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PHASE 2 - COMBINED OVERALL SITE MANAGEMENT AND OPERATION AND MAINTENANCE PLAN

GENERAL SWITCH
MIDDLETOWN, NEW YORK

AUGUST 1990

ENGINEERING AND TECHNOLOGY SERVICES
SHAKTI CONSULTANTS, INC.
CHARLESTON, WEST VIRGINIA & JAMESBURG, NEW JERSEY

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The Sampling Plan shall include

> An over-all Site Management Plan. which shall include identification of proposed contractors and subcontractors and their respective responsibilities for performance of sampling, analysis, and monitoring and investigation activities required by this Consent Decree and the curriculum vitae of each contractor or subcontractor expected to participate in the activities required pursuant to this Decree.

The Remedial Design Plan shall include

> A Preliminary Operation and Maintenance Plan which shall describe how the equipment shall be operated and maintained to ensure that the treatment systems are operating at their levels of peak efficiency.

We have elected to combine these two plans in one document.

GENERAL SWITCH, MIDDLETOWN, NEW YORK

COMBINED
OVERALL SITE MANAGEMENT and OPERATION AND MAINTENANCE PLAN

COMBINED
OVERALL SITE MANAGEMENT PLAN
&
OPERATION AND MAINTENANCE PLAN

1.0 SCOPE

The Operation and Maintenance Plan (O&M) describes how the equipment necessary for the Soil and Groundwater Remedies will be operated and maintained in order to ensure that the treatment systems function with the required efficiency. As provided in Section X.C. of the Consent Order, General Switch will revise the O&M Plan, as required, after the laboratory data obtained during the initial testing program of the equipment has been completed.

Samples from the treatment system will be taken to determine the efficiency of the methods. The laboratory identified in the Quality Control Plan has been used by the USEPA and NYDEC for soil and water analyses similar to those envisaged in this program and has a proven high level of expertise. The quality control program that will ensure accurate sample handling and analysis.

2.0 OPERATION MANAGEMENT

- The groundwater from the Parella well will be pumped through a merry-go-round air stripper that will reduce the contaminant concentration in the influent water to below 5 ppb tetrachloroethylene in the effluent.

  The emission of hydrocarbons from the air stripper will require a permit. The air flow leaving the air stripper will be piped through activated carbon and will be below acceptable air criteria effective at that time.

- Solvent-contaminated soil will be treated by excavation of heavily contaminated soils in the areas detailed in the site map, and by soil treatment by mechanical rotor tilling.

- Purging of the contaminants from the soil will then be completed by dispersion of the treated groundwater through the glacial till, leaching out the solvent in each of the three areas of soil contamination. The treated effluent from the air stripper will infiltrate into the tetrachloroethylene contaminated soils on site to induce cleaning of the soils and leaching of the contaminants that will be intercepted by the cone of depression of the Parella well. Groundwater interception using the Parella well will control and intercept the flow of contaminants to downstream receptors and cleanup the aquifer in a closed cyclic process.

- The piping used for infiltrating the treated groundwater into the soil in the hot spots may be used for vapor extraction.

2.1 Procurement and Control of Contractors

The air stripper fabrication and repair of the Parella Well will be subcontracted by General Switch. The responsibility for subcontractor compliance with applicable quality assurance/quality control requirements for the particular task will be retained by the subcontractor. Shakti will specify the performance of appropriate quality requirements to each subcontractor.

To verify subcontractor conformance to project quality assurance/quality control requirements, Shakti will perform inspections, review documentation prepared by the subcontractor and perform audits of subcontractor activities and report the results to the USEPA. Subcontractors will provide access to their work areas and records to Shakti and USEPA for inspection and auditing.

2.2 Site Meetings

Prior to the field program, a meeting will be held between the Project Coordinator and site contractors and between the Project Coordinator and the contract laboratory to ensure that the quality control aspects of the sampling and cleanup are understood. The laboratory will be inspected. The laboratory chosen has a proven high level of expertise and a quality control program that will ensure accurate sample handling and analysis. Site orientation meetings and site safety meetings will be held as detailed in the Health and Safety Plan.

A copy of all plans compiled under the Order will be presented to each contractor prior to site work.

2.3 Designated Work Zones

A site map designating work zones is presented, established prior to initial site entry. All individuals involved with the site must be familiar with it. The three zones are to be connected by Access Control Points to restrict entry and exit. Work zones can be adjusted as more becomes known about the site.

The three areas of soil treatment and the Parella well, known to contain hazardous substances, are designated the Exclusion Zone. This zone may be divided into sub-areas based upon varying levels of hazard and/or the nature of the tasks to be performed. All personnel within the Exclusion Zone must wear the required level of protection based on those site-specific conditions.

The Contamination Reduction Zone is the buffer area that will be drawn and delineated with construction tape 50 feet from the Exclusion Zone. This area provides a transition between contaminated and clean zones. This zone is to contain any decontamination activities deemed necessary and must be separated from the Exclusion Zone by the Hot Line and from the Support Zone by the Contamination Control Line.

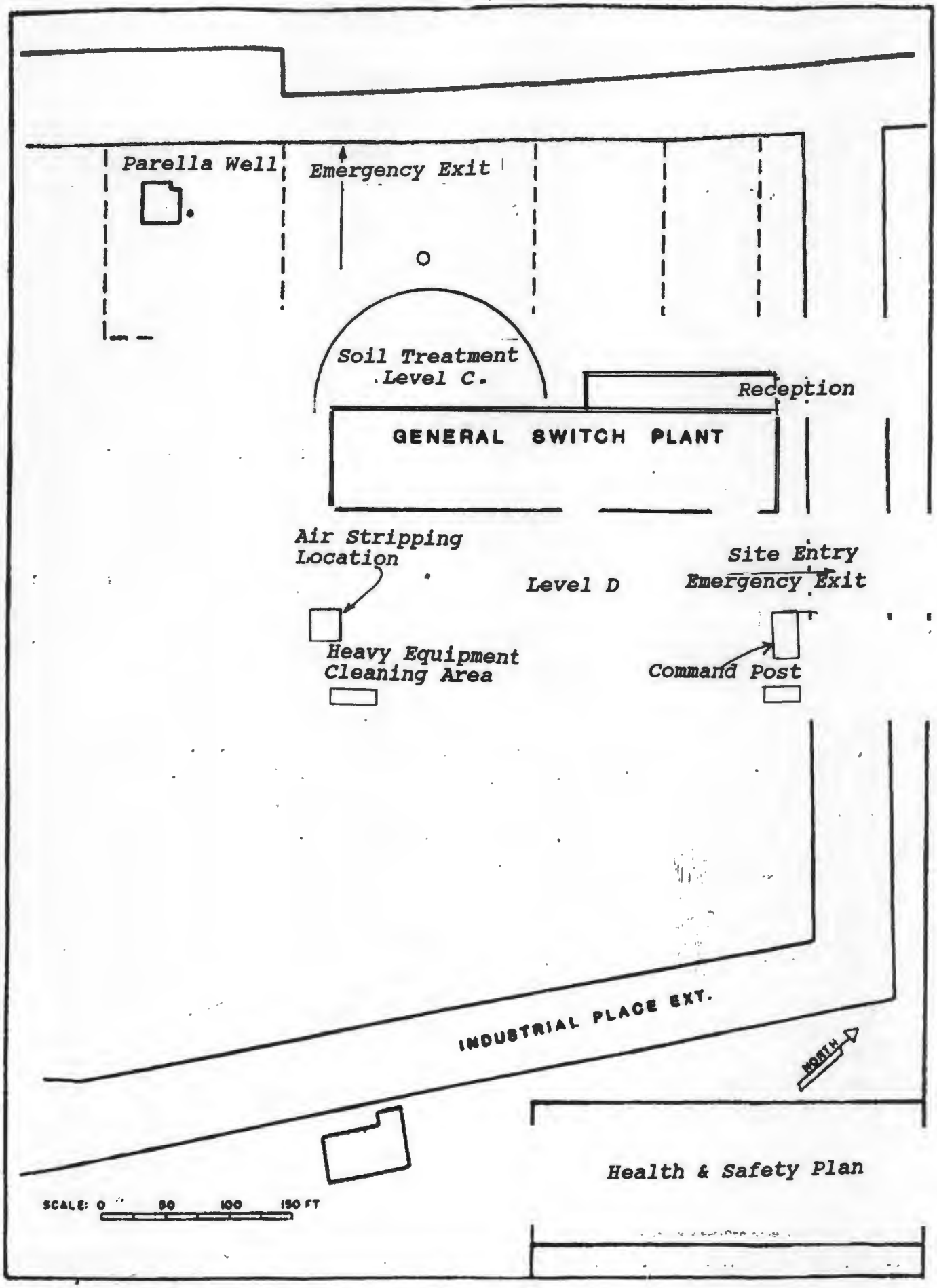
The Support Zone is the rest of the the site and considered to be clean or uncontaminated. The zone contains the command post and site support facilities. It should be positioned upwind of the exclusion zone and will be in the southern parking lot of the site. For additional information see the Site Health and Safety Plan.

