1*	2,4	U063	X	1 (0.454)
1,2:5,6-Dibenzanthracene	53703	Dibenz[a,h]anthracene Dibenzo[a,h]anthracene	1*	2,4	U063	X	1 (0.454)
Dibenzo[a,h]anthracene	53703	Dibenz[a,h]anthracene 1,2:5,6-Dibenzanthracene	1*	2,4	U063	X	1 (0.454)
Dibenz[a,j]pyrene	189559	Benzo[rst]pentaphene	1*	4	U064	A	10 (4.54)
1,2-Dibromo-3-chloropropane	96128	Propane, 1,2-dibromo-3-chloro-	1*	4	U066	X	1 (0.454)
Dibutyl phthalate	84742	Di-n-butyl phthalate n-Butyl phthalate 1,2-Benzenedicarboxylic acid, dibutyl ester	100	1,2,4	U069	A	10 (4.54)
Di-n-butyl phthalate	84742	Dibutyl phthalate n-Butyl phthalate 1,2-Benzenedicarboxylic acid, dibutyl ester	100	1,2,4	U069	A	10 (4.54)
Dicamba	1918009		1000	1		C	1000 (454)
Dichlobenil	1194656		1000	1		B	100 (45.4)
Dichlone	117809		1	1		X	1 (0.454)
Dichlorobenzene	25321226		100	1		B	100 (45.4)
1,2-Dichlorobenzene	95501	Benzene, 1,2-dichloro- o-Dichlorobenzene	100	1,2,4	U070	B	100 (45.4)
1,3-Dichlorobenzene	541731	Benzene, 1,3-dichloro- m-Dichlorobenzene	1*	2,4	U071	B	100 (45.4)
1,4-Dichlorobenzene	106467	Benzene, 1,4-dichloro- p-Dichlorobenzene	100	1,2,4	U072	B	100 (45.4)
m-Dichlorobenzene	541731	Benzene, 1,3-dichloro- 1,3-Dichlorobenzene	1*	2,4	U071	B	100 (45.4)
o-Dichlorobenzene	95501	Benzene, 1,2-dichloro- 1,2-Dichlorobenzene	100	1,2,4	U070	B	100 (45.4)
p-Dichlorobenzene	106467	Benzene,1,4-dichloro- 1,4-Dichlorobenzene	100	1,2,4	U072	B	100 (45.4)
DICHLOROBENZIDINE	N.A.		1*	2			**
3,3'-Dichlorobenzidine	91941	(1,1'-Biphenyl)-4,4'-diamine,3,3'-dichloro-	1*	2,4	U073	X	1 (0.454)
Dichlorobromomethane	75274		1*	2		D	5000 (2270)
1,4-Dichloro-2-butene	764410	2-Butene, 1,4-dichloro-	1*	4	U074	X	1 (0.454)
Dichlorodifluoromethane	75718	Methane, dichlorodifluoro-	1*	4	U075	D	5000 (2270)
1,1-Dichloroethane	75343	Ethane, 1,1-dichloro- Ethylidene dichloride	1*	2,4	U076	C	1000 (454)
1,2-Dichloroethane	107062	Ethane, 1,2-dichloro- Ethylene dichloride	5000	1,2,4	U077	B	100 (45.4)

1,1-Dichloroethylene	75354	Ethene, 1,1-dichloro- Vinylidene chloride	5000	1,2,4	U078	B	100 (45.4)
1,2-Dichloroethylene	156605	Ethene, 1,2-dichloro- (E)	1*	2,4	U079	C	1000 (454)
Dichloroethyl ether	111444	Bis (2-chloroethyl) ether Ethane, 1,1'-oxybis(2-chloro-	1*	2,4	U025	A	10 (4.54)
Dichloroisopropyl ether	108601	Propane, 2,2'-oxybis(2-chloro-	1*	2,4	U027	C	1000 (454)
Dichloromethoxy ethane	111911	Bis(2-chloroethoxy) methane Ethane, 1,1'-(methylenebis(oxy))bis(2-chloro-	1*	2,4	U024	C	1000 (454)
Dichloromethyl ether	542881	Methane oxybis(chloro-	1*	4	P016	A	10 (4.54)
2,4-Dichlorophenol	120832	Phenol 2,4-dichloro-	1*	2,4	U081	B	100 (45.4)
2,6-Dichlorophenol	87650	Phenol 2,6-dichloro-	1*	4	U082	B	100 (45.4)
Dichlorophenylarsine	696286	Arsonous dichloride, phenyl-	1*	4	P036	X	1 (0.454)
Dichloropropane	26638197		5000	1		C	1000 (454)
1,1-Dichloropropane	78999						
1,3-Dichloropropane	142289						
1,2-Dichloropropane	78875	Propane, 1,2-dichloro- Propylene dichloride	5000	1,2,4	U083	C	1000 (454)
Dichloropropane—Dichloropropene (mixture)	8003198		5000	1		B	100 (45.4)
Dichloropropene	26952238		5000	1		B	100 (45.4)
2,3-Dichloropropene	78886						
1,3-Dichloropropene	542756	1-Propene, 1,3-dichloro-	5000	1,2,4	U084	B	100 (45.4)
2,2-Dichloropropionic acid	75990		5000	1		D	5000 (2270)
Dichlorvos	62737		10	1		A	10 (4.54)
Dicofol	115322		5000	1		A	10 (4.54)
Dieldrin	60571	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aalpha,2beta,2aalpha,3beta,6beta,6aalpha,7beta, 7aalpha)-	1	1,2,4	P037	X	1 (0.454)
1,2:3,4-Diepoxybutane	1464535	2,2'-Bioxirane	1*	4	U085	A	10 (4.54)
Diethylamine	109897		1000	1		B	100 (454.4)
Diethylarsine	692422	Arsine, diethyl-	1*	4	P038	X	1 (0.454)
1,4-Diethyleneoxide	123911	1,4-Dioxane	1*	4	U108	B	100 (45.4)
Diethylhexyl phthalate	117817	Bis (2-ethylhexyl)phthalate 1,2-Benzenedicarboxylic acid, [bis(2-ethylhexyl)] ester	1*	2,4	U028	B	100 (45.4)
N,N'-Diethylhydrazine	1615801	Hydrazine, 1,2-diethyl-	1*	4	U086	A	10 (4.54)
O,O-Diethyl S-methyl dithiophosphate	3288582	Phosphorodithioic acid, O,O-diethyl S-methyl ester	1*	4	U087	D	5000 (2270)
Diethyl-p-nitrophenyl phosphate	311456	Phosphoric acid, diethyl 4-nitrophenyl ester	1*	4	P041	B	100 (45.4)
Diethyl phthalate	84662	1,2-Benzenedicarboxylic acid, diethyl ester	1*	2,4	U088	C	1000 (454)
O,O-Diethyl O-pyrazinyl phosphorothioate	297972	Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester	1*	4	P040	B	100 (45.4)
Diethylstilbestrol	56531	Phenol, 4,4'-(1,2-diethyl-1,2-ethenediyl)bis-, (E)	1*	4	U089	X	1 (0.454)
Dihydrosafrole	94586	1,3-Benzodioxole, 5-propyl-	1*	4	U090	A	10 (4.54)
Diisopropylfluorophosphate	55914	Phosphorofluoridic acid, bis(1-methylethyl) ester	1*	4	P043	B	100 (45.4)
1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-(1alpha,4alpha,4abeta,5alpha,8alpha,8abeta)-	309002	Aldrin	1	1,2,4	P004	X	1 (0.454)
1,4:5,8-Dimethanonaphthalene	465736	Isodrin	1*	4	P060	X	1 (0.454)

(Note: All Comments/Notes Are Located at the End of This Table)

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory RQ	Statutory Code †	Statutory RCRA Waste Number	Final RQ Category	Final RQ Pounds (Kg)
6aalpha)-2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aalpha,2beta,2aalpha,3beta,6beta, 6aalpha,7beta,7aalpha)-2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1aalpha,2beta,2abeta,3alpha,6alpha, 6abeta,7beta,7aalpha)-Dimethoate	60571	Dieldrin	1	1,2,4	P037	X	1 (0.454)
	72208	Endrin Endrin, & metabolites	1	1,2,4	P051	X	1 (0.454)
	60515	Phosphorodithioic acid, O,O-dimethyl S-[2(methylamino)-2-oxoethyl] ester	1*	4	P044	A	10 (4.54)
3,3'-Dimethoxybenzidine	119904	[1,1'-Biphenyl]-4,4'-diamine,3,3'dimethoxy-	1*	4	U091	B	100 (45.4)
Dimethylamine	124403	Methanamine, N-methyl-	1000	1,4	U092	C	1000 (454)
p-Dimethylaminoazobenzene	60117	Benzenamine, N,N-dimethyl-4-(phenylazo)-	1*	4	U093	A	10 (4.54)
7,12-Dimethylbenz(a)anthracene	57976	Benz(a)anthracene, 7,12-dimethyl-	1*	4	U094	X	1 (0.454)
3,3'-Dimethylbenzidine	119937	[1,1'Biphenyl]-4,4'-diamine,3,3'-dimethyl-	1*	4	U095	A	10 (4.54)
alpha,alpha-Dimethylbenzylhydroperoxide	80159	Hydroperoxide, 1-methyl-1-phenylethyl-	1*	4	U096	A	10 (4.54)
Dimethylcarbamoyl chloride	79447	Carbamic chloride, dimethyl-	1*	4	U097	X	1 (0.454)
1,1-Dimethylhydrazine	57147	Hydrazine, 1,1-dimethyl-	1*	4	U098	A	10 (4.54)
1,2-Dimethylhydrazine	540738	Hydrazine, 1,2-dimethyl-	1*	4	U099	X	1 (0.454)
alpha,alpha-Dimethylphenethylamine	122098	Benzeneethanamine, alpha,alpha-dimethyl-	1*	4	P046	D	5000 (2270)
2,4-Dimethylphenol	105679	Phenol, 2,4-dimethyl-	1*	2,4	U101	B	100 (45.4)
Dimethyl phthalate	131113	1,2-Benzenedicarboxylic acid, dimethyl ester	1*	2,4	U102	D	5000 (2270)
Dimethyl sulfate	77781	Sulfuric acid, dimethyl ester	1*	4	U103	B	100 (45.4)
Dinitrobenzene (mixed)	25154545		1000	1		B	100 (45.4)
m-Dinitrobenzene	99650						
o-Dinitrobenzene	528290						
p-Dinitrobenzene	100254						
4,6-Dinitro-o-cresol and salts	534521	Phenol, 2-methyl-4,6-dinitro-	1*	2,4	P047	A	10 (4.54)
Dinitrophenol	25550587		1000	1		A	10 (4.54)
2,5-Dinitrophenol	329715						
2,6-Dinitrophenol	573568						
2,4-Dinitrophenol	51285	Phenol 2,4-dinitro-	1000	1,2,4	P048	A	10 (4.54)
Dinitrotoluene	25321146		1000	1,2		A	10 (4.54)
3,4-Dinitrotoluene	610399						
2,4-Dinitrotoluene	121142	Benzene, 1-methyl-2,4-dinitro-	1000	1,2,4	U105	A	10 (4.54)
2,6-Dinitrotoluene	606202	Benzene, 2-methyl-1,3-dinitro-	1000	1,2,4	U106	B	100 (45.4)
Dinoseb	88857	Phenol, 2-(1-methylpropyl)-4,6-dinitro	1*	4	P020	C	1000 (454)
Di-n-octyl phthalate	117840	1,2-Benzenedicarboxylic acid, dioctyl ester	1*	2,4	U107	D	5000 (2270)
1,4-Dioxane	123911	1,4-Diethyleneoxide	1*	4	U108	B	100 (45.4)
DIPHENYLHYDRAZINE	N.A.		1*	2			**
1,2-Diphenylhydrazine	122667	Hydrazine, 1,2-diphenyl-	1*	2,4	U109	A	10 (4.54)
Diphosphoramide octamethyl-	152169	Octamethylpyrophosphoramide	1*	4	P085	B	100 (45.4)
Diphosphoric acid, tetraethyl ester	107493	Tetraethyl pyrophosphate	100	1,4	P111	A	10 (4.54)
Dipropylamine	142847	1-Propanamine, N-propyl-	1*	4	U110	D	5000 (2270)
Di-n-propylnitrosamine	621647	1-Propanamine, N-nitroso-N-propyl-	1*	2,4	U111	A	10 (4.54)
Diquat	85007		1000	1		C	1000 (454)
	2764729						
Disulfoton	298044	Phosphorodithioic acid, o o-diethyl S-[2-(ethylthio)ethyl] ester	1	1,4	P039	X	1 (0.454)
Dithiobiuret	541537	Thioimidodicarbonic diamide [(H2N) C(S)]2NH	1*	4	P049	B	100 (45.4)
Diuron	330541		100	1		B	100 (45.4)
Dodecylbenzenesulfonic acid	27176870		1000	1		C	1000 (454)
Endosulfan	115297	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a- hexahydro- 3-oxide	1	1,2,4	P050	X	1 (0.454)
alpha - Endosulfan	959988		1*	2		X	1 (0.454)
beta - Endosulfan	33213659		1*	2		X	1 (0.454)
ENDOSULFAN AND METABOLITES	N.A.		1*	2			**
Endosulfan sulfate	1031078		1*	2		X	1 (0.454)
Endothall	145733	7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid	1*	4	P088	C	1000 (454)
Endrin	72208	Endrin, & metabolites 2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9 -hexachloro-1a,2,2a,3, 6,6a,7,7a-octa-hydro-, (1aalpha, 2beta,2abeta,3alpha,6alpha, 6abeta,7beta, 7aalpha)-	1	1,2,4	P051	X	1 (0.454)
Endrin aldehyde	7421934		1*	2		X	1 (0.454)
ENDRIN AND METABOLITES	N.A.		1*	2			**
Endrin, & metabolites	72208	Endrin 2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3, 6,6a,7,7a-octa-hydro-, (1aalpha, 2beta,2abeta,3alpha,6alpha, 6abeta,7beta, 7aalpha)-	1	1,2,4	P051	X	1 (0.454)
Epichlorohydrin	106898	Oxirane, (chloromethyl)-	1000	1,4	U041	B	100 (45.4)
Epinephrine	51434	1,2-Benzenediol,4-[1-hydroxy-2-(methylamino)ethyl]-	1*	4	P042	C	1000 (454)
Ethanal	75070	Acetaldehyde	1000	1,4	U001	C	1000 (454)
Ethanamine, N-ethyl-N-nitroso-	55185	N-Nitrosodiethylamine	1*	4	U174	X	1 (0.454)
1,2-Ethanediamine, N,N-dimethyl-N'-2-pyridinyl-N'-(2-thienylmethyl)-	91805	Methapyrilene	1*	4	U155	D	5000 (2270)
Ethane, 1,2-dibromo-	106934	Ethylene dibromide	1000	1,4	U067	X	1 (0.454)
Ethane, 1,1-dichloro-	75343	Ethylidene dichloride 1,1-Dichloroethane	1*	2,4	U076	C	1000 (454)
Ethane, 1,2-dichloro-	107062	Ethylene dichloride 1,2-Dichloroethane	5000	1,2,4	U077	B	100 (45.4)
Ethanedinitrile	460195	Cyanogen	1*	4	P031	B	100 (45.4)
Ethane, hexachloro-	67721	Hexachloroethane	1*	2,4	U131	B	100 (45.4)
Ethane, 1,1'-[methylenebis(oxy)]bis[2-chloro-	111911	Bis(2-chloroethoxy) methane Dichloromethoxy ethane	1*	2,4	U024	C	1000 (454)
Ethane, 1,1'-oxybis-	60297	Ethyl ether	1*	4	U117	B	100 (45.4)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory RQ	Statutory Code †	Statutory RCRA Waste Number	Final RQ Category	Final RQ Pounds (Kg)
Ethane, 1,1'-oxybis[2-chloro-	111444	Bis (2-chloroethyl) ether Dichloroethyl ether	1*	2,4	U025	A	10 (4.54)
Ethane, pentachloro-	76017	Pentachloroethane	1*	4	U184	A	10 (4.54)
Ethane, 1,1,1,2-tetrachloro-	630208	1,1,1,2-Tetrachloroethane	1*	4	U208	B	100 (45.4)
Ethane, 1,1,2,2-tetrachloro-	79345	1,1,2,2-Tetrachloroethane	1*	2,4	U209	B	100 (45.4)
Ethanethioamide	62555	Thioacetamide	1*	4	U218	A	10 (4.54)
Ethane, 1,1,1-trichloro-	71556	Methyl chloroform 1,1,1-Trichloroethane	1*	2,4	U226	C	1000 (454)
Ethane, 1,1,2-trichloro-	79005	1,1,2-Trichloroethane	1*	2,4	U227	B	100 (45.4)
Ethanesulfonic acid, N-[[(methylamino)carbonyl]oxy]-, methyl ester	16752775	Methomyl	1*	4	P066	B	100 (45.4)
Ethanol, 2-ethoxy-	110805	Ethylene glycol monoethyl ether	1*	4	U359	C	1000 (454)
Ethanol, 2,2'-(nitrosoimino)bis-	1116547	N-Nitrosodiethanolamine	1*	4	U173	X	1 (0.454)
Ethanone, 1-phenyl-	98862	Acetophenone	1*	4	U004	D	5000 (2270)
Ethene, chloro-	75014	Vinyl chloride	1*	2,3,4	U043	X	1 (0.454)
Ethene, 2-chloroethoxy-	110758	2-Chloroethyl vinyl ether	1*	2,4	U042	C	1000 (454)
Ethene, 1,1-dichloro-	75354	Vinylidene chloride 1,1-Dichloroethylene	5000	1,2,4	U078	B	100 (45.4)
Ethene, 1,2-dichloro- (E)	156605	1,2-Dichloroethylene	1*	2,4	U079	C	1000 (454)
Ethene, tetrachloro-	127184	Perchloroethylene Tetrachloroethene Tetrachloroethylene	1*	2,4	U210	B	100 (45.4)
Ethene, trichloro-	79016	Trichloroethene Trichloroethylene	1000	1,2,4	U228	B	100 (45.4)
Ethion	563122		10	1		A	10 (4.54)
Ethyl acetate	141786	Acetic acid, ethyl ester	1*	4	U112	D	5000 (2270)
Ethyl acrylate	140885	2-Propenoic acid, ethyl ester	1*	4	U113	C	1000 (454)
Ethylbenzene	100414		1000	1,2		C	1000 (454)
Ethyl carbamate (urethane)	51796	Carbamic acid, ethyl ester	1*	4	U238	B	100 (45.4)
Ethyl cyanide	107120	Propanenitrile	1*	4	P101	A	10 (4.54)
Ethylenebisdithiocarbamic acid, salts & esters	111546	Carbamodithoic acid, 1,2-ethanediylbis-, salts & esters	1*	4	U114	D	5000 (2270)
Ethylenediamine	107153		1000	1		D	5000 (2270)
Ethylenediamine-tetraacetic acid (EDTA)	60004		5000	1		D	5000 (2270)
Ethylene dibromide	106934	Ethane, 1,2-dibromo-	1000	1,4	U067	X	1 (0.454)
Ethylene dichloride	107062	Ethane, 1,2-dichloro- 1,2-Dichloroethane	5000	1,2,4	U077	B	100 (45.4)
Ethylene glycol monoethyl ether	110805	Ethanol, 2-ethoxy-	1*	4	U359	C	1000 (454)
Ethylene oxide	75218	Oxirane	1*	4	U115	A	10 (4.54)
Ethylenethiourea	96457	2-Imidazolidinethione	1*	4	U116	A	10 (4.54)
Ethylenimine	151564	Aziridine	1*	4	P054	X	1 (0.454)
Ethyl ether	60297	Ethane, 1,1'-oxybis-	1*	4	U117	B	100 (45.4)
Ethylidene dichloride	75343	Ethane, 1,1-dichloro- 1,1-Dichloroethane	1*	2,4	U076	C	1000 (454)
Ethyl methacrylate	97632	2-Propenoic acid, 2-methyl-, ethyl ester	1*	4	U118	C	1000 (454)
Ethyl methanesulfonate	62500	Methanesulfonic acid, ethyl ester	1*	4	U119	X	1 (0.454)
Famphur	52857	Phosphorothioic acid, O-[4-[(dimethylamino) sulfonyl] phenyl] O,O-dimethyl ester	1*	4	P097	C	1000 (454)
Ferric ammonium citrate	1185575		1000	1		C	1000 (454)
Ferric ammonium oxalate	2944674 55488874		1000	1		C	1000 (454)
Ferric chloride	7705080		1000	1		C	1000 (454)
Ferric fluoride	7783508		100	1		B	100 (45.4)
Ferric nitrate	10421484		1000	1		C	1000 (454)
Ferric sulfate	10028225		1000	1		C	1000 (454)
Ferrous ammonium sulfate	10045893		1000	1		C	1000 (454)
Ferrous chloride	7758943		100	1		B	100 (45.4)
Ferrous sulfate	7720787 7782630		1000	1		C	1000 (454)
Fluoranthene	206440	Benzo[j,k]fluorene	1*	2,4	U120	B	100 (45.4)
Fluorene	86737		1*	2		D	5000 (2270)
Fluorine	7782414		1*	4	P056	A	10 (4.54)
Fluoroacetamide	640197	Acetamide, 2-fluoro-	1*	4	P057	B	100 (45.4)
Fluoroacetic acid, sodium salt	62748	Acetic acid, fluoro-, sodium salt	1*	4	P058	A	10 (4.54)
Formaldehyde	50000		1000	1,4	U122	B	100 (45.4)
Formic acid	64186		5000	1,4	U123	D	5000 (2270)
Fulminic acid, mercury(2+) salt	628864	Mercury fulminate	1*	4	P065	A	10 (4.54)
Fumaric acid	110178		5000	1		D	5000 (2270)
Furan	110009	Furfuran	1*	4	U124	B	100 (45.4)
Furan, tetrahydro-	109999	Tetrahydrofuran	1*	4	U213	C	1000 (454)
2-Furancarboxaldehyde	98011	Furfural	1000	1,4	U125	D	5000 (2270)
2,5-Furandione	108316	Maleic anhydride	5000	1,4	U147	D	5000 (2270)
Furfural	98011	2-Furancarboxaldehyde	1000	1,4	U125	D	5000 (2270)
Furfuran	110009	Furan	1*	4	U124	B	100 (45.4)
Glucopyranose, 2-deoxy-2-(3-methyl-3-nitrosoureido)-	18883664	D-Glucose, 2-deoxy-2-[[(methylnitrosoamino)-carbonyl]amino] Streptozotocin	1*	4	U206	X	1 (0.454)
D-Glucose, 2-deoxy-2-[[(methylnitrosoamino)-carbonyl]amino]-	18883664	Glucopyranose, 2-deoxy-2-(3-methyl-3-nitrosoureido)- Streptozotocin	1*	4	U206	X	1 (0.454)
Glycolylaldehyde	765344	Oxiranecarboxyaldehyde	1*	4	U126	A	10 (4.54)
Guanidine, N-methyl-N'-nitro-N-nitroso-	70257	MNNG	1*	4	U163	A	10 (4.54)
Guthion	86500		1	1		X	1 (0.454)
HALOETHERS	N.A.		1*	2			**
HALOMETHANES	N.A.		1*	2			**
Heptachlor	76448	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-	1	1,2,4	P059	X	1 (0.454)
HEPTACHLOR AND METABOLITES	N.A.		1*	2			**
Heptachlor epoxide	1024573		1*	2		X	1 (0.454)
Hexachlorobenzene	118741	Benzene, hexachloro-	1*	2,4	U127	A	10 (4.54)
Hexachlorobutadiene	87683	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	1*	2,4	U128	X	1 (0.454)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

