FILE ON EDOC'S ✓ **YES** _____ **NO**

SITE NAME ______________________

SITE # ______________________

COUNTY __________ **TOWN** __________

FOILABLE ✓ **YES** _____ **NO**

SC/PSA _____ **RI/FS** _____

RD _____ **RA** _____

SM _____ **OTHER** _____

NAME DESCRIPTION:

Report.HW130004.1994-09-01.OU1_OU1_RD

workPlan.

LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water
and Environmental Services

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Years of Excellence

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

REMEDIAL DESIGN WORK PLAN FOR OPERABLE UNIT-1

Prepared For

OCCIDENTAL CHEMICAL CORPORATION

September 1994

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TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

APPENDICES

LIST OF TABLES
(at end of report)

Table

FIGURE
(at end of report)

Figure

PLATE
(in pocket)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

REMEDIAL DESIGN WORK PLAN
FOR OPERABLE UNIT-1

1.0 INTRODUCTION

The purpose of this Remedial Design Work Plan (RDWP) is to describe the tasks which will be completed for Operable Unit-1 (OU-1) during the design process for the remedy for the Hooker/Ruco Site in Hicksville, New York. The remedy was described in the Record of Decision (ROD) for the site dated February 16, 1994. The major components of the remedy include:

- installation and operation of a groundwater extraction system and treatment system to prevent further offsite migration, with onsite discharge to groundwater;
- treatability study for onsite groundwater;
- monitoring of the groundwater extraction system;
- soil flushing in Sump 1;
- excavation and offsite disposal of soils in the former drum storage area; and
- further investigations of site soils in the vicinity of MW-E and in Sump 2.

The remedy for the Hooker/Ruco site is based on a Feasibility Study (FS) prepared by Occidental Chemical Corporation (OCC) in August 1993. During preparation of the FS, OCC requested time to perform treatability studies on representative samples of groundwater. This request was denied by United States Environmental Protection Agency (USEPA) and the FS was completed using general assumptions about the treatability of Ruco site chemicals (RSCs) (table 1) in the groundwater. Alternate technologies to be utilized in place of, or in conjunction with, the selected remedy will be evaluated during the design phase. Additional investigations of the site soils will be required to define the extent of soils which may require remediation.

The following sections present a summary of the activities which must be completed prior to initiating the Remedial Design. These field activities have been separated into three sections dealing with groundwater hydraulics, bench- and pilot-scale treatability studies and further *definition of site soils.*

The field tasks and the Remedial Design will be undertaken to comply with the intent of the ROD using appropriate USEPA guidance documents. The design of the groundwater treatment system is dependent on the completion of bench- and pilot-scale treatability studies, the scope of which can only be defined after installation of the extraction wells. A Work Plan for conducting the bench-scale treatability studies will be submitted within 10 months of approval of this Work Plan. The other field activities (further soil definition and groundwater testing) are presented in sufficient detail to permit the work to proceed upon approval of this document.

The Remedial Design tasks are presented to illustrate the items which will be addressed in the Remedial Design reports for the soil and groundwater.

1.1 Field Activities

Field activities will be required to provide data to complete the designs for both the groundwater and soil remedies.

1.1.1 Groundwater Hydraulics

To design a groundwater extraction system which will optimize hydraulic control and minimize the volume of water to be treated, it will be necessary to complete the following tasks:

- installation of a test extraction well;
- completion of a variable-rate pumping test;
- completion of a constant-rate pumping test;
- update of the groundwater computer model;
- *installation of the full extraction well system; and*
- sampling of the extraction wells for use in the treatability studies.

The data obtained from the completion of these field activities will be used to verify the groundwater flow model and to determine the pumping rates necessary to achieve the system objective of minimizing offsite migration of groundwater.

1.1.2 Treatability Studies

To design an effective treatment system for the compounds of concern, both bench-scale and pilot-scale treatability studies will be performed. Bench-scale tests will be conducted for both pre-treatment and primary treatment processes. Primary treatment process testing will review carbon adsorption, ultra-violet (UV) light/chemical oxidation, biological treatment and any other suitable process retained through a screening process. Alternate technologies to achieve the intent of the ROD will be evaluated during the design phase.

Preliminary research suggests that the RSCs may be both aerobically and anaerobically biodegradable. Microcosm studies will be conducted to verify the theoretical research.

1.1.3 Delineation of Site Soils for Remediation

The following pre-design activities will be completed:

- soil sampling and analysis in the vicinity of Test Boring 10 in the former drum storage area;
- soil sampling and analysis in the vicinity of MW-E; and
- soil sampling and analysis in Sump 2.

These tasks will be completed to provide data necessary to determine:

- the location of the soil flushing system;
- the extent of soils in the former drum storage area to be excavated;
- the need for soil removal in the vicinity of MW-E, and, if necessary, the extent of soils to be excavated; and
- the proper disposal of excavated soils.

2.0 FIELD TASKS FOR GROUNDWATER HYDRAULICS

Field activities will consist of well installation and pumping tests to establish hydrogeologic parameters and water-quality information. Each of these preliminary investigations are detailed in the following subsections.

The objective of the groundwater extraction system is to prevent the migration of groundwater beyond the property boundary by extracting groundwater. Based on a groundwater flow model, which was presented in Appendix B of the FS, it was determined that these objectives could be achieved using three wells pumping at a combined rate of 75 gpm (gallons per minute). The design pumping rate was assumed to be 100 gpm (144,000 gpd (gallons per day)). Preliminary well locations were developed using the model and are shown on Plate 1. The model was based on assumed aquifer coefficients, and the FS stated that actual pumping rates and well locations would be determined by field testing during the Remedial Design process.

The following elements will be completed as field tasks, and the results will be used for the bench-scale and pilot-scale treatability studies and in the final design process.

2.1 Well Design

Based on water-quality data developed during the Remedial Investigation (RI), it is anticipated that the extraction wells will be 150 feet deep, with well screens extending from the water table to the completion depth. Blank sections of pipe will be used adjacent to clay layers encountered during monitor well installation.

Optimal well screen design is normally developed by conducting sieve analyses of representative sediment samples, and then designing the screen and associated gravel pack to retain a specific fraction of the formation. At this site, however, the wells are not necessarily being designed to provide the maximum available water; instead, they need to yield only the amount of water necessary to capture the onsite groundwater.

As a field task, sediment samples obtained during installation of additional monitor wells for the offsite program will be submitted for sieve analysis. The results will be used to verify the design specified in this Work Plan. Well design specifications are presented in Attachment A. (All Attachments are located in Appendix 1.)

2.2 Pumping Tests

An extraction well will be installed at the location shown on Plate 1 (as RW-3), per the drilling method and design shown in Attachment A. After the well has been developed to insure a clear discharge a step-rate pumping test will be run on the well to determine its efficiency. Test specifications are presented in Attachment B.

Based on the results of the step-rate test, a pumping rate will be determined for a constant-rate test (Attachment C). The purpose of the constant-rate pumping test will be to assess the response of the aquifer to a pumping stress. Results of the test analysis will be used to properly space the remaining extraction wells such that their combined pumping influence will result in capture of the site groundwater. The test data will be analyzed using distance-drawdown and time-drawdown relationships to arrive at site-specific aquifer coefficients. These, in turn, will be incorporated into the model developed for the FS to refine its ability to predict zones of capture of various well configurations and pumping rates. The additional extraction wells which will be required to meet the site objective will then be constructed and sampled. The results of the sample analyses will be used in the bench-scale and pilot-scale treatability studies.

2.3 Analytical Requirements

During the pumping tests, water samples will be obtained at 8, 16 and 24-hour intervals for characterization of the anticipated influent stream to the treatment system. Sufficient volumes of water will be obtained for use with the treatability studies. The samples will be analyzed for the parameters shown on tables 1, 2, 3 and 4.

The method for analyzing the RSCs is presented in Appendix 1 as Attachment D. The selected chemical list will be analyzed using Contract Laboratory Protocols (CLP) - Statement of Work (SOW) 3/90, OLM 01.9 for organics and ILM 02.0 for inorganics.

CLP methodology is not capable of identifying nor quantifying non-target compounds in the groundwater at the Hooker/Ruco site. OCC developed a list of RSCs using the RI results, raw materials used at the facility and process knowledge. The list is comprised of various ketone, glycol and diol compounds (table 1). The RSC list of compounds is considered complete and comprehensive. The analytical procedure for the determination of the RSCs in soil and water is presented in Appendix 1, Attachment D. This analytical procedure is called the KGD method.

3.0 TREATABILITY STUDIES

Both bench-scale and pilot-scale treatability studies will be conducted using selected technology from the following list: metals pretreatment, UV light/chemical oxidation, carbon adsorption, biological treatment and/or any others that a search suggests are applicable. In each case, the treatability study will be designed to assess the effectiveness of removing the site chemicals from the groundwater and to provide data and parameter values that will enable scale-up to a pilot-scale system. The influent, or raw, water for all treatability study tests will consist of water obtained from the extraction wells. The treatability studies will be used to evaluate preferred alternatives that will achieve the Remedial Action objectives of the ROD while minimizing the life-cycle costs and operation and maintenance costs of the system. A Bench-Scale Treatability Work Plan will be submitted to the USEPA 10 months after approval of this Work Plan. Bench-scale testing will be implemented after approval of the Work Plan.

Bench-scale treatability studies to determine the effectiveness of metals pretreatment technologies may include conventional precipitation, co-precipitation, microfiltration, or other technologies.

Primary treatment technologies to be tested at the bench scale may include aerobic and anaerobic microcosm studies to determine the effectiveness of in-situ bioremediation or ex-situ biological treatment in a fluidized bed reactor, as well as UV light/chemical oxidation, air stripping and/or carbon polishing.

In all cases, OCC's objectives will be to meet the intent of the ROD while minimizing operational labor requirements, minimizing sludge generation and handling requirements, and minimizing life cycle costs. After the conclusion and evaluation of the bench-scale tests, scale-up calculations will be completed to identify pilot-scale operation requirements. A Pilot-Scale Treatability Work Plan will be submitted two months after completion of the bench-scale study. Pilot-scale testing will be implemented using retained technologies after approval of the Pilot-Scale Treatability Work Plan. The method shown to best meet the objectives would be run at a pilot-scale level, both to confirm its effectiveness and to provide a pretreated waste stream for the primary treatment tests.

4.0 DESIGN TASKS FOR GROUNDWATER TREATMENT SYSTEM

Design tasks for the groundwater treatment system will be presented in the RDWP to be submitted three months after completion of the pilot-scale test.

The following elements will be incorporated into the Work Plan:

- Pipe sizes and materials of construction
- Trenches
- Concrete slabs, foundations and well vaults
- Electrical
- Building construction
- Secondary containment
- Equalization tank
- Treatment processes
- Winterization
- Discharge concentrations
- Discharge to groundwater
- Initial testing program
- Long-term monitoring program
- Operation and maintenance plan
- Photographic documentation plan

5.0 FIELD INVESTIGATIONS AND DESIGN CRITERIA FOR SITE SOILS

5.1 Existing Data

The RI, combined with previous studies, has resulted in the characterization of the environmental condition of the Hooker/Ruco site. Although the Risk Assessment prepared by the USEPA showed that risks from site soils under all pathways were within or below levels of concern, the USEPA has identified the shallow (0 to 5 ft bg (feet below grade)) soils in the former drum storage area (TB-10), the vicinity of MW-E, and deeper (+10 ft bg) soils in *Sump 2 as possibly requiring Remedial Action. The results of the field investigation soil* sampling will be used to determine if further action in any of the identified areas is warranted.

5.2 Selected Soils Remedy

The major components of the selected remedy for the site soils include:

- excavation of the soils in the vicinity of TB-10 in the former drum storage area and shipment to an approved offsite disposal facility;
- if field testing results show tetrachloroethylene (PCE) concentrations in the vicinity of MW-E at concentrations that are ten times greater than the New York State Department of Environmental Conservation (NYSDEC) protection of groundwater quality guidelines, then excavation of impacted soils and shipment of the material to a proper offsite disposal facility; and
- if field testing of deep soils in Sump 2 show site chemicals present in the soils that are ten times greater than the NYSDEC protection of groundwater quality guidelines, then the soils in Sump 2 will be addressed by soil flushing. The soils will be flushed with a portion of the discharge of treated groundwater. The method of discharging the treated water (and amount/volume) will be determined in the design phase.

5.3 Field Investigations of Site Soils

The *field investigations to assess the three identified areas will include shallow subsurface* soil borings, split-spoon sampling, field screening and analytical testing. Additional investigations of the shallow soil in the former drum storage area near TB-10 and the area around MW-E, and the deeper soils beneath Sump 2, will be completed as field tasks to determine which of the identified areas may require remedial measures for the protection of groundwater quality.

The Risk Assessment showed that risks from site soils, under all pathways, were within or below levels of concern. The shallow soils in the vicinity of TB-10 and MW-E, and the deeper soils below Sump 2, do not present an unacceptable risk. However, the USEPA has identified these three areas as requiring additional investigation to determine if remediation of the soils is warranted.

5.3.1 Former Drum Storage Area

The shallow (0 to 5 ft bg) soil in the former drum storage area may be a potential source area of RSCs. The shallow soils in the vicinity of TB-10 contained RSCs at 1,600 mg/kg (milligrams per kilogram) in the 0 to 2-foot sample, and at 2,400 mg/kg in the 3 to 5-foot sample. Test borings in close proximity to TB-10 contained RSC concentrations less than 100 mg/kg. The shallow soils in the vicinity of TB-10 will be further investigated for the RSCs.

Four shallow (0 to 5 ft bg) test borings will be drilled at locations 10 feet north, east, south and west of TB-10. Soil samples will be collected for analysis at a depth of 0 to 2 feet and 3 to 5 feet at each location. The soil samples will be analyzed for the RSCs (table 1).

5.3.2 MW-E

The shallow (0 to 5 ft bg) soils in the vicinity of MW-E may contain tetrachloroethylene (PCE) at concentrations that may be above the NYSDEC guideline of 1.4 mg/kg for the protection of groundwater quality. A soil sample obtained from 0.5 to 2.0 ft bg in 1983 contained PCE at a concentration of 244 mg/kg. The soil samples collected from 5 ft bg, 25 ft bg and 50 ft bg were below the to-be-considered (TBC) soil clean-up value for PCE (1.4 mg/kg). The shallow soils in the vicinity of MW-E will be further investigated for selected organic compounds (table 2).

A shallow (0 to 5 ft bg) test boring will be drilled immediately adjacent and east (within 5 feet) of MW-E. Soil samples will be collected for analysis at a depth of 0 to 2 feet and 3 to 5 feet. The soil samples will be analyzed for selected organic compounds (table 2) on a priority basis (verbal results within 48 to 72 hours). If, based on the priority results, tetrachloroethylene (PCE) is detected at elevated levels (greater than ten times the TBC soil clean-up values of 1.4 mg/kg), then additional shallow test borings (0 to 5 ft bg) will be drilled 10 feet north, east and south of MW-3 to define the extent of soil which may require remediation. The shed located immediately adjacent to MW-E prohibits drilling of exploratory test borings in a westerly direction. Soil samples in the expanded test boring pattern, if required, will be collected from 0 to 2 feet and 3 to 5 feet. The soil samples will be submitted for analysis of selected organic compounds.

5.3.3 Sump 2

The deeper soils beneath Sump 2 (10 feet below the sump bottom) to the water table; (approximately 35 ft below the sump bottom) is an area of the site that requires further investigation of RSCs. Analytical results of samples collected during the 1989 RI from Sump 2 showed low levels, less than 0.5 mg/kg, of PCE and the concentrations of PCE decreased with respect to increasing depth. The soil within the first 10 feet in Sump 2 was not identified as a potential source area and the concentration of PCE was below the TBC soil clean-up value for PCE. However, samples from an earlier test boring completed in Sump 2 during 1983 did contain elevated concentrations of PCE at depths greater than 10 feet below the base of Sump 2.

One test boring will be drilled in the center of Sump 2 and will extend from the base of the sump to the water table (approximately 35 feet below the sump bottom). Soil samples will not be collected within 10 feet of the base of Sump 2 since these soils were assessed during the RI and found to be of acceptable quality. At least three soil samples will be collected between 10 ft bg and the water table. Samples selected for analysis will be based on the following:

- three samples with the highest headspace screening readings will be selected for analysis;
- one sample will be collected of the deep soils, 30 feet or deeper below the base of the sump; and
- a visibly stained sample (if available) will be analyzed.

All soil samples collected from Sump 2 will be analyzed for RSCs and selected organic compounds (tables 1 and 2).

5.3.4 Soil Sampling

All soil borings will be drilled using hollow-stem augers. Split-spoon sampling will be completed on a continuous basis from land surface to the completion depth of the boring. The split-spoon sampler will be a 3-inch diameter sampling device to ensure sufficient quantity of material for the requested analysis. A representative portion of each split-spoon sample will be placed in a labeled clean glass jar and be subjected to a headspace screening with a calibrated photoionization detector (PID). The daily calibration procedure for the PID and the headspace screening procedure are presented in Appendix 2. All samples for analysis, other than volatile organics, will be homogenized in the field in accordance with procedures presented in Appendix 2. The soil sampling equipment will be cleaned according to procedures presented in Appendix 2.

Field blanks will be collected from the soil sampling equipment to demonstrate the effectiveness of the cleaning procedures. Field blanks will be collected by pouring demonstrated analyte-free deionized water through/over the sampling equipment and collecting the rinsate in appropriate laboratory containers. Field blanks will be collected from each piece of sampling equipment at the beginning of each work day that the equipment is used. Field blanks will be analyzed for the same parameters as samples collected that day.

5.3.5 Equipment Cleaning

All of the drilling equipment that comes in contact with the boring will be steam-cleaned between each boring. A cleaning area will be set up in a central location and used throughout the pre-design investigation. The cleaning area will be lined with polyethylene sheeting and bermed to collect the runoff. All cleaning water will be collected and staged onsite in 55-gallon drums. The cleaning water will be analyzed to determine proper disposal.

5.3.6 Disposal of Drill Cuttings

Split-spoon samples will be field screened in accordance with procedures presented in Appendix 2. Any split-spoon sample that has a PID reading of 5 ppm (parts per million) or greater from the headspace will require the containerization of drill cuttings. The drill cuttings will be contained in 17-H 55-gallon drums until a split-spoon sample has a concentration less than 5 ppm. If headspace results do not exceed 5 ppm, the drill cuttings will be distributed evenly around the surface of the boring. All test borings will be backfilled with a bentonite-cement grout (15 percent - 85 percent) and sealed with a cement cap. For the deep boring in the base of Sump 2, the boring will be backfilled using a Tremie pipe to ensure complete sealing of the test boring.

5.4 Task Plan for the Remedial Design/Remedial Action of Site Soils

The following section presents the basic strategies for implementing the selected remedy for the shallow and deep soil areas of the Hooker/Ruco site and the steps to be undertaken to satisfy the remedial goals and data quality objectives (DQOs) for the site restoration. Further definition of the steps that will be taken for the shallow soils in the vicinity of MW-E and the deep soils beneath Sump 2 will be provided after completing the field investigation tasks. The Remedial Design report for site soils will be submitted eight months after approval of this Work Plan.

5.4.1 Mobilization

Mobilization of all required equipment, including excavation machines, storage facilities and a decontamination pad will be coordinated and assigned to specific areas of the site selected for their proximity to the work areas and to minimize disruption of plant activities. During mobilization, specific site control measures will be used to limit access to the exclusion zones in the excavation areas. A pre-excavation meeting will be held to ensure that all personnel are familiar with the Health and Safety Plan (HASP) and are aware of their specific responsibilities and chain-of-command for field decisions.

5.4.2 Excavation

The former drum storage area and possibly the shallow soil in the vicinity of MW-E will require excavation. Each area that will require remediation will be staked out in the field. A site map showing the extent, both horizontally and vertically, will be prepared after completing the pre-design investigative tasks. The excavation of all shallow soil areas will be completed in the following manner:

1. Excavation by machine and/or hand will continue until the desired excavation depth is achieved. Desired excavation depths will be determined based upon the results of the pre-design investigation. The Ruco cooling water loop, a series of two 8-inch transite pipes extends along the properties eastern boundary near both the former drum storage area and MW-E. If necessary, extreme care will be taken when exposing these utilities, if they are expected to be within the excavation area. Hand digging, if required, will be employed to minimize physical damage to the utilities.
2. Designated completion depths will be determined in the field by direct measurements.
3. All soil excavated will be immediately transferred to containers for direct shipment offsite, with little or no storage of the soil onsite.
4. Pre-excavation samples will be collected in accordance with procedures that will be outlined in the Field Sampling Plan.