2.4 Site Entry and Exit and Security

For site personnel, all site entry and exit to the General Switch site will be through the eastern site gate. Site visitors are required to register with the receptionist at the front door of the facility and await a site guide.

During on-site activities of known or potentially high hazard emergency escape routes are delineated due north to Highlands Avenue and due east through the eastern gate. The rendezvous point is on the lawn outside the front door of General Switch.

All personnel connected with a site and engaging in field activities will be briefed on standard operating safety procedures and any additional instructions contained in the Site Health and Safety Plan before site entry. Further, all personnel upon their initial visit to a site, will read the Health and Safety Plan before performing any site related activities and will confirm that reading with their signature.



Health & Safety Plan

All personnel going on-site must be adequately trained and thoroughly briefed on anticipated hazards, designated level(s) of protection, special equipment to be used, safety practices to be followed, emergency procedures and site communications prior to going on-site.

The Site Health and Safety Plan addresses safe work practices and the availability of emergency medical care and treatment of response personnel including possible exposures to toxic substances and injuries due to accidents or physical problems.

3.0 MAINTENANCE

The air stripper consists of air blowers, water pumps, valves and electrical controls. These will be inspected daily during site operation and parts will be replaced as required. The efficiency of the vapor extraction from the groundwater will be monitored by in-line sampling of untreated and treated water using a Photovac gas chromatograph and sending 1 in 10 samples to the contract laboratory.

The soil treatment will consist initially of excavating and aerating contaminated soils from three excavations. the maintenance required will be to keep the equipment operating efficiently. A trackhoe loader and farm rotor tiller will be employed. The soil will be rotor tilled on a concrete pad in the soil treatment area

After soil tilling the soil will be stockpiled under plastic and tarpaulins and the treated groundwater from the Parella well will be discharged into the excavations. The discharge pipes and valves will be inspected daily during operation to ensure that they are operating safely and efficiently; that they have not become clogged and are not discharging untreated groundwater.

4.0. PROJECT ORGANIZATION

The facility name is General Switch, located on Industrial Place in Middletown, New York. Martin Baker Esq. of Strook, Strook and Lavan is the present counsel of General Switch. The Project Coordinator (Project Manager) is John Bee, President of Shakti Consultants, Inc. John R. Burger, President of TBCGI is the designated Quality Assurance Officer and Health and Safety Officer. The project description appears in the Work Plan.

Figure 1 of this plan shows the project organization chart indicating individual assignments. All participants are directly subject to the requirements of this Quality Assurance/Quality Control Plan.

4.1. Authority and Responsibility

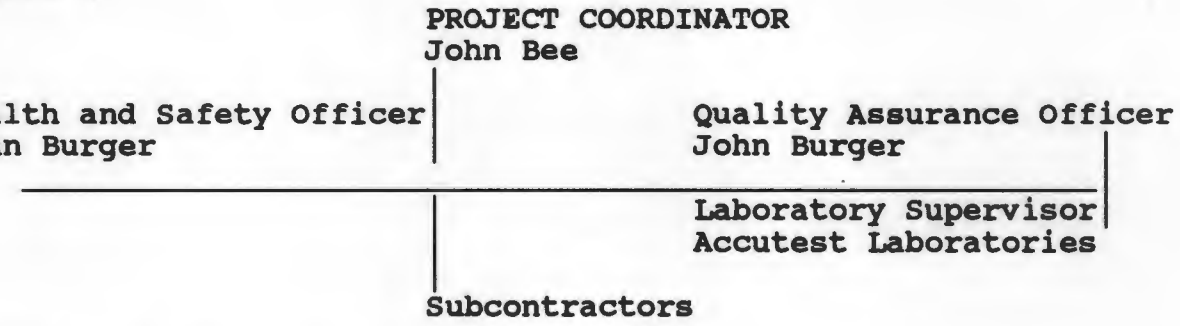
The responsibilities of individual positions for this project are described in the Quality Control Plan and include

Project Coordinator (Project Manager)

The Project Coordinator will have responsibility for technical, financial and scheduling matters. Duties will include the procurement of subcontractor services, assignment of duties to the Project Staff and orientation of the Staff to the needs and requirements of the project, approval of project-specific procedures and internally prepared plans and reports, collection and dissemination of project-related information to USEPA and client and liaison between the project staff and subcontractors and USEPA.

An additional responsibility will be the determination of the effect of nonconformance and changes on the project and the reporting of such items to USEPA.

Figure 1



Health and Safety Officer

The Health and Safety Officer will assume responsibility for developing and implementing the project Health and Safety Plan which satisfies federal and state regulations and is consistent with the nature of the site and are responsible for the performance of health and safety monitoring.

Quality Assurance Officer

The quality assurance responsibilities include the administration of the Project Quality Assurance/Quality Control Program, day-to-day supervision of quality assurance activities, notification of personnel of nonconformances and changes in quality assurance procedures and determination of audit schedule.

The QA/QC Officer does not report to the project coordinator and hence may take independent actions if required for compliance with the Project Quality Assurance/Quality Control Program.

Senior Geologist

John Bee is the Senior Geologist and will take the site samples in performing the cleanup.

Laboratory Supervisor

Accutest Laboratories will have primary responsibility for chemical analyses. Contract laboratory supervisor responsibilities include general supervision of laboratory, collaboration with the Project Group in establishing sampling and testing programs and the scheduling and execution of testing programs.

Contractors

Contractors used to operate the heavy equipment during soil treatment are required to read and conform to the Health and Safety Plan for the site. Contractors employed to renovate the Parella well and fabricate the air stripper will not be exposed to significant volatile organic concentrations and will not require the site medicals. One contractor that may be used is Direct Environmental, Inc.

5.0 PROJECT COMMUNICATIONS

Project related materials which are incoming in the form of correspondence, sketches, logs, authorizations or other information will be routed to the Project Coodinator after the original is marked with the date received and an identifying project number by a member of the Project Staff or a secretary assigned this duty. The Project Coordinator will then determine which personnel should review the incoming materials and will route the materials accordingly.

As soon as practical, incoming correspondence originals will be placed in a project central file. If the correspondence is required by the project personnel for reference, a copy will be made and the original will remain in the central file.

Project related materials transmitted to the USEPA, including correspondence, reports and drawings, will be appropriately reviewed by the Project Coordinator, routed through counsel and copied to General Switch.

Communications relative to the project from third parties (e.g. media, interested individuals and groups) will be referred directly to General Switch management without comment.

5.1 Alterations to The Plan

General Switch will submit to the USEPA for their review and approval, any significant alteration of the site plans. Upon approval these alteration will be incorporated as an Appendix hereto.

6.0 SITE CONTROL: DECONTAMINATION AND DISMANTLING EQUIPMENT

As part of the system to prevent or reduce the physical transfer of contaminants by people or equipment from on-site to off-site areas, procedures must be instituted for decontaminating anything leaving the exclusion area and contamination reduction area. These procedures include the decontamination of protective equipment and also the correct method of removing personnel protective equipment to avoid transfer of contaminants from the clothing to the body. Unless otherwise demonstrated, everything leaving the exclusion area should be considered contaminated and appropriate methods established for decontamination or disposal.

6.1 Decontamination

As the contaminants are volatiles, the primary route of entry into the body is by inhalation. Volatiles are unlikely to be distributed in any significant volume in site soils on clothing or equipment. Thus, an abbreviated decontamination procedure is appropriate:

- Washing or a series of washings using a detergent/water solution
- Allowing the cleaned surface to air dry and volatiles to evaporate in locations away from the breathing zone.