(Note: All Comments/Notes Are Located at the End of This Table)

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory RQ	Statutory Code †	Statutory RCRA Waste Number	Final RQ Category	Final RQ Pounds (Kg)
HEXACHLOROCYCLOHEXANE (all isomers)	608731		1*	2			**
Hexachlorocyclohexane (gamma isomer)	58899	Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1alpha,2alpha,3beta,4alpha,5alpha, 6beta)-gamma-BHC Lindane	1	1,2,4	U129	X	1 (0.454)
Hexachlorocyclopentadiene	77474	1,3-Cyclopentadiene,1,2,3,4,5,5-hexachloro-	1	1,2,4	U130	A	10 (4.54)
Hexachloroethane	67721	Ethane, hexachloro-	1*	2,4	U131	B	100 (45.4)
Hexachlorophene	70304	Phenol, 2,2'-methylenebis(3,4,6-trichloro-	1*	4	U132	B	100 (45.4)
Hexachloropropene	1888717	1-Propene, 1,1,2,3,3,3-hexachloro-	1*	4	U243	C	1000 (454)
Hexaethyl tetraphosphate	757584	Tetraphosphonic acid, hexaethyl ester	1*	4	P062	B	100 (45.4)
Hydrazine	302012		1*	4	U133	X	1 (0.454)
Hydrazine, 1,2-diethyl-	1615801	N,N'-Diethylhydrazine	1*	4	U086	A	10 (4.54)
Hydrazine, 1,1-dimethyl-	57147	1,1-Dimethylhydrazine	1*	4	U098	A	10 (4.54)
Hydrazine, 1,2-dimethyl-	540738	1,2-Dimethylhydrazine	1*	4	U099	X	1 (0.454)
Hydrazine 1,2-diphenyl-	122667	1,2-Diphenylhydrazine	1*	2,4	U109	A	10 (4.54)
Hydrazine, methyl-	60344	Methyl hydrazine	1*	4	P068	A	10 (4.54)
Hydrazinecarbothioamide	79196	Thiosemicarbazide	1*	4	P116	B	100 (45.4)
Hydrochloric acid	7647010	Hydrogen chloride	5000	1		D	5000 (2270)
Hydrocyanic acid	74908	Hydrogen cyanide	10	1,4	P063	A	10 (4.54)
Hydrofluoric acid	7664393	Hydrogen fluoride	5000	1,4	U134	B	100 (45.4)
Hydrogen chloride	7647010	Hydrochloric acid	5000	1		D	5000 (2270)
Hydrogen cyanide	74908	Hydrocyanic acid	10	1,4	P063	A	10 (4.54)
Hydrogen fluoride	7664393	Hydrofluoric acid	5000	1,4	U134	B	100 (45.4)
Hydrogen sulfide	7783064	Hydrogen sulfide H2S	100	1,4	U135	B	100 (45.4)
Hydrogen sulfide H2S	7783064	Hydrogen sulfide	100	1,4	U135	B	100 (45.4)
Hydroperoxide, 1-methyl-1-phenylethyl-	80159	alpha,alpha-Dimethylbenzylhydroperoxide	1*	4	U096	A	10 (4.54)
2-Imidazolidinethione	96457	Ethylenethiourea	1*	4	U116	A	10 (4.54)
Indeno(1,2,3-cd)pyrene	193395	1,10-(1,2-Phenylene)pyrene	1*	2,4	U137	B	100 (45.4)
1,3-Isobenzofurandione	85449	Phthalic anhydride	1*	4	U190	D	5000 (2270)
Isobutyl alcohol	78831	1-Propanol, 2-methyl-	1*	4	U140	D	5000 (2270)
Isodrin	465736	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro, (1alpha,4alpha,4abeta,5beta, 8beta,8abeta)-	1*	4	P060	X	1 (0.454)
Isophorone	78591		1*	2		D	5000 (2270)
Isoprene	78795		1000	1		B	100 (45.4)
Isopropanolamine dodecylbenzenesulfonate	42504461		1000	1		C	1000 (454)
Isosafrole	120581	1,3-Benzodioxole, 5-(1-propenyl-	1*	4	U141	B	100 (45.4)
3(2H)-Isoxazolone, 5-(aminomethyl)-	2763964	Muscimol 5-(Aminomethyl)-3-isoxazolol	1*	4	P007	C	1000 (454)
Kepone	143500	1,3,4-Metheno-2H-cyclobuta[cd]pentalen-2-one, 1,1a,3,3a,4,5,5,5a,5b,6-decachlorooctahydro-	1	1,4	U142	X	1 (0.454)
Lasiocarpine	303344	2-Butenoic acid, 2-methyl-, 7[[2,3-dihydroxy-2-(1-methoxyethyl)-3-methyl-1-oxobutoxy]methyl]-2,3,5,7a-tetrahydro-1H-pyrrolizin-1-yl ester, [1S-[1alpha(Z), 7(2S*,3R*),7aalpha]]-	1*	4	U143	A	10 (4.54)
Lead FT	7439921		1*	2			*
Lead acetate	301042	Acetic acid, lead(2+) salt	5000	1,4	U144		*
LEAD AND COMPOUNDS	N.A.		1*	2			**
Lead arsenate	7784409		5000	1		X	1 (0.454)
	7645252						
	10102484						
Lead, bis(acetato-O)tetrahydroxytri	1335326	Lead subacetate	1*	4	U146	B	100 (45.4)
Lead chloride	7758954		5000	1		B	100 (45.4)
Lead fluoborate	13814965		5000	1		B	100 (45.4)
Lead fluoride	7783462		1000	1		B	100 (45.4)
Lead iodide	10101630		5000	1		B	100 (45.4)
Lead nitrate	10099748		5000	1		B	100 (45.4)
Lead phosphate	7446277	Phosphoric acid, lead(2+) salt (2:3)	1*	4	U145		*
Lead stearate	7428480		5000	1		D	5000# (2270)
	1072351						
	52652592						
	56189094						
Lead subacetate	1335326	Lead, bis(acetato-O)tetrahydroxytri	1*	4	U146	B	100 (45.4)
Lead sulfate	15739807		5000	1		B	100 (45.4)
	7446142						
Lead sulfide	1314870		5000	1		D	5000# (2270)
Lead thiocyanate	592870		5000	1		B	100 (45.4)
Lindane	58899	Cyclohexane, 1,2,3,4,5,6-hexachloro-, (1alpha,2alpha,3beta,4alpha,5alpha,6beta)-gamma-BHC Hexachlorocyclohexane (gamma isomer)	1	1,2,4	U129	X	1 (0.454)
Lithium chromate	14307358		1000	1		A	10 (4.54)
Malathion	121755		10	1		B	100 (45.4)
Maleic acid	110167		5000	1		D	5000 (2270)
Maleic anhydride	108316	2,5-Furandione	5000	1,4	U147	D	5000 (2270)
Maleic hydrazide	123331	3,6-Pyridazinedione, 1,2-dihydro-	1*	4	U148	D	5000 (2270)
Malononitrile	109773	Propanedinitrile	1*	4	U149	C	1000 (454)
Melphalan	148823	L-Phenylalanine, 4-[bis(2-chloroethyl) amino]-	1*	4	U150	X	1 (0.454)
Mercaptodimethur	2032657		100	1		A	10 (4.54)
Mercuric cyanide	592041		1	1		X	1 (0.454)
Mercuric nitrate	10045940		10	1		A	10 (4.54)
Mercuric sulfate	7783359		10	1		A	10 (4.54)
Mercuric thiocyanate	592858		10	1		A	10 (4.54)
Mercurous nitrate	10415755		10	1		A	10 (4.54)
	7782867						
Mercury	7439976		1*	2,3,4	U151	X	1 (0.454)
MERCURY AND COMPOUNDS	N.A.		1*	2			**
Mercury (acetato-O)phenyl-	62384	Phenylmercury acetate	1*	4	P092	B	100 (45.4)
Mercury fulminate	628864	Fulminic acid, mercury(2+) salt	1*	4	P065	A	10 (4.54)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory RQ	Statutory Code †	Statutory RCRA Waste Number	Final RQ Category	Final RQ Pounds (Kg)
Methacrylonitrile	126987	2-Propenenitrile, 2-methyl-	1*	4	U152	C	1000 (454)
Methanamine, N-methyl-	124403	Dimethylamine	1000	1,4	U092	C	1000 (454)
Methanamine, N-methyl-N-nitroso-	62759	N-Nitrosodimethylamine	1*	2,4	P082	A	10 (4.54)
Methane, bromo-	74839	Methyl bromide	1*	2,4	U029	C	1000 (454)
Methane, chloro-	74873	Methyl chloride	1*	2,4	U045	B	100 (45.4)
Methane, chloromethoxy-	107302	Chloromethyl methyl ether	1*	4	U046	A	10 (4.54)
Methane, dibromo-	74953	Methylene bromide	1*	4	U068	C	1000 (454)
Methane, dichloro-	75092	Methylene chloride	1*	2,4	U080	C	1000 (454)
Methane, dichlorodifluoro-	75718	Dichlorodifluoromethane	1*	4	U075	D	5000 (2270)
Methane, iodo-	74884	Methyl iodide	1*	4	U138	B	100 (45.4)
Methane, isocyanato-	624839	Methyl isocyanate	1*	4	P064		# #
Methane, oxybis(chloro-	542881	Dichloromethyl ether	1*	4	P016	A	10 (4.54)
Methanesulfenyl chloride, trichloro-	594423	Trichloromethanesulfenyl chloride	1*	4	P118	B	100 (45.4)
Methanesulfonic acid, ethyl ester	62500	Ethyl methanesulfonate	1*	4	U119	X	1 (0.454)
Methane, tetrachloro-	56235	Carbon tetrachloride	5000	1,2,4	U211	A	10 (4.54)
Methane, tetranitro-	509148	Tetranitromethane	1*	4	P112	A	10 (4.54)
Methane, tribromo-	75252	Bromoform	1*	2,4	U225	B	100 (45.4)
Methane, trichloro-	67663	Chloroform	5000	1,2,4	U044	A	10 (4.54)
Methane, trichlorofluoro-	75694	Trichloromonofluoromethane	1*	4	U121	D	5000 (2270)
Methanethiol	74931	Methylmercaptan Thiomethanol	100	1,4	U153	B	100 (45.4)
6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-3-oxide	115297	Endosulfan	1	1,2,4	P050	X	1 (0.454)
1,3,4-Methano-2H-cyclobuta[cd]pentalen-2-one, 1,1a,3,3a,4,5,5,5a,5b,6-decachlorooctahydro-	143500	Kepone	1	1,4	U142	X	1 (0.454)
4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-	76448	Heptachlor	1	1,2,4	P059	X	1 (0.454)
4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-	57749	Chlordane Chlordane, alpha & gamma isomers Chlordane, technical	1	1,2,4	U036	X	1 (0.454)
Methanol	67561	Methyl alcohol	1*	4	U154	D	5000 (2270)
Methapyrilene	91805	1,2-Ethanediamine, N,N-dimethyl-N'-2-pyridinyl-N'-(2-thienylmethyl)-	1*	4	U155	D	5000 (2270)
Methomyl	16752775	Ethanimidothioic acid, N-[[(methylamino)carbonyl]oxy]-, methyl ester	1*	4	P066	B	100 (45.4)
Methoxychlor	72435	Benzene, 1,1'-(2,2,2-trichloroethylidene) bis[4-methoxy-	1	1,4	U247	X	1 (0.454)
Methyl alcohol	67561	Methanol	1*	4	U154	D	5000 (2270)
Methyl bromide	74839	Methane, bromo-	1*	2,4	U029	C	1000 (454)
1-Methylbutadiene	504609	1,3-Pentadiene	1*	4	U186	B	100 (45.4)

