DELPHI

Automotive Systems

April 30, 1999

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REGION 8

Ms. Mary Jane Peachey, P. E.
Regional Hazardous Waste Remediation Engineer
NYS Department of Environmental Conservation
6274 East Avon-Lima Road
Avon, New York 14414

Re: Delphi Automotive Systems LLC (Delphi)
Lexington Avenue, Rochester NY facility
Remedial Investigation/Feasibility Study Work Plan

Dear Ms. Peachey:

Enclosed are three (3) copies of the draft Remedial Investigation/Feasibility Study (RI/FS) Work Plan which we promised to provide in our December 17, 1998 letter to Dr. Kelly Cloyd of your office. The schedule for submission of the Work Plan was extended until April 30, 1999 by Dr. Cloyd in my conversation with him on March 19, 1999.

Under cover of letter from outside legal counsel Barry Kogut, we will forward our comments on the most recent draft RI/FS Consent Order which was sent by DEC Attorney Maura Desmond. The final Department-approved RI/FS Work Plan will be attached to the Order signed by Delphi.

Please call me at 647-4766 if you or any of the other Department representatives working on this matter have any questions as a result of a review of the Work Plan. I will call Dr. Cloyd on May 10,1999 to set up a meeting to discuss the Work Plan sometime later in May.

Sincerely,

Richard C. Eisenman

Richard C. Eisenman
Senior Environmental Engineer

c: Maura C. Desmond, Esq., DEC Division of Environmental Enforcement
Mr. Richard Elliott, P. E., Monroe County Department of Health
Dawn E. Hettrick, NYS Department of Health

Draft dated 04/30/99

RI/FS WORK PLAN
DELPHI AUTOMOTIVE SYSTEMS
LEXINGTON AVENUE FACILITY
ROCHESTER, NEW YORK
REGISTRY SITE #828064

by

Haley & Aldrich of New York
Rochester, New York

for

Delphi Automotive Systems
Rochester, New York

File No. 70014-052
April 1999

DRAFT dated **04/30/99**

30 April 1999
File No. 70014-52

Delphi Automotive Systems
PO Box 92700
Rochester, New York 14692-8800

Attention: Richard C. Eisenman
Senior Environmental Engineer

Subject: RI/FS Work Plan
Delphi Automotive Systems
Lexington Avenue Facility
Rochester, New York
Registry Site #828064

Ladies and Gentlemen:

Haley & Aldrich is pleased to provide the attached Work Plan for concluding the remedial investigations and feasibility study (RI/FS) for the Delphi Automotive Systems Lexington Avenue Facility located at 1000 Lexington Avenue in the City of Rochester, New York.

Sincerely yours,
HALEY & ALDRICH OF NEW YORK

Thomas D. Wells
Sr. Environmental Geologist

James G. Talpey
Sr. Environmental Geologist

Jeffrey E. Loney
Vice President

C:

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I. INTRODUCTION

1.1 Project Background and Purpose

This Work Plan has been prepared in accordance with the terms of a Consent Order between Delphi Automotive Systems LLC (Delphi) and the New York State Department of Environmental Conservation (NYSDEC) pertaining to the Delphi Lexington Avenue Facility located at 1000 Lexington Avenue in the City of Rochester, Monroe County, New York ("RI/FS Order", Index # B8-0531-98-06).

Delphi Energy & Engine Management Systems, a division of Delphi Automotive Systems LLC (Delphi) is the owner of the property located at 1000 Lexington Avenue (hereinafter referred to as the "site"). The site was owned by General Motors Corporation (GM) and operated by GM's Delphi Energy & Engine Management Systems Division prior to the transfer of the facility to Delphi on 1 January 1999. For administrative convenience, the owner of the facility is referred to in this work plan as Delphi regardless of the timeframe discussed.

Delphi has voluntarily performed remedial investigations and actions at the facility since 1981. Previous investigation findings were summarized in a report entitled "Data Summary Report, Previous Remedial Investigations, Delphi Automotive Systems, 1000 Lexington Avenue Rochester, New York, Site No. 8-28-064" dated September 1998. Recent comprehensive groundwater sampling data are contained in the report entitled "East Parking Lot Area Well Installations and January 1999 Groundwater Sampling Events, Delphi Automotive Systems, Lexington Avenue Rochester, New York" dated February 1999. A detailed review of the history of the site was reported in the "Site History Document, Delphi Automotive Systems, Lexington Avenue Facility, Rochester, New York, Site No. 8-28-064" dated February 1999.

This Work Plan reviews the previous investigative findings and identifies those areas of the site which warrant further investigation. It describes the work scope proposed for completing the Remedial Investigation (RI) and the technical procedures to be followed in implementing the work. The Work Plan also describes the process to be followed in completing the Feasibility Study (FS) and selecting the appropriate remedial alternative for environmental conditions at the site.

Implementation of this RI/FS Work Plan and implementation of the selected remedy will address outstanding regulatory issues at the Lexington Avenue site under New York State's Inactive Hazardous Waste Disposal Site Program, NYSDEC Industrial Hazardous Waste Management Corrective Action Program (the state RCRA program), and the Petroleum Spills Assessment Program.

1.2 Project Schedule

The project schedule is presented in Table I. The schedule is based on the assumption that the Consent Order to which this Work Plan is attached is signed by 31 July 1999.

The supplemental RI activities proposed in this Work Plan will begin in the summer of 1999. This will allow for completion of proposed investigations of possible off-site impacts from onsite environmental conditions by the end of the calendar year. Setting this priority will help determine whether enhancements to the existing groundwater migration-control system Interim Remedial Measure (IRM) are needed in the short term to address offsite migration of site contaminants. An Interim RI Report will be prepared in the first half of 2000 summarizing the results and findings of investigations of offsite areas and the outdoor, onsite areas. The interim report will present an evaluation of the need for making enhancements to the existing migration–control system or for adding new IRMs.

The RI activities proposed for locations inside the facility buildings will be initiated during 2000. The specific indoor investigations to be completed in 2000 are listed in Table I. The schedule for completing remedial investigations inside facility buildings will depend on the accessibility of areas to be investigated and Plant production schedules. Drilling locations inside the Plant specifically proposed in this Work Plan were selected during a recent walk-through on the basis of available access, and most of the proposed locations will be accessible during 2000 and 2001.

However, at this time it appears that some indoor areas of potential environmental impact may not be accessible for investigation until after 2001 because of physical access constraints and the need to avoid undue interruption of manufacturing operations. Delphi will consult with NYSDEC on the progress of the work so that the investigations can accommodate both the operational requirements of the facility and the need to avoid any undue environmental impact from deferring the investigations.

Accessibility will depend on factors such as the physical presence of operating manufacturing equipment over the appropriate location for an exploration and the availability of idle (shutdown) periods which will allow for disruptive (dusty or hazardous) investigative activities in areas of active manufacturing operations. The indoor investigation schedule will be coordinated to take advantage of the relocation of manufacturing equipment within the Plant.

If it is determined on or before 31 July 2001 that accessibility issues will require extending the time frame for completing the RI work after 2001, Delphi will submit for NYSDEC's review and approval a revised schedule for completing the RI work. The revised schedule will be submitted within 30 days of determining that an extension is necessary. The schedule shall reflect both the active manufacturing operations at the Plant and the need to avoid any undue environmental impact from extending the period in which to complete the work.

Following completion of the RI work, a final RI Report will be prepared and submitted for NYSDEC review and approval. The RI Report will incorporate the findings summarized in the Interim RI Report and will include the baseline risk assessment. The Final RI Report will be a stand-alone document summarizing the investigative findings and conclusions.

Enhancements to the existing IRMs identified in the RI/FS Consent Order and pilot testing of potential new IRMs will be conducted concurrently with the performance of the RI. As needs arise, Delphi will submit for NYSDEC's review and approval separate Work Plans for implementing any new IRMs, implementing any enhancements to existing IRMs, or conducting pilot tests.

The FS will be submitted within 120 days after Delphi's receipt of the Department's written approval of the final RI Report. The FS Report will summarize the results of IRMs and pilot tests implemented at the site and will propose a final remedy for NYSDEC review and approval. If requested by NYSDEC in writing, an Interim FS Report will be prepared and submitted to NYSDEC following NYSDEC's review and approval of the Interim RI Report.

1.3 Work Plan Organization

This Work Plan is organized into six sections, which are briefly outlined as follows:

- Section I (this section) states the purpose and schedule of the Work Plan.
- Section II provides a summary description of the site, its history, and the IRMs implemented to date.
- Section III lists the regulatory program requirements to be satisfied by the RI/FS work and describes the basic outline of the project's scope and schedule.
- Section IV evaluates each area of potential environmental impact at the site and identifies potential data gaps. The areas of potential environmental impact have been identified using the available testing data and a site historical review summarized in the Site History Document dated February 1999.
- Section V describes the supplemental investigations proposed for completing the RI. The supplemental investigations include delineating offsite groundwater quality and completing the characterization of environmental conditions at areas of the site which may have been environmentally impacted by past facility operations. These areas include the current and former Plant manufacturing-process areas and waste handling areas. In addition, Section V describes the evaluation of potential exposure pathways, and potential risks to human health and the environment.
- Section VI describes work tasks for completing the FS. Feasibility study activities will include evaluating available remediation technologies, assessing the performance of the IRMs implemented to date, performing pilot tests and treatability studies, and identifying a remedial alternative which meets applicable regulatory requirements.

Information contained in the Work Plan appendices includes the Project Quality Assurance Plan, Project Health & Safety Plan, and descriptions of the various technical procedures to be followed in carrying out the work. A Citizen Participation Plan has been prepared as a stand-alone document to accompany this Work Plan.

II. SITE DESCRIPTION

The property (land) owned by Delphi on which the facility is located is hereinafter referred to as the site, and facility buildings are hereinafter referred to collectively as the Plant. The term facility, which connotes the combination of the land, buildings, industrial equipment, driveways, parking lots, utilities, fences, and other structures and equipment present at the site, is hereinafter used most often to mean the enterprise operating at the site.

The site consists of approximately 90 acres located north and south of Lexington Avenue in the City of Rochester, New York. It is bounded on the west by Mt. Read Boulevard, on the north by Driving Park Avenue, on the northeast by an adjacent manufacturing property (American Packaging Corporation), and on the east by a railroad embankment. The portion of the site which contains the manufacturing Plant is bounded on the south by Lexington Avenue; however, the Delphi site also includes an employee parking lot located on the south side of Lexington Avenue. Land use on the properties surrounding the site are industrial and commercial. The site location is shown on Figure 1, Project Locus.

The definition of the site used in this work plan is broader than the description of the site presented in the Inactive Hazardous Waste Disposal Report presented in the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites. The Registry report describes the site (Site #8-28-064) as a former landfill approximately 5 acres in size located in the northwest portion of the Delphi property. This area of the property was later developed and built upon. The Registry report also, however, notes in its description of the site areas of contamination in and downgradient of the Plant which are beyond the limits of the former landfill.

2.1 Summary of Site History and Past Facility Operations

The Plant was built by GM in 1937 and 1938, and manufacturing operations began in 1938. Since 1938, various GM divisions, including Delco Appliances, Rochester Products Division, AC Rochester Division, AC Delco, and Delphi Energy & Engine Management Systems have operated the Plant. The current owner is Delphi Automotive Systems (Delphi).

The former bed of the Erie Canal traversed along the northern border of the site, paralleling Driving Park Boulevard. A canal widewaters present on low-lying land at the northwest end of the site was used as a turn around basin. The City of Rochester filled the former canal bed and drained the widewaters after the canal was rerouted in approximately 1912. GM constructed the current Plant buildings over the time span from 1937 to 1986. GM continued filling of the site during progressive stages of building expansion, as described in detail in the Site History Document dated February 1999.

The Site History Document identifies the known locations of Plant manufacturing processes conducted throughout the life of the Plant, and other Plant features of potential environmental impact. The identified locations of current and former manufacturing-process areas and other Plant features of potential environmental impact are summarized on Figure 2.

The Plant has been used for producing a wide variety of automotive parts. It produced radar and airplane components during World War II, and after that, steel tubing and automotive fuel systems. Automotive fuel systems have been the primary product line since 1945. Engineering operations have been conducted on site to develop and improve the fuel systems.

Plant processes associated with the production operations have included machining and forming of metal parts, punch pressing, operation of tubing mills, metal plating, heat treating, die casting, solvent degreasing, the assembly of finished automotive parts and fuel systems, fuel-systems flow-testing and calibration, engine output testing, and related product engineering and testing.

Delphi and its predecessor GM divisions have conducted subsurface investigations at the site since 1981. Through the course of these investigations, environmental impacts to soil and groundwater have been identified. The impacts have been identified as being related both to site manufacturing activities and upgradient, offsite conditions. Delphi has taken proactive steps to investigate and mitigate manufacturing-related releases. To date, investigations performed by Delphi include testing approximately 590 soil-vapor sample points for volatile organic compounds (VOCs) related to degreasing solvents and petroleum distillates, analyzing 228 soil samples for VOCs, 40 soil samples for metals, and ten soil samples for polychlorinated biphenyls (PCBs), (a total of 278 soil samples have been analyzed), installing 113 groundwater monitoring wells, and conducting periodic groundwater sampling and analysis of the monitoring well network In addition, Delphi has installed, monitored, modified, expanded and improved four interim remedial measures (IRMs) described in the following section.

2.2 Description of Interim Remedial Measures

In response to the findings of environmental investigations conducted by Delphi since 1981, the following interim remedial measures have been implemented at the site.

A. Groundwater Migration Control, Collection and Treatment System

In 1991 Delphi commissioned the design and installation of a migration-control, collection, and treatment system to capture contaminated groundwater moving north from source areas in the plant and prevent offsite migration of contaminated groundwater along the downgradient northern site boundary. The design process included interaction with NYSDEC personnel concerning the characterization of the vertical extent of contamination at the site. Prior to the installation of the migration-control system, Delphi held a public meeting with its neighbors in which representatives of NYSDEC and the New York State Department of Health (NYSDOH) participated.

Installation of the groundwater migration-control system involved construction of a 50-foot-deep, 1200-foot-long migration-control trench near the downgradient site boundary in the spring of 1992. The trench was installed using engineered blasting techniques to enhance bedrock aquifer permeability. Two recovery wells (GR-1 and GR-2) were installed in the trench and groundwater pumping and treatment was initiated in May 1992.

The system pumps groundwater at rates which vary from 20 to 50 gallons per minute (gpm). Only one of the two wells is usually in operation, and the operation periodically switches between wells. Since 1992 over 110 million gallons of groundwater have been pumped from migration-control wells and treated in the on-site treatment system.

Treatment of the recovered groundwater is accomplished using a UV-oxidation system (Peroxidation Systems, Inc. model "Perox-Pure"). Groundwater is pumped into a holding tank and the transferred at a controlled rate to the Perox-Pure system. The treatment system is owned and operated by Delphi personnel and treats about 60 to 80 gpm. The water treatment process involves hydrogen peroxide addition, and exposed to high-intensity UV light which destroys between 95 and 99.9% of the chlorinated VOCs. The treated discharge water is sent directly to the municipal POTW system. Monthly effluent samples are collected, sampled by a NYSDOH-certified laboratory, and the results reported to Monroe County in accordance with the facility's the sewer-use permit.

VOC concentrations detected in recent samples from wells located along the downgradient site boundary are one order of magnitude or more below the concentrations which were detected in samples from those wells collected before the installation and start-up of the migration-control system. Ongoing monitoring indicates that the continued operation of the groundwater migration-control system has been and remains an effective means of controlling the groundwater flow regime hydraulically downgradient of the Lexington Avenue Plant in proximity to the Driving Park Avenue site boundary. The data collected at the site indicate that the system has functioned as intended and acts as a barrier to further off-site migration of contaminants. The data also indicate that the system is capturing groundwater with relatively low levels of contamination from off-site areas along Driving Park Avenue.

B. Light Non-Aqueous Phase Liquid (LNAPL) Recovery Systems

1. Tank Farm Area

An LNAPL recovery system has been in operation at the tank farm area since 1989. LNAPL recovery was initiated to collect a floating product from an overburden plume discovered at the northeast corner of the Plant 1 building. The LNAPL layer consists of a mixture of Stoddard solvent, test fuels, and cutting oils.

The Tank Farm Area LNAPL-recovery system includes three large-diameter recovery wells (RW-101, RW-2, and RW-3) connected by a 400-foot-long gravel-backfilled overburden trench as shown in Figure 2. Initial LNAPL-recovery operations consisted of passive skimming of product from the water table at the three recovery wells. This process recovered approximately 38,500 gallons of product between 1989 and November 1994.

In November 1994 the passive skimmers were replaced with a total-fluids pumping system. Since 1994 the system operation has used a compressed-air-actuation diaphragm pump in recovery well RW-2, located in the center of the trench. The pumping stream is sent to the wastewater treatment building where it mixes with oily process-wastewater and is treated prior to discharge to the municipal POTW.

Overburden groundwater and product levels in the area of the Tank Farm indicate that the pumping from the collection trench is providing capture of the Tank Farm Area LNAPL plume as well as creating groundwater gradients toward the trench beyond the limits of the oil layer. LNAPL continues to be observed in some adjacent overburden piezometers.

2. Building 22

An LNAPL-recovery system has been operating inside Building 22 since 1994. A floating LNAPL layer was discovered in the area in 1992. The product consists of Stoddard solvent (a mineral spirits blend) containing parts-per-million levels of PCB Aroclors 1242 and 1248.

The LNAPL-recovery system consists of a passive product-skimmer and pump installed in Well RW-4 inside the southern end of the Building 22 basement. The product-skimming system continues in operation at present. Approximately 700 gallons of product have been recovered to date.

Delphi plans to expand and reconfigure the system to include vacuum-enhanced total fluids pumping from Wells RW-4 and Well Z. The new system, which is intended to enhance the rate of product recovery, will work using vacuum-enhanced total-fluids pumping. Recovery of product from the pumping stream will be accomplished using an oil-water separator at the AWTA water treatment plant.

C. Soil Vapor Extraction System (Degreaser Study Area 5)

Delphi initiated soil-vapor extraction (SVE) for remedial purposes in Degreaser Investigation Study Area 5 in June 1996. The Study Area 5 SVE system uses 16 overburden wells installed during subsurface investigations performed in Study Area 5 in 1990 and 1991.

Monitoring data indicate that approximately 3,500 pounds of solvent mass were removed during the initial 18 months of operation of the SVE system. Delphi reported results of initial SVE operations to NYSDEC in April 1998.

The SVE system initially operated by withdrawing soil vapor and filtering the vapor stream through activated-carbon canisters to remove TCE and associated solvent vapors. In 1999, the vapor concentrations had diminished to levels where NYSDEC approved direct discharge of vapors without carbon filtration. Current VOCs levels in untreated vapor are low enough to allow discharge without treatment.

The SVE wells are connected by sub-floor piping to a single vacuum blower unit. Individual sampling ports and valves are installed at each extraction well so that vapor and/or aqueous samples can be collected from each well; total-system influent and effluent samples can also be collected. The SVE system is still configured to allow for in-line carbon filter vessels to treat the effluent vapor prior to discharge through the building roof should monitoring results indicate that VOC levels warrant treatment.

The system is checked periodically by Plant personnel, and influent and effluent vapor-phase VOC levels are measured using PID detectors (permitting approximate calculations of mass removal rates and total mass removed). Less-frequent periodic monitoring is conducted in the form of groundwater and LNAPL measurements, periodic groundwater and LNAPL sampling, and periodic sampling and analysis of whole-air samples collected from the pumping stream.

The Study Area 5 SVE system continues in operation. Delphi is evaluating remedial measures to remove LNAPL composed of cutting oils and degreasing solvents present in the overburden and shallow-bedrock units in Study Area 5.

2.3 Upgradient Conditions

Investigations to date have identified impacts to upgradient groundwater quality unrelated to Delphi operations. Contaminants detected in upgradient wells located in the south parking lot (wells SR-11, R-11, and DR-11 and SR-233) include the following compounds and maximum detected concentrations in parts-per-million:

Parameter	Well SR-11	Well R-11	Well DR-11	Well SR-233
1,1,1-TCA	1.6	0.011	ND	ND
1,1-DCA	0.15	0.025	ND	ND
1,1-DCE	0.086	ND	ND	ND
TCE	0.41	0.009	ND	0.040
1,2-DCE	ND	0.007	ND	0.033
Vinyl Chloride	ND	ND	ND	0.011
Acetone	ND	ND	0.42	ND
MEK	ND	ND	0.12	ND
Benzene	ND	ND	0.035	ND
Toluene	ND	ND	0.014	ND
Xylenes	ND	ND	0.005	ND
Arsenic	0.022	ND	NA	NA
Barium	0.07	ND	NA	NA
Chromium	8.2	0.002	0.004	0.004
Copper	0.05	ND	ND	ND
Lead	0.19	0.005	ND	0.003
Mercury	0.01	ND	ND	ND
Nickel	0.22	ND	ND	ND
Tin	ND	1.4	6.0	NA
Zinc	0.81	0.04	0.007	0.022

NA = not analyzed. ND = not detected

The low levels of acetone, benzene, toluene, and xylenes detected in deep-bedrock Well DR-11 are believed to be naturally occurring concentrations derived from the petroliferous shale of the Rochester Formation. The same suite of compounds in similar, dilute concentrations is found in other deep-bedrock wells installed at the site. The deep-bedrock groundwater at the site is also characterized by having a high specific conductance. The methyl-ethyl ketone (MEK) concentration reported above was the lone detection of MEK noted at DR-11; the single detection may have been the result of a laboratory contaminant.

In addition to the above-listed background water quality data, a Rochester Gas & Electric Company power transformer substation is located off the southeast site corner. The substation was originally installed in the 1940's to service the Plant and has since been enlarged to service area businesses and homes. It is believed that this substation is a potential source for polychlorinated biphenyls (PCBs) which have been detected in oily seeps in the

Lexington Avenue sewer tunnel and in a floating oily layer found in some onsite and nearby offsite bedrock monitoring wells.

III. SUMMARY OF DEPARTMENT PROGRAM REQUIREMENTS

The Consent Order to which this RI/FS work plan is attached provides that performance of the work under the work plan shall satisfy the requirements of NYSDEC's Inactive Hazardous Waste Disposal Site Remedial Program (the state "Superfund" program) and NYSDEC's Industrial Hazardous Waste Management Program (the state RCRA program). The Consent Order states that requirements of NYSDEC's Petroleum Substance Spills program may also apply where these requirements are not inconsistent with the requirements of the other two NYSDEC programs specified above.

Delphi proposes to meet its obligations under the Consent Order and the three regulatory programs listed above by conducting the investigation and remedial-action process in a manner to satisfy the requirements of each of these NYSDEC programs. The work plan has been developed according to the NYSDEC requirements for a Remedial Investigation/Feasibility Study (RI/FS) under the state Superfund program, modified to meet the requirements of the NYSDEC RCRA Corrective Action and Petroleum Spills programs. Applying an integrated approach to the work at the site is facilitated by similarities between the Superfund and RCRA program requirements.

Applying an integrated approach to address the requirements of all three NYSDEC programs is intended to achieve the following objectives:

1. Comprehensively address all of potential areas of environmental impact at the site with one remedial program.

2. Satisfy Delphi's obligations under New York Superfund, RCRA, and Petroleum Spills programs with one remedial program.

3. Minimize the duplication of effort that would otherwise be required for administration of separate investigation and remedial-action programs.

4. Maximize the efficiency of project execution and implementation of remedial actions at the site.

5. Enable implementation of integrated remedial actions which will effectively address all environmentally impacted media at the site for which remedial or corrective actions are warranted.

The Region 8 office of the NYSDEC Division of Environmental Remediation (DER) will coordinate review of the performance of project work with other divisions of NYSDEC. Integrated regulatory-agency feedback and correspondence concerning the project will be provided to Delphi from NYSDEC's Region 8 office.

3.1 State Superfund Program Requirements

The State Inactive Hazardous Waste Disposal Site Remedial Program ("Superfund") is implemented through the NYSDEC regulation - 6 NYCRR Part 375. This regulation provides the basic framework for the State Superfund Program. The regulation is supported by related standards, criteria, and policy guidance documents issued by the NYSDEC in the form of Organization and Delegation ("O&D") Memoranda and Technical & Administrative Guidance Memoranda ("TAGMs").

The Delphi site is on the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites as Site # 828064. The NYSDEC has classified the Site as a class "2" site pursuant to ECL-27-1305.4.b. This classification means that the NYSDEC has determined that the Site presents a "significant threat to the public health or environment" for which action is required. Under the State Superfund Program class "2" sites must be evaluated and a remedy selected in accordance with 6 NYCRR § 375-1.10. This will require the performance of a Remedial Investigation/Feasibility Study (RI/FS).

The RI/FS is a two-part process involving an investigation of the nature and extent of contamination (the Remedial Investigation) followed by a detailed evaluation of potentially applicable remedial alternatives (the Feasibility Study). The scope of the RI/FS process shall conform to guidelines developed by the USEPA under the Federal Superfund program as contained in the document "Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA," dated October 1998.

3.2 State RCRA Corrective Action Program Requirements

The RCRA Corrective Action Program is implemented through NYSDEC's 6 NYCRR Part 373 regulations which require evaluation and corrective actions for releases of hazardous waste or constituents from solid waste management units (SWMUs) and other areas of concern (AOCs). The RCRA Corrective Action process is analogous to the State Superfund program. An initial evaluation of potential areas of concern with respect to the nature and extent of releases is followed by an evaluation and screening of appropriate remedial actions (corrective measures). Under the RCRA program, the nature and extent of contamination from SWMUs and AOCs are identified in a RCRA Facility Assessment (RFA) and RCRA Facility Investigation (RFI), and the assessment of appropriate remedial actions is referred to as the RCRA Corrective Measures Study (CMS). The scope of the RFA/RFI process is analogous to the RI process under the Superfund program. The CMS is comparable to the FS under Superfund.

The Delphi facility has been assigned EPA identification number NYD002215234 and it once operated as a Treatment, Storage and Disposal Facility (TSDF) as that term is defined under New York State's RCRA hazardous waste regulations. The facility filed an Interim Status application with the U.S. EPA in 1980, and submitted a Part B application in 1982. In January 1984 EPA issued a RCRA Part B permit to the facility. The permit became effective on 29 February 1984. NYSDEC was involved indirectly in the permitting process, but at the time the state did not have the authority to issue RCRA Part B permits. Therefore the facility was considered Interim Status by NYSDEC.

In December of 1987 NYSDEC requested that the facility submit an application for a Part 373 permit by July 15, 1988. The facility notified NYSDEC that it would not seek a final permit from the state. The facility completed final RCRA closure in 1989. By letter dated July 24, 1990 from Salvatore J. Carlomagno, P.E., Chief, Regional Permit Section, Bureau of Hazardous Waste Facility Compliance, Division of Hazardous Substances Regulation, NYSDEC terminated the facility's authority to operate as a TSDF and advised: "Once the corrective action provisions of HSWA [Hazardous and Solid Waste Amendments] have been met by the facility or determined to be not necessary at the facility, the facility can have their interim status terminated." Performance of the work under this Work Plan will allow the

Delphi facility to satisfy the corrective action requirements of both the federal and state RCRA programs.

3.3 State Spills Assessment Program Requirements

The cleanup of discharges of petroleum is subject to the requirements of Article 12 of the New York State Navigation Law. Remediation of petroleum –impacted media under this state program is under the jurisdiction if the Spills Bureau of the NYSDEC Division of Environmental Remediation.

In May 1988, the facility discovered and reported to NYSDEC the presence of a plume of oil-like product (LNAPL) on the overburden water table at the northeast corner of the Plant 1 manufacturing building. The product was discovered during a tank-removal excavation adjacent to the south end of an above-ground product–storage tank farm. NYSDEC opened spill file #881732 for this occurrence and the facility has implemented an Interim Remedial Measure (IRM) described above in Section 2.2.B.1 to address the LNAPL.

3.4 Scope of the Project

A. Remedial Investigation Program

The Remedial Investigation (RI) program at the Delphi site will be conducted following the basic format developed by the USEPA ("Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA," October 1998), and NYSDEC TAGM HWR-90-4030, entitled "Selection of Remedial Actions at Inactive Hazardous Waste Sites" (May 15 1990). The RI will complete the investigation of all of the potential areas of environmental impact identified at the Delphi site. The RI will also define the sources of contamination, determine the nature and extent of contamination, and evaluate risks associated with the identified environmental conditions.

The RI program will be conducted to meet the requirements for an RFA/RFI under the RCRA Corrective Action program by including within the scope of the work an investigation of SWMUs/AOCs identified as potential areas of environmental impact. The requirements of the NYSDEC spills program will be met in the evaluation of the petroleum impacted media under the only open spill file (# 8801732) for the site.

B. Feasibility Study Program

The Feasibility Study (FS) conducted at the Delphi site will also be conducted in accordance with the referenced NYSDEC and USEPA Superfund guidance documents. The FS will be based on the findings of the RI and include an assessment of relevant NYSDEC Standards, Criteria, and Guidelines (SCGs). It will identify and evaluate remedial alternatives that may be appropriate for the site and possibly include the performance of treatability studies for certain remedial alternatives under consideration.

The FS program will be conducted to meet the requirements for a CMS under the RCRA Corrective Action program by including evaluation of remedial actions for SWMUs/AOCs where appropriate.

C. Public Participation Plan

A Citizen Participation Plan (CPP) has been prepared to accompany this Work Plan and a copy of the CPP is included as Appendix A.

D. Quality Assurance Project Plan

A Quality Assurance Plan (QAPP) has been prepared to govern this Work Plan and a copy of the QAPP is included as Appendix B.

E. Project Planning, Organization and Management

The Project Managers and other personnel responsible for the execution of this Work Plan are listed in the QAPP (Appendix B). Individual responsibilities of the project team members are also described in the QAPP. Resumes of key personnel are included as Appendix C and the Project Health & Safety Plan is included as Appendix D.

IV. DISCUSSION OF AREAS OF POTENTIAL ENVIRONMENTAL IMPACT

This section of the Work Plan presents an evaluation of areas of potential environmental impact identified at the site. The information presented includes:

- a review of previous investigations and summary of the findings, and
- identification of areas of the site and/or gaps in the existing data which require supplemental investigation and characterization.

Supplemental investigations to close data gaps, identify or characterize known or potential sources of contamination, and characterize the nature and extent of contamination, where required, are described in Section V, Supplemental Remedial Investigation Work Plan.

4.1 Review and Summary of Previous Investigations

As a result of the ongoing environmental investigations conducted by Delphi during the time period from 1981 to 1999, extensive soil and groundwater data have been collected. This data has been used in planning the course of the proposed supplemental investigations. The findings of previous investigations are summarized in the Data Summary Report dated September 1998 and in the report on the January 1999 Sampling Events dated February 1999. The following discussion of previous investigations is adapted from the Data Summary Report submitted to NYSDEC in September 1998.

A. Hydrogeologic Investigations

In response to its interpretation of the requirements of the Resource Conservation and Recovery Act (RCRA), Delphi commissioned a hydrogeologic study of the site in 1981. The investigation began with a series of 13 monitoring wells installed around the perimeter of the site and downgradient from the manufacturing buildings. Regular periodic sampling of the 13 original wells for chemical analysis of groundwater was begun in 1981. Groundwater quality data from 1981 through 1988 indicated the presence of contamination by chlorinated solvent compounds at both the upgradient and downgradient site boundaries.

Beginning in 1988, Delphi conducted additional hydrogeologic investigations at the site to delineate the groundwater contaminants and identify source areas. Related investigative activities have continued to the present. Investigations to date have resulted in the installation of a network of 113 wells across the site. A tabular summary of the well network and a brief chronology of the well installations related to investigation of general hydrogeologic conditions at the site is presented on the following page. Well locations are shown on Figure 2.

Groundwater Monitoring Zone Name and Well Name Prefix	Number of Wells	Monitoring Zone Description	Typical Screened Length (feet)	Range of Well Depths (feet)
Overburden (OW, PZ, or VM)	51	Overburden groundwater table	5 - 10	9 - 19
Shallow-Bedrock (SR or PZ)	35	5 ft above to 7 ft below top-of-bedrock *	5 - 20	15 - 37
Intermediate-Bedrock (R)	22	15 to 25 ft below top-of-bedrock	10	29 - 53
Deep-Bedrock (DR)	5	50 to 80 ft below top-of-bedrock	15 - 30	75 - 95

* The shallow-bedrock wells installed adjacent to the seven-foot sewer tunnel near Driving Park Boulevard (PZ-133 through PZ-141) extend 15 feet into bedrock.

The initial hydrogeologic investigations begun in 1988 included soil-vapor sampling, upgrades of the 13 existing wells, and installation of additional monitoring wells with associated soil and groundwater sampling in 1989. Wells installed in 1989 included the 101, 102, 103, 105, 106, and110 well clusters located up- and downgradient of the Plant. The 107, 108, and 109 shallow bedrock (SR-) and intermediate-bedrock (R-) wells were also installed in 1989 at the downgradient site boundary along Driving Park Avenue adjacent to existing overburden well OW-7 and existing shallow-bedrock wells SR-8 and SR-9.

In 1990, intermediate-bedrock wells R-2, R-3, and R-11 were installed adjacent to 1981 upgradient wells SR-2, SR-3, and SR-11. The SR/R-131 and -132 well clusters and shallow bedrock wells PZ-129 and –130 were installed at locations downgradient of the plant, and a deep-bedrock well (DR-105) was installed downgradient of the plant at the105 well cluster.

In 1991, prior to the installation of the migration control system described above in Section 2.2.A, a series of shallow-bedrock piezometers (PZ-133 to –141) was installed along the municipal sewer tunnel which runs beneath the north facility parking lot (the Driving Park leg of the sewer tunnel), and additional deep-bedrock wells were installed downgradient of the Plant at the 103 and 109 well clusters. In 1992, also prior to the installation of the migration control system, two additional deep-bedrock wells requested by NYSDEC were installed at the 108 (downgradient) and 11 (upgradient) well clusters.

Groundwater conditions at three shallow-bedrock wells and one intermediate-bedrock well formerly located on City of Rochester property north and downgradient of the Delphi site were also monitored by Delphi until the wells were abandoned by the City in 1993. Groundwater quality and elevation data from one sampling event conducted in 1995 at three overburden wells installed on the American Packaging Corporation property located adjacent to the northeast (and downgradient) Delphi site boundary were provided to Delphi by American Packaging Corporation, and these data were evaluated and reported during the course of the Delphi site investigations.

Periodic groundwater sampling has been performed each year from 1989 to the present, and all groundwater analysis data for the site have been reported to

NYSDEC by Delphi. The water table is typically found at or slightly above the top-of-bedrock. The depth to bedrock across the site ranges from approximately 4 feet at Well R-3 in the at the southwest corner of the Plant to approximately 23 feet at Well R-105 at the north end of the Die Cast Building.

Hydrogeologic investigations addressing specific source or plume areas at the site are described in the following sections of the work plan.

B. Tank-Farm Area

In May 1988 Delphi discovered and reported to NYSDEC the presence of oil-like product (LNAPL) floating on the overburden water table near the Tank Farm Area. The LNAPL was discovered in the tank-removal excavation for Tank 21 (10,000-gallon UST). A 2-ft. diameter recovery well (well RW-101) was installed in the excavation in August 1988. NYSDEC opened spill file #8801732 for this occurrence and the spill file currently remains open to monitor the progress of the remedial work.

In 1989, Delphi conducted a soil-vapor survey and a test-pit exploration program of the Tank Farm Area. A test pit excavated near the east side of Building 4 encountered an approximately 1-ft. thick layer of LNAPL floating on the water table and Delphi responded by installing a large-diameter product-recovery Well, RW-2, and an ORS product-skimmer pump. A network of overburden piezometers (PZ-111 through -128 and PZ-132) was installed in 1990. A gravel-backfilled trench was installed connecting wells RW-2 and RW-101. Subsequent enhancements to the Tank Farm Area Product Recovery System included the installation of one additional recovery well and a gravel-backfilled trench connecting the new well with the RW-2 - RW-101 trench.

Testing results indicate that the LNAPL is a mixture of Stoddard solvent, test fuels, and metalworking cutting oil. The downgradient limits of the LNAPL are identified as being located on site. LNAPL-recovery operations were initiated in 1989 and continue at present.

C. Degreaser Investigation

In January 1990, Delphi discovered and reported to NYSDEC the presence of soil contamination by degreasing solvents adjacent to the location of one of its decommissioned solvent degreasers. The contamination was discovered during construction activities related to the repair of an adjacent blocked sanitary sewer line. At the request of NYSDEC Region 8 staff, Delphi initiated an investigation of the locations where degreasers had been located within the manufacturing buildings. Haley & Aldrich prepared a work plan dated March 1990 describing the field methodology for initial investigation at the identified degreaser sites, and the work plan was submitted to NYSDEC for its review.

A soil-vapor survey of each identified degreaser location was conducted in 1990 and the results were summarized in the report entitled "Soil Vapor Survey Report, Lexington Avenue Facility, Degreaser Investigation" dated October 1990. The report was submitted to NYSDEC for its review. Soil-gas results from the Degreaser

Investigation delineated six areas warranting further study. These areas are identified as Degreaser Investigation Study Areas 1 through 6, shown on Figure 2.

In January 1991, a soil and groundwater investigation was conducted in Degreaser Study Area 5, where the largest group of degreasers had been located. (Wells installed during the Study Area 5 investigation included VM-209 through SR-208). Delphi prepared and submitted to NYSDEC a Soil and Groundwater Investigation Work Plan dated April 1991 for investigating the former degreaser areas, and soil and groundwater investigations were subsequently completed in Degreaser Study Areas 4 (well SR-208) and 6 (wells SR-231 and VM-232) within Plant 2. A plan for soil and groundwater investigations in Degreaser Investigation Study Areas 1, 2, and 3 inside Plant 1 and for supplemental investigations in Study Area 4 is described in Section V of this Work Plan.

Implementation of the remedial soil-vapor extraction system in Degreaser Investigation Study Area 5 was described above in Section 2.2.C.

D. Building 22 Area

In 1992 a floating product layer composed of Stoddard solvent developed on the water table in two existing wells near the former location of carburetor testing operations in Building 22. Stoddard solvent had been used for flow testing and calibrating of carburetors in Building 22, and subgrade piping had been used to handle the solvent.

Delphi commissioned an investigation of the source and extent of the product in 1993 which consisted of a soil-vapor survey. On the basis of the study results the facility installed shallow-bedrock recovery well RW-4 and overburden piezometer PZ-142 inside building 22 and implemented a passive LNAPL-recovery operation using a product-skimming system in RW-4. (As described in section 2.2.B.2, this system has been in operation since 1994. Delphi will be enhancing this LNAPL-recovery IRM in 1999 by adding vacuum-assisted total fluids pumping.)

PCBs were subsequently detected in LNAPL samples from the wells at concentrations which varied significantly between locations and over time. PCBs were not a component of the Stoddard solvent used in carburetor testing, and no on-site source for the PCBs was known. A soil investigation was performed in 1995 to identify possible source(s) of the PCBs in the subsurface. A total of 23 soil borings were drilled and the soil sampling identified no apparent PCB source areas. Two additional overburden piezometers (PZ-143 and –144) were installed in 1996. LNAPL sampling results for area wells and piezometers through January 1999 indicate that the highest levels of PCBs are present at location PZ-129.

E. East Parking Lot Area Intermediate-bedrock LNAPL

In 1993 during routine groundwater monitoring activities, a floating product layer composed of mineral oil contaminated with PCBs was encountered in intermediate-bedrock well R-2. R-2 is located near the upgradient site boundary at the southeast corner of the site and LNAPL had not previously been present in the well. LNAPL was not detected then, and has not been detected before or since, in the adjacent shallow-bedrock well SR-2.

In 1993, Delphi began additional on-site investigations of the source and extent of the LNAPL in the intermediate-bedrock unit in this part of the site. Monitoring wells SR-233, SR/R-234, and SR/R-235 were installed in 1995, and wells SR/R-236, R-237, and R-238 were installed in 1997. Five additional wells (R-241, -242, -243, and -244 and SR-245) in the East Parking Lot Area and two additional bedrock wells (R-239 and-240) north of the east parking lot were installed in December 1998 in accordance with the "Work Plan for 1998 Explorations East Parking Lot Area" dated October 1998. The 1998 well installations and most recent sampling results were reported to NYSDEC in a report entitled "East Parking Lot Area Well Installations and January 1999 Groundwater Sampling Events" dated February 1999.

Results of investigations performed to date indicate that the Lexington Avenue sewer tunnel, which is constructed in the intermediate-bedrock zone along the south site boundary, exerts an influence on groundwater and LNAPL migration. Groundwater elevations in nearby monitoring wells appear to indicate flow of groundwater towards the tunnel. LNAPL containing PCBs were detected in two intermediate-bedrock wells installed on either side of the Lexington Avenue tunnel at locations between well R-2 and the RG&E transformer station located south of the Delphi site on the south side of Lexington Avenue. PCBs were also detected in a sample collected from an oily seep in the tunnel at a location adjacent to the substation. The substation is believed to be a potential source of the PCBs detected in the East Parking Lot Area intermediate-bedrock LNAPL. LNAPL containing PCBs has been detected only in intermediate-bedrock wells located in close proximity to Lexington Avenue. However, LNAPL containing chlorinated VOC contaminants is present in other intermediate-bedrock wells in the East Parking Lot.

Supplemental investigations into the source and extent of LNAPL found in the intermediate-bedrock wells on this portion of the site will be performed as part of the off-site well installations described in Section V of this Work Plan.

F. Former Plating Area

In 1995, plating operations were relocated from an area in Plant 2 to a different part of the Plant, and plating equipment was removed from the area. Soil and groundwater sampling was performed in 1995 in the former Ionic III zinc plating and dichromating area in conjunction with the removal of the floor slab and containment structures for the former plating equipment.

Metals contamination was detected in soils within a limited area beneath one former plating line. Metals concentrations above TAGM 4046 levels were detected in soils, but contaminant concentrations were relatively low. The extent of impacted soils was defined. The concrete floor was replaced and resealed, eliminating exposure pathways for personnel engaged in routine plant manufacturing activities.

Groundwater monitoring wells located adjacent to and downgradient of the former plating area were sampled. Metals were detected at concentrations above NYSDEC GA standards (which are standards for groundwater used as a source of drinking water) in half of the overburden groundwater samples, but were below the NYSDEC

GA standards in the remaining overburden samples and in the shallow-bedrock groundwater sample collected. Groundwater in the former plating area is within the capture zone of the groundwater migration-control system. Results of the sampling in the former plating area were reported to NYSDEC in December 1995.

4.2 Identification and Evaluation of Areas of Potential Environmental Impact

Delphi and its predecessors have investigated potential on-site source areas and related releases during the period from 1981 to date. Interim remedial measures have been implemented, as possible, in coordination with ongoing manufacturing operations. The results of the aforementioned activities have been reported to NYSDEC and NYSDOH.

The Site History Document identifies areas of potential environmental concern and these areas are summarized in Table 2. Potentially impacted site areas have been identified on the basis of findings from the investigations performed to date, knowledge of Plant operations and processes, and the historical review of the Plant's development and manufacturing operations reported.

In this section, the potentially impacted areas are identified on the basis of the following information:

- Limited visual inspection of current conditions,
- Review of available Plant construction and engineering drawings,
- Available analytical data for soil, groundwater, and LNAPL samples,
- Equipment and process knowledge,
- Knowledge of operations provided by current and former Delphi personnel.