5.4.3 Shoring

Shoring requirements and volume calculations are the primary design components for the excavation of the former drum storage area. Shoring requirements (i.e., sidewall stability) are determined using the free-end method for anchored sheet pile walls, as presented in "Foundation Analysis & Design", Bowles, 1988. The design requirements identified in this analysis are presented to a shoring subcontractor and an appropriate type and quantity is then specified. Volume calculations for the soil removed during the excavation are determined using the method of equal depth contours, as presented in "Excavation Handbook", Church, 1981.

5.4.4 Erosion Control

The design of any erosion controls exercised during the construction phase of the Remedial Action will comply with New York State's Guidelines for Urban Erosion and Sediment Controls, 1991.

5.4.5 Disposal

Offsite treatment and/or disposal of the excavated soil will comply with the Applicable or Relevant and Appropriate Requirements (ARARs). Notification prior to transport and disposal will include a written statement of the following:

1. name and location of the facility which will receive the soil;
2. types and quantities of material;
3. the expected shipping schedule; and
4. method of transport.

5.4.6 Site Restoration

Restoration of any excavation will include regrading, and where necessary, backfilling and drainage to control storm-water runoff. Open excavations will be backfilled and compacted in appropriate lifts to provide acceptable stability. All restoration will be to pre-existing conditions.

5.5 Contingency Plan

A contingency plan will be included in the Remedial Design plan to respond to conditions, which if present, would require halting or revising the soils remediation.

5.6 Field Sampling

Based upon the data requirements and DQOs, a variety of samples will be collected during the soil remediation. The following subsections outline the sampling activities and define the rationale for each sampling program. A detailed field sampling plan will be completed for *the individual sampling programs.*

5.6.1 Real-Time Monitoring

Site conditions will be monitored during the excavation and soil flushing activities. Air monitoring will be conducted for particulates, and volatile vapors during excavation activities. Volatile and toxic vapor monitoring will be periodically monitored during the implementation of the soil flushing program. The exact air monitoring locations will be determined in the field, but at a minimum, include one upwind and two downwind locations. Sample results will be used to evaluate onsite health and safety conditions. Specific programs will be presented in the HASP and the Soil Design report.

5.6.2 Waste Classification Samples

Representative samples of the soil that will be excavated will be collected in advance of the construction activities during the field investigation phase. At a minimum, one representative sample will be collected from each area that will be required to be excavated. The samples will be analyzed for waste classification requirements of 40 CFR 261 and 6NYCRR 371 to determine proper disposal of the excavated soil. If the soils are classified as hazardous, the material will be disposed of at a RCRA "Subtitle C" landfill. If the soils fail RCRA characteristics for land disposal requirements (LDR) (40 CFR 268), the soil will be pre-treated prior to disposal to meet LDRs. If the material is characterized as non-hazardous, the soil will be properly disposed of offsite at a RCRA "Subtitle D" landfill.

5.6.3 Pre-Excavation Samples

Pre-excavation soil sampling will be completed in the field investigation phase to confirm that the site clean-up objectives will be met. Pre-excavation samples will include two samples collected from beneath the target depth of each excavation. In the former drum storage area (TB-10), the pre-excavation samples will be compared to ten times the TBC NYSDEC Technical Administrative Guidance Memorandum levels for RSCs. If the soil in the vicinity of MW-E requires remediation, the pre-excavation samples will be compared to ten times the NYSDEC guidelines for the protection of groundwater quality for PCE of 1.4 mg/kg.

5.7 Analytical Program

Based upon the proposed sampling plan, analytical techniques will be required for two sample matrices. The types of samples requiring analysis include air and soil samples. Analytical methods for each sample matrix anticipated to be collected during the soil remediation are discussed below.

5.7.1 Air Monitoring

Ambient 8-hour air monitoring samples will be analyzed for particulates. An air monitoring plan will be included in the Soil Design report.

5.7.2 Soil Samples

5.7.2.1 Former Drum Storage Area Pre-Excavation Soil Samples

Soil samples collected during the pre-design phase in the former drum storage area will be analyzed for RSC organic compounds using the KGD method.

5.7.2.2 MW-E Pre-Excavation Soil Samples

Soil samples collected during the field investigation phase in the immediate vicinity of MW-E will be analyzed for selected TCL volatiles (table 2) using CLP methodologies as prescribed in the CLP SOW, 3/90 (OLM 01.9).

5.7.2.3 Sump 2 Soil Samples

Soil samples collected in Sump 2 will be analyzed for CLP selected TCL volatiles (SOW 3/90) and the RSC organics (tables 1 and 2).

6.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

The ARARs governing the Remedial Action for groundwater and soil are shown on tables 5 through 8.

7.0 SURVEYING

Land surveying will be required to establish existing grades, utility locations and other nearby improvements for design and construction purposes. All soil sampling locations will be surveyed and placed on a site plan to use in delineating the soil areas which will require excavation. A temporary benchmark will be established onsite for use during implementation, unless a benchmark already exists onsite or within a reasonable distance offsite. A Licensed Land Surveyor (LLS) registered to practice in the State of New York will be retained to conduct all surveying activities. All surveying work will conform, at a minimum, to New York State's Code of Practice, 1986.

8.0 QUALITY ASSURANCE PROJECT PLAN (QAPP)

8.1 Field Investigation Activities

The Quality Assurance Project Plan (QAPP) utilized during the OU-2 Remedial Action will be incorporated by reference for the field activities. It will be updated to include the KGD method and the selected laboratory's QAPP. Most of the samples obtained during the field activities will be analyzed by USEPA SW-846 Test Methods for Evaluating Solid Waste Third Edition, Standard Methods for the Examination of Water and Wastewater, and/or the KGD method (for RSC organics).

Tables 1, 2, 3 and 4 present analytical parameter lists which will be utilized for groundwater sample analysis for all samples, except those specified below. For the specified analysis CLPs, as presented in the USEPA CLP SOW for Organic Analyses, 3/90 (OLM 01.9) and for Inorganic Analysis, 3/90 (ILM 02.0), will be utilized. The QAPP is presented in Appendix 3.

8.1.1 Groundwater

CLP procedures and the KGD method for RSCs will be used to analyze the Target Compound and Target Analyte Lists for the samples obtained from the test extraction well during the pumping test.

The total number of water samples that will be analyzed cannot be determined due to the variable nature of the treatability studies. The minimum laboratory program is shown on table 9.

8.1.2 Soils

CLP procedures will be used to analyze the following soil samples (see table 10):

- one representative sample from the borings in the vicinity of MW-E;
- one representative sample from the boring beneath Sump 2; and

- one representative sample from the former drum storage area.

The latter two samples will also be analyzed by the KGD method.

8.2 Remedial Plan Implementation

The QAPP for implementation, and subsequent operation of the system, will be prepared as part of the design documents, using the existing site QAPP as the base document.

9.0 PERMITS AND REGULATORY REQUIREMENTS

The following section lists tentatively-identified permits and notification requirements which will be considered in conducting remedial activities at the Hooker/Ruco site. It is noted that the Remedial Design/Remedial Action is a CERCLA action and, therefore, is not subject to permitting requirements of State and Local jurisdictions for onsite actions. The following subsections detail the relevant State and local regulatory framework and specify which permit requirements will be met.

9.1 Federal Permits

New York State has a well developed State Implementation Program (SIP) for USEPA-promulgated regulations. Furthermore, Nassau County has NYSDEC approved air and water discharge programs in place. Accordingly, no Federal permits are required for the proposed action.

9.2 State Permits

Under its SIP filed with the USEPA, New York State regulates discharges to local and regional water- and air-sheds and oversees the construction and operation of treatment plants. Furthermore, New York requires permits for groundwater recovery wells constructed on Long Island. Of these programs, New York relegates responsibility of discharges to local and regional airsheds to the County of Nassau. The following subsections detail the relevant environmental permitting requirements of the State of New York. Although no NYSDEC permits are required, the Remedial Action will meet the objectives of the permit framework in the following sections.

9.2.1 State Pollutant Discharge Elimination System

Direct discharges of waters to ground water are regulated by the National Pollutant Discharge Elimination System (NPDES) program pursuant to the Clean Water Act (CWA) and the State Pollutant Discharge Elimination System (SPDES) program as presented in Article 17 of New York's Environmental Conservation Law.

SPDES permits include provisions requiring compliance with: 1) technology-based and water-quality based effluent limitations as required by the CWA; 2) standards of performance for new sources; 3) toxic and pretreatment effluent standards; 4) ocean discharge criteria adopted by the Federal government; and 5) any additional limitations necessary to ensure compliance with water-quality standards adopted pursuant to State law.

9.2.2 Well Construction

The installation of recovery wells is governed by a Long Island Well Construction Permit application under Title 6 New York Compilation of Rules and Regulations (NYCRR) Part 602. This is primarily a reporting requirement.

9.3 Nassau County Permits

The Nassau County Department of Health (NCDH) is the NYSDEC's designated agent for administration of the Clean Air Act in the County of Nassau. Furthermore, the NCDH regulates the storage of certain hazardous materials under Article XI of the Nassau County Health Ordinance, as amended. The following subsections detail Nassau County permitting requirements. All County permit programs would only pertain to onsite actions, which are exempt from permitting requirements. Therefore, no County permits are required.

9.3.1 Air Emissions

The construction and operation of treatment plants require that a Permit Application to Construct and Operate a Process, Exhaust or Ventilation System be filed with the NCDH prior to construction to account for any potential fugitive emissions from the treatment plant. This permit process is regulated by the Nassau County Department of Health in accordance with requirements specified in Title 6 NYCRR Part 201, and guidelines presented in New York State AIR GUIDE-1. Air permits will not be required.

9.3.2 Article XI, Containment

The NCDH regulates the construction of structures containing hazardous materials under Article XI of the Nassau County Health Ordinance. These regulations dictate the manner in which facilities storing greater than 250 gallons (combined storage) of hazardous or toxic materials will be built, permitted and operated.

9.4 Town of Oyster Bay, Building Permit

The Town of Oyster Bay building permit requirements will be met for the treatment enclosure and the seven well vaults.

10.0 ACCESS, EASEMENTS, RIGHTS-OF-WAY

OCC will obtain access to the plant through an agreement with Ruco Polymer Corporation.

11.0 HEALTH AND SAFETY REQUIREMENTS

The existing HASP for the site will be amended to cover all construction, chemical handling and transportation activities. The HASP currently on file for the site covers all activities which will be undertaken during the field investigation phase of work.

12.0 SITE MANAGEMENT PLAN

The scope of the Remedial Design/Remedial Action necessitates the use of highly trained and skilled personnel. To this end, OCC will assemble a team with the proper qualifications to implement the Remedial Design/Remedial Action.

12.1 Subcontractors

The scope of the Remedial Design/Remedial Action will require the following services:

- Surveying;

- Drilling firms;
- Analytical laboratories; and
- Construction and Excavation Contractors.

Because of the undeveloped nature of the Remedial Design/Remedial Action, a full list of subcontractors will not be available until all bids are awarded.

13.0 PROJECT SCHEDULES

The schedules presented consist of two concurrent time lines: one time line for soil activities and one time line for groundwater activities (figure 1). These timelines present the gross overall schedule up to the conclusion of all construction activities for the groundwater treatment system and the removal of all soils. Long-term monitoring and Operation & Maintenance schedules are not presented because of their extended time periods and the preliminary nature of the treatment system. Long term monitoring, as stipulated under the CERCLA, requires the filing of annual monitoring reports and a review and report of the treatment progress every five years.

13.1 Schedule for Field Activities and Remedial Design for Site Soils

(from approval of RDWP)

Soil borings and sampling	3 months
Sample analysis and validation	6 months
Soil Remedial Design report	8 months

13.2 Schedule for Field Activities and Remedial Design for Groundwater

13.2.1 Field Activities

Task	Time from approval of RDWP
Extraction well installation	2 months
Pumping tests, analysis, model calibration	5 months
Install and sample remaining extraction wells	9 months
Submit Treatability Study Work Plan (Bench Scale)	10 months

13.2.2 Treatability Studies and Design Submittals

The following tasks are shown with their anticipated time frame for completion. Time for USEPA review and comments, or for document review, cannot be anticipated at this time.

Task	Anticipated Duration
Treatability studies (bench scale)	6 months
Pilot Study Work Plan	2 months
Pilot-scale testing	7 months
Remedial Design report (30-percent complete)	3 months
Remedial Design report (100-percent complete)	6 months

(Note: The Groundwater Remedial Design report (100% complete) will present a construction schedule, which cannot be completed until the actual treatment system is finalized).

skd
September 16, 1994
deswp/OCC

TABLES

TABLE 1

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Ruco Site Chemicals

Ethylene Glycol
Diethylene Glycol
Triethylene Glycol
Dipropylene Glycol
2,2-Dimethyl-1,3-Propane Diol
2,6-Dimethyl-4-Heptanol
2,2,4-Trimethyl-1,3-Pentanediol
2-Ethylhexanoic Acid
Octonoic Acid
Hexonoic Acid

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TABLE 2

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Selected Organic Compounds

Carbon Disulfide
Chlorobenzene
Dichloroethylene (total)
Tetrachloroethylene
Trichloroethylene
Vinyl Chloride
Di N-Butyl Phthalate
4-Methyl-2-Pentanone

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TABLE 3

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Selected Target Analyte List Constituents

Chromium (hexavalent)
Chromium (trivalent)
Iron
Manganese
Magnesium
Potassium
Sodium
Calcium
Cobalt
Lead
Nickel
Zinc

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TABLE 4

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Physicochemical Parameters for Groundwater Medium
(all methods from "Standard Methods for the Examination of Water and Wastewater" 1985)

Parameter	Method
pH	Method 423 (field measurement)
Temperature	Method 212 (field measurement)
Total Suspended Solids: TSS	Method 209C
Total Dissolved Solids: TDS	Method 209B
Biological Oxygen Demand: BOD	Method 507
Chemical Oxygen Demand: COD	Method 508
Hardness	Method 314B
Turbidity	Method 214 (field measurement)
Spectral Analysis (% Absorbance) (150-450nm)	Method 204B
Conductivity	Method 205 (field measurement)
Total Organic Carbon	Method 505

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TABLE 5

LIST OF ARARs

1.0 Applicable or Relevant and Appropriate Requirements (ARARs)

1.1 ARARs for Groundwater Cleanup Criteria

1.1.1 Federal Regulations

The following sources of ARARs have been identified for site groundwater:

40 CFR	Part 141	National Primary Drinking Water Regulations
	Subpart B	Maximum Contaminant Levels
	Section 141.11	Maximum Contaminant Levels for Inorganic Chemicals
	Section 141.12	Maximum Contaminant Levels for Organic Chemicals
	Subpart F	Maximum Contaminant Level Goals
	Section 141.50	Maximum Contaminant Level Goals for Organic Contaminants
	Section 141.51	Maximum Contaminant Level Goals for Inorganic Contaminants
	Subpart G	National Revised Drinking Water Regulations: Maximum Contaminant Levels
	Section 141.61	Maximum Contaminant Levels for Organic Contaminants
40 CFR	Part 143	National Secondary Drinking Water Regulations
	Section 143.3	Secondary Maximum Contaminant Levels

1.1.2 New York Regulations

The following sources of ARARs have been identified for site groundwater:

6 NYCRR	Part 701	Classifications-Surface Waters and Ground Waters
	Section 701.15	Class GA Fresh Ground Waters
	Part 702	Derivation and Use of Standards and Guidance Values
	Section 702.1	Basis for Derivation of Water Quality Standards and Guidance Values
	Section 702.2	Standards and Guidance Values for Protection of Human Health and Sources of Potable Water Supplies
	Part 703	Surface Water and Ground Water Quality Standards and Ground Water Effluent Standards
	Section 703.5	Water Quality Standards for Taste, Color and Odor-Producing, Toxic and Other Deleterious Substances
10 NYCRR	Part 5	Drinking Water Supplies
	Subpart 5-1	Public Water Systems
	Section 5-1.51	Maximum Contaminant Levels

	Section 5-1.52	Tables: Table 1 - Inorganic Chemicals and Physical Characteristics Maximum Contaminant Level Determination; Table 3 - Organic Chemicals Maximum Contaminant Level Determination

1.1.3 Specific ARARs for Groundwater Cleanup Criteria

The specific ARARs for groundwater cleanup criteria are listed in table 2.

1.2 ARARs for Groundwater Discharge Criteria

1.2.1 Federal Regulations

The following sources of ARARs have been identified for site groundwater discharge:

40 CFR	Part 141	National Primary Drinking Water Regulations
	Subpart B	Maximum Contaminant Levels
	Section 141.11	Maximum Contaminant Levels for Inorganic Chemicals
	Section 141.12	Maximum Contaminant Levels for Organic Chemicals
	Subpart F	Maximum Contaminant Level Goals
	Section 141.50	Maximum Contaminant Level Goals for Organic Contaminants
	Section 141.51	Maximum Contaminant Level Goals for Inorganic Contaminants
	Subpart G	National Revised Drinking Water Regulations: Maximum Contaminant Levels
	Section 141.61	Maximum Contaminant Levels for Organic Contaminants

40 CFR	Part 143	National Secondary Drinking Water Regulations
	Section 143.3	Secondary Maximum Contaminant Levels

1.2.2 New York Regulations

The following sources of ARARs have been identified for site groundwater discharge:

6 NYCRR	Part 701	Classifications-Surface Waters and Ground Waters
	Section 701.15	Class GA Fresh Ground Waters
	Part 702	Derivation and Use of Standards and Guidance Values

	Section 702.1	Basis for Derivation of Water Quality Standards and Guidance Values
	Section 702.2	Standards and Guidance Values for Protection of Human Health and Sources of Potable Water Supplies
	Section 702.16	Derivation and Implementation of Effluent Limitations
	Section 702.18	More Stringent Groundwater Effluent Standards or Limitations
	Part 703	Surface Water and Ground Water Quality Standards and Ground Water Effluent Standards
	Section 703.5	Water Quality Standards for Taste, Color and Odor-Producing, Toxic and Other Deleterious Substances
	Section 703.6	Ground Water Effluent Standards and Limitations for Discharges to Class GA Waters
10 NYCRR	Part 5	Drinking Water Supplies
	Subpart 5-1	Public Water Systems
	Section 5-1.51	Maximum Contaminant Levels
	Section 5-1.52	Tables: Table 1 - Inorganic Chemicals and Physical Characteristics Maximum Contaminant Level Determination, Table 3 - Organic Chemicals Maximum Contaminant Level Determination

1.2.3 Specific ARARs for Groundwater Discharge Criteria

The specific ARARs for groundwater discharge criteria are listed in table 3. The substantive requirements of the State Pollutant Discharge Elimination System (SPDES) permit program shall be met for the discharge of treated groundwater at the site. The final effluent standards for discharge are set through the SPDES process.

1.3 ARARs for Air Emission Discharge Criteria

1.3.1 Federal Regulations

The EPA has established guidance values on the control of air emissions through the Clean Air Act at CERCLA sites for groundwater treatment (EPA, 1989). This guidance indicates that the sources most in need of controls are those with an actual emissions rate in excess of 3 lbs/hr or 15 lbs/day, or a calculated annual rate of 10 tons/year of total VOCs. The calculated annual rate assumes 24-hour operation, 365 days per year.

RCRA regulations outlined in 10 CFR Parts 264 and 265, Subpart AA-Air Emission Standards for Process Vents and Subpart BB - Air Emission Standards for Equipment Leaks are potential ARARs. These standards, applicable to wastestreams with organic concentrations of at least 10 ppmw (parts per million by weight), require that the total organic emissions from all effected processes be reduced below 3 lbs/hr and 3.1 tons/yr or reduction of total organic emissions by 95 percent weight.

1.3.2 New York Guidelines

The New York State DEC Division of Air Resources has issued draft guidelines for the control of toxic ambient air contaminants in New York State. These guidelines are presented in the New York State Air Guide-1. State guidance values pertaining to potential air emissions from groundwater treatment equipment to be used at the Hooker/Ruco site are listed in table 5.