Contaminated Material

The decontamination process uses water and rinse solutions for washing down personnel and equipment. The spent solution, brushes, sponges, containers, stands, etc., used in the decontamination process must, until shown otherwise, be considered contaminated and, therefore, must be properly disposed of in sealed plastic bags and drums. Non turbid wash water may be introduced into the air stripper.

Personnel equipment that has been worn into the exclusion area and subsequently decontaminated upon leaving the area, may need to be used in subsequent operations; therefore, it should be stored for air-drying in the support zone.

7.0 SCHEDULE

Prior to conducting work under the Consent Decree, General Switch will submit a Pump Test Plan, Sampling and Analysis Plan, Quality Assurance and Quality Control Plan, Combined Overall Site Management and Operations and Maintenance Plan and a Health and Safety Plan.

Initial Testing Program

General Switch will build the air stripper prior to the pump test. Following fabrication of the air stripper, the pump test and sampling of neighborhood wells will be conducted along with a demonstration of the feasibility of the soil treatment. General Switch will submit to the USEPA the results of this program in a combined Initial Testing Program Report and Remedial Design Report (RD). The RD Report will consist of the the time schedules for fabrication of equipment and will detail the demonstrated efficiency of the proposed remedial soil and groundwater treatment systems and the plans for any alternative water supply connections along with the appropriate schedules.

Final Inspection Before Site Remediation

General Switch and its contractor will then be available for a Final Inspection in conjunction with EPA and/or its designated representatives and contractors. The Final Inspection will include a walk-through of the entire project to determine project consistency with the RD Report and EPA-approved Work and O&M Plans. Upon EPA approval the cleanup effort will commence.

O&M INSPECTION CHECKLIST

DATE	PARELLA WELL	INFLUENT FLOW	INFLUENT CONC.	EFFLUENT FLOW	EFFLUENT CONC.		AIR PUMP	LEVEL IN TANK	DISCHARGE PIPING COMMENTS

Attachment 2

ATTACHMENT A

STATEMENT OF WORK

FOR

MAINTENANCE OF A QUALITY-CONTROLLED PREPARED SAMPLE CONTAINER REPOSITORY

4/87

Rev: 7/87, 8/87

SECTION E

QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

I. QUALITY ASSURANCE CHECKPOINTS

The key quality assurance/quality control (QA/QC) activities of the Contractor shall be: incoming materials inspection and QC testing of cleaned Lots of containers, including monitoring of QC container storage area. Written records of results of all QC inspections (signifying acceptance or rejection) shall be maintained as part of the permanent Repository files. All QA/QC records (i.e., preparation/QC logbook, analytical data, data tapes, storage log) shall be kept in the Repository in a central location.

Following is a description of the two primary QC checkpoints.

A. Incoming Materials Inspection

The Contractor shall inspect a representative item from each case/carton of containers and component materials received from a vendor, to check for conformance with contract specifications. Any deviation shall be considered unacceptable, and materials shall immediately be returned to the vendor for replacement. The Contractor shall maintain a log of incoming shipments (see Figure 17, Incoming Materials Inspection Log), in which cases/cartons shall be identified by material type, vendor purchase order number and delivery date. The Contractor shall indicate on this log the date of incoming inspection and acceptance or rejection of the material.

B. Quality Control Inspection of Cleaned Lots of Containers

1.

Following container cleaning and labeling, the Contractor shall randomly select two containers from each container Lot to be used for quality control purposes. A notice, as shown in Figure 11, shall be placed in each case from which QC containers have been removed. The two categories of QC containers are: Analysis QC Containers and Storage QC Containers.

a. Analysis QC Containers

One selected QC container per Lot shall be designated as the Analysis QC Container. The Analysis QC Container(s) shall be analyzed by the Contractor to check for contamination, prior to releasing the container Lot for shipment. The QC analyses procedures to be used by the Contractor for determination of extractable organics, pesticides, volatiles, metals, and cyanide are specified in Part II of this section. This series of analyses shall constitute the QC check for Superfund Analysis QC Containers.

1. QC Clearance

If the representative Analysis QC Container(s) passes the QC check, the related Lot of containers shall be assigned the appropriate QC number (see 2., b., following) and released from Inventory Control Point No. 3 - Prepared and Awaiting QC Clearance. The Contractor shall label one face (excluding top and bottom faces) of each case of the Lot with the QC Clearance number and move the Lot to Inventory Control Point No. 4 - Cleared for Shipment. The appropriate QC number shall then be entered in the preparation/QC logbook (see Figure 20) to indicate clearance or rejection of the Lot for shipment.

2. QC Clearance/Rejection Number

The QC number shall be a six-digit number sequentially assigned to Lots that have undergone QC analysis. The first alphabetical character shall be the container type letter (from Figure 9), the next four digits shall be assigned sequentially in numerical order (starting with "0001" for the first Lot to undergo QC analyses), and the last character shall be either a "C" to indicate clearance, or an "R" to indicate rejection (see c., below).

NOTICE

One or more containers have been removed from this case in accordance with the quality control provisions of this program. You are to accept this case as if it contained the full complement of containers. Should you have any questions regarding this, you may contact:

(Contractor address and phone)

- OR -

Talia Peters, Repository Project Coordinator
USEPA Sample Management Office
Contract Laboratory Program
P.O. Box 818
Alexandria, Virginia 22313
703/557-2490 or FTS 557-2490

Figure 11

3. QC Rejection

If the Analysis QC Container is found to be contaminated per the specified QC analysis procedures, the appropriate QC Rejection Number shall be assigned and entered in the preparation/QC Log (see Figure 20). The Contractor shall then reclean/reprepare and rerun QC on the entire Lot of containers from which the contaminated container originated, at no additional cost to the government. Container labels shall be either removed or obscured and the entire Lot returned to Inventory Control Point No. 1 for reprocessing under a new Lot Number. In this event, the Storage QC Container for that Lot shall be removed from the storage area and returned with the Lot for reprocessing.

A laboratory standard and a blank shall be run with each QC analysis. All QC analysis results shall be kept in chronological order by QC report numbers in a central QC file. As specified, the QC numbers assigned shall be documented in the preparation logbook, indicating acceptance or rejection, and date of analysis, as shown in Figure 20.

The Contractor shall not, under any circumstances, release a container Lot for shipment prior to QC analysis and clearance. Once the containers have cleared QC, the Contractor shall store the containers in a contaminant-free area until packaging and shipment.

b. Storage QC Containers

One selected QC container per Lot shall be designated as the Storage QC Container. The Storage QC Container shall be separated from the Lot after cleaning and labeling and stored by the Contractor in a designated contaminant-free storage area, which shall be continuously monitored for volatile contaminants. The date the storage container is placed in the storage area shall be entered into the Storage QC Container logbook (see Figure 19).

Upon EPA Project Officer request, the Contractor shall remove the Storage QC container from the storage area and analyze the container using the QC analysis procedures specified for that container type. Such analysis shall be completed and data reported to the Project Officer within ten (10) days following the analysis request. Analysis of the Storage QC Container will be indicated if contamination of the particular container Lot comes into question at any time pursuant to Contractor shipment. Upon removal, containers shall be logged out of the storage area.

NOTE: QC Storage Container [illegible] the contract QA/QC requirements and shall be performed by the Contractor as required at no additional cost to the government.

The designated storage area for the Storage QC Containers shall be monitored continuously. A pre-cleaned, QC cleared 40 mL vial filled with ASTM Type I organic-free water shall be placed in the storage area. These vials shall be changed at one-week intervals. The removed vial shall be subjected to the volatile organics QC check procedure described in Part II of this Section. Any peaks shall indicate contamination. Contaminants, if present, shall then be identified and the results included in the monthly report. In the event that contaminants are detected, the Contractor shall notify the EPA Project Officer immediately.

II. QUALITY CONTROL TESTING

PROCEDURES

The type(s) of QC tests applied correlates with the type of container being tested and its future use in sample collection. The required QC tests are for determination of: extractable organics, pesticides, volatile organics, metals, cyanide, and conductivity. Quality control tests shall be run according to the container type and related sample type utilizing the specified Method(s), as described following.

A. Determination of Extractable Organics/Pesticides - Quality Control Procedure for Superfund Container Types A, E, F, G, H, J, and K.

1. Sample Preparation

- Add sixty (60) mL of pesticide-grade methylene chloride to the container and shake for two minutes.
- Transfer the solvent to a Kuderna-Danish (KD) apparatus equipped with a three-ball Snyder column. Concentrate to less than 10 mL on a steam bath.
- Add 50 mL of pesticide-grade hexane to the KD apparatus by slowly pouring down through the Snyder column. Concentrate to less than 10 mL to effect solvent replacement of hexane for methylene chloride.