The purpose of this evaluation is to screen the potentially impacted areas for inclusion in the Supplemental Remedial Investigation presented in Section V of this Work Plan. Further investigation is proposed if there is evidence of a release and further characterization of the potential source-area is warranted.

A. Plant Process Areas

This section describes current and former Plant process areas and discusses the status of investigations conducted to date. Plant processes were identified in the Site History Document and are summarized in Table 2. The Plant process areas were identified by reviewing existing Plant features, available model-year maps of department locations, and Plant engineering drawings, and by conducting interviews with appropriate current and former Plant personnel. Past and present Plant processes are listed below:

FORMER PROCESS AREAS

- Solvent Degreasers
- Plating Areas
- Heat-treating Areas
- Machining Areas
- Tubing Mills Area
- Stoddard Flow-testing Areas
- Product Engineering Areas

- Maintenance Painting Booths
- Former Die Casting Area

CURRENT PROCESS AREAS
- Plating Area
- Heat Treating
- Machining Areas
- Maintenance Paint Booth
- Die Cast Building

Each of the Plant process areas is discussed below with respect to the investigation findings to date. Available data is summarized where pertinent, and the need for further investigations is evaluated.

1. Former Solvent Degreasers

Known releases of degreasing solvents occurred near some former degreasers as identified in the Degreaser Investigation Soil Vapor Survey Report dated October 1990. All of the former solvent degreasers have been decommissioned and removed. The facility switched its degreasing operations to aqueous washers in approximately 1991.

Soil and groundwater conditions in each of the Degreaser Investigation Study Areas inside Plant 2 have already been characterized by drilling and monitoring well installation programs. Work performed in these areas includes soil-vapor screening, soil test borings, well installations, and soil, groundwater, and LNAPL sampling and analysis. The data are contained in the reports entitled Study Area 5 Report (dated April 1991), Hydrogeologic Report Degreaser Study Area 4 and Column EE-27 Area (November 1991), and Degreaser Investigation – Study Area 6 (November 1995).

Subsurface investigations are planned for the Degreaser Investigation Study Areas inside Plant 1 in conformance with the April 1991 Work Plan submitted to NYSDEC. Because of overlapping site features shown on Figure 2, Supplemental Investigations Plan, the sampling and analysis programs for some explorations will be combined to address subsurface conditions for more than one former Plant feature. For example, some former degreaser locations are adjacent to former plating areas and machining operations, and a single exploration will "see" potential subsurface impacts from all three features. The proposed supplemental investigations are described in Section V and the currently anticipated schedule for degreaser source-area investigations is summarized in Table 1. The Work Plan includes additional work to delineate the extent of LNAPL at Study Area 4 in Plant 2.

During the historical review performed during preparation of the Site History Document, three additional degreaser locations were identified (degreaser number 36, two locations, and degreaser number 39, one location, shown on Figure 2).

Degreaser number 39 was a barrel degreaser which was reportedly used infrequently for batch degreasing by dipping a basket of parts into a drum of liquid solvent. This degreaser was associated with low-volume production of small parts and had no subgrade piping or foundation. It was similar in scale to a Safety-Kleen parts washer. Two other former barrel degreaser locations were investigated during the 1990 Degreaser Investigation and relatively low levels of degreasing solvent vapors in the range of up to 4 ppm were detected. No investigation of this former barrel degreaser is planned.

Degreaser 36 was a vapor degreaser and was associated with in-line parts production. Conditions at the two former locations of Degreaser 36 will be investigated as described in Section V.

2. Plating Areas

Former Plant 2 Plating Area Removed from Operation in 1993

In 1995, Delphi investigated a former zinc and chrome plating area inside Plant 2. The investigation included sampling and analysis of groundwater from existing downgradient wells, soil test borings adjacent to plating wastewater sumps, and closely spaced shallow soil sampling by hand in and around the footprint of the Ionic III plating line where degraded concrete was evident in the plating area deck.

Soil contamination by metals was found in close proximity to the former Ionic III plating line. The maximum concentrations detected in the soils were at depths of 1 to 3 feet below the former plater foundation. Chromium and zinc were the primary metals detected and their concentrations diminished with depth and lateral distance outside the plater footprint. The results of the investigation are summarized in a report entitled "Former Plating Area Investigation, Delphi Automotive Systems Lexington Avenue Facility, Rochester, New York" dated December 1995. Samples were analyzed for cadmium, chromium, copper, lead, mercury, nickel, tin, zinc, and cyanide with the following maximum detections:

Parameter	Maximum Detected in Soil (mg/kg)	Maximum Detected in Groundwater (mg/L)	NYSDEC Groundwater Guidance Value (mg/L)
Cadmium	---	0.014	0.005
Chromium	1150	0.49	0.050
Copper	244	0.67	0.200
Lead	21	24	0.025
Mercury	0.4	0.0022	0.0007
Nickel	167	0.58	0.100
Zinc	5950	1.93	No value stipulated
Cyanide	0.375	0.125	0.200

The 24-ppm lead value was reported for an unfiltered groundwater sample from Well VM-215 located in Degreaser Study Area 5. A filtered sample collected concurrently was reported to contain 0.24-ppm lead.

Other Former Plating Areas

Other former plating areas in the Delphi Plant have not been investigated previously. The locations of the former plating areas are shown on Figure 2. The proposed strategy and schedule for conducting investigations of other former plating areas are discussed in Section V of this Work Plan.

Current Plating Area

The current plating area, also shown on Figure 2, is located in the northwest corner of Plant 1. The current plating area was constructed in 1993 to replace the operations in the Plant 2 areas described on the previous page.

An increase in metals concentrations in groundwater at SR-131 was noted in the January 1999 sampling event. Chromium, copper, lead, tin, and zinc concentrations detected in the January 1999 sample may be an indication of a release of metals at a at an upgradient location. The current plating area is located upgradient of SR-131 inside Plant 1. However, the source of the elevated metals detected in the 1999 sample from SR-131 is not known, and no releases from the relatively-new plating operation are known by Plant personnel to have occurred. A possible source for the metals detected is the center dock, which is also located upgradient of SR-131 and is closer to SR-131 than the current plating area. Conditions in the center dock will be investigated during the supplemental RI activities, and appropriate follow-up investigation of the occurrence of metals in groundwater at SR-131 will be conducted as necessary after results from the center-dock investigations are received. The center dock is described below in Section 4.2.C.1.

Offsite Sources of Metals Contamination

The groundwater-quality database indicates the presence of an upgradient source of chromium contamination to groundwater south of the Plant. Groundwater samples collected from upgradient Well SR-11 have contained up to 8.2 ppm chromium. This chromium appears to originate from an upgradient source. Chromium was detected at concentrations of 4.2 to 12.0 ppm in groundwater samples collected in January 1999 from shallow-bedrock wells SR-234 and SR-235, located on the south and north sides of Lexington Avenue near the southeast corner of the Plant. Chromium contamination from an unknown, possibly upgradient source appears to be migrating along the route of the Lexington Avenue sewer tunnel. Additional investigation of this occurrence is described in Section V of the Work Plan.

3. Cyanide Heat-treating Areas

Cyanide heat-treating of metal parts has been conducted in three areas within the Plant, which are located as shown on Figure 2. Two former heat-treating areas were located in Plant 2 southeast of column MM9, and between columns JJ13 and HH13, respectively. The current heat-treating area is located between columns L13 & J11 in Plant 1. The current and former heat-treating equipment is completely above-grade.

Heat-treating (case-hardening) is accomplished by immersing steel parts in a liquid cyanide-salt bath and then in a quench-oil bath. The finished parts are then washed and the effluent routed to the Plant's wastewater treatment system. Cyanide-salt is stored in the original containers supplied by the manufacturer which are kept in a locked cage within the heat-treating area.

No subsurface impacts are anticipated based on a visual inspection of the current heat-treating area. The heat-treating equipment is all above-grade and Delphi personnel report that there are no documented cyanide releases associated with the heat-treating operations. Cyanide salt is a solid at room temperature and any minor spills from the heat-treating furnace would harden quickly and be relatively immobile. No investigations are planned at the current heat-treating area inside Plant 1.

Several former plating operations were located adjacent to the two former cyanide heat-treating areas in Plant 2. Groundwater analyses for cyanide will be included in the investigations at these former plating areas. The need for any future investigations of the heat-treating areas will be based on the results of the groundwater testing.

4. Machining Areas

Various cutting oils including both mineral-oil-based straight oils and water-soluble oils have been used extensively throughout the Plant as coolants and lubricants for machining operations. Most machining oil usage has been associated with the in-ground flow-through oil pits in which oil-handling, scrap-metal-handling, and oil-filtration equipment was or is located. A total of 29 floor pits have been present inside the Plant, as shown on Figure 2. (The pit locations shown on Figure 2 have been modified from those reported in the Site History Document based on a further detailed review of the pit construction drawings.)

The pit depths range from 5 to 23 feet below the Plant floor slab. The floors of the pits are typically at or above the top of bedrock except pits 7, 20, 28, 29, and 30 (all inside Plant 1). These pits extend approximately eight feet into the top-of-bedrock. Pit depths are listed in Appendix I, Revised Storage Tank Plot Plan.

Potential environmental impacts associated with the machining operations are related to the cutting oils used in the machining process. The cutting oils themselves have low toxicity profiles, but they tend to absorb organic compounds including degreasing solvents, petroleum distillates, and PCBs due to the solubility of these organic compounds in oils. Dissolution of degreasing solvents from cutting oil LNAPL to the groundwater can cause a continuing source of groundwater contamination.

During the 1980's, Delphi conducted an inspection of the Acme machines served by pits 20, 21, and 22 and the Davenport machines served by pits 28, 29, and 30. It was determined by Plant personnel that leakage had occurred in the piping systems serving the Acme machines. All identified leaks were repaired by Delphi. No apparent piping leaks were found by Delphi on the Davenport machines.

Additional subsurface investigations adjacent to the oil pits are planned as described in Section V of this Work Plan. The purpose of the investigations will be to determine the areal extent of LNAPL potentially originating from the pits and associated subgrade piping. The widespread nature of the machining operations lends itself to an area-wide approach. The schedule of investigations is somewhat dependent on the removal of machining equipment during Plant upgrades. Drilling-rig access is not possible in some areas of the Plant until in-line machines (large above-grade robotic production equipment performing successive steps in the drilling and forming of a metal part) are removed or reconfigured.

In Plant 1, Delphi plans to remove the Acme screw-machines and remove the associated pits numbers 20, 21 and 22 from service during 1999. In Plant 2, the in-line machines associated with pits 19 and 34 have been removed and the pits are not currently in service. Access to the area downgradient of pits 9, 10, and 44, located along the north wall of Plant 2, is possible by drilling inside the Plant 2 Addition, north of the cinder-block wall separating the two buildings. Locations which are currently open and accessible to a drilling rig have been selected during a recent building walk-through. Proposed test boring and monitoring well locations are shown on Figure 2.

5. Former Tubing Mills Area

Tubing mills operated in the Plant from the 1940's until approximately 1970 to manufacture steel tubing for GM vehicles and Frigidaire appliances. The tubing mill area was located at the north end of Plant 2 within column grid 35FF to 31KK. There were a total of ten weld mills producing tubing.

The tubing manufacturing process involved passing flat-rolled steel stock through forming rolls until it was round; the tube then passed under a weld-wheel where electric current and pressure made the weld, then through sizing rolls to correct the diameter, and finally through an annealing process which used mercury as an electrode. Specially grooved rollers annealed the finished tubing with electric current. The grooved rollers consisted of two approximately 8-inch diameter wheels on an approximately 12-inch long axle. One wheel was immersed in an approximately 10-inch diameter cup containing mercury to pick up the electric current, and the other wheel applied the current to the tubing as it rolled through.

The tubing itself did not come into contact with the mercury. The hot tubing went through a copper-coating step where copper powder in an oil carrier was fused onto the outside of the tubing. The tubing then passed through a cool-out run and through a quench water step at the south end of the area. Cooling water used in the process flowed through floor trenches to a reclaim water pit located just south of column 31HH. The tubing mills area and reclaim-water pit are shown on Figure 2.

The annealer boxes were completely above-grade and rested on wood-block floor tiles over the Plant's concrete floorslab. Current and former Plant personnel report that some mercury escaped onto the Plant floorslab during routine operations, and that some mercury was recovered from under the wood-block floor tiles when the tubing mills were dismantled in the 1970's. Mercury was reportedly stored in one-pint size plastic bottles in the adjacent tool crib shown on Figure 2, and was added to the annealer boxes as needed.

No subsurface investigations are currently planned for the former Tubing Mills Area. The water reclaim pit is still present but currently inaccessible to a drilling rig, being closely surrounded by in-line machines constructed across the former tubing mills area. Monitoring wells will be installed adjacent to oil pits located downgradient of the former tubing mills area. Sampling and analysis of these wells will include the site-related metals cadmium, chromium, copper, lead, mercury, nickel, and zinc (herein referred to collectively as "site metals"). The proposed well locations are shown on Figure 2.

6. Stoddard Flow-testing Areas

Delphi performed Stoddard flow testing and calibration of finished carburetors and fuel-injection systems in four different areas of the Plant. The locations of the Stoddard flow-testing areas are shown on Figure 2.

The Stoddard flow-testing area inside Building 22 was previously investigated in 1993 with a soil-vapor survey and well installation program. Additional monitoring wells were placed outside the building in 1994. The other Stoddard flow-testing areas have not been investigated. Delphi engineering and construction drawings show that the Stoddard areas were of similar construction. They consisted of banks of test stands and underground copper drainage pipes which gravity-drained the Stoddard blend to one or more concrete sumps. From the sumps, the used Stoddard blend was pumped back overhead to a reclaim station inside the northwest corner of Plant 1.

Stoddard blend is present on the water table under Building 22 and is currently being addressed by a product-recovery IRM (described in Section 2.3.2B) that has recovered some 700 gallons of Stoddard blend to date. The soil-vapor survey data indicates that the Stoddard vapors are most concentrated in the vicinity of the former sumps in the Building 22 carburetor flow-testing area.

Soil-vapor investigations are proposed for the sumps in the other Stoddard flow-test areas not previously investigated as described in Section V of this Work Plan.

7. Former Product Engineering Areas

From the 1940's until 1987, product engineering was conducted at the Plant inside Buildings 3 and 4 and an adjacent area inside the east end of Plant 1, as shown on Figure 2. The engineering operations involved the use of a range of petroleum test fuels (including, at various times, diesel, regular and unleaded gasoline, Stoddard blend, M-1150 whitegas, and Indolene, a high-octane gasoline). The engineering processes involved dynomometer testing of engines and flow-testing of prototype fuel systems. Test fuels were burned in the dynomometer tests; Stoddard solvent and test fuels used in the carburetor flow-testing operations were recovered and stored in tanks 8, 24, 26 and 26A (locations shown on the revised Storage Tank Plot Plan in Appendix I).

Previous investigations near Buildings 3 and 4 have focused on the adjacent former UST areas and on the area near the Tank Farm Area product-recovery trench located northeast of Building 4. Building 4 is immediately upgradient of the Tank Farm Area product-recovery trench. The investigations to date have all been outside the buildings and include a 1991 soil-vapor survey, a test pit exploration program, and drilling of various piezometers and monitoring wells associated with the product-recovery trench.

The ability to conduct subsurface investigations inside these buildings is limited by low overhead clearance and physical accessibility. Soil-vapor investigations inside Buildings 3 and 4 will be conducted as described in Section V. Depending on the results of the soil-vapor testing, evaluations will be performed in conjunction with input from NYSDEC regarding the practicability of conducting further investigations inside the buildings.

8. Maintenance Paint Booths

Delphi has never conducted production painting of manufactured parts at the Lexington Plant. Three maintenance paint booths have been operated at the Plant. Their locations are shown on Figure 2. The paint booths have been used for repainting equipment and for painting equipment built by the maintenance Department for operations within the Plant. Paint has typically been handled in one and five gallon containers and applied with compressed-air sprayers. No sumps, floor drains or subgrade piping are known to be associated with the paint booths. Based on the known history and configuration of the painting operations, it is believed that the paint booths are unlikely sources of environmental impact, and therefore no investigation of these areas is planned.

9. Die Casting

Production operations conducted in the Die Cast Building have involved the casting of zinc and aluminum alloys to make metal parts for fuel systems (carburetor bodies and fuel-injection rails). Die-cast parts have been air-cooled or quenched with water.

The Die Cast Building was built in 1965 and is currently active. Production operations are conducted on the ground floor. The building has a basement and there are four reclaim water pits and three wastewater sumps in the basement. The reclaim water pits are constructed of reinforced concrete. Wastewater sumps are constructed of reinforced concrete and/or vitrified clay tile.

Hydraulic fluids, die-lube oils, and plunger-lube oils are used in the die cast production processes. The die-lubes are semi-synthetic oils (mixtures of oils, silicones and waxes). The plunger-lubes are petroleum grease, and the hydraulic fluids are glycol-water mixtures. Formerly, aryl-phosphate hydraulic fluids were used. Occasional small spills of molten metal alloys which may have occurred would have solidified quickly on the building floor slab. Solvents and acids and plating solutions are not used in the Die Cast Building. Wastewater from the Die Cast Building is transferred via the process sewer system to the AWTA Waste Water treatment plant. Wastewater generated during the die cast operations is not chemically-aggressive to concrete.

No releases of metals, wastewater, or other materials associated with the die-cast operations are known by Delphi personnel to have occurred. Based on that knowledge and on the knowledge of the types of processes and the materials used in die cast operations, as described above, the potential for environmental impacts from the die cast operations is believed to be low. Therefore, no investigations related to the Die Cast operations are planned.

B. Other Plant Features

Other features of potential environmental impact at the site are summarized below. The summaries describe investigation findings to date, visual inspection of current conditions, evaluation of construction drawings, and process knowledge or any documented releases from operations as reported by appropriate Delphi personnel.

1. Oil House

The Oil House is described in Section 4.2.C.1 of this work plan.

2. Stoddard Tank Farm

The Stoddard Tank Farm is located off the northeast corner of Plant 1 and consists of six 20,000-gallon and four 50,000-gallon aboveground storage tanks contained within bentonite-lined earthen berms. Two of the 20,00-gallon tanks were formerly used to store cutting oil, and these are now empty.

Stoddard components are delivered by tank truck to the four other 20,000-gallon tanks and blended by Delphi into the 50,000-gallon tanks. The resultant Stoddard blend is piped inside the building for use in fuel-systems flow-testing and calibration.

The Stoddard Tank Farm and current and former Plant flow-testing areas are shown on Figure 2. Stoddard from the Tank Farm is supplied to the Plant by underground pipes into the northeast end of Plant 1, and then in overhead pipes to the Stoddard flow-testing areas. Used Stoddard solvent was formerly reclaimed by an oil/water separator and by distillation inside the northeast corner of Plant 1 adjacent to column Y39. Waste Stoddard was formerly stored in Tanks 4, 8, 26, and 26A, located in the general vicinity of the Stoddard Tank Farm as shown in Figure 2, prior to being shipped offsite. The current volume of waste Stoddard is low enough that it is shipped offsite in drums from the Oil House.

Previous spills have occurred within the bentonite-clay-lined soil containment berms. These spills have been associated with piping connections and occasional tank overflows. Spilled material was recovered. Soil sampling will be conducted beneath the bermed areas as described in Section V of this Work Plan at such time in the future when the tanks are removed.

The Tank Farm Area has been previously investigated by the excavation and removal of nearby USTs, a soil-vapor survey, a test-pit exploration program, and by installing a network of 17 overburden piezometers. In addition, the area has been addressed by installing a product-recovery IRM consisting of three large-diameter product-recovery wells interconnected by a 400-foot long gravel-filled trench. LNAPL remains in some of the piezometers surrounding the product-recovery trench and LNAPL recovery operations are ongoing. The extent of LNAPL in the Stoddard Tank Farm Area has been determined by the work performed to date, and no further investigation of groundwater or LNAPL conditions is planned beyond the continued monitoring of existing wells and piezometers. Additional investigations will be performed near the Tank Farm Area because of overlap with soil borings planned for the former location of a TCE UST (tank number 30), tank 26A, and Former UST Areas B and C. These planned investigations are described in Section V of the Work Plan.

3. Former TCE UST

A former 10,000-gallon TCE UST (tank 30) was present outside the northeast corner of the Plant as shown in Figure 2. TCE was formerly delivered to the tank by truck and fed into the Plant by an underground pipe. Once inside the Plant, the TCE was supplied to degreasers by overhead pipes. The TCE tank was excavated and removed in 1988 concurrent with the phase-out of solvent use in the Plant.

Parts-per-billion levels of TCE were detected in some of the 1989 soil-vapor samples collected from the vicinity of the former UST. The levels of TCE detected are not indicative of a significant TCE source. However, soil and groundwater samples were not collected. Therefore, soil and groundwater sampling at the former UST location will be performed as described in Section V of this Work Plan.

4. Former UST Areas A through F

A total of 37 underground petroleum storage tanks (USTs) have been present at the site. All of the USTs have been removed except Tank 3 which was abandoned in place by filling it with K-crete, and Tank 88 which is still in use for fueling Plant vehicles. Tank 88 is a double-walled tank with interstitial monitoring that tested tight in August 1990.

The USTs were clustered in six general areas outside the Plant walls, identified as UST Areas A through F on Figure 2. The USTs were used for storing a range of petroleum products including: leaded and unleaded gasoline, diesel, M-1150 whitegas, Indolene, reclaim (waste) fuel, oils, and Stoddard solvent. In general the tanks were connected to the Plant by subgrade piping from the tanks to the building and then by overhead piping within the Plant.

Soil or groundwater sampling was previously performed by Delphi in the excavations of tanks 4, 8, 10, 18, 23, 24, 33, 40, and 49. These tanks were closed between December 1986 and September 1991. Nondetect results for BTEX compounds were obtained at tanks 8, 10, and 18 in Areas D and E, respectively. Contaminants detected in the samples from the tank excavations are summarized below.

Parameters (mg/kg)	Tank 4 Waste Gasoline	Tank 18 Regular and Unleaded Gasoline	Tanks 23 & 24 M-1150 and Recovery test fuel	Tanks 33& 49 Indolene and Unleaded Gasoline	Tank 40 Chlorinated cutting oil
Benzene	0.75	<1.0	<1.0	6.5 *	--
Toluene	7.43	<1.0	3.5	0.69 *	--
Ethylbenzene	<0.1	--	--	<0.05	--
Xylenes	21.0	<1.0	170	2.6 *	--
p-Dichlorobenzene	<0.5	--	--	<0.05	--
m-Dichlorobenzene	<0.5	--	--	<0.05	--
o-Dichlorobenzene	<0.5	--	--	<0.05	--
PCBs	<0.03	--	--	--	--
Lead	--	480	30	--	--
Petrol. Hydrocarb.	--	--	--	--	2,140

* mg/L detected in water sample collected from the excavation.
-- indicates parameter not analyzed.

The soil from the excavation of tank 40 was also tested for semi-volatile organic compounds (SVOCs) by the TCLP (toxicity characteristic leaching procedure) method. All SVOCs were non-detect except for phenanthrene (0.002 mg/L) and anthracene (0.002 mg/L).

Areas A, B, C, D, and E were investigated in the 1991 soil-vapor-testing program conducted for the Tank Farm Area. The soil-vapor results indicated the presence of apparent gasoline vapors associated with Areas A and B, and apparent Stoddard solvent vapors and apparent mixed Stoddard solvent and test fuels vapors associated with Area C and tanks 26 and 26A in Area D.

Elevated levels of petroleum vapors were not detected in the vicinity of tanks 8 and 9 in Area D, or in Area E.

Areas A, C and D have been further investigated by drilling soil borings and installing piezometers as part of the 1991 Tank Farm Area Investigation. Overburden piezometer PZ-120 is adjacent to the former locations of tanks 1, 2, 3, and 4 in Area A and that piezometer is free of petroleum LNAPL. Benzene at a concentration of 0.025 ppm was detected in the January 1999 groundwater sample from this well. Adjacent shallow-bedrock well SR-236 had an LNAPL layer which contained 35 ppm benzene in January 1999. In Area D, wells PZ-117 and PZ–132/SR-132 are adjacent to the former locations of tanks 26 & 26A, and tanks 8 & 9, respectively. Those piezometers contain thin layers of petroleum LNAPL associated with the Tank Farm Area LNAPL plume. VOC contaminants were not detected in the January 1999 groundwater samples from PZ-117 and SR-132 or the January 1999 LNAPL sample from PZ-132.

Conditions in Area A have been adequately characterized during previous investigations. Investigations will be performed in Areas B, C, E and F by drilling soil test borings, obtaining soil samples for analysis, obtaining hydropunch groundwater samples, and completing selected borings as overburden piezometers screened across the water table in accordance with the decision criteria and methods described in Section V of this Work Plan. In addition, Area D will be further investigated by drilling near the former TCE tank and tank 26A as described above.

5. Power House and Former Coal Pile

Coal was historically used to provide heat and process steam to the Plant until 1998 when coal was completely eliminated and the Power House was converted to natural gas. The coal pile is visible on aerial photographs of the Plant dating from 1951. Coal piles can leach heavy metals, iron, magnesium, and sulfate to groundwater. The nearest monitoring wells, SR-131 and R-131, are located between the former coal pile and the power house. These wells do not show significant elevated levels of metals. Metals concentrations detected in the groundwater at the SR-131/R-131 well cluster are summarized below:

Parameter	SR-131 (mg/L) 11/90	SR-131 (mg/L) 1/99	R-131 (mg/L) 11/90	R-131 (mg/L) 1/99	NYS Water Quality Standard (GA) 6(A-4) NYCRR S703.5 (mg/L)
Cadmium	NA	0.0009	NA	ND	0.005
Chromium	0.007	0.12	0.001	ND	0.050
Copper	ND	0.14	ND	ND	0.200
Cyanide	NA	ND	NA	ND	0.200
Lead	0.065	2.2	0.003	ND	0.025
Mercury	ND	0.0001	ND	ND	0.0007
Nickel	ND	0.14	ND	ND	0.100
Tin	ND	5.0	ND	2.0	No value stipulated
Zinc	0.038	5.24	0.022	ND	No value stipulated

The source of the elevated metals detected in the 1999 sample from SR-131 is not known, and additional investigation of this occurrence will be performed during the supplemental RI activities. However, the samples obtained in November 1990, while the coal pile was still in use for supplying the Power Plant, did not indicate significant environmental impact from the coal pile, and therefore it appears unlikely that the metals in the SR-131 sample are related to past coal storage in this area.

Sampling of soil and groundwater will be performed on the south side the facility scrap-metal handling building (Building 11), as described below in Section 4.2.B.8 of this Work Plan. The south wall of Building 11 corresponds to the north side of the former coal storage area. Sampling of soil and groundwater at that location for metals analysis will provide information which may confirm that past impacts from coal storage at the site have not been significant.

6. Plant 2 Elevator

An elevator was installed as part of the Plant 2 Addition in 1954. The elevator is located between columns 39RR and 39SS in the northwest corner of the Plant 2 Addition, as shown on Figure 2. The elevator's hydraulic cylinder was replaced in the late 1970's because the elevator appeared to be losing hydraulic fluid. Delphi personnel report that rust holes were found in the old cylinder and inferred that it had experienced a cathodic grounding problem resulting in rusting. Following the cylinder replacement, the elevator remains in operation today with no evidence of further loss of hydraulic fluid.

No subsurface investigations have been performed adjacent to the elevator shaft. An exploration adjacent to the elevator shaft will be performed as part of the supplemental investigations proposed in Section V of this Work Plan.

7. Former PCB-containing Equipment

Delphi personnel report that PCBs were never used in the Plant manufacturing processes. However, the Plant had hundreds of electrical capacitors containing PCBs. These capacitors were removed in the 1980's and incinerated at off-site TSCA-permitted incinerators. According to Delphi personnel, available information indicates that there have been no PCB transformers at the site. In 1990, a non-PCB transformer located in the east end of Plant 1 at column 21YE was found to be PCB-contaminated at levels of 60 to 80 ppm. It is believed that the dielectric oil in this transformer was contaminated with PCBs during routine maintenance by an outside vendor.

Despite the fact that PCBs were not used in the manufacturing processes, PCBs are present in LNAPL found at two on-site areas: the Building 22 Area and the East Parking Lot Area. LNAPL containing PCBs has been found in the AWTA sump and is inferred to have migrated from the Building 22 Area possibly along utility lines and then into the perimeter drain around the AWTA basement. As noted in Section 4.1E, a Rochester Gas & Electric transformer station is present on the south side of Lexington Avenue across from the East Parking Lot Area. This substation is suspected of being the source of PCBs detected in the East Parking Lot Area. PCBs have been found in oily seeps into the south side of the Lexington Avenue sewer tunnel adjacent to the transformer station.

Delphi has investigated the extent of PCB-containing LNAPL with several phases of investigation in both areas. In the most recent (January 1999) sampling, PCBs were detected in LNAPL samples from the following site monitoring wells:

Well	Aroclor 1242 (mg/kg)	Aroclor 1248 (mg/kg)
Building 22 Area Wells:		
PZ-129	408	ND
PZ-142	ND	4.6
RW-4	ND	17
Well Z	ND	35
East Parking Lot Area Wells:		
R-2	ND	69
R-243	ND	96
R-244	ND	23

Delphi is currently recovering LNAPL containing PCBs from the Building 22 Area as described in Section 2.2.2.B. Following conversion of the Building 22 IRM to vacuum-enhanced pumping, the need for installing one or more additional recovery wells will be evaluated. Investigations to further identify and evaluate LNAPL and PCB impacts in and adjacent to the East Parking Lot Area will be conducted as part of the off-site monitoring wells proposed in Section V of this Work Plan.

8. Scrap-metal Handling in Building 11

Oily scrap metal turnings and pressings from machining operations at the Plant are accumulated in and shipped from the Scrap Building (Building 11). The Scrap Building is located on the east side of the Die Cast Building north of the former location of the coal pile.

Oily scrap metal is staged in totes on three pads located as shown on Figure 2 on the west and south walls of the building. The pads are shallow concrete-lined decks under a steel grating; each deck drains to a sump which is pumped out to the oil-reclaim system in the CWTA wastewater treatment area of the Plant. The condition of the concrete linings of the decks and sumps is not readily visible. Plant personnel reported that the integrity of the concrete is not known; however, no releases of oil from the decks or sumps are known.

Oily scrap metal is also staged in roll-off box luggers or trailers in the eastern of the two truck docks located at the north end of the building. The east dock is shown on Figure 2. The eastern dock is a concrete-paved former rail dock. A trench drain at the north, low end of the dock drains to a sump which is pumped out to the CWTA oil-reclaim system.

The outside driveway ramp leading down to the Scrap Building docks was repaved with a concrete pavement in October 1998. Plant personnel reported that oily soils were encountered beneath the old asphalt pavement. The depth of stained soils was reported to be15 inches at the doorway to the building; the oil staining became shallower to the north, and unstained soils were present at the top of the ramp. Plant personnel reported that all oil-stained soils were removed for off-site disposal.

Soil sampling and groundwater sampling with Hydropunch equipment will be performed during the RI at three borings located outside the north and south walls of the building. Borings will be placed in close proximity to two of the tote-deck sumps and to the east truck dock. The proposed investigations are described in Section V of this Work Plan.

According to plant personnel, the east dock is scheduled to be extended at its south end in the near future. Excavations associated with the construction of the extension will be monitored to determine whether soil contamination is present, and appropriate follow-up investigation will be performed if necessary.

9. Basement Sumps

Sumps which may collect groundwater from sub-basement drains or from seepage through basement walls are present in the Plant. These include:

- A sump in the basement utility room located at the south side of Plant 1 between columns L-3 and N-3, where oil staining and an accumulation of oil in the sump indicate possible oil infiltration through the basement walls.

- A sump in the northwest corner of the powerhouse.
- A sump in the northeast corner of the shipping building.
- The sump in the northwest corner of the AWTA building, which is known to collect Stoddard solvent containing PCBs, and which is being addressed by the planned enhancement to the Building 22 LNAPL-recovery system.
- Possible other sumps not yet identified.

The RI will include an assessment of Plant basement sumps to determine whether oil or groundwater infiltration is occurring. Samples of water and/or oil will be collected during the RI at each sump where groundwater or LNAPL infiltration is apparent. Wipe samples of oil-staining in basements where oil infiltration is apparent will also be performed. The proposed investigations are described in Section V of this Work Plan.

C. Solid Waste Management Units / Areas of Concern (SWMUs/AOCs)

SWMUs/AOCs at the Lexington Avenue Plant include the following:

1. Oil House and the Adjacent Center Dock and Sludge Storage Pad

The Oil House has historically been used as a drum storage area since 1938. Originally, the Oil House had a perimeter floor drain with a discharge pipe to the ground outside. In 1957, the Oil House Dock was built and the discharge pipe was connected to the storm sewer. Later on, the floor drains were closed and the area served as a RCRA storage area. Based on the past use of the Oil House as a hazardous materials and waste storage area since the Plant opened, and the apparent presence of an exterior drain from the building prior to 1957, additional investigations will be performed at the Oil House. The proposed investigations are described in Section V of this Work Plan.

A single-bay truck dock known as the center dock is located south of the oil house in the northwest corner of Plant 1. The center dock is used for shipping waste drums and empty drums, and occasionally is used for receiving or shipping manufacturing equipment and other general uses. The dock is also periodically used for staging tanker trucks used to receive machining coolants or other materials removed from manufacturing equipment during maintenance activities. The current truck dock was formerly a rail car dock.

Plant personnel report that several spills to the floor of the dock have occurred during tanker filling related to equipment maintenance. Spilled materials have reportedly soaked through the floor of the dock. The construction of the floor of the dock is not known and is not apparent from a visual inspection. If the floor is paved, the surface condition of the pavement appears to be degraded. Based on the information concerning past spills in the dock, investigation of soil and groundwater conditions will be performed. The proposed investigations are described in Section V of this Work Plan.

The center dock sludge-storage pad is located on the east side of the truck dock. Oily diatomaceous-earth filter media from machining-oil filtration systems is brought to the pad in totes which are allowed to drain for a period of time prior to being emptied into waste trucks staged in the center dock. Plant personnel report that empty product drums are also periodically drained on the pad prior to being staged in the area between the pad and the oil house.

The pad is a shallow concrete-lined deck with a steel grating and a sump which is pumped out to the oil-reclaim system in the CWTA wastewater treatment area of the Plant. The pad and sump are periodically cleaned out, and the condition of the concrete lining is reported to be good. The pad is reported to be approximately 15 years old. Plant personnel report that no releases from the pad are known or suspected. No investigation of the pad is planned.

Previous investigations near the Oil House include the installation of well cluster SR-131/R-131 in September 1990 at a location on the west side of the facility powerhouse approximately 75 feet north and downgradient of the Oil House. Periodic groundwater sampling of those wells for VOCs has been performed since installation to the present. Metals analysis of groundwater samples from these wells was performed in November 1990 and January 1999.

Significant levels of dissolved metals have not been detected in R-131. An increase in the metals concentrations detected in the January 1999 sample from SR-131 relative to concentrations detected in November 1990 is interpreted as a possible indication of a release from an unknown source upgradient of the well. Sampling of soil and groundwater in the center dock is planned to determine whether the spills which have reportedly occurred there have resulted in release of metals.

Since being installed, SR-131 has had decreasing concentrations of total VOCs 18.9 to 2.7 parts per million, and R-131 has had 56.07 to 32.712 ppm total VOCs. The primary compounds detected in both wells are 1,2-dichloroethylene (1,2-DCE) and vinyl chloride. Parts-per-billion levels of trichloroethylene (TCE) and 1,1-dichlororethylene (1,1-DCE) have also been detected. The ratio of vinyl chloride to 1,2-DCE to TCE found in Wells SR-131 and R-131 is approximately 1:1:0.001.

This ratio appears to indicate that extensive natural attenuation of TCE has resulted in the nearly complete degradation of TCE to its primary daughter products. This VOC profile, and the fact that higher concentrations are present in the intermediate-bedrock well, rather than he shallow-bedrock well, indicate that the most likely source of the VOCs found in well cluster R-131 originates from an upgradient area within the Plant and not from the nearby Oil House.

The compound vinyl acetate was detected in both wells starting in the June 1993 sampling event and then diminishing over time. The source of the vinyl acetate is unknown. Acetate compounds have been used to stimulate biological activity in bioremediation IRMs at other sites. Following the appearance of vinyl acetate in the wells, the levels of 1,2-DCE and TCE decreased sharply from 1993 to 1996. It is interpreted that the vinyl acetate stimulated biodegradation of 1,2-DCE and TCE near these wells. Evaluation of the in-situ bioremediation of TCE and its daughter products will be performed in the Feasibility Study.

2. Former USTs 26 and 26A

Former USTs 26 and 26A stored used Stoddard solvent which had been used as a test fuel medium. Tank 26A fed the Stoddard-solvent recovery (distillation) equipment located adjacent to the tank inside the Plant. Tank 26 was removed in 1982, and tank 26A was removed in November 1987.

Overburden piezometers PZ-117, located approximately 20 feet south of the former location of Tanks 26 and 26A, was installed in February 1990 in connection with determining the extent of the Tank Farm Area LNAPL plume. PZ-117 has LNAPL ranging in thickness from zero to 0.45 feet and has been generally free of LNAPL since January 1992. An additional investigation is planned beside the former location of tanks 26 and 26A and in the adjacent area inside the Plant around the former location of the Stoddard distillation equipment. These supplemental investigations are discussed in Section V of this Work Plan.

3. AWTA (Additional Waste Treatment Area)

The AWTA was constructed in 1977 and the wastewater treatment operations have been rearranged and upgraded several times since then. Wastewater treatment processes conducted in the AWTA include neutralization, flocculation, settling, sand filtration, and oil/water separation. Sludge generated from the wastewater treatment operations is stored in rolloff boxes inside the building. The sludge is shipped offsite by truck and landfilled as non-hazardous waste.

In 1994, a thin layer of LNAPL was found in the AWTA perimeter drain sump, located on the north side of the building. The LNAPL appears to be Stoddard solvent blend and has been found to contain PCBs ranging in concentration 840 to 160 mg/kg (parts per million). Based on its composition, the LNAPL is believed to originate from the Building 22 Area. It is interpreted that the LNAPL migrated along the backfill of the 48-inch storm sewer pipe and/or the 24-inch process sewer pipe and found its way into the perimeter drain around the AWTA building. A soil-boring investigation and PCB testing program was conducted in 1995 which included seven soil borings around the AWTA and in the courtyard between the AWTA and Building 22. The maximum PCB result in soil was 30 ppm found at a depth of 10 to 12 feet below grade in the vicinity of the 24-inch process sewer.

No further investigation of the AWTA Building is planned. Further investigations along the 48-inch sewer are included in Section V of this Work Plan and will incorporate some additional PCB testing in the area between Building 22 and the AWTA.

4. CWTA (Central Waste Treatment Area)

The CWTA is located in Building 13 at the north end of Plant 2, adjacent to the courtyard. It has been in operation since 1973 for treating plating wastewater and soluble oil used in machining operations. Treatment operations are conducted in above-grade equipment installed on the Plant's concrete floorslab and there are no underground feed lines or sumps in use. Plating wastewater and used soluble machining oil are routed to the CWTA in overhead pipes. Hazardous waste (F006) was formerly stored under the Plant's Part B RCRA Permit at the sludge storage area shown on Figure 2. This filter press sludge was stored in one-cubic-yard metal tubs that were staged on a concrete floor. Non-hazardous process wastes generated by various plant processes are currently stored in an above-grade roll-off container located at the CWTA.

According to Delphi personnel, there have been no documented or otherwise-known releases of plating wastewater, machining oils, or hazardous waste associated with the CWTA operations, and therefore no subsurface investigations of the CWTA Area are necessary.

5. Former Incinerator

An incinerator was present at the north end of the Plant 2 Addition from 1954 until the late 1970's. The incinerator was used to burn waste oil, degreaser still bottoms (oil containing some degreasing solvent) waste Stoddard solvent blend, waste test fuels, and cardboard. Waste oil was pumped to the incinerator from an adjacent concrete-lined pit (tank 66 on the Revised Storage Tank Plot Plan in Appendix I, and shown on Figure 2). Planned investigative activities adjacent to the formed incinerator are discussed in the following section, Waste Oil Storage Areas

6. Waste Oil Storage Areas

Used cutting oils have historically been stored in large above-ground storage tanks (ASTs) located in and near the courtyard at the north end of Plant 2, as shown on Figure 2 and in the Revised Tank Plot Plan in Appendix I. Waste oils are currently also stored in ASTs at the AWTA and at the sewer-system interceptor in the north parking lot.

The following current and former waste oil tanks have been present in the waste oil storage area in and near the courtyard at the north end of Plant 2:

Tank Numbers	Tank Status	Contents	Capacity (gallons)	Combined Capacity (gallons)
53, 54, 55	Active	Soluble oil	25,300	75,900
56	Removed	Waste oil	17,600	17,600
57, 58, 59, 60	Removed	Waste oil	1,435	4,305
61	Removed	Waste oil	1,980	1,980
63	Removed	Waste oil	4,135	4,135
64, 65	Removed	Oil sludge	5,250	10,500
66*	Removed	Waste oil	3,000	3,000
95, 96	Active	Used oil	5,000	10,000
107, 108	Active	Used oil	5,000	10,000

* UST

Documented waste oil releases in this area include:

DATE	SPILL NO.	MATERIAL	ESTIMATED VOLUME
5/20/87	8701424	mineral oil with TCE	200gal on asphalt
9/5/92	9206560	soluble oil	200 gal on asphalt
10/21/95	9508981	mineral oil	50 gal

The concrete-lined waste-oil pit (tank 66) associated with the former incinerator was closed in 1988 and no sampling data or subsurface observations are available. The closest monitoring wells are the OW-102/SR-102/R-102 well cluster, located approximately 15 feet west of the former concrete-lined pit. Well SR-102 has had LNAPL in it consistently since August 1990. The LNAPL thickness in the well has ranged from 1.8 to 10.1 feet. LNAPL samples from SR-102 have been found to contain degreasing solvents ranging in concentration from 2120 to 381 ppm and is non-detect for PCBs. LNAPL appeared in overburden Well OW-102 in November 1996 and since that time has ranged in thickness from 0.03 to 0.34 feet. LNAPL has never been observed in well R-102.

A one-day vacuum-extraction pilot test was conducted at SR-102 during November 1993. Approximately 6.5 gallons of LNAPL were recovered during the pilot test with approximately 800 gallons of groundwater.

Additional investigations will be performed to determine the extent of LNAPL near the former location of tank 66. The need for further pilot testing will be evaluated based on results of the investigative work. The supplemental investigations are described in Section V of this Work Plan and potential pilot-test technologies are discussed in the work plan for the Feasibility Study in Section VI.

Apparent mineral oil-based LNAPL is found in PZ-130 located off the north edge of the waste oil storage area. The product present in PZ-130, like that present in nearby well SR-102, is a dark-colored oil, which is compositionally different from the clear Stoddard Blend LNAPL found in nearby piezometers PZ-129, PZ-140 and Well RW-4.

Additional overburden and shallow-bedrock piezometers will be installed in the courtyard to better define the extent, character and volume of LNAPL present in the area near PZ-130 and SR-102. The scope of the planned investigations is described in Section V of this Work Plan. Delphi anticipates that a single drilling program will be conducted in the Plant 2 courtyard area addressing the former incinerator and the waste oil storage area.

7. Sewers

Underground utility maps for the site showing sewer locations and invert elevations are reproduced in Appendix I of this work plan.