1.4 ARARs for Transport and Disposal of Hazardous Byproduct Wastes

1.4.1 Federal Regulations

The following sources of ARARs have been identified for treatment, transportation and disposal of hazardous byproducts:

40 CFR	Part 261	Identification and Listing of Hazardous Waste
	Part 262	Standards Applicable to Generators of Hazardous Waste
	Part 263	Standards Applicable to Transporters of Hazardous Waste
	Part 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities
	Subpart B	General Facility Standards
	Subpart E	Manifest System, Recordkeeping and Reporting
	Subpart N	Landfills
	Subpart O	Incinerators
	Part 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities
	Subpart B	General Facility Standards
	Subpart E	Manifest System, Recordkeeping and Reporting
	Subpart N	Landfills
	Subpart O	Incinerators

	Subpart P	Thermal Treatment
	Subpart Q	Chemical, Physical and Biological Treatment
	Part 268	Land Disposal Restrictions
49 CFR	Part 172	Hazardous Material Regulations of the Department of Transportation, Hazardous Materials Tables and Hazardous Communication Requirements and Emergency Response Information Requirements
	Part 173	Hazardous Material Regulations of the Department of Transportation, Shippers, General Requirements for Shipping and Packaging
	Part 178	Hazardous Material Regulations of the Department of Transportation, Shipping Container Specifications
	Part 179	Hazardous Material Regulations of the Department of Transportation, Specifications for Tank Cars

1.4.2 New York Regulations

The following sources of ARARs have been identified for treatment, transportation and disposal of hazardous byproducts:

6 NYCRR	Part 360	Solid Waste Management Facilities
	Part 370	Hazardous Waste Management System - General
	Part 371	Identification and Listing of Hazardous Waste
	Part 372	Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities
	Part 373	Hazardous Waste Management Facilities
	Subpart 373.1	Hazardous Waste Treatment, Storage and Disposal Facility Permitting Requirements
	Subpart 373.2	Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities
	Part 376	Land Disposal Restrictions

Section 1.4.3 New York State ARARs for Air Emissions

The following sources of New York State ARARs have been identified for air emissions:

6 NYCRR	Part 200	General Provisions
6 NYCRR	Part 201	Permits and Certificates
6 NYCRR	Part 202	Emissions Testing, Sampling and Analytical Determinations
6 NYCRR	Part 212	General Process Emissions Sources
6 NYCRR	Part 257	Air Quality Standards

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TABLE 6

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Chemical-Specific ARARs for Groundwater Cleanup Criteria[1/]

Compound	Federal Standards			State Standards		Minimum ARAR-Based Groundwater Cleanup Criteria
	MCL[2/]	MCLGs[3/]	SMCLs[4/]	Groundwater Quality Standards[5/]	Drinking Water Standards[6/]	
Acetone	NR	NR	NR	NR	50^{U}	50
Benzene	5	0*	NR	0.7	5^{P}	0.7
Bis (2-ethylhexyl) phthalate	NR	NR	NR	50	50^{U}	50
2-Butanone	NR	NR	NR	NR	50^{U}	50
Carbon disulfide	NR	NR	NR	NR	50^{U}	50
Chlorobenzene	NR	NR	NR	5	5^{P}	5
Chloroform	100	NR	NR	7	100	7
Chloromethane	NR	NR	NR	NR	5^{P}	5
Dieldrin	NR	NR	NR	$\text{ND}_{2.5}$	50^{U}	$\text{ND}_{2.5}$
1,2-Dichloroethylene total[2/]	70	70	NR	5	5^{P}	5
Di-n-butyl-phthalate	NR	NR	NR	NR	50^{U}	50
Di-n-octyl-phthalate	NR	NR	NR	NR	50^{U}	50
Ethylbenzene	700	700	NR	5	5^{P}	5
Heptachlor epoxide	NR	0*	NR	$\text{ND}_{2.2}$	50^{U}	$\text{ND}_{2.2}$
4-Methyl-2-pentanone	NR	NR	NR	NR	50^{U}	50
Naphthalene	NR	NR	NR	NR	50^{U}	50
Tetrachloroethylene	5	0*	NR	5	5^{P}	5
Trichloroethylene	5	0*	NR	5	5^{P}	5
Vinyl chloride	2	0*	NR	2	2	2
Xylenes	10,000	10,000	NR	5	5^{P}	5
TICs	NR	NR	NR	NR	50^{U}	50
Aluminum	NR	NR	50	NR	NR	NR
Antimony	6	3	NR	NR	NR	6
Arsenic	50	NR	NR	25	50	25

TABLE 6
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Chemical-Specific ARARs for Groundwater Cleanup Criteria[1/]

Compound	Federal Standards			State Standards		Minimum ARAR-Based Groundwater Cleanup Criteria
	MCL[2/]	MCLGs[3/]	SMCLs[4/]	Groundwater Quality Standards[5/]	Drinking Water Standards[6/]	
Barium	1,000	2,000	NR	1,000	1,000	1,000
Beryllium	1	0*	NR	NR	NR	1
Cadmium	10	5	NR	10	10	5
Calcium	NR	NR	NR	NR	NR	NR
Chromium III	NR	NR	NR	50	50	50
Chromium VI	50	100	NR	50	50	50
Cobalt	NR	NR	NR	NR	NR	NR
Copper	NR	1,300	1,000	200	1,000	200
Iron	NR	NR	300	300†	300†	300
Lead	15	0*	NR	25	50	15
Magnesium	NR	NR	NR	NR	NR	NR
Manganese	NR	NR	50	300†	300†	300
Nickel	NR	NR	NR	NR	NR	NR
Potassium	NR	NR	NR	NR	NR	NR
Selenium	10	NR	NR	10	10	10
Silver	50	NR	NR	50	50	50
Sodium	NR	NR	NR	20,000	NR	20,000
Vanadium	NR	NR	NR	NR	NR	NR
Zinc	NR	NR	5,000	300	5,000	300

1/ Micrograms per liter.
2/ 40 CFR 141.11, 141.12, 141.61.
3/ 40 CFR 141.50, 141.51.
4/ 40 CFR 143.3.
5/ 6 NYCRR 703.5
6/ 10 NYCRR 5-1.52.
NR Not regulated.
P Principle Organic Compound; each cannot exceed 5 ug/l.
U Unspecified Organic Compound; each cannot exceed 50 ug/l.

ND_x Not detected at or above X.
* The EPA believes that an MCLG of zero is not an appropriate setting for cleanup levels, and the corresponding MCL will be the potentially relevant and appropriate requirement (EPA, 1990).
† The total of iron and manganese cannot exceed 500 ug/l.

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TABLE 7

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Chemical-Specific ARARs for Groundwater Discharge Criteria[1]

Compound	Federal Standards			State Standards			ARAR-Based Groundwater Discharge Criteria[8]
	MCL[2]	MCLGs[3]	SMCLs[4]	Groundwater Quality Standards[5]	Drinking Water Standards[6]	Groundwater Effluent Standards Class GA[7]	
Acetone	NR	NR	NR	NR	50^{U}	NR	50
Benzene	5	0^{*}	NR	0.7	5^{P}	0.7	0.7
Bis (2-ethylhexyl) phthalate	NR	NR	NR	50	50^{U}	4200	50
2-Butanone	NR	NR	NR	NR	50^{U}	NR	50
Carbon disulfide	NR	NR	NR	NR	50^{U}	NR	50
Chlorobenzene	NR	NR	NR	5	5^{P}	NR	5
Chloroform	100	NR	NR	7	100	7	7
Chloromethane	NR	NR	NR	NR	5^{P}	NR	5
Dieldrin	NR	NR	NR	ND	50^{U}	ND	ND $_{2.5}$
1,2-Dichloroethylene total[2]	70	70	NR	5	5^{P}	NR	5
Di-n-butyl-phthalate	NR	NR	NR	NR	50^{U}	770	50
Di-n-octyl-phthalate	NR	NR	NR	NR	50^{U}	NR	50
Ethylbenzene	700	700	NR	5	5^{P}	NR	5

TABLE 7
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Chemical-Specific ARARs for Groundwater Discharge Criteria[1/]

Compound	Federal Standards			State Standards			ARAR-Based Groundwater Discharge Criteria[8/]
	MCL[2/]	MCLGs[3/]	SMCLs[4/]	Groundwater Quality Standards[5/]	Drinking Water Standards[6/]	Groundwater Effluent Standards Class GA[7/]	
Heptachlor epoxide	NR	0*	NR	ND	50^{U}	ND	$\text{ND}_{2.2}$
4-Methyl-2-pentanone	NR	NR	NR	NR	50^{U}	NR	50
Naphthalene	NR	NR	NR	NR	50^{U}	NR	50
Tetrachloroethylene	5	0*	NR	5	5^{P}	NR	5
Trichloroethylene	5	0*	NR	5	5^{P}	10	5
Vinyl chloride	2	0*	NR	2	2	5	2
Xylenes	10,000	10,000	NR	5	5^{P}	NR	5
TICs	NR	NR	NR	NR	50^{U}	NR	50††
Aluminum	NR	NR	50	NR	NR	2,000	2,000
Antimony	6	3	NR	NR	NR	NR	6
Arsenic	50	NR	NR	25	50	50	25
Barium	1,000	2,000	NR	1,000	1,000	2,000	1,000
Beryllium	1	0*	NR	NR	NR	NR	1

TABLE 7
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Chemical-Specific ARARs for Groundwater Discharge Criteria[1]

Compound	Federal Standards			State Standards			ARAR-Based Groundwater Discharge Criteria[8]
	MCL[2]	MCLGs[3]	SMCLs[4]	Groundwater Quality Standards[5]	Drinking Water Standards[6]	Groundwater Effluent Standards Class GA[7]	
Cadmium	10	5	NR	10	10	20	10
Calcium	NR	NR	NR	NR	NR	NR	NR
Chromium III	NR	NR	NR	50	50	NR	50
Chromium VI	50	100	NR	50	50	100	50
Cobalt	NR	NR	NR	NR	NR	NR	NR
Copper	NR	1,300	1,000	200	1,000	1,000	1,000
Iron	NR	NR	300	300†	300†	600‡	600‡
Lead	50	0*	NR	25	50	50	25
Magnesium	NR	NR	NR	NR	NR	NR	NR
Manganese	NR	NR	50	300†	300†	600‡	600‡
Nickel	NR	NR	NR	NR	NR	2,000	2,000
Potassium	NR	NR	NR	NR	NR	NR	NR
Selenium	10	NR	NR	10	10	40	10
Silver	50	NR	NR	50	50	100	100

TABLE 7
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Chemical-Specific ARARs for Groundwater Discharge Criteria[1]

Compound	Federal Standards			State Standards			ARAR-Based Groundwater Discharge Criteria[8]
	MCL[2]	MCLGs[3]	SMCLs[4]	Groundwater Quality Standards[5]	Drinking Water Standards[6]	Groundwater Effluent Standards Class GA[7]	
Sodium	NR	NR	NR	20,000	NR	NR	20,000
Vanadium	NR	NR	NR	NR	NR	NR	NR
Zinc	NR	NR	5,000	300	5,000	5,000	5,000

1/	Micrograms per liter.	P	Principle Organic Compound; each cannot exceed 5 ug/l.
2/	40 CFR 141.11, 141.12, 141.61.	U	Unspecified Organic Compound; each cannot exceed 50 ug/l.
3/	40 CFR 141.50, 141.51.	ND_x	Not detected at or above X.
4/	40 CFR 143.3.	*	The EPA believes that an MCLG of zero is not an appropriate setting for cleanup levels, and the corresponding MCL will be the potentially relevant and appropriate requirement (EPA, 1990).
5/	6 NYCRR 703.5.	††	Applies to each individual compound.
6/	10 NYCRR 5-1.52.	†	The total of iron and manganese cannot exceed 500 ug/l.
7/	6 NYCRR 703.6.	‡	Combined concentration of iron and manganese shall not exceed 1,000 ug/l.
8/	6 NYCRR 702.16.		
NR	Not regulated.		

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TABLE 8

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Specific TBC Soil Cleanup Criteria to Protect Groundwater Quality[1/]

Compound	Solubility S (mg/l)	Partition Coefficient K_{oc} (ml/g)	Groundwater Standards Criteria C_w (ug/l)	Allowable Soil Conc.[2/] C_s (ppm)	Soil Cleanup Objectives to Protect Ground-Water Quality[3/] (ppm)	Recommended Soil Cleanup Objective[4/] (ppm)	Background[5/6/7/] (ppm)	TBC Soil Cleanup Criteria to Protect Groundwater Quality (ppm)
Volatile Organics								
Benzene	1,750	83	0.7	0.0006	0.06	0.06	NA	0.06
Xylenes	198	240	5	0.012	1.2	1.2	NA	1.2
Ethylbenzene	152	1,100	5	0.055	5.5	5.5	NA	5.5
Toluene	535	300	5	0.015	1.5	1.5	NA	1.5
Tetrachloroethene	150	277	5	0.014	1.4	1.4	NA	1.4
Trichloroethene	1,100	126	5	0.007	0.70	0.7	NA	0.7
Methylene chloride	16,700	21	5	0.001	0.1	0.1	NA	0.1
Acetone	1,000,000	2.2	50	0.0011	0.11	0.2	NA	0.2
2-Butanone	268,000	4.5*	50	0.003	0.3	0.3	NA	0.3
4-Methyl-2-Pentanone	19,100	19*	50	0.01	1.0	1.0	NA	1.0
1,1-Dichloroethane	5,500	30	5	0.002	0.2	0.2	NA	0.2
1,2-Dichloroethane	8,520	14	5	0.001	0.1	0.1	NA	0.1
1,1,1-Trichloroethane	1,500	152	5	0.0076	0.76	0.8	NA	0.8
1,1,2,2-Tetrachloroethane	2,900	118	5	0.006	0.6	0.6	NA	0.6
1,1-Dichloroethane	2,250	65	5	0.004	0.4	0.4	NA	0.4

TABLE 8

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Specific TBC Soil Cleanup Criteria to Protect Groundwater Quality[1/]

Compound	Solubility S (mg/l)	Partition Coefficient K_{oc} (ml/g)	Groundwater Standards Criteria C_w (ug/l)	Allowable Soil Conc.[2/] C_s (ppm)	Soil Cleanup Objectives to Protect Ground-Water Quality[3/] (ppm)	Recommended Soil Cleanup Objective[4/] (ppm)	Background[5/6/7/] (ppm)	TBC Soil Cleanup Criteria to Protect Groundwater Quality (ppm)
1,2-Dichloroethene (trans)	6,300	59	5	0.003	0.3	0.3	NA	0.3
Chlorobenzene	466	330	5	0.017	1.7	1.7	NA	1.7
Chloroethane	5,740	37*	50	0.019	1.9	1.9	NA	1.9
1,2-Dichlorobenzene	100	1,700	4.7	0.079	7.9	7.9	NA	7.9
1,3-Dichlorobenzene	123	310*	5	0.0155	1.55	1.6	NA	1.6
1,4-Dichlorobenzene	79	1,700	5	0.085	8.5	8.5	NA	8.5
1,2,4-Trichlorobenzene	30	670*	5	0.034	3.4	3.4	NA	3.4
Vinyl chloride	2,670	57	2	0.0012	0.12	0.2	NA	0.2
1,2,3-Trichloropropane	1,900	68	5	0.0034	0.34	0.4	NA	0.4
1,3-Dichloropropane	2,700	51	5	0.003	0.3	0.3	NA	0.3
Dibromochloromethane	N/A	N/A	50	N/A	N/A	N/A	NA	N/A
Chloroform	8,200	31	7	0.003	0.30	0.3	NA	0.3
Carbon Tetrachloride	757	110*	5	0.006	0.6	0.6	NA	0.6
Benzoic Acid	2,900	54*	50	0.027	2.7	2.7	NA	2.7
Carbon Disulfide	2,940	54*	50	0.027	2.7	2.7	NA	2.7
Semi-Volatile Organics								
Benzo(b)fluoranthene	0.014	550,000	0.002	0.011	1.1	1.1	NA	1.1

TABLE 8

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Specific TBC Soil Cleanup Criteria to Protect Groundwater Quality[1/]

Compound	Solubility S (mg/l)	Partition Coefficient K_{OC} (ml/g)	Groundwater Standards Criteria C_W (ug/l)	Allowable Soil Conc.[2/] C_S (ppm)	Soil Cleanup Objectives to Protect Ground-Water Quality[3/] (ppm)	Recommended Soil Cleanup Objective[4/] (ppm)	Background[5/6/7/] (ppm)	TBC Soil Cleanup Criteria to Protect Groundwater Quality (ppm)
Benzo(k)fluoranthene	0.0043	550,000	0.002	0.011	1.1	1.1	NA	1.1
Phenanthrene	1	4,365*	50	2.20	220	50.0	NA	50.0
Fluoranthene	0.206	38,000	50	19	1,900	50.0	NA	50.0
Pyrene	0.132	13,295*	50	6.65	665	50.0	NA	50.0
Benzo(a)pyrene	0.0012	5,500,000	0.002 (ND)	0.110	11.0	0.061 or MDL	NA	11.0
Indeno(1,2,3-cd)pyrene	0.0005	1,600,000	0.002	0.032	3.2	3.2	NA	3.2
2-Methylphenol	31,000	15	5	0.001	0.1	0.100 or MDL	NA	0.100 or MDL
4-Methylphenol	24,000	17	50	0.009	0.9	0.9	NA	0.9
Fluorene	1.7	7,300	50	3.5	350.0	50.0	NA	50.0
Dibenzofuran	10	1,230*	5	0.062	6.2	6.2	NA	6.2
Acenaphthene	3.42	4,600	20	0.9	90.0	50.0	NA	50.0
Acenaphthylene	3.93	2,056*	20	0.41	41.0	41.0	NA	41.0
Napthalene	31.70	1,300	10	0.130	13.0	13.0	NA	13.0
2-Methynaphthalene	26	727*	50	0.364	36.4	36.4	NA	36.4
Anthracene	0.045	14,000	50	7.00	700.0	50.0	NA	50.0
bis(2-ethylhexyl)phthalate	0.285	8,706*	50	4.35	435.0	50.0	NA	50.0
Dimethylphthlate	5,000	40	50	0.020	2.0	2.0	NA	2.0

TABLE 8

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Specific TBC Soil Cleanup Criteria to Protect Groundwater Quality[1]

Compound	Solubility S (mg/l)	Partition Coefficient K_{OC} (ml/g)	Groundwater Standards Criteria C_W (ug/l)	Allowable Soil Conc.[2] C_S (ppm)	Soil Cleanup Objectives to Protect Ground-Water Quality[3] (ppm)	Recommended Soil Cleanup Objective[4] (ppm)	Background[5][6][7] (ppm)	TBC Soil Cleanup Criteria to Protect Groundwater Quality (ppm)
Diethylphthlate	896	142	50	0.071	7.1	7.1	NA	7.1
Butybenzylphthlate	2.9	2,430	50	1.215	122.0	50.0	NA	50.0
Di-n-butyl phthalate	400	162*	50	0.081	8.1	8.1	NA	8.1
Di-n-octyl phthlate	3	2,346*	50	1.2	120.0	50.0	NA	50.0
Chrysene	0.0018	200,000	0.002	0.004	0.4	0.4	NA	0.4
Benzo(a)anthracene	0.0057	1,380,000	0.002	0.03	3.0	0.220 or MDL	NA	3.0
Benzo(g,h,i)perylene	0.0007	1,600,000	5	8.0	800	50.0	NA	50.0
2,4-Dichlorophenol	4,600	380	1	0.004	0.4	0.4	NA	0.4
2,4,5-Trichlorophenol	1,190	89*	1	0.001	0.1	0.1	NA	0.1
Dibenzo(a,h)anthracene	0.0005	33,000,000	50	1,650	165,000	0.014 or MDL	NA	165,000
3,3'-Dichlorobenzidine	N/A	N/A	N/A	N/A	N/A	N/A	NA	N/A
Hexachlorobenzene	0.006	3,900	0.35	0.014	1.4	0.41	NA	1.4
Phenol	82,000	27	1	0.0003	0.03	0.03 or MDL	NA	0.03 or MDL
Pentachlorophenol	14.00	1,022	1	0.01	1	1 or MDL	NA	1 or MDL
Nitrobenzene	1,900	36	5	0.002	0.2	0.200 or MDL	NA	0.200 or MDL
4-Chloro-3-methylphenol	3,850	47	5	0.0024	0.24	0.240 or MDL	NA	0.240 or MDL
2,4-Dinitrophenol	5,600	38	5	0.002	0.2	0.200 or MDL	NA	0.200 or MDL

TABLE 8

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Specific TBC Soil Cleanup Criteria to Protect Groundwater Quality[1]