- Concentrate the solvent to 1 mL using a micro-Snyder column.
- Prepare a solvent blank by adding 60 mL of pesticide-grade hexane directly to a KD apparatus and proceed as above.

2. Extractable Organics QC Check

- Inject 3 uL of solvent into a gas chromatograph mass spectrometer (GC/MS).
- GC/MS operating conditions are listed in Figure 13. NOTE: As an alternative to the column specified in Figure 13, the following column may be used.

  Column - 30 m x 0.25 mm ID (or 0.32 mm) bonded-phase silicone-coated fused silica capillary column (J&W Scientific DB-5 or equivalent). A film thickness of 0.25 micron may be used.
- Any peaks found in the container solvent that are not found in the solvent blank or with peak heights or areas not within ± 50% of the blank peak height or area shall be cause for rejection.
- Perform tentative identification and tentative quantitation of any contaminant(s) that cause rejection of a container Lot.
- A standard mixture of the 10 semivolatile organic compounds listed in Figure 12 with concentrations in the 20-50 ppb range must be analyzed to ensure that the required sensitivities are achieved.
- A blank shall be run with each analysis.

3. Pesticides QC Check

- Inject 1 uL of solvent into a gas chromatograph (GC) equipped with an electron capture detector (ECD).
- GC/ECD operating conditions are listed in Figure 14.
- Any peaks found in the container solvent that are not found in the solvent blank or with peak heights or areas not within ± 50% of the blank peak height or area shall be cause for rejection.
- A standard mixture of the 5 pesticide organic compounds listed in Figure 12 with concentrations in the 0.10 to 1 ppb range must be analyzed to ensure that the required sensitivities are achieved.
- A blank shall be run with each analysis.

B. Determination of Volatile Organics - Quality Control Procedure for Superfund Container Type B (including 40-mL QC storage monitoring vials) and Container Type D.

- Fill the container with ASTM Type I organic-free water.
- Analyze for volatile organics by EPA Method 624 (44 FR 69464, December 3, 1979) using GC/MS with the operating conditions specified in Figure 15.
- Any peaks not found in the blank, or with peak heights or areas not within ± 50% of the blank peak height or area shall be cause for rejection.
- Perform tentative identification and tentative quantitation of any contaminant(s) that cause rejection of a container Lot.
- A standard mixture of the 5 volatile organics listed in Figure 12 with concentrations in the 20-50 ppb range shall be analyzed to ensure that the required sensitivities are achieved.
- A blank shall be run with each analysis.

C. Determination of Metals - Quality Control Procedures for Superfund Container Types C, E, F, G, J, and L.

- Add 50 ml of ASTM Type I deionized water to the container and acidify with 0.5 ml metals-grade HNO_3. Cap and shake well.
- Treat the sample as a dissolved metals sample. Analyze the undigested water by applying the EPA method specified in Figure 16. The detection limits must not exceed the detection limits shown in Figure 16.
- Concentration at or above the detection limit for each parameter (listed in Figure 16) will be cause for rejection of the Lot of containers.
- A set of standards in the expected working range and a blank must be analyzed with each analytic run. The acid matrix of the standards and blank must match that of the samples.

D. Determination of Cyanide - Quality Control Procedures for Superfund Container Types C and L

- Cyanide is to be determined by EPA Method 335.1, 335.2, or 335.3[1] by placing 250 ml of ASTM Type I deionized water in the container. Add 1.25 ml of 6N NaOH. Cap the container and shake vigorously for two minutes. Analyze an aliquot by the EPA method selected. The detection limit must be 10 ppb or lower.

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[1]U.S. EPA, 1979, Methods for Chemical Analysis of Water and Wastes EPA-600/4-79-020, Washington, D.C.

- A blank must be run by analyzing an aliquot of the ASTM Type I water used above.
- A set of standards in the expected working range must be analyzed with each run along with the blank.
- The detection of contaminants of 10 ppb cyanide will be cause for rejection of the Lot of containers. (Note: Contamination could be due to the container, the cap, or the NaOH).

Compounds Analyzed To Demonstrate Sensitivity

Volatile -

- Methylene Chloride
- Acetone
- Toluene
- 2-Butanone
- Trichloroethene

Semivolatiles -

- Benzoic Acid
- Pentachlorophenol
- Bis(2-ethylhexyl) phthalate
- Di-n-butyl phthalate
- Nitrobenzene
- Diethyl phthalate
- Hexachlorobenzene
- 2,6-Dinitrotoluene
- 4-Bromophenyl phenyl ether
- 4-Chloroaniline

Pesticides -

- Endrin
- 4-4'DDT
- Heptachlor
- Dieldrin
- Aldrin

Figure 12

OPERATOR _____ DATE _____

JOB NUMBER _____ SAMPLE IDENTIFICATION Container lot number

SOLVENT Hexane _____ ANALYTICAL METHOD 625, 44 Fr 69464, 12/3/79 Extractable Organics Fraction

COLUMN
- Type Glass
- Length 6'
- Diameter 2 mm ID
- Liquid Phase (% wt) 3% SP 2250
- Support Supelcoport
- Mesh 100/120

CARRIER GAS Helium
- Rotameter 60
- Inlet Pressure, psig 15
- Flow Rate, mL/min 30

SCAVENGER GAS _____

SPLIT _____

FID GAS
- Hydrogen, mL/min _____
- Air, mL/min _____

CHART SPEED, cm/min _____

DETECTOR Mass Spectrometer
- Range 50-350 a.m.u.
- Attenuation _____

TEMPERATURE, °C
- Detector _____
- Injection Port 225
- Column
  - Initial 70°/3 min
  - Program 10°/min
  - Final 270°C

INSTRUMENT HP 59938 GC/MS

Figure 13
GC/MS Operating Conditions for Extractable Organics QC Analysis

OPERATOR _____ DATE _____

JOB NUMBER _____ SAMPLE IDENTIFICATION Container lot number

SOLVENT Hexane _____ ANALYTICAL METHOD 608, 44 FR69464, 12/3/79 Pesticide Fraction

COLUMN
- Type Glass
- Length 6'
- Diameter 4mm ID
- Liquid Phase (% wt) 1.5% SP2250/1.95% SP2401
- Support Supelcoport
- Mesh 100/120

CARRIER GAS Nitrogen
- Rotameter _____
- Inlet Pressure, psig _____
- Flow Rate, mL/min _____

SCAVENGER GAS _____

SPLIT _____

FID GAS
- Hydrogen, mL/min _____
- Air, mL/min _____

CHART SPEED, cm/min 1 cm/min

DETECTOR Electron Capture
- Range 10^{-12}
- Attenuation 16

TEMPERATURE, °C
- Detector 350
- Injection Port 250
- Column
  - Initial 200 isothermal
  - Program _____
  - Final _____

INSTRUMENT Varian 3700 GC

Figure 14

GC/ECD Operating Conditions for Pesticides QC Analysis

OPERATOR _____ DATE _____

JOB NUMBER _____ SAMPLE IDENTIFICATION Container Lot No.

SOLVENT ASTM Type I Water ANALYTICAL METHOD 624, 44 FR 69464, 12/3/79 Volatile Organics Fraction

COLUMN
- Type Stainless Steel
- Length 8'
- Diameter 2mm ID
- Liquid Phase (% wt) 1% SP-1000
- Support Chromosorb W
- Mesh 60/80

CARRIER GAS Helium
- Rotameter 60
- Inlet Pressure, psig 15
- Flow Rate, mL/min 30

SCAVENGER GAS _____

SPLIT _____

FID GAS
- Hydrogen, mL/min _____
- Air, mL/min _____

CHART SPEED, cm/min _____

DETECTOR Mass Spectrometer
- Range 40-300 a.m.u.
- Attenuation _____

TEMPERATURE, °C
- Detector _____
- Injection Port 150
- Column
  - Initial 70/15 min
  - Program 10/min
  - Final 220

INSTRUMENT HP 5993 B GC/MS

Figure 15
GC/MS Operating Conditions for
Volatiles QC Analysis

ANALYTICAL METHODS FOR METAL ANALYSIS

Element	Methods[1]	Detection Limit, ug/L
Aluminum	200.7	80
Antimony	204.2	5
Arsenic	206.2	5
Barium	200.7	50
Beryllium	200.7 or 210.2	1
Cadmium	213.2	1
Calcium	200.7 or 215.1	500
Chromium	200.7 or 218.2	10
Cobalt	200.7	20
Copper	200.7	10
Iron	200.7	50
Lead	239.2	4
Magnesium	200.7 or 242.1	100
Manganese	200.7	10
Mercury	245.1	0.2
Nickel	200.7	20
Potassium	200.7 or 258.1	1000
Selenium	270.2	2
Silver	200.7 or 272.2	5
Sodium	200.7 or 273.1	1000
Thallium	279.2	5
Vanadium	200.7	10
Zinc	200.7	10

Figure 16

Metals QC Analysis Requirements

[1] U.S. EPA, 1979, Methods for Chemical Analysis of Water and Wastes EPA-600/4-79-020, Washington, D.C.