Underground process-wastewater sewer lines are constructed of 4- to 12-inch diameter vitrified tile (VT) pipe inside the Plant and 24-inch reinforced concrete pipe (RCP) outside the Plant. Storm sewer lines are constructed of 4- to 48-inch diameter RCP, VT, and cast iron (CI) pipe. Sanitary sewer lines are constructed of 3- to 15-inch diameter VT and CI pipe.

Since the 1970s, all process wastewater including all plating and dichromating wastewater and all oily wastewater and soluble-oil solution machining-system coolant has been transmitted from process equipment or process sumps to the CWTA in overhead lines. Dichromating and oily wastewater is carried from the CWTA to the AWTA in overhead lines. Prior to the 1970s, all process wastewater was discharged to underground process sewer lines.

Known releases

Prior to installing the CWTA in 1973, the process and storm sewers both discharged to a ditch which ran in a northerly direction overland to the stone culvert shown on Figure 2 and then into the seven-foot municipal sewer tunnel which runs beneath the north parking lot parallel to Driving Park Avenue. The 48-inch facility storm sewer was constructed in sections along the course of the former drainage ditch as the site was developed. Wells PZ-142 and PZ-144 at the north end of Building 22 are close to the 48-inch sewer and elevated levels of chromium and other dissolved metals were detected in PZ-144 groundwater during the January 1999 sampling event.

The current soil and groundwater conditions along the old drainage ditch will be investigated as described in Section V of this Work Plan by drilling a series of soil borings along the course of the 48-inch sewer.

A blockage in a sanitary sewer line adjacent to former degreaser location number 6 in Plant 1 occurred and was repaired in 1990. No other repairs of site sewers are documented. Two sections of the process sewer under Plant 2 have been abandoned and re-routed, as shown on the Utility Plan in Appendix I. Delphi personnel report that there have been no documented or otherwise-known breaks in the process sewer piping.

Based on review of plant records by Plant personnel and Plant-personnel knowledge of sewer operations, the existing sewer systems are not known to be a source of environmental impact. However, the borings planned for investigation of the 48-inch storm sewer line in and north of Plant 2 will provide information on conditions along the main process sewer line which runs parallel to the 48-inch storm line.

<u>Potential groundwater flow along or discharge into sewer lines</u>

The Lexington Avenue municipal sewer tunnel and portions of the seven-foot municipal sewer tunnel paralleling Driving Park Avenue are constructed in bedrock. These tunnels provide potential migration pathways for groundwater and LNAPL in the bedrock around the outside of the tunnels. Investigations related to the east Parking Lot Area will in part focus on the effects of the Lexington Avenue sewer tunnel on the local groundwater flow regime and LNAPL and PCB distribution.

Underground sewer systems for the Plant are for the most part constructed in the overburden soils. On-site sewer lines are also generally installed above the water table. The principal exception is the main sanitary sewer line for the plant, which is shown on Figure 2. In its lower reach where it crosses the east parking lot, this sewer is apparently installed in a trench which was cut as much as a few feet into the top of bedrock. In this area and in the upstream section beneath Plant 1, the sanitary sewer may be below the water table by as much as a few feet.

As shown on Figure 2, previously-installed piezometers are present along and in close proximity to the sanitary sewer east of Plant 1 in the east parking lot, and two monitoring wells will be installed adjacent to the sewer inside Plant 1 in connection with investigations of Degreaser Study Area 3. The results of monitoring of these wells and other nearby wells during the RI will provide information on the potential for groundwater flow along or discharge into this sewer line.

8. RCRA Storage Areas

The Plant received a Resource Conservation and Recovery Act (RCRA) permit in 1984. The permit covered the five container storage areas and two USTs listed below:

- the Degreasing Sludge Storage Area, located in the Oil House.
- the Cyanide Drum Wash Area, located in Plant 2 near column LL21.
- the Non-Cyanide Drum Wash Area, located in Plant 2 near column MM9.
- the Cyanide Storage Area, located in Plant 1 near column J13.
- the Wastewater Treatment Sludge Area in Plant 2 south of the CWTA.
- Tanks 4 and 8, USTs formerly used for storage of waste gasoline and Stoddard solvent, were located outside of Plant 1 in UST Areas A and D, respectively.

The facility completed final RCRA closure in 1989. Investigations to characterize subsurface conditions at the former Non-Cyanide Drum Wash Area, Degreaser Sludge Storage Area and the Oil House will be performed as described in Section V of this Work Plan. Investigations have already been conducted at the former Cyanide Drum Wash Area and former locations of USTs 4 and 8, as described below. The Wastewater Treatment Sludge Area and Cyanide Storage Area do not warrant investigation based on process knowledge as discussed below.

Degreasing Sludge Storage Area

Degreasing Sludge Storage Area was located in the Oil House, which is described above in Section 4.2.C.1.

The Cyanide and Non-Cyanide Drum Wash Areas

Delphi conducted drum washing operations at two locations in Plant 2 until the mid 1980's when the Plant's Part B RCRA Permit was terminated. The Cyanide Drum Wash Area was closed in 1985 and the Non-Cyanide Drum Wash Area was closed in 1989. No subsurface investigations were performed at the time. Both of the former Drum Wash Areas had sumps. Delphi personnel reported that there were no documented or otherwise-known releases of hazardous materials or wastes associated with the drum wash operations. Washwater generated from the drum wash operations was routed to the sumps and then pumped out to the process sewer.

The former Cyanide Drum Wash Area was located within Degreaser Investigation Study Area 5. It is closely surrounded by overburden wells VM-224 and VM-213 and the other VM-wells installed as part of the subsurface investigations conducted at Degreaser Investigation Study Area 5. Cyanide has been reported at low concentrations of up to 0.125 ppm in some of the VM-series overburden wells in Study Area 5. These low cyanide concentrations do not warrant further characterization of the area with respect to cyanide.

The former Non-Cyanide Drum Wash Area was located in Plant 2 near column MM9. No releases are known or suspected in this area; however, as shown on Figure 2, a test boring adjacent to the former location of the wash station is planned to investigate an adjacent former plating area.

The Cyanide Storage Area

The Cyanide Storage Area is located in a heat-treatment area in Plant 1 near column J13. Cyanide salts were and are stored in this area in solid form. The salts are used in molten form in the heat-treatment process. No potential pathways for release were evident from a visual inspection of the area, and no releases in this area are known or suspected by Plant personnel. This area does not represent an area of potential environmental impact, and no subsurface investigations are planned for this area.

The Wastewater Treatment Sludge Area

The Wastewater Treatment Sludge Area was formerly located in the north end of the Plant 2 Addition as shown on Figure 2. Dewatered wastewater treatment sludge from plating operations (waste code F-006) was stored in above-grade one-cubic-yard metal tubs. The sludge was transported and disposed offsite by a contract waste hauler. Delphi personnel reported that there were no documented releases of wastewater treatment sludge to the environment. This area does not represent an area of potential environmental impact, and no subsurface investigations are planned for this area.

Former RCRA USTs

Former USTs 4 and 8 were used to store waste test fuels. Former USTs 8 and 4 were closed by Lozier Architects/Engineers on 16 and 17 December 1986, respectively. Soil samples were collected from the tank-removal excavations and analyzed by the EP toxicity method for RCRA metals (As, Ba, Cd, Cr, Pb, Hg, Se, and Ag), BTEX compounds, and PCBs. Soil samples from the excavation of former UST 8 were non-detect for all parameters tested. The soil sample from the excavation of former UST 4 was non-detect for metals and PCBs, but contained benzene (0.75 ppm), toluene (7.43 ppm), and xylene (21.0 ppm).

Monitoring wells PZ-, SR-, and R-132 were installed adjacent to the former location of tank 8 during previous investigations of the Tank Farm Area LNAPL plume. PZ-132 contains a thin layer of high-flash-point LNAPL related to the Tank Farm Area plume. The January 1999 LNAPL sample from PZ-132 contained no BTEX or other VOCs, and no VOCs were detected in the January 1999 groundwater samples from SR- or R-132.

Monitoring wells PZ-120 and SR- and R-236 have been installed adjacent to the former location of tank 4 during previous remedial investigations at the site. In January 1999 samples collected from these wells, overburden groundwater was found to contain 0.25 ppm benzene, and a high flash-point mineral-oil LNAPL layer containing 35 ppm benzene was present in shallow-bedrock well SR-236. LNAPL containing chlorinated VOCs is present in intermediate-bedrock well R-236.

No further investigation is planned at the former locations of tanks 4 and 8. These former tank locations have been adequately characterized by the investigations performed to date.

9. Trash Compactors

A former trash compactor was located adjacent to the incinerator at the south side of the Plant 2 courtyard. The current trash compactor is located east of

Plant 1 in the Building 3 courtyard. The trash compactors have been used for handling non-hazardous solid wastes. These trash compactors are unlikely to be sources of potential environmental impact and no investigation of either trash compactor is planned.

10. Roll-off Boxes

A roll-off box used for non-hazardous bulk process waste is located in the Building 13 CWTA, and roll-off boxes for non-hazardous wastewater treatment sludge are located in the AWTA. These roll-off boxes rest on the Plant's concrete floorslab and are periodically transported off-site for landfill disposal of the contents. Delphi personnel reported that no documented or otherwise-known releases to the environment of process waste or wastewater treatment sludge have occurred from these roll-off boxes and no investigation of them is planned.

11. Former Easement A Disposal Area

From the 1950's to 1965, Delphi operated a disposal area near the current location of the north end of the Die Cast Building pursuant to an easement granted by the City of Rochester in June 1937 ("Easement A"). Several explorations have penetrated the fill area including the R-105 and R-110 Well Clusters, soil borings C-120 and C-121, and a trench excavated for the groundwater piping from the migration-control trench. The logs from these explorations appear to confirm reports of Delphi personnel regarding the variety of materials disposed. The logs describe primarily black ash, with cinders, slag, and dark oily staining, brick fragments, pieces of concrete, wood-block floor tiles, rubber fittings, metal carburetor parts and other miscellaneous debris.

Several samples of the fill materials have been submitted for analysis. A soil sample from R-110 contained 4.0 ppm toluene and 8.0 ppm xylene. A soil sample from R-105 was non-detect for VOCs. A soil sample from the pipe-trench excavation contained parts-per-billion of TCE. Groundwater from Well SR-105 has historically contained low parts-per-billion concentrations of 1,1-dichloroethane (1,1-DCA), 1,2-DCE, and vinyl chloride. Well SR-110 had up to 16.3 ppm total dissolved VOCs in 1993, but the concentrations have decreased to a current level of 0.06 ppm total dissolved VOCs concurrent with the start-up and continued operation of the groundwater migration-control trench. Except for OW-105, which has been dry since its installation in 1989, the current site monitoring well network does not include overburden wells in or downgradient of the former disposal area.

A soil boring program and overburden well installations will be conducted to characterize the nature and extent of the former Easement A Disposal Area according to the procedures and decision criteria described in Section V of this Work Plan.

12. Old Canal Fill Area

As described in the Site History Document, the former Erie Canal and western widewaters turn-around basin had occupied the northern end of the site under what is now the north parking lots. These lands are labeled "Canal Parcels" on some of the old property maps.

In approximately 1937, the City of Rochester converted the old canal bed to a light-gauge rail system serving the Plant. To accommodate rail service, the City lowered the canal bed east of the site so trains could fit under the low canal bridges. This was accomplished by digging the overburden out of the canal bed, loading it into side-dump rail cars and transporting it back to the start of the line where it was placed as fill on the Canal Parcels adjacent to the Plant. A fill berm running along Driving Park Boulevard is visible in the 1939-40 aerial photograph of the site. Railroad tracks, an apparent switching yard, a rail passenger station, and the Hetzler Brothers Ice Company occupied the filled land. Delphi acquired the Canal Parcels in 1973 and graded the land for parking lots.

Soil test boring logs from borings drilled along the seven-foot sewer tunnel under the north parking lots describe the presence of silty gravelly sand fill deposits, overlying apparent disturbed and mottled sandy and clayey silt deposits, in turn overlying native brown organic peat and native glacial till. Shallow ash and cinder deposits are noted in places, but no other evidence of contaminated fill or unsuitable solid waste materials is noted.

Previous test borings and associated soil-sample analytical data from PZ-141, PZ-140, PZ-139, PZ-138, PZ-137, PZ-136, PZ-135, drilled along the seven-foot sewer tunnel, and borings B-107, B-108, and B-109, drilled along Driving Park Boulevard, have adequately characterized the old Canal Fill Area. Therefore, no further investigation of these fill deposits is planned.

V. SUPPLEMENTAL REMEDIAL INVESTIGATION WORK PLAN

This section of the Work Plan describes the work tasks that will be performed in each of the areas of potential environmental impact identified as requiring further investigation in Section IV. A summary of the screening of areas of potential environmental impact which was described in Section IV is presented in Table 2. Areas requiring further investigation and the proposed investigations and sampling and analysis programs for each area are summarized in Table 3.

The work will be conducted under the Project Health & Safety Plan included as Appendix B of this Work Plan. The work will be performed by qualified personnel trained in accordance with OSHA requirements for their respective work tasks.

5.1 Objectives

The primary objective of the supplemental remedial investigations is to address gaps in the existing data concerning known and potential on-site source areas and the extent of any off-site migration of contaminants. The findings of the work proposed in this Work Plan will be combined with the existing data to form the basis for selecting a feasible remedial alternative for the site. The current body of data has been compiled during investigations conducted by Delphi and its predecessor GM Divisions in the time period from 1981 to 1999. The findings to date are summarized in the Data Summary Report dated September 1998 and the report on the January 1999 Groundwater Sampling Events dated February 1999.

Additional objectives of the supplemental remedial investigations are to more completely define the groundwater capture zone north and east of the migration control trench, delineate the extent of LNAPL at the site, characterize soil and groundwater conditions in source areas, evaluate site-specific natural attenuation processes occurring within the VOC plume, and obtain other information pertinent to selecting the final remedy.

5.2 General Site Conditions

Completing the investigation of general site conditions will include installing offsite monitoring wells, installing an additional on-site deep-bedrock monitoring well, and installing an additional monitoring well cluster along the north wall of Plant 1. Installation of monitoring wells will also be performed along Lexington Avenue south of the plant to provide additional information on upgradient groundwater quality and hydraulic gradients along the Lexington Avenue sewer tunnel. Additional characterization of the various LNAPL plumes which have been identified at the site will be performed, and the current practice of periodic monitoring of groundwater conditions at the site will be continued.

A. Offsite Conditions

1. North and West of Site

   In a 16 November 1998 letter to Delphi concerning the data presented in the Data Summary Report, NYSDEC has indicated a need for investigation of groundwater quality north of Driving Park Avenue in the area downgradient of the migration control trench and in the area along the western side of the site where the limits of the chlorinated VOC plume have not yet been defined. Two off-site monitoring well clusters north of Driving Park Avenue will be installed at the approximate locations shown on Figure 2, pending landowner permission. Alternatively, the offsite wells will be drilled in the DOT right-of-ways, pending DOT permit approval. A well cluster will also be installed at the northwest side of the site to further define groundwater quality and groundwater flow gradients in this area.

The three monitoring well clusters will each consist of a shallow-bedrock well and an intermediate-bedrock well installed in the same manner as previous well clusters at the site and in accordance with the procedures described in the October 1998 Work Plan for 1998 Explorations in the East Parking Lot Area. The well installation procedures are included as Appendix D of this Work Plan.

Following installation, the wells will be developed to remove silt and sediment according to the procedures described in Appendix D. Records of any drilling water lost during the well-drilling and coring operations will be kept and well development will continue until an equal volume of water has been purged, or until a minimum of three well volumes has been purged, or until the well is purged dry. The wells will be allowed to equilibrate to static conditions for at least two weeks prior to sampling.

Well sampling will be performed using the procedures described in Appendix E. The water samples will be collected and analyzed by Free-Col Laboratories of Meadville, Pennsylvania using USEPA Method 8260 for Target compound list (TCL) volatile organic compounds (VOCs), and appropriate EPA methods for the following list of metals (the site metals): cadmium, chromium, copper, lead, mercury, nickel, tin, and zinc.

The wells will be slug-tested to determine the approximate hydraulic conductivity using the Bouwer and Rice method. The slug tests will be conducted and the data reduced according to the procedures described in Appendix F.

2. Adjacent to East Parking Lot LNAPL Area

The onsite extent of LNAPL in the intermediate bedrock zone downgradient of plant buildings has been delineated by the intermediate-bedrock monitoring wells installed in the east parking lot and adjacent areas of the site. Offsite intermediate-bedrock monitoring wells will be installed north and east of the East Parking Lot at the approximate locations shown on Figure 2, pending landowner permission. The well to be installed north of the east parking lot will be installed north of the Driving Park leg of the Lexington Avenue municipal sewer tunnel. Additional offsite intermediate-bedrock wells will be added, if needed, to delineate LNAPL extent if LNAPL is encountered at the two proposed offsite locations.

Two additional intermediate bedrock wells will be installed adjacent to Lexington Avenue west and east of the east parking lot area to determine the extent of LNAPL along the Lexington Avenue leg of the municipal sewer tunnel up- and downgradient of the area in which intermediate-bedrock LNAPL is currently known to be present along the sewer. The upgradient well will be installed south of Plant 1, possibly at an on-site location, and will be paired with a shallow-bedrock well.

Following installation, the wells will be developed to remove silt and sediment according to the procedures described in Appendix D. Records of any drilling water lost during the well-drilling and coring operations will be kept and well development will continue until an equal volume of water has been purged, or until a minimum of three well volumes has been purged, or until the well is purged dry. The wells will be allowed to equilibrate to static conditions for at least two weeks prior to sampling.

Well sampling will be performed using the procedures described in Appendix E. The water samples will be collected and analyzed by Free-Col Laboratories of Meadville, Pennsylvania for VOCs and site metals. If LNAPL is encountered in a well, it will be sampled and tested for PCBs by EPA 8082 as part of the LNAPL characterization program discussed in Section 5.2.D below. LNAPL will also be analyzed for VOCs by EPA 8260, flashpoint, density (specific gravity), viscosity, and petroleum fingerprint scan.

The wells will be slug-tested to determine the approximate hydraulic conductivity using the Bouwer and Rice method. The slug test will be conducted and the data reduced according to the procedures described in Appendix F.

If possible and as warranted by conditions indicated by the results of sampling of the new off-site wells to be installed in the east parking lot area, an inspection of the sections of the Lexington Avenue and Driving Park Avenue municipal sewer tunnels located between the site and the junction of the tunnel legs east of the Delphi site will be performed to determine if there are any features which may be related to discharge or migration of contamination into or along the sewers.

B. Onsite Deep Bedrock Monitoring Well

One additional onsite deep-bedrock monitoring well will be installed to evaluate the possible presence of dense non-aqueous phase liquids (DNAPL) downgradient of the degreaser source areas but in closer proximity to the former degreasers than existing deep wells.

Well clusters OW/SR/R-102, SR/R-131, PZ/SR/R-132, and the new well cluster to be installed north of Plant 1 between the 131 and 132 well clusters will all be sampled for VOC analyses as part of the investigation. The deep well will be installed at the well cluster that exhibits the highest level of VOC in the intermediate bedrock zone.

To date, the results of groundwater sampling of deep-bedrock monitoring wells have not detected contamination by site-related compounds of concern. Compounds typically detected in the deep-bedrock wells at the site include parts-per-billion levels of BTEX and acetone. These compounds are interpreted to be naturally-occurring organic compounds derived from the petroliferous Rochester Shale Formation.

Following the installation of the supplemental deep-bedrock well, there will be a total of six deep-bedrock monitoring wells at the site (one upgradient location and five downgradient locations). Delphi anticipates that the additional deep well installation will complete the monitoring network for deep-bedrock groundwater at the site.

Following installation, the well will be developed to remove silt and sediment according to the procedures described in Appendix D. Records of any drilling water lost during the well-drilling and coring operations will be kept and well development will continue until an equal volume of water has been purged, or until a minimum of three well volumes has been purged, or until the well is purged dry. The well will be allowed to equilibrate to static conditions for at least two weeks prior to sampling.

Well sampling will be performed using the procedures described in Appendix E. The water samples will be collected and analyzed by Free-Col Laboratories of Meadville, Pennsylvania for VOCs using USEPA Method 8260, for total chloride by Method 9250-2 and for sulfate by Method 375. The purpose of the chloride and sulfate analyses will be to further evaluate potential dissimilarities between the deep-bedrock water and water present in shallower water-bearing zones.

The well will be slug-tested to determine the approximate hydraulic conductivity using the Bouwer and Rice method. The slug test will be conducted and the data reduced according to the procedures described in Appendix E.

C. Monitoring Well Cluster North of Plant 1

To better define groundwater quality downgradient of Plant 1, a monitoring well cluster will be installed north of Plant 1 at the approximate location shown on Figure 2. The well cluster will consist of a shallow-bedrock and intermediate-bedrock well, and possibly the deep-bedrock monitoring well described in Section 5.2.B above. These wells will be installed according to the procedures described in Appendix D. If appropriate (if a saturated thickness of overburden is present several feet above the overburden/shallow-bedrock interface), an overburden well will also be installed according to the procedures described in Appendix D.

Following installation, the wells will be developed to remove silt and sediment according to the procedures described in Appendix D. Records of any drilling water lost during the well-drilling and coring operations will be kept and well development will continue until an equal volume of water has been purged, or until a minimum of three well volumes has been purged, or until the well is purged dry. The wells will be allowed to equilibrate to static conditions for at least two weeks prior to sampling.

Well sampling will be performed using the procedures described in Appendix E. The water samples will be collected and analyzed by Free-Col Laboratories of Meadville, Pennsylvania for VOCs and site metals. This well and other selected well clusters will be sampled for parameters related to natural attenuation of degreasing solvents including alkalinity, pH, sulfate, sulfide, nitrate, nitrite, methane, chloride, TKN, and dissolved oxygen, and other applicable parameters.

The wells will be slug-tested to determine the approximate hydraulic conductivity using the Bouwer and Rice method. The slug tests will be conducted and the data reduced according to the procedures described in Appendix F.

D. Supplemental Characterization of LNAPL

LNAPL samples from all of the LNAPL-bearing wells in the East Parking Lot and Building 22 Areas and from selected wells located elsewhere on site will be submitted to a lab or labs other than the project laboratory for PCB analysis by modified EPA method 680 or other high resolution GC/MS methods and for detailed fingerprinting of hydrocarbon products. Split samples of each LNAPL will be submitted to the project laboratory for PCB analysis by EPA method 8082. Analysis of physical parameters including flashpoint and specific gravity will be performed as in the past, and analysis of additional physical parameters such as viscosity and heat content may also be performed.

The purpose of the high resolution PCB analysis will be to evaluate potential differences between PCBs by identifying and quantifying either the individual PCB isomers or isomers grouped by the number of chlorine atoms attached to the biphenyl molecule (mono- to deca-chlorinated biphenyls). The purpose of the detailed hydrocarbon fingerprinting will be to evaluate potential differences between LNAPL types present by identifying and quantifying the various hydrocarbon fractions present in each LNAPL. Together these data and the data on physical characteristics may identify with more specificity the sources and/or ages of PCBs and the oils or products which contain them. The data may also prove to be useful in screening and evaluating remedial methods during the feasibility study.

The supplemental LNAPL characterization will also include analysis of VOCs by method 8260 and Semi-volatiles (SVOCs) by method 8270 in approximately 8 to 10 samples of LNAPL characteristic of all areas of the site and all types of LNAPL present at the site. The VOC and SVOC analyses will include reporting of the 10 most prominent tentatively-identified compounds (TICs) indicated in each analysis.

E. Periodic Groundwater Monitoring

Semi-annual sampling of selected existing site wells will be performed during the period of the supplemental RI activities. Newly installed wells (those described in Sections A, C, and D above and in the following sections of the work plan) will also be included in each subsequent sampling event. Each event will include a one-day measurement event to determine water and LNAPL levels in all on-site and off-site wells.

Well sampling will be performed using the procedures described in Appendix E. LNAPL and water samples will be collected and analyzed by Free-Col Laboratories of Meadville, Pennsylvania. Analytical parameters will include TCL VOCs for EPA method 8260 analysis. Other parameters including site metals, PCBs, or other compounds or characteristics will be analyzed as warranted. The list of wells to be sampled and parameters to be analyzed will be submitted to NYSDEC prior to each sampling event.

5.3 Plant Process Areas

The Plant Process Areas warranting supplemental investigations are the following:

- Degreaser Investigation Study Areas 1 through 4 and Degreaser 36
- Machining Areas
- Tubing Mills Area and Reclaim Water Pit
- Stoddard Flow-Testing Areas
- Product Engineering and Test Fuel Areas
- Platers

The Plant process areas will be investigated primarily by drilling soil test borings and installing monitoring wells inside the Plant at the locations shown on Figure 2. Soil test borings will be drilled either with direct-push equipment or with auger equipment. Specific investigative work to be conducted at each of the Plant process areas is described below.

A. Degreaser Investigation Study Areas 1 through 4

In each of Degreaser Investigation Study Areas 1 through 4, one or more soil borings and one or more well clusters will be installed. No further investigations are planned for Study Areas 5 and 6. Proposed soil-sampling and well locations are shown on Figure 2; they have been selected on the basis of previous soil-vapor sampling results for each area, previous soil and monitoring well sampling results from Study Area 4, considerations of current drill-rig accessibility, and, where appropriate, proximity to other potential areas of environmental concern.

During drilling, continuous split-spoon or direct-push sampling of soil will be performed to refusal on bedrock. Representative soil samples from each 2-ft. sample interval will be collected in 8-oz. driller's jars and visually logged. Sample splits will be collected in 4-oz. jars supplied by the contract laboratory and reserved in an iced cooler. The 8-oz. jar samples will be sealed with foil and allowed to equilibrate to room temperature for a minimum of one hour. The air headspace above the soil samples will then be screened with a Photovac MicroTIP photo-ionization organic vapor meter equipped with a 10.6 eV UV lamp detector, or equivalent, by carefully piercing the foil cap with the probe tip and recording the maximum meter reading. Up to two soil sample splits per borehole will then be selected and submitted for laboratory analysis, one from above and one from below the water table. The soil samples with the highest organic vapor readings from each horizon will be submitted for lab analysis. The soil samples will be analyzed for VOCs using EPA 8260.

If oil staining or other evidence of potential oil contamination is observed in soil samples, analyses of soil samples will be performed to determine the total petroleum hydrocarbon (TPH) content by Modified EPA Method 8015B for diesel-range organics (DRO). The TPH analysis results will be calibrated to available site-specific petroleum products including non-soluble machining oils used at the Plant and Stoddard solvent. Selection of samples for TPH analysis will be determined on the basis of degree of staining or oil observed in the samples and the VOC screening described above.

Where monitoring wells are to be installed, the soil-sampling boreholes will be advanced seven feet into bedrock and completed as shallow-bedrock monitoring wells as described in Appendix D. If the groundwater table at that location is above the top-of-bedrock by several feet, an adjacent overburden monitoring well will be installed by augering without sampling to the top-of-bedrock. The overburden wells will be installed as described in Appendix D.

Ambient air monitoring will be conducted in the work zone as required under the Project Health & Safety Plan, and appropriate personnel protective equipment will be donned as warranted.

Following installation, the wells will be developed to remove silt and sediment according to the procedures described in Appendix D. Records of any drilling water lost during the well-drilling and coring operations will be kept and well development will continue until an equal volume of water has been purged, or until a minimum of three well volumes has been purged, or until the well is purged dry. The wells will be allowed to equilibrate to static conditions for at least one week prior to sampling.

Well sampling will be performed using the procedures described in Appendix E. The water samples will be collected and analyzed by Free-Col Laboratories of Meadville, Pennsylvania using USEPA Method 8260 for volatile organics. Analysis for site metals will also be performed to provide information on possible groundwater quality impacts from former plating area operations in other areas of the plant. If LNAPL is encountered in a well, it will be sampled and tested for PCBs by EPA 8082, VOCs by EPA 8260, and for flashpoint, viscosity, and petroleum fingerprint.

The wells will be slug-tested to determine the approximate hydraulic conductivity using the Bouwer and Rice method. The slug tests will be conducted and the data reduced according to the procedures described in Appendix F.

1. Former Degreaser-36 Locations

    Soil-vapor testing at both former locations of Degreaser 36 will be conducted using the same procedures used in earlier soil-vapor surveys at the Plant. The soil-vapor investigative methods are described in Appendix G. The need and practicability of drilling soil test borings and installing wells at these locations will be evaluated based on the soil-vapor testing results. Drilling investigations at these areas, if performed, would follow the same procedures as those described above for the Degreaser Investigation Study Areas 1 through 4.

B. Machining Areas

An area-wide approach for the investigations of machining areas is warranted because of the large size, large number, and widespread extent of machining operations at the site. Subsurface investigations of the machining areas will consist of installing monitoring wells inside the Plant at the approximate locations shown on Figure 2.

1. Plant 1

Pits 20, 21, and 22 and the associated Acme screw machines will be removed from service in 1999, freeing up space for drilling in the area. The floor of pit 20 is constructed approximately 9 feet below the top-of-bedrock. An intermediate-bedrock monitoring well will therefore be installed adjacent to pit 20. Elsewhere in Plant 1, soil borings and overburden and shallow-bedrock wells to be installed in Degreaser Investigation Study Areas 1, 2, and 3, as described above in Section 5.3.A, will serve to better define the impacts from machining operations and the extent of LNAPL beneath Plant 1. The Study Area 1, 2, and 3 wells and the Pit #20 well will be monitored for LNAPL presence during each subsequent groundwater sampling event. If LNAPL is present in the wells, it will be sampled for analysis of VOCs, PCBs, flashpoint, viscosity, and petroleum fingerprint.

2. Plant 2

Shallow-bedrock wells will be installed at three locations adjacent to or downgradient of machining-system and machining-oil-filter pits in Plant 2, as shown on Figure 2. If the groundwater table at that location is above the top-of-bedrock by several feet, an adjacent overburden monitoring well will be installed by augering without sampling to the top-of-bedrock. The purpose of installing these wells will be to evaluate subsurface conditions in the overburden and shallow-bedrock for the presence of LNAPL. None of the machining-system pits in Plant 2 are believed to extend below the top-of-bedrock.

The wells will be installed in accordance with the procedures described in Appendix D. Continuous soil samples will be collected and logged during the drilling activities. If oily soils are observed, selected soil samples will be submitted for lab analysis of TPH by Method 8015B modified (DRO). The wells will be sampled for lab analysis of groundwater for VOCs and site metals. If LNAPL is encountered in a well, it will be sampled and tested for VOCs, PCBs by EPA 8082, flashpoint, viscosity, and petroleum fingerprint.

As described above in Section 5.3.A and below in Section 5.5.C, additional borings and wells will be installed in and near Degreaser Investigation Study Area 4 and adjacent to the 48-inch sewer pipe. These borings and wells will serve to further define the extent of LNAPL beneath Plant 2.

C. Former Tubing Mills Area

Delphi personnel report that releases of mercury or other contaminants to the subsurface from the former tubing mills area are not known to have occurred, and the potential for unknown releases is thought to be unlikely. However, interior monitoring wells near the former tubing mills area installed during the supplemental RI will be sampled for analysis of mercury in groundwater.

D. Stoddard Flow-Testing Areas

Sumps in the Stoddard Flow-Test Areas will be investigated by soil-vapor testing. Soil-vapor sampling methods are described in Appendix G. A limited number of soil-vapor sampling points will be deployed across the rest of each former Flow-Test area. Follow-up soil-vapor sampling, soil borings, and wells will be installed as warranted on the basis of the initial soil-vapor results. Soil borings will be installed in the Stoddard Flow-Test Areas if concentrations greater than 100 ppm of petroleum vapors are found in the soil-vapor samples. Selected soil samples from each boring will be analyzed for VOCs and TPH.

Wells will be installed in these areas if visual or analytical soil sample results indicate the potential presence of LNAPL or dissolved groundwater contamination. If wells are installed and LNAPL is found, the LNAPL will be sampled and analyzed for VOCs, PCBs using Method 8082 and a petroleum fingerprint scan will be performed. If PCBs are detected in LNAPL encountered, PCB characterization using GC-MS methods (modified EPA method 680 or other appropriate procedure) will be performed as warranted. In the absence of LNAPL, groundwater samples will be collected for analysis of VOCs.

E. Product Engineering and Test Fuel Areas

Soil-vapor testing inside Buildings 3 and 4 and the adjacent area inside the east end of Plant 1 will be performed. Soil-vapor sampling methods and procedures for follow-up soil borings and wells will be the same as those described for the former Stoddard flow-testing areas in Section D above. Physical accessibility may constrain the scope of follow-up work in these areas.

F. Platers

Hand-sampling or direct-push sampling of shallow soils will be performed in former plating areas at identifiable former locations of plating wastewater sumps and crocks and plater or dichromater foundations. Available plant-engineering and construction drawings will be reviewed to determine, where possible, the location of sumps, crocks, and foundations. Soil samples will be obtained to approximately 3 feet below the bottom depth of the foundation, sump, or crock, and samples will be submitted to the contract laboratory for analysis of site metals and cyanide.

5.4 Other Plant Features

Other Plant features to be investigated include the Tank Farm Area, former UST Areas B, C, D, E and F, the Plant 2 elevator, the Scrap Building, and basement sumps. Specific investigative work to be conducted at each of these features is described below. Proposed investigations at the Oil House are discussed in section 5.5.

A. Tank Farm Area

Supplemental investigations at the Tank Farm Area will include drilling soil borings and collecting soil samples for analysis of VOCs and TPH in the current footprint of the secondary containment basin at a future date when the tanks are removed.

B. Former UST Areas B, C, D, E, and F

A test boring program for purposes of collecting soil samples for analysis in former UST areas B, C, D, E, and F and for evaluating the Areas for LNAPL presence will be performed. The approximate test boring locations are shown on Figure 2. Selected soil samples will be submitted from each boring for analysis of VOCs and TPH. If evidence of residual petroleum product is found, a soil boring will be completed as an overburden or shallow-bedrock well for purposes of monitoring potential LNAPL on the water table. The criteria for basing a decision on whether to install a well will be visual evidence of petroleum product in soil samples, on the drilling tools, or in the borehole.

LNAPL or groundwater if LNAPL is absent will be sampled for VOC analysis at each well installed.

No further investigation is planned in former UST Area A. Previous groundwater monitoring results from PZ-120 and SR-236 have adequately defined groundwater conditions in this area. The water table at PZ-120 is within a few feet of ground surface, and low levels of benzene have been detected in shallow groundwater.

1. Former TCE UST

A soil test boring will be advanced as close as possible to the former location of tank 30, which was a 10,000-gallon TCE UST formerly located within UST Area D. Continuous soil samples will be obtained and screened with a PID meter using the headspace methods described in Appendix D. The two soil samples with the highest headspace readings will be submitted for lab analysis of VOCs by Method 8260. A hydropunch groundwater sample will be obtained from the bottom of the borehole using a stainless-steel screened drive point and a disposable polyethylene bailer. The groundwater sample will be submitted for lab analysis of VOCs by Method 8260.

C. Plant 2 Elevator

A single test boring will be installed just downgradient of the elevator shaft, and the test boring will be completed as a shallow-bedrock monitoring well according to the procedures described in Appendix D. The purpose of installing this well will be to evaluate the possible presence of hydraulic fluid in the subsurface. If LNAPL is encountered in the well, the LNAPL will be sampled and analyzed for SVOCs by Method 8270, PCBs by Method 8082 and petroleum fingerprint scan. If oily soils are encountered during the drilling, soil samples will be submitted for SVOC and PCB analysis.

D. Scrap Metal Building (Building 11) and Adjacent Coal Pile

Test borings will be performed to attempt to whether releases of machining oil or coolants have occurred to soil or groundwater from the scrap metal handling areas in Building 11. Three proposed test boring locations are shown on Figure 2. All borings will be at outdoor locations. One boring will be positioned as close as possible to the tote-staging-deck sump located on the south wall inside the building; this boring will also be used to assess soil and groundwater conditions related to the former coal pile. A second boring will be placed north of the tote-staging-deck located in the northwest corner of the building. The third will be positioned at the northeast corner of the building as close as possible to the door to the east truck dock. The second and third borings will double as explorations for the former Easement A disposal area; a full description of explorations in that area is presented below in Section 5.5.E

Continuous split-spoon soil samples will be obtained and examined for the presence of oil or oil staining. Selected soil samples will be submitted for analysis of TPH by modified Method 8015B (DRO), and site metals will be analyzed in the samples from the boring on the south (coal-pile) side of the building. VOC screening and analysis of additional parameters (and possibly additional samples) will be added for the samples from the two borings on the north side of the building to investigate conditions in the Easement A Disposal Area.

One hydropunch groundwater grab sample will be obtained per boring using a stainless steel screened drive point attached to the drilling rods and a disposable polyethylene bailer. The hydropunch groundwater samples will be submitted for lab analysis of VOCs and site metals. If field observations indicate that LNAPL is potentially present at a test boring location, an overburden well will be installed. If LNAPL is encountered in a well, the LNAPL will be sampled and analyzed for PCBs by Method 8082 and petroleum fingerprint scan.

E. Basement Sumps

Basements and basement sumps will be evaluated to determine whether groundwater or LNAPL is infiltrating the structure. Samples of water and/or oil will be collected at each sump where groundwater or LNAPL infiltration is apparent. Samples of groundwater will be analyzed for VOCs and site metals, and samples of LNAPL will be analyzed for VOCs, PCBs, physical parameters, and petroleum fingerprint. Wipe samples of oil-staining on basement walls where oil infiltration is apparent will also be performed for PCB analysis.

5.5 SWMUs / AOCs

The SWMUs/AOCs to be investigated include the Oil House, the former incinerator and adjacent waste oil storage area behind Plant 2, the 48-inch storm sewer and precursor drainage ditch, the former non-cyanide drum wash area , and the former Easement A Disposal Area.

A. Oil House and Center Dock

Test borings will be performed to attempt to determine potential impacts in the area where drain lines from the original oil house reportedly discharged onto the ground surface in the period prior to 1957. A single boring will also be performed at each end of the interior section of the center dock where spills are reported to have occurred. The four proposed boring locations are shown on Figure 2.

Continuous split-spoon soil samples will be obtained and screened with a PID meter using the headspace methods described in Appendix D. Selected soil samples will be submitted for analysis of VOCs by Method 8260, PCBs by method 8082, and site metals by Method 6010/7740. One hydropunch groundwater grab sample will be obtained per boring using a stainless steel screened drive point attached to the drilling rods and a disposable polyethylene bailer. The hydropunch groundwater samples will be submitted for lab analysis of VOCs by Method 8260, PCBs by method 8082, and site metals.

B. Former USTs 26 and 26A

One test boring is planned at the former location of the north end of tank 26A. Selected soil samples from the boring will be analyzed for VOCs and TPH.

C. Former Incinerator, Waste Oil Pit, and Waste Oil Storage Area

A test boring and well installation program will be conducted in the Plant 2 courtyard to determine the extent of LNAPL in the overburden and shallow bedrock in the vicinity of the former incinerator and waste oil pit (tank 66). This drilling program will concurrently address the Waste Oil Storage Area. Three proposed boring locations are shown on Figure 2. Continuous split-spoon soil samples will be obtained and screened with a PID meter using the headspace methods described in Appendix D. The two soil samples with the highest headspace readings will be submitted from each boring for lab analysis of VOCs by Method 8260 and PCBs by Method 8082. TPH analysis will also be performed on these samples or other samples if they appear to be oily. The borings may each be completed as overburden piezometers or shallow bedrock wells; a decision to install a well at each location will be made in the field on the basis of conditions observed.

D. Former Drainage Ditch

As described in the Site History Document, the existing 48-inch diameter main trunk of the storm sewer at the site was constructed in a predecessor drainage ditch which extended west from the west wall of Plant 1 and then north to where it discharged into a culvert leading to the municipal sewer. Three soil test borings to refusal on bedrock will be installed within Plant 2 alongside the existing 48-inch diameter sewer. Three additional soil test borings to refusal on bedrock will be installed north of Plant 2 along the side the existing 48-inch diameter sewer and along the path of the former ditch where it does not coincide with the path of the existing sewer. These borings will also serve to determine whether releases have occurred from the parallel, adjacent main underground process sewer line. The approximate locations of the proposed soil borings are shown on Figure 2.

Continuous split-spoon soil samples will be collected from each of the borings in an attempt to identify the former bed of the drainage ditch. Soil samples elected on the basis of elevation relative to the former ditch bottom and visual evidence of soil type and contamination will be submitted for analysis of VOCs by Method 8260, PCBs by method 8082, and site metals. TPH analysis will be performed if oil staining is apparent.

One hydropunch groundwater grab sample will be obtained per boring using a stainless-steel screened drive point attached to the drilling rods and a disposable polyethylene bailer. The hydropunch groundwater samples will be submitted for lab analysis of VOCs by Method 8260, PCBs by method 8082, and site metals.

E. Former Non-Cyanide Drum Wash Area

A single soil test boring will be advanced as close as possible to the former sump. Two soil samples and one hydropunch groundwater sample will be submitted for lab analysis of VOCs by Method 8260, site metals, and cyanide.

F. Former Easement A Disposal Area

Up to five soil test borings will be installed in and near the former Easement A Disposal Area. The purpose of these borings will be to determine whether there are environmental impacts related to the fill and to identify the extent of the fill. The approximate locations of the proposed soil borings are shown on Figure 2. One or more soil samples from each boring will be selected on the basis of field-screening results and conditions observed, and the samples will be submitted for lab analysis of VOCs, PCBs, and site metals. TPH analysis will be performed if oil staining is apparent. Based on evaluation of the field-screening results, two of the soil borings will be completed as overburden monitoring wells which will be sampled for analysis of VOCs, PCBs, and site metals.

5.6 Baseline Risk Assessment

The baseline risk assessment evaluates the potential impacts on human health from compounds of concern identified at the Delphi site. The assessment will be prepared in accordance with USEPA's Risk Assessment Guide (RAG). The primary objective of the baseline risk assessment is to evaluate the risks associated with soil and groundwater contamination at the site as identified in the findings of the RI.

The baseline risk assessment report will be included in the Remedial Investigation/Feasibility report and will be presented in accordance with USEPA's RAG documentation. The risk assessment report will include discussions of the following risk assessment topics.

A. Identification of Compounds of Concern and Potential Exposure Pathways

Compounds of concern (COCs), as defined by USEPA's RAG, are chemicals that are potentially related to the site and for which analytical data of sufficient quality exists. Current and historical site data will be reviewed, and site sampling and chemical analyses have been and will be conducted (prior to and as part of the RI) to identify COCs on the site. Data from these investigations will be used in the baseline risk assessment as representative of site conditions.

There are a number of site COCs which have been preliminarily identified based on past sampling and analysis data. These include volatile organic compounds (VOCs) associated with past solvent degreaser usage at the site, such as trichloroethene, tetrachloroethene, 1,2-dichloroethene, and vinyl chloride, PCBs (detected in site LNAPL samples), and several inorganic constituents (metals) including chromium and lead.

Free-phase oils, including a varied a mixture of Stoddard solvent, cutting oil, and test fuels, are present at several locations across the site and often contain VOCs or PCBs. However these oils are generally not considered to be compounds of concern. VOCs or PCBs present within the LNAPL will be considered as COCs separately from the LNAPL.