Compound	Solubility S (mg/l)	Partition Coefficient K_{oc} (ml/g)	Groundwater Standards Criteria C_w (ug/l)	Allowable Soil Conc.[2] C_s (ppm)	Soil Cleanup Objectives to Protect Ground-Water Quality[3] (ppm)	Recommended Soil Cleanup Objective[4] (ppm)	Background[5,6,7] (ppm)	TBC Soil Cleanup Criteria to Protect Groundwater Quality (ppm)
4-Nitrophenol	16,000	21	5	0.001	0.1	0.100 or MDL	NA	0.100 or MDL
2-Nitrophenol	2,100	65	5	0.0033	0.33	0.330 or MDL	NA	0.330 or MDL
2-Chlorophenol	28,500	15*	50	0.008	0.8	0.8	NA	0.8
Aniline	35,000	13.8	5	0.001	0.1	0.1	NA	0.1
2-Nitroaniline	1,260	86	5	0.0043	0.43	0.430 or MDL	NA	0.430 or MDL
3-Nitroaniline	1,100	93	5	0.005	0.5	0.500 or MDL	NA	0.500 or MDL
4-Chlroraniline	--	43†	5	0.0022	0.22	0.220 or MDL	NA	0.220 or MDL
2,6-Dinitrotoluene	277.0	198*	5	0.01	1.0	1.0	NA	1.0
Organic Pesticides/Herbicides and PCBs								
4,4'-DDD	0.16	770,000*	ND(<0.01)	0.077	7.7	2.9	NA	7.7
4,4'-DDE	0.04	440,000*	ND(<0.01)	0.0440	4.4	2.1	NA	4.4
4,4'-DDT	0.005	243,000*	ND(<0.01)	0.025	2.5	2.1	NA	2.5
Dieldrin	0.195	10,700*	ND(<0.01)	0.0010	0.1	0.044	NA	0.1
Endrin	0.26	9,157*	ND(<0.01)	0.001	0.1	0.10	NA	0.1
Aldrin	0.017	96,000	ND(<0.01)	0.005	0.5	0.041	NA	0.5
Endosulfan I	0.32	8,168*	0.1	0.009	0.9	0.9	NA	0.9
Endosulfan II	0.33	8,031*	0.1	0.009	0.9	0.9	NA	0.9

TABLE 8

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Specific TBC Soil Cleanup Criteria to Protect Groundwater Quality[1/]

Compound	Solubility S (mg/l)	Partition Coefficient K_{OC} (ml/g)	Groundwater Standards Criteria C_W (ug/l)	Allowable Soil Conc.[2/] C_S (ppm)	Soil Cleanup Objectives to Protect Ground-Water Quality[3/] (ppm)	Recommended Soil Cleanup Objective[4/] (ppm)	Background[5/6/7/] (ppm)	TBC Soil Cleanup Criteria to Protect Groundwater Quality (ppm)
Endosulfan Sulfate	0.22	10,038*	0.1	0.01	1.0	1.0	NA	1.0
Heptachlor	0.18	12,000	ND(<0.01)	0.0010	0.1	0.10	NA	0.1
Heptachlor epoxide	0.35	220	ND(<0.01)	0.0002	0.02	0.02	NA	0.02
Chlordane	0.056	21,305*	0.1	0.02	2.0	0.54	NA	2.0
2,4-D	890	104*	4.4	0.005	0.5	0.5	NA	0.5
2,4,5-T	238	53	35	0.109	1.9	1.9	NA	1.9
Silvex	140	2,600	0.26	0.007	0.7	0.7	NA	0.7
PCBs	0.08	17,510*	0.1	0.1	10.0	1.0 (surface) 10.0 (subsurface)	NA	10.0
Polychlorinated dibenzofuranes (PCDF)	N/A	N/A	N/A	N/A	N/A	N/A	NA	N/A
Dibenzo-P-dioxins (PCDD) 2,3,7,8 TCDD	0.0000193	1,709,800	0.000035	0.0006	0.06	N/A	NA	N/A
alpha - BHC	1.63	3,800	ND(<0.05)	0.002	0.2	0.11	NA	0.2
beta - BHC	0.24	3,800	ND(<0.05)	0.002	0.2	0.2	NA	0.2
delta - BHC	3.14	6,600	ND(<0.05)	0.003	0.3	0.3	NA	0.3
gamma - BHC (Lindane)	7.0	1,080	ND(<0.05)	0.0006	0.06	0.06	NA	0.06
Parathion	24.0	760	1.5	0.012	1.2	1.2	NA	1.2

TABLE 8

OCCIDENTAL CHEMICAL CORPORATION
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HICKSVILLE, NEW YORK

Specific TBC Soil Cleanup Criteria to Protect Groundwater Quality[1]

Compound	Solubility S (mg/l)	Partition Coefficient K_{OC} (ml/g)	Groundwater Standards Criteria C_W (ug/l)	Allowable Soil Conc.[2] C_S (ppm)	Soil Cleanup Objectives to Protect Ground-Water Quality[3] (ppm)	Recommended Soil Cleanup Objective[4] (ppm)	Background[5][6][7] (ppm)	TBC Soil Cleanup Criteria to Protect Groundwater Quality (ppm)
Mitotane	N/A	N/A	N/A	N/A	N/A	N/A	NA	N/A
Methoxychlor	0.040	25,637	35.0	9.0	900	10.0	NA	900
Endrin keytone	N/A	N/A	N/A	N/A	N/A	N/A	NA	N/A
gamma - chlordane	0.56	140,000	0.1	0.14	14.0	0.54	NA	14.0
Inorganics								
Aluminum					N/A	SB	246-25,000	25,000
Antimony					N/A	SB	<3-18	18
Arsenic					N/A	7.5 or SB	0.44-21	21
Barium					N/A	300 or SB	2.3-1,600	1,600
Beryllium					N/A	1.0 or SB	0-7	7
Cadmium					N/A	1 or SB	0.01-2	2
Calcium					N/A	SB	<15-35,000	35,000
Copper					N/A	25 or SB	1.7-31	31
Chromium					N/A	10 or SB	1.1-4.	40
Cobalt					N/A	30 or SB	<0.48-60	60
Cyanide					N/A	N/A	<2.9	<2.9
Iron					N/A	2,000 or SB	901-16,000	16,000

TABLE 8

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
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Specific TBC Soil Cleanup Criteria to Protect Groundwater Quality[1/]

Compound	Solubility S (mg/l)	Partition Coefficient K_{OC} (ml/g)	Groundwater Standards Criteria C_W (ug/l)	Allowable Soil Conc.[2/] C_S (ppm)	Soil Cleanup Objectives to Protect Ground-Water Quality[3/] (ppm)	Recommended Soil Cleanup Objective[4/] (ppm)	Background[5/6/7/] (ppm)	TBC Soil Cleanup Criteria to Protect Groundwater Quality (ppm)
Lead					N/A	30 or SB	0.68-240	240
Magnesium					N/A	SB	<12.1-9,700	9,700
Manganese					N/A	SB	<3.4-5,000	5,000
Mercury					N/A	0.1	<0.07-0.33	0.33
Nickel					N/A	13 or SB	0.5-34	34
Potassium					N/A	SB	56-43,000	43,000
Silver					N/A	SB	<0.15-24.3	24.3
Selenium					N/A	2 or SB	0.1-3.9	3.9
Sodium					N/A	SB	10.7-50,000	50,000
Thallium					N/A	SB	<0.17-0.55	0.55
Vanadium					N/A	150 or SB	1-300	300
Zinc					N/A	20 or SB	<1.7-110	110

1/ NYSDEC TAGM 4046, "Determination of Soil Cleanup Objectives and Cleanup Levels," 1992.

2/ Allowable soil concentration $C_S = f * C_W * K_{OC}$ (f=0.01).

3/ Soil Cleanup Objective = C_S * 100 (correction factor).

4/ As per proposed TAGM, total VOCs ≤10 ppm, total semi VOCs ≤500 ppm, individual semi VOCs ≤50 ppm and total pesticides ≤10 ppm.

5/ McGovern, E., "Background Concentrations of 20 Elements in Soil with Special Regard for New York State".

6/ Geraghty & Miller, Inc. "Data Report, Phase I Remedial Investigation, Grumman Aerospace Corporation, Bethpage, New York (1992)"; Inorganic Soil Concentrations from GMS-1S, GMS-1I, GMS-2I and GMS-3I.

7/ Inorganic soil concentrations from baseline borings Pilot Hole G, Pilot Hole S and Well Q-1 installed during the 1989 RI.

NA Not applicable.

* Log K_{oc} = -0.55 log S + 3.64. Other values are experimental values.

N/A Not available.

MDL Method Detection Limit.

occfs6.tbl/occhic

TABLE 9

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Summary of Groundwater Analyses for Pumping Tests

Activity	No. of Samples	Parameters	Analytical Methods
Pumping test	3	Tables 1, 2, 3 and 4	Standard Methods SW-846, 7000 and 8000 series; Methods for Chemical Analysis of Water and Wastewater and KGD method.
	1	TCL/TAL	Contract laboratory protocols and KGD method
QA/QC Samples for Pumping test			
Field blank	1	TCL VOAs	CLP SOW 3/90
Trip blank	1	TCL VOAs	CLP SOW 3/90
Matrix spike	1	Selected VOAs and RSCs	CLP/TCL VOAs and KGD method

hic2.tab/occhic

TABLE 10

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Soil Sampling Summary

Soil boring locations	Number of test borings	Number of soil samples[1/]	Analysis[2/]
Former drum storage area	4	8	Table 3 - RSCs
MW-E	1[a/]	2[b/]	Table 2 - Selected Organics
Sump 2	1	3	Tables 2 and 3 RSCs and Selected Organics
Total	6[a/]	13[b/]	

[1/] Number of soil samples for analytical testing.

[2/] Analytical testing:
RSCs: Analysis for semivolatiles by OCC analysis method.
Selected Organics: Analysis of selected TCL volatile compounds by CLP methodologies.

[a/] The number of test borings may increase by 3 based upon priority testing results from the initial test boring.

[b/] The number of soil samples may increase by 6 based upon priority testing results from the initial test boring.

NOTE: The following Quality Control samples will be submitted for specified analyses:

field blanks:	one per day of sampling - selected CLP VOAs
trip blanks[1/]:	one per day of sampling - selected CLP VOAs
duplicates:	at a rate of 10 percent - selected CLP VOAs and RSCs by OCC method
matrix spike/matrix spike duplicates:	one per batch of 20 samples (1 minimum) - selected CLP VOAs and RSCs by OCC method

[1/] Only to be analyzed if constituents of concern are detected in the field blank.

hic2.tab/occhic

FIGURE

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

REMEDIAL DESIGN SCHEDULE

TASK	MONTHS																																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Soils Borings & sampling	■	■	■																															
Analysis and validation	■	■	■	■	■	■																												
Remedial design report						■	■	■																										
Groundwater Extraction well installation	■	■																																
Pumping tests, Analysis & Model			■	■	■																													
Install remaining extraction system/sample						■	■	■	■																									
Bench-scale treatability study work plan							■	■	■	■	*																							
Bench-scale treatability study											■	■	■	■	■	■																		
Pilot study work plan																	■	■	*															
Pilot scale testing																			■	■	■	■	■	■	■									
Remedial design report 30%																										■	■	■						
Remedial design report 100%																													■	■	■	■	■	■

Note: Time for EPA review and revisions to submittals not included.

* Schedule to restart upon EPA approval.

FIGURE 1

APPENDIX 1

ATTACHMENT A

EXTRACTION WELL DRILLING AND CONSTRUCTION SPECIFICATIONS

1. Mobilization

A. Contractor will supply all equipment and materials sufficient to complete the extraction well installation in a timely manner and without undo delays. A staging area will be provided on the plantsite which will be used through out the project. Contractor will be responsible for setting up decontamination equipment of sufficient size to accommodate the drill end of the rig, including the turntable, mast, platform and rear wheels, as well as drill rods and bits.

B. A source of water will be designated on the plant for use throughout the project.

C. Contractor will coordinate at all times with the client's representative and personnel of Ruco Polymer Corporation to insure that there is minimal disruption to plant activities.

D. Contractor will check in with security every time personnel or equipment enter or leave the plant property.

E. Contractor will have available for immediate use Level C procedure equipment, and all personnel will have been properly trained in its use.

2. Drilling Procedures

A. A 12-inch borehole will be drilled to 150 feet in depth using the mud-rotary method. The drilling fluid will be bentonite and water. All drill cuttings and drilling mud must be containerized and transported to a designated area onsite for disposal.

B. Formation sampling for geologic characterization, using a split-spoon sampler, will be conducted at 10-foot intervals and at the discretion of the supervising hydrogeologist. Split-spoon contents will be disposed of onsite with the drill cuttings.

C. OCC's site representative will monitor the work space breathing zone using a photoionization detector. Based on organic vapor levels, as specified in the site Health and Safety Plan, the site safety officer may require that Level C personal protection be employed.

D. OCC's site representative may determine that certain drill cuttings and/or drilling fluids should be contained for analytical testing and possible offsite disposal. Contractor must be able to segregate these materials and store them in DOT 17E open-top drums upon request.

E. At the conclusion of the drilling, OCC's representative will run a geophysical (gamma-ray) log for further geologic characterization.

F. Upon completion of the log, contractor will be given the final screen setting.

3. Well Construction

A. The well will be constructed of 6-inch (pipe size) diameter, 20-slot, wire-wound stainless-steel screen, Johnson or equivalent. The screen length and setting will be selected in the field by the onsite hydrogeologist.

B. The screen will be attached to 6-inch low-carbon steel casing, sufficient in length to complete the well to 0.5 ft bg (foot below grade).

C. Centralizers will be affixed to the casing to insure placement of a uniform thickness of gravel pack.

D. After the casing/screen assembly has been set in the borehole, the well will be flushed to thin the mud.

E. Morie No. 1 gravel pack (or equivalent) will be introduced around the well screen using a Tremie pipe. A weighted steel tape will be used to periodically check the level of the gravel pack. The gravel pack will extend to 5 feet below the top of the casing.

F. Prior to surface completion, the well will be developed using a surge block and pumping. All development water must be containerized for disposal in Sump 1. Development will continue until the discharge is less than 5 NTUs (nephelometric turbidity units).

G. The well will be completed at the surface with a pitless adapter. The wellhead will be covered with a standard steel cap with compression fittings to keep out surface water. A 2-foot square or 2-foot diameter round manhole and gate box will be cemented in place.

cmp
August 24, 1994
wpapp/OCC

ATTACHMENT B

PROCEDURES FOR RUNNING A STEP-RATE PUMPING TEST

1. Purposes of the Test

A step-rate pumping test provides data which can be used for 1) determination of well efficiency; and 2) determination of an appropriate rate of pumping for a constant-rate aquifer pumping test. Step tests are generally run at increments which range from well under the well's capacity to a rate in excess of the design yield. At the lowest rate the well should exhibit maximum efficiency, and at the highest rate the lowest efficiency, assuming the well is sufficiently stressed.

2. Setting up the Test

A) Obtain several static water levels in the well during the hour preceding the test. All measurements should be obtained with reference to a fixed point, generally on the top of the casing. The short duration of step-rate tests makes the collection of background measurements less crucial than for constant-rate tests. The purpose of the static readings is to determine if there are any radical changes in the water levels due to pumping or extreme precipitation events.

B) If the well is not already equipped with a pump, install one with the full range of capacities required for the testing. The depth of the pump intake should be sufficient to insure that the anticipated drawdown will not dewater the pump. Reaction of the well during development should provide a good indication of expected drawdowns.

C) Install a flow measuring device which has an accuracy of at least 90 percent of the true flow (± 10 percent). Use of an orifice plate and manometer is recommended, though not always possible. If the rates are low, a graduated container or 55-gallon drum is sufficiently accurate.

If a flow meter is to be used, it must be capable of providing rapid data, either through a volume/time measurement or through a totalizer which can be accurately read over a short period of time, such as one minute. All meters should be calibrated prior to running a test.

D) Water levels will be obtained by transducers and the data stored on a logger, follow the standard operating procedure for the use of the equipment model. Make sure that the transducer has the right pressure range for the anticipated drawdowns.

E) The discharge from the step-rate test will be directed to Sump 3.

3. Test Procedures

A) Four steps will be run for one-half hour each, without recovery periods between steps. The test rates will be 20, 40, 60 and 80 gpm. This will result in 6,000 gallons of water requiring treatment prior to discharge. It is anticipated that treatment will be by carbon filtration and that the discharge will be directed to Sump 3.

B) Immediately before start-up obtain a static water level. Turn the pump on at the desired rate and rapidly adjust it to correct flow. Set the datalogger to record measurement at 10-second intervals for the first 1 to 10 minutes, and at 5-minute intervals for the remainder of the step. Take several manual measurements during the test as a check of the equipment performance and accuracy. Repeat this procedure for each additional step. At the end of the last step shut the pump off and measure water-level recovery using the same frequency of measurements as above.

4. Data Analysis

To calculate well efficiency, use the equation $S = BQ + CQ^2$. A good explanation of the analytical method is presented in Ground Water and Wells by Driscoll. This analysis will aid in the determination about the sufficiency of well development and construction. It will also provide a basis for future comparisons of well efficiency to determine when the well should be redeveloped.

To determine the optimal rate for the constant-rate test, plot the data on semilogarithmic paper and project each trend to determine what pumping rate can be used without causing excessive drawdown, as determined by the pump setting or hydrogeologic conditions.

cmp
August 24, 1994
wpapp/OCC

ATTACHMENT C

PROCEDURES FOR RUNNING A CONSTANT-RATE PUMPING TEST

1. Purpose of the Test

A constant-rate pumping test will be used to determine the transmissivity and storativity of the Magothy aquifer. These will be used to refine the flow component of the computer model generated in the FS process so that it will more accurately simulate aquifer responses to pumping.

The test will also be used to determine the zone of capture of the well so that a full-scale groundwater extraction system can be designed.

2. Setting up the Test

A) In order to establish antecedent trends in the levels of the potentiometric surface, water levels should be obtained for 48 hours prior to the test in the pumping well, all observation wells which will be monitored during the test, and a background well, located well beyond the anticipated influence of the pumping test response. Measurements should be a minimum of four hours apart. Two hours prior to start-up of the test, the frequency of measurements should be increased to hourly. All readings should be taken from the same point throughout the test, usually a well-marked point on the top of the casing.

B) A rain gage and barometer should be set up 48 hours prior to the test and readings should be taken daily on both instruments, with barometric changes obtained more frequently during the actual test.

C) Install a pump of sufficient capacity to pump to a rate of 50 gpm. This will insure available capacity which may be needed as the water level in the well is lowered.

D) Install a flow measuring device which has an accuracy of at least 90 percent of the true flow (± 10 percent). Use of an orifice plate and manometer is recommended, though not always possible.

If a flow meter is to be used, it must be capable of providing rapid data, either through a volume/time measurement or through a totalizer which can be accurately read over a short period of time, such as one minute. All meters should be calibrated prior to running a test.

E) Water levels will be obtained by transducers and the data stored on a logger, follow the standard operating procedure for the use of the equipment model. Make sure that the transducer has the right pressure range for the anticipated drawdowns.

F) The technology to be implemented for treating the water during the test will be determined after bench-scale testing has been completed. The anticipated pumping rate is 30 gpm for a 24-hour period, which will results in 43,200 gallons of water requiring treatment. The actual pumping rate will be determined after review of the step-test results.

G) Discharge will be directed to the new recharge basin being constructed in the western plant area.

3. <u>Test Procedures</u>

A) Immediately before start-up, obtain a static water level. Turn the pump on at the desired rate and rapidly adjust it to the current flow. Set the datalogger to record measurements at 10-second intervals for the first minute, 1-minute intervals from 1 to 10 minutes, and at 5-minute intervals for the first hour. Hourly measurements should be obtained until the end of the test. Take several manual measurements during the test as a check of the equipment performance and accuracy.

B) Obtain water-level measurements in all observation wells at the following frequency:

- every minute for the first 10 minutes;
- every 10 minutes for the remainder of the first hour;
- hourly until the end of the test.

C) Samples from the pumping well for water-quality analyses should be obtained after 8 hours and 16 hours of the test, and just before the well is turned off. Sampling and analytical protocols are presented in the Quality Assurance Project Plan.

D) At the end of the test, shut down the pump and obtain water levels during the recovery period at the same frequency as during start-up. The length of the recovery period will be determined in the field.

4. Data Analysis

A) The data will be converted to drawdown readings by subtracting the depth to the static water level from the pumping water level.

B) Drawdown data will be plotted on semilogarithmic format with time on the x-axis and drawdown on the y-axis for all wells. Use the Jacob Method to arrive at transmissivity and storage coefficient values.