Methyl chloride	74873	Methane, chloro-	1*	2,4	U045	B	100 (45.4)
Methyl chlorocarbonate	79221	Carbonochloridic acid, methyl ester Methyl chloroformate	1*	4	U156	C	1000 (454)
Methyl chloroform	71556	Ethane, 1,1,1-trichloro- 1,1,1-Trichloroethane	1*	2,4	U226	C	1000 (454)
Methyl chloroformate	79221	Carbonochloridic acid, methyl ester Methyl chlorocarbonate	1*	4	U156	C	1000 (454)
3-Methylcholanthrene	56495	Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-	1*	4	U157	A	10 (4.54)
4,4'-Methylenebis(2-chloroaniline)	101144	Benzenamine, 4,4'-methylenebis(2-chloro-	1*	4	U158	A	10 (4.54)
Methylene bromide	74953	Methane, dibromo-	1*	4	U068	C	1000 (454)
Methylene chloride	75092	Methane, dichloro-	1*	2,4	U080	C	1000 (454)
Methyl ethyl ketone (MEK)	78933	2-Butanone	1*	4	U159	D	5000 (2270)
Methyl ethyl ketone peroxide	1338234	2-Butanone peroxide	1*	4	U160	A	10 (4.54)
Methyl hydrazine	60344	Hydrazine, methyl-	1*	4	P068	A	10 (4.54)
Methyl iodide	74884	Methane, iodo-	1*	4	U138	B	100 (45.4)
Methyl isobutyl ketone	108101	4-Methyl-2-pentanone	1*	4	U161	D	5000 (2270)
Methyl isocyanate	624839	Methane, isocyanato-	1*	4	P064		# #
2-Methyllactonitrile	75865	Acetone cyanohydrin Propanenitrile, 2-hydroxy-2-methyl-	10	1,4	P069	A	10 (4.54)
Methylmercaptan	74931	Methanethiol Thiomethanol	100	1,4	U153	B	100 (45.4)
Methyl methacrylate	80626	2-Propenoic acid, 2-methyl-, methyl ester	5000	1,4	U162	C	1000 (454)
Methyl parathion	298000	Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester	100	1,4	P071	B	100 (45.4)
4-Methyl-2-pentanone	108101	Methyl isobutyl ketone	1*	4	U161	D	5000 (2270)
Methylthiouracil	56042	4(1H)-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-	1*	4	U164	A	10 (4.54)
Mevinphos	7786347		1	1		A	10 (4.54)
Mexacarbate	315184		1000	1		C	1000 (454)
Mitomycin C	50077	Azirino[2',3',3,4]pyrrolo[1,2-a]indole-4,7-dione, 6-amino-8-[[(aminocarbonyl)oxy]methyl]-1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5-methyl-, [1aS-(1aalpha, 8beta, 8aalpha, 8balpha)]-	1*	4	U010	A	10 (4.54)
MNNG	70257	Guanidine, N-methyl-N'-nitro-N-nitroso-	1*	4	U163	A	10 (4.54)
Monoethylamine	75047		1000	1		B	100 (45.4)
Monomethylamine	74895		1000	1		B	100 (45.4)
Multi Source Leachate			1*	4	F039	X	1 (0.454)
Muscimol	2763964	3(2H)-Isoxazolone, 5-(aminomethyl)- 5- (Aminomethyl)-3-isoxazolol	1*	4	P007	C	1000 (454)
Naled	300765		10	1		A	10 (4.54)
5,12-Naphthacenedione, 8-acetyl-10-[(3-amino-2,3,6-trideoxy-alpha-L-lyxo-hexopyranosyl)oxy]-7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-, (8S-cis)-	20830813	Daunomycin	1*	4	U059	A	10 (4.54)
1-Naphthalenamine	134327	alpha-Naphthylamine	1*	4	U167	B	100 (45.4)
2-Naphthalenamine	91598	beta-Naphthylamine	1*	4	U168	A	10 (4.54)
Naphthalenamine, N,N'-bis(2-chloroethyl)-	494031	Chlornaphazine	1*	4	U026	B	100 (45.4)
Naphthalene	91203		5000	1,2,4	U165	B	100 (45.4)
Naphthalene, 2-chloro-	91587	beta-Chloronaphthalene, 2-Chloronaphthalene	1*	2,4	U047	D	5000 (2270)
1,4-Naphthalenedione	130154	1,4-Naphthoquinone	1*	4	U166		5000 (2270)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

(Note: All Comments/Notes Are Located at the End of This Table)

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory RQ	Statutory Code †	Statutory RCRA Waste Number	Final RQ Category	Final RQ Pounds (Kg)
2,7-Naphthalenedisulfonic acid, 3,3'-[(3,3'-dimethyl-(1,1'-biphenyl)-4,4'-diyl)-bis(azo)]bis(5-amino-4-hydroxy)-tetrasodium salt	72571	Trypan blue	1*	4	U236	A	10 (4.54)
Naphthenic acid	1338245		100	1		B	100 (45.4)
1,4-Naphthoquinone	130154	1,4-Naphthalenedione	1*	4	U166	D	5000 (2270)
alpha-Naphthylamine	134327	1-Naphthalenamine	1*	4	U167	B	100 (45.4)
beta-Naphthylamine	91598	2-Naphthalenamine	1*	4	U168	A	10 (4.54)
alpha-Naphthylthiourea	86884	Thiourea, 1-naphthalenyl-	1*	4	P072	B	100 (45.4)
Nickel ††	7440020		1*	2		B	100 (45.4)
Nickel ammonium sulfate	15699180		5000	1		B	100 (45.4)
NICKEL AND COMPOUNDS	N.A.		1*	2			**
Nickel carbonyl	13463393	Nickel carbonyl Ni(CO)4, (T-4)-	1*	4	P073	A	10 (4.54)
Nickel carbonyl Ni(CO)4, (T-4)-	13463393	Nickel carbonyl	1*	4	P073	A	10 (4.54)
Nickel chloride	7718549		5000	1		B	100 (45.4)
	37211055						
Nickel cyanide	557197	Nickel cyanide Ni(CN)2	1*	4	P074	A	10 (4.54)
Nickel cyanide Ni(CN)2	557197	Nickel cyanide	1*	4	P074	A	10 (4.54)
Nickel hydroxide	12054487		1000	1		A	10 (4.54)
Nickel nitrate	14216752		5000	1		B	100 (45.4)
Nickel sulfate	7786814		5000	1		B	100 (45.4)
Nicotine, & salts	54115	Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-	1*	4	P075	B	100 (45.4)
Nitric acid	7697372		1000	1		C	1000 (454)
Nitric acid, thallium (1+) salt	10102451	Thallium (I) nitrate	1*	4	U217	B	100 (45.4)
Nitric oxide	10102439	Nitrogen oxide NO	1*	4	P076	A	10 (4.54)
p-Nitroaniline	100016	Benzenamine, 4-nitro-	1*	4	P077	D	5000 (2270)
Nitrobenzene	98953	Benzene, nitro-	1000	1,2,4	U169	C	1000 (454)
Nitrogen dioxide	10102440	Nitrogen oxide NO2	1000	1,4	P078	A	10 (4.54)
	10544726						
Nitrogen oxide NO	10102439	Nitric oxide	1*	4	P076	A	10 (4.54)
Nitrogen oxide NO2	10102440	Nitrogen dioxide	1000	1,4	P078	A	10 (4.54)
	10544726						
Nitroglycerine	55630	1,2,3-Propanetriol, trinitrate-	1*	4	P081	A	10 (4.54)
Nitrophenol (mixed)	25154556		1000	1		B	100 (45.4)
m-Nitrophenol	554847					B	100 (45.4)
o-Nitrophenol	88756	2-Nitrophenol					
p-Nitrophenol	100027	Phenol, 4-nitro- 4-Nitrophenol					
o-Nitrophenol	88756	2-Nitrophenol	1000	1,2		B	100 (45.4)
p-Nitrophenol	100027	Phenol, 4-nitro- 4-Nitrophenol	1000	1,2,4	U170	B	100 (45.4)
2-Nitrophenol	88756	o-Nitrophenol	1000	1,2		B	100 (45.4)
4-Nitrophenol	100027	p-Nitrophenol Phenol, 4-nitro-	1000	1,2,4	U170	B	100 (45.4)
NITROPHENOLS	N.A.		1*	2			**
2-Nitropropane	79469	Propane, 2-nitro-	1*	4	U171	A	10 (4.54)
NITROSAMINES	N.A.		1*	2			**
N-Nitrosodi-n-butylamine	924163	1-Butanamine, N-butyl-N-nitroso-	1*	4	U172	A	10 (4.54)
N-Nitrosodiethanolamine	1116547	Ethanol, 2,2'-(nitrosoimino)bis-	1*	4	U173	X	1 (0.454)
N-Nitrosodiethylamine	55185	Ethanamine, N-ethyl-N-nitroso-	1*	4	U174	X	1 (0.454)
N-Nitrosodimethylamine	62759	Methanamine, N-methyl-N-nitroso-	1*	2,4	P082	A	10 (4.54)
N-Nitrosodiphenylamine	86306		1*	2		B	100 (45.4)
N-Nitroso-N-ethylurea	759739	Urea, N-ethyl-N-nitroso-	1*	4	U176	X	1 (0.454)
N-Nitroso-N-methylurea	684935	Urea, N-methyl-N-nitroso-	1*	4	U177	X	1 (0.454)
N-Nitroso-N-methylurethane	615532	Carbamic acid methylnitroso- ethyl ester	1*	4	U178	X	1 (0.454)
N-Nitrosomethylvinylamine	4549400	Vinylamine N-methyl-N-nitroso-	1*	4	P084	A	10 (4.54)
N-Nitrosopiperidine	100754	Piperidine 1-nitroso-	1*	4	U179	A	10 (4.54)
N-Nitrosopyrrolidine	930552	Pyrrolidine 1-nitroso-	1*	4	U180	X	1 (0.454)
Nitrotoluene	1321126		1000	1		C	1000 (454)
m-Nitrotoluene	99081						
o-Nitrotoluene	88722						
p-Nitrotoluene	99990						
5-Nitro-o-toluidine	99558	Benzenamine, 2-methyl-5-nitro-	1*	4	U181	B	100 (45.4)
Octamethylpyrophosphoramide	152169	Diphosphoramide, octamethyl-	1*	4	P085	B	100 (45.4)
Osmium oxide OsO4 (T-4)-	20816120	Osmium tetroxide	1*	4	P087	C	1000 (454)
Osmium tetroxide	20816120	Osmium oxide OsO4 (T-4)-	1*	4	P087	C	1000 (454)
7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid	145733	Endothall	1*	4	P088	C	1000 (454)
1,2-Oxathiolane, 2,2-dioxide	1120714	1,3-Propane sultone	1*	4	U193	A	10 (4.54)
2H-1,3,2-Oxazaphosphorin-2-amine, N,N-bis(2-chloroethyl)tetrahydro-, 2-oxide	50180	Cyclophosphamide	1*	4	U058	A	10 (4.54)
Oxirane	75218	Ethylene oxide	1*	4	U115	A	10 (4.54)
Oxiranecarboxyaldehyde	765344	Glycidylaldehyde	1*	4	U126	A	10 (4.54)
Oxirane, (chloromethyl)-	106898	Epichlorohydrin	1000	1,4	U041	B	100 (45.4)
Paraformaldehyde	30525894		1000	1		C	1000 (454)
Paraldehyde	123637	1,3,5-Trioxane, 2,4,6-trimethyl-	1*	4	U182	C	1000 (454)
Parathion	56382	Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester	1	1,4	P089	A	10 (4.54)
Pentachlorobenzene	608935	Benzene, pentachloro-	1*	4	U183	A	10 (4.54)
Pentachloroethane	76017	Ethane, pentachloro-	1*	4	U184	A	10 (4.54)
Pentachloronitrobenzene (PCNB)	82688	Benzene, pentachloronitro-	1*	4	U185	B	100 (45.4)
Pentachlorophenol	87865	Phenol, pentachloro-	10	1,2,4	U242	A	10 (4.54)
1,3-Pentadiene	504609	1-Methylbutadiene	1*	4	U186	B	100 (45.4)
Perchloroethylene	127184	Ethene, tetrachloro- Tetrachloro- ethene Tetrachloroethylene	1*	2,4	U210	B	100 (45.4)
Phenacetin	62442	Acetamide, N-(4-ethoxyphenyl)-	1*	4	U187	B	100 (45.4)
Phenanthrene	85018		1*	2		D	5000 (2270)
Phenol	108952	Benzene, hydroxy-	1000	1,2,4	U188	C	1000(454)
Phenol, 2-chloro-	95578	o-Chlorophenol 2-Chlorophenol	1*	2,4	U048	B	100 (45.4)
Phenol, 4-chloro-3-methyl-	59507	p-Chloro-m-cresol 4-Chloro-m-cresol	1*	2,4	U039	D	5000 (2270)
Phenol, 2-cyclohexyl-4,6-dinitro-	131895	2-Cyclohexyl-4,6-dinitrophenol	1*	4	P034	B	100 (45.4)
Phenol, 2,4-dichloro-	120832	2,4-Dichlorophenol	1*	2,4	U081	B	100 (45.4)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

(Note: All Comments/Notes Are Located at the End of This Table)