III. REPOSITORY EVALUATION PROCEDURES

The government may periodically evaluate the Contractor's facility/equipment and performance, through two methods: 1) on-site inspection of Repository facility, and 2) evaluation of Repository QC analysis. Such evaluation shall occur no more frequently than quarterly.

A. On-site Inspection

The EPA Project Officer (PO) and/or PO representatives may periodically visit the Contractor's facility to audit adherence to contract requirements and contract or SOPs.

The site visit will include a walk-through of the Contractor's facility and inspection of any or all Repository records, including: Prep/QC Logbook, QC data, GC/MS data tapes, Storage QC Container Log, Delivery Request Log, Incoming Materials Inspection Log, and Inventory Transfer Log. The Contractor shall be required to make such records available for inspection during EPA on-site visits.

B. Performance Evaluation (PE) Analysis

The Performance Evaluation (PE) sample set will be sent to the Contractor no more frequently than quarterly to verify the Contractor's continuing ability to produce acceptable analytical results. Contractors are required to return PE analytical data within fifteen (15) calendar days of receipt. Analysis requirements and instructions will be provided with the PE samples.

If the Contractor performs unacceptably, the Contractor will be immediately notified by the Project Officer. A Contractor so notified may expect, but the government is not limited to, the following actions: a site visit, a full data audit, and/or laboratory analysis of a second PE sample. Failure by the Contractor to take corrective actions and/or failure of two successive PE sample analyses will require that the Contractor discontinue provision of containers, or shall provide analyses through alternate means (as approved by the PO) at no additional cost to the Government until such time as the Project Officer has determined that the Contractor may resume analyses.

Curriculum Vitae of Contractors

Shakti

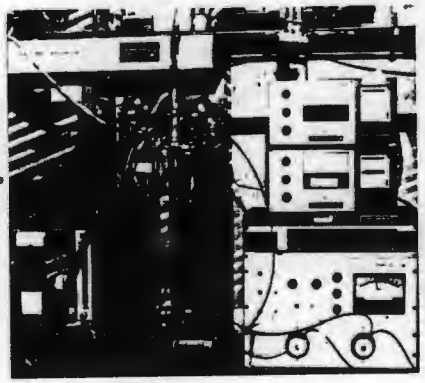
ENVIRONMENTAL ENGINEERING SERVICES

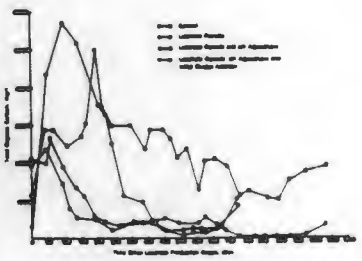
About the Firm

Shakti Consultants, Inc. is an independently owned, private consulting firm with demonstrated capabilities in reducing the risks and liabilites associated with past spills and handling hazardous materials. It is dedicated to assisting Industry in complying with complex environmental laws.

Risk Control Services

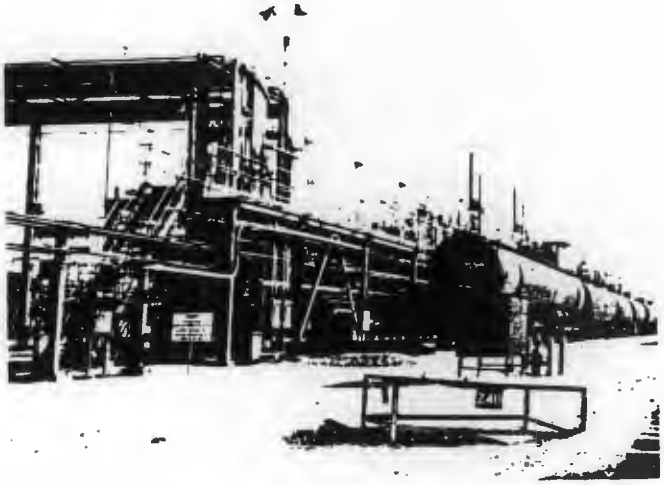
- *Experienced in Spill Prevention and Hazardous Materials Management*
- *Providing Environmental Audits of compliance and liability*
- *Offering Risk Control and Training programs.*





Emergency Spill Response and Project Management Services

- *Available 24 hours a day. Experienced in Spill Responses and Project Management of Federal and Industrial resources at numerous hazardous materials spills and clean-up actions.*
- *Disaster Response: damage assessment and cost control, disaster management and public health risk assessment.*
- *Knowledgeable of the engineering geology, civil engineering, waste disposal and treatment methods used in Site Remedial Actions.*



For more information please contact

Shakti Consultants, Inc.

Environmental Monitoring for Air, Soil, Surface Water and Groundwater

- *Pollutant sampling and analysis methods to determine the Extent of Risk or Liability*

Contaminant Geology

- *Senior Hydrogeologist available for soil and groundwater investigations and the design and installation of abatement technology for hazardous materials spills; hazardous waste site investigations; enforcement and remedial actions.*

Environmental Compliance

- *Determining Environmental Compliance. Expert witness and consultant on numerous enforcement cases for the United States Environmental Protection Agency.*

Remedial Action

- *Responding to accidental spills of hazardous materials, reducing health hazards from uncontrolled waste sites, tank spills: providing hazard assessment and cost-effective cleanup.*

Intergovernmental and Government - Industrial Negotiations

- *Negotiator and coordinator representing Federal agencies and Industrial clients, as part of the project management for hazardous material spills and cleanup operations.*

Shakti Consultants, Inc.

SHAKTI CONSULTANTS INC.

185, Gatzmer Avenue
Jamesburg, NJ 08831
(201) 521-2322

John Bee **Principal of Shakti Consultants**

Registration: Certified Professional Geologist
American Institute of Professional Geologists, #6173

Fields of Competency:

Oil and Hazardous Materials Spill Response and Project Management: Senior emergency response team member and on-site coordinator of Federal or industrial resources at numerous hazardous materials spills and clean-up actions. Familiar with pollutant sampling and analysis methods, waste disposal and treatment methods.

Environmental Compliance Expert witness. Witness and consultant on numerous enforcement cases for the United States Environmental Protection Agency and the chemical industry.

Intergovernmental and Government-Industrial Negotiations: As part of project management for hazardous material spills and cleanup operations acted as negotiator and coordinator representing Federal agencies and industrial clients.

Engineering Geology: Site investigation for roads, bridges, dams, high-rise structures, dry docks and slope stability analysis.

Contaminant Geology: Project Manager and Senior Hydrogeologist for soil and groundwater investigations and the design and installation of abatement technology for hazardous materials spills; hazardous waste site investigations; enforcement and remedial actions.

Environmental Monitoring of Air, Soil, Surface and Groundwater Experienced in spill prevention and hazardous materials management; disaster response, damage assessment and cost control, disaster management and public health risk assessment.

Author and Lecturer on Hazardous Materials and Hydrogeology; Geophysics: Regional Groundwater Use Policy; Environmental Law and Regulations. Conference Organization and Public Relations.

Experience Summary:

Mr. Bee's 15 years of professional experience heve made him completely familiar with hazardous substance spill scenarios and cleanup operations. In addition, he has extensive experience in writing, editing and publication of professional reports and books and in expert testimony.

In early 1987, Mr Bee founded Shakti Consultants and has had experience dealing with very small to very large corporations in areas such as RCRA compliance, contingency planning for RCRA and SARA Title III, emergency response, hazardous waste management training, public relations, chemical industry audits, groundwater investigations and spill cleanup and remedial design.