C) Plot final drawdowns from all wells on a semilogarithmic format with distance from the pumping well on the x-axis and drawdown on the y-axis. Use the Theim Method for determining transmissivity and storage coefficients.

cmp
August 24, 1994
wpapp/OCC

ATTACHMENT D

Method for the Analysis of Ketone, Glycol, and Diol Compounds in Groundwater and Soil

April 27,1992

SCOPE AND APPLICATION

This method is used to determine the concentration of selected ketone, glycol, and diol compounds in groundwater or soil (Table 1). The method detection limit determined for all the compounds shown in Table 1 from reagent water is 100 μg/L which converts to 3 μg/g for soil samples.

SUMMARY OF METHOD

This method provides extraction procedures and gas chromatographic conditions for the detection of selected ketone, glycol and diol compounds (Table 1).

Groundwater Samples

SW846 3rd Edition Method 3510 (Separatory Funnel Liquid/Liquid Extraction) is used to extract compounds listed in Table 2 using methyl tert-butyl ether (MTBE) from groundwater samples. The MTBE extract is concentrated using a rotary evaporator to less than 10 ml and the final volume is adjusted to 10 ml with MTBE. A 3 uL aliquot is injected onto a gas chromatograph equipped with a acid modified polyethylene glycol (DB-FFAP) mega-bore capillary column and a flame ionization detector (GC/FID).

After MTBE solvent extraction, the remaining aqueous sample is concentrated to 10 ml using a rotary evaporator under vacuum. A 3 uL aliquot of the concentrated aqueous sample is injected into a gas chromatograph equipped with a polyethylene glycol (DB-WAX) mega-bore capillary column and a flame ionization detector (GC/FID).

Soil Samples

Soil samples are extracted first with MTBE and then water by SW846 3rd Edition Method 3550 (Sonication Extraction). The MTBE extract is concentrated using a rotary evaporator to less than 10 ml and the final volume is adjusted to 10 ml with MTBE. A 3 uL aliquot is injected onto a gas chromatograph equipped with a acid modified polyethylene glycol (DB-FFAP) mega-bore capillary column and a flame ionization detector (GC/FID).

The water extract is concentrated to 10 ml using a rotary evaporator under vacuum. A 3 uL aliquot of the concentrated aqueous sample is injected into a gas chromatograph equipped with a polyethylene glycol (DB-WAX) mega-bore capillary column and a flame ionization detector (GC/FID).

APPARATUS AND MATERIALS

Gas Chromatography:

Gas Chromatograph: Analytical system complete with gas chromatograph suitable for on-column injections and all required accessories, including detectors, column supplies, recorder, gases and syringes. A data system for measuring peaks heights and/or areas is also used.

Column: For analyses of MTBE extract, a DB-FFAP (acid modified polyethylene glycol) fused silica mega-bore capillary column, 30 m x 0.53 mm i.d., 1.0 um film thickness (J&W Scientific, or equivalent). For analyses of aqueous concentrate, a DB-WAX (polyethylene glycol) fused silica mega-bore capillary column, 30 m x 0.53 mm i.d., 1.0 um film thickness (J&W Scientific, or equivalent).

Detector: Flame ionization detector (FID).

Rotary-Evaporator:

A rotary-evaporator capable of maintaining a water bath temperature of 55°C and a vacuum efficiency to concentrate aqueous sample.

Unltrasonic Cell Disruptor:
Ultrasonics, Inc., Model W-385 (475 watt) sonicator or equivalent (Power wattage must be a minimum of 375 with pulsing capability and N0. 200 1/2" Tapped Disrupter Horn) plus No. 207 3/4" Tapped Disrupter Horn, and No. 419 1/8" Standard Tapered microtip probe.

Vacuum Filtration Apparatus
Buchner Funnel
Filter Paper: Whatman No. 41 or equivalent

Laboratory Glassware:
Volumetric Flasks: 10, 50, and 100 ml ground-glass stopper.
Separatory Funnel: 2-Liter with Teflon stopper
Round Bottom Flask: 1-Liter
Beaker: 400-ml glass
Pasteur Glass Pipets: Disposable, 1ml

Microsyringe:
10-uL

Solvents:
Methyl tert-butyl ether (MTBE): pesticide grade (or equivalent)
Methanol: pesticide grade (or equivalent)

Calibration Standards:

Calibration standards at a minimum of five concentration levels of compounds listed in Table 1 are prepared through dilution of the stock standards with methanol. Initially, a five point calibration will be analyzed to verify linearity. After linearity has been demonstrated, a three point calibration will be performed prior to analysis. One of the concentration levels should be at a concentration near, but above, the method detection limit The remaining concentration levels should correspond to the expected range of concentrations found in real samples or should define the working range of the GC. Calibration solutions must be replaced after six months, or sooner, if comparison with check standards indicates a problem.

SAMPLE COLLECTION, PRESERVATION, AND HANDLING

Samples will be collected in clean 1-liter amber glass containers. The samples will be shipped to the laboratory at 4°C. Samples must be extracted within 7 days of collection. All extracts must be stored under refrigeration and analyzed within 40 days. Concentrated aqueous samples must be stored under refrigeration and analy:zed within 7 days.

PROCEDURE

Groundwater Extraction:

Groundwater samples are extracted using SW846 3rd Edition Method 3510 (separatory liquid-liquid). A 500 ml aliquot is measured using a graduated cylinder and added to a 2-L separatory funnel with a teflon stopper. The ground water sample is extracted with 3x100 ml of methyl tert-butyl ether (MTBE) by shaking the separatory funnel for 2 minutes with periodic venting to. release excess pressure. The MTBE extracts are combined into a 1-L boiling flask and rotary evaporated under vacuum at a temperature of <40°C to approximately 2-5 ml. The MTBE extract is quantitatively transferred to a 10 ml volumetric flask and brought to volume with MTBE. The extract is stored at 4°C prior to analysis.

The remaining aqueous sample is rotary evaporated under vacuum at a temperature of <55°C to 2-5 ml. The aqueous concentrate is quantitatively transferred to another 10 ml volumetric flask and brought to volume with methanol. This results in a 20-50% methanol:water solution. The methanol/water extract is stored at 4°C prior to analysis. Figure 1A shows a flow diagram of the analytical method.

Soil Extraction

Soil samples are extracted using SW846 3rd Edition Method 3510 (separatory liquid-liquid). Aproximately 30 g of soil is weighed to the nearest 0.1 g and added to a 400 ml glass beaker. The sample is extracted with 150 ml ofMTBE. The bottom of the tip of the #207 3/4 in disruptor horn is placed about 1/2 in below the surface of the water, but above the sediment layer, and sonicated for three minutes. The sonication is reapeated with two additional 150 ml aliquots of MTBE. On the final sonication, the entire sample is poured into a buchner funnel apparatus and rinsed with 50 mlMTBE. The soil sample is then returned to a 400-ml beaker and the above extraction procedure is repeated using 3-100 ml aliquots of deionized water.

The water extracts are combined and rotary evaporated under vacuum at a temperature of <55°C to 2-5 ml. The aqueous concentrate is quantitatively transferred to another 10 ml volumetric flask and brought to volume with methanol. This results in a 20-50% methanol:water solution. The methanol/water extract is stored at 4°C prior to analysis. Figure 1B shows a flow diagram of the analytical method.

The MTBE extracts are combined into a 1-L boiling flask and rotary evaporated under vacuum at a temperature of <40°C to approximately 2-5 ml. The MTBE extract is quantitatively transferred to a 10 ml volumetric flask and brought to volume with MTBE. The extract is stored at 4°C prior to analysis.

Gas Chromatography Conditions for MTBE Extract:

Set the carrier gas (helium) linear velocity at 20 cm/sec. Column temperature is set to 60°C initially. The initial temperature should be maintained for 1 minute and then ramped at a rate of 4°C/minute to a final temperature of 230°C. The final temperature should be held for at least 15 minutes. The complete oven profile is given in Table 6.

Calibration for MTBE Extract:

Five concentration levels of semi-volatile compounds (Table 2) must be used for initial calibration of the GC system. The initial calibration curve is comprised of 2.5, 5, 10, 50, and 100 µg/ml concentrations. Once linearity is established, a three point calibration consisting of a 2.5, 10, 100 µg/ml standards will be used.

Gas Chromatographic Analysis of MTBE Extracts:

The elution times of the semi-volatile compounds are shown in Table 4. Figure 2 shows a sample of a GC chromatogram. The sample peak must be within +/- 0.05 minutes to be considered as positive identification. The sample area response of analyte must be within the calibration range. If the area is above the calibration range, a dilution must be performed and re-analyzed.
Calculations are performed using linear regression analysis. The area response is plotted versus analyte concentration using first order regression. The expression $y=mx+b$ is used to calculate sample concentration by:

$$x = (y-b)/m$$

where
x is defined as the concentration in µg/L
y is defined as the area response
b is defined as the y-intercept of the calibration curve
m is defined as the slope of the calibration curve

Gas Chromatography Conditions for Aqueous Extract:

Column: Set the carrier gas (helium) linear velocity at 20 cm/sec. Column temperature is set to 60°C initially. The initial temperature should be maintained for 1 minute and then ramped at a rate of 4°C/minute to a final temperature of 220°C. The final temperature should be held for at least 15 minutes. The complete oven profile is given in Table 7.

Calibration for Aqueous Extract:

Five concentration levels of semi-volatile compounds (Table 3) must be used for initial calibration of the GC system. The initial calibration curve is comprised of 2.5, 5, 10, 50, and 100 µg/ml concentrations. Once linearity is established, a three point calibration consisting of a 2.5, 10, 100 µg/ml will be used.

Gas Chromatographic Analysis of Aqueous Extracts:

The elution times of the semi-volatile compounds are shown in Table 5. Figure 3 shows a sample of a GC chromatogram. The sample peak must be within ±0.05 minutes to be considered as a positive identification. The sample area response of analyte must be within the calibration range. If the area is above the calibration range, a dilution must be performed and re-analyzed.
Calculations are performed using linear regression analysis. The area response is plotted versus analyte concentration using first order regression. The expression $y=mx+b$ is used to calculate sample concentration by:

$$x = (y-b)/m$$

where x is defined as the concentration in µg/L
y is defined as the area response
b is defined as the y-intercept of the calibration curve
m is defined as the slope of the calibration curve

Table 1
Selected Ketone, Glycol and Diol Compounds

2,2,4,4-tetramethyl-1,3-pentanone
2-ethoxy ethanol
2,6-dimethyl-4-heptanol
2-ethyl- 1-hexanol
dimethyl malonate
hexanoic acid
2,2,4-trimethyl-1,3-pentane diol
2-ethyl hexanoic acid
heptanoic acid
octanoic acid
bis(2-ethylhexyl)adipate
1,2-propane diol
2-ethyl-2(hydroxymethyl)-1,3-propane diol
1,3-butane diol
2,2-dimethyl-1,3-propane diol
dipropylene glycol
1,4-butane diol
diethylene glycol
1,6-hexane diol
e-caprolactam
triethylene glycol
cis trans-1,4-cyclohexanedimethanol
1-methyl-2-pyrrolidinone
ethylene glycol
2-ethoxyethyl acetate

Table 2
MTBE Extractable Compounds

2,2,4,4-Tetramethyl- 1,3-pentanone
2-Ethoxyethyl acetate
2-Ethoxy ethanol
2,6-Dimethyl-4-heptanol
2-Ethyl- 1-hexanol
Dimethyl malonate
Hexanoic acid
2,2,4-Trimethyl-1,3-pentane diol
2-Ethyl hexanoic acid
Heptanoic acid
Octanoic acid
bis(2-Ethylhexyl)adipate

Table 3
Aqueous Extract Compounds

1,2-propane diol
ethylene glycol
1-methyl-2-pyrrolidinone
1,3-butane diol
2,2-dimethyl-1,3-propane diol
dipropylene glycol
1,4-butane diol
diethylene glycol
1,6-hexane diol
e-caprolactam
triethylene glycol
cis,trans-1,4-cyclohexane dimethanol
2-ethyl-2(hydroxymethyl)-1,3propane diol
1,2,6-trihydroxyhexane

Table 4
MTBE Extractable Compounds
GC Retention Times

Analyte	Retention Time (min)
2,2,4,4-Tetramethyl-1,3-pentanone	5.4
2-Ethoxyethyl acetate	8.8
2-Ethoxy ethanol	10.9
2,6-Dimethyl-4-heptanol	12.3
2-Ethyl-1-hexanol	17.0
Dimethyl malonate	18.0
1-Methyl-2-pyrrolidinone	23.7
2,2-Dimethyl-1,3-propane diol	26.8
Hexanoic acid	28.0
2,2,4-Trimethyl-1,3-pentane diol	30.2
2-Ethyl hexanoic acid	30.7
Heptanoic acid	30.9
Octanoic acid	33.7
e-Caprolactam	37.7
cis,trans-1,4-cyclohexane dimethanol	43.3
bis(2-Ethylhexyl)adipate	54.1

Table 5
Aqueous Extract (after MTBE extraction) Compounds

Analyte	Retention Time (min)
1,2-propane diol	21.5
ethylene glycol	22.6
1-methyl-2-pyrrolidinone	24.6
1,3-butane diol	26.0
2,2-dimethyl-1,3-propane diol	27.8
dipropylene glycol	28.7, 30.1, 30.3
1,4-butane diol	31.1
diethylene glycol	32.7
1,6-hexane diol	36.9
e-caprolactam	38.6
triethylene glycol	41.6
cis, trans-1,4-cyclohexane dimethanol	44.4, 45.3
2-ethyl-2(hydroxymethyl)-1,3-propane diol	49.4
1,2,6-trihydroxyhexane	53.0

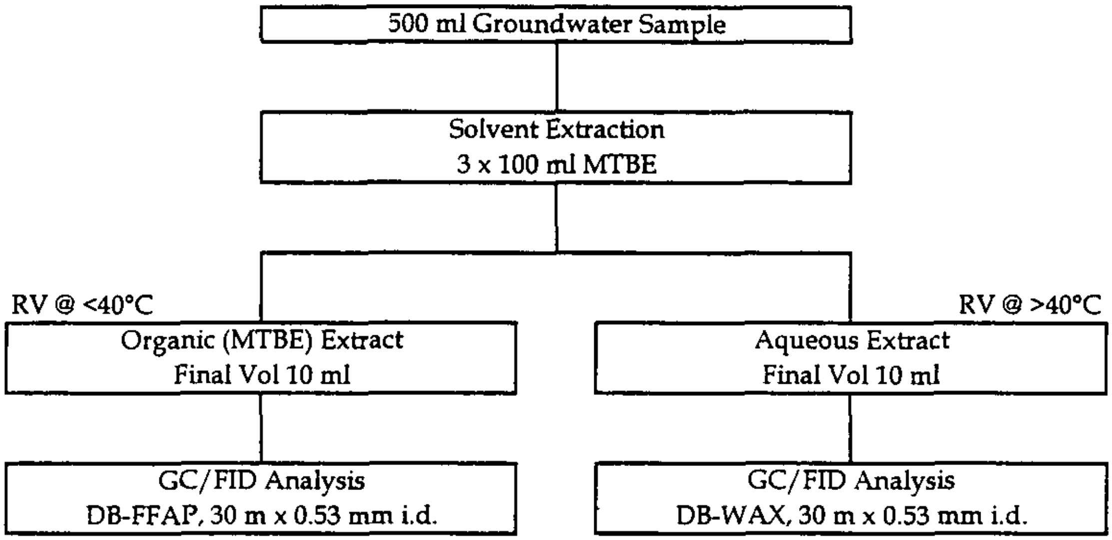
Table 6.
Gas Chromatograph Conditions for MTBE Extract Analysis

Gas Chromatograph	Hewlett-Packard Model 5880 with Model 3396 Integrator
Detector	Flame Ionization Detector (FID)
Column	DB-FFAP (polyethylene glycol - acid modified) fused silica capillary, 30 m x 0.53 i.d., 1.0 um film thickness
Injection Volume	3 uL (splitless)
Injection Port Liner	Uniliner (Restek)
Carrier Gas	Helium
Linear Velocity	18 cm/sec (head pressure 4 psi)
Initial Temperature	60°C
Initial Time	1 minute
Oven Temperature Rate	4°C/minute
Final Temperature	230°C
Final Temperature Hold	15 minutes
Detector Temperature	250°C
Detector Makeup Gas	Nitrogen
Makeup Gas Flow Rate	30 ml/minute
Detector Attenuation	Attn 2^0

Table 7.
Gas Chromatograph Conditions for Aqueous Analysis

Gas Chromatograph	Hewlett Packard Model 5880 with Model 3396 Integrator
Detector	Flam Ionization Detector (FID)
Column	DB-WAX (polyethylene glycol) fused silica capillary, 30 m x 0.53 i.d., 1.0 um film thickness
Injection Volume	3 uL (splitless)
Injection Port Liner	Uniliner (Restek)
Carrier Gas	Helium
Linear Velocity	18 cm/sec (head pressure 4 psi)
Initial Temperature	60°C
Initial Time	1 minute
Oven Temperature Rate	4°C/minute
Final Temperature	220°C
Final Temperature Hold	15 minutes
Detector Temperature	250°C
Detector Makeup Gas	Nitrogen
Makeup Gas Flow Rate	30 ml/minute
Detector Attenuation	Attn 2^0

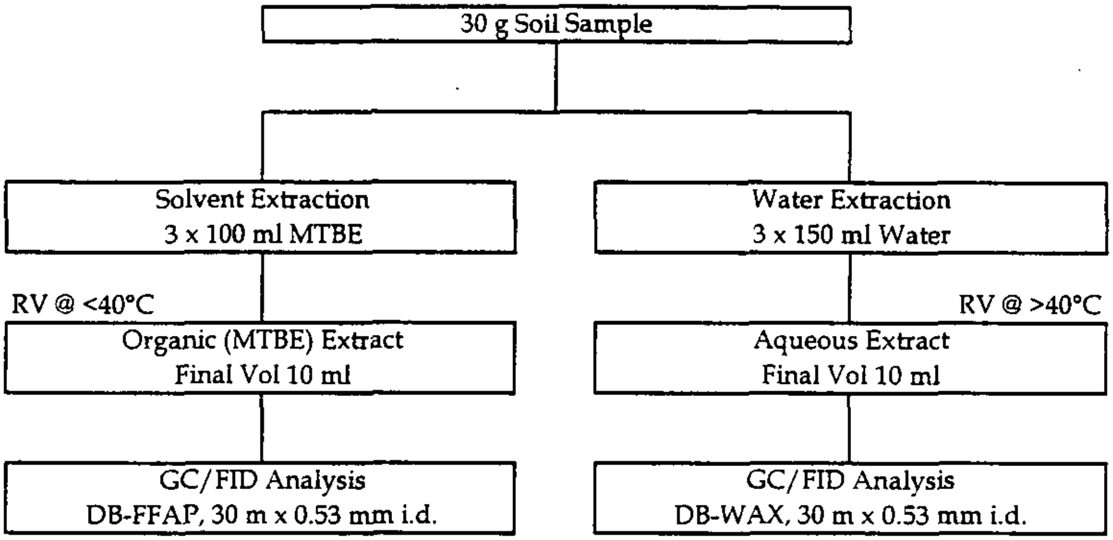
Figure 1A
FLOW DIAGRAM OF ANALYTICAL METHOD
GROUNDWATER SAMPLE



2,2,4,4-Tetramethyl-3-pentanone
2,2,4,4-Tetramethyl- 1,3-pentanone
2-Ethoxyethyl acetate
2-Ethoxy ethanol
2,6-Dimethyl-4-heptanol
2-Ethyl- 1-hexanol
Dimethyl malonate
Hexanoic acid
2,2,4-Trimethyl-1,3-pentane diol
2-Ethyl hexanoic acid
Heptanoic acid
Octanoic acid
bis(2-Ethylhexyl)adipate

1,2-propane diol
ethylene glycol
1-methyl-2-pyrrolidinone
1,3-butane diol
2,2-dimethyl-1,3-propane diol
dipropylene glycol
1,4-butane diol
diethylene glycol
1,6-hexane diol
e-caprolactam
triethylene glycol
cis,trans-1,4-cyclohexane dimethanol
2-ethyl-2(hydroxymethyl)-1,3propane diol
1,2,6-trihydroxyhexane