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory RQ	Statutory Code †	Statutory RCRA Waste Number	Final RQ Category	Final RQ Pounds (Kg)
Phenol, 4,4'-(1,2-diethyl-1,2-ethenediyl)bis-, (E)	56531	Diethylstilbestrol	1*	4	U089	X	1 (0.454)
Phenol, 2,4-dimethyl-	105679	2,4-Dimethylphenol	1*	2,4	U101	B	100(45.4)
Phenol, 2,4-dinitro-	51285	2,4-Dinitrophenol	1000	1,2,4	P048	A	10 (4.54)
Phenol, methyl-	1319773	Cresol(s) Cresylic acid	1000	1,4	U052	C	1000 (454)
m-Cresol	108394	m-Cresylic acid					
o-Cresol	95487	o-Cresylic acid					
p-Cresol	106445	p-Cresylic acid					
Phenol, 2-methyl-4,6-dinitro-	534521	4,6-Dinitro-o-cresol and salts	1*	2,4	P047	A	10 (4.54)
Phenol, 2,2'-methylenebis[3,4,6-trichloro-	70304	Hexachlorophene	1*	4	U132	B	100 (45.4)
Phenol, 2-(1-methylpropyl)-4,6-dinitro-	88857	Dinoseb	1*	4	P020	C	1000 (454)
Phenol, 4-nitro-	100027	p-Nitrophenol 4-Nitrophenol	1000	1,2,4	U170	B	100 (45.4)
Phenol, pentachloro-	87865	Pentachlorophenol	10	1,2,4	U242	A	10 (4.54)
Phenol, 2,3,4,6-tetrachloro-	58902	2,3,4,6-Tetrachlorophenol	1*	4	U212	A	10 (4.54)
Phenol, 2,4,5-trichloro-	95954	2,4,5-Trichlorophenol	10	1,4	U230	A	10 (4.54)
Phenol, 2,4,6-trichloro-	88062	2,4,6-Trichlorophenol	10	1,2,4	U231	A	10 (4.54)
Phenol, 2,4,6-trinitro-, ammonium salt	131748	Ammonium picrate	1*	4	P009	A	10 (4.54)
L-Phenylalanine, 4-[bis(2-chloroethyl) amino]-	148823	Melphalan	1*	4	U150	X	1 (0.454)
1,10-(1,2-Phenylene)pyrene	193395	Indeno(1,2,3-cd)pyrene	1*	2,4	U137	B	100 (45.4)
Phenylmercury acetate	62384	Mercury, (acetato-O)phenyl-	1*	4	P092	B	100 (45.4)
Phenylthiourea	103855	Thiourea, phenyl-	1*	4	P093	B	100 (45.4)
Phorate	298022	Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester	1*	4	P094	A	10 (4.54)
Phosgene	75445	Carbonic dichloride	5000	1,4	P095	A	10 (4.54)
Phosphine	7803512		1*	4	P096	B	100 (45.4)
Phosphoric acid	7664382		5000	1		D	5000 (2270)
Phosphoric acid, diethyl 4-nitrophenyl ester	311456	Diethyl-p-nitrophenyl phosphate	1*	4	P041	B	100 (45.4)
Phosphoric acid, lead(2+) salt (2:3)	7446277	Lead phosphate	1*	4	U145		9
Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl] ester	298044	Disulfoton	1	1,4	P039	X	1 (0.454)
Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester	298022	Phorate	1*	4	P094	A	10 (4.54)
Phosphorodithioic acid, O,O-diethyl S-methyl ester	3288582	O,O-Diethyl S-methyl dithiophosphate	1*	4	U087	D	5000 (2270)
Phosphorodithioic acid, O,O-dimethyl S-[2(methylamino)-2-oxoethyl] ester	60515	Dimethoate	1*	4	P044	A	10 (4.54)
Phosphorofluoridic acid, bis(1-methylethyl) ester	55814	Diisopropylfluorophosphate	1*	4	P043	B	100 (45.4)
Phosphorothioic acid, O,O-diethyl O-(4-nitrophenyl) ester	56382	Parathion	1	1,4	P089	A	10 (4.54)
Phosphorothioic acid, O,[4-[(dimethylamino) sulfonyl]phenyl]O,O-dimethyl ester	52857	Famphur	1*	4	P097	C	1000 (454)
Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester	298000	Methyl parathion	100	1,4	P071	B	100 (45.4)
Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester	297972	O,O-Diethyl O-pyrazinyl phosphorothioate	1*	4	P040	B	100 (45.4)
Phosphorus	7723140		1	1		X	1 (0.454)
Phosphorus oxychloride	10025873		5000	1		C	1000 (454)
Phosphorus pentasulfide	1314803	Phosphorus sulfide Sulfur phosphide	100	1,4	U189	B	100 (45.4)
Phosphorus sulfide	1314803	Phosphorus pentasulfide Sulfur phosphide	100	1,4	U189	B	100 (45.4)
Phosphorus trichloride	7719122		5000	1		C	1000 (454)
PHTHALATE ESTERS	N.A.		1*	2			**
Phthalic anhydride	85449	1,3-Isobenzofurandione	1*	4	U190	D	5000 (2270)
2-Picoline	109068	Pyridine, 2-methyl-	1*	4	U191	D	5000 (2270)
Piperidine, 1-nitroso-	100754	N-Nitrosopiperidine	1*	4	U179	A	10 (4.54)
Plumbane, tetraethyl-	78002	Tetraethyl lead	100	1,4	P110	A	10 (4.54)
POLYCHLORINATED BIPHENYLS (PCBs)	1336363		10	1,2		X	1 (0.454)
Aroclor 1016	12674112	POLYCHLORINATED BIPHENYLS (PCBs)					
Aroclor 1221	11104282	POLYCHLORINATED BIPHENYLS (PCBs)					
Aroclor 1232	11141165	POLYCHLORINATED BIPHENYLS (PCBs)					
Aroclor 1242	53469219	POLYCHLORINATED BIPHENYLS (PCBs)					
Aroclor 1248	12672296	POLYCHLORINATED BIPHENYLS (PCBs)					
Aroclor 1254	11097691	POLYCHLORINATED BIPHENYLS (PCBs)					
Aroclor 1260	11096825	POLYCHLORINATED BIPHENYLS (PCBs)					
POLYNUCLEAR AROMATIC HYDROCARBONS	N.A.		1*	2			**
Potassium arsenate	7784410		1000	1		X	1 (0.454)
Potassium arsenite	10124502		1000	1		X	1 (0.454)
Potassium bichromate	7778509		1000	1		A	10 (4.54)
Potassium chromate	7789006		1000	1		A	10 (4.54)
Potassium cyanide	151508	Potassium cyanide K (CN)	10	1,4	P098	A	10 (4.54)
Potassium cyanide K(CN)	151508	Potassium cyanide	10	1,4	P098	A	10 (4.54)
Potassium hydroxide	1310583		1000	1		C	1000 (454)
Potassium permanganate	7722647		100	1		B	100 (45.4)
Potassium silver cyanide	506616	Argentate (1-), bis(cyano-C)-, potassium	1*	4	P099	X	1 (0.454)
Pronamide	23950585	Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-	1*	4	U192	D	5000 (2270)
Propanal, 2-methyl-3-(methylthio)-, O-[(methylamino)carbonyl]oxime	116063	Aldicarb	1*	4	P070	X	1 (0.454)
1-Propanamine	107108	n-Propylamine	1*	4	U194	D	5000 (2270)
1-Propanamine, N-propyl-	142847	Dipropylamine	1*	4	U110	D	5000 (2270)
1-Propanamine, N-nitroso-N-propyl-	621647	Di-n-propylnitrosamine	1*	2,4	U111	A	10 (4.54)
Propane, 1,2-dibromo-3-chloro-	96128	1,2-Dibromo-3-chloropropane	1*	4	U066	X	1 (0.454)
Propane, 2-nitro-	79469	2-Nitropropane	1*	4	U171	A	10 (4.54)
1,3-Propane sultone	1120714	1,2-Oxathiolane, 2,2-dioxide	1*	4	U193	A	10 (4.54)
Propane, 1,2-dichloro-	78875	Propylene dichloride 1,2-Dichloropropane	5000	1,2,4	U083	C	1000 (454)
Propanedinitrile	109773	Malononitrile	1*	4	U149	C	1000 (454)
Propanenitrile	107120	Ethyl cyanide	1*	4	P101	A	10 (4.54)
Propanenitrile, 3-chloro-	542767	3-Chloropropionitrile	1*	4	P027	C	1000 (454)
Propanenitrile, 2-hydroxy-2-methyl-	75865	Acetone cyanohydrin 2-Methyllactonitrile	10	1,4	P069	A	10 (4.54)
Propane, 2,2'-oxybis[2-chloro-	108601	Dichloroisopropyl ether	1*	2,4	U027	C	1000 (454)
1,2,3-Propanetriol, trinitrate-	55630	Nitroglycerine	1*	4	P081	A	10 (4.54)
1-Propanol, 2,3-dibromo-, phosphate (3:1)	126727	Tris(2,3-dibromopropyl) phosphate	1*	4	U235	A	10 (4.54)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory RQ	Statutory Code †	Statutory RCRA Waste Number	Final RQ Category	Final RQ Pounds (Kg)
1-Propanol, 2-methyl-	78831	Isobutyl alcohol	1*	4	U140	D	5000 (2270)
2-Propanone	67641	Acetone	1*	4	U002	D	5000 (2270)
2-Propanone, 1-bromo-	598312	Bromoacetone	1*	4	P017	C	1000 (454)
Propargite	2312358		10	1		A	10 (4.54)
Propargyl alcohol	107197	2-Propyn-1-ol	1*	4	P102	C	1000 (454)
2-Propenal	107028	Acrolein	1	1,2,4	P003	X	1 (0.454)
2-Propenamide	79061	Acrylamide	1*	4	U007	D	5000 (2270)
1-Propene, 1,1,2,3,3,3-hexachloro-	1888717	Hexachloropropene	1*	4	U243	C	1000 (454)
1-Propene, 1,3-dichloro-	542756	1,3-Dichloropropene	5000	1,2,4	U084	B	100 (45.4)
2-Propenenitrile	107131	Acrylonitrile	100	1,2,4	U009	B	100 (45.4)
2-Propenenitrile, 2-methyl-	126987	Methacrylonitrile	1*	4	U152	C	1000 (454)
2-Propenoic acid	79107	Acrylic acid	1*	4	U008	D	5000 (2270)
2-Propenoic acid, ethyl ester	140885	Ethyl acrylate	1*	4	U113	C	1000 (454)
2-Propenoic acid, 2-methyl-, ethyl ester	97632	Ethyl methacrylate	1*	4	U118	C	1000 (454)
2-Propenoic acid, 2-methyl-, methyl ester	80626	Methyl methacrylate	5000	1,4	U162	C	1000 (454)
2-Propen-1-ol	107186	Allyl alcohol	100	1,4	P005	B	100 (45.4)
Propionic acid	79094		5000	1		D	5000 (2270)
Propionic acid, 2-(2,4,5-trichlorophenoxy)-	93721	Silvex (2,4,5-TP) 2,4,5-TP acid	100	1,4	U233	B	100 (45.4)
Propionic anhydride	123626		5000	1		D	5000 (2270)
n-Propylamine	107108	1-Propanamine	1*	4	U194	D	5000 (2270)
Propylene dichloride	78875	Propane, 1,2-dichloro- 1,2-Dichloropropane	5000	1,2,4	U083	C	1000 (454)
Propylene oxide	75569		5000	1		B	100 (45.4)
1,2-Propylenimine	75558	Aziridine, 2-methyl-	1*	4	P067	X	1 (0.454)
2-Propyn-1-ol	107197	Propargyl alcohol	1*	4	P102	C	1000 (454)
Pyrene	129000		1*	2		D	5000 (2270)
Pyrethrins	121299		1000	1		X	1 (0.545)
	121211						
	8003347						
3,6-Pyridazinedione, 1,2-dihydro-	123331	Maleic hydrazide	1*	4	U148	D	5000 (2270)
4-Pyridinamine	504245	4-Aminopyridine	1*	4	P008	C	1000 (454)
Pyridine	110861		1*	4	U196	C	1000 (454)
Pyridine, 2-methyl-	109068	2-Picoline	1*	4	U191	D	5000 (2270)
Pyridine, 3-(1-methyl-2-pyrrolidinyl)-, (S)-	54115	Nicotine, & salts	1*	4	P075	B	100 (45.4)
2,4-(1H,3H)-Pyrimidinedione, 5-[bis(2-chloroethyl)amino]-	66751	Uracil mustard	1*	4	U237	A	10 (4.54)
4(1H)-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-	56042	Methylthiouracil	1*	4	U164	A	10 (4.54)
Pyrrolidine, 1-nitroso-	930552	N-Nitrosopyrrolidine	1*	4	U180	X	1 (0.454)
Quinoline	91225		1000	1		D	5000 (2270)

RADIONUCLIDES	N.A.		1*	3			§
Reserpine	50555	Yohimban-16-carboxylic acid, 11,17-dimethoxy-18-[(3,4,5-trimethoxybenzoyl)oxy-, methyl ester (3beta, 16beta, 17alpha, 18beta, 20alpha)-	1*	4	U200	D	5000 (2270)
Resorcinol	108463	1,3-Benzenediol	1000	1,4	U201	D	5000 (2270)
Saccharin and salts	81072	1,2-Benzisothiazol-3(2H)-one, 1,1-dioxide	1*	4	U202	B	100 (45.4)
Safrole	94597	1,3-Benzodioxole, 5-(2-propenyl)-	1*	4	U203	B	100 (45.4)
Selenious acid	7783008		1*	4	U204	A	10 (4.54)
Selenious acid, dithallium (1+) salt	12039520	Thallium selenite	1*	4	P114	C	1000 (454)
Selenium ††	7782492		1*	2		B	100 (45.4)
SELENIUM AND COMPOUNDS	N.A.		1*	2			**
Selenium dioxide	7446084	Selenium oxide	1000	1,4	U204	A	10 (4.54)
Selenium oxide	7446084	Selenium dioxide	1000	1,4	U204	A	10 (4.54)
Selenium sulfide	7488564	Selenium sulfide SeS2	1*	4	U205	A	10 (4.54)
Selenium sulfide SeS2	7488564	Selenium sulfide	1*	4	U205	A	10 (4.54)
Selenourea	630104		1*	4	P103	C	1000 (454)
L-Serine, diazoacetate (ester)	115028	Azaserine	1*	4	U015	X	1 (0.454)
Silver ††	7440224		1*	2		C	1000 (454)
SILVER AND COMPOUNDS	N.A.		1*	2			**
Silver cyanide	506649	Silver cyanide Ag (CN)	1*	4	P104	X	1 (0.454)
Silver cyanide Ag (CN)	506649	Silver cyanide	1*	4	P104	X	1 (0.454)
Silver nitrate	7761888		1	1		X	1 (0.454)
Silvex (2,4,5-TP)	93721	Propionic acid, 2-(2,4,5-trichlorophenoxy)- 2,4,5-TP acid	100	1,4	U233	B	100 (45.4)
Sodium	7440235		1000	1		A	10 (4.54)
Sodium arsenate	7631892		1000	1		X	1 (0.454)
Sodium arsenite	7784465		1000	1		X	1 (0.454)
Sodium azide	26628228		1*	4	P105	C	1000 (454)
Sodium bichromate	10588019		1000	1		A	10 (4.54)
Sodium bifluoride	1333831		5000	1		B	100 (45.4)
Sodium bisulfite	7631905		5000	1		D	5000 (2270)
Sodium chromate	7775113		1000	1		A	10 (4.54)
Sodium cyanide	143339	Sodium cyanide Na (CN)	10	1,4	P106	A	10 (4.54)
Sodium cyanide Na (CN)	143339	Sodium cyanide	10	1,4	P106	A	10 (4.54)
Sodium dodecylbenzenesulfonate	25155300		1000	1		C	1000 (454)
Sodium fluoride	7681494		5000	1		C	1000 (454)
Sodium hydrosulfide	16721805		5000	1		D	5000 (2270)
Sodium hydroxide	1310732		1000	1		C	1000 (454)
Sodium hypochlorite	7681529		100	1		B	100 (45.4)
Sodium methylate	10022705						
Sodium nitrite	124414		1000	1		C	1000 (454)
Sodium phosphate, dibasic	7632000		100	1		B	100 (45.4)
	7558794		5000	1		D	5000 (2270)
	10039324						
	10140655						