Potential exposure pathways are developed to evaluate the means by which affected potential human receptors may come into contact with identified COCs. Compounds of concern have been identified as being present within site soils, groundwater, and LNAPL media. The magnitude, frequency, and duration of exposure will be evaluated using scenarios of exposure. Such scenarios will be derived from current site use and setting and reasonably predictable future conditions. Exposure routes which may result in exposure to the general public or to Delphi workers may involve soils, groundwater, soil vapor within ambient air, or soil particles within ambient air, and may include some or all of the following scenarios:

- Site worker or public exposure to COCs in ambient air or in airborne dust.
- Site worker exposure to COCs in site soils.
- Site worker or public exposure to groundwater containing COCs.

Additional exposure scenarios may be identified during the baseline risk assessment.

B. Human Health Risk Assessment

Exposure scenarios considered to represent realistic likelihood for exposure to humans will be reviewed and each practical exposure pathway will be used to calculate Reasonable Maximum Exposure (RME) risk, or a measure of the potential future exposure risk.

Exposure intake estimation will integrate population, activities, and exposure pathways into exposure scenarios representing RME conditions for the evaluation of human health risk. The RME determined for each potential exposure scenario will use average intake parameters and the concentrations of COCs detected in the media of concern. Exposure estimation will be measured in terms of Absorbed Dose, which accounts for COC concentration, intake rate, exposure frequency and duration, absorbed fraction, body weight, and averaging time of exposure (extrapolated).

Calculated absorbed doses will be calculated for each COC in each scenario to estimate both the lifetime average daily dose (LADD) for potential carcinogenic risks, and pathway-specific, chronic-daily intake (CDI) for potential non-carcinogenic risks, if applicable.

Carcinogenic and non-carcinogenic risks are calculated separately based on human health toxicity data for the COCs identified at the site through a hazard identification and dose-response evaluation in accordance with USEPA guidance. The hazard identification is a qualitative description of the potential toxic properties of selected COCs at the site. Such data usually include the uses for the compound, forms of the compound, permissible exposure limits, and results and effects of exposure to the compound.

The dose-response assessment will be a quantitative measure of toxicity to estimate the relationship between the extent of potential exposure to a COC and the potential increased likelihood and/or severity of adverse effects. COCs are classified as carcinogens or non-carcinogens and are assessed as such using RAG methods to calculate the effects of carcinogenic or non-carcinogenic COCs. Hazard index values are calculated to indicate whether the exposure dosage exceeds an acceptable level.

Risk characterization is the final step of the baseline risk assessment process. Potential carcinogenic or non-carcinogenic risk will be assessed for COCs. The cancer risk estimates and the hazard index values for non-carcinogenic effects, initially calculated separately, are then summed to obtain the total excess cancer risk and non-carcinogenic effects.

An evaluation of the level of confidence/uncertainty will also be included which describes assumptions made during the baseline risk assessment and assessments of the risk estimates based on the nature of the data used in the calculations.

C. Ecological Risk Assessment

The Delphi site is located within an industrial setting in the City of Rochester. The site is not adjacent to any wetlands, streams or other bodies of water, or other significant grounds for flora or fauna. The subsurface nature of the site contaminants, the fact most of the site is covered by impermeable structure, and the relative lack of a significant variety of wildlife on the site makes it unlikely that plant or animal life would be adversely impacted by site contaminants. In respect to the industrial setting discussed above no ecological risk assessment is warranted or planned.

5.7 Remedial Investigation Report Structure

An Interim Remedial Investigation Report will be prepared in the first quarter of 2000 to describe results of investigations of offsite and outdoor onsite areas and to present an evaluation of the need for making enhancements to the existing migration-control system or for adding new IRMs.

Following the completion of all work tasks described above, a Final Remedial Investigation Report will be prepared. The Final RI report will integrate the cumulative findings of the various site investigation programs conducted since 1981, and the findings of the 2000 Interim RI report will be incorporated in the Final RI report. The report will include summary data tables, site maps, hydrogeologic cross sections, and text sufficient to characterize the RI findings.

The Final Report will be prepared in accordance with the 1988 EPA Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. The report will include a certification by the individual or firm with primary responsibility for the day to day performance of the RI that all activities that comprised the RI were performed in full accordance with the RI/FS Work Plan.

VI. FEASIBILITY STUDY

6.1 Objectives

A Feasibility Study (FS) will be prepared for the site pursuant to the requirements of the Consent Order. The objectives of the FS are to identify and evaluate, in a manner consistent with State Superfund and RCRA Corrective Action requirements, potential remedial alternatives and propose a final remedy which will attain conditions protective of human health and the environment for the current, intended and reasonably anticipated uses of the site. The remedy selection will be based on screening criteria that include the protection of potential human and environmental receptors, compliance with applicable NYSDEC Standards, Criteria and Guidance (SCGs), effectiveness, cost, implementability, and technical feasibility.

The FS will be based on the collective findings of the RI conducted at the site. The FS will identify a final remedial alternative, or combination of alternatives, which meet the remedial action and corrective measure objectives and is both cost effective and technologically feasible.

Delphi has implemented four IRMs that are currently in operation at the site. The threat to off-site receptors has been mitigated by the installation and operation of the ~~a~~ groundwater migration-control, collection, and treatment trench along the downgradient north-northeast site boundary. This IRM is effective at controlling migration of the groundwater contaminant plume toward off-site areas. This IRM may be upgraded or augmented to increase its effectiveness and area of influence, as warranted. LNAPL- and vapor-recovery systems are currently operating within certain contaminant source areas located within the site. The FS will evaluate these IRMs and other potential remedial alternatives for application on the site.

6.2 Description of Remedial Action Objectives

The Remedial Action Objectives (RAOs) consist of medium-specific or operable-unit specific goals protective of human health and the environment. Establishing RAOs involves identifying the contaminants of concern, the media of interest, potential exposure pathways, and preliminary site-specific remediation goals that permit a range of treatment and containment alternatives to be developed. The site-specific remediation goals will be developed on the basis of:

- allowable exposures based on risk assessment analysis. The risk assessment analysis will be conducted using EPA Risk Assessment Guidance (RAG) Procedures:
- current and potential future uses of the site, including potential impacts to offsite receptors; and
- applicable SCGs. Potentially applicable SCGs include the soil cleanup levels in NYSDEC TAGM 4046 (24 January 1994), the groundwater standards and guidance values set forth in 6 NYCRR § 703.5 (updated March 1998), and NYSDEC's "Guidelines for the Control of Toxic Ambient Air Contaminants," NYSDEC Division of Air Resources (DAR)-1 (November 1997).

The RAOs will provide a basis for the evaluation of remedial alternatives that are both suitable to be implemented on the site and protective of human health and the environment.

6.3 Description of General Response Actions and Remedial Action/Corrective Measure Alternatives

General Response Actions are those actions which are capable of satisfying the RAOs and which may be applicable to remediation of the site. These actions are selected on the basis of the RI findings and the RAO criteria. A preferred hierarchy of groups of remedial technologies has been promulgated by NYSDEC in its TAGM HWR-90-4030, "Selection of Remedial Actions at Inactive Hazardous Waste Sites". When selecting General Response Actions, consideration will be given to the hierarchy of desired remedial technologies. The hierarchy of treatment groups, in order of preference includes chemical destruction, separation and treatment, solidification/chemical fixation, control and isolation, and off-site land disposal. Remedial technologies and process options within these treatment groups will be evaluated for technical implementability at the site based on accessibility, subsurface characteristics, the contaminants present, and proven success as demonstrated by pilot- or full-scale testing.

At present, the following General Response Actions and remedial actions/corrective measures appear to be applicable to the Delphi site:

A. LNAPL Recovery

LNAPL recovery technologies may be applied to areas of the site to remove free product where present in soil and bedrock. This General Response Action is a form of separation and treatment and serves to mitigate contaminant source material by removal of LNAPL from the soil or bedrock.

LNAPL recovery systems are either a passive system in the form of a device which is installed in a well and then removed and drained/discarded when full or saturated with oil, or an active system which serves to mechanically pump free-phase product from a well or sump.

Passive systems are primarily hydrophobic, oil-absorbent, or osmosis-related units such as ORS Environmental Systems Filter Scavenger® Systems that are designed to allow collection of oil by skimming from the water table. Active systems typically involve groundwater pumping to lower the water table and induce oil flow toward a collection point where it can be collected by skimming, or total-fluids pumping or vacuum-assisted total-fluids pumping with processing of the effluent through an oil/water separator. Active systems are typically designed to recover the floating oil layer from the groundwater surface while minimizing the volume of water collected.

Both active and passive systems can be effective at removing oil that is mobile in the subsurface and can travel to the collection well. Residual, immobile oil will typically remain trapped in soil pores or bedrock fractures without other enhancement technologies.

In addition, other suitable product recovery technologies deemed practical will be screened and evaluated for potential application to free-product removal at the site.

B. Groundwater Capture, Containment, & Treatment

Groundwater capture and containment is a combination of separation and treatment and control and isolation technologies. General Response Actions of this type would be effective for capturing contaminants that are mobile in groundwater, such as dissolved VOCs and metals.

Application of these technologies is typically in the form of a groundwater pump-and-treat system or other groundwater capture system (vacuum-enhanced pumping, vacuum extraction, etc.) coupled with an enhanced-permeability collection system, such as a gravel-filled trench or blasted-bedrock trench. Groundwater pumping wells installed within a zone of enhanced permeability increase the rate of extraction and the zone of groundwater capture. As discussed in Section 2.2 A, controlled bedrock-blasting to create a migration-control trench has been implemented at the Delphi site and has been shown to be effective and reliable.

Similar applications of these technologies could include using arrays of groundwater pumping wells to provide localized capture and prevent contaminant migration without an enhanced-permeability zone. Other suitable groundwater capture, containment, and treatment technologies deemed practicable will be screened and evaluated for potential application such as:

- site capping,
- impermeable cut-off walls,
- funnel and gate systems,
- in-situ bioremediation, and
- monitored natural attenuation.

C. Source Area Soil Remediation Measures

Soil remediation technologies are believed applicable to the site based on the nature of the contamination, the composition and permeability of subsurface materials, and the locations of specific apparent source areas of contamination. Soil remediation technologies may consist of contaminant destruction, separation and treatment, solidification/fixation, or control and isolation technology groups.

Applicable technologies include capping, vapor extraction, in-situ bioremediation, thermal stripping, excavation and removal, chemical fixation, and other potential measures as discussed below. Excavation and removal options would include potential on- and off-site treatment and off-site disposal elements.
Destruction technologies would include in-situ bioremediation, thermal destruction, or other technologies that chemically destroy or break down the chemical structure of the contaminants into non-hazardous byproducts.

Separation and treatment include technologies which extract or remove the contamination from beneath the subsurface, such as excavation, coupled with treatment at the surface (for example, destruction technology, treatment technology such as surfactant flushing, air-sparging, soil vapor extraction, peroxidation treatment, biological treatment, land-farming, or off-site treatment). Both on-site ~~or~~ and off-site treatment options will be considered with preference to on-site and in-situ remedial alternatives.

Solidification/chemical fixation technologies treat impacted soils to render the medium a solid piece of material or to render the contaminant species immobile and non-reactive to natural subsurface processes. Such technologies include thermal solidification and grout mixing to solidify the soil/contaminant mass.

Control and isolation treatment would include actions that do not reduce toxicity but merely attempt to isolate the contaminants. Such technologies include slurry walls, sheet pilings, and other containment systems to prevent further contaminant migration.

These remedial measures may be applicable to relatively small and manageable units of metals or VOCs in soils at the site. The feasibility of these technologies is dependent upon subsurface conditions and accessibility within the Plant with respect to installed manufacturing equipment.

D. Site Control Measures

Site control measures reduce exposure risks for both facility personnel and the public. In addition, restrictions on building ventilation, building uses, or access to the subsurface within specific areas of the site minimize site worker exposure risks. These site-control measures will mitigate risk to human health during the time Delphi owns the site.

Delphi currently enforces site control measures in the form of a site boundary fence and security guards. Gates that are either security-card controlled or are guarded by security personnel around the clock control entry into the manufacturing area. Closed-circuit television coverage of all exterior areas of the site provides additional site control.

Capping of an impacted area with an impermeable layer is another site control measure that may be employed to reduce the potential for occupational exposure to subsurface contaminants on the site.

Measures which would dictate how the site may be used in the future if the site were to change ownership or leased to tenants may be implemented through the use of a deed restriction. This would mandate that the site could only be utilized or developed in accordance with property uses stipulated in the deed restriction. It is currently anticipated that a deed restriction will be incorporated into the final remedy.

E. Monitored Natural Attenuation

The process of natural attenuation refers to contaminants degrading naturally over time, with or without the application of any specific external technology to any site media. It differs from "No Action" in that a number of subsurface parameters and conditions must be measured, and favorable conditions met, before this alternative can be considered an applicable option. This option includes ongoing groundwater monitoring. Natural attenuation relies on time and naturally occurring bacteria to destroy constituents of concern and decrease contaminant levels through metabolic activities.

Subsurface conditions at the site, including currently observed contaminant degradation rates, the presence and amount of bacteria, oxygen, sources of metabolic activity, and other parameters are evaluated. If conditions are acceptable and the technology is applied, the subsurface parameters initially measured must continue to be monitored to ensure the desired subsurface conditions exist. In addition, continued groundwater and/or soil monitoring must be conducted, specifically at site boundaries, to assess changes in the soil and groundwater quality patterns.

Currently observed conditions with respect to former degreasing solvents and related daughter compounds indicate that natural attenuation/biodegradation of the solvent-related compounds is occurring at the site. The FS will evaluate alternatives for monitoring and potentially enhancing this process.

6.4 Evaluation of Existing Interim Remedial Measures (IRMs)

The FS will evaluate the continued operation of IRMs currently operating at the site. The following is a summary of the existing IRMs in place at the Delphi site.

A. Groundwater Migration Control System

As described in Section 2.2.A of this Work Plan, Delphi currently operates and maintains a groundwater migration control, collection, and treatment system. The principal component of the system is a collection trench located along the downgradient boundary of the site parallel to Driving Park Avenue, as shown in Figure 2. The system, which has been in operation since 1992, intercepts and treats contaminated groundwater moving downgradient from the manufacturing buildings.

The groundwater migration control, collection, and treatment system is effective in controlling groundwater flow downgradient of the Plant. VOC concentrations detected in groundwater have decreased by approximately one order of magnitude from the concentrations detected prior to the system's inception. The data indicate the system is operating as intended, providing a barrier to the additional off-site migration of the contaminant plume, and reversing the hydraulic gradient in the area immediately north of the trench.

The Feasibility Study will evaluate the capabilities, performance, and limitations of the current system in light of the additional data to be collected during the supplemental remedial investigations. Possible enhancements to the system will be evaluated.

B. Light Non-Aqueous Phase Liquid (LNAPL) Recovery Systems

1. Tank Farm Area

As indicated in Section 2.2.B.1 of this Work Plan, an LNAPL-recovery system located in the former Tank Farm Area was initiated in 1989 to collect a floating product from an overburden plume present at the northeast corner of the Plant 1 building. Since 1994 the system has involved total-fluids pumping of LNAPL and groundwater from recovery well RW-2, which is located in the center of a 400-foot-long LNAPL- recovery trench.

Overburden groundwater and product levels in the area of the Tank Farm indicate that the pumping from the collection trench is providing capture of the Tank Farm Area LNAPL plume as well as creating groundwater-flow gradients toward the trench beyond the limits of the oil layer. LNAPL continues to be observed in some adjacent overburden piezometers including PZ-121, PZ-123, and PZ-124.

The Feasibility Study will evaluate the performance of the current system in light of the additional data to be collected during the supplemental remedial investigations. Possible enhancements to the system to increase the rate of LNAPL recovery will be evaluated.

2. Building 22

As indicated in Section 2.2.B.2 of this work plan, a floating LNAPL layer (Stoddard solvent) was discovered in 1992. A passive oil-collection system has been operated in recovery well RW-4 since 1994. A new system to be installed in 1999 will use vacuum-enhanced total-fluids pumping at well RW-4 and Well Z. The enhanced system is expected produce groundwater drawdown in the vicinity of the recovery wells, causing oil to flow towards the wells; the system is intended to increase the rate of product recovery and capture.

Design plans for the new LNAPL-recovery system will be submitted for NYSDEC review and approval under separate cover. Recovery of product from the pumping stream will be accomplished using an oil-water separator in the AWTA water treatment plant. Water and LNAPL recovered from the AWTA foundation drain will also be treated in this system.

The FS will evaluate the system performance in light of the additional data to be collected during the supplemental RI. Possible enhancements to the system will be evaluated over time depending on the observed subsurface response to the IRM improvements.

C. Soil Vapor Extraction System (Degreaser Study Area 5)

As indicated in Section 2.2.C of this Work Plan, remediation of Study Area 5 soils using soil vapor extraction (SVE) started in June 1996. The system has proven to be an effective means of subsurface mass removal. To date the SVE system has extracted about 4,000 pounds of contaminant mass, with about 3,500 pounds in the first 18 months of operation. Mass removal rates continue to indicate about one to two pounds per day are being extracted from the subsurface in this area.

The Feasibility Study will evaluate the capabilities, performance, and limitations of the current system in light of the additional data to be collected during the supplemental remedial investigations. Possible enhancements to the system will be evaluated. Delphi intends to continue to utilize the SVE for source area mass removal and may upgrade the system as necessary or implement SVE at other Degreaser Study Areas based upon the supplemental RI results.

6.5 Pilot Tests and Treatability Studies

In order to assess the effectiveness of potentially applicable General Response Actions, pilot tests or treatability studies of remedial technologies which are believed to be applicable to site remediation may be conducted. Bench-scale studies may be conducted to evaluate a technology's potential with respect to site-specific soil and groundwater conditions. Results or information from studies conducted at other similar sites demonstrating the effectiveness and cost-benefits of a remedial technology will also be considered.

The purpose of pilot testing is to provide an initial, small-scale, experimental application of a proven technology at an on-site location to determine that technology's ~~its~~ applicability to the site-specific subsurface conditions. Technologies which are effective at bench (laboratory) scales often prove ineffective when applied to field conditions due to unanticipated factors, natural or otherwise. Results from any pilot tests conducted will be evaluated to determine the effects of site-specific conditions and re-evaluate the applicability of the technology to the specific area(s) of the site.
Surfactant flushing, thermal desorption, bioremediation, and vacuum extraction are examples of technologies which may be pilot tested. These technologies are destruction or separation and treatment technologies and have been proven effective in bench-scale, pilot test-scale, and applied field-scale applications at other sites.

6.6 Identification of Applicable Remedial Technologies

The most effective, realistic, and practical means to achieve risk mitigation for potential off-site receptors is to adopt remedial measures which address a site-wide control strategy. Such an approach is reflected in Delphi's current operation of its groundwater migration control, collection, and treatment system.

A. Assembly of Site-Wide Remedial Alternatives

Further evaluation of potentially applicable site-wide control strategies will be performed.

As described in Section 6.3, General Response Actions will be evaluated and screened to identify potentially applicable remedial alternatives. Alternatives best suited to the site will be screened and considered for application.

It is anticipated that a relatively small number of the individual remedial alternatives will be applicable to the site as a whole. The final remedy, which will likely be a combination of alternatives, will emphasize migration control, groundwater and LNAPL capture, site control, and natural attenuation.

B. Screening of Alternatives

A select group of remedial alternatives will be chosen for further evaluation and screening. The screening objective at this point in the FS will be to check and potentially reduce the number of alternatives to be evaluated in detail. Detailed analyses will be performed on alternatives passing this screening.

In accordance with TAGM HWR-90-4030 the alternatives will be screened on the basis of two criteria: effectiveness and implementability.

Effectiveness pertains to the degree to which an alternative reduces toxicity, mobility, or volume of contamination through treatment, the degree to which an alternative minimizes residual risks and affords long-term, post-remedial-installation protection, and the degree to which it conforms to applicable SCGs. It also evaluates short-term impacts and how rapidly the alternative achieves protection.

Implementablity focuses on the administrative and technical feasibility of implementing the alternative. Technical aspects include the ability to construct, operate, maintain, replace, and monitor into the future required process units as well as the availability of equipment and technical specialists. Administrative aspects include compliance with applicable rules, regulations, and statutes, the ability to obtain office or agency approvals, and the availability of treatment, storage, and disposal services.

Scoring sheets will be utilized to record the effectiveness and implementability of an alternative. Scoring sheets would be included in the FS Report. Based on these scores the alternatives selected for detailed analysis are chosen.

C. Detailed Analysis of Alternatives

A detailed analysis of the selected alternatives provides sufficient information to compare alternatives, identify an appropriate remedy(s) for the site, and provide a basis for remedial alternative selection.

Nine criteria are used to rank the remedial alternatives. Two of the criteria, NYSDEC acceptance and community acceptance, are addressed in the course of NYSDEC's promulgation of a Proposed Remedial Action Plan (PRAP) and issuance of a Record Of Decision (ROD). The remaining seven criteria are:

Compliance with ARARs: whether a remedial alternative conforms to Applicable or Relevant and Appropriate Requirements (ARARs).

Protection of Human Health and the Environment: whether an alternative provides sufficient protection of human health and the environment.

Short-Term Effectiveness: includes the possible effects of an alternative during the construction and implementation phase on such factors as protection of workers and the community, mitigating measures, and time frame to achieve response objectives.

Long-Term Effectiveness and Permanence: potential risk remaining at the site after the response objectives have been met, based on comparison of residual risks to the calculated baseline risk contained in the site RI.

Reduction of Toxicity, Mobility, or Volume: the ability of an alternative to significantly and permanently diminish the toxicity, mobility, or volume of hazardous materials.

Implementability: the technical and administrative feasibility of implementing the alternative.

Cost: estimated costs of implementation and maintenance, if required, over time. Estimates are based on data available from the RI and may vary in accuracy. The costs estimated include the following discrete costs:

- **Capital Costs** – potential direct (construction) and indirect (overhead) costs associated with alternative implementation.

- **Annual O&M Costs** – post-construction operation and maintenance (O&M) costs normally associated with monitoring, maintaining, or affirming progress of an alternative.

- **Net Present Worth** – a single-cost figure, including capital and O&M as necessary, such that alternatives may be compared on a similar cost basis over the life of the alternative's operation.

The scoring of these criteria is based on a weighted system that awards from 10 to 20 points, with a total sum of 100 points for all criteria. Again, scoring sheets may be utilized to record the scores of each alternative. Also, the more detailed evaluation of costs is reflected in three scoring sheets for each of the individual cost parameters, as described above.

6.7 Selection of Remedial Alternative

Based on the final scoring sheets for the selected remedial alternatives, a combination of alternatives will be selected as the final remedial alternative for the site. The final remedy will be suitable to the site conditions, capable of being implemented, protective of public health and the environment, able to meet applicable SCGs to the maximum extent possible, and cost-effective.

6.8 Feasibility Study Report

The FS Report will address the site-wide remedial technologies which are believed applicable to the site in three sections (i.e. Sections II through IV below): the identification and screening of technologies, during which RAOs, General Response Actions, and General Response Action areas and volumes are developed; the development and screening of alternatives; and a detailed analysis of the alternatives.

The FS Report will be presented as a stand-alone document, following NYSDEC's review and approval of the Remedial Investigation Report. The FS Report will be organized as follows:

<u>Section I</u> will contain a summary of background information, an overview of the RI findings, and a brief synopsis of what is contained in the FS Report.

<u>Section II</u> will describe the identification and screening of remedial technologies and include the following:

- Development of Remedial Action Objectives based on site contaminants of concern, potential exposure pathways, and risk assessment.
- Development of General Response Actions which may be undertaken to satisfy the remedial objectives.
- Identification of areas and volumes to which General Response Actions might be applied.
- Identification and screening of technology types and process options, and selection of representative technologies.

<u>Section III</u> will describe the development and screening of remedial alternatives. This includes a preliminary screening relative to effectiveness and implementability, utilizing scoring methods provided by the TAGM HWR-90-4030.

<u>Section IV</u> will present a detailed analysis of the alternatives retained from the preliminary screening, with respect to the following criteria:

- Overall protection of human health and the environment.
- Compliance with New York State Standards, Criteria, and Guidelines.
- Short-term impacts and effectiveness.
- Long-term effectiveness and permanence.
- Reduction of toxicity, mobility, or volume of site contaminants.
- Implementability.
- Cost.

Section V will summarize the FS and present conclusions, and Section VI will present a certification of the work.

REFERENCES

1. Data Summary Report, Previous Remedial Investigations, Delphi Automotive Systems, 1000 Lexington Avenue, Rochester, New York, Site No. 8-28-064, Volumes I through V; by Haley & Aldrich of New York, for Delphi Automotive Systems, September 1998.

2. Site History Document, Delphi Automotive Systems, Lexington Avenue Facility, Rochester, New York, Site No. 8-28-064; by Haley & Aldrich of New York, for Delphi Automotive Systems, February 1999.

3. East Parking Lot Area Well Installations and January 1999 Groundwater Sampling Events, Delphi Automotive Systems, Lexington Avenue, Rochester, New York, Volumes I and II, by Haley & Aldrich of New York, for Delphi Automotive Systems, February 1999.

4. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, EPA/540/G-89/004, October 1988.

5. Soil/Groundwater Investigation Work Plan, Lexington Avenue Facility, Degreaser Investigation, by H&A of New York for AC Rochester Division, April 1991.

6. Soil Vapor Survey Report, Lexington Avenue Facility, Degreaser Investigation, Rochester, New York, Volumes I through III, by H&A of New York for AC Rochester Division, October 1990.

7. Study Area 5 Report, Lexington Avenue Facility, Degreaser Investigation, Rochester, New York, by H&A of New York for AC Rochester Division, April 1991.

8. Hydrogeologic Report, Subsurface Investigation, Degreaser Study Area 4 and Column EE-27 Area, AC Rochester Lexington Avenue Facility, Rochester, New York, by H&A of New York for AC Rochester Division, November 1991.

9. Report on 2-Phase Extraction Pilot Test, Wells SR-102 and PZ-123, AC Rochester Lexington Avenue Facility, by H&A of New York for AC Rochester Division, April 1994.

10. Environmental Impact Evaluation, Coal Storage Area, Milliken Station, Town of Lansing, Tompkins County, New York, by H&A of New York , November 1992.

11. Degreaser Investigation – Study Area 6, Delphi Automotive Systems, Lexington Avenue Facility, Rochester, New York, by H& A of New York LLP for General Motors Corporation Delphi Automotive Systems, November 1995.

12. Report on Lexington Avenue Building 22 Investigation, AC Rochester, Rochester, New York, by H&A of New York for AC Rochester Division, February 1994.

13. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater, EPA/600/R-98/128, September 1998.

14. Hydrogeologic Report AC Rochester Lexington Avenue Facility Tank Farm Oil Recovery Investigation Rochester, New York, Volumes I and II, by H&A of New York for AC Rochester Division, July 1991.

15. NYSDEC letter to Mr. Dennis Grady, General Motors Corporation Rochester Products Division, RE: Closure of General Motors – Rochester Products Division EPA Identification Number NYD002215234, dated 24 July 1990.

16. NYSDEC letter to Mr. Richard Eisenman, Delphi Automotive Systems, RE: Delphi Automotive Systems 1000 Lexington Avenue, Rochester, New York, Site #828064, dated 16 November 1998.

17. Citizen Participation in New York's Hazardous Waste Site Remediation Program: A Guidebook, by NYSDEC Division of Environmental Remediation, June 1998.

18. New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, by NYSDEC Division of Air Resources, 12 November 1997.

19. Water Quality Regulations Surface Water and Groundwater Classifications and Standards, New York State Codes, Rules and Regulations Title 6, Chapter X, Parts 700-705, updated March 1998.

20. Revised Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels, by NYSDEC Division of Hazardous Waste Remediation (now, Division of Environmental Remediation), TAGM HWR-94-046, 24 January 1994.

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TABLE I
DELPHI AUTOMOTIVE SYSTEMS LEXINGTON AVENUE FACILITY
RI/FS PROJECT SCHEDULE

	1999					2000	DATES OF COMPLETION
	AUG	SEP	OCT	NOV	DEC		TO BE DETERMINED
REMEDIAL INVESTIGATION							
SEMI-ANNUAL GROUNDWATER MONITORING EVENTS							
INVESTIGATIONS AT OUTDOOR LOCATIONS							
MOBILIZATION							
OFF-SITE WELL INSTALLATIONS							
ON-SITE TEST BORINGS AND WELLS AT OUTDOOR LOCATIONS							
SUPPLEMENTAL LNAPL CHARACTERIZATION							
INTERIM RI REPORT							
INVESTIGATIONS AT INDOOR LOCATIONS **							
SOIL-VAPOR SURVEYS IN FORMER STODDARD FLOW-TEST AND FORMER PRODUCT-ENGINEERING AREAS							
DEGREASER STUDY AREA 4							
MACHINING AREA IN PLANT 1 NEAR PIT #20							
OTHER INDOOR LOCATIONS: PLANT 1 DEGREASER AREAS, PLATING AREAS, MACHINING AREAS, SEWERS, ETC.							
RISK ASSESSMENT **							
FINAL RI REPORT **							
FEASIBILITY STUDY							

Note:

1. ** Completion of these work items may extend beyond the year 2001 because of the inaccessibility of some of the proposed exploration and sampling locations in areas of active manufacturing operations. Please refer to Section 1.2 of the Work Plan text for additional information on the project schedule.

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TABLE II

SUMMARY AREAS OF POTENTIAL ENVIRONMENTAL IMPACT

Area of Potential Environmental Impact	IRM Installed*	Previous Investigation Adequate	No Investigation Required	Requires Additional Investigation
A. Plant Process Areas				
1. Former Solvent Degreasing				
Plant 1 - Area 1	1			✓
Plant 1 - Area 2	1			✓
Plant 1 - Area 3	1			✓
Plant 2 - Area 4	1			✓
Plant 2 - Area 5	1,2	✓		NO
Plant 2 - Area 6	1	✓		NO
Degreaser 36	1			✓
Degreaser 39	1		✓	NO
2. Plating Areas	1			✓
3. Cyanide Heat Treating Areas	1		✓	NO
4. Machining Areas	1			✓
5. Former Tubing Mills Area	1			✓
6. Stoddard Flow-testing Areas				
Plant 1 West	1			✓
Plant 2 West	1			✓
Building 22	1,3	✓		NO
7. Former Product Engineering	1			✓
8. Maintenance Paint Booths	1		✓	NO
9. Die Casting	1		✓	NO
B. Other Plant Features				
1. Oil House (see section C.1)				
2. Stoddard Tank Farm	1,4			✓
3. Former TCE UST (tank 30)	1			(in UST area D) ✓
4. Former UST Areas				
Area A	1	✓		NO
Area B	1			✓
Area C	1			✓
Area D	1			✓ (Former TCE UST)
Area E	1			✓
Area F	1			✓
5. Power House & Coal Pile	1		✓	NO
6. Plant 2 Elevator	1			✓
7. PCB-Containing Equipment	1		✓	NO
8. Scrap metal building	1			✓
9. Basement Sumps	1			✓
C. SWMUs / AOCs				
1. Oil House, Center Dock	1			✓
2. Waste Tanks 26 and 26A	1			✓
3. AWTA Wastewater Treatment	1		✓	NO
4. CWTA Wastewater Treatment	1		✓	NO
5. Former Incinerator	1			✓
6. Waste Oil Storage	1			✓
7. Sewers				
48 inch storm sewer & ditch	1			✓
sanitary sewers	1		✓	NO
process sewers	1		✓	NO
8. RCRA Storage Areas				
Former Degreaser Sludge Area	1			(in Oil House) ✓
Former Cyanide Drum Wash	1	✓		NO
Former Non-Cyanide Drum Wash	1			✓
Cyanide Storage	1		✓	NO
WWT Sludge Area	1		✓	NO
Former USTs 4 and 8	1	✓		NO
9. Trash Compactors	1		✓	NO
10. Roll-Off Boxes	1		✓	NO
11. Easement A Disposal Area	1			✓
12. Old Canal Fill Area	1	✓		NO

* IRMs: 1. Groundwater migration control system.
2. Degreaser Investigation Study Area 5 SVE system.
3. Building 22 LNAPL recovery system.
4. Tank Farm Area LNAPL recovery system.

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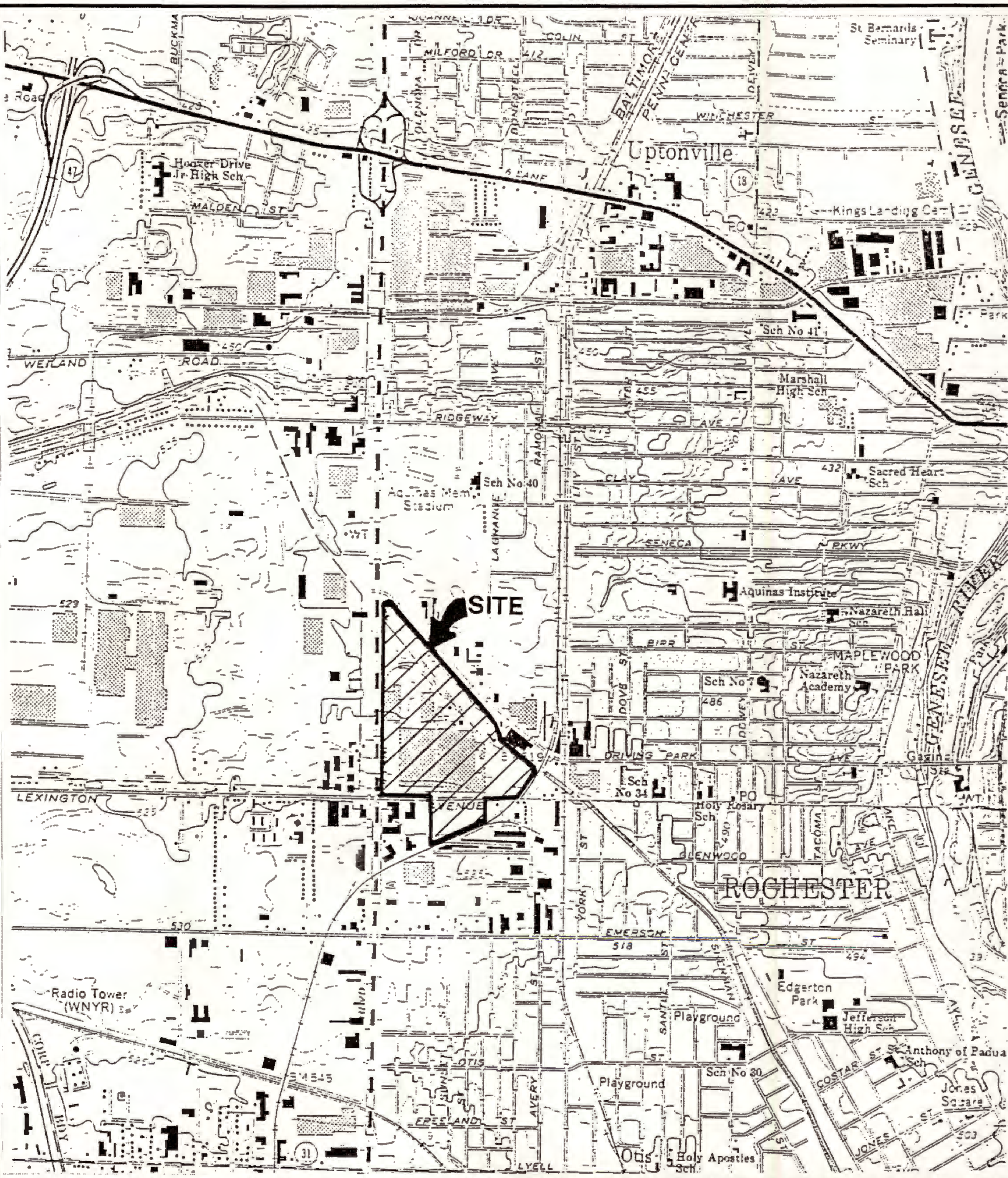
TABLE III
SUMMARY OF SUPPLEMENTAL INVESTIGATIONS

Areas Requiring Additional Investigation	Supplemental Investigations	Sample Analyses	Analytical Procedures
General Site Conditions			
Offsite Areas North & West	3 two-well clusters (SR + R)	6 Groundwater	8260 VOCs , site metals
East Parking Lot area	1 two-well cluster, 3 Intermediate bedrock (R) wells	10 Groundwat. LNAPL if pres.	GW - VOCs , site metals LNAPL – PCBs (8082), VOCs, phys. parameters
Deep-Bedrock Groundwater	1 on-site deep bedrock (DR) well	1 Groundwater	8260 VOCs, sulfate (375), chloride (9250-2)
North of Plant 1	1 cluster north of Plant 1	2 to 3 GW	8260 VOCs, site metals
Natural attenuation potential	Sample selected existing wells and new cluster north of Plant 1	+/- 12 GW	Alkalinity, pH, sulfate, sulfide, nitrate, nitrite, methane, chloride, TKN, dissolved oxygen, others
Supplemental LNAPL Characterization	**A**) Identification of PCB isomers at all wells in East Parking Lot and Building 22 areas **B**) Analysis of VOCs and SVOCs with TICs at 8 existing wells **C**) Identification of hydrocarbon components	**A**) 12-14 NAPL **B**) R-2, R-236, R-241, PZ-129, RW-2, PZ-139, PZ-136, 7, or 8, SR-102, SR-216 **C**) 8-10 NAPL	**A**) Modified 680 PCBs **B**) 8260 VOCs+10 TICs, 8270 SVOCs+10 TICs **C**) supplemental petroleum fingerprinting, supplemental physical parameters
Semi-annual groundwater monitoring	**A**) site-wide groundwater- and LNAPL-level measurements **B**) sampling and analysis of GW and LNAPL from selected existing wells and all newly installed wells	Various – will incorporate the groundwater and LNAPL sampling and analyses for new wells described in this table, and will repeat that sampling in subsequent events	
A. Plant Process Areas			
Degreaser Study Area 1	1 soil boring, 1 SR well or OW/SR well pair	4 Soils 1 or 2 GW	Soil- 8260 VOCs, TPH by 8015b DRO if oily GW – 8260 VOCs, Site metals LNAPL (if pres.) – 8082 PCBs, 8260 VOCs, physical parameters, petroleum fingerprinting
Degreaser Study Area 2	1 soil boring, 1 SR well or OW/SR well pair	4 Soils 1 or 2 GW	
Degreaser Study Area 3	4 soil borings, 2 SR wells or OW/SR well pairs	8 Soils 2 to 4 GW	
Degreaser Study Area 4	1 soil boring, 1 well cluster	4 Soil 1 or 2 GW	
Former Degreaser 36 locations	Soil-vapor testing, follow-up soil borings if warranted	Soil vapor	GC Screening
Plating Areas	Review drawings, sample soils at selected locations, evaluate metals in adj. + downgrad. wells	Soils	Site Metals, cyanide
Machining Areas & Oil Pits	Plant 1 - 1 intermediate-bedrock well adjacent to Pit 20 Plant 2 – Three soil borings completed as shallow-bedrock wells, with OW wells if warranted	Soils if oily 4 or more GW LNAPL if present	Soil- 8015b DRO TPH GW - 8260 VOCs, Site metals LNAPL – 8260 VOCs, 8082 PCBs, physical parameters, petrol. ID
Former Tubing Mills Area	No direct investigation; evaluate Hg results for adjacent wells	(2 GW)	(Hg)
Former Stoddard Flow Test Areas – Plant 1 west & Plant 2 west	Soil-vapor sampling near former sumps, follow up with soil borings and wells if indicated	Soil Vapor, possible soil and GW or LNAPL	Soil Vapor - VOCs (GC) Soils - VOCs, TPH GW - VOCs LNAPL- VOCs, PCBs, petroleum fingerprint
Former Product Engineering Areas – Buildings 3, 4 and Plant 1 east	Soil-vapor survey inside Plant , follow up with soil borings and wells if indicated		

TABLE III, page 2

B. Other Plant Features			
Stoddard Tank Farm Area	Soil sampling in containment basin during future tank removal	Soils	8260 VOCs, 8015b DRO TPH if oily
Former UST Areas:			
Area B	1 soil boring, possibly convert to water-table monitoring well	2 Soils, poss. 1 GW or NAPL	Soil- 8260 VOCs, 8015b DRO TPH if oily GW - 8260 VOCs LNAPL - 8260 VOCs, petroleum fingerprint
Area C	Two soil borings, possibly convert to water-table monitoring wells	4 Soils, poss. 2 GW or NAPL	
Area D	1 soil boring at **former TCE UST** (tank 30), hydropunch sampling	2 Soils, 1 GW	
Area E	3 soil borings, plus new well cluster north of Plant 1 (see p.1)	6 Soils	
Area F	1 soil boring, possibly convert to water-table monitoring well	2 Soils, poss. 1 GW or NAPL	
Plant 2 Elevator	1 soil boring, complete as shallow-bedrock well	Soils if oily 1 groundwater, LNAPL if pres.	Soils – PCBs, SVOCs GW - 8260 VOCs, site metals LNAPL – 8082 PCBs, 8270 SVOCs, fingerprint
Scrap Building	3 soil borings with hydropunch groundwater samples, install overburden wells if LNAPL indicated	6 Soils 3 Groundwater LNAPL if present	Soil - TPH (8015b DRO) GW - check for LNAPL, Site metals LNAPL- PCBs, petroleum fingerprint
Basement Sumps	Assess potential GW infiltration, sample GW and/or LNAPL, wipe sample walls if oil infiltrating	+/- 3 GW, LNAPL if pres., PCB wipes if staining pres.	GW - VOCs, Site Metals LNAPL – PCBs (8082), VOCs, physical param., petroleum fingerprint
C. SWMUs / AOCs			
Oil House, Center Dock	4 soil borings with hydropunch groundwater samples	8 soil 4 groundwater	Soil and GW – 8260 VOCs, Site Metals Soil only – 8015b DRO TPH
Former tanks 26 and 26A	1 boring	2 soil	8260 VOCs, 8015b TPH
Former Incinerator and Waste Oil Storage Area behind Plant 2	3 soil borings each to be possibly completed as an overburden or shallow-bedrock well	6 soils 3 possible groundwater or LNAPL	Soils- 8260 VOCs, 8015b DROTPH if oily GW – VOCs, site metals LNAPL – 8082 PCBs, Petroleum fingerprint
48-inch storm sewer	5 soil borings with hydropunch groundwater samples	5 soil 5 groundwater	Soil and GW – 8260 VOCs, site metals, 8082 PCBs Soil only – 8015b DROTPH if oily
Non-cyanide drum wash station	1 soil boring with hydropunch groundwater samples adjacent to former plating area	2 soil 1 groundwater	8260 VOCs Site metals Cyanide
Easement A Disposal Area	3 soil borings plus 2 at north side of Scrap Building (described above), 2 of which completed as water-table monitoring wells	10 soil 2 groundwater	Soil and GW – 8260 VOCs, Site metals, PCBs (8082) Soil only – 8015b DRO TPH

Site metals include cadmium, chromium, copper, lead, mercury, nickel, tin and zinc.



FILE NO. – 70014-052

LATITUDE: 43° 10'52"N LONGITUDE: 77° 39'23"W

-N-

QUADRANGLE LOCATION

U.S.G.S. QUADRANGLE: ROCHESTER, WEST, N.Y.