Figure 1B
FLOW DIAGRAM OF ANALYTICAL METHOD
SOIL SAMPLE



2,2,4,4-Tetramethyl-3-pentanone
2,2,4,4-Tetramethyl- 1,3-pentanone
2-Ethoxyethyl acetate
2-Ethoxy ethanol
2,6-Dimethyl-4-heptanol
2-Ethyl- 1-hexanol
Dimethyl malonate
Hexanoic acid
2,2,4-Trimethyl-1,3-pentane diol
2-Ethyl hexanoic acid
Heptanoic acid
Octanoic acid
bis(2-Ethylhexyl)adipate

1,2-propane diol
ethylene glycol
1-methyl-2-pyrrolidinone
1,3-butane diol
2,2-dimethyl-1,3-propane diol
dipropylene glycol
1,4-butane diol
diethylene glycol
1,6-hexane diol
e-caprolactam
triethylene glycol
cis,trans-1,4-cyclohexane dimethanol
2-ethyl-2(hydroxymethyl)-1,3propane diol
1,2,6-trihydroxyhexane

Figure 2.
Gas Chromatogram of
MTBE Extract

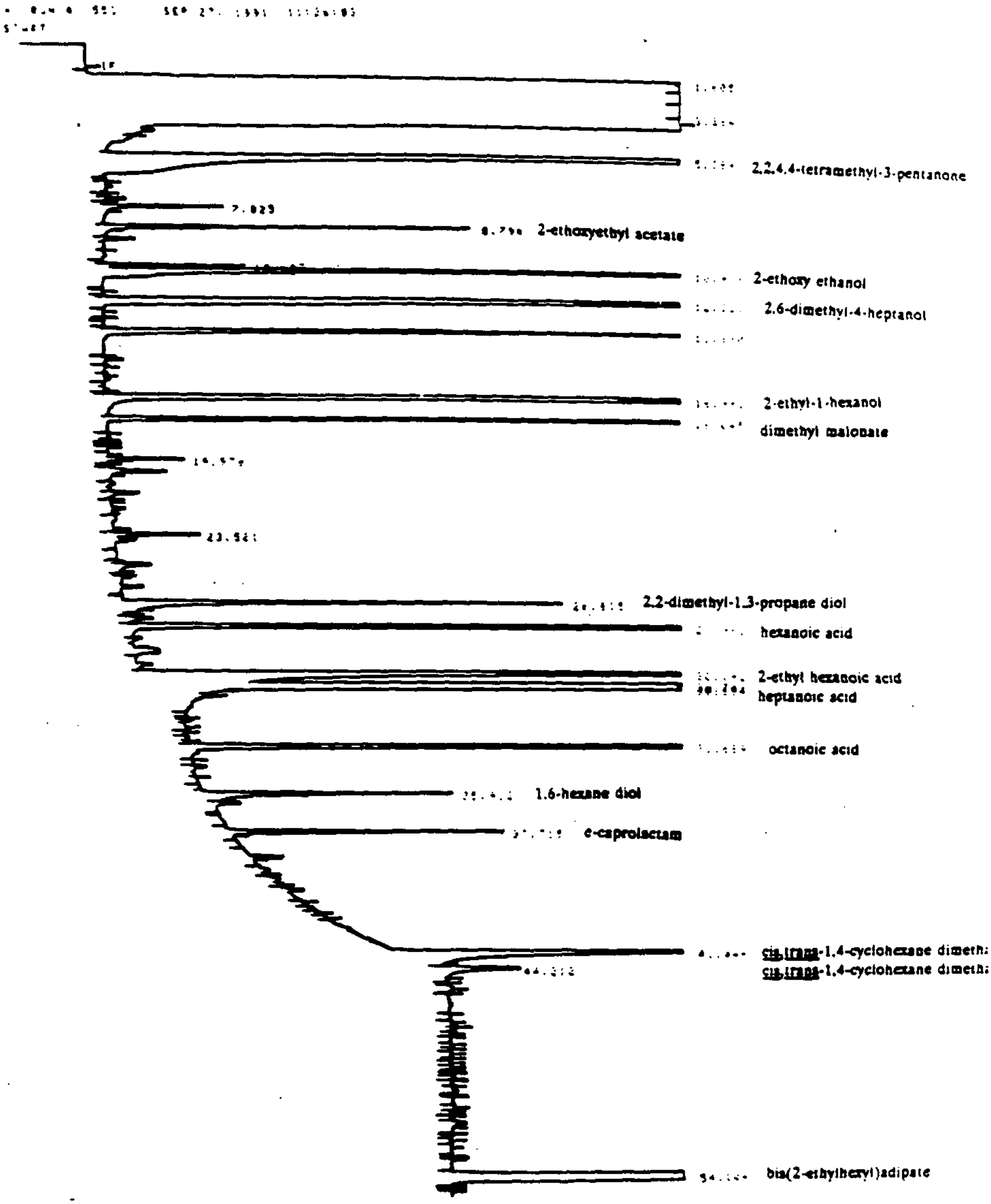
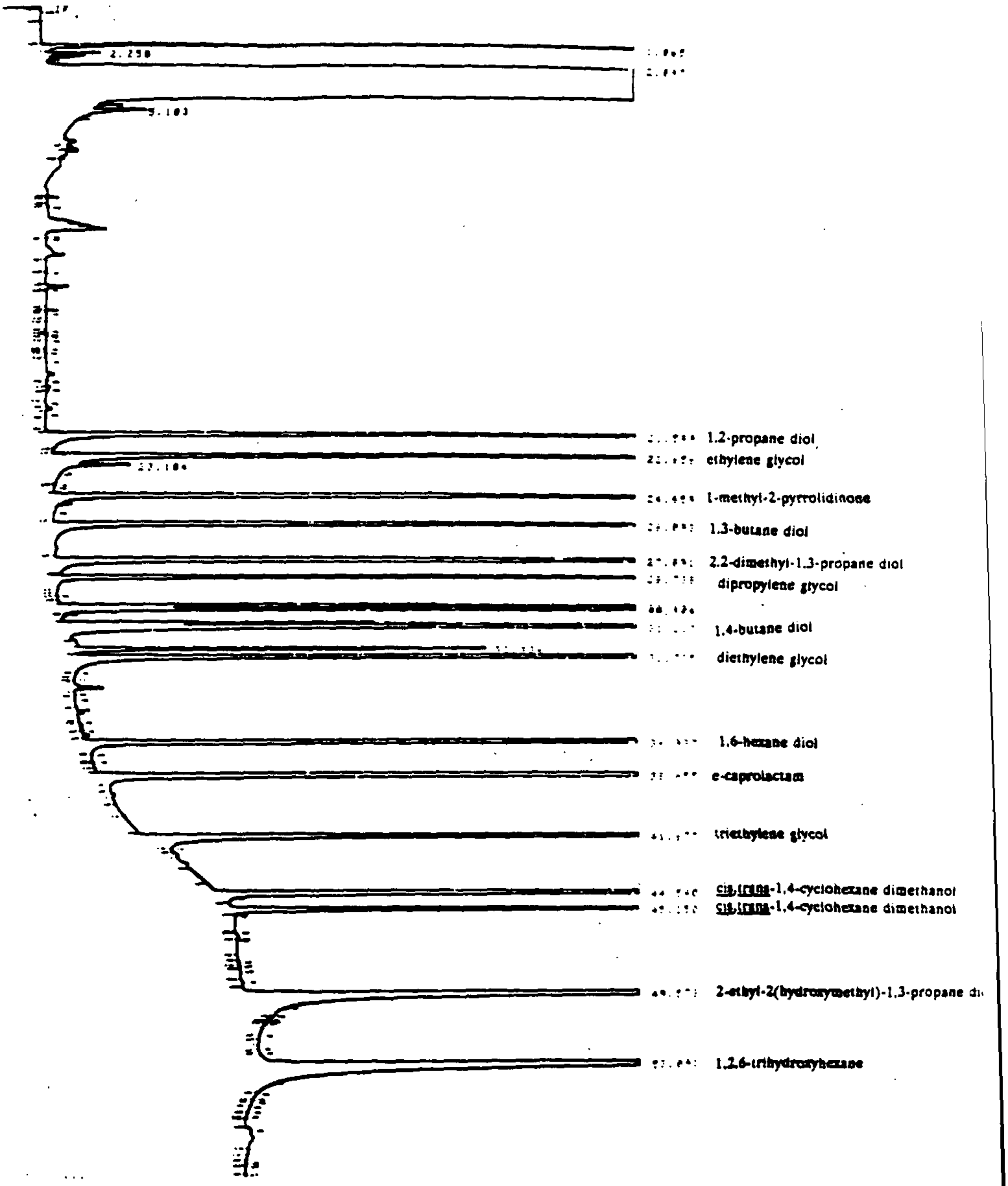


Figure 3.
Gas Chromatogram of
Aqueous (after MTBE Extraction) Extract



APPENDIX 2

HNU MODEL PI-101 PHOTOIONIZATION ANALYZER SPECIFICATIONS AND CALIBRATION

Application:	Detection of trace volatile organic vapors in ambient air
Method Detection:	Photoionization
Ranges:	0-20, 0-200 and 0-2,000 ppm (benzene referred)
Sensitivity:	0.1 ppm
Repeatability:	±1% of full scale
Operational Temperature:	greater than 32°F
Response Time:	Less than 3 seconds to 90% of full scale
Dimensions:	Probe - 2-1/2" dia. x 11-1/4" long Unit - 8-1/4" w. x 6-1/2" h. x 5-3/16" d.
Power:	Internal rechargeable battery - 12 VDC
Maximum Continuous Operation:	10 hours on fully charged battery
Outputs:	Analog meter; 0-20, 0-200 and 0-2,000 ppm Signal output for recorder; 0-5 VDC
Alarms:	Audible and visual alarm to be set at 5 ppm.

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STANDARD OPERATING PROCEDURE
HNU MODEL HW-101
PHOTOIONIZATION DETECTOR

Meter Use

1. Unclamp the cover from the main readout assembly and connect the probe cable to the 12 pin keyed connector on the readout assembly panel.

2. Screen the filter nozzle securely into the probe end cap.

3. Check the battery operation. Turn the function switch to the BATT position. If the battery is fully charged, the needle should move to the right and go into the green zone of the scale. If the needle is below the green zone or if the low battery indicator comes on, the batteries must be recharged.

4. Check the zero adjustment. Turn the function switch to the STANDBY position. The needle should align with the zero position on the scale. If this does not occur, then adjust the needle until a zero reading is achieved using the zero adjustment.

5. Select an appropriate operating range using the function switch. It is recommended that the user start with a 0 to 2,000 position and switch to a more sensitive range as required. Once the appropriate operating range has been selected, the instrument is now operational and ready for use.

Calibration Procedure

1. Attach the regulator to the calibration cylinder which has a mixture of 100 ppm isobutylene in pure air. Attach the analyzer directly to the output of the regulator using a short piece (butt connected) of flexible tubing.

2. Open the regulator and allow the calibrant gas to flow directly from the cylinder to the analyzer.

3. Unlock the span control knob on the main readout assembly by turning the locking mechanism counter-clockwise. Adjust the span control knob to read the required setting

shown on the calibrant cylinder. (Note, the span knob should be set at 9.8 and the needle should read 57 ppm when the function switch is positioned on the 0 to 200 scale, using a 10.2eV lamp and 100 ppm isobutylene calibrant gas.) After setting the span knob to the correct setting, relock the knob by turning the locking mechanism clockwise.

4. After adjusting the span knob, set the function switch back to STANDBY position and recheck the zero setting. If the zero setting requires adjustment, complete the adjustment and recalibrate the span setting using the calibrant gas.

5. If the span setting is less than 9.0, after zero readjustments, or calibration cannot be achieved, then the lamp bulb must be cleaned.

Lamp Cleaning

1. The function switch must be in the off position prior to disassembling the instrument.

2. Disassemble the probe following directions outlined in Paragraph 6.2-1 of the operation manual.

3. Clean the lamp bulb with a mild detergent, rinse with deionized water and wipe dry with lens paper.

4. If rigorous cleaning of the lamp bulb is required, clean the lamp with special HNU cleaning compound supplied by the manufacturer.

5. Reassemble the probe and recheck the calibration of the analyzer.

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PROTOCOL FOR SCREENING SOIL SAMPLES FOR VOLATILE ORGANIC COMPOUNDS

Equipment

PID

Sample jars with lids (approximately 40 milliliter)

Aluminum foil

Rubber band

Procedure

1. Transfer a representative portion of the sample into the sample jar. Close the split spoon to minimize volatilization.
2. Seal the jar with a piece of the aluminum foil and secure it with a rubber band.
3. Store the sample in a warm area (25°C minimum).
4. In order to take a measurement, push the intake probe of the instrument through the aluminum foil, taking care not to allow soil or water to enter the intake.
5. Record the highest reading, which usually occurs within 5 seconds of puncturing the seal. Record measurement on log. Allow meter to return to zero before next measurement.

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PROTOCOL FOR CLEANING SOIL SAMPLING EQUIPMENT

1. With a dedicated wire brush, clean out any solid material remaining in or on the sampling equipment.
2. Place all sampling equipment on a grate with a catchment drum beneath it.
3. Wash with detergent and tap water.
4. Rinse with tap water.
5. Rinse with 10 percent HNO_3 (or 1 percent HNO_3 if the sampling equipment is made of carbon steel (if used for metal sampling).
6. Rinse with tap water.
7. Rinse with acetone (or methanol, followed by hexane).
8. Rinse with deionized water. The deionized water will be demonstrated analyte free. Copies of the laboratory analysis will be kept onsite for inspections during EPA audit.
9. Air dry.
10. Reassemble all sampling equipment with gloved hands.
11. Wrap in aluminum foil, shiny side/out.

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PROTOCOL FOR SOIL SAMPLING

Equipment

Split-spoon samplers

Polyethylene sheeting

Table (optional)

Surgical gloves (or equivalent) and Solvex gloves

Procedure

1. Assemble the 3-inch diameter rust-free carbon steel Lynex, or equivalent, split-spoon sampler when all parts have been cleaned.
2. Transfer the sampler to the driller (or helper); be sure that this person has clean gloves on.
3. The sample will then be collected by the driller using the standard penetration test.
4. Obtain the sampler from the driller and place it on polyethylene sheeting.
5. Unscrew the end cap and break the spoon open to expose the sample.
6. Using only the spatula, cut off the top 2 to 3 inches of sample and discard, and transfer an appropriate portion to the sample container for volatile organic analysis. Fill the container as completely as possible. If the sample is from a pre-determined depth requiring analysis, homogenize the sample using a stainless steel pan and a stainless steel spatula. Where appropriate, because of sample cohesiveness, use the coning and quartering method of homogenization. Put the sample in the appropriate containers. If the sample is to be screened, remove a small portion and conduct the screening as specified in Appendix C, making sure the split spoon is closed. If the screening results in readings above 5 ppm, immediately transfer some of the sample to volatile vials. Homogenize the remainder and put it in the appropriate containers. If, for some reason, a decision cannot be reached within 5 minutes, immediately fill two vials so that the decision can be postponed.
7. Fill out the sample label (project, location, depth, date, etc.) and cover with transparent tape. Place the container in a cooler with ice.
8. Fill out sample/core log and chain-of-custody form.

APPENDIX 3

1.0 QUALITY ASSURANCE PROJECT PLAN (QAPP)

1.1 Introduction

The Quality Assurance Project Plan (QAPP) defines all Quality Assurance/Quality Control (QA/QC) procedures which will be used during the analysis of samples from Operable Unit 1 of the Hooker/Ruco site during the Remedial Design and Remedial Action. The QAPP has been prepared following specifications and definitions described in "Test Methods for Evaluating Solid Wastes" (SW-846), November 1986, revised July 1992, Region II CERCLA Quality Assurance Manual (October 1989), Guidance for Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring, Office of Water Regulations and Standards, United States Environmental Protection Agency (USEPA), May 1988.

Analytical testing of solid and liquid media, as detailed in this Plan, will be completed in accordance with one of the following specifications:

- "Test Methods for Evaluating Solid Wastes" (SW-846), November 1986, revised July 1992 (SW-846);
- "Standard Methods for Evaluating Water and Wastewater", 16th Edition, 1985 (SM);
- USEPA Contract Laboratory Protocols, Statement of Work, March 1990 (CLP) for "Organic Analysis, Multi-Media, Multi-Concentration" (OLM 01.9) and for "Inorganic Analysis, Multi-Media, Multi-Concentration" (ILM 02.0); and
- Ketone, Glycols and Diol (KGD) method.

1.2 Project Description

A comprehensive description of the Remedial Design project is contained in Sections 2.0 and 5.0 of the RDWP.

1.3 Project Organization and Responsibility

1.3.1 Project Organization, Remedial Design Implementation

Site Coordinator	Dr. Alan Weston (OCC)
Project Manager	Jim Havas (OCC)
Project Engineer	William Beckman (LBG)
Remedial Leader	William T. West (LBG)
Health and Safety Officer	Robert Lamonica (LBG)
QA/QC Officer	Patrick Garrity (OCC)
External Laboratory Coordinator (ELC)	Michael Bonomo (IEA)
Sampling Coordinator	Patrick Garrity (OCC)

1.4 Definition of Responsibilities

a. The QA/QC Officer (QAO) is responsible for the following:

- selecting and reviewing all sampling and analytical protocols required for measuring and monitoring;
- selecting analytical laboratories;
- directing the activities of the external analytical laboratory used for the project;
- reviewing all QA/QC results;
- has overall responsibility for management of the analytical program and the validity of all data;
- reviewing and advising on all aspects of QA/QC;
- making QC evaluations to assist in reviewing QA/QC procedures, and, if problems are detected, making recommendations to the ELC to rectify the problem;
- evaluating and recommending corrections to sample custody procedures;
- informing the Project Manager that appropriate QA/QC procedures have been established and are being implemented by the proper personnel; and
- evaluating and recommending corrections in sampling and/or analytical techniques.

b. The ELC is responsible for the following:

- the laboratory's activities;
- training and qualifying personnel in specified laboratory QC and analytical procedures, prior to receiving samples;
- informing the QAO if any review of data quality appears to warrant repeat analysis of some or all samples;
- receiving samples from the field and verifying that incoming samples correspond to the packing list or chain-of-custody sheet;

- maintaining records of all incoming samples, tracking those samples through subsequent processing, analysis and ultimately, appropriate disposal of those samples at the conclusion of the project;
- preparing QC samples for analysis prior to and during the program;
- preparing QC and sample data for review by the QAO;
- review of raw data with laboratory chemists against calibration and QC records;
- approval of finished data; and
- preparing QC and sample data for transmission to the QAO.

c. Sampling Coordinator

The sampling coordinator is responsible for the following:

- coordinating field activities and delivery of samples to the analytical laboratory;
- determining appropriate sampling equipment and sample containers to minimize contamination;
- training and qualifying field personnel in sampling procedures and field analytical procedures prior to sampling;
- ensuring that samples are collected, labeled, preserved, stored, transported, and, when necessary, filtered as specified in the procedures or protocols;
- checking that all sample documentation is correct and transmitted with the samples to the analytical laboratory and the APM;
- verifying that field analytical QC procedures are being followed as specified in the QA/QC protocol and prepares QC for review by the APM and QAO; and
- participating in field analytical/sampling quality audits with the APM and QAO.

1.5 Quality Assurance Objectives

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analyses and reporting that will provide accurate data. Specific procedures to be used for chain-of-custody, calibration, laboratory analysis, reporting, QC, audits, preventive maintenance and corrective actions are presented in other sections of this QAPP. Procedures relative to sampling are presented in Sections 2.0 and 5.0 of the Work Plan and Section 1.6 of the QAPP.

Data quality objectives (DQOs) have been established in accordance with the USEPA guidance document entitled "Data Quality Objectives for the RI/FS Process", dated March 1987. DQO's have been established to ensure that the database developed during the field tasks for groundwater hydraulics and field investigations for site soils meets the objectives and quality necessary for its intended use. Table 1-1 presents the analytical programs and DQO's for each analysis.

The purpose of this section is to define the goals for the level of QA effort. Objectives for accuracy, precision, sensitivity, completeness, representativeness and comparability of measurement data from the analytical laboratory will be identified. In addition, QA objectives for field measurements will be defined.

1.6 Sampling Procedures

A comprehensive description of the field sampling procedures for the design tasks of the Remedial Action is contained in Sections 2.3 Groundwater Analytical Requirements and 5.3.4 Soil Sampling of the RDWP. Groundwater samples will be collected to achieve two objectives; characterize anticipated influent groundwater and provide sufficient volume of raw material for treatability studies. Soil samples will be collected to achieve two objectives; delineate the extent of soil requiring cleanup and to classify soils requiring excavation. Analytical results from the groundwater sampling will be used to design the groundwater treatment system and to determine the efficiency of the selected system under bench and pilot-test studies. Analytical results from soil samples collected in the former drum storage area, in the vicinity of MW-E and in the base of Sump 2 will be used to delineate the extent of RSCs and selected organic compounds and determine if these areas will require cleanup. Analytical results of the waste classification samples from areas requiring excavation will be used for transport and disposal purposes. During all sample activities, split samples will be supplied upon request to the EPA representative. A copy of the sample analysis program is presented in table 1-2.