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory RQ	Statutory Code †	Statutory RCRA Waste Number	Final RQ Category	Final RQ Pounds (Kg)
Sodium phosphate, tribasic	7601549		5000	1		D	5000 (2270)
	7758294						
	7758544						
	10101890						
	10124568						
	10361894						
Sodium selenite	10102188		1000	1		B	100 (46.4)
	7782823						
Streptozotocin	18883664	D-Glucose, 2-deoxy-2-[[(methylnitrosoamino)-carbonyl]amino]-.	1*	4	U206	X	1 (0.454)
		Glucopyranose, 2-deoxy-2-(3-methyl-3-nitrosoureido)-					
Strontium chromate	7789062		1000	1		A	10 (4.54)
Strychnidin-10-one	57249	Strychnine, & salts	10	1,4	P108	A	10 (4.54)
Strychnidin-10-one, 2,3-dimethoxy-	357573	Brucine	1*	4	P018	B	100 (46.4)
Strychnine, & salts	57249	Strychnidin-10-one	10	1,4	P108	A	10 (4.54)
Styrene	100425		1000	1		C	1000 (454)
Sulfur monochloride	12771083		1000	1		C	1000 (454)
Sulfur phosphide	1314803	Phosphorus pentasulfide	100	1,4	U189	B	100 (46.4)
		Phosphorus sulfide					
Sulfuric acid	7664939		1000	1		C	1000 (454)
	8014957						
Sulfuric acid, dithallium (1+) salt	7446186	Thallium (I) sulfate	1000	1,4	P115	B	100 (46.4)
	10031591						
Sulfuric acid, dimethyl ester	77781	Dimethyl sulfate	1*	4	U103	B	100 (46.4)
2,4,5-T acid	93765	Acetic acid, (2,4,5-trichlorophenoxy)-	100	1,4	U232	C	1000 (454)
		2,4,5-T					
2,4,5-T amines	2008460		100	1		D	5000 (2270)
	1319728						
	3813147						
	6369966						
	6369977						
2,4,5-T esters	93798		100	1		C	1000 (454)
	1928478						
	2545597						
	25168154						
	61792072						
2,4,5-T salts	13560991		100	1		C	1000 (454)
2,4,5-T	93765	Acetic acid, (2,4,5-trichlorophenoxy)-	100	1,4	U232	C	1000 (454)
		2,4,5-T acid					
TDE	72548	Benzene, 1,1'-(2,2-dichloroethylidene)bis(4-chloro-	1	1,2,4	U060	X	1 (0.454)
		DDD 4,4' DDD					
1,2,4,5-Tetrachlorobenzene	95943	Benzene, 1,2,4,5-tetrachloro-	1*	4	U207	D	5000 (2270)
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746016		1*	2		X	1 (0.454)
1,1,1,2-Tetrachloroethane	630206	Ethane, 1,1,1,2-tetrachloro-	1*	4	U208	B	100 (45.4)
1,1,2,2-Tetrachloroethane	79345	Ethane, 1,1,2,2 tetrachloro-	1*	2,4	U209	B	100 (45.4)
Tetrachloroethene	127184	Ethene, tetrachloro-	1*	2,4	U210	B	100 (45.4)
		Perchloroethylene					
		Tetrachloroethylene					
Tetrachloroethylene	127184	Ethene, tetrachloro-	1*	2,4	U210	B	100 (45.4)
		Perchloroethylene Tetrachloroethene					
2,3,4,6-Tetrachlorophenol	58902	Phenol, 2,3,4,6-tetrachloro-	1*	4	U212	A	10 (4.54)
Tetraethyl lead	78002	Plumbane, tetraethyl-	100	1,4	P110	A	10 (4.54)
Tetraethyl pyrophosphate	107493	Diphosphonic acid, tetraethyl ester	100	1,4	P111	A	10 (4.54)
Tetraethyldithiopyrophosphate	3689245	Thiodiphosphonic acid, tetraethyl ester	1*	4	P109	B	100 (45.4)
Tetrahydrofuran	109999	Furan, tetrahydro-	1*	4	U213	C	1000 (454)
Tetranitromethane	509148	Methane, tetranitro-	1*	4	P112	A	10 (4.54)
Tetraphosphonic acid, hexaethyl ester	757584	Hexaethyl tetraphosphate	1*	4	P062	B	100 (45.4)
Thallic oxide	1314325	Thallium oxide Tl2O3	1*	4	P113	B	100 (45.4)
Thallium 1†	7440280		1*	2		C	1000 (454)
Thallium and compounds	N.A.		1*	2			**
Thallium (I) acetate	563688	Acetic acid, thallium(1+) salt	1*	4	U214	B	100 (45.4)
Thallium (I) carbonate	6533739	Carbonic acid, dithallium(1+) salt	1*	4	U215	B	100 (45.4)
Thallium (I) chloride	7791120	Thallium chloride TlCl	1*	4	U216	B	100 (45.4)
Thallium chloride TlCl	7791120	Thallium(I) chloride	1*	4	U216	B	100 (45.4)
Thallium (I) nitrate	10102451	Nitric acid, thallium (1+) salt	1*	4	U217	B	100 (45.4)
Thallium oxide Tl2O3	1314325	Thallic oxide	1*	4	P113	B	100 (45.4)
Thallium selenite	12039520	Selenious acid, dithallium(1+) salt	1*	4	P114	C	1000 (454)
Thallium (I) sulfate	7446186	Sulfuric acid, dithallium(1+) salt	1000	1,4	P115	B	100 (45.4)
	10031591						
Thioacetamide	62555	Ethanethioamide	1*	4	U218	A	10 (4.54)
Thiodiphosphonic acid, tetraethyl ester	3689245	Tetraethyldithiopyrophosphate	1*	4	P109	B	100 (45.4)
Thiofanox	39196184	2-Butanone, 3,3-dimethyl-1-(methylthio)-, O((methylamino)carbonyl) oxime	1*	4	P045	B	100 (45.4)
Thiomidodicarbonic diamide ((H2N)C(S)) 2NH	541537	Dithiobiuret	1*	4	P049	B	100 (45.4)
Thiomethanol	74931	Methanethiol	100	1,4	U153	B	100 (45.4)
		Methylmercaptan					
Thioperoxydicarbonic diamide ((H2N)C(S)) 2S2, tetramethyl-	137268	Thiram	1*	4	U244	A	10 (4.54)
Thiophenol	108985	Benzenethiol	1*	4	P014	B	100 (45.4)
Thiosemicarbazide	79196	Hydrazinecarbothioamide	1*	4	P116	B	100 (45.4)
Thiourea	62566		1*	4	U219	A	10 (4.54)
Thiourea, (2-chlorophenyl)-	5344821	1-(o-Chlorophenyl)thiourea	1*	4	P026	B	100 (45.4)
Thiourea, 1-naphthalenyl-	86884	alpha-Naphthylthiourea	1*	4	P072	B	100 (45.4)
Thiourea, phenyl-	103855	Phenylthiourea	1*	4	P093	B	100 (45.4)
Thiram	137268	Thioperoxydicarbonic diamide ((H2N)C(S)) 2S2, tetramethyl-	1*	4	U244	A	10 (4.54)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory			Final RQ	
			RQ	Code †	RCRA Waste Number	Category	Pounds (Kg)
Toluenediamine	95807 496720 823405 25376458	Benzenediamine, ar-methyl-	1*	4	U221	A	10 (4.54)
Toluene diisocyanate	584849 91087 26471625	Benzene, 1,3-diisocyanatomethyl-	1*	4	U223	B	100 (45.4)
o-Toluidine	95534	Benzenamine, 2-methyl-	1*	4	U328	B	100 (45.4)
p-Toluidine	106490	Benzenamine, 4-methyl-	1*	4	U353	B	100 (45.4)
o-Toluidine hydrochloride	636215	Benzenamine, 2-methyl-, hydrochloride	1*	4	U222	B	100 (45.4)
Toxaphene	8001352	Camphene, octachloro-	1*	1,2,4,	P123	X	1 (0.454)
2,4,5-TP acid	93721	Propanoic acid, 2-(2,4,5-trichlorophenoxy)- Silvex (2,4,5-TP)	100	1,4	U233	B	100 (45.4)
2,4,5-TP esters	32534955		100	1		B	100 (45.4)
1H-1,2,4-Triazol-3-amine	61825	Amitrole	1*	4	U011	A	10 (4.54)
Trichlorfon	52686		1000	1		B	100 (45.4)
1,2,4-Trichlorobenzene	120821		1*	2		B	100 (45.4)
1,1,1-Trichloroethane	71556	Ethane, 1,1,1-trichloro- Methyl chloroform	1*	2,4	U226	C	1000 (454)
1,1,2-Trichloroethane	79005	Ethane, 1,1,2-trichloro-	1*	2,4	U227	B	100 (45.4)
Trichloroethene	79016	Ethene, trichloro- Trichloroethylene	1000	1,2,4	U228	B	100 (45.4)
Trichloroethylene	79016	Ethene, trichloro- Trichloroethene	1000	1,2,4	U228	B	100 (45.4)
Trichloromethanesulfenyl chloride	594423	Methanesulfenyl chloride, trichloro-	1*	4	P118	B	100 (45.4)
Trichloromonofluoromethane	75694	Methane, trichlorofluoro-	1*	4	U121	D	5000 (2270)
Trichlorophenol	25167822		10	1		A	10 (4.54)
2,3,4-Trichlorophenol	15950660						
2,3,5-Trichlorophenol	933788						
2,3,6-Trichlorophenol	933755						
2,4,5-Trichlorophenol	95954	Phenol, 2,4,5-trichloro-	10*	1,4	U230	A	10 (4.54)
2,4,6-Trichlorophenol	88062	Phenol, 2,4,6-trichloro-	10*	1,2,4	U231	A	10 (4.54)
3,4,5-Trichlorophenol	609198						
2,4,5-Trichlorophenol	95954	Phenol, 2,4,5-trichloro-	10*	1,4	U230	A	10 (4.54)
2,4,6-Trichlorophenol	88062	Phenol, 2,4,6-trichloro-	10	1,2,4	U231	A	10 (4.54)
Triethanolamine dodecylbenzenesulfonate	27323417		1000	1		C	1000 (454)
Triethylamine	121448		5000	1		D	5000 (2270)
Trimethylamine	75503		1000	1		B	100 (45.4)
1,3,5-Trinitrobenzene	99354	Benzene, 1,3,5-trinitro-	1*	4	U234	A	10 (4.54)
1,3,5-Trioxane, 2,4,6-trimethyl-	123637	Paraldehyde	1*	4	U182	C	1000 (454)

Tris(2,3-dibromopropyl) phosphate	126727	1-Propanol, 2,3-dibromo-, phosphate (3:1)	1*	4	U235	A	10 (4.54)
Trypan blue	72571	2,7-Naphthalenedisulfonic acid, 3,3'-[3,3'-dimethyl-(1,1'-biphenyl)-4,4'-diyl]-bis(azo)]bis(5-amino-4-hydroxy)-tetrasodium salt	1*	4	U236	A	10 (4.54)
Unlisted Hazardous Wastes Characteristic of Corrosivity.	N.A.		1*	4	D002	B	100 (45.4)
Unlisted Hazardous Wastes Characteristics	N.A.		1*	4			
Characteristic of Toxicity							
Arsenic (D004)	N.A.		*1	4	D004	X	1 (0.454)
Barium (D005)	N.A.		*1	4	D005	C	1,000 (454)
Benzene (D018)	N.A.		1000	1, 2, 3, 4	D018	A	10 (4.54)
Cadmium (D006)	N.A.		*1	4	D006	A	10 (4.54)
Carbon tetrachloride (D019)	N.A.		5,000	1, 2, 4	D019	A	10 (4.54)
Chlordane (D020)	N.A.		1	1, 2, 4	D020	X	1 (0.454)
Chlorobenzene (D021)	N.A.		100	1, 2, 4	D021	B	100 (45.4)
Chloroform (D022)	N.A.		5,000	1, 2, 4	D022	A	10 (4.54)
Chromium (D007)	N.A.		*1	4	D007	A	10 (4.54)
o-Cresol (D023)	N.A.		1,000	1, 4	D023	C	1,000 (454)
m-Cresol (D024)	N.A.		1,000	1, 4	D024	C	1,000 (454)
p-Cresol (D025)	N.A.		1,000	1, 4	D025	C	1,000 (454)
Cresol (D026)	N.A.		1,000	1, 4	D026	C	1,000 (454)
2,4-D (D016)	N.A.		100	1, 4	D016	B	100 (45.4)
1,4-Dichlorobenzene (D027)	N.A.		100	1, 2, 4	D027	B	100 (45.4)
1,2-Dichloroethane (D028)	N.A.		5,000	1, 2, 4	D028	B	100 (45.4)
1,1-Dichloroethylene (D029)	N.A.		5,000	1, 2, 4	D029	B	100 (45.4)
2,4-Dinitrotoluene (D030)	N.A.		1,000	1, 2, 4	D030	A	10 (4.54)
Endrin (D012)	N.A.		1	1, 4	D012	X	1 (0.454)
Heptachlor (and epoxide) (D031)	N.A.		1	1, 2, 4	D031	X	1 (0.454)
Hexachlorobenzene (D032)	N.A.		*1	2, 4	D032	A	10 (4.54)
Hexachlorobutadiene (D033)	N.A.		*1	2, 4	D033	X	1 (0.454)
Hexachloroethane (D034)	N.A.		*1	2, 4	D034	B	100 (45.4)
Lead (D008)	N.A.		*1	4	D008		(8)
Lindane (D013)	N.A.		1	1, 4	D013	X	1 (0.454)
Mercury (D009)	N.A.		*1	4	D009	X	1 (0.454)
Methoxychlor (D014)	N.A.		1	1, 4	D014	X	1 (0.454)
Methyl ethyl ketone (D035)	N.A.		*1	4	D035	D	5,000 (2270)
Nitrobenzene (D036)	N.A.		1,000	1, 2, 4	D036	C	1,000 (454)
Pentachlorophenol (D037)	N.A.		10	1, 2, 4	D037	A	10 (4.54)
Pyridine (D038)	N.A.		*1	4	D038	C	1,000 (454)
Selenium (D010)	N.A.		*1	4	D010	A	10 (4.54)
Silver (D011)	N.A.		*1	4	D011	X	1 (0.454)
Tetrachloroethylene (D039)	N.A.		*1	2, 4	D039	B	100 (45.4)
Toxaphene (D015)	N.A.		1	1, 4	D015	X	1 (0.454)
Trichloroethylene (D040)	N.A.		1000	1, 2, 4	D040	B	100 (45.4)
2,4,5-Trichlorophenol (D041)	N.A.		10	1, 4	D041	A	10 (4.54)
2,4,6-Trichlorophenol (D042)	N.A.		10	1, 2, 4	D042	A	10 (4.54)
2,4,5-TP (D017)	N.A.		100	1, 4	D017	B	100 (45.4)
Vinyl chloride (D043)	N.A.		*1	2, 3, 4	D043	X	1 (0.454)
Unlisted Hazardous Wastes Characteristic of Ignitability	N.A.		1*	4	D001	B	100 (45.4)

258

259

008152

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory RQ	Statutory Code †	Statutory RCRA Waste Number	Final RQ Category	Final RQ Pounds (Kg)
Unlisted Hazardous Wastes Characteristic of Reactivity.	N.A.		1*	4	D003	B	100 (45.4)
Uracil mustard	66751	2,4-(1H,3H)-Pyrimidinedione, 5-[bis(2-chloroethyl)amino]-	1*	4	U237	A	10 (4.54)
Uranyl acetate	541093		5000	1		B	100 (45.4)
Uranyl nitrate	10102064		5000	1		B	100 (45.4)
	36478769						
Urea, N-ethyl-N-nitroso-	759739	N-Nitroso-N-ethylurea	1*	4	U176	X	1 (0.454)
Urea, N-methyl-N-nitroso-	684935	N-Nitroso-N-methylurea	1*	4	U177	X	1 (0.454)
Vanadic acid, ammonium salt	7803556	Ammonium vanadate	1*	4	P119	C	1000 (454)
Vanadium oxide V2O5	1314621	Vanadium pentoxide	1000	1,4	P120	C	1000 (454)
Vanadium pentoxide	1314621	Vanadium oxide V2O5	1000	1,4	P120	C	1000 (454)
Vanadyl sulfate	27774136		1000	1		C	1000 (454)
Vinyl chloride	75014	Ethene, chloro-	1*	2,3,4	U043	X	1 (0.454)
Vinyl acetate	108054	Vinyl acetate monomer	1000	1		D	5000 (2270)
Vinyl acetate monomer	108054	Vinyl acetate	1000	1		D	5000 (2270)
Vinylamine, N-methyl-N-nitroso-	4549400	N-Nitrosomethylvinylamine	1*	4	P084	A	10 (4.54)
Vinylidene chloride	75354	Ethene, 1,1-dichloro- 1,1-Dichloroethylene	5000	1,2,4	U078	B	100 (45.4)
Warfarin, & salts, when present at concentrations greater than 0.3%	81812	2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenyl-butyl)-, & salts, when present at concentrations greater than 0.3%	1*	4	P001	B	100 (45.4)
Xylene (mixed)	1330207	Benzene dimethyl	1000	1,4	U239	C	1000 (454)
m-Benzene, dimethyl	108383	m-Xylene					
o-Benzene, dimethyl	95476	o-Xylene					
p-Benzene, dimethyl	106423	p-Xylene					
Xylenol	1300716		1000	1		C	1000 (454)
Yohimban-16-carboxylic acid,11,17-dimethoxy-18-[(3,4,5-trimethoxybenzoyl)oxy]-, methyl ester (3beta,16beta,17alpha, 18beta, 20alpha)-	50555	Reserpine	1*	4	U200	D	5000 (2270)
Zinc **	7440666		1*	2		C	1000 (454)
ZINC AND COMPOUNDS	N.A.		1*	2			**
Zinc acetate	557346		1000	1		C	1000 (454)
Zinc ammonium chloride	52628258		5000	1		C	1000 (454)
	14639975						
	14639986						
Zinc borate	1332076		1000	1		C	1000 (454)
Zinc bromide	7699458		5000	1		C	1000 (454)
Zinc carbonate	3486359		1000	1		C	1000 (454)
Zinc chloride	7646857		5000	1		C	1000 (454)
Zinc cyanide	557211	Zinc cyanide Zn(CN)2	10	1,4	P121	A	10 (4.54)
Zinc cyanide Zn(CN)2	557211	Zinc cyanide	10	1,4	P121	A	10 (4.54)
Zinc fluoride	7783495		1000	1		C	1000 (454)
Zinc formate	557415		1000	1		C	1000 (454)
Zinc hydrosulfite	7779864		1000	1		C	1000 (454)
Zinc nitrate	7779886		5000	1		C	1000 (454)
Zinc phenolsulfonate	127822		5000	1		C	1000 (454)
Zinc phosphide	1314847	Zinc phosphide Zn3P2, when present at concentrations greater than 10%	1000	1,4	P122	D	5000 (2270)
Zinc phosphide Zn3P2 when present at concentrations greater than 10%	1314847	Zinc phosphide	1000	1,4	P122	B	100 (45.4)
Zinc silicofluoride	16871719		5000	1		B	100 (45.4)
Zinc sulfate	7733020		1000	1		D	5000 (2270)
Zirconium nitrate	13746899		5000	1		C	1000 (454)
Zirconium potassium fluoride	16923958		5000	1		D	5000 (2270)
Zirconium sulfate	14644612		5000	1		C	1000 (454)
Zirconium tetrachloride	10026116		5000	1		D	5000 (2270)
F001			1*	4	F001	D	5000 (2270)
The following spent halogenated solvents used in degreasing: all spent solvent mixtures/blends used in degreasing containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.						A	10 (4.54)
(a) Tetrachloroethylene	127184		1*	2,4	U210	B	100 (45.4)
(b) Trichloroethylene	79016		1000	1,2,4	U228	B	100 (45.4)
(c) Methylene chloride	75092		1*	2,4	U080	C	1000 (454)
(d) 1,1,1-Trichloroethane	71556		1*	2,4	U226	C	1000 (454)
(e) Carbon tetrachloride	56235		5000	1,2,4	U211	A	10 (4.54)
(f) Chlorinated fluorocarbons	N.A.					D	5000 (2270)
F002			1*	4	F002	A	10 (4.54)
The following spent halogenated solvents: all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those listed in F001, F004, or F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.							
(a) Tetrachloroethylene	127184		1*	2,4	U210	B	100 (45.4)
(b) Methylene chloride	75092		1*	2,4	U080	C	1000 (454)
(c) Trichloroethylene	79016		1000	1,2,4	U228	B	100 (45.4)
(d) 1,1,1-Trichloroethane	71556		1*	2,4	U226	C	1000 (454)
(e) Chlorobenzene	108907		100	1,2,4	U037	B	100 (45.4)
(f) 1,1,2-Trichloro-1,2,2-trifluoroethane	76131					D	5000 (2270)
(g) o-Dichlorobenzene	95501		100	1,2,4	U070	B	100 (45.4)
(h) Trichlorofluoromethane	75694		1*	4	U121	D	5000 (2270)

260

261

008153

Environmental Protection Agency

§ 302.4

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory RQ	Statutory Code †	Statutory RCRA Waste Number	Final RQ Category	Final RQ Pounds (Kg)
(l) 1,1,2-Trichloroethane	79005		1*	2,4	U227	B	100 (45.4)
F003			1*	4	F003	B	100 (45.4)
The following spent non-halogenated solvents and the still bottoms from the recovery of these solvents:							
(a) Xylene	1330207					C	1000 (454)
(b) Acetone	67641					D	5000 (2270)
(c) Ethyl acetate	141786					D	5000 (2270)
(d) Ethylbenzene	100414					C	1000 (454)
(e) Ethyl ether	60297					B	100 (45.4)
(f) Methyl isobutyl ketone	108101					D	5000 (2270)
(g) n-Butyl alcohol	71363					D	5000 (2270)
(h) Cyclohexanone	108941					D	5000 (2270)
(i) Methanol	67561					D	5000 (2270)
F004			1*	4	F004	C	1000 (454)
The following spent non-halogenated solvents and the still bottoms from the recovery of these solvents:							
(a) Cresols/Cresylic acid	1319773		1000	1,4	U052	C	1000 (454)
(b) Nitrobenzene	98953		1000	1,2,4	U169	C	1000 (454)
F005			1*	4	F005	B	100 (45.4)
The following spent non-halogenated solvents and the still bottoms from the recovery of these solvents:							
(a) Toluene	108883		1000	1,2,4	U220	C	1000 (454)
(b) Methyl ethyl ketone	78933		1*	4	U159	D	5000 (2270)
(c) Carbon disulfide	75150		5000	1,4	P022	B	100 (45.4)
(d) Isobutanol	78831		1*	4	U140	D	5000 (2270)
(e) Pyridine	110861		1*	4	U196	C	1000 (454)
F006			1*	4	F006	A	10 (4.54)