As a Senior Geologist and Project Manager for Union Carbide, he directed the site investigations, spill responses and remedial actions for numerous environmental problems and coordinated compliance with the hazardous materials spill and hazardous waste regulations facing this corporation.

As a consultant to the US Environmental Protection Agency his experience, as a Senior Geologist and Project Manager, included major sites involving air, surface water, groundwater and solid waste management. He has directed the investigation and remedial action at over fifty hazardous material spills and hazardous waste sites.

As a Senior Emergency Response Team Member, his experience includes the management of responses to chemical fires, oil spills, hazardous materials transportation incidents and air pollution episodes in New York, New Jersey, Ohio, Louisiana, Texas and Puerto Rico. Areas of specific training and experience include geology, hydrology, analytical chemistry and toxicology, civil engineering, environmental monitoring, emergency response techniques, site safety supervision, the engineering and operation of cleanup equipment such as air strippers, wastewater treatment plants, the preparation of proposals and the accounting of multi-million dollar site operations. Skills used include an intimate knowledge of environmental law, regulations and enforcement policy.

Experienced in scientific editing and publishing: For four years, and with two leading publishing houses, Mr. Bee was responsible for all levels of scientific book productions including editing articles on geology, hydrology, oceanography and atmospheric science; supervising freelance copy editors, reference editors and illustrators; supervising typesetters; and coordinating printers and binders.

For three years as a Soils Engineer and Geologist in England and Canada, Mr. Bee performed site investigations for civil and environmental engineering projects for power stations, docks, roads, dams, quarries, earth-retaining structures and slope stability, spoil tips, groundwater contamination, mapping and aeriel photographic interpretation.

Credentials:

BSc. Geology and Zoology with Honours. University of London, 1971.

Graduate Courses, Environmental Science, McMaster University, 1975 and College of Graduate Studies, Charleston, WV, 1983.

Certified Professional Geologist #6173, American Institute of Professional Geologists. 1980

Executive Committee Member, American Institute of Professional Geologists, North East Section, 1983.

Guest Lecturer: New York Polytechnical Institute and Redmond Foundation, International Association of Fire Fighters.

Instructor of Emergency Response Branch, USEPA.

National Water Well Association Member.

Board Member, Middlesex 208 Study (Clean Waters Act - Water Resources), 1983. Member, Jamesburg Water Commission, N.J., 1983

Councilman, Jamesburg, NJ., 1983

Employment History:

1987 - Present: President, Shakti Consultants Inc., 52 Mountaineer Drive, Elkview, Charleston, WV 25071; 185 Gatzmer Avenue, Jamesburg, NJ 08831

1984 - 1987: Senior Geologist, Union Carbide Corporation, Environmental, Health and Safety Division, Technical Center, South Charleston, WV 25303.

1982 - 1984: Senior Hydrogeologist, Consultant to USEPA. Roy F. Weston, Inc. Spill Prevention and Emergency Response Division, Raritan Center, NJ.

1980 - 1982: Hydrogeologist, Consultant to USEPA. Ecology and Environment, Inc. Raritan Center, NJ.

1977 - 1980: Senior Science Editor, Academic Press, 110 Fifth Avenue, New York, NY 10005.

1976 - 1977: Geologist, Pollution Probe, Queens Park, Toronto, Ontario, Canada.

1973 - 1975: Engineering Geologist, Peto Associates, 65 Cartwright Avenue, Toronto, Ontario, Canada.

1971 - 1973: Engineering Geologist, Wimpey Laboratories, Hayes, Middlesex, England.

Key Projects:

Project Manager and Senior Geologist for the following Hazardous Materials Responses:

Project Management and Groundwater Investigation

Wallkill, New York -Responded under contract to the USEPA Region II to a report of well contamination through a housing estate in Wallkill, New York. Conducted a soil and groundwater site investigation to assess the hazard of the 1/4 mile-long tetrachloroethylene plume that had infiltrated through the glacial till and was moving through a fractured bedrock aquifer away from the source. Identified potentially responsible parties and assisted EPA Enforcement in formulating a Consent Order for further site assessment and interim cleanup. Assisted in an Immediate Removal Action under Superfund to contain the spread of the groundwater contamination and provide an interim piped municipal water supply to the homeowners. Subsequently was hired by one of the PRPs to address remedial action and formulate a consent agreement and release with the USEPA. A multi-stage air stripper will be used to treat the groundwater plume. The treated water will be used to flush the soil contamination to the interceptor well. The procedures were described in a detailed work plan.

Moira, NY - PCB waste clean-up - The site was three lagoons containing PCB oils that had contaminated a wetland area. Conducted an extent of contamination survey. Remedial operations involved a marsh cleanup, coagulation of contaminated soil, and the initial design and coordination of a hazardous landfill, costing and accounting.

Lipari Landfill, NJ - At this Superfund site, to address the impact of this hazardous waste landfill, the study involved an extent of contamination survey, drilling and sampling program, design of groundwater remedial measures, leachate characterization and treatability, air, leachate and soil sampling, geophysical mapping, aerial photograph observation, and costing and accounting in a remedial investigation and feasibility study that determined the most cost effective remedial measure: the installation of a slurry wall and cap.

Development of groundwater monitoring sample tube devices - multilevel samplers.

GEMS Landfill, NJ - Conducted air, soil, water sampling, risk assessment and safety planning. Developed drilling plans and estimates. Conducted hydrologic investigation, resistivity survey, feesibility and cost effectiveness study to address the need for groundwater interception by gravity drains, wellpoint system, interceptor wells or a slurry wall at this hazardous landfill. Developed design sketches and specifications.

Hicksville MEK Spill, Long Island, NY - Preliminary remedial funding proposal and design. Hydrogeologic evaluation, design and implementation of extraction well system to intercept MEK plume in the groundwater. Air stripping pilot study. Sampling. Public Relations plans. Liaison with State, Local, and Federal air, solid waste and hazardous materials response authorities.

Upjohn, Puerto Rico - Directed the response to a carbon tetrachloride spill into groundwater in a Karst environment. Site activities involved: ground water monitoring, well condemnation, and emergency water supply. Liaison with Puerto Rican authorities for the U.S. EPA. Vacuum extraction of volatiles from soil. Groundwater extraction and clean-up contractor supervision. Formulation of Regional Groundwater Use Strategy.

Vega Alta, Puerto Rico - Response to trichloroethylene spill into groundwater affecting public and private supply wells in a Karst terrain. Alternative clean-up options considered: activated carbon, air-stripping, spray irrigation. Regional groundwater monitoring, extent of contamination survey.

Goose Farm and Bridgeport Oil & Rental, NJ - Technical evaluation of groundwater contamination and remedial operation.

Expert Witness

TOSCA - Expert Witness -Served as an expert consultant in the case Joy Mfg v Aliff, a PCB/Furan/Dioxin contaminated site in a karst environment under Consent Order by the USEPA Region III. The site involved a PCB cleanup in an industrial facility with surface water, groundwater and particulate contamination.

Groundwater - Expert Witness -Served as an expert witness in the contamination of the drinking water wells of individual homeowners. Municipal and industrial sludge was landfarmed onto a hillside above the wells near Princeton, West Virginia.

Parkersburg, WV -Environmental impact of a treatment plant upon the surface and groundwater resources of the area.

ECRA and other Policy Considerations

Involved in the site assessment, negotiation and cleanup at several sites involving environmental regulations governing real estate transactions (ECRA etc.) under New Jersey law. Provided audits for chemical companies in other States.

ECRA/Audits

Audits and Spill Prevention: Presented seminar on Audits and Spill Prevention in conjunction with the Audit Programs of Union Carbide and Occidental Chemical. The seminar addressed the Design of an Audit System. Experience from the Occidental Audit Program, Air Pollution Regulations and Audits, Water Pollution Regulations and Audits, RCRA Regulations and Audits and Industry Programs in Process Safety.

Confidential Chemical Plant, WV -Site assessment for the purchase of a major chemical plant near Parkersburg, West Virginia Confidential Chemical Plant, WV. Conducted an audit to assess environmental compliance and permits and review the methods and technology applied to attain compliance. Researched past spills, RCRA permits. Met with local government officials, water supply officials, reviewed State files under freedom of information act.