1.7 Sample Custody Procedures

It will be the responsibility of the Sampling Coordinator to maintain and document sample handling. This will be completed using a chain-of-custody form. The ELC will provide documentation that the samples have been properly disposed of after completing the analyses.

The designated laboratory will provide sample chain-of-custody as prescribed by CLP. Sample custody procedures will be followed for all samples. At a minimum, the record will contain the following types of information:

- sample number;
- signature of collector;
- date and time of collection;
- sample matrix (e.g., soil, air);
- identification of sample location;
- number of containers;
- parameters requested for analysis;
- signature of person(s) involved in the chain of possession; and
- inclusive dates of possession.

A copy of the chain-of-custody form is included as figure 1-1. To prevent misidentification of samples, legible labels will be affixed to each sample container. The labels will be sufficiently waterproof and durable to remain legible even when wet and will contain the following information:

- sample identification number;
- name of collector;
- date and time of collection;

- place of collection; and
- parameter(s) requested (if space permits).

In cases where samples may leave the site project coordinator's immediate control, such as shipment to laboratory by a common carrier, a seal will be provided on the shipping container or individual sample bottles to ensure that the samples have not been disturbed during transportation.

Sample tags will be filled out for each sample and kept on file at the laboratory. The sample tags will be sequentially numbered.

1.8 Sample Storage Procedures and Holding Times

Sample size, storage, preservation techniques and holding times, are presented in table 1-3.

1.9 Sample Preparation Methods

Sample preparation methods for groundwater and soil samples for Ruco Site Chemicals (RSCs) are addressed in the KGD method presented in Appendix I, Attachment D. Sample preparation methods for selected organic compounds will be completed according to procedures presented in CLP. Sample preparation methods for selected target analyte compounds will be completed according to procedures presented in CLP. Sample preparation methods for selected physicochemical parameters in groundwater samples will be completed according to procedures presented in SM. Waste classification samples will be completed according to procedures presented in SW-846, and the September 25, 1990 procedures for toxicity characteristics in accordance with 40 CFR 261, Appendix II.

1.10 Analytical Procedures

1.10.1 Groundwater Samples

The KGD method will be used in the analysis of all water samples for RSC parameters. CLP will be used in the analysis of all water samples for selected TCL parameters and in the analysis of all water samples for selected TAL parameters. SM will be used in the analysis of selected physicochemical parameters. Groundwater samples will be analyzed by IEA Laboratories (Monroe, Connecticut).

1.10.2 Soil Samples

The KGD method will be used in the analysis of all soil samples for RSC parameters. CLP will be used in the analysis of all soil samples for selected TCL parameters. Soil samples will be analyzed by IEA Laboratories (Monroe, Connecticut).

1.10.3 Waste Classification Samples

The waste classification samples will be analyzed for ignitability, reactivity, corrosivity and toxicity by IEA Laboratories (Monroe, Connecticut). Testing parameters and regulatory levels applicable to the disposal of the waste material will be completed pursuant to 40 CFR 261.24.

1.11 Calibration Procedures and Frequency

All calibration procedures and their frequency shall be followed as described in SM, SW-846 and CLP. All standards used for quantitation must be traceable to an EPA EMSL standard whenever possible, and if not, to a verified standard. This is a compound whose purity has been determined by at least two different analytical procedures. Linearity of detector response for each parameter must be demonstrated by generation of a linearity curve containing five concentrations of that parameter. All sample calculations must be made from responses which fall within this linearity range. During the course of the analysis, standards must be interspersed at frequent intervals to check the calibration. The preparation of all standards, including purity verification, dilutions, linearities, etc., must be recorded in a bound notebook with each page or work unit signed and dated by the analyst.

1.12 Data Reduction, Validation and Reporting

All raw data will be examined, evaluated and then reduced to final results by the ELC. The final results will be expressed in units of measurement that permit comparison with data generated from similar projects and analyses performed pursuant to the remediation at the referenced site.

All raw data shall be reviewed and validated against calibration and QC records to ensure that data are reliable, and that the data are in compliance with the QA/QC objectives. Any data determined to be invalid shall not be used in the final reporting, however, will be made available to EPA upon request. However, the fact that data have been invalidated and the reasons for the invalidation will be reported to the following people in the following order:

- QAO;
- Site Coordinator; and
- EPA.

The report format will include at least the following:

- sample ID number or code;
- place of collection;
- date sampled; and
- date analyzed.

Analytical procedures for samples analyzed for selected organic and inorganic compounds will be performed using CLP methods. Data from samples analyzed for selected organic compounds and selected target analyte compounds will be validated using USEPA Region II protocols. CLP deliverables will be used to validate data according to current Region II protocols (S.O.P. No. HW-6 Revision 8 and S.O.P. No. HW-2 Revision XI). Data validation for confirmation analysis will be performed by an auditor.

Analytical procedures for samples analyzed will be performed by SW-846 and SM. The generic QC procedures listed in Volume 1, Section A, Part II, Chapter 1 and the specific QC procedures listed in Section 8 of each method will be followed. Verification data will be tabulated upon completion and submitted to USEPA Region II.

CLP samples will have the following deliverables:

- CLP deliverables will be supplied for all samples analyzed for 8240. All CLP QC, with the exception of MS/MSMD criteria, will be followed.

Method 8150 analytical deliverables will use reporting forms. The following raw data deliverables will be supplied for Method 8150:

- quantitation reports;
- gas chromatograms;
- an example of analyte and surrogate concentration calculations;
- cleanup procedures;
- surrogate recovery;
- initial and continuing calibration data;
- retention time window; and
- standards summary evaluation forms.

RSC samples will have the following deliverables:

- reporting forms; the raw data will include:
  - gas chromatograms;
  - an example of analyte and surrogate concentration calculations;
  - cleanup procedures;
  - initial and continuing calibration data;
  - retention time window; and
  - standards summary evaluation forms.

The following Toxicity Characteristic Leaching Procedure (TCLP) deliverables will be supplied:

- the TCLP and preparative extraction dates and analysis dates;
- a physical description of the samples;
- the sample weights and the extraction fluids and volumes used in TCLP extraction;
- the final volume of TCLP extract and the volume of extract analyzed;

- the calculations used to compute percent dry solids and the weight of the liquid phase (if applicable);
- extraction logs for each sample, indicating the volume and pH of acid added and the pH of the extract at different intervals of time;
- a description of the materials of construction for extraction vessels, filtration devices, and ZHE extraction devices (i.e., glass, Teflon, PVC, stainless steel, etc.);
- the calculations used to compute TCLP extract concentrations for multi-phase samples;
- when VOA samples consist of oily waste that cannot be filtered, describe how the TCLP extract is separated from the oily waste;
- a copy of the sample log;
- any evidence of leakage in the ZHE device; and
- a TCLP trip blank will be analyzed in addition to the method blanks.

1.12.1 Turnaround Time

All samples will be sent to the laboratory promptly. The normal expected turnaround period for the various analyses are summarized below:

Waste classification:	30 days
Waste classification: (rush analysis)	5 days (verbal results)
TCL/TAL parameters:	40 days
TCL/TAL parameters: (rush analysis)	5 days (verbal results)
RSC parameters:	40 days
RSC parameters: (rush analysis)	5 days (verbal results)
Physicochemical parameters:	30 days
Physicochemical parameters: (rush analysis)	5 days (verbal results)

1.13 Internal QC Checks

The QC checks described below will be used to assess the quality of both the sampling procedures and of the sample analyses used for this project.

1. Method Blank(s): Method blanks are to be prepared in the laboratory and analyzed to assess possible laboratory contamination. The frequency of method blanks will be one per batch or a minimum of one per day.
2. Laboratory Control Samples (Method Spikes): Method spikes (blank spikes) will be prepared and analyzed. Reagent grade water is spiked with one or more selected compounds prior to extraction. The recovery of the compound(s) is used as a measure of the accuracy of the sample preparation and analysis procedures. At least ten percent of the total number of samples analyzed will also be method spike samples.
3. Calibration Check Sample(s): During the course of analysis, every twentieth sample shall be a calibration check standard. This standard shall be prepared from a "second source", that is, a supplier(s) different from the primary calibration standard. The purpose of this calibration check is to ensure the validity of the calibration standard.
8. Replicate Sample(s): These samples are analyzed in order to establish control and assess the precision of analysis and/or of sampling. At least ten percent of the total number of samples to be analyzed will be replicated.
5. Matrix-Spiked Sample(s): Matrix-spiked samples are from site(s) sampled in duplicate. This sample is spiked with one or more selected compounds prior to extraction. The recovery of the compound(s) is used as a measure of the accuracy of the sample preparation and analysis procedures. At least ten percent of the total number of samples analyzed will also be spiked samples.
6. Control Charts: Precision and accuracy will be monitored by use of control charts. Accuracy will be expressed in terms of percent recovery. A minimum of 20 data points are needed to construct the percent recovery control chart. The

details of control charting are beyond the scope of this document, but at a minimum will include the following:

- the average (mean) recovery of 20 analyses (X);
- the standard deviation of the mean (SD);
- an upper and lower warning limit, which is the mean plus or minus two standard deviation units (X ± 2xSD); and
- an upper and lower control limit, which is the mean plus or minus three standard deviation units (X ± 3xSD).

Percent recoveries will then be plotted on the control chart to determine whether or not they are acceptable.

7. Surrogate Compounds: Surrogate compounds will be used to determine extraction efficiency and analytical accuracy as described in CLP.
8. Reagent QC Checks: Reagent and solvent blanks are prepared in the laboratory and analyzed to determine background of reagents and solvents used in the routine analysis.

1.14 Specific Routine Procedures Used to Assess Data Precision, Accuracy and Completeness

Assessment of precision and accuracy of analytical data is accomplished via review of duplicate analyses (precision) and spike recovery (accuracy) in sample matrices. Precision is generally expressed as the coefficient of variation (CV). Accuracy is expressed as percent recovery. Precision will be assessed for each matrix since distribution of parameters may be non-homogeneous, especially in non-water matrices. Precision in samples will be reviewed with knowledge of the matrix and level of analyte present. Corrective action and documentation of substandard precision is a laboratory responsibility. Accuracy will reflect the impact of matrix interferences. Each method which provides QC requirements and acceptance criteria also specifies the method of generating the data to be reviewed. It is also the laboratory's responsibility to attempt to identify the source of substandard recoveries and either take corrective action or document the cause. The calculation is presented below:

$$\%R = \frac{\text{observed value}}{\text{theoretical value}} \times 100$$

$$CV = (s/x) \times 100$$

where,

$\%R$ = percent recovery;
CV = coefficient of variation;
s = sample standard deviation; and
x = mean value of data set.

Completeness is generally assessed as a percentage of data intended to be generated.

1.15 QA Reports

On a predetermined schedule, the QAO will meet with the APM to review QC data summaries, documentation and other aspects of the analytical performance. The assessment of the QA/QC data shall be reported to the Project Manager. This report will highlight any areas that appear to require corrective action, and will also present proposed plans to rectify the apparent problems. Included in this report shall be any results of earlier corrective action that had been initiated.

QA audits are performed to assure and document that QC measures are being utilized to provide data of acceptable quality and that subsequent calculation, interpretation and other project outputs are checked and validated.

System and performance audits will be conducted by the QAO. The APM and the QAO will conduct project audits of calculations, interpretations and reports which are based on the measurement system outputs. In addition, personnel from the State or its authorized representatives may obtain access to performance audits.

1. <u>Performance Audits</u>: These audits are intended primarily for analytical and data generation system. This audit will be accomplished by the use of performance

evaluation samples. These samples will be randomly submitted by either the APM or QAO during the period when surveys and studies are being carried out for the duration of the program. In addition, audit samples may be submitted by the State.

2. System Audit: A systems audit will be conducted on all components of measurement systems to determine proper selection and utilization. The systems audit includes evaluation of both field and laboratory procedures. Systems audits will be made at regular intervals at each laboratory used and whenever a new analysis is initiated. The results of the systems audit will be reported in an appropriate QA report.

3. Organization and Personnel: The QA Plan organization is reviewed for compliance with the proposed organization and for clarity of assigned responsibility. Personnel assigned to the project will be evaluated to determine that assigned responsibility, skill and training of the personnel are properly matched. The APM maintains firsthand knowledge of his team's capabilities and will discuss the organization's efficiency with the QAO. Assigned personnel may be interviewed by the QAO during an audit.

8. Facilities and Equipment: The audit will address whether field tools and analytical instruments are selected and used to meet requirements specified by the QA Plan objectives. Equipment and facilities provided for personnel health and safety will also be evaluated. Calibration and documentation procedures for instruments used in the field will receive special attention.

5. Analytical Methodology: A review of analytical methodology in regard to the data requirements for the QA Plan will be performed. An onsite observation of analyst technique, data reduction and record keeping may be performed if

determined necessary. A review of precision and accuracy data will be performed for each batch of samples.

6. Sampling and Sample Handling Procedure: An audit of scheduled samples versus samples collected versus samples received for analysis will be performed. Field documentation will be reviewed. If deemed necessary, field or laboratory visits will be made to assure that designated control procedures are practiced during sampling activities.

7. Data Handling: During a systems audit, the QAO will review data handling procedures with the APM. Accuracy, consistency and documentation will be discussed.

8. QA Plan Audit: QA Plan audits encompass the aspects of both the systems audit and the performance audit. The QA Plan audit typically occurs once but may occur more often if required. Timing is keyed to the systems involved and the QA Plan objectives.

9. QA Plan Audit Report: A written QA Plan Audit Report will be prepared for each QA Plan Audit and will include:
   - an assessment of QA Plan team status in each of the major QA Plan areas;
   - clear statements of areas requiring improvement or problems to be corrected. Recommendation and assistance will be provided regarding proposed corrective actions or system improvements. If no action is required, the report will state that the QA Plan audit was satisfactorily completed;
   - a timetable for any corrective action required; and
   - a follow-up to assure that recommendations have been implemented.

The format for the QA Plan Audit is found below. The QA Plan Audit Report will be distributed to the APM and the Project Coordinator.

QUALITY ASSURANCE PLAN AUDIT REPORT FORM
(Topics for inclusion in report)
Organization and Personnel
Facilities Utilized
Analytical Methodologies
Sampling and Sample Handling
Quality Control Measures Utilized
Data Handling
Quality Assurance Deficiencies
Recommended Corrective Actions and Schedule

1.16 Preventative Maintenance

It will be the responsibility of the ELC to follow the instrument manufacturer's suggested instrument maintenance program for all instruments and equipment which are to be utilized by the external laboratory. The ELC should be prepared documentation of proper institution all maintenance programs.

The photoionization detector will be inspected daily to determine if the ionization lamp is free of dust and the wand is free of obstructions. The sample inputs of both the explosivity and oxygen meter will be checked daily for obstructions.

1.17 Corrective Action

Corrective actions will be deemed necessary and/or appropriate by the APM, QAO or the ECL. Corrective actions may include and are not limited to the following:

- additional training and/or reassignment of personnel;
- replacement of solvents and/or reagents that yield unacceptable blank values;

- reclamation of insurgents with fresh standards; and/or
- replacement of the analytical equipment.

The analytical laboratory utilized will be equipped with multiple instruments required to perform each procedure to minimize the chance of excessive down time due to equipment failure.

cmp
September 16, 1994
qapp.8/OCC

TABLES

TABLE 1-1

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Data Quality Objectives of the Analytical Program for the Remedial Design/Remedial Action

Sample Activity	Data Quality Objectives
Groundwater Sampling	Characterize anticipated influent groundwater stream for design of treatment system by means of providing representative samples to be used in treatability studies.
Soil Sampling	Delineate the extent of RSC's in the soils in the former drum storage area and the base of Sump 2 and delineate the extent of selected organic compounds in the soils in the vicinity of MW-E and the base of Sump 2.
Waste Characterization Sampling	Characterize all waste generated by the remedial program for purposes of disposal. Analytical results will be used to satisfy the minimum requirements of the treatment, storage and disposal facility (TSDF).

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TABLE 1-2

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Sample Analysis Program

Sample Activity	Parameter	Method reference		Matrix
Waste Characterization Sampling	Ignitability	SW-846 1010 SW-846 1010		Soil Water
	Corrosivity	SW-846 1110 SW-846 9040/9041		Soil Water
	Reactivity			
	Cyanide	SW-846, Chapter 7.3.3		Soil
	Sulfide	SW-846, Chapter 7.3.4		Soil
	Cyanide	SW-846 9010		Water
	Sulfide	SW-846 9030		Water
		Preparation	**Analysis**	
	TCLP TC Metals	40 CFR 261 Appendix II	CLP ILM 02.0	Soil
	TCLP TC VOA	40 CFR 261 Appendix II	SW-846 8240	Soil
	TCLP TC BNA	40 CFR 261 Appendix II	SW-846 8270	Soil
	TCLP TC Pesticides	40 CFR 261 Appendix II	CLP OLM 01.9	Soil
	TCLP TC Herbicides	40 CFR 261 Appendix II	SW-846-8150	Soil

TABLE 1-2
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Sample Analysis Program

Sample Activity	Parameter	Method reference	Matrix
Groundwater Sampling	Selected TCL Parameters	CLP OLM 01.9 EPA SOW 3/90	Water
	RSC parameters	KGD Method	Water
	Selected TAL parameters	CLP ILM 02.0 EPA SOW 3/90	Water
	Total Suspended Solids	Standard Methods: Method 209C	Water
	Total Dissolved Solids	Standard Methods: Method 209B	Water
	BOD	Standard Methods: Method 507	Water
	COD	Standard Methods: Method 508	Water
	Hardness	Standard Methods: Method 314B	Water
	Spectral Analysis	Standard Methods: Method 204B	Water
	TOC	Standard Methods: Method 505	Water
Soil Sampling	Selected TCL Parameters	CLP OLM 01.9 EPA SOW 3/90	Soil
	RCS Parameters	KGD Method	Soil

qapp.tbl/OCC

TABLE 1-3

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Parameters

Parameters	Method reference		Matrix	Sample preservation	Holding time[1]	Sample container
Ignitability	SW-846 1010[2]		Soil	4°C	--	8 oz. glass
Corrosivity	SW-846 9040/9041 SW-846 1110		Water Soil	4°C 4°C	-- --	8 oz. glass 8 oz. glass
Reactivity						
Cyanide	SW-846, Chapter 7.3.3		Soil	4°C	--	8 oz. glass
Sulfide	SW-846, Chapter 7.3.4		Soil	4°C	--	8 oz. glass
Cyanide	SW-846 9010		Water	4°C	--	8 oz. glass
Sulfide	SW-846 9030		Water	4°C	--	8 oz. glass
	Preparation	Analysis				
Toxicity						
TCLP TC Metals	40 CFR 261 Appendix II	CLP ILM01.0	Soil	4°C	56 days[3] 360 days[4]	8 oz. glass
TCLP TC BNA	40 CFR 261 Appendix II	SW-846 8270	Soil	4°C	61 days[5]	8 oz. glass
TCLP TC Pesticides	40 CFR 261 Appendix II	CLP OLM01.6	Soil	4°C	61 days[5]	8 oz. glass
TCLP TC Herbicides	40 CFR 261 Appendix II	SW-846 8150	Soil	4°C	61 days[5]	8 oz. glass
TCLP VOA Zero-headspace extraction	40 CFR 261 Appendix II	SW-846 8240	Soil	4°C	28 days[6]	40 ml glass with Teflon septa
TSS	SM 212[7]		Water	Cool, 4°C	7 days	P/G
TDS	SM 209C[7]		Water	Cool, 4°C	7 days	P/G
BOD	SM 209B[7]		Water	Cool, 4°C	Analyze immediately	G
COD	SM 508[7]		Water	Cool, 4°C, H_2SO_4 to pH<2	Analyze immediately	G
Hardness	SM 314B[7]		Water	HNO_3 or H_2SO_4 to pH<2	6 months	P/G

TABLE 1-3
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Parameters

Parameters	Method reference	Matrix	Sample preservation	Holding time[1]	Sample container
Spectral anlaysis	SM 204B[7]	Water	None required	Analyze immediately	P/G
TOC	SM 505[7]	Water	Cool, 4°C, HCL/H_2SO_4 to $pH<2$	28 days	P/G
RSC parameters	KGD method[8]	Water	Cool, 4°C	Extract 7 days analyze 40 days	G
	KGD method[8]	Soil	Cool, 4°C	Extract 7 days analyze 40 days	G
TCL volatiles	EPA SOW 3/90[9]	Water	Cool, 4°C, HCL to $pH<2$	10 days	40 ml VOA
	EPA SOW 3/90[9]	Soil	Cool, 4°C	10 days	4 oz. G
TCL extractables	EPA SOW 3/90[9]	Water	Cool, 4°C	Extract 5 days Analyze 40 days	1 liter G
	EPA SOW 3/90[9]	Soil	Cool, 4°C	Extract 10 days Analyze 40 days	4 oz. G
TAL parameters	EPA SOW 3/90[10]	Water	Cool, 4°C, HNO_3 to $pH<2$	180 days	P/G
TAL mercury	EPA SOW 3/90[10]	Water	Cool, 4°C, HNO_3 to $pH<2$	26 days	P/G
TAL cyanide	EPA SOW 3/90[10]	Water	Cool, 4°C, HNO_3 to $pH<12$	12 days	P/G

1/ All holding times begin at the time of sampling, except CLP samples where holding times begin with verified time of sample receipt (VTSR).
2/ "Test Methods for Evaluating Solid Waste" (SW-846), Third Edition, Office of Solid Waste and Emergency Response, November 1986, revised July 1992.
3/ Mercury requires extraction within 28 days and analysis within 28 days; total elapsed holding time is 56 days.
4/ Metals, excluding mercury require extraction within 180 days and analysis within 180 days, total elapsed holding time is 360 days.
5/ Semi-volatiles require extraction within 14 days, prepare extraction within 7 days and analysis within 40 days; total elapsed holding time is 54 days.
6/ Volatiles require extraction within 14 days and analysis within 14 days; total elapsed holding time is 28 days.
7/ "Standard Methods for Examination of Water and Wastewater", 16th Edition, 1985.
8/ Ketone, Glycol, Diol method attached in Appendix I, Attachment D.
9/ United States Environmental Protection Agency, "Contract Laboratory Protocols, Statement of Work for Organic Analyses, Multi-Media, Multi-Concentration", OLM 01.0, March 1990.
10/ United States Environmental Protection Agency, "Contract Laboratory Protocols, Statement of Work for Inorganic Analyses, Multi-Media, Multi-Concentration", ILM 02.0, March 1990.