Wastewater treatment sludges from electroplating operations except from the following processes: (1) sulfuric acid anodizing of aluminum, (2) tin plating on carbon steel, (3) zinc plating (segregated basis) on carbon steel, (4) aluminum or zinc-aluminum plating on carbon steel, (5) cleaning/stripping associated with tin, zinc and aluminum plating on carbon steel, and (6) chemical etching and milling of aluminum.							
F007			1*	4	F007	A	10 (4.54)
Spent cyanide plating bath solutions from electroplating operations.							
F008			1*	4	F008	A	10 (4.54)
Plating bath residues from the bottom of plating baths from electroplating operations where cyanides are used in the process.							
F009			1*	4	F009	A	10 (4.54)
Spent stripping and cleaning bath solutions from electroplating operations where cyanides are used in the process.							
F010			1*	4	F010	A	10 (4.54)
Quenching bath residues from oil baths from metal heat treating operations where cyanides are used in the process.							
F011			1*	4	F011	A	10 (4.54)
Spent cyanide solution from salt bath pot cleaning from metal heat treating operations.							
F012			1*	4	F012	A	10 (4.54)
Quenching wastewater treatment sludges from metal heat treating operations where cyanides are used in the process.							
F019			1	4	F019	A	10 (4.54)
Wastewater treatment sludges from the chemical conversion coating of aluminum except from zirconium phosphating in aluminum can washing when such phosphating is an exclusive conversion coating process							
F020			1*	4	F020	X	1 (0.454)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

(Note: All Comments/Notes Are Located at the End of This Table)

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory			Final RQ	
			RQ	Code †	RCRA Waste Number	Category	Pounds (Kg)
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- or tetrachlorophenol, or of intermediates used to produce their pesticide derivatives. (This listing does not include wastes from the production of hexachlorophene from highly purified 2,4,5-trichlorophenol.)							
F021			1*	4	F021	X	1 (0.454)
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of pentachlorophenol, or of intermediates used to produce its derivatives.							
F022			1*	4	F022	X	1 (0.454)
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzenes under alkaline conditions.							
F023			1*	4	F023	X	1 (0.454)
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- and tetrachlorophenols. (This listing does not include wastes from equipment used only for the production or use of hexachlorophene from highly purified 2,4,5-trichlorophenol.)							
F024			1*	4	F024	X	1 (0.454)
Wastes, including but not limited to distillation residues, heavy ends, tars, and reactor cleanout wastes, from the production of chlorinated aliphatic hydrocarbons, having carbon content from one to five, utilizing free radical catalyzed processes. (This listing does not include light ends, spent filters and filter aids, spent dessicants(sic), wastewater, wastewater treatment sludges, spent catalysts, and wastes listed in Section 261.32.)							
F025			1*	4	F025	X	1 (0.454)
Condensed light ends, spent filters and filter aids, and spent dessicant wastes from the production of certain chlorinated aliphatic hydrocarbons, by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution.							
F026			1*	4	F026	X	1 (0.454)
Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzene under alkaline conditions.							
F027			1*	4	F027	X	1 (0.454)
Discarded unused formulations containing tri-, tetra-, or pentachlorophenol or discarded unused formulations containing compounds derived from these chlorophenols. (This listing does not include formulations containing hexachlorophene synthesized from prepurified 2,4,5-trichlorophenol as the sole component.)							
F028			1*	4	F028	X	1 (0.454)
Residues resulting from the incineration or thermal treatment of soil contaminated with EPA Hazardous Waste Nos. F020, F021, F022, F023, F026, and F027.							
F032			1*	4	F032	X	1(0.454)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

A-43

(Note: All Comments/Notes Are Located at the End of This Table)

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory			Final RQ	
			RQ	Code †	RCRA Waste Number	Category	Pounds (Kg)
Wastewaters, process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that currently use or have previously used chlorophenolic formulations (except wastes from processes that have had the F032 waste code deleted in accordance with § 261.35 and do not resume or initiate use of chlorophenolic formulations). This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.							
F034			1*	4	F034	X	1(0.454)
Wastewaters, process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use creosote formulations. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.							
F035			1*	4	F035	X	1(0.454)
Wastewaters, process residuals, preservative drippage, and spent formulations from wood preserving processes generated at plants that use inorganic preservatives containing arsenic or chromium. This listing does not include K001 bottom sediment sludge from the treatment of wastewater from wood preserving processes that use creosote and/or pentachlorophenol.							
F037			1*	4	F037	X	1 (0.454)
Petroleum refinery primary oil/water/solids separation sludge—Any sludge generated from the gravitational separation of oil/water/solids during the storage or treatment of process wastewaters and oily cooling wastewaters from petroleum refineries. Such sludges include, but are not limited to, those generated in: oil/water/solids separators; tanks and impoundments; ditches and other conveyances; sumps; and stormwater units receiving dry weather flow. Sludge generated in stormwater units that do not receive dry weather flow, sludges generated from non-contact once-through cooling waters segregated for treatment from other process or oily cooling waters, sludges generated in aggressive biological treatment units as defined in § 261.31(b)(2) (including sludges generated in one or more additional units after wastewaters have been treated in aggressive biological treatment units) and K051 wastes are not included in this listing.							
F038			1*	4	F038	X	1 (0.454)
Petroleum refinery secondary (emulsified) oil/water/solids separation sludge—Any sludge and/or float generated from the physical and/or chemical separation of oil/water/solids in process wastewaters and oily cooling wastewaters from petroleum refineries. Such wastes include, but are not limited to, all sludges and floats generated in: induced air flotation (IAF) units, tanks and impoundments, and all sludges generated in DAF units. Sludges generated in stormwater units that do not receive dry weather flow, sludges generated from once-through non-contact cooling waters segregated for treatment from other process or oil cooling wastes, sludges and floats generated in aggressive biological treatment units as defined in § 261.31(b)(2) (including sludges and floats generated in one or more additional units after wastewaters have been treated in aggressive biological treatment units) and F037, K048, and K051 wastes are not included in this listing.							
K001			1*	4	K001	X	1 (0.454)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

(Note: All Comments/Notes Are Located at the End of This Table)

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory			Final RQ	
			RQ	Code †	RCRA Waste Number	Category	Pounds (Kg)
Bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol. K002			1*	4	K002		*
Wastewater treatment sludge from the production of chrome yellow and orange pigments. K003			1*	4	K003		*
Wastewater treatment sludge from the production of molybdate orange pigments. K004			1*	4	K004	A	10 (4.54)
Wastewater treatment sludge from the production of zinc yellow pigments. K005			1*	4	K005		*
Wastewater treatment sludge from the production of chrome green pigments. K006			1*	4	K006	A	10 (4.54)
Wastewater treatment sludge from the production of chrome oxide green pigments (anhydrous and hydrated). K007			1*	4	K007	A	10 (4.54)
Wastewater treatment sludge from the production of iron blue pigments. K008			1*	4	K008	A	10 (4.54)
Oven residue from the production of chrome oxide green pigments. K009			1*	4	K009	A	10 (4.54)
Distillation bottoms from the production of acetaldehyde from ethylene. K010			1*	4	K010	A	10 (4.54)
Distillation side cuts from the production of acetaldehyde from ethylene. K011			1*	4	K011	A	10 (4.54)
Bottom stream from the wastewater stripper in the production of acrylonitrile. K013			1*	4	K013	A	10 (4.54)
Bottom stream from the acetonitrile column in the production of acrylonitrile. K014			1*	4	K014	D	5000 (2270)
Bottoms from the acetonitrile purification column in the production of acrylonitrile K015			1*	4	K015	A	10 (4.54)
Still bottoms from the distillation of benzyl chloride K016			1*	4	K016	X	1 (0.454)
Heavy ends or distillation residues from the production of carbon tetrachloride. K017			1*	4	K017	A	10 (4.54)
Heavy ends (still bottoms) from the purification column in the production of epi-chlorohydrin K018			1*	4	K018	X	1 (0.454)
Heavy ends from the fractionation column in ethyl chloride production. K019			1*	4	K019	X	1 (0.454)
Heavy ends from the distillation of ethylene dichloride in ethylene dichloride production. K020			1*	4	K020	X	1 (0.454)
Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production. K021			1*	4	K021	A	10 (4.54)
Aqueous spent antimony catalyst waste from fluoromethanes production. K022			1*	4	K022	X	1 (0.454)
Distillation bottom tars from the production of phenol/acetone from cumene. K023			1*	4	K023	D	5000 (2270)
Distillation light ends from the production of phthalic anhydride from naphthalene. K024			1*	4	K024	D	5000 (2270)
Distillation bottoms from the production of phthalic anhydride from naphthalene. K025			1*	4	K025	A	10 (4.54)
Distillation bottoms from the production of nitrobenzene by the nitration of benzene. K026			1*	4	K026	C	1000 (454)
Stripping still tails from the production of methyl ethyl pyridines. K027			1*	4	K027	A	10 (4.54)
Centrifuge and distillation residues from toluene diisocyanate production. K028							

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory			Final RQ	
			RQ	Code †	RCRA Waste Number	Category	Pounds (Kg)
Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane. K089			1[c]	4	K089	X	1 (0.454)
Waste from the product steam stripper in the production of 1,1,1-trichloroethane. K090			1[c]	4	K090	X	1 (0.454)
Column bottoms or heavy ends from the combined production of trichloroethylene and perchloroethylene. K091			1[c]	4	K091	X	1 (0.454)
By-product salts generated in the production of MSMA and cacodylic acid K092			1[c]	4	K092	A	10 (4.54)
Wastewater treatment sludge from the production of chlordane. K093			1[c]	4	K093	A	10 (4.54)
Wastewater and scrub water from the chlorination of cyclopentadiene in the production of chlordane. K094			1[c]	4	K094	A	10 (4.54)
Filter solids from the filtration of hexachlorocyclopentadiene in the production of chlordane. K095			1[c]	4	K095	X	1 (0.454)
Wastewater treatment sludges generated in the production of creosote. K096			1[c]	4	K096	X	1 (0.454)
Still bottoms from toluene reclamation distillation in the production of disulfoton. K097			1[c]	4	K097	X	1 (0.454)
Wastewater treatment sludges from the production of disulfoton. K098			1[c]	4	K098	A	10 (4.54)

Wastewater from the washing and stripping of phorate production. K099			1[c]	4	K099	A	10 (4.54)
Filter cake from the filtration of diethylphosphorodithioic acid in the production of phorate. K040			1[c]	4	K040	A	10 (4.54)
Wastewater treatment sludge from the production of phorate. K041			1[c]	4	K041	X	1 (0.454)
Wastewater treatment sludge from the production of toxaphene K042			1[c]	4	K042	A	10 (4.54)
Heavy ends or distillation residues from the distillation of tetrachlorobenzene in the production of 2,4,5-T. K043			1[c]	4	K043	A	10 (4.54)
2,6-Dichlorophenol waste from the production of 2,4-D. K044			1[c]	4	K044	A	10 (4.54)
Wastewater treatment sludges from the manufacturing and processing of explosives. K045			1[c]	4	K045	A	10 (4.54)
Spent carbon from the treatment of wastewater containing explosives. K046			1[c]	4	K046	B	100 (45.4)
Wastewater treatment sludges from the manufacturing, formulation and loading of lead-based initiating compounds. K047			1[c]	4	K047	A	10 (4.54)
Pink/red water from TNT operations. K048			1[c]	4	K048		0
Dissolved air flotation (DAF) float from the petroleum refining industry. K049			1[c]	4	K049		0
Slop oil emulsion solids from the petroleum refining industry. K050			1[c]	4	K050	A	10 (4.54)
Heat exchanger bundle cleaning sludge from the petroleum refining industry. K051							

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued A-46

[Note: All Comments/Notes Are Located at the End of This Table]

Hazardous Substances	CASRN	Regulatory Synonyms	Statutory			Final RQ	
			RQ	Code †	RCRA Waste Number	Category	Pounds (Kg)
API separator sludge from the petroleum refining industry. K062			1*	4	K062	A	10 (4.54)
Tank bottoms (leaded) from the petroleum refining industry. K060			1*	4	K060	X	1 (0.454)
Ammonia still lime sludge from coking operations. K061			1*	4	K061		0
Emission control dust/sludge from the primary production of steel in electric furnaces. K062			1*	4	K062		0
Spent pickle liquor generated by steel finishing operations of facilities within the iron and steel industry (SIC Codes 331 and 332). K064			1*	4	K064		0
Acid plant blowdown slurry/sludge resulting from thickening of blowdown slurry from primary copper production. K065			1*	4	K065		0
Surface impoundment solids contained in and dredged from surface impoundments at primary lead smelting facilities. K066			1*	4	K066		0
Sludge from treatment of process wastewater and/or acid plant blowdown from primary zinc production. K069			1*	4	K069		0
Emission control dust/sludge from secondary lead smelting. K071			1*	4	K071	X	1 (0.454)
Brine purification muds from the mercury cell process in chlorine production, where separately prepurified brine is not used. K073			1*	4	K073	A	10 (4.54)
Chlorinated hydrocarbon waste from the purification step of the diaphragm cell process using graphite anodes in chlorine production. K083			1*	4	K083	B	100 (45.4)
Distillation bottoms from aniline extraction. K084			1*	4	K084	X	1 (0.454)
Wastewater treatment sludges generated during the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds. K085			1*	4	K085	A	10 (4.54)
Distillation or fractionation column bottoms from the production of chlorobenzenes. K086			1*	4	K086		0
Solvent washes and sludges, caustic washes and sludges, or water washes and sludges from cleaning tubs and equipment used in the formulation of ink from pigments, driers, soaps, and stabilizers containing chromium and lead. K087			1*	4	K087	B	100 (45.4)
Decanter tank tar sludge from coking operations. K088			1*	4	K088		
Spent potliners from primary aluminum reduction. K090			1*	4	K090		
Emission control dust or sludge from ferrosilicomanganese production. K091			1	4	K091		
Emission control dust or sludge from ferrochromium production. K092			1*	4	K092	D	5000 (2270)
Distillation light ends from the production of phthalic anhydride from ortho-xylene. K093			1*	4	K093	D	5000 (2270)
Distillation bottoms from the production of phthalic anhydride from ortho-xylene. K095			1*	4	K095	B	100 (45.4)
Distillation bottoms from the production of 1,1,1-trichloroethane. K096			1*	4	K096	B	100 (45.4)
Heavy ends from the heavy ends column from the production of 1,1,1-trichloroethane. K097			1*	4	K097	X	1 (0.454)

TABLE 302.4—LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

(Note: All Comments/Notes Are Located at the End of This Table)

Hazardous Substance	CASRN	Regulatory Synonyms	Statutory			Final RQ	
			RQ	Code †	RCRA Waste Number	Category	Pounds (Kg)
Wastewater from the reaction vent gas scrubber in the production of ethylene dibromide via bromination of ethene.							
K118			1*	4	K118	X	1 (0.454)
Spent absorbent solids from purification of ethylene dibromide in the production of ethylene dibromide.							
K123			1*	4	K123	A	10 (4.54)
Process wastewater (including supernates, filtrates, and washwaters) from the production of ethylenebisdithiocarbamic acid and its salts.							
K124			1*	4	K124	A	10 (4.54)
Reactor vent scrubber water from the production of ethylenebisdithiocarbamic acid and its salts.							
K125			1*	4	K125	A	10 (4.54)
Filtration, evaporation, and centrifugation solids from the production of ethylenebisdithiocarbamic acid and its salts.							
K126			1*	4	K126	A	10 (4.54)
Baghouse dust and floor sweepings in milling and packaging operations from the production or formulation of ethylenebisdithiocarbamic acid and its salts.							
K131			100	4	K131	X	100 (45.4)
Wastewater from the reactor and spent sulfuric acid from the acid dryer in the production of methyl bromide.							
K132			1000	4	K132	X	1000 (454)
Spent absorbent and wastewater solids from the production of methyl bromide.							
K136			1*	4	K136	X	1 (0.454)
Still bottoms from the purification of ethylene dibromide in the production of ethylene dibromide via bromination of ethene.							

† Indicates the statutory source as defined by 1, 2, 3, and 4 below

†† No reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is equal to or exceeds 100 micrometers (0.004 inches).
††† The RQ for asbestos is limited to friable forms only.
1—Indicates that the statutory source for designation of this hazardous substance under CERCLA is CWA Section 311(b)(4).
2—Indicates that the statutory source for designation of this hazardous substance under CERCLA is CWA Section 307(a).
3—Indicates that the statutory source for designation of this hazardous substance under CERCLA is CAA Section 112.
4—Indicates that the statutory source for designation of this hazardous substance under CERCLA is RCRA Section 3001.
1*—Indicates that the 1-pound RQ is a CERCLA statutory RQ.
# Indicates that the RQ is subject to change when the assessment of potential carcinogenicity is completed.
The Agency may adjust the statutory RQ for this hazardous substance in a future rulemaking; until then the statutory RQ applies.
‡—The adjusted RQs for radionuclides may be found in Appendix B to this table.
‡*—Indicates that no RQ is being assigned to the generic or broad class.