H & A OF NEW YORK

Geotechnical Engineers & Environmental Consultants

DELPHI AUTOMOTIVE SYSTEMS
LEXINGTON AVENUE FACILITY
ROCHESTER, NEW YORK

PROJECT LOCUS

SCALE: 1"=2000'

April 1999

FILENAME: 70014-048:GPL005A.MAN

FIGURE 1

APPENDIX A

CITIZEN PARTICIPATION PLAN
DELPHI AUTOMOTIVE SYSTEMS
LEXINGTON AVENUE PLANT
CITY OF ROCHESTER
MONROE COUNTY, NEW YORK
REGISTRY SITE 8-28-064

1.1 INTRODUCTION

The New York State Department of Environmental Conservation (NYSDEC), in partnership with the New York State Department of Health (NYSDOH), is responsible for seeing that inactive hazardous waste disposal sites across the State are investigated and, if necessary, remediated. Under the State's Inactive Hazardous Waste Disposal Site Remedial Program, the process follows a path of thorough investigation, remedial action evaluation, selection, design and construction. Throughout this process, and in cooperation with other agencies, the NYSDEC conducts a Citizen Participation Program. **Citizen participation**[1] (CP) promotes **public** understanding of the State's responsibilities, planning activities, and remedial activities at inactive hazardous waste disposal sites. It provides an opportunity for the State to learn from the public and develop a comprehensive remedial program that addresses public concerns and is protective of public health and the environment.

This specific plan has been developed as a mechanism by which information pertaining to the Delphi Automotive Systems (Delphi) Plant located at 1000 Lexington Avenue in Rochester, New York will be exchanged with the public. It provides background information pertaining to the site history, previous investigations completed at the site, as well as plans for upcoming activities. It also identifies **document repositories** and agency contacts where the public may seek information, ask questions, or provide comments regarding proposed site activities.

1.2 BASIC SITE INFORMATION

The Delphi site is listed on the NYSDEC **Registry of Inactive Hazardous Waste Disposal Sites** as Site 8-28-064. It is designated as a **Class 2** site indicating that the NYSDEC believes that the site poses a significant threat to human health or the environment and action is required.

1.2.1 SITE LOCATION AND DESCRIPTION

The Delphi plant is located on a 90 acre parcel of land north of Lexington Avenue in the City of Rochester, New York (Figure 1). The Delphi plant was constructed by General Motors Corporation (GM) during the time frame from 1937 to 1986. Various GM divisions have operated the facility to manufacture automotive fuel systems and other automotive components. Delphi Automotive Systems currently owns the facility.

The Delphi site is bounded on the west by Mt. Read Boulevard, on the north by Driving Park Avenue, and on the northeast by an adjacent manufacturing property (American Packaging Corporation), and on the east by a railroad embankment. The portion of the site which contains the manufacturing facility is bounded on the south by Lexington Avenue. Located on the south side of Lexington Avenue are

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[1] The final section of this plan consists of a glossary of terms used throughout this document. The reader should refer to this section for complete definitions of terms. Terms defined in the glossary are shown in bold print the first time they appear in the text.

Redmen's Party House, Jasco Tool, Inc., a Rochester Gas & Electric substation, and a Delphi employee parking lot.

In response to its interpretation of the requirements of the Resource Conservation and Recovery Act (RCRA), Delphi commissioned a hydrogeologic investigation in 1981 which consisted of installing 13 monitoring wells downgradient of the manufacturing building and at the upgradient and downgradient site boundaries.

In 1984 Delphi responded to a NYSDEC Community-Right-to-Know survey and provided groundwater monitoring data to the NYSDEC. The data indicated the presence of groundwater contamination by organic solvent compounds at wells located near a former landfill area. In 1985 the site was listed in New York's Registry of Inactive Hazardous Waste Disposal Sites (site code 8-28-504-P, classification 2A). In 1986 NYSDEC requested and received from Delphi additional information on groundwater quality, and in January 1987 NYSDEC reclassified the site to Class 2 and assigned the current site code, 8-28-064.

Groundwater-quality data from 1981 through 1988 indicated the presence of contamination by **chlorinated solvent** compounds at both the upgradient and downgradient site boundaries.

In 1988, Delphi commissioned a review of the previous data and an additional investigation of hydrogeologic conditions at the site. The 1988 review and subsequent investigations were performed to address delineation of the groundwater contaminants and identification of source areas. The initial work included soil vapor sampling, repairs and upgrades of existing wells, installing additional monitoring well clusters, and associated soil and groundwater sampling.

Related investigative activities have continued to the present. In order to address the issue of potential offsite migration of contaminants in a more expedient fashion, Delphi installed a groundwater migration-control, collection and treatment system during 1991. Periodic groundwater sampling has been performed each year from 1989 to the present, and all groundwater analysis data for the site have been reported to NYSDEC by Delphi. At present there are 113 monitoring wells, piezometers, and recovery wells located on site (Figure 2).

1.3 PROJECT DESCRIPTION

1.3.1 OVERALL PROGRAM OBJECTIVES

New York State's remedial program for inactive hazardous waste disposal sites is managed by the Division of Environmental Remediation of the NYSDEC. The program consists of seven major elements and may include Interim Remedial Measures (**IRM**) as an optional eighth major element. These seven elements are:

1. Listing of the site on the State Registry of Inactive Hazardous Waste Disposal Sites

2. **Preliminary Site Assessment (PSA)**

3. **Remedial Investigation (RI)**

4. **Feasibility Study (FS)**

   PRAP & ROD

5. **Remedial Design**

6. **Remedial Construction**

7. Operation, **Maintenance** and Long-term **Monitoring**

A Preliminary Site Assessment (PSA) is performed to determine if hazardous wastes were disposed of at the site and if a significant threat to public health or the environment exists due to the hazardous wastes disposal. The PSA data and evaluations are used to determine what actions may be necessary (i.e., initiating emergency response, executing **consent orders,** mandating **responsible party** cleanups, nominating the site for the **National Priorities List (NPL)**, conducting further investigation, and reclassifying or **delisting** the site from the registry).

Once the presence of hazardous waste and/or a potential threat have been identified or assumed, the RI/FS phase (elements 3 and 4) of the program begins. The intent of the RI is to characterize site conditions and determine the nature and extent of contamination. This information is then used in the FS to evaluate various remedial technologies. The RI/FS process results in the selection of an appropriate remedial response action(s), which can then be implemented (elements 5, 6 and 7) and the site remediated to meet the selected cleanup goals.

The Delphi RI/FS is scheduled to take several years to complete. The RI/FS process will be conducted using a phased approach. This approach is designed to identify sources of continmnants and the extent of subsurface contamination so that remedial measures can be implemented as warranted.

The activities to be conducted under the RI/FS program include **soil gas surveys,** additional well installations, ongoing groundwater sampling, soil sampling, pilot testing of remedial technology types, and ongoing evaluation of the IRMs currently operating at the site. The results of these investigations will be used by Delphi, with NYSDEC approval, to design all necessary IRMs to abate groundwater contaminant migration from the site. A final feasible remedial alternative will be selected by NYSDEC and implemented for the site.

1.3.2 <u>PROJECT OBJECTIVES</u>

The following RI/FS objectives are identified for the Delphi facility:

1. Identify the nature (type of compounds) and extent (location and depth) of the contamination identified at the site.

2. Identify potential migration pathways for the identified contamination.

3. Assess the risk to human health and the environment posed by the contamination.

4. Define the site-specific cleanup levels.

5. Identify and evaluate the remedial alternatives. Perform an FS, in which remedial alternatives are evaluated, culminating in an FS Report.

The following objectives are identified for the IRM for the Delphi facility:

1. Identify exposure pathways which may exist at the Delphi facility boundary which could facilitate impacts to human health or the environment.

2. Characterize environmental conditions within any exposure pathways identified at the facility perimeter.

3. Compare environmental conditions at the facility boundary with appropriate health standards and guidance values to determine if an IRM is appropriate to protect human health and the environment.

4. Expand the existing IRMs, as warranted. Develop and implement new IRMs, if appropriate.

1.4 IDENTIFICATION OF AFFECTED AND/OR INTERESTED PUBLIC

People and/or organizations that might be interested in or affected by this project are identified in this section.

A **contact list** of public officials and other interested public names, addresses and/or phone numbers who represent the local area is presented below. This contact list may be used to inform the public of site activities and project status. The site contact for Delphi is as follows:

Delphi Automotive Systems
1000 Lexington Avenue (716) 647-4766
P.O. Box 1790
Rochester, New York 14692
Attn: Richard C. Eisenman, Senior Environmental Engineer

If additional contacts are identified during the course of this project the list will be expanded, where necessary, to include the additional contacts. Parties interested in being included on this list may contact:

Meaghan Boice-Green (716) 226-2466
NYSDEC
6274 E. Avon Lima Rd
Avon, New York 14414
NYSDEC **Toll-Free Information Number**: (800) 342-9296

1.4.1 STATE AND FEDERAL ELECTED OFFICIALS AND ORGANIZATIONS

Federal Officials:

A. U.S. Senate
Guaranty Building (716) 551-4097
28 Church Street
Buffalo, New York 14202
Attn: Daniel Patrick Moynihan

B. U.S. Senate
Federal Office Building (716) 263-5866
100 State Street, Room 3040
Rochester, New York 14614
Attn: Charles E. Schumer

C. U.S. House of Representatives,
Federal Building (716) 232-4850
100 State Street, Room 3120
Rochester, New York 14614
Attn: Louise M. Slaughter

State Officials:

D. New York State Senate — (716) 546-6890
339 East Avenue, Suite 309
Rochester, NY
Attn: Richard A. Dollinger

E. New York State Assembly
2300 Ridge Road
Rochester, New York 14626
Attn: Joseph E. Robach

1.4.2 REGULATORY/COUNTY OFFICIALS

Monroe County Officials:

A. Monroe County Legislature — (716) 428-5255
110 County Office Building
39 West Main Street
Rochester, New York 14614
Attn: Dennis A. Pelletier, President

B. Monroe County Clerk — (716) 428-5151
110 County Office Building
39 West Main Street
Rochester, New York 14614
Attn: Maggie Brooks-Lynd

C. Department of Helath
111 Westfall Road — (716) 274-6068
Rochester, New York 14620
Attn: Andrew S. Doniger, M.D., Director

D. Office of Emergency Preparedness
Monroe County — (716) 473-0710
111 Westfall Raod, Room 11
Rochester, New York 14620
Attn: Mary Louise Meisenzahl, Administrator

E. Monroe County Planning and Development
50 West Main Street, 8th Floor (716) 428-5010
Rochester, New York 14614
Attn: Rocco DiGiovanni, Director

F. Monroe County Department of Transportation
50 West Main Street, 6th Floor (716) 428-4900
Rochester, New York 14614
Attn: Frank L. Dolan, P.E., Director

G. Monroe County Sheriff's Office
236 Hall of Justice (716) 428-5781
Rochester, NY 14614
Attn: Andrew P. Meloni, Sheriff

H. Board of Directors
Cooperative Extension Association (716) 461-1000
of Monroe County
249 Highland Avenue
Rochester, New York 14620
Attn: Charles Krueger, President

I. Monroe County Environmental Services
50 West Main Street, 7th Floor (716) 760-7610
Rochester, New York 14614
Attn: John E. Graham, P.E., Director

1.4.3 REGIONAL BOARDS AND ORGANIZATIONS

A. Rochester Committee for Scientific Information
PO 276766
River Campus Station
Rochester, New York 14627

B. Sierra Club of Rochester
Regional Group (716) 244-2625
PO Box 39516
Rochester, New York 14614-9516
Attn: Hugh Michell, Chairperson

C. Central and Western NY Chapters

The Nature Conservancy — (716) 546-8030
315 Alexander Street
Rochester, New York 14604
Attn: David Klein, Director

D. Center for Environmental Information
55 Saint Paul Street — (716) 262-2870
Rochester, New York 14604
Attn: William Wagner, Director

E. Center for Government Research
37 South Washington Street — (716) 325-6360
Rochester, New York 14608
Attn: Scott Sherwood, Director
of Geographic and Env. Analysis

1.4.4 LOCAL OFFICIALS, COMMITTEES AND BOARDS

City of Rochester Officials:

A. City of Rochester
City Hall — (716) 428-7045
30 Church Street
Rochester, New York 14614
Attn: William A. Johnson, Jr., Mayor

B. City of Rochester City Clerk
City Hall — (716) 428-7421
30 Church Street
Rochester, New York 14614

C. City of Rochester Environmental Services Dept.
City Hall — (716) 428-5990
30 Church Street
Rochester, New York 14614

D. City of Rochester Fire Chief
300 Public Safety Building — (716) 428-6739
Rochester, New York 14614

E. City of Rochester Chief of Police — (716) 428-7033

300 Public Safety Building
Rochester, New York 14614

F. City of Rochester Planning Bureau
City Hall (716) 428-6885
30 Church Street
Rochester, New York 14614

G. City of Rochester Council Office
City Hall (716) 428-7538
30 Church Street
Rochester, New York 14614

1.4.5 LOCAL/REGIONAL MEDIA

Newspapers:

A. Gannett Rochester Newspapers
55 Exchange Street (716) 232-7100
Rochester, New York 14614
Attn: Regional Editor

B. City Newspaper
250 North Goodman Street (716) 244-3329
Rochester, New York 14614

C. Rochester Business Journal
55 Saint Paul Street (716) 546-8303
Rochester, New York 14614

Radio:

D. News Editor, WXXI-AM
280 State Street (716) 325-7500
Rochester, New York 14614

E. News Director, WHAM Radio
350 East Avenue (716) 454-5759
Rochester, New York 14606

Television:

F.	News Editor, Cable Channel 9 Greater Rochester Cable 71 Mt. Hope Avenue Rochester, New York 14620-1090	(716) 987-6300
G.	News Editor, TV 8 201 Humboldt Street Rochester, New York 14604	(716) 288-8400
H.	News Editor, TV 10 191 East Avenue Rochester, New York 14604	(716) 546-5670
I.	News Editor, TV 13 4225 West Henrietta Road Rochester, New York 14623	(716) 334-8700
J.	News Editor, TV 21 280 State Street Rochester, New York 14614	(716) 325-7500

1.4.6 ADJACENT PROPERTY OWNERS

People may determine if they are on the contact list by calling Meaghan Boice-Green, NYSDEC, Citizen Participation Specialist at (716) 226-2466. This list will be updated as needed.

1.5 IDENTIFICATION OF DEPARTMENT CONTACTS

The list below identifies names, addresses, and telephone numbers of contact persons within the NYSDEC, the NYSDOH and the Monroe County Department of Health who may assist with finding reports or information.

For Technical Information:

NYSDEC-Regional Project Manager

NYSDEC Division of Hazardous Waste Remediation 50 Wolf Road Albany, New York 12233-4343	(518) 457-3373

NYSDEC-Region 8 Contact

Kelly C. Cloyd, Ph.D. NYSDEC Region 8 6274 East Avon-Lima Road Avon, New York 14414	(716) 266-2466

For General Information:

NYSDEC Citizen Participation Specialist

Meaghan Boice-Green NYSDEC Region 8 6274 East Avon-Lima Road Avon, New York 14414	(716) 226-2466
NYSDEC Hazardous Waste Information	1(800) 342-9296 (Not Staffed)

For Health Related Concerns:

NYSDOH Health Liaison Program

Dawn Hettrick NYSDOH Health Liaison Program 2 University Place Albany, New York 12203	(800) 458-1158

NYSDOH Contact Person (Project Lead)

David Napier
NYSDOH-Rochester Field Office (716) 423-8071
42 South Washington Street
Rochester, New York 14608

Monroe County DOH Contact Person

Richard Elliott
Monroe County Department of Health (716) 274-6067
Room 908
111 Westfall Road
Rochester, New York 14692

1.6 IDENTIFICATION OF DOCUMENT REPOSITORY

Documents related to remedial activities at the site are available for public review at the Document Repository. The local repository for documents is at the following address:

Rochester Public Library
115 South Avenue (716) 428-7300
Rochester, New York 14604

Hours of operation: Mon., Thur.: 9 am – 9 pm
Tues., Wed., Fri.: 9 am – 6 pm
Saturday: 9 am - 4 pm
Sunday: 1 pm – 5 pm

In addition, documents are located at the NYSDEC Regional Office at the following address:

NYSDEC Region 8
6274 East Avon-Lima Road (716) 226-2466
Avon, New York 14414
Attn: Meaghan Boice-Green

Hours of operation: By appointment only, 9 am - 4 pm, Monday - Friday

As additional information becomes available, copies will be added to the repository.

1.7 DESCRIPTION OF CITIZEN PARTICIPATION (CP) ACTIVITIES FOR EACH MAJOR ELEMENT OF THE REMEDIAL PROGRAM

This section describes the specific citizen participation activities that have been, or will be, carried out during the Delphi site Remedial Program. They are based on New York State regulation Part 375-1.5 (May 1992) which sets forth requirements for citizen participation during hazardous waste site programs, and the NYSDEC Guidebook for Inactive Hazardous Waste Site Citizen Participation Plans (June 1998).

These citizen participation activities may be modified, and additional activities may be conducted as NYSDEC, NYSDOH, Monroe County DOH and Delphi gain additional insight into local interest in citizen participation and the remedial program, or as the technical program and information about the site changes.

NOTE: At the completion of the RI/FS process, NYSDEC will prepare a Record of Decision for the Delphi site, detailing the remedial action chosen and the decision process used. At that time, this CP Plan will be reviewed and updated to address the specific CP activities to be conducted during Design and Construction of the remedial program. NYSDEC policy requirements and options for these activities are detailed in its Statewide CP Plan referenced above.

Below are listed completed and ongoing CP activities, and future CP activities. Future CP activities are listed under several major elements of the site remedial program

COMPLETED AND ONGOING CP ACTIVITIES

1. NYSDEC will mail an initial fact sheet to the contact list that:

   - announces availability of the final draft RI/FS work plan;
   - briefly outlines the proposed RI/FS investigation;
   - specifies local document repositories, important documents available for review, and project contacts.

2. NYSDEC, with assistance from NYSDOH, Monroe County DOH, and Delphi has reviewed and approved this site-specific CP Plan for the Delphi site. This Plan fulfills the requirements of Part 375-1.5(b)(1). Periodically, and at the Record of Decision (ROD) stage, it will be reviewed and revised as appropriate. The finalized, approved CP Plan will be distributed to the NYSDEC **project manager** and **citizen participation specialist,** the NYSDOH site contact, the Monroe County DOH site contact, the document repositories, and Delphi.

3. NYSDEC has established local document repositories at the regional NYSDEC office in Avon,

and the Rochester Public Library, 115 South Avenue, Rochester, New York.

4. NYSDEC has established a preliminary contact list. This list will be reviewed periodically and updated as required. It also will be updated by the NYSDEC after each **public meeting**, and as additional interested citizens are located by NYSDEC, NYSDOH, Monroe County DOH, and Delphi.

5. Delphi will provide copies of all necessary documents to the local repositories, NYSDEC central and regional offices, NYSDOH and Monroe County DOH. NYSDEC will approve the list of documents to be placed in the repositories.

ANTICIPATED IRM AND CP ACTIVITIES

Anticipated IRM/CP activities will include, but are not limited to the preparation and distribution of **fact sheets** and the scheduling of availability sessions. All such activities will occur per NYSDEC's Division Technical and Guidance Memo dated December 9, 1992 (see Appendix D).

UPON COMPLETION OF THE FEASIBILITY STUDY AND THE PROPOSED REMEDIAL ACTION PLAN (PRAP)

1. NYSDEC will draft a fact sheet to be mailed to the contact list that:

   - briefly discusses the results of the RI/FS, and outlines the proposed remedial action plan (PRAP)
   - announces the public meeting to discuss the PRAP (including meeting date, time and place)
   - details the start and end dates of the 30-day PRAP public comment period
   - discusses how the process will evolve
   - lists project contacts
   - list documents repository locations and important documents available for public review

   This fact sheet will be reviewed by NYSDOH, Monroe County DOH, and Delphi. It will be mailed by the NYSDEC to the contact list.

2. NYSDEC will make necessary room arrangements for the meeting referenced in the mailing above. The meeting will take place within a 30-day PRAP public comment period, and at a date, time and location convenient to the interested/affected community.

3. NYSDEC, in conjunction with NYSDOH and Monroe County DOH will conduct the PRAP public meeting. Delphi and its consultants will supplement the presentation as appropriate, present appropriate additional information, and also field questions and comments. NYSDEC staff, with appropriate NYSDOH, Monroe County DOH and Delphi assistance, will keep notes of public comments for preparation of the PRAP responsiveness summary.

4. NYSDEC, with assistance of NYSDOH, Monroe County DOH, and Delphi will prepare a responsiveness summary to comments received at the public meeting. NYSDEC will mail the responsives summary to the contact list. The **responsiveness summary** will discuss comments received during the comment period, the results of those comments, and any significant changes from the PRAP.

UPON SIGNING OF THE RECORD OF DECISION (ROD)

1. NYSDEC press office in the central office will prepare and distribute a press release about the signing of the ROD.

2. NYSDEC will draft a notice to be mailed to contact list that:

   - Briefly outlines the selected remedy.
   - Includes discussion of any significant changes from the proposed remedy.
   - Responds to significant comments, criticisms and new data submitted to the state.

1.8 GLOSSARY OF KEY TERMS AND MAJOR PROGRAM ELEMENT

The attached glossary defines major elements of the remedial program. Key terms have been reprinted from the NYSDEC Guidebook for Inactive Hazardous Waste Site Citizen Participation Plans (June 1998).

Definitions of Commonly Used Citizen Participation Terms

Availability Session - Scheduled gathering of the state project staff and the public in a setting less formal than a public meeting. Encourages "one-to-one" discussions in which the public meets with state project staff on an individual or small group basis to discuss particular questions or concerns.

Citizen Participation - A process to inform and involve the interested/affected public in the decision-making process during identification, assessment and remediation of inactive hazardous waste sites. This process helps to assure that the best decisions are made from environmental, human health, economic, social and political perspectives.

Citizen Participation Specialist - A NYSDEC staff member within the Office of Public Affairs who provides guidance, evaluation and assistance to help the Project Manager carry out his/her site-specific Citizen Participation program.

Contact List - Names, addresses and/or telephone numbers of individuals, groups, organizations and media interested and/or affected by a particular hazardous waste site. Compiled and updated by the NYSDEC. Interest in the site, state of remediation and other factors guide how comprehensive the list becomes. Used to assist the Department to inform and involve the interested/affected public.

Document Repository - Typically a regional DEC office and/or public building, such as a library, near a particular site, at which documents related to remedial and citizen participation activities at the site are available for public review. Provides access to documents at times and location convenient to the public. Environmental Management Councils (EMCs), Conservation Advisory Committees (CACs) as well as active local groups often can serve as supplemental document repositories.

Fact Sheet - A written discussion of a site's remedial process, or some part of it, prepared by the NYSDEC for the public in easily understandable language. May be prepared for the "general" public or a particular segment. Uses may include, for example: discussion of an element of the remedial program opportunities for public involvement, availability of a report or other information, or announcement of a public meeting. May be mailed to all or part of the interested public, distributed at meetings and availability sessions or sent on an "as requested" basis.

Project Manager - A NYSDEC staff member within the Division of Hazardous Waste Remediation (usually an engineer, geologist or hydrogeologist) responsible for the day-to-day administration of activities, and ultimate disposition of, one or more hazardous waste sites. The Project Manager works with the Office of Public Affairs as well as fiscal and legal staff to accomplish site-related goals and objectives.

Public - The universe of individuals, groups and organizations: a) affected (or potentially affected) by an inactive hazardous waste site and/or its remedial program; b) interested in the site and/or its remediation; c) having information about the site and its history.

Public Meeting - A scheduled gathering of the state project staff and the public to give and receive information, ask questions and discuss concerns. May take one of the following forms: large-group meeting called by the NYSDEC; participation by the NYSDEC at a meeting sponsored by another organization such as a city board or Department of Health; working group or workshop; tour of the hazardous waste site.

Public Notice - A written or verbal informational technique for telling people about an important part of the site's remedial program coming up soon (examples: announcement that the report for the RI/FS is publicly available; a public meeting has been scheduled).

The public notice may be formal and meet legal requirements (for example: what it must say, such as announcing beginning of a public comment period; where, when and how it is published).

Publish - For purposes of 6NYCRR Part 375.7, at a minimum requires publication of a legal notice in a local newspaper of general circulation.

Another kind of public notice may be more informal and may not be legally required (examples: paid newspaper advertisement; telephone calls to key citizen leaders; targeted mailing).

Responsiveness Summary - A formal or informal written or verbal summary and response by the NYSDEC to public questions and comments. Prepared during or after important elements in a site's remedial program. The responsiveness summary may list and respond to each question, or summarize and respond to questions in categories.

Toll-Free Information Number - Provides cost-free access to the NYSDEC and NYSDOH members of the public who have questions, concerns or information about a particular hazardous waste site. Calls are taken and recorded 24 hours a day and a staff member contacts the caller as soon as possible (usually the same day).

Definitions of Significant Elements and Terms of the Remedial Program

NOTE: The first seven definitions represent major elements of the remedial process. They are presented in the order in which they occur, rather than in alphabetical order, to provide a context to aid in their definition.

Preliminary Site Assessment (PSA) - The two phase site investigation approach has become obsolete with the advent of standby contracts that allow the Department to tailor investigations specific to the needs of a site. The new approach, termed Preliminary Site Assessments, effectively reduces the costs and time requirements of site investigations. The two phase approach did not provide enough flexibility to make "tailoring" practical.

Preliminary Site Assessments (PSA) are conducted to determine if hazardous wastes were disposed at a site and if a significant threat to health or environment exists due to the hazardous waste disposed.

The PSA data and evaluations are used to determine what actions may be necessary. Examples of these might be initiating emergency response, executing consent orders mandating responsibly party clean-ups, nominating sites for the National Priorities List (NPL), conducting further investigation and reclassifying or delisting the site from the registry.

Registry of Inactive Hazardous Waste Sites - Each inactive site known or suspected of containing hazardous waste must be included in the Registry. Therefore, all sites which state or county environmental or public health agencies identify as known or suspected to have received hazardous waste should be listed in the Registry as they are identified. Whenever possible, the Department carries out an initial evaluation at the site before listing.

Remedial Investigation (RI) - A process to determine the nature and extent of contamination by collecting data and analyzing the site. It includes sampling and monitoring, as necessary, and includes the gathering of sufficient information to determine the necessity for, and proposed extent, of a remedial program for the site.

Feasibility Study (FS) - A process for developing, evaluating and selecting remedial actions, using data gathered during the remedial investigation to: define the objectives of the remedial program for the site and broadly develop remedial action alternatives; perform an initial screening of these alternatives; and perform a detailed analysis of a limited number of alternatives which remain after the initial screening stage.

Remedial Design - Once a remedial action has been selected, technical drawings and specifications for remedial construction at a site are developed, as specified in the final RI/FS report. Design documents are used to bide and construct the chosen remedial actions. Remedial design is prepared by consulting engineers with experience in inactive hazardous waste disposal site remedial actions.

Remedial Construction - DEC approves contractors and oversees construction activities to carry out the designed remedial alternative. Construction may be as straightforward as excavation of contaminated soil with disposal at a permitted hazardous waste facility. On the other hand, it may involve drum sampling and identification, complete encapsulation, leachate collection, storage and treatment, groundwater management, or other technologies. Construction costs may vary from several thousand dollars to many millions of dollars, depending on the size of the site, the soil, groundwater and other conditions, and the nature of the wastes.

Monitoring/Maintenance - Denotes post-closure activities to insure continued effectiveness of the remedial actions. Typical monitoring/maintenance activities include quarterly inspection by an engineering technician; measurement of level of water in monitoring wells; or collection of groundwater and surface water samples and analysis for factors showing the condition of water, presence of toxic substances, or other indicators of possible pollution from the site. Monitoring/maintenance may be required indefinitely at many sites.

Consent Order - A legal and enforceable negotiated agreement between the NYSDEC and responsible parties where responsible parties agree to undertake investigations and cleanup or pay for the costs of investigation and cleanup work at a site. The order includes a description of the remedial actions to be undertaken at the site and a schedule for implementation.

Contract - A legal document signed by a contractor and the Department to carry out specific site remediation activities.

Contractor - A person or firm hired to furnish materials or perform services, especially in construction projects.

Delisting - Removal of a site from the State Registry based on study which shows the site does not contain hazardous wastes.

Potentially Responsible Party Lead Site - An inactive hazardous waste site at which those legally liable for the site have accepted responsibility for investigating problems at the site, and for developing and implementing the site's remedial program. PRP's include: those who owned the site during the time wastes were placed, current owners, past and present operators of the site, and those who generated the wastes placed at the site. Remedial programs developed and implemented by PRP's generally result from an enforcement action taken by the State and the costs of the remedial program are generally borne by the PRP.

Ranking System - The United States Environmental Protection Agency uses a hazard ranking system (HRS) to assign numerical scores to each inactive hazardous waste site. The scores express the relative risk or danger from the site.

Responsible Parties - Individuals, companies (e.g. site owners, operators, transporters or generators of hazardous waste) responsible for or contributing to the contamination problems at a hazardous waste site. PRP is a potentially responsible party.

Site Classification - The Department assigns sites to classifications established by state law, as follows:

- **Class 1** - A site causing or presenting an imminent danger of causing irreversible or irreparable damage to the public health or environment - immediate action required.

- **Class 2** - A site posing a significant threat to the public health or environment - action required.

- **Class 2a** - A temporary classification for a site known or suspected to contain hazardous waste.

- **Class 3** - A site which has hazardous waste confirmed, but not a significant threat to the public health or environment - action may be deferred.

- **Class 4** - A site which has been properly closed - requires continued management.

- **Class 5** - A site which has been properly closed, with no evidence or potential adverse impact - no further action required.

State-Lead Site - An inactive hazardous waste site at which the Department has responsibility for investigating problems at the site and for developing and implementing the site's remedial program. The Department uses money available from the State Superfund and the Environmental Quality Bond Act of 1986 to pay for these activities. The Department has direct control and responsibility for the remedial program.

Definitions for Terms used in Delphi Citizen Participation Plan

Chlorinated Solvents – Organic chemicals commonly used in the manufacturing industry for degreasing, paint removal, and other "dry" cleaning processes.

Interim Remedial Measure (IRM) - Activities and equipment designed and implemented to prevent, mitigate or remedy migration of EDC or other site-related compounds of concern.

National Priorities List (NPL) - A listing of inactive hazardous waste sites that are eligible for federal funds for investigation and clean-up. This list is produced and updated annually by the US EPA.

Soil Gas Survey - Field procedure to quickly detect volatile organic compounds present below the ground surface. A hollow soil probe is inserted several feet into the ground and air is withdrawn from the soil pore-space. Air samples are analyzed by gas chromatography.

Volatile Organic Compound - (VOC) A compound made up of carbon and hydrogen atoms that may also contain other molecules, such as Chlorine. The material will have the tendency to transfer easily from the liquid to the gaseous state.

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Part 375 Citizen Participation Requirements for Remedial Programs

This attachment lists major milestones in a site's Remedial Investigation/Feasibility Study. Listed below each milestone is one or more citizen participation activity required by the new Part 375 regulation.

Please note that some CP activities incorporated in new Part 375 previously had been set forth as DEC policy in the Statewide CP Plan. They now have the force of regulation. Some CP activities, such as the taking of a legal transcript of the PRAP public meeting and the placement of legal public notices, are not required in new Part 375. Anyone still referring to the original Part 375 to determine CP requirements should cease doing so.

Following this list is a brief reiteration of the CP activities required by Department Policy to be conducted during the Design, Construction and Operation/Maintenance aspects of a site's program. This is followed by discussion of parts of the existing Statewide CP Plan which remain particularly helpful for the development and implementation of CP programs.

▸ Part 375 Citizen Participation Requirements During Remedial Investigation/Feasibility Study

I. Prior to Start of RI/FS

A. Develop a CP Program, Including at Minimum:

1. A Site-Specific CP Plan (regardless of program's funding source)

    a. List specific CP activities to be implemented

    b. This Plan is subject to DEC review and approval

2. A Site-Specific Contact List of Interested/Affected residents, groups, officials and media

3. Site-specific document repositories established at:

    a. Appropriate DEC regional office

    b. Local public facility near site

4. Mail to the contact list a notice that:

    a. Announces availability of final draft RI/FS workplan

    b. Briefly outlines the proposed investigation

- Before the start of remedial construction which may affect the public, use contact list as appropriate to:

  - briefly describe the site
  - provide a brief overview of the remedial construction and its goals
  - discuss the upcoming activity
  - present schedule for the remainder of work
  - identify the project's local document repository
  - identify DEC contact person (also DOL and DOH, if appropriate) *(p. 20)*

- At the completion of remedial construction, use contact list as appropriate to:

  - briefly describe the site and the remedial program
  - explain how the remedial program has mitigated problems at the site
  - provide a brief description of the long-term operational, monitoring and maintenance requirements at the site
  - identify who is responsible for operations, monitoring and maintenance
  - identify DEC contact person (also DOL and DOH, if appropriate) *(pp. 20, 21)*

- Long-term monitoring, operation and maintenance: During the development and implementation of an O & M program, a site-specific citizen participation plan will be developed and implemented. The plan will be designed to involve the public in the development of the long-term monitoring, operation and maintenance program and to keep them informed throughout the program's implementation. *(p. 21)*

Note: The above represents the minimal required CP program. Additional CP activities should receive serious consideration for a site where the remedial action is controversial, there is a high degree of public interest or concern, etc. This consideration and related decisions are best made jointly by the CPS, regional engineer and project manager.

▸ Aspects of *New York State Inactive Hazardous Waste Site Citizen Participation Plan* Which Remain Particularly Useful

Many aspects of the Statewide CP Plan remain particularly useful for developing and implementing site-specific citizen participation activities and programs. Particularly useful sections include:

- The Introduction/Philosophy statement at the beginning of the CP Plan *(p. 1)* provides a clear, concise rationale for the integration and conduct of citizen participation within site remedial programs. You also should refer to the introductory language to the CP portion of new Part 375 (375-1.5(a)) for a rationale for conducting CP programs.

- Appendix B - Technique Selection/Implementation *(pp. B-1, B-2)* suggests a process to decide *when* to implement CP activities, and *what* activities to implement by encouraging staff to ask four major questions prior to each milestone in the remedial process:

Part 375 Citizen Participation Requirements for New Use of Sites; Site Classification; Interim Remedial Measures

▸ Citizen Participation and New Use of Sites

Part 375-1.6 requires notification when a proposal is made regarding a substantial change of use of a site listed on the Registry. This notice must be made:

- By the person proposing the substantial change of use;
- At least 60 days before the substantial change of use;
- To the Commissioner of DEC, county clerk, city or town clerk, and village clerk (if applicable), the site's contact list (if any) as identified in Part 375-1.5(b)(2) (see Appendix C for description) and adjacent property owners;
- Identifying the site by its Registry number, identifying the person giving notice, and providing a description of the proposed substantial change of use.

▸ Citizen Participation and Site Classification

When a site is classified on the Registry, or when its classification changes, Part 375-1.8 requires the Department to notify the appropriate county and municipal clerks, site owner and adjacent property owners.

Currently, the Bureau of Hazardous Site Control prepares and sends classification letters to the above list. A letter references the site's Registry number, discusses the classification change, why it occurred, includes the site's Registry description and provides DHWR's toll-free information number in case recipients have questions or need more information. Copies of the letters are retained by the CP Section which monitors the toll-free number. CP staff field toll-free calls about classifications, and attempt to answer questions about the classification. If additional information is needed, they refer the caller to appropriate staff.

▸ Citizen Participation and Interim Remedial Measures

Part 375-1.5(f) and 375-1.11(a) discuss the conduct of CP during IRMs. While Part 375 exempts an IRM from the comprehensive CP requirements set forth for the RI/FS process (see Attachment A) the Department or PRP will conduct "such public participation activities as the Department deems necessary and appropriate under the circumstances."

Presently, the Bureau of Construction Services is developing a TAGM that will set forth CP requirements to be implemented during IRMs. IRMs will be categorized as "time critical" or "non-time critical" with CP requirements for each. CP requirements for "time critical" IRMs likely will be less comprehensive than those for "non-time critical" IRMs. Other criteria such as size/proximity of affected population, extent of the IRM, etc. likely also will be factors to consider when implementing CP activities.

Note: Part 375 specifies that when the Department determines that an IRM constitutes complete remediation of a site, it will solicit public comment and issue a Record of Decision.

6 NYCRR Part 375
Inactive Hazardous Waste Disposal Site Remedial Program

Citizen Participation Regulatory Requirements

375-1.5 Public participation.

(a) To facilitate the remedial process and enable citizens to participate more fully in decisions that affect their health, the Department will require the provision of opportunities for citizen involvement and will encourage consultation with the public early in that process before the Department forms or adopts final positions. The primary goals of the citizen participation program at sites are to facilitate two-way communication between the Department and individuals, groups, and organizations that have expressed interest in or are affected by the site or the site's program, in the decision making process associated with the remediation of sites. The Department will require that opportunities for public involvement be included in the development and implementation of a remedy.

(b) Before the start of the remedial investigation/feasibility study for a particular site, the Department will require the development of a citizen participation program that will include, at a minimum,

(1) a plan that details the citizen participation activities that will be implemented for the particular site. The plan will be subject to Departmental review and approval;

(2) a list of government representatives, civic organizations, environmental groups, residents, media representatives, business interests, and other individuals and groups that have expressed an interest in, or are affected by, the site or the site's program;

(3) site-specific document repositories in the regional office of the Department region in which the site is located and in a publicly accessible building located near the site; and

(4) a mailing to those on the list described in paragraph 375-1.5(b)(2) of this Part of an announcement of availability of the final draft remedial investigation/ feasibility study workplan and a notice and brief analysis of the proposed investigation.

(c) The Department will communicate with and solicit the views of all interested parties. To accomplish this, at the appropriate time, the Department will, at a minimum:

375-1.6 New use of sites. (Continued)

(b) Such notice must be given in writing addressed to the Commissioner at 50 Wolf Road, Albany, New York 12233 and to the clerks of the county; the town or city (as the case may be); and (where located in one) the village, within which the site is located and must include an identification of the site by means of its Registry number, an identification of the person giving notice, a brief description of the proposed substantial change of use, and such other information as the Commissioner shall deem necessary. Notice shall be provided by the person proposing to make a substantial change of use to the site's contact list identified in paragraph 375-1.5(b)(2) of this Part (if any) and adjacent property owners.

(Note: This section provides for compliance with ECL 27-1317 only. Nothing in this section relieves any person of the duty to comply also with Public Health Law Section 1389-d, of new use of sites. Nothing in this section relieves any person from any requirement to obtain a permit or other authorization from State, federal, or local governments in order to engage in the new use of site.)

375-1.8 Site classification. [Excerpted portion]

(d) When final decisions concerning a site's classification are made, the Department shall announce by mail or telephone the decision to the clerks of the county; the town or city (as the case may be); and (where located in one) the village, within which the site is located, the site owner and adjacent property owners.

(e) Any person may provide to the Department, and the Department shall consider, information claimed to be relevant to a site listed in the Registry or to an area or structure which may need to be included in the Registry. After considering such information, the Department shall respond to such person stating whether the site or area or structure has been listed and the appropriate classification thereof.

375-1.11 Interim remedial measures. [Excerpted portion]

(a) Depending on site specific circumstances and post-IRM investigation and/or monitoring, the Department may determine that steps taken as an IRM constitute complete remediation of a site if the IRM achieves the goal of a complete program as described in subdivision 375-1.10(b) of this Part, in which event the Department will propose that no further remedy is required, will solicit public comment on that proposal, and will issue a Record of Decision.

APPENDIX B

Quality Assurance Project Plan

HALEY & ALDRICH

DRAFT

I. PROJECT DESCRIPTION

A. Introduction

This Quality Assurance Project Plan (QAPP) is part of a Work Plan for a site investigation for Delphi, Lexington Avenue Facility. This QAPP presents analytical methods and procedures to be used during site work. Delphi does not, at this time, anticipate that data validation will be performed for the laboratory analytical data generated. However, because one of the goals of this work plan is to provide supportable results and conclusions which will serve as the basis for determining future requirements for a specific site, this QAPP incorporates procedures and protocols which are required to support validation of the analytical results (if necessary).

Information contained in this QAPP has been organized into the following sections:

I Project Description
II Project Organization and Responsibilities
III Quality Assurance Objectives for Measurement of Data
IV Sampling Procedures
V Sample and Document Custody
VI Calibration Procedures and Frequency
VII Analytical Procedures
VIII Data Reduction, Validation, and Reporting
IX Field and Laboratory Quality Control Checks
X Performance and System Audits
XI Preventive Maintenance
XII Data Assessment Procedures
XIII Corrective Action
XIV Quality Assurance Reports to Management

Details are provided in the subsequent sections. This document is intended to be used in conjunction with the Work Plan, Field Sampling Plan and Health and Safety Plan.

B. Objectives of The Work Plan

The purpose of this QAPP is to present the quality assurance/quality control (QA/QC) procedures to be implemented during the Work Plan stated to provide data quality which is sufficient to meet the Work Plan objectives. The overall objective of the work Plan is to provide data that can be used to assess current site conditions and to evaluate whether future remedial activities may be necessary at the Site. Based on this general objective, the following specific objectives have been established for the Work Plan:

1. Characterize nature and extent of chemical constituents in on-site soil and ground water

2. Evaluate off-site groundwater quality

3. Provide information necessary to implement interim and long-term remedial measures to address the potential presence of chemical constituents in environmental media at the Work Site

C. Work Plan Data Quality Objectives

1. General

Based on previous environmental investigations and remedial activities conducted at the Delphi Facility, the Work Plan activities covered under this Field Sampling Procedures include the following on-site field investigation activities:

1. Groundwater investigation
2. Soil investigation
3. Evaluation of IRM and Remedial System performance

Preliminary Data Quality Objectives were identified to ensure that the data generated during field investigations will be of adequate quality and sufficient quantity to form a sound basis for decision making purposes relative to the above objectives. Data quality objectives have been specified for each data collection activity or investigation. The Data Quality Objectives presented herein address investigation efforts only and do not cover health and safety issues, which are presented in detail in the Health and Safety Plan.

A Data Quality Objectives summary for each of the investigation efforts is presented below. The summary consists of stated Data Quality Objectives relative to the following items:

A. Data Uses
B. Data Types
C. Data Quality
D. Data Quantity
E. Sampling and Analytical Methods
F. Data Precision, Accuracy, Representativeness, Completeness, Comparability and Sensitivity Parameters

The analytical levels discussed in the following sections with regard to data quality are defined as follows:

- □ Field Screening - This level is characterized by the use of field instruments and field chemical kits that can provide real-time data to assist in the optimization of sampling point locations and for health and safety support. This data can be used in refining sampling plans and determining the extent or presence or absence of chemical constituents at a site.

- □ Laboratory Analysis Using Methods Other Than ASP - This level involves the use of standard USEPA SW-846 approved methods. Some procedures are equivalent to ASP, containing the same rigorous QA/QC protocols as used in ASP analyses, but without the ASP requirements for documentation. Non-ASP data are used for site characterization, environmental monitoring, confirmation of field data, and to support engineering studies. This data is still usable and reliable since rigorous SW-846 protocols are adhered to.

- □ Non-Standard Methods - Analyses which may require method modification and/or development. Non-Standard Methods are used to provide data that cannot be obtained through standard methods. Analysis of samples at this level may involve research, development, and documentation of a new method or the modification of an existing method.

D. Groundwater Investigation

1. Data Uses

The groundwater investigation is designed to generate hydrogeologic and water quality data to support the following evaluations:

1. Determine groundwater quality at the Site

2. Determine the groundwater flow direction and hydraulic gradient in overburden at the Site

The groundwater data will also be used to assess risks to human health and the environment associated with any chemical constituents detected in the groundwater samples and to evaluate applicable remedial alternatives, if necessary.