Confidential Client, WV -Report on the environmental liabilities associated with the purchase of a site near Bridgeport, in West Virginia. Conducted a site audit and sampling of a confidential site in West Virginie. Obtained background information from WVDNR Hazardous Waste & Groundwater Sections, WV Geological Survey, and County Sanitarian under the freedom of information act. Wrote assessment of liabilities involved in purchase of the property
ECRA Site Investigations/Remedial Actions:
Hillside, New Jersey: Conducted the site investigation and developed the remedial plan for the leaking underground tanks at a facility in Hillside , New Jersey. Testing tanks, tank removal groundwater recovery and treatment. We are continuing with the the investigation and remedial action proposed.

Longport, NJ -Environmental assessment of a marina involving abandoned underground tanks and real estate negotiations under ECRA. An ECRA site assessment report and remedial action.

Roselle, NJ -ECRA property transfer and soil cleanup for an electroplating facility

ECRA Property Transfers -Industrial real estate assessment and property transfers in Trenton, Edison and Clifton, NJ.

Union, New Jersey -Completed the background research of the soils, geology and hydrology for the ECRA submission of site.

Hydrogeological assessment - For facilities in Clifton, NJ, Edison NJ, Paterson, NJ., Elizabeth NJ., Bay Avenue, Port Elizabeth, NJ, involving petroleum hydrocarbon and heavy metal contamination.

Underground Tank Spill, Linden NJ -Completed soil borings and installed monitor wells at a New Jersey site in accordance with the requirements of the New Jersey DEP. Soil and water samples were screened for volatile contaminants using a Photovac 10S50 portable Gas Chromatograph. Initial; indications are that while the situation in regard to groundwater contamination is serious, from previous experience with these same soils for Union Carbide and Dana Transport in this same area, contaminated groundwater is often held in the perched groundwater, in a somewhat immobile state above the weathering zone of the Brunswick Shale. The high concentration of contamination indicate that little has moved away from the site and may require the pumping of a sump and groundwater/soil treatment to diffuse the situation.

Underground Tank Spill -ECRA groundwater monitoring Fairview, NJ.

Underground Tank Spill, Hillside, NJ -A soil and groundwater survey was conducted to determine the lateral and vertical extent of the spill using a Photovac 10S50 Portable Gas Chromatograph. Soil samples were taken from the soil borings for Laboratory analysis according to NJDEP protocol.

Monitor wells were placed in the soil borings. Most of the soil borings were noted to be free of volatile organics. The spill appears localized around the tank site and is at the water table. The site investigation continues towards a report with proposed remedial measures for NJDEP approval.

Extent of Contamination Survey, Teaneck, NJ -In one day the environmental liabilities of an old fuel oil depot were surveyed. Ten backhoe pits were dug during the site investigation. Soil and water samples were screened using a Photovac 10S50 Portable Gas Chromatograph. Water samples were sent for analysis. A summary was provided of the liabilities and the cleanup measures required.

References: Ron Dana, United Technologies, Main Street. Mail Stop 25, Hartford, Connecticut 06101. Charles Grigsby, BASF Corp, 8 Campus Drive, Persippany, NJ 07054, Ms. Dana Evans, Evans Enterprises, Willow Tree Plaza, 575 South Willow Street, Manchester, NH 03103. Richard Lovett, Longport Marine, Longport, NJ. Stephen Binikos, Utilities Associates, 1475 Palisade Avenue, Teaneck, NJ 07666

Hazardous Waste Management

Familiar with the RCRA regulations. Specialize in a complete package of Spill Prevention, Contingency Planning and Hazardous Materials and Waste Management Training given to several companies in 1987. Conducted a seminar on Hazardous Waste Management for the College of Graduate Studies, Charleston WV in June 1988.

RCRA Closure, Confidential Client, WV and NJ -Retained to address the monitoring and closure of a RCRA lagoon and the investigation and negotiation under a consent decree under Superfund. Developed proposal for solidification in place. Provided closure plan and safety plan, designed landfill to obtain authorization from WVDNR.

Financial Assurance -Developed articles of financial assurance and insurance for RCRA Lagoon Closure.

RCRA Lagoon, Holz Pond Project -Completed a pump test at Holz Pond on the nested wells. Demonstrated the hydrologic isolation of the lagoon. In the absence of a comprehensive operations manual for the data logger to trouble-shoot the transfer of data from the data logger to display in graphic form.

RCRA Monitoring Wells -At Holz Pond retrofitted sampling pumps for RCRA monitoring

Monitor wells -Installed at an Avenel, NJ facility. Soil and water samples were screened using a Photovac 10S50 Portable Gas Chromatograph. Groundwater samples were tested according to NJ Tier 1 protocol

Underground Tanks -See ECRA

Hillside, NJ -Responded to leaking underground tanks: tanks were tested excavated and removed, the extent of soil and groundwater contamination is to be defined, a groundwater/fuel oil recovery operation and cleanup is in progress.

Underground Tanks, Confidential Client -Directed a program to address underground tank storage regulations that involved the testing of tanks, removal of disused tanks and the monitoring of the remaining tanks.

Contingency Planning -Completing the Prevention Plan, Contingency Plan and Training Plan for a Nitro, WV truck washing facility.

RCRA Contingency Plan -Developed Contingency plan and trained facility personnel, Weirton WV

References: Ron Dana, Dana Container, 210 Essex Avenue
Avenel, NJ 07001.

For Union Carbide

Directed the operations at major Union Carbide sites that required both the management skills of negotiation with the respective State agencies, supervision of contractors and Union Carbide technical staff, scheduling, cost accounting, and administration and the technical skills of spill site investigation, scientific report writing and remedial design.

Carbon Products facility, Union Carbide, Fostoria, Ohio Directed the Remedial Investigation as part of a Consent Decree being negotiated between Union Carbide and Ohio EPA for this site with soil and groundwater contaminated with volatile organics. The job included negotiation with the facility and the State, supervision of contractors, budgeting and supervision of technical activities following strict procedures.

The investigation proved that the contaminants in the shallow, intermediate and deep aquifers on site were restricted to plant property. Thus the public and regulatory liabilities were dramatically curtailed and major involvement was avoided in a regional groundwater study proposed by the Ohio EPA.

Seven sources of volatile contaminants were detected ranging from leaking underground tanks to process spills. Remedial measures were developed.

Napoleonville Saline Intrusion, Louisiana Acted as project manager to address a saline intrusion into the groundwater and marsh surrounding the Napoleonville site of UCAR Pipelines.

Through field work conducted at Napoleonville proved the integrity of the existing partial slurry wall around the facility.

Thus the facility, in accordance with a State agreement, will be able to comply with Louisiana's 8-29 regulations by completing the slurry wall around the rest of the facility at a cost of $350,000 and avoid lining the Brine Ponds on site at a cost of more that $3.2 million. Supervised the remedial site investigation. Demonstrated the extent of saline contamination of the soils and groundwater around and under the site. Supervised the hydrogeologic field work and botanical review of vegetation damage.

Formulated the overall remedial strategy for cleanup of the saline intrusion: a cost effective method of collection of saline contaminated groundwater. The method involved the installation of flexible PVC field drains into the marsh to collect the leachate mobilized by soil treatment of the contaminants in the soil and collecting the mobilized solutions for disposal in a deep injection well.

Taft, Louisiana. Supervised a major program in RCRA groundwater compliance at the Taft facility. Continued progress according to State-defined schedules in the investigation and remedial action at 5 separate sites in the facility.

Conducted Groundwater Quality Assessments as required by Louisiana State DEQ. Developed the Remedial Action Plan for three abandoned burning pits that involved dewatering of the formations in and around the old Burning Pits and interception of the contaminant plume.

Transportation Spill Planning

Development of spill response planning for major pesticide shipments.

Geophysics

South Charleston facility, West Virginia Completed a magnetometer survey and background information review that gave the particular site a clean bill of environmental health.

Seadrift, Texas & Napoleonville, Louisiana, Charleston WV Familiar with state-of-the-art computer assisted environmental sensing. Operated a Electro-Piezometer Data Logger for monitoring pump tests and other environmental measurements

Terrain Conductivity Survey, Napoleonville, LA Completed a geophysical terrain conductivity survey that defined the extent of the saline intrusion within 3 days of field work. Terrain conductivity surveying is a remote non-destructive geophysical method used to quickly investigate the surface soil and pore water conductivity of a site. It has in the last few years been used extensively to track the migration of contaminants from landfills and hazardous material spills.

Spill Prevention

As a Spill Prevention Inspector, under contract to the U.S. EPA, Completed over fifty inspections and reviews of spill prevention plans and major and minor facilities throughout New York and New Jersey.