WRIGHT STATE UNIVERSITY
175 BREHM LABORATORY
DEPARTMENT OF CHEMISTRY

S.O.P. T1.A.2.1

SAFETY AND PRECAUTIONS IN HANDLING CHLORODIBENZODIOXINS, CHLORODIBENZOFURANS, POLYCHLORINATED BIPHENYLS, AND RELATED TOXIC MATERIALS

The toxicity of some of the chlorodibenzodioxins (PCDDs), chlorodibenzofurans (PCDFs), and polychlorinated biphenyls (PCBs) dictates that stringent safety procedures must be followed when handling and processing samples which contain these compounds, as well as the pure compounds used as standards. Wright State University (WSU) has established an elaborate safety protocol which has been followed throughout all government- and industry-sponsored programs. Principal features of the protocol followed in projects in which such toxic materials are handled are as follows:

1. PCDD, PCDF, and PCB standards and samples thought to contain these compounds are maintained in controlled-access, locked rooms and in locked freezers at all times except when actual analyses are being conducted. The standards and samples are handled only by experienced, authorized personnel.

2. The extraction and preparation of samples, preparation of PCDD, PCDF, and PCB standard solutions and related operations are accomplished only in controlled-access laboratories, to which only directly involved personnel are admitted. These laboratories are equipped with high velocity hoods and work surfaces are covered with removable coverings which are periodically replaced to ensure cleanliness and minimize contamination. Personnel working in these laboratories wear appropriate laboratory equipment (i.e., disposable gloves, masks, and coveralls)

when working with hazardous materials. All sample processing occurs in the immediate proximity of a laboratory hood. Samples potentially containing high concentrations of hazardous components are processed in a glove box. The extraction procedures have been designed to utilize disposable glassware, disposable chromatography columns, and disposable sample vessels. Very little laboratory ware must be cleaned or reutilized; all disposable vessels are discarded after one use. All waste material which is contaminated with PCDDs, PCDFs, and/or PCBs (including waste solutions, lab ware, disposable clothing, etc.) is placed in sealed containers in the lab pending final disposition. No waste material is discarded by routing disposal procedures. The plastic-lined 55-gallon steel waste drums, containing the laboratory waste, are sealed and stored in a locked and secured warehouse until approval disposition.

3. The gas chromatography/mass spectrometry (GC/MS) instrumentation utilized for analyzing the sample extracts is maintained in a secured controlled-access laboratory, controlled-access laboratories, and only authorized personnel are admitted. This instrumentation is vented through charcoal traps. This laboratory is equipped with ventilation facilities for rapid exchange of the environmental air supply. Syringes used for sample injection are kept in locked cabinets except when being utilized. Personnel conducting GC/MS analyses wear appropriate safety clothing (gloves, etc.) at all times.

4. Personnel handling chlorodioxins are carefully instructed on the hazards and safety precautions to be applied, prior to their involvement in the program. This training is reinforced by close supervision and periodic safety inspections. All personnel handling chlorodioxins are provided with physical examinations, at least every six months, with emphasis on the appropriate tests to detect chlorodioxin ingestion (see following section for protocol).

5. All laboratory and instrument surfaces which could become contaminated by chlorodioxins are cleaned regularly and the surfaces are regularly subjected to wipe tests to check for contamination. Periodically, personal industrial hygiene air samplers are used to monitor workplace air for organic vapors and aerosol-borne toxic compounds.

WSU's extensive experience in handling chlorodioxins and adherence to the rigid safety protocol described, ensure that experiments conducted by laboratory personnel and samples analyzed under the proposed program will be properly handled.

1. Protocol for Physical Examinations Provided to Brehm Laboratory Personnel Engaged in Handling Toxic Materials

   a. Upon employment, termination, and at 3- or 5-year intervals.

      1. Obtain complete report of medical history from the patient. This must be completed on the standard form which will be supplied to you prior to the date for your physical.

      2. Perform physical examination.

      3. Diagnostic chest x-ray.

   b. Conduct the following clinical laboratory test every six months at a local hospital laboratory.

      1. CBC and erythrocyte sedimentation rate;

      2. Routine urinalysis including urinary porphyrins;

3. Super 17 Clinical Chemistry including determination of glucose, BUN, Uric Acid, SGOT, LDH, creatinine, cholesterol, calcium, magnesium, phosphorus, carbon dioxide, chloride, alkaline phosphate;

4. Other clinical chemical tests including SGPT, Y-GT, triglycerides, TT3;

5. Immunologic testing including TB skin test (PPD), and if negative, mumps skin test, and if mumps skin test is negative, candida skin test, and if candida skin test is negative, evaluate SK, SD response.

c. Summarize findings and maintain in patient's file.

APPENDIX B

MATERIAL SAFETY DATA SHEETS

MATERIAL SAFETY DATA SHEET

Identity: Crystalline Silica (Quartz)

SECTION I

Manufacturer's Name
U. S. Silica Company

Address
P.O. Box 187
Berkeley Springs, WV 25411

Emergency Telephone Number
304-258-2500

Telephone Number for Information
304-258-2500

Date Prepared
02-01-90

008166

SECTION II — HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Components:
Silica, Crystalline Quartz (respirable)

Specific Chemical Identity: Silicon Dioxide SiO_2 (CAS 14808-60-7)

Common Names: Silica, Flint, Sand, Crystalline Silica, Crystalline Free Silica, Quartz, Ground Silica, trade names (see Page 4).

OSHA PEL: Exposure to airborne crystalline silica shall not exceed an 8-hour time-weighted average limit as stated in 29 CFR § 1910.1000 Table Z-1-A, Air Contaminants, specifically;

Silica, Crystalline Quartz (Respirable) 0.1 mg/M^3

ACGIH TLV: Crystalline Quartz
TLV—TWA = 0.1 mg/M^3 (Respirable Dust)
See Threshold Limit Value and Biological Exposure Indices for 1988-1989 American Conference of Governmental Industrial Hygienists.

Other Limits Recommended: National Institute for Occupational Safety and Health (NIOSH). Recommended standard maximum permissible concentration = 0.05 mg/M^3 (respirable free silica) as determined by a full-shift sample up to 10-hour working day, 40-hour work week. See NIOSH Criteria for a Recommended Standard Occupational Exposure to Crystalline Silica.

SECTION III — PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point:	4046°F	**Specific Gravity (H_2O = 1):**	2.65
Vapor Pressure (mm Hg.):	None	**Melting Point:**	3050°F
Vapor Density (AIR = 1):	None	**Evaporation Rate: (Butyl Acetate = 1)**	None

Solubility in Water: Insoluble in water

Appearance and Odor: White or tan sand, granular, crushed, or ground — No odor or taste.

SECTION IV — FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): Non-flammable

Flammable Limits: None **LEL:** None **UEL:** None

Extinguishing Media:

None required; sand may be used as extinguishing media.

Special Fire Fighting Procedures: N/A

Unusual Fire and Explosion Hazards:

Crystalline silica is neither a fire nor an explosion hazard. Crystalline silica may be used to put out Class A and B fires.

SECTION V — REACTIVITY DATA

Stability: **Unstable:** **Stable:** X **Conditions to Avoid:** None

Incompatibility (Materials to Avoid):

Contact with powerful oxidizing agents such as fluorine, chlorine trifluoride, manganese trioxide, oxygen difluoride, may cause fires.

Hazardous Decomposition or Byproducts:

Silica will dissolve in Hydrofluoric Acid and produce a corrosive gas - silicon tetrafluoride.

Hazardous Polymerization: **May Occur:** **Will Not Occur:** X **Conditions to Avoid:** None

SECTION VI — HEALTH HAZARD DATA

Route(s) of Entry:

Inhalation? Yes **Skin?** No **Ingestion?** No

Health Hazards (Acute and Chronic)

Prolonged exposure to respirable crystalline quartz may cause delayed (chronic) lung injury (silicosis). Acute or rapidly developing silicosis may occur in a short period of time in heavy exposure in certain occupations such as sandblasters. Silicosis is a form of disabling pulmonary fibrosis which can be progressive and may lead to death.

Carcinogenicity:

NTP? No

OSHA Regulated? Not as a carcinogen.

IARC Monographs? Yes

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans (volume 42, 1987) concludes that there is sufficient evidence for the carcinogenicity of crystalline silica to experimental animals, and that there is limited evidence of the carcinogenicity of crystalline silica to humans. IARC Class 2A.

Signs and Symptoms of Exposure:

Undue breathlessness, wheezing, cough, and sputum production.

Medical Conditions Generally Aggravated by Exposure:

Pulmonary function may be reduced by inhalation of respirable crystalline silica. Also lung scarring produced by such inhalation may lead to a progressive massive fibrosis of the lung which may aggravate other pulmonary conditions and diseases and which increases susceptibility to pulmonary tuberculosis. Progressive massive fibrosis may be accompanied by right heart enlargement, heart failure, and pulmonary failure. Smoking aggravates the effects of exposure.

Emergency and First Aid Procedures:

For sand in eyes, wash immediately with water. If irritation persists, seek medical attention. For gross inhalation, remove person immediately to fresh air, give artificial respiration as needed, seek medical attention as needed

SECTION VII — PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to Be Taken in Case Material is Released or Spilled:

Spills: Use dustless methods (vacuum) and place into closable container for disposal, or flush with water. Do not dr sweep. Wear protective equipment specified below.

Waste Disposal Method:

Dispose in accordance with Federal, State, and Local regulations.

Precautions To Be Taken In Handling and Storing:

Avoid breakage of bagged material or spills of bulk material. See control measures in Section VIII.

Other Precautions:

Use dustless systems for handling, storage, and clean up so that airborne dust does not exceed the PEL. Use adequate ventilation and dust collection. Practice good housekeeping. Do not permit dust to collect on walls, floors, sills, ledges, machinery, or equipment. Maintain, clean, and fit test respirators in accordance with OSHA regulations. Maintain and test ventilation and dust collection equipment. Wash or vacuum clothing which has become dusty. See also control measures in Section VIII.

See OSHA Hazard Communication Rule 29 CFR Sections 1910.1200, 1915.99, 1917.28, 1918.90, 1926.59, and 1928.21, and state and local worker or community "right to know" laws and regulations. We recommend that smoking be prohibited in all areas where respirators must be used. WARN YOUR EMPLOYEES (AND YOUR CUSTOMERS-USERS IN CASE OF RESALE) BY POSTING AND OTHER MEANS OF THE HAZARD AND OSHA PRECAUTIONS TO BE USED. PROVIDE TRAINING FOR YOUR EMPLOYEES ABOUT THE OSHA PRECAUTIONS.

See also American Society for Testing and Materials (ASTM) standard practice E 1132-86, "Standard Practice for Health Requirements Relating to Occupational Exposure to Quartz Dust."

SECTION VIII — CONTROL MEASURES

Respiratory Protection (Specify Type)

The following chart specifies the types of respirators which may provide respiratory protection for crystalline silic

RESPIRATORY PROTECTION FOR CRYSTALLINE SILICA

CONDITION	MINIMUM RESPIRATORY PROTECTION*
Particulate Concentration	
5 x PEL or less	Any dust respirator.
10 x PEL or less	Any dust respirator, except single-use or quarter-mask respirator. Any fume respirator or high efficiency particulate filter respirator. Any supplied-air respirator. Any self-contained breathing apparatus.
50 x PEL or less	A high efficiency particulate filter respirator with a full facepiece. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
500 x PEL or less	A powered air-purifying respirator with a high efficiency particulate filter. A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.
Greater than 500 x PEL or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Abrasive Blasting	Any type CE, supplied-air respirator with a full facepiece, hood, or helmet, operated in a positive-pressure mode. (See 29 CFR § 1910.94 (a)).

*Only NIOSH-approved or MSHA-approved equipment should be used. (See 29 CFR § 1910.134).

See also ANSI standard Z88.2-1980 "Practices for Respiratory Protection," and standard Z9.4-1984 "Ventilation and Safe Practices of Abrasive Blasting Operations."

008168

Ventilation:

Local Exhaust: Use sufficient local exhaust to reduce the level of respirable crystalline silica to the PEL. See ACGIH "Industrial Ventilation, A Manual of Recommended Practice," the latest edition.

Mechanical
See "Other Precautions" under Section VII.

Special
See "Other Precautions" under Section VII.

Other
See "Other Precautions" under Section VII.

Protective Gloves
Optional

Eye Protection
Wear protective shield (safety glasses) when exposed to dust particles.

Other Protective Clothing and Equipment
Optional.

Work/Hygienic Practices
Avoid creating and breathing dust. See "Other Precautions" under Section VII.

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, express or implied, is made with respect to the information contained herein. We accept no responsibility and disclaim all liability for any harmful effects which may be caused by exposure to our silica. Customers-users of silica must comply with all applicable health and safety laws, regulations, and orders.

U. S. SILICA COMPANY TRADE NAMES

ASTM TESTING SANDS
F -SERIES FOUNDRY SANDS
FLINTSHOT®
FLINTSHOT® BLASTING SANDS
GRAVEL PACK
HYDRAULIC FRACING SANDS
MIN-U-SIL®
MYSTIC WHITE®
PENN SAND®
Q-MIX™
Q-ROK®
SIL-CO-SIL®
SUPERSIL®

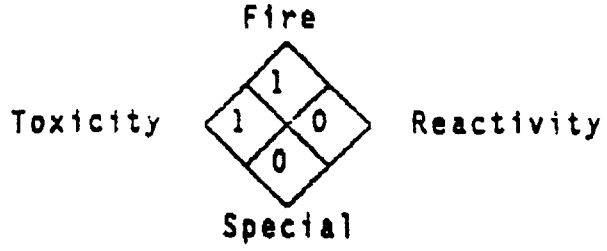
WITCO MATERIAL SAFETY DATA SHEET

WAXY MEDIUM NEUTRAL

Product Code: C10 4301

CAS NO:68410-00-4

NFPA HAZARD RATING
4 - Extreme
3 - High
2 - Moderate
1 - Slight
0 - Insignificant



DIVISION AND LOCATION---SECTION I

Division: KENDALL/AMALIE
Location: BRADFORD, PENNSYLVANIA
77 N. KENDALL AVE.,BRADFORD,PA,16701
Emergency Telephone Number: (814) 368-6111
Transportation Emergency: CHEMTREC 1-(800) 424-9300 (U.S. and Canada)

CHEMICAL AND PHYSICAL PROPERTIES---SECTION II

Chemical Name:
petroleum hydrocarbon
Formula: not applicable
Hazardous Decomposition Products:
carbon monoxide and carbon dioxide from burning.
Incompatibility (Keep away from):
strong oxidizers such as hydrogen peroxide, bromine, and chromic acid.
Toxic and Hazardous Ingredients: CAS #
petroleum distillate 68410-00-4
Form: waxy liquid Odor: lubricating base oil
Appearance: mixed wax liquid Color: medium orange
Specific Gravity (water=1): .86
Boiling Point: greater than 343°C (650°F)
Melting Point: greater than 16°C (60°F)
Solubility in Water (by weight %): 0 at 20 °C
Volatile (by weight %): 0
Evaporation Rate: 0
Vapor Pressure (mm Hg at 20°C): 0
Vapor Density (air=1): not applicable
pH (as is): not applicable
Stability: Product is stable under normal conditions
Viscosity SUS at 100°F: Greater than or = to 100

FIRE AND EXPLOSION DATA---SECTION III

Special Fire Fighting Procedures:
Do not use water except as fog.
Unusual Fire and Explosion Hazards:
none

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

Product Code: C10 4301

(Section III continued)

Flashpoint: (Method Used) Cleveland open cup greater than 177°C (350°F)
Flammable limits %: not applicable
Extinguishing agents:
Drychemical or Waterfog or CO_2 or Foam
Closed containers exposed to fire may be cooled with water.

HEALTH HAZARD DATA---SECTION IV

Permissible concentrations (air):
If used in applications where a mist may be generated, observe a TWA/PEL of 5 mg/m^3 for mineral oil mist (OSHA and ACGIH).
Chronic effects of overexposure:
Prolonged or repeated skin contact may cause dermatitis (skin irritation)
Acute toxicological properties:
no data available
Emergency First Aid Procedures:
Eyes: Immediately flush with large quantities of water for at least 15 minutes and call a physician.
Skin Contact: If burned by contact with hot material, cool burned skin area as quickly as possible by immersing in cold water, or applying cold water. Call a physician.
Inhalation: Remove victim to fresh air. Call a physician.
If Swallowed: Contact a physician immediately.

SPECIAL PROTECTION INFORMATION---SECTION V

Ventilation Type Required (Local,mechanical,special):
Local if necessary to maintain allowable PEL(permissible exposure limit) or TLV(threshhold limit value)
Respiratory Protection (Specify type):
Use NIOSH/MSHA certified respirator with organic vapor cartridge if vapor concentration exceeds permissible exposure limit
Protective Gloves:
heat protective
Eye Protection:
chemical safety goggles and full face shield
Other Protective Equipment:
heat protective clothing suggested

HANDLING OF SPILLS OR LEAKS---SECTION VI

Procedures for Clean-Up:
Transfer bulk of mixture into another container. Absorb residue with an inert material such as earth, sand, or vermiculite. Sweep up and dispose as solid waste in accordance with local, state, and federal regulations.
Waste Disposal:
Dispose of in accordance with all applicable federal, state and local

(Continued on next page)

WITCO MATERIAL SAFETY DATA SHEET

Product Code: C10 4301

(Section VI continued)

regulations.

SPECIAL PRECAUTIONS---SECTION VII

Precautions to be taken in handling and storage:
Handling and storage will likely be at temperatures of 100-200°F.
Exercise suitable precautions to avoid thermal burns.