2. Data Types

Hydrogeologic and water quality data are required to meet the objectives of the groundwater investigation. Hydrogeologic data will consist of water level information from monitoring wells. Water quality data will consist of field parameters, including: pH, temperature, conductivity, redox and dissolved oxygen, as well as any laboratory parameters.

During the installation of groundwater monitoring wells, overburden soil samples will be obtained for visual characterization for color, texture, moisture, and soil types. Soil samples will be collected and selected samples submitted for laboratory analysis if staining, odors, or elevated PID readings are encountered.

3. Data Quality

Analytical Methods Non-ASP SW-846 will be used for analyses.

Field Screening will be used for the groundwater elevation measurements and water quality field parameters.

4. Data Quantity

The groundwater investigation will involve the collection of groundwater samples from existing monitoring wells and monitoring well to be installed as part of the Work Plan. Groundwater elevation measurements will also be obtained from each monitoring well. The quantity of groundwater samples to be collected for the Work Plan will be based on conditions and identified in the Work Plan. The frequency of QA/QC samples to be collected is stated under the current Sampling and Analysis Plan between Delphi and the contract laboratory.

5. Sampling and Analytical Methods

The groundwater level measurement procedures, water quality measurement procedures, and groundwater sampling procedures are provided in Appendix F. The laboratory analytical methods for groundwater samples are listed in Table I.

6. PARCCS Parameters

Data representativeness will be addressed in the Work Plan. Data comparability is achieved through the use of standard USEPA-/NYSDEC-approved methods, which are presented in Table I. Data completeness will be assessed at the conclusion of the work Plan.

E. Soil Investigation

1. Data Uses

The soil investigation is designed to generate data to support the following evaluations:

1. Determine the presence and extent of chemical constituents in soil at the Site

2. Characterize surface and subsurface soils at the Site

3. Evaluate soil conditions at the Site to determine whether chemical constituents may be migrating from the Site

4. Evaluate applicable remedial alternatives, if necessary

2. Data Types

The soil investigation will include the collection and analysis of soil samples for compounds of interest. The Work Plan presents the frequency of QA/QC samples to be collected for laboratory analysis. Visual examination and PID/FID screening of soil samples from test borings will also be conducted to evaluate subsurface conditions at the Site and to select soil samples for laboratory analysis as described in the Work Plan.

The Work Plan will provide the rationale for the soil chemical parameters selected for analysis.

3. Data Quality

Analytical Methods Non-ASP SW-846 will be used for analyses.

Field Screening will be used for soil sample quality measurements.

4. Data Quantity

The quantity of surface and subsurface soil samples to be collected during Site activities will be based on conditions and identified in the Work Plan.

5. Sampling and Analytical Methods

The Work Plan contains a description of the soil sampling procedures to be employed during Site activities.

6. PARCCS Parameters

Data representativeness will be addressed in the Work Plan. Data comparability is intended to be achieved through the use of standard USEPA-/NYSDEC-approved methods, which are presented in Table I. Data completeness will be assessed at the conclusion of the Work Plan.

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II. PROJECT ORGANIZATION AND RESPONSIBILITIES

A. Project Organization

The Delphi, Lexington Avenue Work Plan will require integration of personnel from the various organizations, collectively referred to as the project team. A detailed description of the responsibilities of each member of the project team is presented below.

B. Overall Project Management

Haley & Aldrich of New York (the "Consultant"), on behalf of Delphi, will have overall responsibility for the Work Plan activities to be implemented at the Site. The Consultant's personnel will perform the groundwater and soil investigations and an assessment of potential interim remedial measures (IRMs). In addition, the Consultant will be responsible for evaluating resultant investigation data and preparing the Work Plan Report as specified in the Work Plan. Project direction and oversight will be provided by Delphi personnel. Oversight in the field will also be provided by Delphi. The key project personnel for each Work Plan are as follows.

Project Title	Company/Organization	Name	Phone Number
Delphi Project Manager	Delphi Automotive Systems	Richard C. Eisenman	(716) 647-4766
Project Officer (The Consultant)	Haley & Aldrich of New York	Jeffrey E. Loney	(716) 327-5532
Project Manager	Haley & Aldrich of New York	Thomas D. Wells	(716) 327-5531

1. Task Managers

The staff performing the investigations and engineering activities of the Work Plan will be directed by representatives of the Consultant. The personnel responsible for each of the Work Plan tasks are as follows:

Project Title	Company/Organization	Name	Phone Number
Soil Investigation Task Manager	Haley & Aldrich of NY	James G. Talpey	(716) 327-5513
Groundwater Investigation Task Manager	Haley & Aldrich of NY	James G. Talpey	(716) 327-5513
Health and Safety Manager	Haley & Aldrich of NY	Branch H&S Representative	716-232-7386

2. Analytical Laboratory Services

Laboratory analytical services for environmental media samples associated with the Work Plan will be provided by an analytical laboratory qualified to perform laboratory analyses for environmental investigations. The analytical laboratory is site-specific and will be determined prior to implementing the Work Plan activities.

Title	Company	Name	Phone Number
Laboratory Project Manager	Free-Col Laboratories	Dale Ferguson	814-724-6242

3. Quality Assurance Staff

The quality assurance staff is site-specific and will be determined prior to implementing the Work Plan activities.

Title	Company/Organization	Name	Phone Number
Quality Assurance Officer (The Consultant)	Haley & Aldrich of NY	Kellie Gregoire	716-327-5525
Quality Assurance Officer (Analytical Laboratory)	Free-Col Laboratories	John Paraska	814-724-6242

4. Team Member Responsibilities

This section of the QAPP discusses the responsibilities and duties of the project team members.

C. Delphi, Lexington Avenue Facility

1. Project Manager

Responsibilities and duties include:

1. Overall direction of the Work Plan
2. Direction of the Consultant
3. Review of the Consultant's work products, including data, memoranda, letters, and reports

D. The Consultant

1. Project Officer

Responsibilities and duties include:

1. Oversight of the Consultant's Work Plan work products

2. Provide the Consultant's approval for major project deliverables

2. Project Manager

Responsibilities and duties include:

1. Management and coordination of all aspects of the project as defined in the site-specific Work Plan with an emphasis on adhering to the objectives of the Work Plan

2. Review the Work Plan Report and all documents prepared by the Consultant

3. Assure corrective actions are taken for deficiencies cited during audits of Work Plan activities

3. Task Managers

The Work Plan will be managed by Task Managers. Responsibilities and duties of each Task Manager include:

1. Manage day-to-day relevant Work Plan activities

2. Develop, establish, and maintain files on relevant Work Plan activities

3. Review data reductions from the relevant Work Plan activities

4. Perform final data review of field data reductions and reports on relevant Work Plan activities
5. Assure corrective actions are taken for deficiencies cited during audits of relevant Work Plan activities
6. Overall QA/QC of the relevant portions of the Work Plan
7. Review all relevant field records and logs
8. Instruct personnel working on relevant Work Plan activities
9. Coordinate field and laboratory schedules pertaining to relevant Work Plan activities
10. Request sample bottles from the laboratory
11. Review the field instrumentation, maintenance, and calibration to meet quality objectives
12. Prepare sections of Work Plan report pertaining to relevant Work Plan activities
13. Maintain field and laboratory files of notebooks and logs, data reduction and calculations, and transmit originals to the Project Manager

4. Field Personnel

Responsibilities and duties include:

1. Perform field procedures associated with the soil, surface water, sediment, groundwater, and subsurface structure investigations as set forth in the Field Sampling Plan
2. Perform field analyses and collect samples
3. Calibrate, operate, and maintain field equipment
4. Reduce field data
5. Maintain sample custody
6. Prepare field records and logs

5. Quality Assurance Officer (QAO)

Responsibilities and duties include:

1. Review laboratory data packages
2. Oversee and interface with the analytical laboratory
3. Coordinate field QA/QC activities with task managers, including audits of PSA activities, concentrating on field analytical measurements and practices to meet data quality objectives
4. Review field reports
5. Review audit reports
6. Prepare interim QA/QC compliance reports
7. Prepare QA/QC report which includes an evaluation of field and laboratory data and data validation reports

E. The Analytical Laboratory

General responsibilities and duties of the analytical laboratory include:

1. Perform sample analyses and associated laboratory QA/QC procedures
2. Supply sampling containers and shipping cartons
3. Maintain laboratory custody of sample
4. Strictly adhere to all protocols in the Work Plan/QAPP

1. Project Manager

Responsibilities and duties include:

1. Serve as primary communication link between the Consultant and laboratory technical staff
2. Monitor work loads and ensure availability of resources
3. Oversee preparation of analytical reports
4. Supervise in-house chain-of-custody

2. Quality Assurance Officer

Responsibilities and duties include:

1. Supervise the group which reviews and inspects all project-related laboratory activities
2. Conduct audits of all laboratory activities

3. Sample Custodian

Responsibilities and duties include:

1. Receive all samples
2. Maintain custody of the samples and all documentation.

4. Laboratory Data Reviewer

Responsibilities and duties include:

Verify final analytical data prior to transmittal to the Consultant.

5. The Subcontractor

General responsibilities and duties include:

1. Performance of Work Plan groundwater monitoring well installations in accordance with the protocols stated in the Work Plan.

2. Decontamination of drilling equipment.

III. QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT OF DATA

A. Selection of Measurement Parameters, Laboratory Methods, and Field Testing Methods

1. Field Parameters

During groundwater activities, selected field parameters consisting of pH, conductivity, dissolved oxygen, Redox and temperature will be measured to provide general water quality information. Field test methods to measure pH, conductivity, dissolved oxygen, and temperature are presented in the Field Sampling Plan.

Soil samples collected as part of the soil investigation will be screened with a PID/FID to determine the presence and relative concentrations of volatile organic vapors. PID/FID measurement protocols are presented in the Work Plan.

2. Hydrogeologic Measurements

Groundwater level measurements will be performed as described in the Work Plan.

3. Laboratory Parameters and Methods

Laboratory analyses will be performed as set forth in Table 1 (quantities will be based on site-specific conditions).

4. Quality Assurance Objectives

The overall quality assurance objective for the Work Plan is to develop and implement procedures for sampling, COC, laboratory analysis, instrument calibration, data reduction and reporting, internal quality control, audits, preventive maintenance, and corrective action, such that valid data will be generated. These procedures are presented or referenced in the following sections of this QAPP. Specific QC checks are discussed in this QAPP.

Quality assurance objectives are generally defined in terms of five parameters:

1. Representativeness
2. Comparability
3. Completeness
4. Precision
5. Accuracy

Each parameter is defined below. Specific objectives for the Work Plan are set forth in other sections of this QAPP as referenced below.

5. Representativeness

Representativeness is the degree to which sampling data accurately and precisely represent site conditions, and is dependent on sampling and analytical variability and the variability of environmental media at the Site. The Work Plan will be designed to assess the presence of the chemical constituents at the time of sampling. The Work Plan will present the rationale for sample quantities and location. The Field Sampling Plan and this QAPP present field sampling methodologies and laboratory analytical methodologies, respectively. The use of the prescribed field and laboratory analytical methods with associated holding times and preservation requirements are intended to provide representative data.

6. Comparability

Comparability is the degree of confidence with which one data set can be compared to another. Comparability between phases of the Work Plan will be maintained through consistent use of the sampling and analytical methodologies set forth in this QAPP; the Field Sampling Plan, as well as through the use of established QA/QC procedures; and the utilization of appropriately trained personnel.

7. Completeness

Completeness is defined as a measure of the amount of valid data obtained from an event and/or investigation compared to the total amount that was obtained. This will be determined upon final assessment of the analytical results, as discussed in this QAPP.

8. Precision

Precision is a measure of the reproducibility of sample results. The goal is to maintain a level of analytical precision consistent with the objectives of the Work Plan. To maximize precision, sampling and analytical procedures will be followed. All work for the Work Plan will adhere to established protocols presented in this QAPP and the Field Sampling Plan. Checks for analytical precision will include the analysis of matrix spike, matrix spike duplicates, laboratory duplicates, and field duplicates. Checks for field measurement precision will include obtaining duplicate field measurements.

9. Accuracy

Accuracy is a measure of how close a measured result is to the true value. Both field and analytical accuracy will be monitored through initial and continuing calibration of instruments. In addition, reference standards, matrix spikes, blank spikes, and surrogate standards will be used to assess the accuracy of the analytical data.

IV. SAMPLING PROCEDURES

Soil, groundwater, and soil vapor samples will be collected as described in Appendices E, F, and H, respectively, of this Work Plan. These appendices contain detailed procedures for: drilling test borings and installing monitoring wells; measuring groundwater levels; performing field measurements; collection of Work Plan samples; and handling, packing, and shipping of Work Plan samples.

V. SAMPLE AND DOCUMENT CUSTODY

A. Field Procedures

The objective of field sample custody is to assure that samples are not tampered with from the time of sample collection through time of transport to the analytical laboratory. Persons will have "custody of samples" when the samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel. A discussion of sample custody and directions for the field use of chain-of-custody forms are provided in the appropriate appendices.

B. Laboratory Procedures

1. General

Upon sample receipt, laboratory personnel will be responsible for sample custody. The original field COC form will accompany all samples requiring laboratory analysis. Samples will be kept secured in the laboratory until all stages of analysis are complete. All laboratory personnel having samples in their custody will be responsible for documenting and maintaining sample integrity.

2. Sample Receipt and Storage

Immediately upon sample receipt, the laboratory sample custodian will verify the package seal, if appropriate, open the package, and compare the contents against the field COC. If a sample container is received broken, the sample is in an inappropriate container, or has not been preserved by appropriate means, the Consultant will be notified. The laboratory sample custodian will be responsible for logging the samples in, assigning a unique laboratory identification number to each sample, labeling the sample bottle with the laboratory identification number, and moving the sample to an appropriate storage location to await analysis. The project name, field sample code, date sampled, date received, analysis required, storage location and date, and action for final disposition will be recorded in laboratory records. All relevant custody documentation will be maintained in readily available laboratory files.

3. Sample Analysis

Analysis of an acceptable sample will be initiated by worksheets which contain all pertinent information for analysis.

Samples will be organized into sample delivery groups (SDGs) by the laboratory. A SDG may contain up to 20 field samples (field duplicates, trip blanks, and rinse blanks are considered field samples for the purposes of SDG assignment). All field samples assigned to a single SDG shall be received by the laboratory over a maximum of five calendar days (less, when five-day holding times for extraction must be met), and must be processed through the laboratory (preparation, analysis, and reporting) as a group. Every SDG must include a minimum of one site-specific matrix spike/matrix spike duplicate (MS/MSD) pair, which shall be received by the laboratory at the start of the SDG assignment.

Each SDG will be self-contained for all of the required quality control samples. All parameters within an SDG will be extracted and analyzed together in the laboratory. At no time will the laboratory be allowed to run any sample (including QC samples) at an earlier or later time than the rest of the SDG. These rules for analysis will ensure that the quality control samples for an SDG are applicable to the field samples of the same SDG, and that the best possible comparisons may be made.

Information regarding the sample, analytical procedures performed, and the results of the testing will be recorded on laboratory worksheets by the analyst. These worksheets will be dated, and will also identify the analyst, the instrument used, and the instrument conditions, if applicable.

4. Laboratory Project Files

All pertinent Work Plan data will be kept in the appropriate, readily available files or records. Files or records will include the COC forms, raw data, chromatograms (required for all constituents analyzed by chromatography), and sample preparation information. The analytical laboratory will retain all project files and data packages for a period of five years.

C. Laboratory Documentation

1. Documentation

Workbooks, bench sheets, instrument logbooks, and instrument printouts, are used to trace the history of samples through the analytical process, and document and relate important aspects of the work, including the associated quality controls. As such, all logbooks, bench sheets, instrument logs, and instrument printouts will be part of the permanent record of the laboratory.

Each page or entry will be dated and initialed by the analyst at the time of entry. Errors in entry will be crossed out in indelible ink with a single stroke, corrected without the use of white-out or by obliterating or writing directly over the erroneous entry, and initialed and dated by the individual making the correction. Pages of logbooks that will be not used are completed by lining out unused portions.

All relevant laboratory data production information will be periodically reviewed by the appropriate laboratory section leaders for accuracy, completeness, and compliance to this QAPP. All entries and calculations on analytical worksheets will be verified by the appropriate laboratory section leader. If all entries on the pages are correct, then the appropriate laboratory section leader will initial and date the pages. Corrective action will be taken for incorrect entries before the appropriate laboratory section leader signs.

2. Computer Tape and Hard Copy Storage

GC/MS raw data files will be maintained on magnetic tape for five years, hard copy GC chromatograms will be maintained in files for five years.

3. Sample Storage Following Analysis

Samples will be maintained by the laboratory for one month after the final report is delivered to Consultant. After this period, the samples will be disposed of in accordance with applicable rules and regulations.

4. Project File

Work Plan documentation will be placed in a single project file at the Consultant's office. This file will consist of the following components:

1. Agreements (filed chronologically)
2. Correspondence (filed chronologically)
3. Memos (filed chronologically)
4. Notes and Data (filed by topic)

Reports will be filed with correspondence. Analytical laboratory documentation (when received) and field data will be filed with notes and data. Filed materials may be removed and signed out by authorized personnel on a temporary basis only.

VI. CALIBRATION PROCEDURES AND FREQUENCY

A. Field Equipment Calibration Procedures and Frequency

Procedures utilized for performing and documenting calibration and maintenance for the field equipment used to measure conductivity, temperature, dissolved oxygen, pH, groundwater level, surface water flow rates, and organic vapors are followed according to manufactures specifications. Calibration checks will be performed daily when measuring conductivity, temperature, dissolved oxygen, pH, and total organic vapors. Field equipment, frequency of calibration, and calibration standards are provided in the laboratory's Field Sampling Procedure.

As indicated in the Health and Safety Plan, the equipment used to measure the levels of oxygen, carbon monoxide, hydrogen sulfide, and combustible gas, will be calibrated prior to use on a daily basis according to the manufacturer's specifications.

B. Laboratory Equipment Calibration Procedures and Frequency

Instrument calibration will follow the specifications provided by the instrument manufacturer or specific analytical method used. The analytical methods for chemical constituents are identified below.

VII. ANALYTICAL PROCEDURES

A. Field Analytical Procedures

Field analytical procedures will include the measurement of temperature, conductivity, dissolved oxygen, pH, turbidity, organic vapors, and groundwater levels. Specific field measurement protocols are provided in the Field Sampling Plan.

B. Laboratory Analytical Procedures

Current SW-846, EPA, Standard Methods and ASTM Methods will be used. All samples will be analyzed by the laboratory on a standard turnaround basis. Laboratory Analytical Methods are listed in Table I.

VIII. DATA REDUCTION, VALIDATION, AND REPORTING

Data reduction and reporting is intended to ensure that documentation of all field and analytical data is complete, that errors in data transcription and reduction are avoided, that the data is regularly reviewed and that reported values are correct and properly reported. Data validation is intended to establish parameters such as limits of detection and limits of quantification for use in reporting and interpreting analytical data. The resume of the person assigned responsibility for data validation is contained in Appendix C.

A. Data Reduction

Data reduction of raw data generated in the laboratory will be the responsibility of the laboratory and more specifically the analyst that produced the data. Sample concentrations will be calculated for each analyte according to the SW-846 Methods Standard Operating Procedures (SOP). The laboratory will be responsible for data review and the generation of a preliminary report prior to submittal of the data to the Consultant.

The Consultant will review the data to ensure adherence to the quality control objectives of the project. During this portion of the review process, the data will be reviewed for the presence of outliers. An outlier is a value that is unusually large or small when compared to other values in the data set.

The Consultant's data review will include the matrix spike and matrix spike duplicate results, and the percent recovery rates for internal and surrogate standards.

B. Data Review and Use

All data will be recorded on a preprinted data collection form, which are shown in the respective Field Operating Procedures found in the figures and appendices attached. The data will be verified by the Project Manager for completeness and logged into a master file. The master files are kept in a secure area with restricted access. Copies of the data will be made and filed for storage in a separate file.

Paper copies of the laboratory reports will be distributed to the appropriate task leaders and to persons responsible for data entry. The data will be stored into computer data files for later retrieval and manipulation. An entry-by-entry check of the computer printout of the data will be made after the data has been entered into the data management system. The printout will be compared to the original paper copies to check for entry errors. Corrections will be noted on the computer printout.

C. Data Quality Review

The Quality Assurance Officer will review all data for acceptable sample collection and analysis procedures and adherence to the quality assurance procedures described in this plan. The Quality Assurance Officer will determine whether sampling and analytical quality control checks were performed properly. The QC results will be reviewed to determine possible systematic contamination, precision and/or accuracy problems. If problems are indicated, more specific performance criteria will be examined. Methods and compounds for which the QC objectives are not satisfied will be identified. Resampling will be recommended if the sampling and analytical procedures adversely affect the analytical results.

D. Data Reporting

The data from investigations will be presented in the form of a Work Plan Report. The report is intended to document the results of the Work Plan and will be submitted after the completion of the project. The draft report will include the following:

- An Executive Summary stating primary conclusions of the Work Plan report and primary recommendations further site characterization, risk assessment analysis, and feasibility study.

- A Table of Contents outlining all sections of the report and supporting figures and appendices.

- A main report text describing all work actually performed on the site, procedures used for all explorations, and conditions actually encountered on the site. Summary sections will be provided describing site geologic conditions, site hydrogeologic conditions, compounds found on the site and the extent of their presence.

- A site Figure prepared at approximately 1 in. to 100 ft. scale showing site property lines, pertinent surface features, soil vapor sampling points, soil sampling, test boring and monitoring well locations, pertinent site elevation data, and figures displaying isopotential and isoconcentration contours.

- A section of Tables including data results of the soil vapor survey, results of the soil and groundwater chemical analyses, a summary of groundwater elevations, and a summary of the permeability test results.

- A section of Appendices including exploratory boring logs, well completion reports and analytical results provided by the laboratory.

E. Data Validation

Data validation entails a review of the QC data and the raw data to verify that the laboratory was operating within required limits, the analytical results are correctly transcribed from the instrument read outs, and which, if any, environmental samples are related to any out-of-control QC samples. The objective of data validation is to identify any questionable or invalid laboratory measurements.

The Consultant will maintain the laboratory data following the Work Plan for potential validation at a later date, if required by Delphi. If data validation is required, it will consist of data editing, screening, checking, auditing, review, and interpretation to document analytical data quality to determine if the quality is sufficient to meet the data quality objectives. Data validation will include, but not limited to, a review of completeness and compliance.

The data validator will use the most recent versions of the NYSDEC 1991 ASP documents available at the time of project initiation as guidance, where appropriate.

The data validator will verify that reduction of laboratory measurements and laboratory reporting of analytical parameters is in accordance with the procedures specified for each analytical method (i.e., perform laboratory calculations in accordance with the method-specific procedure) and/or as specified in this QAPP. Any deviations from the analytical method will be delineated on chain of custody forms. Any special reporting requirements apart from this QAPP will also be detailed on chain of custody forms. The data quality will be evaluated by application of the Functional Guidelines procedures and criteria modified as necessary to address project-specific and method-specific criteria, control limits, and procedures.

Upon receipt of the laboratory data, the following reduction, validation, and reporting scheme will be executed by the data validator:

- Evaluate completeness of data package.

- Verify that field COC forms were completed and that samples were handled properly.

- Verify that holding times were met for each parameter. Holding times exceedences, should they occur, will be documented. Data for all samples exceeding holding time requirements will be flagged as either estimated or rejected. The decision as to which qualifier is more appropriate will be made on a case-by-case basis.

- Verify that parameters were analyzed according to the methods specified.

- Review QA/QC data (i.e., make sure duplicates, blanks, and spikes were analyzed on the required number of samples, as specified in the method, verify that duplicate and matrix spike recoveries are acceptable).

- Investigate anomalies identified during review. When anomalies are identified, they will be discussed with the project manager and/or laboratory manager, as appropriate.

- If data appears suspect, the specific data of concern will be investigated. Calculations will be traced back to raw data if calculations do not agree, the cause will be determined and corrected.

Deficiencies discovered as a result of data validation, as well as the corrective actions implemented in response, will be documented and submitted in the form of a written report with supporting documentation supplied as check sheets.

Resolution of any issues regarding laboratory performance or deliverables will be handled between the analytical laboratory and the data validator. Suggestions for re-analysis may be made to the Consultant's Quality Assurance Officer at this point.

Upon completion of the validation of each sample delivery group/parameter, a data validation report addressing the following topics as applicable to each method will be prepared:

1. Assessment of the data package

2. Description of any protocol deviations

3. Failures to reconcile reported and/or raw data

4. Assessment of any compromised data

5. Laboratory case narrative

6. Overall appraisal of the analytical data

If data validation is performed, the data validation/usability reports will be included as an appendix to the Work Plan Report, if appropriate, and kept in the project file at the Consultant's office.

IX. FIELD AND LABORATORY QUALITY CONTROL CHECKS

Both field and laboratory quality control checks are proposed for the Work Plan. In the event that there are any deviations from these checks, the Consultant's Quality Assurance Officer will be notified. The proposed field and laboratory control checks are discussed below.

A. Field Quality Control Checks

1. Sample Containers

Certified-clean sample containers will be supplied by the analytical laboratory. Certificates of analysis will be filed in the project file.

2. Field Duplicates

Field duplicates will be collected for soil, surface water, sediment, groundwater, and debris samples to verify the reproducibility of the sampling methods. Field duplicates will be prepared as discussed in the Field Sampling Plan. In general, soil and groundwater sample field duplicates will be analyzed at a 5 percent frequency (every 20 samples) for the chemical constituents.

3. Rinse Blanks

Rinse blanks are used to monitor the cleanliness of the sampling equipment and the effectiveness of the cleaning procedures. Rinse blanks will be prepared and submitted for analysis at a frequency of one per day (when sample equipment cleaning occurs) or once for every 20 samples collected, whichever is more. Rinse blanks will be prepared by filling sample containers with analyte-free water (supplied by the laboratory) which has been routed through a cleaned sampling device. When dedicated sampling devices are used or sample containers are used to collect the samples, rinse blanks will not be necessary.

4. Trip Blanks

Trip blanks will be used to assess whether site samples have been exposed to non-site-related volatile constituents during sample storage and transport. Trip blanks will be submitted at a frequency of once per day, per cooler containing groundwater samples to be analyzed for volatile organic constituents. A trip blank will consist of a container filled with analyte-free water (supplied by the laboratory) which remains unopened with field samples throughout the sampling event. Trip blanks will only be analyzed for volatile organic constituents.

B. Analytical Laboratory Quality Control Checks

Internal laboratory quality control checks will be used to monitor data integrity. These checks will include method blanks, matrix spikes (and matrix spike duplicates), spike blanks, internal standards, surrogate samples, calibration standards, and reference standards. Laboratory control charts will be used to determine long-term instrument trends.

1. Method Blanks

Sources of contamination in the analytical process, whether specific analytes or interferences, need to be identified, isolated, and corrected. The method blank is useful in identifying possible sources of contamination within the analytical process. For this reason, it is necessary that the method blank is initiated at the beginning of the analytical process and encompasses all aspects of the analytical work. As such, the method blank would assist in accounting for any potential contamination attributable to glassware, reagents, instrumentation, or other sources which could affect sample analysis. One method blank will be analyzed with each analytical series associated with no more than 20 samples. Guidelines for non-standard methods are provided in the appropriate protocols.

2. Matrix Spikes/Matrix Spike Duplicates

Matrix spikes and matrix spike duplicates will be used to measure the accuracy of organic analyte recovery from the sample matrices. All matrix spikes and matrix spike duplicates will be site-specific. For organic constituents, matrix spike/matrix spike duplicate pairs will be analyzed at a 5 percent frequency (every 20 samples). For inorganics, a matrix spike will be analyzed at a 5 percent frequency.

For soil and water organic matrix spike data, results will be examined in conjunction with matrix spike blank data and surrogate spike data to assess the accuracy of the analytical method. When matrix spike recoveries are outside QC limits, associated matrix spike blank and surrogate recoveries will be evaluated to attempt to verify the reason for the deviation and determine the effect on the reported sample results.

3. Matrix Spike Blanks (MSB)

For soil, sediment, debris, and water organic analyses, MSBs will be included to provide an additional assessment of data accuracy. The MSBs provide an assessment of method performance without interferences which may be present in environmental samples. MSBs will be analyzed at a frequency of one spike associated with no more than 20 samples. For MSB analyses, clean matrix is spiked and recoveries are calculated similar to matrix spike recoveries. The clean matrix will consist of laboratory reagent water and clean, dried sand for water and soil analyses, respectively.

4. Surrogate Spikes

Surrogates are compounds which are unlikely to occur under natural conditions that have properties similar to the analytes of interest. This type of control is primarily used for organic samples analyzed by GC/MS and GC methods and is added to the samples prior to purging or extraction. The surrogate spike is utilized to provide broader insight into the proficiency and efficiency of an analytical method on a sample specific basis. This control reflects analytical conditions which may not be attributable to sample matrix.

If surrogate spike recoveries exceed specified QC limits, the analytical results need to be evaluated thoroughly in conjunction with other control measures. In the absence of other control measures (i.e., internal standard and matrix spikes), the integrity of the data may be verifiable and reanalysis of the sample with additional controls would be necessary.

5. Laboratory Duplicates

For inorganics, laboratory duplicates will be analyzed to assess laboratory precision. Laboratory duplicates are defined as a second aliquot of an individual sample which is analyzed as a separate sample.

6. Calibration Standards

Calibration check standards analyzed within a particular analytical series provide insight regarding the instruments' stability. A calibration check standard will be analyzed at the beginning and end of an analytical series, or periodically throughout a series containing a large number of samples.

In general, calibration check standards will be analyzed after every 12 hours, or more frequently as specified in the applicable analytical method. In analyses where internal standards are used, a calibration check standard will only be analyzed in the beginning of an analytical series. If results of the calibration check standard exceed specified tolerances, then all samples analyzed since the last acceptable calibration check standard will be reanalyzed.

7. Internal Standards

Internal standard areas and retention times are monitored for organic analyses performed by GC/MS methods. Method-specified internal standard compounds are spiked into all field samples, calibration standards and QC samples after preparation and prior to analysis. The response of each internal standard is plotted on a control chart. If internal standard areas in one or more samples exceed the specified tolerances, then the instrument will be recalibrated and all affected samples reanalyzed.

8. Reference Standards

Reference standards are standards of known concentration and independent in origin from the calibration standards. Reference standards, are generally available through the EPA, the National Bureau of Standards, or are specified in analytical methods. The intent of reference standard analysis is to provide insight into the analytical proficiency within an analytical series. This includes the preparation of calibration standards, the validity of calibration, sample preparation, instrument set-up, and the premises inherent in quantification. Reference standards will be analyzed at the frequencies specified within the analytical methods.

X. PERFORMANCE AND SYSTEMS AUDITS

Performance and systems audits will be completed in the field and the laboratory during the Work Plan as described below.

A. Field Audits

The following field performance and systems audits will be completed during this project.

1. Performance Audits

The appropriate Task Manager will monitor field performance. Field performance audit summaries will contain an evaluation of field measurements and field meter calibrations to verify that measurements are taken according to established protocols. The Consultant's Quality Assurance Officer will review all field reports and communicate concerns to the Consultant's Project Manager and/or Task Managers, as appropriate. In addition, the Consultant's Quality Assurance Officer will review the rinse and trip blank data to identify potential deficiencies in field sampling and cleaning procedures.

2. Internal Systems Audits

A field internal systems audit is a qualitative evaluation of all components of field QA/QC. The systems audit compares scheduled QA/QC activities from this document with actual QA/QC activities completed. The appropriate Task Manager and Quality Assurance Officer will periodically confirm that work is being performed consistent with this QAPP, the Work Plan, the Field Sampling Plan, and the Health and Safety Plan.

B. Laboratory Audits

The following laboratory performance and systems audits will be completed during this project.

1. Internal Audits

Internal audits take the form of continuous re-evaluations of methods of operations and management systems. This effort is lead by (but not exclusive to) the laboratory Quality Assurance Manager acting on the suggestions of regulatory agencies and officers of the laboratory. Internal audits are conducted as described below:

- An internal audit of each analytical department is conducted at least once per year. If an analytical quality problem exists, or if department personnel has changed, audits will be conducted more frequently.
- Internal audits are conducted by the Quality Assurance Manager and the Laboratory Director.
- Audit personnel are trained in the performance of audits and are not directly responsible for the work under evaluation.

The following items will be checked during the internal audit of each analytical department:

- Standard Operating Procedure (SOP) Manuals
- Instrument maintenance
- Laboratory notebooks
- QC charts

In addition to analytical department audits, one sample for each analytical method is used to audit laboratory activities from the sample login to the finished report. The items are checked during this audit:

- Sample login
- Sample storage
- Sample analysis
- Sample holding time

- Sample calculation
- Sample QC
- Sample report

If a problem is observed, recommendations will be made for correcting the problem. A follow-up audit will be made within one month to ensure the problem remains corrected.

2. External Audits

There are several mechanisms by which external laboratory audits may be conducted.

As a participant in state and federal certification programs, the laboratory sections are audited by representatives of the regulatory agency issuing certification. Audits are usually conducted on an annual basis and focus on laboratory conformance to the specific program protocols for which the laboratory is seeking certification. The auditor reviews sample handling and tracking documentation, analytical methodologies, analytical supportive documentation, and final reports. The audit findings are formally documented and submitted to the laboratory for corrective action, if necessary.

The Consultant reserves the right to conduct an on-site audit of the laboratory prior to the start of analyses for the project. Additional audits may be performed during the course of the project, as deemed necessary.

XI. PREVENTATIVE MAINTENANCE

Preventive maintenance schedules have been developed for both field and laboratory instruments. A summary of the maintenance activities to be performed is presented below.

A. <u>Field Instruments and Equipment</u>

Prior to any field sampling, each piece of field equipment will be inspected to assure it is operational. If the equipment is not operational, it must be serviced prior to use. All meters which require charging or batteries will be fully charged or have fresh batteries. If instrument servicing is required, it is the responsibility of the appropriate Task Manager or field personnel to follow the maintenance schedule and arrange for prompt service.

Field instrumentation to be used in this study includes meters to measure conductivity, temperature, pH, dissolved oxygen, water level, and organic vapors. Field equipment also includes sampling devices for ground water. Field equipment returned from a site will be inspected to confirm it is in working order.

Non-operational field equipment will be either repaired or replaced. Appropriate spare parts will be made available for field meters.

B. <u>Laboratory Instruments and Equipment</u>

1. General

Laboratory instrument and equipment documentation procedures are provided in standard operating procedures (SOPs). Documentation includes details of any observed problems, corrective measure(s), routine maintenance, and instrument repair (which will include information regarding the repair and the individual who performed the repair).

Preventive maintenance of laboratory equipment generally will follow the guidelines recommended by the manufacturer. A malfunctioning instrument will be repaired immediately by in-house staff or through a service call from the manufacturer. Specific procedures used by the analytical laboratory are discussed below.

2. Instrument Maintenance

Maintenance schedules for laboratory equipment will adhere to the manufacturer's recommendations. Records will reflect the complete history of each instrument and specify the time frame for future maintenance. Major repairs or maintenance procedures will be performed through service contracts with manufacturer or qualified contractors. All paperwork associated with service calls and preventative maintenance calls will be kept on file by the laboratory.

Each laboratory Supervisor is responsible for the routine maintenance of instruments used in the particular laboratory. Any routine preventative maintenance carried out will be logged into the appropriate logbooks. The frequency of routine maintenance will be dictated by the nature of samples being analyzed, the requirements of the method used, and/or the judgment of the laboratory Supervisor.

All major instruments will be backed up by comparable (if not equivalent) instrument systems in the event of unscheduled downtime. An inventory of spare parts will also be available to minimize equipment/instrument downtime.

XII. DATA ASSESSMENT PROCEDURES

The analytical data generated during Work Plan activities will be evaluated with respect to precision, accuracy, and completeness and compared to data quality objectives.

Following collection of the Work Plan data, various statistical analyses can be performed to determine the data validity, sufficiency, and sensitivity of the data, as described below.

Data validity can be checked through not only standard data validation procedures, but also through statistical cross-validation procedures. These procedures involve predicting a data value for one point, based on results from other points. The difference between the measured and predicted number can indicate an invalid result.

An assessment of data sufficiency involves the determination of whether the confidence intervals for measured values are rigorous enough to satisfy regulatory or engineering requirements.

The sensitivity of the data can be measured by the use of methods, such as kriging, that can be used to calculate the range of probable values at non-sampled locations and to determine the effect of this uncertainty on site assessment.

The procedures utilized when assessing data precision, accuracy, and completeness are presented below.

A. Data Precision Assessment Procedures

Field duplicates will be used to assess precision for the entire measurement system including sampling, handling, shipping, storage, preparation, and analysis.

Laboratory data precision for organic analyses will be monitored through the use of matrix spike/matrix spike duplicate sample analyses. For other parameters, laboratory data precision will be monitored through the use of field duplicates and/or laboratory duplicates.

The precision of data will be measured by calculation of the relative percent difference (RPD) by the following equation:

$$RPD = \frac{(A-B)}{(A+B)/2} \times 100$$

Where:

A = Analytical result from one of two duplicate measurements
B = Analytical result from the second measurement

B. Data Accuracy Assessment Procedures

Laboratory accuracy will be assessed via the use of matrix spikes, surrogate spikes and reference standards. Where available and appropriate, A performance standards will be analyzed periodically to assess laboratory accuracy. Accuracy will be calculated in terms of percent recovery as follows:

$$\%\ Recovery = \frac{A-X}{B} \times 100$$

Where:

A = Value measured in spiked sample or standard
X = Value measured in original sample
B = True value of amount added to sample or true value of standard

This formula is derived under the assumption of constant accuracy between the original and spiked measurements.

C. Data Completeness Assessment Procedures

Completeness of a field or laboratory data set will be calculated by comparing the number of valid sample results generated to the total number of results generated.

$$\text{Completeness} = \frac{\text{Number Valid Results}}{\text{Total number of results generated x 100}}$$

As a general guideline, overall project completeness is expected to be at least 90 percent. The assessment of completeness will require professional judgement to determine data usability for intended purposes.

Calculation of Method Detection Limits

The method detection limit (MDL) is defined as the minimum concentration of a substance that can be measured and reported with 99% confidence that the value is above zero. The MDL achieved in a given analysis will vary depending on instrument sensitivity and matrix effects. MDL is calculated as follows:

$$MDL - t_{(n-1,1-a=0.99)}\ s$$

Where:

MDL = method detection limit

s = standard deviation of replicate analyses

$t_{(n-1,1-a=0.99)}$ = student's t-value for a one-sided 99% confidence level and a standard deviation estimate with n-1 degrees of freedom

XIII. CORRECTIVE ACTION

Corrective actions are required when field or analytical data are not within the objectives specified in this QAPP, the Work Plan or the Field Sampling Plan. Corrective actions include procedures to promptly investigate, document, evaluate, and correct data collection and/or analytical procedures. Field and laboratory corrective action procedures for the Work Plan are described below.

A. Field Procedures

When conducting the field work, if a condition is noted that would have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause, and corrective action implemented will be documented on a Corrective Action Form and reported to the Consultant's appropriate Task Manager, Quality Assurance Officer and Project Manager.

Examples of situations which would require corrective actions are:

1. Protocols as defined by this QAPP and the Field Sampling Plan have not been followed
2. Equipment is not in proper working order or properly calibrated
3. QC requirements have not been met
4. Issues resulting from performance or systems audits

Project personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities.

B. Laboratory Procedures

1. General

In the laboratory, when a condition is noted to have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause, and corrective action to be taken will be documented, and reported to the appropriate project manager and Quality Assurance Officer.

Corrective action may be initiated, at a minimum, under the following conditions:

1. Protocols as defined by this QAPP have not been followed
2. Predetermined data acceptance standards are not obtained
3. Equipment is not in proper working order or calibrated
4. Sample and test results are not completely traceable
5. QC requirements have not been met
6. Issues resulting from performance or systems audits.

Laboratory personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities. Additional details of corrective action procedures used by the analytical laboratory are provided below.

XIV. QUALITY ASSURANCE REPORTS TO MANAGEMENT

A. Internal Reporting

If data validation is required by the Delphi, Lexington Avenue Facility, the data validator will submit validation report(s) to the Consultant's Quality Assurance Officer. The Consultant's Quality Assurance Officer will review analytical concerns identified by the data validator with the laboratory. For data qualified by the data validator, data usability will be assessed by data users relative to project decision-making requirements. Supporting data (i.e., historic data, related field or laboratory data) will be reviewed to assist in determining data quality, as appropriate. The Consultant's Quality Assurance Officer will incorporate results of data validation reports and assessments of data usability into a summary report that will be submitted to the Consultant's Project Manager and appropriate Task Managers. This report will be filed in the project file at the Consultant's office and will include the following:

1. Assessment of data accuracy, precision, and completeness for both field and laboratory data
2. Results of the performance and systems audits
3. Significant QA/QC problems, solutions, corrections, and potential consequences
4. Analytical data validation report

B. Work Plan Reporting

If data validation is required, the Work Plan Report prepared by the Consultant will contain a separate QA/QC section(s) summarizing the quality of data collected and/or used as appropriate to the project data quality. Additional details of data quality objectives will be provided in the Work Plan. The Consultant's Quality Assurance Officer will prepare the QA/QC summaries using reports and memoranda documenting the data assessment and validation.

In addition, records will be maintained to provide evidence of the activities. A records index will be initiated at the beginning of the project, and all information received from outside sources or developed during the project will be retained by the Consultant. Upon termination of an individual task or work assignment, working files will be forwarded to the project files.