Emergency Response

As a Senior Emergency Response Team Member, managed the following hazardous materials responses:

Chemical Control Site, Elizabeth NJ - Acted as Scientific Support Coordinator for USEPA Region II, at this major hazardous waste site fire. Conducted priority pollutant survey, and produced Scientific Support Coordinator's Report to assess the public health risk resulting from the fire and associated air pollution episode and remaining waste drums.

Varick Street, New York , NY - Extent of contamination survey; pesticide laboratory.

Dermal Toxicity - Assisted in developing tables on dermal toxicity of compounds.

Pesticide Fire, Monroe Twp. NJ - Coordination of police, fire, civil defense, local, state and federal agencies at a pesticide fire in Monroe Township, NJ. Sampling and cleanup. USEPA spokesman and liaison with private citizens. Supervision of analyses.

Solvent Recovery - Response to fire at Solvent Recovery Plant, Linden, NJ. Air monitoring.

Brandis Landfill - Air monitoring, Staten Island, NY.

Secaucus, NJ - Spill response and groundwater recovery operation for 1,000,000 gallons of spilled diesel fuel.

Raritan Center, Edison, NJ - Spill response and PCB cleanup.

Carteret, NJ - Pyridine tank truck spill and cleanup.

Diamond Shamrock - Dioxin contamination site. Public relations plan.

Engineering Geology

As a Senior Geologist, involved in the following:

Albany, NY - Damage assessment of a water supply dam following flooding.

Rio Blanco, Puerto Rico - Assessment of damage, landslide activity/slope stability assessment and proposed rehabilitation of the Rio Blanco hydroelectric dam and penstock following landslide.

Training

As an Instructor to Emergency Response Branch, Region II USEPA conducted the following courses:

Groundwater Pollution and Monitoring Course
Environmental Monitoring and Sampling Seminars
Site Costing and Accounting under 311 Act and Superfund
Geophysics in Hazardous Material Investigation.
Emergency Response Management.

Trained in Field Monitoring and Sampling of Hazardous Materials, Emergency Response to Chemical Spills, Emergency Medical Treatment, Respiratory Protection and Site Safety.

Public Relations Coordinated the public relations efforts at numerous environmentally sensitive sites.

Public Relations Training
Developed and presented a seminar on Public Relations at a Chemical Spill for the Center for Science and Technology, WV State University, May 1988.

As an Author and Lecturer on Hazardous Materials Hazardous Waste and Hydrogeology; Geophysics; Regional Groundwater Use Policy; Environmental Law and Regulations.

University of McMaster and Toronto, College of Graduate Studies, Charleston, WV, Gilford County, NC
Organized numerous conferences and seminars, training courses and lectures on Emergency Response to Chemical Spills, Public Relations at Chemical Spills, Hazardous Waste Management, Spill Site Investigation, Audits and Spill Prevention, Health and Safety in the Workplace and Waste Minimization.

Emergency Response For a major corporation, developed plans to assist plant managers to respond effectively to the environmental imperatives of various spill situations and to provide timely, safe and effective site assessment, spill management and cleanup. Some 30 briefs were prepared that included:

Measures to Contain a Spill Situation
The Site Assessment of a Spill
Health and Safety at Spill Sites
Standard Operating Procedures for Environmental Sampling
A Standard Tracking Procedure to Ensure Quality Analytical Results
Public Relations Efforts at a Spill Site

Seminars

A Seminar Series was arranged for 1988 for the Science and Technology Center established by the College of Graduate Studies and WV Institute of Technology. The seminars were aimed at continuing education of the members of the chemical and associated industries regulated by environmental laws.

April 7	Emergency Response to Chemical Spills
May 5	Community Relations & Communications at a Chemical Spill
June 2	Hazardous Waste Management and Hazardous Waste Issues
Sept 8	Spill Site Investigation and Cleanup
Oct 6	Audits and Spill Prevention and
Nov 3	Health and Safety Training for the Chemical Industry
Nov 16	Waste Minimization

Shakti developed lists of sponsors and potential speakers, approached sponsors and obtained their support for the seminars;

Sponsors included: The Science and Technology Center, The West Virginia College of Graduate Studies, Charleston Section of The American Institute of Chemical Engineers, Union Carbide Corporation, Kanawha Valley Section of The American Chemical Society, Occidental Chemical Company, Meyer, Darragh, Buckler, Bebenek & Eck, Jackson & Kelly, Currey Communications, Inc, E.I. Du Pont de Nemours and Co, Monsanto Corporation, The West Virginia DNR, USEPA Region III, American Congress of Governmental Industriel Hygienists. Speakers included Rob Wheeler (NIOSH), Ken Ellison (WVDNR), Bruce Smith EPA Region III, Joe Wisuri, Steel Tank Institute, Peter Hutter, Vern Lloyd, Don McCloud (Occidental) K.C. Lee, Ran Berglund (Union Carbide). For each seminar a manual was provided and specific presentations were made by Shakti consultants (see brochure).

Guilford County Health Dept -Conducted Emergency Response Seminar and Spill Site Investigation Seminar in June, 1988.

Groundwater Training -Camp Dawson, September 28, 1988: Provide a hydrogeologist with 15 years experience to provide approximately 50 WVDNR inspectors groundwater training relating to their particular regions.

References: Betty Braxton, Guilford County Health Dept., 301 Eugene Street, Greensboro, NC 27401. Dr Charles Ware, Center for Science and Technology, Big 6, State Capitol, Charleston WV. Frank Pelurie, Groundwater Section, West Virginia DNR

Chemical Control Site, Elizabeth NJ - Acted as Scientific Support Coordinator for USEPA Region II, at this major hazardous waste site fire. Conducted priority pollutant survey, and produced Scientific Support Coordinator's Report to assess the public health risk resulting from the fire and associated air pollution episode and remaining waste drums.

Varick Street, New York , NY - Extent of contamination survey; pesticide laboratory.

Dermal Toxicity - Assisted in developing tables on dermal toxicity of compounds.

Pesticide Fire, Monroe Twp. NJ - Coordination of police, fire, civil defense, local, state and federal agencies at a pesticide fire in Monroe Township, NJ. Sampling and cleanup. USEPA spokesman and liaison with private citizens. Supervision of analyses.

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Sponsors included: The Science and Technology Center, The West Virginia College of Graduate Studies, Charleston Section of The American Institute of Chemical Engineers, Union Carbide Corporation, Kanawha Valley Section of The American Chemical Society, Occidental Chemical Company, Meyer, Darragh, Buckler, Bebenek & Eck, Jackson & Kelly, Currey Communications, Inc, E.I. Du Pont de Nemours and Co, Monsanto Corporation, The West Virginia DNR, USEPA Region III, American Congress of Governmental Industrial Hygienists. Speakers included Rob Wheeler (NIOSH), Ken Ellison (WVDNR), Bruce Smith EPA Region III, Joe Wisuri, Steel Tank Institute, Peter Mutter, Vern Lloyd, Don McCloud (Occidental) K.C. Lee, Ron Berglund (Union Carbide). For each seminar a manual was provided and specific presentations were made by Shakti consultants (see brochure).

Guilford County Health Dept -Conducted Emergency Response Seminar and Spill Site Investigation Seminar in June, 1988.

Groundwater Training -Camp Dawson, September 28, 1988: Provide a hydrogeologist with 15 years experience to provide approximately 50 WVDNR inspectors groundwater training relating to their particular regions.

References: Betty Braxton, Guilford County Health Dept., 301 Eugene Street, Greensboro, NC 27401. Dr Charles Ware, Center for Science and Technology, Blg 6, State Capitol, Charleston WV. Frank Peluria, Groundwater Section, West Virginia DNR

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A Cost Effectiveness Study of Water and Soil Decontamination at the Goose Farm Uncontrolled Hazardous Waste Site, NJ. Richard Chapin & John Bee, USEPA 1981.

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Specialized Training

Groundwater Modelling Trained in the development of groundwater models including 2-D leachate generation and dispersion models and models to assess the feasibility of remedial measures; and 3-D contaminant transport models. These programs help determine the ownership of groundwater contaminant plumes and their potential impact and assist in selecting the appropriate groundwater interception remedies, Waterloo University, 1986.

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Field Monitoring and Analysis of Hazardous Materials, USEPA Edison, NJ, 1980

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