TRANSPORTATION DATA---SECTION VIII

D.O.T.: Not Regulated
Reportable Quantity: not applicable
Freight Classification: Petroleum Lubricating Oil
Special Transportation Notes:
none

Prepared by: Robert Kellam
Title: Group Supervisor, Lubricants Testing, Maintenance, and Safety
Original Date: 05/07/90 Sent to: _____
Revision Date: _____
Supersedes ___: _____
Date Sent ___: _____

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

PRODUCT PROPERTIES

MEDIUM NEUTRAL

KENDEX 0150

PROJECT #301

SUBMITTED BY M. J. KOSMINSKI

JULY 1992

MEDIUM NEUTRAL

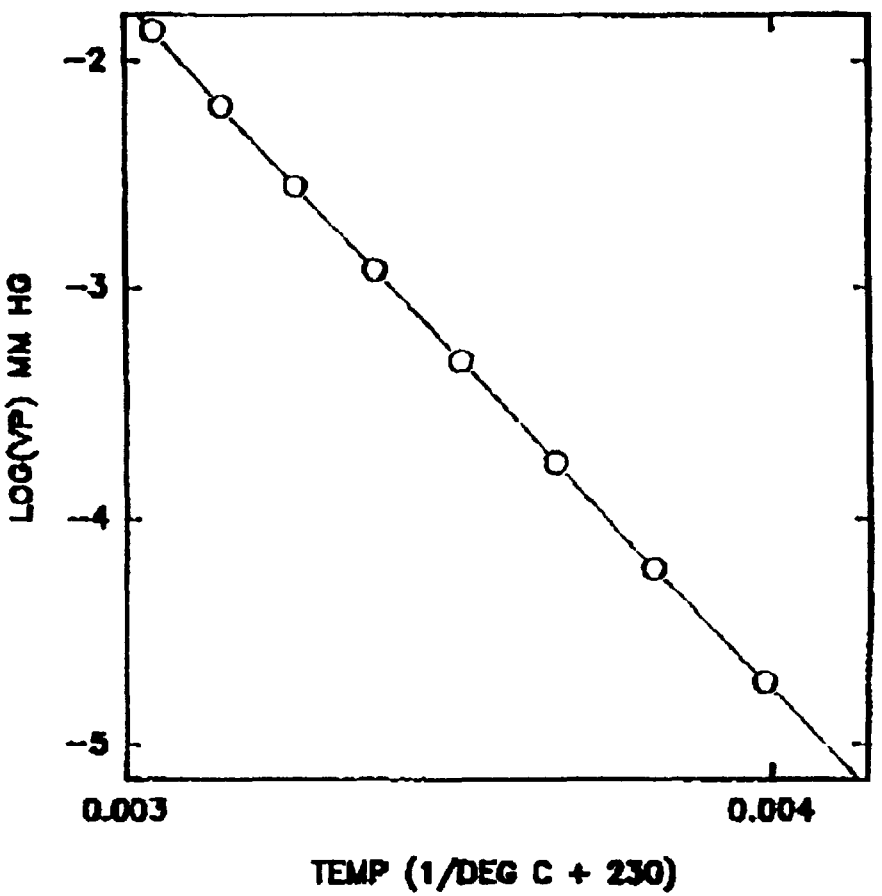
KENDEX 0150

Kinematic Viscosity @ 40°C (D-445) = 30.70 cSt
Kinematic Viscosity @ 100°C (D-445) = 5.24 cSt
VI (D-2270-74) = 101
Density @ 20°C = 0.8663 g/ml
Refractive Index @ 20°C = 1.4783
Gravity = 31.7° API 7.219 #/gal
Cloud Point = 0°F
Pour Point = 0°F
Solid Point = -2°F
Color = L2.0
Sulfur Content (D-2622) = 0.075% wt
Nitrogen Content (D-4629) = 48 ppm
Total Acid # = 0.05 @ 5 grams of sample
Aniline Point (D-611) = 101.9°C
Surface Tension (D-971) = 32.84 dynes/cm
Demulsibility (D-1401) = 41-34-5 @ 30 min
Flash Point (COC) = 415°F
Spectro Analysis (ICPAES) = clean
Molecular Weight (NDM) = 399

% CA = 4.48	RA = 0.22
% CN = 30.15	RN = 1.79
% CP = 65.37	RT = 2.01

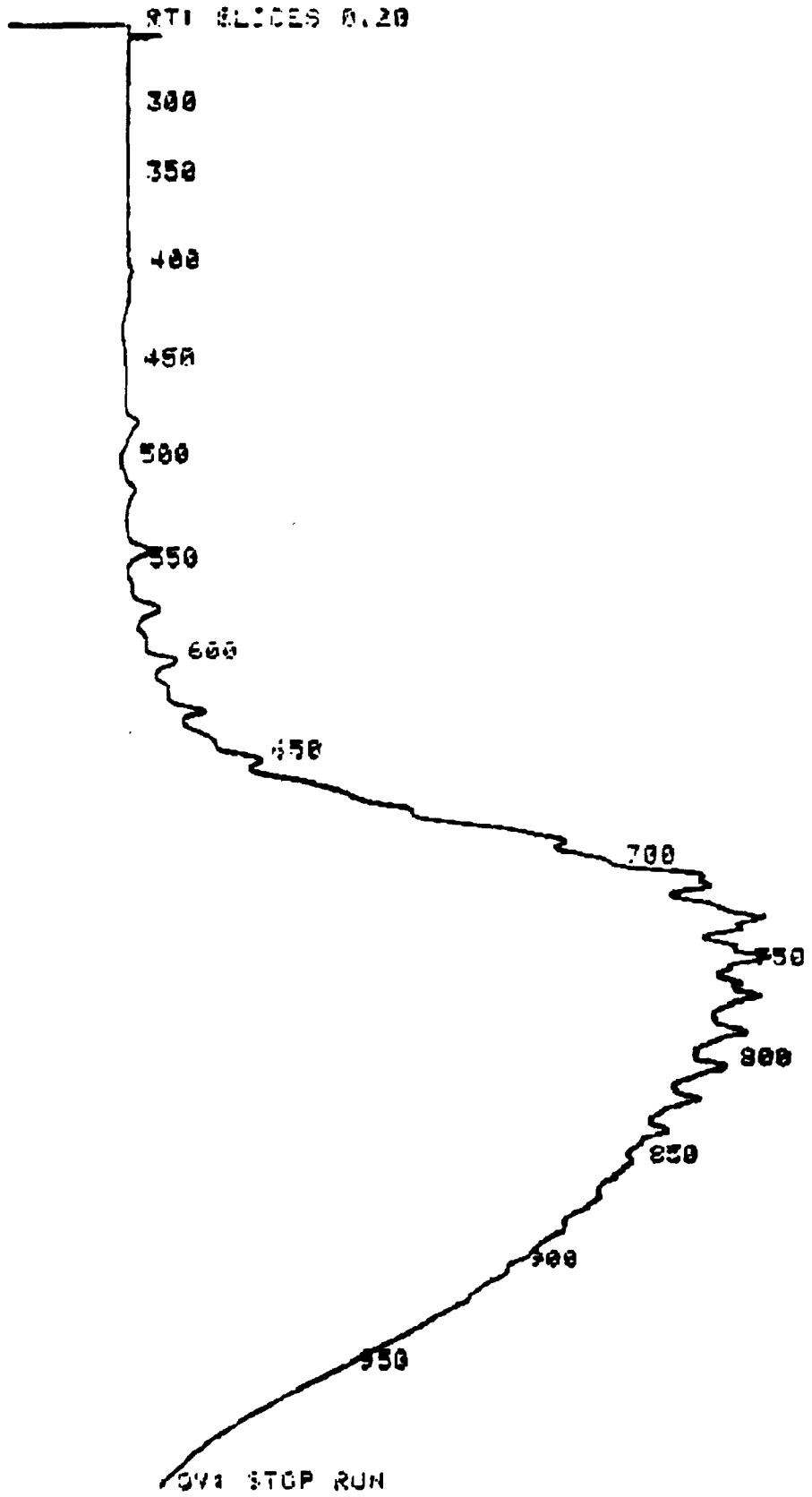
VAPOR PRESSURE OF MEDIUM NEUTRAL

LOG(VP)=-3012*(1/(DEG C+230))+7.84



SAMPLE# 91315-05 POSITION 1
MED NEUT #72 10/91
PR: 14:25 NOV 19, 1991
PP: ATTN = 2410

READY FOR INJECTION



COMMENTS:

MED NEUT #72 10/91
SAMPLE# 91315-05
14:29 NOV 19, 1991

008177

%	BP F (C)	%	BP F (C)	%	BP F (C)	%	BP F (C)
IBP	569(298)						
1	603(317)	26	736(391)	51	798(425)	76	870(466)
2	634(335)	27	738(392)	52	800(427)	77	874(468)
3	651(344)	28	741(394)	53	803(428)	78	877(469)
4	662(350)	29	743(395)	54	805(430)	79	880(471)
5	669(354)	30	745(396)	55	808(431)	80	883(473)
6	675(357)	31	748(398)	56	811(433)	81	887(475)
7	680(360)	32	750(399)	57	814(434)	82	890(477)
8	685(363)	33	753(400)	58	816(436)	83	894(479)
9	689(365)	34	755(402)	59	819(437)	84	897(481)
10	692(367)	35	758(403)	60	822(439)	85	901(483)
11	696(369)	36	760(405)	61	825(440)	86	905(485)
12	699(371)	37	763(406)	62	828(442)	87	909(487)
13	702(372)	38	765(407)	63	830(444)	88	913(489)
14	705(374)	39	767(409)	64	833(445)	89	917(491)
15	708(375)	40	770(410)	65	836(447)	90	921(494)
16	710(377)	41	772(411)	66	839(448)	91	925(496)
17	713(378)	42	775(413)	67	842(450)	92	930(499)
18	715(380)	43	777(414)	68	845(452)	93	935(502)
19	718(381)	44	780(416)	69	848(453)	94	940(505)
20	721(383)	45	782(417)	70	851(455)	95	946(508)
21	723(384)	46	785(418)	71	854(457)	96	953(512)
22	726(385)	47	787(420)	72	857(459)	97	961(516)
23	728(387)	48	790(421)	73	861(460)	98	970(521)
24	731(388)	49	793(423)	74	864(462)	99	982(528)
25	733(389)	50	795(424)	75	867(464)		
FBP	991(533)						

MED NEUT #72 10/91
SAMPLE# 91315-05
14:29 NOV 19, 1991

TEMP, °F	+0	+5	+10	+15	+20
555	0.0	0.0	0.0	0.5	0.6
580	0.7	0.7	0.8	0.9	1.0
605	1.1	1.2	1.4	1.5	1.7
630	1.9	2.0	2.3	2.6	2.9
655	3.2	3.8	4.4	5.1	6.0
680	6.9	8.0	9.4	10.9	12.4
705	14.1	16.0	17.9	19.7	21.7
730	23.8	25.8	27.8	29.8	31.9
755	33.9	35.9	38.0	40.0	42.0
780	44.0	46.0	48.0	49.9	51.9
805	53.8	55.7	57.5	59.3	61.1
830	62.9	64.6	66.3	68.0	69.6
855	71.2	72.8	74.4	75.9	77.4
880	79.0	80.5	81.9	83.4	84.7
905	86.1	87.4	88.6	89.8	90.9
930	92.0	93.0	93.9	94.8	95.5
955	96.3	96.9	97.5	98.0	98.4

October 12, 1992

TO: T. L. OLIPHANT
P. A. WEINBERG

SUBJECT: CARBON NUMBER DISTRIBUTION-- KENDEX 0150 MEDIUM NEUTRAL

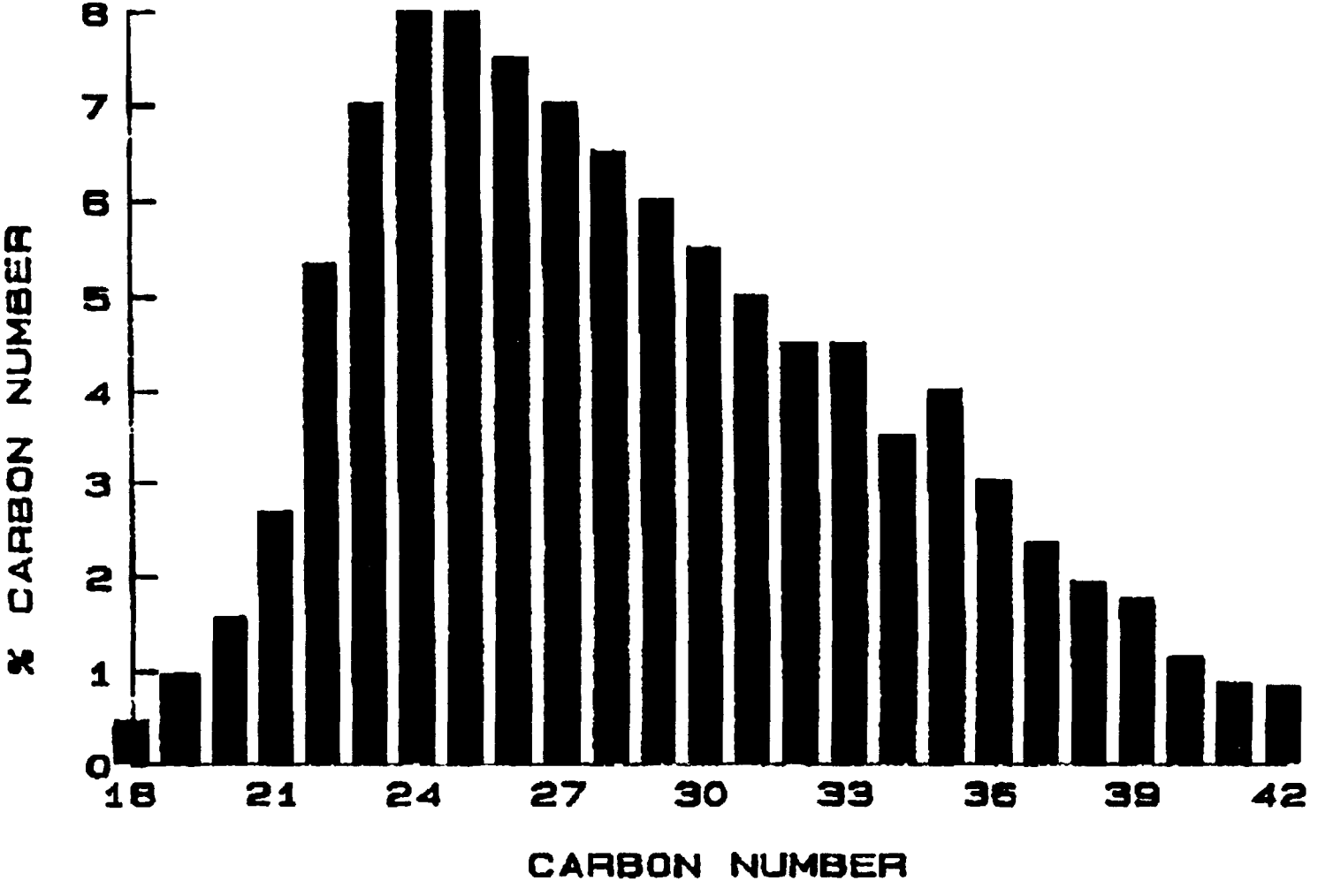
PROJECT: 301

The carbon number distribution was determined for Kendex 0150 (Medium Neutral) from the G. C. Simulated Distillation data. The carbon number distribution for Medium Neutral is as follows:

C18=	0.47%	C31=	5.0%
C19=	0.97%	C32=	4.5%
C20=	1.56%	C33=	4.5%
C21=	2.67%	C34=	3.5%
C22=	5.33%	C35=	4.0%
C23=	7.0%	C36=	3.0%
C24=	8.0%	C37=	2.33%
C25=	8.0%	C38=	1.92%
C26=	7.5%	C39=	1.75%
C27=	7.0%	C40=	1.14%
C28=	6.5%	C41=	0.86%
C29=	8.0%	C42=	0.83%
C30=	5.5%		

M. J. KOZMINSKI

MJK/db



CARBON NUMBER DISTRIBUTION
KENDEX 0150 MEDIUM NEUTRAL

Canonie Environmental

Canonie Environmental Services Corp.
800 Canonie Drive
Porter, Indiana 46304
Phone: 219-926-8651
Fax: 219-926-7169

October 27, 1992

92-229-01

008181

Mr. Albert J. Lefranc, P.E.
Hercules Incorporated
Hercules Plaza
1313 North Market
Wilmington, DE 19894-0001

Transmittal
Final Quality Assurance Project Plan
and Final Work Plan
Dechlorination Treatability Study
Vertac Site
Jacksonville, Arkansas

Dear Mr. Lefranc:

Canonie Environmental Services Corp. (Canonie) submits the enclosed Final Quality Assurance Project Plan (QAPP) and Final Work Plan for the Dechlorination Treatability Study. Enclosed please find two copies of each plan.

Appropriate revisions were made to the draft QAPP and Work Plan based on your comments and comments by other participants in this study. A separate letter will be issued to you responding to comments submitted by Roy F. Weston, Inc.

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Please call if you have any questions concerning this submittal.

Very truly yours,

008183

Thomas J. Froman
Project Engineer

Scott R. Smith, P.E.
Project Manager

TJF/SRS/tk

Enclosures

cc: Jerome Downey, Hazen Laboratories, Inc.
Roger Nielson, SoilTech ATP Systems, Inc.
Thomas O. Tiernan, Wright State University