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Methods Summary

TABLE 1

Delphi Automotive Systems

Lexington Avenue Plant RI/FS Work Plan QAPP

Summary of Laboratory Methods

Parameter	Analysis Method		Source
	Groundwater	Soils	
Volatile Organic Compounds	8260B	8260B	SW-846
SemiVolatiles	8270C	8270C	SW-846
PCB	8082	8082	SW-846
Mineral Spirits	8015B	8015B	SW-846
Petroleum Finger Printing (LNAPL)	8270C	8270C	SW-846
Total Petroleum Hydrocarbons	8015B(mod)DRO	8015B(mod)DRO	SW-846
Alkalinity	2320B	2320B	Standard Methods
Nitrogen, Ammonia	350.2	350.2	EPA
Nitrate	353.2	353.2	EPA
TKN	351.3	351.3	EPA
Sulfide	9030B/335.2	9030B/335.2	SW-846/EPA
Sulfate	9038	9038	SW-846
Chloride	325.3	325.3	EPA
Phosphorus	4500-P E/4500-P B.5	4500-P E/4500-P B.5	Standard Methods
TOC	9060	9060	SW-846
BOD	5210B	5210B	Standard Methods
COD	8000	8000	HACH
Density/Specific Gravity	In House	In House	In House
Viscosity	D 445	D 445	ASTM
Flash Point	1010	1010	SW-846
Metals:			
Cyanide	9010B	9010B	SW-846
Arsenic	7060A	7060A	SW-846
Cadmium	7131A	6010B	SW-846
Chromium	7191	6010B	SW-846
Lead	7421	6010B	SW-846
Tin	7870	7870	SW-846
Mercury	7470A	7470A	SW-846
Iron, Manganese, Copper,	6010B	6010B	SW-846
Nickel, Zinc	6010B	6010B	SW-846
Hexavalent Chromium	7196A	7196A/3060A	SW-846
Field Parameters			
pH	Field Meter	---	---
Conductivity	Field Meter	---	---
Eh	Field Meter	---	---
DO	Field Meter	---	---
CO2	Hach Kit		
Temperature	Field Meter	---	---
Turbidity	Field Meter	---	---

Notes:

1. Where two methods are listed, the method after the backslash is the sample preparation method.
2. Method 8015B(mod)DRO will provide a measure of the total petroleum hydrocarbons present in a sample and a qualitative petroleum fingerprint scan.
3. DRO = diesel-range organics

NYSDOH Certificate Of Approval

NEW YORK STATE DEPARTMENT OF HEALTH

BARBARA A. DEBUONO, M.D., M.P.H. Commissioner

Expires 12:01 AM April 1, 1999
ISSUED April 1, 1998
REVISED February 9, 1999

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

Lab ID No.: 10552

Director: MR. ERIC BOTNICK
Lab Name: FREE-COL LABORATORIES LTD
Address : COTTON ROAD
MEADVILLE PA 16335

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES NON POTABLE WATER

All approved subcategories and/or analytes are listed below:

Chlor. Hydrocarbon Pesticides :
- 4,4'-DDD
- 4,4'-DDE
- 4,4'-DDT
- alpha-BHC
- Aldrin
- beta-BHC
- Chlordane Total
- delta-BHC
- Dieldrin
- Endrin aldehyde
- Endrin
- Endosulfan I
- Endosulfan II
- Endosulfan sulfate
- Heptachlor
- Heptachlor epoxide
- Isodrin
- Lindane
- Mirex
- Methoxychlor
- Toxaphene

Wastewater Miscellaneous :
- Bromide
- Boron, Total
- Cyanide, Total
- Color
- Phenols
- Oil & Grease Total Recoverable
- Hydrogen Ion (pH)
- Specific Conductance
- Silica, Dissolved
- Sulfide (as S)
- Surfactant (MBAS)
- Organic Carbon, Total

Purgeable Aromatics (ALL)
TCLP Additional Compounds (ALL)

Wastewater Metals III :
- Gold, Total
- Cobalt, Total
- Molybdenum, Total
- Tin, Total
- Titanium, Total
- Thallium, Total

Demand (ALL)
Wastewater Metals I (ALL)
Mineral (ALL)
Nitrosoamines (ALL)
Polynuclear Aromatics (ALL)
Phthalate Esters (ALL)
Purgeable Halocarbons (ALL)

Wastewater Bacteriology :
- Coliform, fecal
- Coliform, Total

Acrolein and Acrylonitrile (ALL)
Benzidines (ALL)
Chlorophenoxy Acid Pesticides (ALL)
Chlorinated Hydrocarbons (ALL)
Haloethers (ALL)
Wastewater Metals II (ALL)
Nitroaromatics and Isophorone (ALL)
Nutrient (ALL)
Polychlorinated Biphenyls (ALL)
Priority Pollutant Phenols (ALL)
Residue (ALL)

Serial No.: 104345

Wadsworth Center

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NEW YORK STATE DEPARTMENT OF HEALTH

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REVISED August 4, 1998

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Lab Name: FREE-COL LABORATORIES LTD
Address : COTTON ROAD
MEADVILLE PA 16335

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES/AIR AND EMISSIONS

All approved subcategories and/or analytes are listed below:

scellaneous Air :
F aldehyde
F rs
rogen Oxide
Particulates

Chlorophenoxy Acid Pesticides (ALL)
Chlor. Hydrocarbon Pesticides (ALL)
Chlorinated Hydrocarbons (ALL)
Fuels (ALL)
Metals I (ALL)
Metals II (ALL)
Mineral (ALL)

S rial No.: 103634

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Address : COTTON ROAD
MEADVILLE PA 16335

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES/SOLID AND HAZARDOUS WASTE

All approved subcategories and/or analytes are listed below:

ellaneous :
Asbestos in Friable Material
Cyanide, Total
Lead in Paint
Hydrogen Ion (pH)
Sulfide (as S)

Characteristic Testing :
Ignitability
TCLP
E.P. Toxicity
Polynuclear Arom. Hydrocarbon (ALL)
Priority Pollutant Phenols (ALL)

Acrolein and Acrylonitrile (ALL)
Chlor. Hydrocarbon Pesticides (ALL)
Haloethers (ALL)
Metals II (ALL)
Polychlorinated Biphenyls (ALL)
Purgeable Aromatics (ALL)

Chlorophenoxy Acid Pesticides (ALL)
Chlorinated Hydrocarbons (ALL)
Metals I (ALL)
Nitroaromatics Isophorone (ALL)
Phthalate Esters (ALL)
Purgeable Halocarbons (ALL)

Serial No.: 103635

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Lab ID No.: 10552

Director: MR. ERIC BOTNICK
Lab Name: FREE-COL LABORATORIES LTD
Address : COTTON ROAD
MEADVILLE PA 16335

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES/ POTABLE WATER

All approved subcategories and/or analytes are listed below:

Drinking Water Non-Metals :
- Alkalinity
- Calcium Hardness
- Chloride
- Cyanide
- Co[illegible]
- Corrosivity
- Fluoride, Total
- Nitrite (as N)
- Nitrate (as N)
- Hydrogen Ion (pH)
- Orthophosphate (as P)
- Solids, Total Dissolved
- Specific Conductance
- Silica, Dissolved

D.W. Miscellaneous :
- Di (2-ethylhexyl) adipate
- Bis(2-ethylhexyl) phthalate
- Benzo(a)pyrene
- Butachlor
- Diquat
- Endothall
- Hexachlorobenzene
- Hexachlorocyclopentadiene
- PCB,Total (as decachlorobipheny
- Propachlor

D.W. Chlorinated Acids :
- 2,4-D
- Dalapon
- Dicamba
- Dinoseb
- Picloram
- 2,4,5-TP (Silvex)

Polychlorinated Biphenyls (ALL)
Volatile Halocarbons (ALL)

Drinking Water Bacteriology :
- Coliform, Total

Drinking Water Trihalomethane (ALL)
Drinking Water Metals I (ALL)
Drinking Water Metals II (ALL)
Microextractables (ALL)
D.W. Organohalide Pesticides (ALL)
Volatile Aromatics (ALL)

Serial No.: 104363

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DOH-3317 (3/97)

APPENDIX C

Resumes of Key Personnel

HALEY & ALDRICH

JEFFREY E. LONEY, P.G., CHMM
Associate and Vice President

Summary of Qualifications

Mr. Loney has over 25 years of professional experience in conducting investigations to characterize localized subsurface geologic and hydrogeologic conditions. Mr Loney serves as the manager of Haley & Aldrich's Rochester, New York office. As a Vice President with the firm, Mr. Loney is responsible for the direction, project management and technical support of subsurface investigations involving the delineation of groundwater contamination and subsequent remedial action conducted under RCRA and CERCLA jurisdiction. He is experienced in planning and supervising work conducted in conformance with health and safety protocols specified in OSHA 29 CFR 1910.120.

Mr. Loney has been responsible for the design of well construction specifications and the contracting of technical services. His project experience includes planning and implementation of vadose zone soil-vapor surveys, supervision of the drilling and installation of observation, monitoring and recovery wells, execution of long duration pump tests and resultant interpretation, analysis of geological, hydrologic and chemical data to characterize local hydrogeologic conditions, risk-based evaluation of remedial options and the design and implementation of remedial action to mitigate the presence of soil and/or groundwater contamination.

Prior to joining H&A, Mr. Loney was a Senior Geologist/Project Manager with various independent oil and gas companies operating in the Appalachian, Michigan and Illinois basins and on-shore Gulf Coast area. Mr. Loney had responsibility for oversight and geological characterization activities associated with over one million-linear-feet of technical drilling services including vertical and directionally drilled boreholes. Mr. Loney conducted subsurface structural and stratigraphic studies; provided technical support for State and Federal environmental permitting; and executed technical and feasibility studies associated with the evaluation of producing and nonproducing oil, gas and coal properties.

Relevant Project Experience

Remedial Design/Implementation. Project Officer/Project Manager for remedial projects focused at mitigating the presence of both light and dense phase organic contaminants, petroleum compounds, metals and PCBs in soils, bedrock and/or groundwater. Work has been performed for Fortune 50 clients including General Motors, Xerox, FMC Corporation and Chevron. Remedial experience includes the application of controlled blasting to enhance bedrock permeability, installation and start-up of groundwater recovery and treatment systems utilizing existing and emerging technologies, including UV-oxidation systems, and performance of process latitude studies to identify optimal remedial system operating conditions. Experienced in the design and start-up of source area remedial systems using 2-PHASE vacuum extraction techniques. Responsibilities have included coordination and oversight remedial facility design and construction.

Environmental Assessment/Compliance - Manufacturing Facilities. Project Manager for environmental assessment/compliance audits performed to support the sale/closure of 11 heavy-manufacturing facilities located in States of New York, Connecticut, Michigan, New Jersey, and Mexico. Scope of work included Phase I/V investigations, compliance audits and participation in the support of contractual negotiations associated with the asset transfer. Responsible for the preparation and implementation of a comprehensive work plan prepared to identify and resolve outstanding environmental, compliance and operational issues at the time of transfer. An aggressive risk-based approach was developed and implemented to assess impacted media. Responsible for post-transaction activities to assess the environmental integrity of operational systems and development of a comprehensive work plan to assess baseline conditions associated with storm, trade-waste and process water systems.

Project Manager for remedial investigations including hydrogeologic characterization associated with identifying potential environmental impacts of former plating, degreasing and bulk chemical/petroleum storage operations. Developed and implemented proactive community/regulatory communication program to inform plant/neighbor/regulatory personnel of planned voluntary remedial activities to address environmental issues associated with on-site manufacturing operations.

Responsible for the design; installation and operation of a passive oil recovery system that has recovered over 50,000 gallons of product to date, with no significant water production. Product consists of a mixture of cutting oil, Stoddard solvent and blended fuel components.

Implemented activities to assess the environmental integrity of 35 former solvent degreaser sites. Remedial measures to address soil contamination included the design and installation of a soil-vapor extraction system and pilot testing of 2-PHASE vacuum extraction. Groundwater remedial measures include the conceptualization, design, installation and start-up of a 100 gpm migration-control system. The migration-control system includes a blasted-bedrock trench, two recovery wells and collection system discharging to a UV-oxidation treatment unit. The system has been effective in implementing hydraulic control of the dissolved-phase contaminant plume and operation has reduced contaminant concentration levels by several orders of magnitude.

Municipal/C&D Landfills. Responsible for the planning and execution of investigations supporting the siting, permitting construction and/or closure of municipal and construction and demolition debris (C&D) landfills under the New York State Part 360 regulations. Project experience includes regulatory interaction, construction/operational permit compliance issues, groundwater quality database management and statistical analyses, and implementation of remedial action. Project work includes support of the permitting/construction of the Mill Seat Landfill, Monroe County, N.Y., the largest new landfill built to date under the New York State Part 360 regulations. Project was awarded a 1994 Honors Award for Technical Excellence by the New York Consulting Engineers Council.

Industrial Tank Farms/Major Petroleum Storage Facilities. Project Manager for subsurface geologic, hydrogeologic and geochemical investigations, conducted to delineate groundwater contamination adjacent to several tank farms associated with industrial manufacturing/petroleum storage facilities. Project scopes encompassed the definition of the horizontal and vertical extent of contamination, evaluation of potential effects on human health and the environment through risk assessment and the design and implementation of remedial action.

RI/FS Investigations for Industrial Firms in Upstate New York. Project Manager for RI/FS investigations conducted for Fortune 50 Industrial firms involving chlorinated solvent, PCB, petroleum and/or heavy metals contamination. Project experience includes planning and execution of vadose zone sampling, supervision of the installation of observation, monitoring and recovery wells, long duration aquifer testing, groundwater sampling and analysis, design and implementation of remedial action and analysis and assimilation of site specific hydrogeologic and hydrochemical data into report format for submittal to various regulatory agencies.

RCRA Facility Investigation (RFI) - Solid Waste Management Units (SWMU's). Project Manager for four RFI investigations involving characterization of the environmental impact of 15 SWMUs. Contaminants of concern included chlorinated solvents and metal plating wastes. Investigative activity results ranged from the delisting of two SWMUs under a no-action remedial scenario to the design and implementation of corrective action.

Facilities Reference Document (FRD) for a 1100 Acre Industrial Manufacturing Complex. Project hydrogeologist responsible for technical support associated with the preparation of an FRD addressing spill histories, hydrogeologic characterization and subsequent remedial action, if required, for 89 Solid Waste Management Units (SWMU's) present on site in conformance with Section 3004(u) of RCRA and 6 NYCRR Part 373 Regulations. Included within the FRD document was a Quality Assurance Project Plan (QAPP) detailing field and laboratory procedures to be followed during all future hydrogeological investigations to ensure the collection of data in a technically acceptable, uniform manner necessary for hydrogeological characterization under regulatory oversight.

Groundwater Heat Exchange System. Project Manager for hydrogeologic investigations performed to assess the feasibility of developing a closed-loop groundwater heat exchange system with an operating capacity of 2,000 to 3,000 gallons-per-minute for a Fortune 50 industrial client. The system will be utilized for the dissipation of heat associated with turbine compressor testing operations. Project scope included assembly, evaluation and interpretation of existing data regarding local aquifer characteristics and groundwater quality and assimilation of the data into report format, which included conceptual design of a multiple well withdrawal/injection system.

Underground Injection Well Permitting. Project Manager responsible for geologic/hydrogeologic investigations associated with the design, permitting, start-up and operation of a Class II injection well permitted under USEPA underground injection control (UIC) program jurisdiction. The disposal well, completed in the Salina "B" Salt unit, was utilized for the disposition of oil-field related brines. Project scope included significant regulatory interaction in respect to the determination of project environmental integrity relative to potential impacts on local drinking water supply wells and/or adjacent active salt mining operations.

Proposed Subsurface Municipal Incinerator Flyash - Bottom Ash Disposal Facility in Western New York. Responsible for research delineating existing geologic/hydrogeologic conditions adjacent to a proposed 5000 acre facility, to be installed in abandoned salt mine workings. Designed a technical data acquisition program utilizing the Westbay MP System to further characterize the local hydrogeologic regime over the 15,000 acre area adjacent to the site. Executed subsurface geologic studies to identify the continuity of confining geologic strata overlying the storage horizon. Responsible for formulation of a Work Plan identifying protocols to be implemented during hydrogeologic characterization investigations.

Subsurface Investigations. Project Manager for extensive subsurface investigations utilizing geologic/geophysical techniques conducted throughout the Appalachian and Michigan Basins. Responsibilities included collection and interpretation of geologic/geophysical data leading to the discovery of over 60 billion-cubic-feet of natural gas reserves. Responsible for the design, drilling and operation of over 300 oil and gas wells with depths ranging from 1500 to 9500 feet. Experience includes acquisition and interpretation of reflection seismic data to assist in the determination of a broad spectrum subsurface conditions including localized zones of structural and/or stratigraphic enhanced porosity/permeability.

Education

Rider University, B.S. Geology 1974
Wayne State University, M.B.A. Program, 1980-1981
Wright State University, Applied Groundwater
Hydrogeology Program 1986-1987

Special Studies and Courses

Resource Conservation & Recovery Act (RCRA). McCoy and Associates, 1998
New York Law for Design Professionals, Lorman Associates, Inc., 1998
Applied Contaminant Geochemistry, Dr. Donald Siegel, 1997
Trends In Urban Property Recycling, ACEC, 1996
In-Situ Remedial Technologies, Dr. Robert Hinchee, 1996
Institute for Professional Practice, AFSE, 1994
Environmental Regulation in New York, Institute of Business Law, 1994

Professional Registration/Certification

American Association of Petroleum Geologists

JEFFREY E. LONEY

Certified Petroleum Geologist #2910
American Institute of Professional Geologists
Certified Professional Geologist #4974
Institute of Hazardous Materials Management
Certified Hazardous Material Manager, Master Level #7259
Professional Geologist - Florida No. 0000075, Pennsylvania No. 000266

Professional Societies/Public Participation

Association of Ground Water Scientists and Engineers
Buffalo Association of Professional Geologists (Past Director)
Central New York Association of Professional Geologists
Genesee County, New York - Environmental Management Council
New York State Council of Professional Geologists (Director)
The Business Council of New York State, Environmental Committee

Recent Publications and Presentations

Edwards, D.A., Loney, J.E. and V.B. Dick., "Estimating Aquifer Transmissivity and Storativity Using Early-Time Drawdown Data from Distant Observation Wells ", In preparation for *Ground Water*.

Loney, J.E. and Edwards, D.A., "Limitation of Environmental Liability - Active and Passive Hydraulic Control of Fractured-Bedrock Aquifers Through Application of Engineered Blasted-Bedrock Zones", ACHMM National Meeting, 7 October 1997.

Loney, J.E., "Application of Engineered Blasted Bedrock Zones and Refractive Flow and Treatment to Enhance Groundwater Recovery/Remediation at the Tuba City, AZ. UMTRA Site ", Sandia Laboratories/DOE, Innovative Treatment Remedial Development Program, April 1997.

Loney, J.E., Edwards, D.A, and Little, J.W., "Groundwater Capture and Remediation with Engineered Blasted-Bedrock Zones", Northeastern Geology and Environmental Sciences, V. 18, No. 3, 1996.

Loney, J.E., and Conley, D.M., "Applied Groundwater Treatment for Volatile Organic Compounds Using Ultra-Violet (UV) Light-Oxidation Technologies", Proceedings of the Twenty-Eighth Mid-Atlantic Industrial and Hazardous Waste Conference, Technomic Publishing Co., Inc., Lancaster, PA, 1996.

JEFFREY E. LONEY

McKown, A.F., Smith, L.P. and Loney, J.E., "Blast Trenches for Groundwater Remediation ", 21st Conference on Explosives and Blasting Techniques, International Society of Explosive Engineers, 1995.

Loney, J.E. 1994, "Guidelines for Personnel Involved in Construction Monitoring Activities", ASFE Institute for Professional Practice.

Smith, L.P., Davidson, W. and Loney, J.E., "Linear Blasting for Migration Control in Low Permeability Rock Formations," Hazardous Materials Control Resources Institute/Federal Environmental Restoration III, April 1994.

THOMAS D. WELLS
Senior Environmental Geologist

Summary of Qualifications

As a Senior Environmental Geologist and Project Manager, Mr. Wells is responsible for the development and supervision of subsurface exploration programs, remedial actions, and site evaluations. Project experience includes due diligence assessment and investigation activities to support commercial and industrial real estate transactions, hydrogeologic studies and remedial investigations for landfills, industrial sites, and aquifers, and geotechnical investigations for buildings and tunnels.

Prior to joining Haley & Aldrich of New York in 1989, Mr. Wells was a Geologist with Ernest K. Lehmann & Associates of Minneapolis, Minnesota. Mr. Wells was responsible for field management of mineral exploration projects and geological investigations in a variety of geologic terrains. Project experience included assignments in the northeastern, central, and western U.S. and a year-long assignment in Nicaragua, where he managed Spanish-speaking drilling and sampling crews. Responsibilities included supervision and management of diamond drilling, geologic mapping, geochemical and geophysical prospecting, geological research, and claim-staking activities.

Relevant Project Experience

Confidential Industrial Client - Due Diligence. Project Manager/Project Geologist responsible for performance of Phase I to Phase V environmental site assessments and investigations related to the sale or disposition of twelve automotive manufacturing facilities at locations in New York, Ohio, Michigan, Connecticut, New Jersey, Mexico, and France. Project work scopes included identification of potential areas of environmental concern associated with site manufacturing activities, development of site-specific sampling and analytical plans, preparation of site-specific work plans used by the client as specifications in a Phase III/Phase IV Request-For-Proposals, implementation of investigative activities to assess environmental conditions, and development and implementation of remedial action. Project experience includes oversight of the development of electronic analytical databases and coordination of sub-contracted risk assessment services. Provided support for development of comprehensive work plans to identify and resolve outstanding environmental, compliance, and operational issues at the time of transfer, and participated with the client's project managers in negotiations to resolve pre- and post-sale environmental issues between the client and buyers of its facilities.

Confidential Industrial Client - RI/FS Support. Project Manager/Project Geologist responsible for supporting hydrogeologic characterization and remedial activities at automotive components manufacturing facilities in New York and New Jersey. Work to date at the New York facility has included investigation of 35 former degreaser sites to identify potential releases of chlorinated solvents to the environment, investigation of former plating facilities and PCB issues, installation and regular periodic sampling of a groundwater monitoring network to define the areal and vertical extent of dissolved-phase, DNAPL, and LNAPL contaminants at the site, installation, start-up, and performance monitoring of a groundwater migration-control system designed to implement hydraulic control of a dissolved-phase contaminant plume, and installation and performance-monitoring of an oil-recovery system utilizing both passive and active recovery methods for an area of LNAPL contamination. Work to date at the New Jersey facility has been performed in connection with a Memorandum of Agreement between the client and the state and has included excavation and removal of 100 drums of various toxic wastes buried on-site in the 1950s, monitoring the demolition of a sub-grade oil-water separator tank, and investigation of soil and groundwater conditions in the buried-drum area, at the separator tank, and at the facility's hazardous waste drum storage pad.

Confidential Industrial Client. Project geologist responsible for preparation of a work plan to comprehensively investigate soil and groundwater contamination within the interior of a 100-year-old manufacturing complex. Work plan preparation involved reviewing and summarizing results of all previous subsurface environmental investigations performed at the site.

Confidential Industrial Client. Project geologist responsible for an environmental audit of a large municipal and industrial solid waste landfill located in Cincinnati, Ohio. The landfill was under consideration by the client as a potential waste disposal contractor. The audit focused on facility compliance with local, state, and federal regulations, current regulatory status, and identification of environmental and hydrogeologic conditions.

Also responsible for the performance of eight Phase I Environmental Site Assessments of current client facilities or sites under review for purchase or lease by the client. Facility size ranged from 0.2 to 1.4 million sq. ft. Scope of work included identification of potential areas of environmental concern associated with current or former site activities and performance of limited follow-up sampling activities.

Confidential Industrial Client. Project geologist for an RI/FS investigation of contamination by industrial solvents of overburden aquifers at an industrial plant site located adjacent to a municipal water-supply well field.

Confidential Industrial Client. Performed review of public records of environmental conditions and aquifer characteristics in an industrialized urban area to assist the client in assessing the costs and risks associated with pumping and post-use reinjection of contaminated groundwater from a water-supply aquifer. The client's interest was in the potential for periodic use of large volumes of site groundwater in a non-contact cooling process.

Confidential Real Estate Development Client. Project geologist for an RI/FS investigation of pesticide contamination of soil and groundwater at the former site of a horticultural research facility. The project resulted in delisting of the site from the NYSDEC Hazardous Waste Site Registry.

Hemlock Tunnel Rehabilitation. Project geologist on a geotechnical investigation for the proposed rehabilitation of a municipal water-supply tunnel.

Mill Seat Landfill. Project geologist for hydrogeologic, stratigraphic, and structural-geologic studies to support the design and construction of a new municipal landfill permitted under the

NYSDEC Part 360 regulations. The project was awarded a 1994 Honors Award for Technical excellence by the New York State Engineers Council.

Confidential Mining Company Client. Project geologist supporting the installation of a large-diameter, 2000-gpm capacity, water-supply well at a gold mine in Nevada. Project support activities included overseeing the well construction and subsequent well-development and testing activities.

Education

Williams College, B.A. Geology, 1978

Professional Societies

Central New York Association of Professional Geologists
New York State Council of Professional Geologists
Air & Waste Management Association

Certification

Certified Hazardous Materials Manager - Master Level (Academy of Certified Hazardous Materials Managers)

JAMES E. SIEGFRIED, P.E.
Senior Engineer

Summary of Qualifications

Mr. Siegfried has over 18 years of experience in contaminated site remediation programs, solid waste management projects, and water supply and wastewater management systems. As a project manager, Mr. Siegfried is responsible for all aspects of project development and execution including design, construction, and operation and maintenance.

Recently, Mr. Siegfried has specialized in the use of high vacuum dual phase extraction techniques for the remediation of a number of sites with chlorinated solvent, and petroleum hydrocarbon contamination.

Relevant Project Experience

Former Electronics Manufacturing Facility, Auburn, New York. Project Manager for the design of an Interim Action for the aggressive hydraulic control of the shallow bedrock groundwater. The design applies vacuum enhanced recovery techniques in fractured limestone to provide lateral groundwater flow containment, and to minimize vertical migration of DNAPL chlorinated solvents, acetone, and methanol to protect deeper aquifers. The system utilizes a series of wells at various source areas on the site, connected by a pipe header to a centralized collection and treament facility. The process includes deep vacuum groundwater and soil vapor recovery, vapor treatment by catalytic oxidation and acid gas scrubber, and groundwater treatment by a fluidized bed biological reactor and activated carbon. Innovative features of the project include reinjection of partially treated groundwater containing acetone and methanol to supplement subsurface biological decomposition of chlorinated solvents, and spray irrigation of fully treated water to minimize discharge to the POTW resulting in significant cost savings to the client.

Petroleum Contaminated Site Remediation. Project Manager, and or project consultant on a number of petroleum contaminated sites providing remedial program development and implementation services. Sites have included filing station, bulk storage, government owned facilities and petroleum based contamination at industrial complexes. Projects have included pilot testing of remedies where appropriate, and use of a variety of remedial technologies including soil vapor extraction, dual phase extraction, pump and treat, passive and active free product recovery, air stripping, carbon adsorption and thermal treatment of process effluent.

Xerox Corporation, Calgary, Alberta, Canada. Project manager for remediation of chlorinated solvent contamination beneath an operating warehouse and product distribution facility on property leased by Xerox. The project used the Xerox 2-PHASE Extraction process for removal of contaminants from the low permeability glacial till soils beneath the facility. Risk Management Criteria, developed through a site specific risk assessment, were achieved in two years of active remediation. Regulatory closure was accomplished prior to the end of the lease allowing Xerox to vacate the property in accordance with their business objectives.

Xerox Corporation, Mississauga, Ontario, Canada. Project manager for the remediation of chlorinated solvent and mineral spirits contamination beneath an operating manufacturing and warehouse facility on property leased by Xerox. The project used the Xerox 2-PHASE Extraction process for removal of contaminants from the low permeability glacial till soils beneath the facility. Clean up criteria were achieved in two years of active remediation with minimal disruption to existing operations, meeting Xerox business plans for completion of remediation activities prior to the end of the lease.

Xerox Corporation, Oakville, Ontario, Canada. Project manager for the remediation of toluene and chlorinated solvents beneath an operating toner manufacturing facilty. The project used the Xerox 2-PHASE Extraction process for removal of contaminants from the low permeability glacial till soils beneath the facility. Risk Management Criteria, developed through a site specific risk assessment, were achieved in four years of active remediation using the Xerox 2-PHASE Extraction process.

Education

Arizona State University, Tempe Arizona, B.S.E. Civil Engineering, 1980.
SUNY College of Environmental Science and Forestry, Syracuse, New York,
B.S. Forest Engineering, 1979.
Syracuse University, Syracuse, New York, B.S., 1979.

Professional Registration

Professional Engineer, New York State.

MICHAEL G. BEIKIRCH
Hydrogeologist

Summary of Qualifications

As a hydrogeologist at Haley & Aldrich of New York Mr. Beikirch provides hydrogeologic support to technical staff and team members on a variety of environmental and geotechnical projects. He has a particularly strong knowledge of hydrogeology, aqueous geochemistry, and geophysics. Since joining Haley & Aldrich, he has served as project hydrogeologist on RCRA Corrective Action projects and been involved with monitoring well installations, and data interpretation in connection with hydrogeologic investigations for industrial clients and general construction monitoring.

Relevant Experience

Erie Canal Industrial Park, Rochester, New York. Responsible for implementing environmental and geotechnical field programs. Mr. Beikirch performed EM-Flux and soil vapor screening surveys for volatile organic compounds, and supervised several geotechnical aspects relating to foundation design of a new facility. These activities primarily consisted of soil borings and test pits to evaluate and characterize subsurface conditions in the area of proposed re-development.

2-PHASE Extraction Pilot Testing. Involved in the planning and implementation of in-situ 2-PHASE Extraction pilot testing at several Xerox Corporation sites in Henrietta and Webster, New York. Installed soil-vapor and groundwater monitoring points for system performance monitoring. Responsible for preparing sampling and monitoring plans, conducting sampling and systems performance monitoring and preparation of final reports.

Ex-Situ Soil Remediation. Responsible for oversight of an ex-situ soil venting project at Xerox facility involving the enhanced vacuum extraction of 125 cubic yards of soil containerized in roll-off vessels. Evaluated the performance of the vacuum extraction system as well as oversight of system operation. Also installed vacuum and soil-vapor monitoring points. Evaluated the degree of effectiveness of vacuum system on the soil contamination cleanup with respect to established soil cleanup criteria for individual contaminant compounds. Determined appropriate on-site disposal and/or placement of the soil in based on cleanup criteria.

Horizontal Well. Provided technical oversight of the installation of a horizontal groundwater recovery well installed in bedrock at Xerox Corporation, Webster, New York. Also conducted several basic pumping tests on the installed horizontal recovery well to evaluate conventional groundwater recovery rates. Performed enhanced groundwater recovery test using 2-PHASE Extraction rates, resulting in an order-of-magnitude increase in groundwater recovery rates.

Surfactant Extraction Bench Test. Conducted a bench-scale pilot test of the feasibility of using surfactant-enhanced dissolution as a means of increasing contaminant recovery from a bedrock aquifer at a large industrial facility. Actual bedrock and groundwater media from the facility were used to more realistically simulate the site's subsurface chemical conditions that would be encountered in the event the enhancement procedure were implemented in-situ. Comparative dissolution rates were observed, using several trade name surfactant solutions (made with site groundwater) on trichloroethene (TCE) saturated bedrock. The comparison yielded an option solution for surfactant-enhanced dissolution of TCE in the approximate subsurface chemical conditions at the facility.

RCRA Corrective Action. Responsible for technical support of ongoing compliance reporting in conformance with a RCRA 3008(h) Corrective Action Consent Order for Xerox Corporation. Quarterly reporting requirements, corrective measures study and corrective measures implementation phases of a Corrective Action Order (CAO) have been managed in part, as well as continued activity in field investigations on the site for meeting compliance with the respective phase of the CAO. Mr. Beirkirch also has major responsibility with developing the Semi-Annual Report required in the Part 373 Permit.

Installation of Monitoring Wells. Mr. Beikirch assisted in installation of multi-level monitoring points and small injection wells at Canadian Forces Base Borden (CFBB) pilot project with University of Waterloo and at University of Buffalo. Wells and multi-level points were used in a field-scale pilot test program to monitor subsurface response to a controlled solvent release, to verify surfactant-enhanced removal of the solvent.

Aquifer Remediation. Mr. Beikirch was actively involved with an aquifer remediation effort at CFBB with Waterloo Center for Groundwater Research, using surfactant flushing procedure developed at SUNY Buffalo. He helped conceptualize, construct, operate and maintain the remediation operation. Also involved with similar aquifer remediation effort currently under operation near Corpus Christi, TX for E.I. DuPont, Company.

Groundwater Sampling and Installation of Bedrock Wells. Monitored installation of bedrock wells at Eastman Kodak Company, Rochester, New York and conducted groundwater sampling from those wells. During field work, monitored daily activities of drilling crew, coordinated with project team leader and client to verify work was done in accordance with project work plan and specifications, and maintained daily and total production quantities of contract pay materials.

Landfill Gas Management System. Monitored the installation of 10 landfill gas collection wells and the construction associated with placing 2500 ft. of subsurface gas lines, which connect newly installed system to the existing gas collection system, at High Acres Landfill, Perinton, NY. Coordinated with Waste Management Inc. personnel and project managers to insure compliance with project work specifications, including daily and total quantities of contract pay materials.

Underground Storage Tanks. Field oversight of the excavation and removal of multiple underground waste fuel storage tanks at Genesee Hospital, Rochester, NY. Also conducted sampling of tank contents for chemical analysis. Coordinated between contractors (Pike Co. and Piedmont Equipment Co.) and project managers to verify work plans were being adhered to, as well as general construction monitoring.

Education

State University of New York at Buffalo, M.A., Geology, 1991

State University of New York at Buffalo, B.A., Geological Sciences, 1987

Thesis Topic

Experimental Evaluation of Surfactant Flushing for Aquifer Remediation, Submitted to Graduate School of SUNY Buffalo, September 1991.

Publications and Presentations

Fountain, J.C., Starr, R.C., Middleton, T., Beikirch, M.G., Taylor, C. and Hodge, D., "Controlled Field Test of Surfactant-Enhanced Aquifer Remediation", Groundwater, Vol. 34, No. 5, September-October 1996.

Edwards, D., Conley, D. and Beikirch, M., "Surfactant Applications in Environmental Restoration", In Hazardous and Industrial Wastes, Proceedings of the Twenty-Eighth Mid-Atlantic Industrial and Hazardous Waste Conference, University at Buffalo, Buffalo, New York, July 14-17, 1996.

Fountain, J.C., Klimek, A., Beikirch, M.G. and Middleton, T.M., 1991. "The Use of Surfactants for In-Situ Extraction of Organic Pollutants From A Contaminated Aquifer". Journal of Hazardous Materials, Special Issue on In-Situ Remediation, 1991.

Beikirch, M.G. "Summary of Research on Behavior of Chlorinated Solvents In An Aquifer". University of Waterloo Groundwater Solvent Summit IV, June 1990.

JAMES G. TALPEY, P.G.
Senior Environmental Geologist

Summary of Qualifications

Mr. Talpey joined the firm in 1986. He is currently employed as Senior Environmental Geologist conducting site investigations relative to the cleanup of oil and hazardous materials. He is responsible for project management and technical support to delineate soil and groundwater contamination, and developing remediation measures for clients under RCRA jurisdiction. He is skilled in interpreting subsurface data to define local hydrogeology, the migration of contaminant plumes, and subsurface response to remedial measures. He negotiates work plans with state regulators to conduct site studies focusing on remedial actions.

His professional interests include defining the sources and extent of subsurface contamination at hazardous waste sites, developing acceptable remediation measures and systems to measure the remediation effectiveness over time. His project experience includes performing site evaluations for large and small industrial facilities in the U.S. and Mexico, primarily involving investigation and remediation of solvent and petroleum releases. From 1987 to 1992 he specialized in numerous exploration programs using soil-gas techniques to investigate solvent and petroleum fuel releases. He concurrently developed methods for site screening by gas chromatography.

He has written RCRA Facility Investigation Final Reports accepted by NYSDEC and an Interim Corrective Measures Plan for a large industrial manufacturing client under NY State Part 373 Permit requirements. He is currently managing a Phased RI/FS project for a chemical manufacturer under a modified NYSDEC Consent Order which is the first of its kind in New York. As part of this project, he was instrumental in the design and construction of two interim remedial measures (IRMs) to provide groundwater capture and source-area bioremediation. Both IRMs are now in operation. He has designed and implemented programs to assess the IRM results. His site remediation experience includes installing blasted-bedrock trenches to control groundwater migration, 2-Phase vacuum extraction networks to remediate sources areas, groundwater pumping wells to limit recharge, and bioremediation by air injection.

He has experience with aquifer pumping tests, groundwater capture-zone studies, and groundwater contour mapping of a 570 acre industrial complex under RCRA remediation. He has experience in magnetic resistivity surveys for finding buried metal objects, monitoring and optimizing UV-Oxidation water treatment systems, dig-and-haul operations with concurrent determination of excavation limits, and in numerous subsurface drilling and well installation programs with subsequent interpretation of site conditions.

Relevant Project Experience

Chemical Manufacturing Plant, Orleans County, NY. Project manager for a Phased RI/FS under NY State Consent Order based on CERCLA requirements. Developed strategic site investigation program utilizing Hydropunch and soil-gas sampling and a limited number of monitoring well clusters. Over four construction seasons, he has progressively defined the local hydrogeology, chemical source areas, and apparent migration pathways at the plant. He developed, proposed, and implemented a blasted-bedrock trench as an acceptable IRM to control offsite flow, and a bioventing IRM to remediate petroleum distillates. Under the Phased approach, which is the first of its kind in New York, annual project funds are limited by a budget cap negotiated into the Order, requiring the annual work plans to be prioritized and tightly managed. The project involves a nearby residential neighborhood.

Industrial Manufacturing Complex, Webster, NY. From 1987 to the present, has performed RCRA Facility investigations at six primary investigative sites within the Complex, and provided hydrogeologic support for remedial design using 2-PHASE Vacuum Extraction. His project contributions, which have increased over time, range from finding source areas by soil-gas surveys, writing RCRA Facility Investigation Final Reports satisfying NYSDEC Part 373 Permit requirements, site-wide groundwater contouring of three hydrogeologic zones, site-wide plume delineation maps, recommending and managing well installation programs for 2-PHASE Extraction from target hydrogeologic zones - primarily beneath important interior production areas, groundwater capture zone studies, developing programs to document remediation progress, and producing graphical maps of the subsurface vacuum response to 2-PHASE Extraction

Industrial Manufacturing Facility, Rochester, NY. Project scientist responsible for investigating 35 former solvent degreasers and an extensive network of subgrade petroleum tankage. Sampled and analyzed soil-gas at over 500 probe locations using a portable gas chromatograph. Mapped surface limits of various petroleum test fuels and chlorinated solvent vapors, installed product recovery trenches and well networks in Level B personnel protective equipment.

Fort Drum Infrastructure, Fort Drum, NY. Exploration geologist during water-supply assessment for military base expansion. Monitored drilling and pumping tests of 10-in. diameter, 200-ft. deep water wells in buried karstic limestone, correlated drill hole cuttings with subsurface stratigraphy to determine final well depths and best water bearing zones.

Former Copier Refurbishing Facility, Blauvelt, NY. Project Hydrogeologist investigating groundwater recharge potential of the local soils and bedrock. Provided technical support to optimize ongoing 2-PHASE Extraction targeting contaminated soil horizon. Performed supplemental site characterization to define soil stratigraphy and groundwater production capacity of the aquifers. Improved site remediation by proposing and installing bedrock pumping wells to dewater bedrock underneath the target area.

Education

University of Rochester, M.S. Geological Sciences, 1985
Hamilton College, B.A. Geology, 1979

JAMES G. TALPEY

Special Studies and Courses

ASTM Technical & Professional Training Course: Risk-Based Corrective Action Applied at Petroleum Release Sites, September, 1997
University Of Waterloo, Solvents in Groundwater Plume Course, May 1996
Word-Wrights Technical Writing Class, Strategies and Style, February 1993
University of Rochester Hydrogeology Series, Spring & Fall 1987
Rochester Institute of Technology, Math and Chemistry Studies, 1981-1982
N.A.G.T.-U.S.G.S. Field Internship, Central Cascade Range, Washington, 1979
University of Oregon Geologic Mapping Course, Southern Cascade Range, Oregon, 1978
Hamilton College Geologic Mapping Course, West Texas, January 1977

Publications and Papers

"Petrochemistry & Tectonics of an Archean Complex at South Pass, Wyoming", EOS, Trans. Amer. Geophys. Union, Vol. 67, No. 16, p. 375, 1986.

"Geochemical & Structural Evolution of Archean Gneisses at South Pass, Wyoming", Unpublished MS Thesis, 102 pp., map, 1985.

Technical Societies

Association of Groundwater Scientists and Engineers
Air and Waste Management Association, Finger Lakes Chapter

Professional Registration

P.G. #763 Wyoming Board of Professional Geologists

KELLIE L. GREGOIRE
Staff Scientist

Summary of Qualifications

Ms. Gregoire has over six years of experience in analytical laboratory work. Her work experience includes field sampling of air, soil, water and hazardous waste; storm sewer sediment sampling; site assessments and characterizations; monitoring well installations; underground fuel tank extractions; field analysis, data validation and reporting. Prior to joining Haley & Aldrich, Kellie's professional experience consisted of laboratory testing and research and included work with chemical wastewater treatment processes.

Ms. Gregoire has experience with organizing research projects, analytical protocols, and coordinating reporting requirements/deliverables with laboratories. She has performed analyses of air , potable water, wastewater, soils, sludge and leachate samples using atomic absorption spectroscopy (Flame,ICP), gas chromatography, gas chromatography/mass spectroscopy, total organic carbon analyzers, biological oxygen demand, chemical oxygen demand, nuclear magnetic resonance, high performance liquid chromatography, UV/VIS spectrometers and classical chemistry techniques. Kellie is experienced in USEPA CLP/NYSDEC ASP laboratory analyses.

Ms. Gregoire has data validation experience including the review of raw laboratory data, quality control (QC) performance criteria and regulatory compliance to meet various federal and state analytical requirements. She has also interpreted field and laboratory analytical data from wastewater treatment facilities investigations and has provided guidance to project personnel on implementing field and plant procedures.

Relevant Project Experience

NYSDEC Certification for Organic and Inorganic Data Validation. Completed 35 hour basic training course for each certification. Experienced in validating data for organic and inorganic groundwater, soils, sediments and sludges.

Screening of 2-PHASE Extraction vapors and waters, Multiple Clients, USA and International. Performed screening analysis and QA/QC of samples, on vapors and waters from 2-PHASE Extraction systems, using a purge and trap with a Hewlet Packard 5890 Gas Chromatograph.

PCB and BTEX soil removal, Orange & Rockland Utilities, New York. Assisted in the oversight of PCB and BTEX contaminated soil removal. Performed field testing for PCBs using Immunano Assay test kits for guidance toward the removal of contaminated soil from the excavation area. Also, performed field analysis of BTEX in soils using a field Gas Chromatograph for guidance toward the removal of contaminated soil from the excavation area. During site activities, air monitoring was performed using a h-nu to measure organic vapors and a Particle Data Recorder (PDR).

KELLIE GREGOIRE

PCB soil removal, Nashua, New York. Assisted in the oversight of PCB contaminated soil removal. Used immunano assay test kits for guidance of excavation of contaminated soils. During site activities, air monitoring was performed using a Particle Data Recorder (PDR).

Site Safety Officer for soil and sediment removal, New Jersey. Construction Site Safety Officer performing Real Time Air monitoring on a construction site for the removal of contaminated soil and sediment for community safety. Air monitoring was performed using a Jerome vapor monitor, Particle Data Recorder (PDR), Organic Vapor Monitor (OVM) and a h-nu to measure Lower Explosive Limits (LEL), %oxygen and organic vapors.

Expansion of Industrial Landfill, International Paper, New York. Assisted in the oversight of monitor well installation and groundwater flow study. Installed micro-purge bladder pumps. Developed monitor wells using micro-purge techniques. Coordination of Expanded Part 360 sampling events and analysis with analytical laboratory. Data Validation of expanded Part 360 data generated by landfill sampling event, including inorganics, organics (VOA and Semi-VOA), Pesticide/PCB Herbicides and Dioxins.

Storm Sewer PCB Clean up Study, General Electric, New York. Storm Sewer sediment and stormwater sampling for PCB to generate follow up data from storm sewer cleaning of PCB contamination. Studied sewer water flow and sampled for PCB during storm events. Entered sewers and sampled sediment for PCB analysis. Equipment used during sampling h-nu for %oxygen, LEL and organic vapors, tripod and winch for confined space retrieval.

Underground Storage Tank Removal, Freihofers, New York. Oversight of contractors during underground fuel storage tank removal and backfill. Used a h-nu organic vapor meter to monitor soil volatile organic contamination.