FIGURE

LEGGETTE, BRASHEARS & GRAHAM, INC.

CONSULTING HYDROGEOLOGISTS
72 DANBURY RD. WILTON CT. 06897 (203) 762-1207

PROJ. NO.

CLIENT/LOCATION

SAMPLERS: *(Signature)*

STA. NO.	DATE	TIME	PUMP	BAIL	REMARKS/ COLOR, ODOR, ETC.	NO. OF CONTAINERS	TYPE OF SAMPLE (SOIL,GW,SW,ETC.)	PRODUCT PRESENT	TEMP.	pH	CONDUCTIVITY	PARAMETERS TO BE ANALYSED FOR

WEATHER CONDITIONS

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	

CHAIN OF CUSTODY

Figure 1-1

APPENDIX I

Short Form

WORK/QA PLAN SHORT FORM

RD/RA at Occidental Chemical Corporation
Hooker/Ruco Site

Occidental Chemical Corporation

Project Officer's Signature ______________________________

Project Officer's Name: Patrick J. Garrity

Project Quality Assurance Officer's Signature _____________

Project Quality Assurance Officer's Name: **Dr. Philip Holt**

1. **Project:** Hooker/Ruco Remedial Action
2. **Project Requested by:** USEPA
3. **Date of Request:** July 23, 1994
4. **Date of Project Initiation:** N/A
5. **Project Officer:** (QA Program Manager) Patrick Garrity
6. **Quality Assurance Officer: Dr. Philip Holt**
7. **Project Description:** Detailed description is presented in Sections 2.0 and 5.0 of the RDWP.

   A. **Objective and Scope Statement:** To collect analytical data from surface and subsurface soils and groundwater performed pursuant to Section 106(A) of CERCLA, 42 U.S.C. §9606(A).

   B. **Data Usage:** To define the presence of residual selected organic, inorganic, and physicochemical parameters in the groundwater for design of a groundwater treatment system and to define the presence, extent and magnitude of selected organics and RSC's in the soil for purposes of remediation within the facilities boundaries.

   C. **Monitoring Network Design and Rationale:** Groundwater sampling for characterization of influent groundwater stream and delineation of extent and magnitude of site chemicals in soil and sump sediments. Sample results will be used to design groundwater treatment system during treatability studies and to determine if site soil requires cleanup.

   D. **Monitoring Parameters and their Frequency of Collection:** See E. for parameters; will be a single event sampling.

E. Parameter Table

Parameter	Number of samples	Sample matrix	Analytical method reference*	Sample preservation	Holding time	Container
See attached table 1-3						

* if other than EPA, must be attached.

F. QA Sample Parameter Table

	Parameter	Number of samples	Sample matrix	Analytical method reference*	Sample preservation	Holding time	Containers
Field blank	all as above	10%	all as above				
Field split	all as above	10%	all as above				
Laboratory duplicate	all as above	10%	all as above				

* if other than EPA, must be attached.

8. Project Fiscal Information (Optional):

A. Survey Costs: NA

Salaries: ________________

Supplies: ________________

Equipment: ________________

Mileage: ________________

B. Laboratory Services: ______________

C. Administrative Overhead: ______________

D. Consultant Services: ______________

Total Project Costs: ______________

9. **Schedule of Tasks and Products:** Reference RDWP for schedule.

10. **Project Organization and Responsibility:** The following is a list of key project personnel and their corresponding responsibilities:

Leggette, Brashears & Graham - sampling operations

Leggette, Brashears & Graham - sampling QC

P. Garrity, OCC - laboratory analysis

Dr. P. Holt, OCC - laboratory QC

P. Garrity, OCC - data processing activities

P. Garrity, OCC - data processing QC

P. Garrity, OCC - data quality review

Dr. P. Holt, OCC - performance auditing

Dr. P. Holt, OCC - systems auditing

Dr. P. Holt, OCC - overall QA

Dr. A. Weston, OCC - overall project coordination

(Note: an organizational chart should be supplied with this plan) See figure 1.

11. **Data Quality Requirements and Assessments:** The precision and accuracy objectives will be based upon each method presented on table 1-1. Estimated precision shall be 95 percent.

12. **Documentation, Data Reduction and Reporting:**
    - **A.** **Objective and Scope Statement:** Data sheets, field logs, photographs and chain of custody will be kept by all applicable personnel until the project is closed.
    - **B.** **Data Usage:** The designation laboratory will calculate and report the data to the OCC Site Coordinator, who will transmit the data to the EPA.

13. **Data Validation:** The OCC Quality Assurance Officer (QAO) will evaluate the data based on surrogate recoveries, detection limits, instrument standards and evaluation of chromatogram. The QAO will determine precision and accuracy and utilize the QA criteria set fourth in the methodology of the analysis to validate the data.

14. **Performance and Systems Audits:** Audits will be conducted in accordance with Section 4.0 of RDWP.

15. **Corrective Action:** Corrective Actions will be conducted in accordance with Section 4.0 RDWP.

16. **Reports:** The final output of the project will be a sampling and analysis report. The report shall include the following: a) map of sample locations, b) sample I.D. numbers, c) sample analysis information, d) sample analysis results, e) QA/QC data, f) QA/QC review and g) assessment of the data.

cmp
September 16, 1994
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TABLE

APPENDIX 1-1

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Parameters

Parameters	Method reference		Matrix	Sample preservation	Holding time[1]	Sample container
Ignitability	SW-846 1010[2]		Soil	4°C	--	8 oz. glass
Corrosivity	SW-846 9040/9041		Water	4°C	--	8 oz. glass
	SW-846 1110		Soil	4°C	--	8 oz. glass
Reactivity						
Cyanide	SW-846, Chapter 7.3.3		Soil	4°C	--	8 oz. glass
Sulfide	SW-846, Chapter 7.3.4		Soil	4°C	--	8 oz. glass
Cyanide	SW-846 9010		Water	4°C	--	8 oz. glass
Sulfide	SW-846 9030		Water	4°C	--	8 oz. glass
	Preparation	**Analysis**				
Toxicity						
TCLP TC Metals	40 CFR 261 Appendix II	CLP ILM01.0	Soil	4°C	56 days[3] 360 days[4]	8 oz. glass
TCLP TC BNA	40 CFR 261 Appendix II	SW-846 8270	Soil	4°C	61 days[5]	8 oz. glass
TCLP TC Pesticides	40 CFR 261 Appendix II	CLP OLM01.6	Soil	4°C	61 days[5]	8 oz. glass
TCLP TC Herbicides	40 CFR 261 Appendix II	SW-846 8150	Soil	4°C	61 days[5]	8 oz. glass
TCLP VOA Zero-headspace extraction	40 CFR 261 Appendix II	SW-846 8240	Soil	4°C	28 days[6]	40 ml glass with Teflon septa
TSS	SM 212[7]		Water	Cool, 4°C	7 days	P/G
TDS	SM 209C[7]		Water	Cool, 4°C	7 days	P/G
BOD	SM 209B[7]		Water	Cool, 4°C	Analyze immediately	G
COD	SM 508[7]		Water	Cool, 4°C, H_2SO_4 to pH<2	Analyze immediately	G
Hardness	SM 314B[7]		Water	HNO_3 or H_2SO_4 to pH<2	6 months	P/G

APPENDIX 1-1
(continued)

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

Parameters

Parameters	Method reference	Matrix	Sample preservation	Holding time[1]	Sample container
Spectral anlaysis	SM 204B[7]	Water	None required	Analyze immediately	P/G
TOC	SM 505[7]	Water	Cool, 4°C, HCL/H_2SO_4 to pH < 2	28 days	P/G
RSC parameters	KGD method[8]	Water	Cool, 4°C	Extract 7 days analyze 40 days	G
	KGD method[8]	Soil	Cool, 4°C	Extract 7 days analyze 40 days	G
TCL volatiles	EPA SOW 3/90[9]	Water	Cool, 4°C, HCL to pH < 2	10 days	40 ml VOA
	EPA SOW 3/90[9]	Soil	Cool, 4°C	10 days	4 oz. G
TCL extractables	EPA SOW 3/90[9]	Water	Cool, 4°C	Extract 5 days Analyze 40 days	1 liter G
	EPA SOW 3/90[9]	Soil	Cool, 4°C	Extract 10 days Analyze 40 days	4 oz. G
TAL parameters	EPA SOW 3/90[10]	Water	Cool, 4°C, HNO_3 to pH < 2	180 days	P/G
TAL mercury	EPA SOW 3/90[10]	Water	Cool, 4°C, HNO_3 to pH < 2	26 days	P/G
TAL cyanide	EPA SOW 3/90[10]	Water	Cool, 4°C, HNO_3 to pH < 12	12 days	P/G

[1] All holding times begin at the time of sampling, except CLP samples where holding times begin with verified time of sample receipt (VTSR).

[2] "Test Methods for Evaluating Solid Waste" (SW-846), Third Edition, Office of Solid Waste and Emergency Response, November 1986, revised July 1992.

[3] Mercury requires extraction within 28 days and analysis within 28 days; total elapsed holding time is 56 days.

[4] Metals, excluding mercury require extraction within 180 days and analysis within 180 days, total elapsed holding time is 360 days.

[5] Semi-volatiles require extraction within 14 days, prepare extraction within 7 days and analysis within 40 days; total elapsed holding time is 54 days.

[6] Volatiles require extraction within 14 days and analysis within 14 days; total elapsed holding time is 28 days.

[7] "Standard Methods for Examination of Water and Wastewater", 16th Edition, 1985.

[8] Ketone, Glycol, Diol method attached in Appendix I, Attachment D.

[9] United States Environmental Protection Agency, "Contract Laboratory Protocols, Statement of Work for Organic Analyses, Multi-Media, Multi-Concentration", OLM 01.0, March 1990.

[10] United States Environmental Protection Agency, "Contract Laboratory Protocols, Statement of Work for Inorganic Analyses, Multi-Media, Multi-Concentration", ILM 02.0, March 1990.

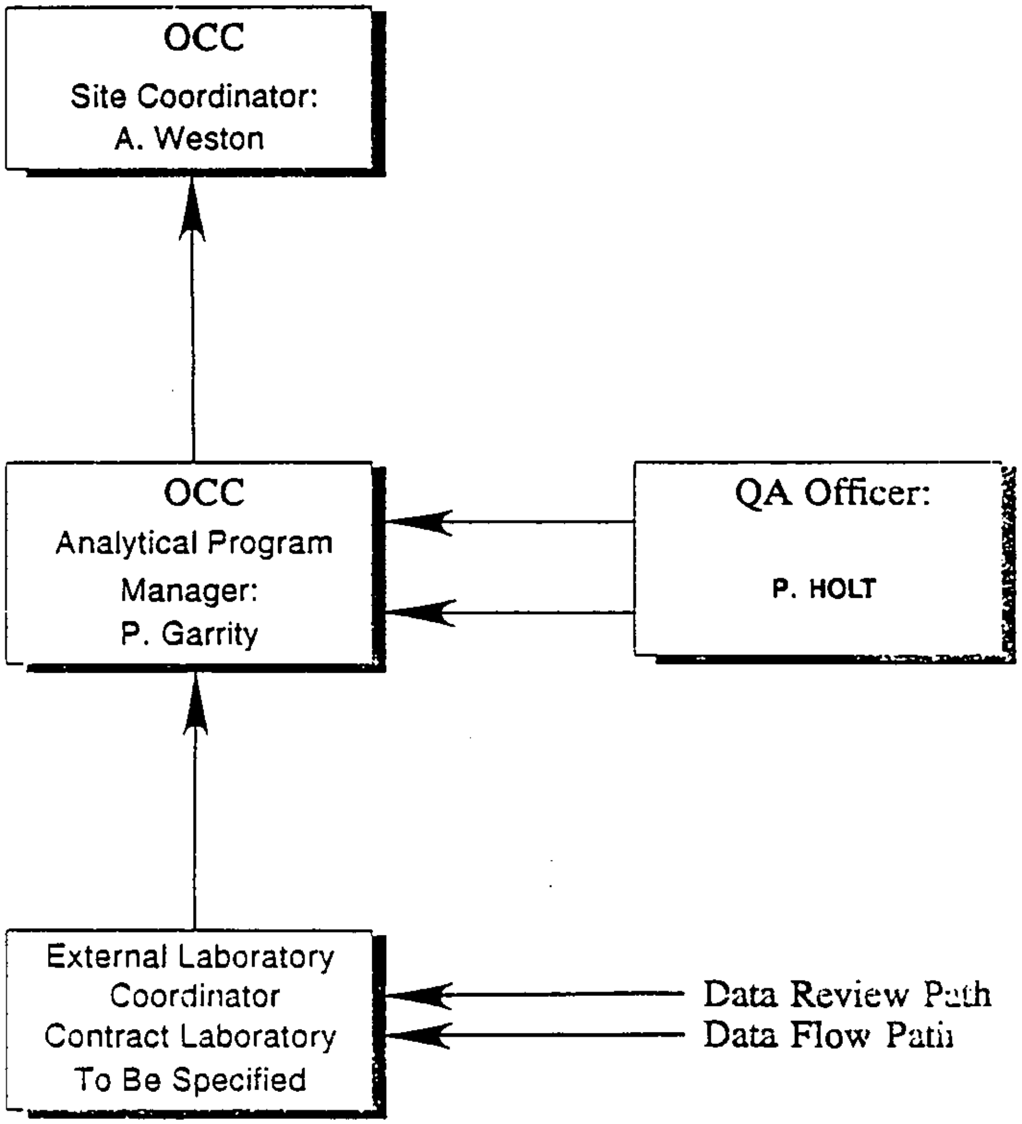
qapp.tbl/OCC

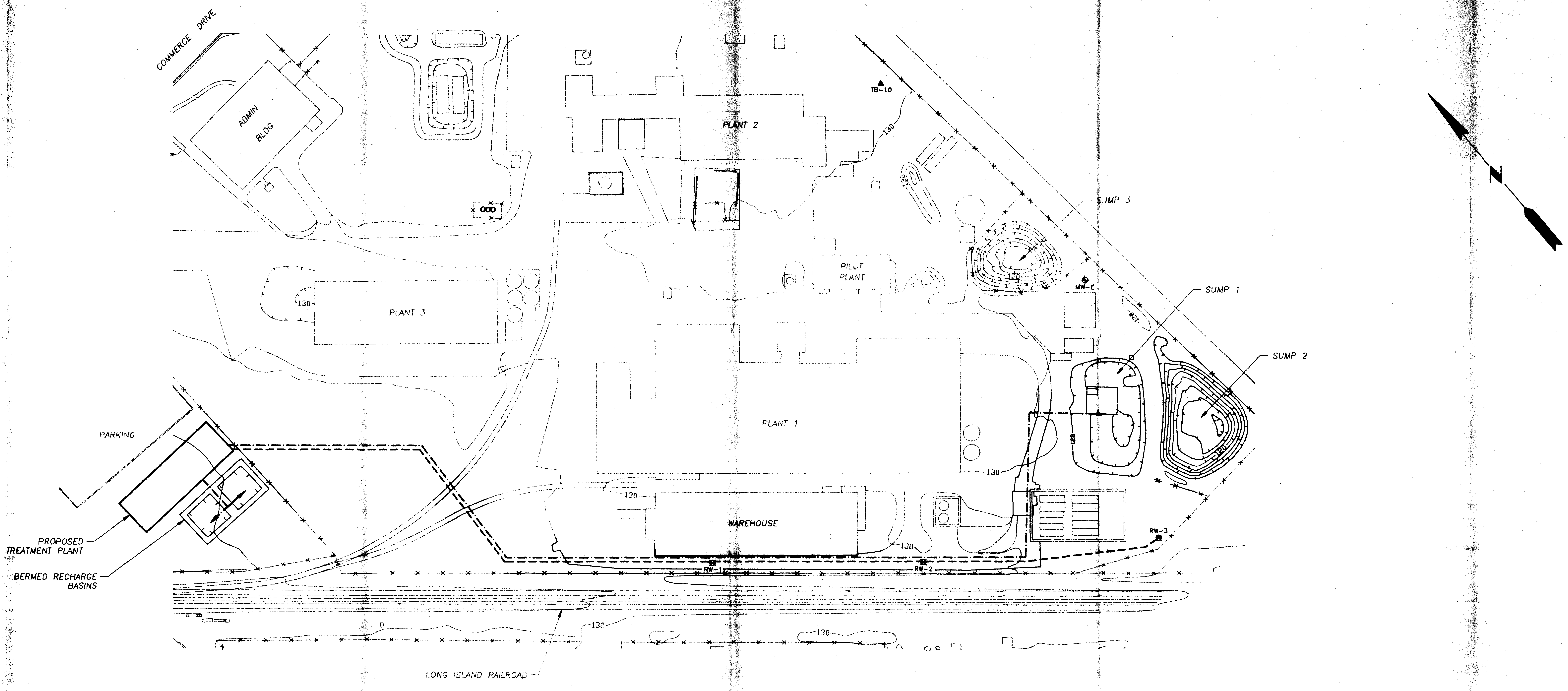
FIGURE

FIGURE 1

QA PROJECT ORGANIZATION
HOOKER/RUCO SITE

REMEDIAL PROJECT TEAM





LEGEND

⊠ RECOVERY WELL

- - - - REMEDIAL SYSTEM INFLUENT PIPING

-·-·- REMEDIAL SYSTEM EFFLUENT PIPING

NOTES:

1. EFFLUENT LINE TO SUMP 1 FOR SOIL FLUSHING IF REQUIRED.
2. CONTOUR INTERVAL IS 2 FEET.

0 60
SCALE IN FEET

DRAWN: M.R.V.
CHECKED: W.K.B.

OCCIDENTAL CHEMICAL CORPORATION
HOOKER/RUCO SITE
HICKSVILLE, NEW YORK

GROUNDWATER REMEDIATION SYSTEM PLAN

DATE	REVISED

PREPARED BY:
LBG ENGINEERING SERVICES, P.C.
Professional Environmental and Civil Engineers
72 Danbury Road
Wilton, CT 06897
(203) 762-5502

DATE: 8/24/94 PLATE: 1 OF 1

ST. PAUL
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NEW JERSEY

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