Hydrolysis of Methyl Bromide and Ethyl Bromide , SUNY Cortland, Independent Study Research. A study was drawn to defend/defeat the argument that methyl bromide, used as a fumigant and is a known ozone depletor, goes through hydrolysis in the environment. Developed laboratory analytical procedures, analysis methods and generated report to be presented at The American Chemical Society National Meeting, August 1995. Used glass blowing techniques to create sealed bulbs for testing procedures. Operated a Purge and Trap Hewlett-Packard 5880 Gas Chromatograph with a Flame Ionization Detector. Samples were analyzed for degradation of methyl bromide and ethyl bromide was used as an internal standard. The results showed the hydrolysis rate of methyl bromide under certain conditions was optimal. This supported the fact that methyl bromide could degrade in our environment.

Chloride Effect on Total Organic Carbon Analysis and Chemical Oxygen Demand, Occidental Chemical Corporation, New York. Developed research methods, sample preparation, analysis of samples on a O.I. Model 700 TOC Analyzer or a HACH COD DR/3 Spectrometer and reports generation for presentation to internal personnel considering testing brine samples for TOC and COD. In digestion, chloride competes with organic carbon for the oxidizing reagent. Samples were treated with either chloride reducing agents, diluted, additions of oxidizer or instrument parameters were adjusted. Results confirmed that highly chlorinated samples, such as brine, do pose a significant problem when analyzing for TOC or COD.

KELLIE GREGOIRE

Poplar Tree Degradation of Trichloroethylene into its Metabolites, Occidental Chemical Corporation, New York in conjunction with Washington State University. Site assessment for the planting of genetically engineered poplar trees on a TCE contaminated site. Poplar trees were planted in pertinent areas associated with TCE concentrations, cared for and later removed for laboratory analysis. Laboratory extractions and instrument procedures were developed to maximize contaminant recovery taken up by the plants. Samples were analyzed with a Hewlett-Packard 5890 purge and trap gas chromatograph. Results were reported as positive for TCE uptake and possibly degradation occurred.

Chlorinated Compound Degradation Using a Hybrid Bioreactor, Occidental Chemical Corporation, New York. Assembled a Hybrid Bioreactor containing anaerobic and aerobic microbes capable of degrading chlorinated compounds. Maintained the microbes, bioreactor and analyzed aqueous and air samples from reactor on a Hewlett-Packard 5840 Gas Chromatograph. Results displayed that TCE degraded into its metabolites through the anaerobic and aerobic phases.

Migration of Chlorinated Organics Through Soils, Occidental Chemical Corporation, New York. Sealed columns constructed for migration study of chlorinated organic compounds through soil. Assessment of soils pH, affinity for compound used, flowrate and testing of aqueous solution at various times and levels of operation until breakthrough occurred. Samples were tested on a Hewlett-Packard 5880 Gas Chromatograph. Results were reported and used for assessment of sites contaminated with chlorinated organics.

Characterization of Charcoal Carbons for Wastewater Treatment, Occidental Chemical Corporation, New York. Set up carbon columns for carbons used in wastewater treatment facilities. Used Master Flex flow pumps, Perkin-Elmer UV/VIS Spectrometer for assessment of carbon ability to absorb various chemicals in solution. Data was used to inform treatment facilities for future events.

Groundwater Sampling, Air Sampling and Wipe Tests, Various Contract Sites, New York. Groundwater samples, air samples and wipe tests performed at various contract sites on a as needed or quarterly bases for baseline, routine or PCB analysis. Sampling was done using appropriate equipment, packaged and shipped according to DOT regulations.

Education

BS Chemistry, State University of New York at Cortland, 1995
AAS Science Laboratory Technology, Niagara County Community College, 1990

Special Studies and Courses

Gas Chromatography Use, Maintenance and Trouble Shooting for the Hewlett-Packard 5890 GC
O.I. TOC Model 700 Set Up, Use, Maintenance and Trouble Shooting course
Certified NYSDEC/EPA Organic and Inorganic Data Validation Course
OSHA Hazardous Waste Operations Emergency Response-40 Hour, Level III Training
OSHA Laboratory Safety Inspection Course
10 Hour Construction-Site Safety Course

KELLIE GREGOIRE

Publications

Hydrolysis of Methyl Bromide and Ethyl Bromide - 1995
Effects of Chloride on TOC Analysis - 1991
Effects of Chloride on COD Analysis - 1991
Removal of Chromate from Salt Cake - 1992

APPENDIX D

Health & Safety Plan

ENVIRONMENTAL HEALTH & SAFETY PLAN

by

Haley & Aldrich of New York
Rochester, New York

for

Delphi Automotive Systems
Lexington Avenue
Rochester, New York

30 April 1999

ENVIRONMENTAL HEALTH AND SAFETY REQUIREMENTS

TABLE OF CONTENTS

* Task-specific pages are non-paginated to allow for duplication.

TABLE OF CONTENTS (Cont.)

TABLE OF CONTENTS (Cont.)

EMERGENCY PHONE NUMBERS

Monroe County Emergency Services (Dial 7 first within the plant)	**911**
Ambulance Service	**911**
Fire Department	**911**
Police Department	**911**
Haley & Aldrich of New York - Project Manager	**327-5531**
Tom Wells	
Haley & Aldrich of New York - Health & Safety Representative	**232-7386**
Branch H&S Representative	
Delphi - Project Manager	**647-4766**
Rick Eisenman	**(4766 in plant)**
Delphi - Health & Safety Representative	**647-7126**
Gary Elliott	**(7126 in plant)**
Occupational Health Physician	**275-7795**
Dr. Kenneth Dodgeson Strong Memorial Hospital 601 Elmwood Avenue Rochester, New York	
CHEMTREC (CHEMICAL TRANSPORTATION EMERGENCY CENTER)	**1-800-424-9300**
Hospital - Strong Memorial Hospital	**275-4511**
601 Elmwood Avenue **Rochester, New York** **Emergency Dept.** (map next page)	
Poison Control	275-5151
Strong Memorial Hospital	
New York State Department of Health	423-8071
David Napier	
Monroe County Health Department	274-6067
Richard Elliott	
New York State Department of Environmental Conservation - Region 8	226-2466

<u>Map to Hospital</u>
(attach below)

Route to Strong Memorial Hospital

TASK MODIFICATIONS AND PLAN APPROVAL

LIST BELOW EACH MODIFICATION TO THIS PLAN AND DATE MODIFIED

1. The 1990 Health and Safety Plan and subsequent modifications has been revised in December 1998 with the current word-processing format and addition of tasks for monitoring of the Study Area 5 SVE system and pilot testing of LNAPL recovery methods.

2. The 1998 Health and Safety Plan has been revised in April1999 with addition of tasks for soil vapor sampling and collection within various areas of the facility.

THE FOLLOWING SIGNATURES CONSTITUTE APPROVAL OF THIS HEALTH & SAFETY PLAN. THIS PLAN SHOULD NOT BE DEVIATED FROM WITHOUT PRIOR WRITTEN OR VERBAL APPROVAL.

THIS PLAN APPROVED BY: **REVISIONS:**

CORPORATE HEALTH & SAFETY MANAGER	DATE	INITIAL/DATE	INITIAL/DATE
Morgan B Holt	4/29/99		
H&A BRANCH HEALTH & SAFETY MANAGER	DATE	INITIAL/DATE	INITIAL/DATE
PROJECT MANAGER	DATE	INITIAL/DATE	INITIAL/DATE

HEALTH AND SAFETY BRIEFING:

I HAVE READ, UNDERSTOOD AND AGREE TO FOLLOW THIS HEALTH & SAFETY PLAN.

REVISIONS:

NAME	SIGNATURE	DATE	INITIAL/DATE	INITIAL/DATE
NAME	SIGNATURE	DATE	INITIAL/DATE	INITIAL/DATE
NAME	SIGNATURE	DATE	INITIAL/DATE	INITIAL/DATE
NAME	SIGNATURE	DATE	INITIAL/DATE	INITIAL/DATE
NAME	SIGNATURE	DATE	INITIAL/DATE	INITIAL/DATE
NAME	SIGNATURE	DATE	INITIAL/DATE	INITIAL/DATE
NAME	SIGNATURE	DATE	INITIAL/DATE	INITIAL/DATE

I. INTRODUCTION

This document presents the Environmental Health and Safety Plan to be followed by Haley & Aldrich for environmental projects conducted at the Delphi Lexington Avenue facility. The scope of work covered by this Health and Safety Plan (HASP) includes site characterization and monitoring pilot testing of LNAPL recovery systems. Other parties performing field work shall provide a health and safety plan for their specific activities.

The provisions of this HASP are mandatory for all personnel assigned to the activities described in the work plan for this project. The Health and Safety procedures contained in this document have been developed for the activities associated with this project and will be periodically reviewed and revised as necessary to keep them current and technically correct.

The requirements set forth in this HASP are minimum health and safety protocols and duties to be adhered to and enforced during environmental investigation activities described in the following sections.

Plan Organization

Occupational Safety and Health Administration (OSHA) regulations under 29 CFR 1910.120 require that a project specific health and safety plan be developed for RCRA and CERCLA related hazardous materials/waste investigations and activities. This plan has been developed to meet these requirements and related OSHA criteria such as, but not limited to, respiratory protection, eye and hearing protection, trenching/excavation safety and confined space entry. This plan includes hazard evaluation, engineering controls, administrative controls, personal protective equipment (PPE), monitoring procedures, decontamination procedures, and emergency response provisions to meet the OSHA requirements above.

The plan is organized into two parts. The first part (Section II) contains task-specific health and safety procedures. It is intended to be updated and revised as new tasks are added to the project or new information becomes available which modifies task-specific health & safety needs. The second part (Section III) describes general health and safety procedures and information that applies to all tasks. Permissible exposure limits (PELs), odor thresholds and hazardous compound physical properties appear in Table 1. Monitoring instrument action levels and appropriate level of protection responses appear in Table 2. **EMERGENCY CONTACTS AND PHONE NUMBERS ARE LISTED IMMEDIATELY FOLLOWING THE TABLE OF CONTENTS.**

2.2 TASK-SPECIFIC HEALTH AND SAFETY REQUIREMENTS

___ Initial
_x_ Revision

Task Name(s)*: Groundwater and LNAPL level monitoring:
a) general areas
b) former degreaser sites

Task Description: Existing wells and boreholes levels will be measured using remote conductivity sensing lines. Primary hazard is from exposure to airborne and liquid contaminants. Monitoring at general area and former degreaser sites will be conducted in modified Level D, and upgraded to Level C protection if warranted based on field screening.

Duration: Investigation and monitoring will occur over the next few months. Time at each well will vary depending on accessibility and depth.

Media Affected: _x_ air ___ soil ___ surface water ___ waste _x_ groundwater

Area Within Site Where Task(s) to be performed: Wells are located within the plant structure and outside the buildings on Delphi property.

HAZARD EVALUATION (check all that apply)

CHEMICAL HAZARDS:**

CHARACTERISTICS:

x_____ FLAMMABLE/COMBUSTIBLE
_____ CORROSIVE
_____ REACTIVE
x_____ TOXIC
x_____ VOLATILE
_____ EXPLOSIVE
_____ RADIOACTIVE
_____ UNKNOWN
_____ OTHER ___________

TYPE:

_____ SOLID/DUST
x_____ LIQUID/MIST
_____ SLUDGE
x_____ GAS/VAPOR/FUMES (Chlorinated organics, Vinyl chloride)
_____ ORGANIC
x_____ HEAVY METAL
_____ INORGANIC
_____ PESTICIDE
x_____ PCB
_____ ACID
_____ BASE
x_____ CARCINOGEN (Vinyl chloride, Benzene)
x_____ FUEL/PETROLEUM PRODUCT
_____ OTHER

PHYSICAL HAZARDS:

x_____ ACTIVE MANUFACTURING SITE
_____ CONFINED SPACE ENTRY
_____ ELECTRICAL EQUIPMENT
_____ EXCAVATION/TRENCHING
_____ UNDERGROUND UTILITIES
_____ OVERHEAD UTILITIES
_____ OPEN WATER
_____ TEMPERATURE EXTREMES
x_____ NOISE (within plant in designated areas)
_____ ASBESTOS
_____ OTHER ______

* May include individual or related tasks for which hazards and health and safety requirements are common. Refer to General Health and Safety Procedures (Section III) as necessary).

** Verify that compounds that may be encountered are listed in Table 1.

B. PROTECTIVE AND CONTROL MEASURES

ENGINEERING CONTROLS:

x	VENTILATE AREA
	DISCONNECT/CLEAN OUT LINES
	SLOPE EXCAVATION
___	SHORE EXCAVATION
___	ELIMINATE IGNITION SOURCES
	TAPE OFF AREA
	POST WORK/WARNING SIGNS
	PLASTIC SHEETING IN AREA
___	DESIGNATE NO SMOKING AREA
	ESCAPE LADDER
	UTILITY CLEARANCES OBTAINED (DIG SAFE CONTACTED)
___	PRIVATE UTILITIES CLEARED
	LINES SHIELDED/DE-ENERGIZED
	LOCKED & TAGGED OUT
___	LIFE JACKETS/BARRICADES NEAR WATER
___	HEAT OR AIR CONDITIONING SOURCE FOR TEMPERATURE EXTREMES
	OTHER ____________

PERSONAL PROTECTIVE EQUIPMENT:

x	SAFETY GLASS
___	EYE/FACE SHIELD
x	GLOVES (CIRCLE TYPES) INNER **(Nitrile Inner)** **(Neoprene Outer)**
___	DUCT TAPE
x	EAR PROTECTION (CIRCLE TYPE) **(EAR PLUGS)**
x	BOOTS (CIRCLE TYPE) (STEEL TOE),
___	DISPOSABLE COVERS, LATEX, WADERS, OTHER ________
	TYVEK COVERALL
___	SARANEX COVERALL
___	HARD HAT
x	RESPIRATOR (INDICATE TYPE OF CARTRIDGE) Organic
___	FIRE EXTINGUISHER
___	FIRST AID KIT
___	LOUD SIGNALING DEVICE (CIRCLE TYPE) AIR HORN, WHISTLE
___	FLASHLIGHT
___	SAFETY SHOWER/EYE WASH
___	WALKIE-TALKIE
___	OTHER: ____________

LEVEL OF PROTECTION

x	MODIFIED D (gloves at general sites)
	LEVEL D
	MODIFIED C (HOW MODIFIED) ________
x	LEVEL C (degreaser areas-possible upgrade to Level C based on monitoring)
___	MODIFIED B (HOW MODIFIED) ________

C. ENVIRONMENTAL MONITORING

	Equipment	Action Thresholds*	Level of Protection
x	HNU (CIRCLE ONE) (10.2 EV) 11.7 EV	Table 2	Level D with possible upgrade to Level C
___	PHOTOVAC MICROTIP (10.6 EV)		
	OVA		
	EXPLOSIMETER/02 METER		
	RADIATION METER		
	HYDROGEN CYANIDE METER		
x	PHOTOVAC GC		
x	DRAEGER TUBE ______		
	RESPIRABLE DUST MONITOR		
	OTHER		

Frequency

x	BREATHING ZONE (Monitor constantly when well is un-capped)
x	PERIMETER (Monitor perimeter if levels above action threshold are encountered)
___	

* List only those differing from or in addition to Table 2.

2.2 TASK-SPECIFIC HEALTH AND SAFETY REQUIREMENTS

___ Initial
_x_ Revision

Task Name(s)*: Groundwater and LNAPL sampling:
a) general areas
b) former degreaser sites

Task Description: Existing wells will be sampled with bailers. Primary hazard is from exposure to airborne and liquid contaminants. General sites will be sampled in modified Level D (gloves/tyvek), former degreaser sites will be sampled in Level C.

Duration: Investigation and monitoring will occur over the next few months. Time at each well will vary depending on accessibility and depth.

Media Affected: _x_ air ___ soil ___ surface water ___ waste _x_ groundwater

Area Within Site Where Task(s) to be performed: Wells are located within the plant structure and outside the buildings on Delphi property.

HAZARD EVALUATION (check all that apply)

CHEMICAL HAZARDS:**

CHARACTERISTICS:

x FLAMMABLE/COMBUSTIBLE
CORROSIVE
REACTIVE
x TOXIC
x VOLATILE
EXPLOSIVE
RADIOACTIVE
UNKNOWN
OTHER ___________

TYPE:
_x___ SOLID/DUST
_____ LIQUID/MIST
_____ SLUDGE
_x___ GAS/VAPOR/FUMES (Chlorinated organics)
_____ ORGANIC
_x___ HEAVY METAL
_____ INORGANIC
_____ PESTICIDE
_x___ PCB
_____ ACID
_____ BASE
_x___ CARCINOGEN (Vinyl chloride, Benzene)
_x___ FUEL/PETROLEUM PRODUCT
_____ OTHER

PHYSICAL HAZARDS:

_x___ ACTIVE MANUFACTURING SITE
_____ CONFINED SPACE ENTRY
_____ ELECTRICAL EQUIPMENT
_____ EXCAVATION/TRENCHING
_____ UNDERGROUND UTILITIES
_____ OVERHEAD UTILITIES
_____ OPEN WATER
_____ TEMPERATURE EXTREMES
_x___ NOISE (within plant designated areas)
_____ ASBESTOS
_____ OTHER ______

* May include individual or related tasks for which hazards and health and safety requirements are common. Refer to General Health and Safety Procedures (Section III) as necessary).

** Verify that compounds that may be encountered are listed in Table 1.

B. PROTECTIVE AND CONTROL MEASURES

ENGINEERING CONTROLS: EQUIPMENT:

x VENTILATE AREA
DISCONNECT/CLEAN OUT LINES
SLOPE EXCAVATION
____ SHORE EXCAVATION
____ ELIMINATE IGNITION SOURCES
TAPE OFF AREA
POST WORK/WARNING SIGNS
PLASTIC SHEETING IN AREA
____ DESIGNATE NO SMOKING AREA
ESCAPE LADDER

UTILITY CLEARANCES OBTAINED
(DIG SAFE CONTACTED)
____ PRIVATE UTILITIES CLEARED
LINES SHIELDED/DE-ENERGIZED
LOCKED & TAGGED OUT
____ LIFE JACKETS/BARRICADES NEAR WATER
____ HEAT OR AIR CONDITIONING SOURCE FOR TEMPERATURE EXTREMES
OTHER____________________

PERSONAL PROTECTIVE

x____ SAFETY GLASS
____ EYE/FACE SHIELD
x____ GLOVES (CIRCLE TYPES) INNER
(Nitrile Inner)
(Neoprene Outer)

____ DUCT TAPE
x____ EAR PROTECTION (CIRCLE TYPE)
(EAR PLUGS)
x BOOTS (CIRCLE TYPE) (STEEL TOE),
____ DISPOSABLE COVERS, LATEX, WADERS, OTHER ________
x____ TYVEK COVERALL
____ SARANEX COVERALL
____ HARD HAT
x RESPIRATOR (INDICATE TYPE OF CARTRIDGE) Organic
____ FIRE EXTINGUISHER
____ FIRST AID KIT
LOUD SIGNALING DEVICE (CIRCLE TYPE) AIR HORN, WHISTLE
____ FLASHLIGHT
____ SAFETY SHOWER/EYE WASH
____ WALKIE-TALKIE
____ OTHER: ____________
____

LEVEL OF PROTECTION

MODIFIED D (HOW MODIFIED):
x LEVEL D (general areas)
MODIFIED C (HOW MODIFIED) __________
x____ LEVEL C (degreaser areas-possible downgrade to Level D based on monitoring)
____ MODIFIED B (HOW MODIFIED) __________

C. ENVIRONMENTAL MONITORING

Equipment | Action Thresholds* | Level of Protection

x HNU (CIRCLE ONE) (10.2 EV) 11.7 EV Table 2
____ PHOTOVAC MICROTIP (10.6 EV)
OVA
EXPLOSIMETER/02 METER
RADIATION METER
HYDROGEN CYANIDE METER
x PHOTOVAC GC
x DRAEGER TUBE ______
RESPIRABLE DUST MONITOR
____ OTHER

Level of Protection:
General areas-Level D
Degreaser areas-Level C

Frequency

x____ BREATHING ZONE (Monitor constantly when well is un-capped)
x PERIMETER (Monitor perimeter if levels above action threshold are encountered)
____

* List only those differing from or in addition to Table 2.

D. DECONTAMINATION EQUIPMENT AND PROCEDURES

DECONTAMINATION EQUIPMENT:

x____ TAP WATER
____ DISTILLED WATER
____ HEXANE
____ METHANOL
____ ACETONE
x____ ALCONOX
x____ BRUSHES
x____ PLASTIC SHEETING
____ DISPOSAL BAGS
x____ WASH TUBS (HOW MANY) as needed__________
____ PAPER TOWELING
____ STEAM CLEANER

SITE CONTROL/DECONTAMINATION PROCEDURES:

DISTINGUISHING FEATURES WHICH DELINEATE ZONES AND APPROXIMATE DIMENSIONS IN FEET:

EXCLUSION ZONE - 5-10 feet from well access point and sample collection area

CONTAMINATION REDUCTION ZONE - 5-10 feet from exclusion zone

SUPPORT ZONE - as needed based on site layout

DECONTAMINATION PROCEDURES WHICH ARE TO OCCUR IN:

EXCLUSION ZONE - removal of gross contamination

CONTAMINATION REDUCTION ZONE - rinse liquid contamination from sampling devices and gloves, collect rinse water

SUPPORT ZONE - as needed based on site layout

E. EMERGENCY RESPONSE

SEE EMERGENCY CONTACTS LISTED IMMEDIATELY FOLLOWING THE TABLE OF CONTENTS.

2.2 TASK-SPECIFIC HEALTH AND SAFETY REQUIREMENTS

___ Initial
_x_ Revision

Task Name(s)*: Test boring and monitoring well installation
a) general areas
b) former degreaser sites

Task Description: Monitoring wells and soil test borings will be installed using powered drilling rig. Primary hazard is from exposure to airborne and liquid contaminants and physical hazards from operation of powered equipment. General sites will be sampled in modified Level D (gloves/tyvek), former degreaser sites will be sampled in Level C.

Duration: Well/test boring installation will occur over the next few months. Time at each well will vary depending on accessibility and depth.

Media Affected: _x_ air _x_ soil ___ surface water ___ waste _x_ groundwater

Area Within Site Where Task(s) to be performed: Test borehole and wells will located within the plant structure and outside the buildings on Delphi property.

HAZARD EVALUATION (check all that apply)

CHEMICAL HAZARDS:**

CHARACTERISTICS:

x	FLAMMABLE/COMBUSTIBLE
	CORROSIVE
	REACTIVE
x	TOXIC
x	VOLATILE
	EXPLOSIVE
	RADIOACTIVE
	UNKNOWN
	OTHER ___________

TYPE:

x	SOLID/DUST
x	LIQUID/MIST
	SLUDGE
x	GAS/VAPOR/FUMES (Chlorinated organics)
	ORGANIC
x	HEAVY METAL
	INORGANIC
	PESTICIDE
x	PCB
	ACID
	BASE
x	CARCINOGEN (Vinyl chloride, Benzene)
x	FUEL/PETROLEUM PRODUCT
	OTHER

PHYSICAL HAZARDS:

x	ACTIVE MANUFACTURING SITE
	CONFINED SPACE ENTRY
	ELECTRICAL EQUIPMENT
	EXCAVATION/TRENCHING
x	UNDERGROUND UTILITIES
x	OVERHEAD UTILITIES (inside Plant)
	OPEN WATER
	TEMPERATURE EXTREMES
x	NOISE (within Plant in designated areas)
	ASBESTOS
	OTHER _____

* May include individual or related tasks for which hazards and health and safety requirements are common. Refer to General Health and Safety Procedures (Section III) as necessary).

** Verify that compounds that may be encountered are listed in Table 1.

B. PROTECTIVE AND CONTROL MEASURES

ENGINEERING CONTROLS:

x VENTILATE AREA
DISCONNECT/CLEAN OUT LINES
SLOPE EXCAVATION
____ SHORE EXCAVATION
____ ELIMINATE IGNITION SOURCES
TAPE OFF AREA
x POST WORK/WARNING SIGNS
PLASTIC SHEETING IN AREA
____ DESIGNATE NO SMOKING AREA
ESCAPE LADDER
____
x UTILITY CLEARANCES OBTAINED
____ (DIG SAFE CONTACTED)
x PRIVATE UTILITIES CLEARED
LINES SHIELDED/DE-ENERGIZED
LOCKED & TAGGED OUT
____ LIFE JACKETS/BARRICADES NEAR WATER
____ HEAT OR AIR CONDITIONING SOURCE FOR TEMPERATURE EXTREMES
OTHER

PERSONAL PROTECTIVE EQUIPMENT:

x____ SAFETY GLASS
____ EYE/FACE SHIELD
x____ GLOVES (CIRCLE TYPES) INNER **(Nitrile Inner)** **(Neoprene Outer)**
DUCT TAPE
____
x____ EAR PROTECTION (CIRCLE TYPE) **(EAR PLUGS)**
x BOOTS (CIRCLE TYPE) (STEEL TOE)
____ DISPOSABLE COVERS, LATEX, WADERS, OTHER ____
x____ TYVEK COVERALL
____ SARANEX COVERALL
____ HARD HAT
x RESPIRATOR (INDICATE TYPE OF CARTRIDGE) Organic
____ FIRE EXTINGUISHER
____ FIRST AID KIT
LOUD SIGNALING DEVICE (CIRCLE TYPE) AIR HORN, WHISTLE
____ FLASHLIGHT
____ SAFETY SHOWER/EYE WASH
____ WALKIE-TALKIE
____ OTHER: ____

LEVEL OF PROTECTION

MODIFIED D (HOW MODIFIED):
x LEVEL D (general areas)
MODIFIED C (HOW MODIFIED) ____
x____ LEVEL C (degreaser areas,LNAPL areas, etc.)
____ MODIFIED B (HOW MODIFIED) ____

C. ENVIRONMENTAL MONITORING

Equipment / Action Thresholds* / Level of Protection

x HNU (CIRCLE ONE) (10.2 EV) 11.7 EV Table 2
____ PHOTOVAC MICROTIP (10.6 EV)
OVA
EXPLOSIMETER/02 METER
RADIATION METER
HYDROGEN CYANIDE METER
x PHOTOVAC GC
x DRAEGER TUBE ____
RESPIRABLE DUST MONITOR
____ OTHER

Level of Protection: Start at level C, downgrade to D based on air monitoring

Frequency

x____ BREATHING ZONE (Monitor every 15 mins. during boring)
x PERIMETER (Monitor perimeter if levels above action threshold are encountered)
____

* List only those differing from or in addition to Table 2.

D. DECONTAMINATION EQUIPMENT AND PROCEDURES

DECONTAMINATION EQUIPMENT:

x____ TAP WATER
_____ DISTILLED WATER
_____ HEXANE
_____ METHANOL
_____ ACETONE
x____ ALCONOX
x____ BRUSHES
x____ PLASTIC SHEETING
_____ DISPOSAL BAGS
x____ WASH TUBS (HOW MANY) as needed__________
_____ PAPER TOWELING
x____ STEAM CLEANER (contaminated well installation equipment only)

SITE CONTROL/DECONTAMINATION PROCEDURES:

DISTINGUISHING FEATURES WHICH DELINEATE ZONES AND APPROXIMATE DIMENSIONS IN FEET:

EXCLUSION ZONE - 5-10 feet from soil penetration point and sample collection area

CONTAMINATION REDUCTION ZONE - 5-10 feet from exclusion zone

SUPPORT ZONE - as needed based on site layout

DECONTAMINATION PROCEDURES WHICH ARE TO OCCUR IN:

EXCLUSION ZONE - removal of gross contamination

CONTAMINATION REDUCTION ZONE - rinse liquid contamination from equipment, steam clean where appropriate, collect gloves and rinse water for disposal

SUPPORT ZONE - as needed based on site layout

E. EMERGENCY RESPONSE

SEE EMERGENCY CONTACTS LISTED IMMEDIATELY FOLLOWING THE TABLE OF CONTENTS.

2.2 TASK-SPECIFIC HEALTH AND SAFETY REQUIREMENTS

x Initial
___ Revision

Task Name(s)*: Soil-vapor survey including soil-vapor sample collection at locations within plant buildings.

Task Description: Investigations will include installation of small-diameter soil probes at various locations, and subsequent soil-vapor sampling.

Duration: Several weeks, or as determined by project demands

Media Affected: x air x soil ___ surface water ___ waste x groundwater

Area Within Site Where Task(s) to be performed: At former degreaser locations, and Plant 1 east and west, Plant 2 west, and Plants 3 and 4.

HAZARD EVALUATION (check all that apply)

CHEMICAL HAZARDS:**

CHARACTERISTICS:

x	FLAMMABLE/COMBUSTIBLE
	CORROSIVE
	REACTIVE
x	TOXIC
x	VOLATILE
	EXPLOSIVE
	RADIOACTIVE
	UNKNOWN
	OTHER ___________

TYPE:

x	SOLID/DUST
x	LIQUID/MIST (Chlorinated solvents and organics)
	SLUDGE
x	GAS/VAPOR/FUMES (Chlorinated solvents and organics)
x	ORGANIC
x	HEAVY METAL
	INORGANIC
	PESTICIDE
x	PCB
	ACID
	BASE
x	CARCINOGEN (Vinyl chloride, Benzene)
x	FUEL/PETROLEUM PRODUCT
	OTHER

PHYSICAL HAZARDS:

x	ACTIVE MANUFACTURING SITE
	CONFINED SPACE ENTRY
x	ELECTRICAL EQUIPMENT
	EXCAVATION/TRENCHING
x	UNDERGROUND UTILITIES
	OVERHEAD UTILITIES
	OPEN WATER
	TEMPERATURE EXTREMES
x	NOISE
	ASBESTOS
	OTHER ______

* May include individual or related tasks for which hazards and health and safety requirements are common. Refer to General Health and Safety Procedures (Section III) as necessary).

** Verify that compounds that may be encountered are listed in Table 1.

B. PROTECTIVE AND CONTROL MEASURES

ENGINEERING CONTROLS:

____	VENTILATE AREA
	DISCONNECT/CLEAN OUT LINES
	SLOPE EXCAVATION
	SHORE EXCAVATION
x	ELIMINATE IGNITION SOURCES
x	TAPE OFF AREA
	POST WORK/WARNING SIGNS
	PLASTIC SHEETING IN AREA
	DESIGNATE NO SMOKING AREA
____	ESCAPE LADDER
	UTILITY CLEARANCES OBTAINED (DIG SAFE CONTACTED)
x	PRIVATE UTILITIES CLEARED
	LINES SHIELDED/DE-ENERGIZED
	LOCKED & TAGGED OUT
____	LIFE JACKETS/BARRICADES NEAR WATER
	HEAT OR AIR CONDITIONING SOURCE FOR TEMPERATURE EXTREMES
	OTHER

LEVEL OF PROTECTION

x	MODIFIED D (HOW MODIFIED): GLOVES
	LEVEL D
	MODIFIED C (HOW MODIFIED) ________
	LEVEL C
____	MODIFIED B (HOW MODIFIED) ________
____	LEVEL B

PERSONAL PROTECTIVE EQUIPMENT:

x	SAFETY GLASS
____	EYE/FACE SHIELD
x	GLOVES (CIRCLE TYPES) INNER LATEX INNER - **(NITRILE)** **(NEOPRENE)** OTHER
____	DUCT TAPE
x	EAR PROTECTION (CIRCLE TYPE) EAR PLUGS - IN DESIGNATED AREAS
x	BOOTS (CIRCLE TYPE) **STEEL TOE** DISPOSABLE COVERS, LATEX, WADERS, OTHER ________
	TYVEK COVERALL
____	SARANEX COVERALL
____	HARD HAT
____	RESPIRATOR (INDICATE TYPE OF CARTRIDGE) ________
____	FIRE EXTINGUISHER
____	FIRST AID KIT
____	LOUD SIGNALING DEVICE (CIRCLE TYPE) AIR HORN, WHISTLE
____	FLASHLIGHT
____	SAFETY SHOWER/EYE WASH
____	WALKIE-TALKIE
____	OTHER: ________

C. ENVIRONMENTAL MONITORING

	Equipment	Action Thresholds*	Level of Protection
x	HNU (CIRCLE ONE) (10.2 EV) 11.7 EV	Table 2	Modified Level D
	PHOTOVAC MICROTIP (10.6 EV)		
	OVA		
	EXPLOSIMETER/02 METER		
	RADIATION METER		
	HYDROGEN CYANIDE METER		
	PHOTOVAC GC		
	DRAEGER TUBE ______		
	RESPIRABLE DUST MONITOR		
	OTHER		

Frequency

x	BREATHING ZONE Continuously during installation through floor and during sample collection
x	PERIMETER As needed based on Breathing Zone results

* List only those differing from or in addition to Table 2.

D. DECONTAMINATION EQUIPMENT AND PROCEDURES

DECONTAMINATION EQUIPMENT:

x____ TAP WATER
____ DISTILLED WATER
____ HEXANE
____ METHANOL
____ ACETONE
x____ ALCONOX
x____ BRUSHES
____ PLASTIC SHEETING
____ DISPOSAL BAGS
____ WASH TUBS (HOW MANY) ________
x____ PAPER TOWELING
____ STEAM CLEANER

SITE CONTROL/DECONTAMINATION PROCEDURES:

DISTINGUISHING FEATURES WHICH DELINEATE ZONES AND APPROXIMATE DIMENSIONS IN FEET:

EXCLUSION ZONE - 5-10 ft. from sample collection point

CONTAMINATION REDUCTION ZONE - 5-10 ft. from exclusion zone

SUPPORT ZONE - as needed

DECONTAMINATION PROCEDURES WHICH ARE TO OCCUR IN:

EXCLUSION ZONE - remove gross contamination

CONTAMINATION REDUCTION ZONE - rinse with water and alconox solution, tap water rinse

SUPPORT ZONE - as needed

E. EMERGENCY RESPONSE

SEE EMERGENCY CONTACTS LISTED IMMEDIATELY FOLLOWING THE TABLE OF CONTENTS.

TABLE 1
HAZARD MONITORING
(BOLD CONTAMINANTS OF CONCERN, WRITE ADDITIONAL CONTAMINANTS ON NEXT PAGE)

SITE OF CONTAMINANTS OF CONCERN	ROUTES OF EXPOSURE	IDLH	PEL	TLV	PID	FID	ODOR THRESHOLD	IRRITATION THRESHOLD	ODOR DESCRIPTION
Acetone	R,I,C	20000	750	750	9.69	60	13	---	Chem, sweet, pungent
Benzene	R,A,I,C	Ca	1	10	9.25	150	4.68	---	Solvent
Carbon tetrachloride	R,A,I,C	Ca	2	Skin 5	11.47	10	50	---	Sweet, pungent
Chlorobenzene	R,I,C	2400	75	75	9.07	200	0.68	---	Almond like
Chloroform	R,I,C	Ca	2	10	11.42	65	50	E4096	Sweet
Cyanides (as CN)	R,A,I,C	50 mg/m^3	5 mg/m^3	5 mg/m^3	---	---	---	---	Faint almond odor
o-Dichlorobenzene	R,A,I,C	1700	Cv30	Cv30	9.06	50	0.3	E 20-30	Pleasant, aromatic
p-Dichlorobenzene	R,I,C	1000	75	75	8.94	---	0.18	E 80-160	Distinct, aromatic mothball-like
1,1-Dichloroethane	R,I,C	4000	100	200	---	80	200	---	Distinct
1,2-Dichloroethane	R,I,A,C	Ca	1	10	11.12	80	88	---	Chloroform
1,1-Dichloroethylene	R,I	Ca	1	5	*	40	190	---	---
1,2-Dichloroethylene	R,I,C	4000	200	200	9.65	50	0.085	---	Ether-like, acrid
Ethanol	R,A,I,C	---	1000	1000	10.48	25	10	---	Sweet
Ethyl benzene	R,I,C	2000	100	100	8.76	100	2.3	E 200	Aromatic
Ethylene Glycol vapor	R,A,I,C	---	Cv 50	Cv 50	---	---	---	---	---
Formaldehyde	I,C	Ca	3	1	10.88	---	0.83	E 0.5	Hay
Gasoline	R,I,C	---	300	300	---	---	---	---	---
Hexane, n-isomer	R,I,C	5000	50	50	10.18	70	130	E.T 1400-1500	Mild, gasoline-like
Hydrogen Cyanide (as CW)	R,A,I,C	50	10	SkCv-10	13.69	---	0.58	---	Bitter almonds
Methanol	R,I,C	25000	Sk 200	Sk 200	10.84	12	1000	---	Sweet
MEK	R,I,C	3000	200	200	9.48	80	5.4	---	Acetone-like
Methyl Chloroform (1,1,1-TCA)	R,I,C	1000	350	350	**	105	20-100	---	Chloroform-like
Methylene Chloride	R,I,C	Ca	500	50	11.35	100	25-50	E 5000	Ether-like
Methyl Mercaptan	R,C	400	Cv 0.5	0.5	9.44	---	---	---	Garlic, Rotten Cabbage
MIBK (Hexone)	R,I,C	3000	50	50	---	---	---	---	Pleasant
Naptha (coal tar)	R,I,C	10000	100	---	---	---	---	---	Aromatic
Naphthalene	R,A,I,C	500	10	10	8.14	---	0.3	E 15	Mothball-like
Octane	R,I,C	5000	300	300	9.9	80	48	---	Gasoline-like
Pentachlorophenol	R,A,I,C	150mg/m^3	0.5mg/m^3sk	0.5mg/m^3sk	---	---	---	---	Pungent when hot
Phenol	R,A,I,C	250	Sk5	Sk5	8.5	---	0.04	E.N.T 68	Medicinal

SITE OF CONTAMINANTS OF CONCERN	ROUTES OF EXPOSURE	IDLH	PEL	TLV	PID	FID	ODOR THRESHOLD	IRRITATION THRESHOLD	ODOR DESCRIPTION
Propane	R,C	20000	1000	Asphyx.	10.95	80	16000	---	Natural gas odor
Stoddard Solvent (Mineral Sprits)	R,CI,I	5000	100	100	*	---	1	E 400	Kerosene-like
1,1,2,2-Tetrachloroethane	R,A,I,C	Ca	Sk1	1	11.1	100	1.5	---	---
Tetrachloroethylene	R,I,C	Ca	25	50	9.32	70	4.68	N.T513-690	Ether, Chloroform-like
Toluene	R,A,I,C	2000	100	100	8.82	110	2.14	E 300-400	Mothballs
Trichloroethylene	R,I,C	Ca	50	50	9.47	70	21.4	---	Solventy, chloroform-like
Turpentine	R,A,I,C	1900	100	100	---	---	200	E.N 200	Pine like
Vinyl Chloride	R	Ca	1	5	9.995	---	3000	---	Ethereal
Xylenes	R,A,I,C	1000	100	100	8.56/8.44	111/116	1.1	E.N.T. 200	Aromatic
Asbestos	R	Ca	0.2fibr/cc	0.2fibr/cc	---	---	---	---	---
Dichlorodifluoromethane (Freon 12)	R,C	50000	1000	1000	11.97	15	---	---	---
Hydrogen peroxide	R,I,C	75	1	1	11	---	---	---	Sharp
MEK peroxide	R,I,C	---	Cv 0.7	Cv 0.2	---	---	---	---	---
PCBs-42% Chlorine	R,A,I,C	Ca	1mg/m³Sk	1mg/m³Sk	---	---	---	---	Mild, hydrocarbon
PCBs-54% Chlorine	R,A,I,C	Ca	0.5mg/m³Sk	0.5mg/m³Sk	---	---	---	---	Mild, hydrocarbon
Styrene	R,I,C	5000	50	---	8.47	85	0.047	E 200-400	Rubber, solvent
Styrene monomer	R,I,C	---	---	50	---	---	200	---	Aromatic
Aluminum - metal dust	R,I,C	---	15mg/m³	10mg/m³	---	---	---	---	---
- soluble salts	R,I,C	---	2mg/m³	2mg/m³	---	---	---	---	---
Arsenic	R,A,I,C	Ca	0.01mg/m³	0.2mg/m³	---	---	---	---	---
Barium: soluble compounds	R,I,C	250mg/m³	0.5mg/m³	0.5mg/m³	---	---	---	---	---
Beryllium & compounds	R	Ca	0.002mg/m³	0.002mg/m³	---	---	---	---	---that he hasn't seen a spec for this yet
Cadmium dusts	R,I	Ca	0.2mg/m³	0.05mg/m³	---	---	---	---	---
(Proposed value)				0.01mg/m³	---	---	---	---	---
Chromium:									
Metal & insoluble salts	R,I	500mg/m³	1mg/m³	0.5mg/m³	---	---	---	---	---
Soluble salts	I,C	250mg/m³	0.5mg/m³	0.05mg/m³	---	---	---	---	---
Copper - dust & mist	R,I,C	---	1mg/m³	1mg/m³	---	---	---	---	---
Lead - arsenate	R,I,C	Ca	0.05mg/m³	0.15mg/m³	---	---	---	---	---
- inorg. dust & fume	R,I,C	---	0.05mg/m³	0.15mg/m³	---	---	---	---	---
- chromate	R,I,C	---	---	0.05mg/m³	---	---	---	---	---
Manganese & cmpds	R,I	10000mg/m³	C-5mg/m³	5mg/m³	---	---	---	---	---

SITE OF CONTAMINANTS OF CONCERN	ROUTES OF EXPOSURE	IDLH	PEL	TLV	PID	FID	ODOR THRESHOLD	IRRITATION THRESHOLD	ODOR DESCRIPTION
Mercury & inorg. comp.	R,A,C	28mg/m^3	Cv0.1mg/m^3	0.1mg/m^3		—	—	—	—
- (organo) alkyl comp.	R,A,I,C	10mg/m^3	0.01mg/m^3	0.01mg/m^3	—	—	—	—	—
Nickel - metal, insoluble	R,I,C	Ca	1mg/m^3	1mg/m^3	—	—	—	—	—
- soluble comp.	R,I,C	Ca	0.1mg/m^3	0.1mg/m^3	—	—	—	—	—
Portland cement	R,I,C	—	10mg/m^3	10mg/m^3	—	—	—	—	—
Selenium compounds	R,A,I,C	100mg/m^3	0.2mg/m^3	0.2mg/m^3	—	—	—	—	—
Silver - metal	R,I,C	—	0.01mg/m^3	0.1mg/m^3	—	—	—	—	—
- soluble comp.	R,I,C	—	—	0.01mg/m^3	—	—	—	—	—
Thallium, soluble	R,A,I,C	20mg/m^3	0.1mg/m^{3}Sk	0.1mg/m^{3}Sk	—	—	—	—	—
Tin, metal & inorganic comp. except oxides	R,C	400mg/m^3	2mg/m^3	2mg/m^3	—	—	—	—	—
Tin, organic compounds	R,A,I,C	200mg/m^3	0.1mg/m^3	0.1mg/m^{3}Sk	—	—	—	—	—
Zinc chromates, as Cr	R,I,C	—	Cv0.1mg/m^3	Cv0.1mg/m^3	—	—	—	—	—
Zinc oxide dust	R,I,C	—	10mg/m^3	10mg/m^3	—	—	—	—	—

Notes: All units in ppm unless otherwise noted.

E = Eyes R = Respiratory (Inhalation)
N = Nose A = Skin Absorption
T = Throat I = Ingestion
SK = Skin C = Skin and/r Eye Contact
Cv = Ceiling value * = Use 10.2 eV lamp
Ca = Carcinogen ** = Use 11.7 eV lamp

TABLE 2

MONITORING METHOD, ACTION LEVELS AND PROTECTIVE MEASURES

INSTRUMENT	HAZARD	ACTION LEVEL[1]	ACTION RESPONSE
Respirable Dust Monitor	Contaminant Particles	> 0.05 mg/m^3	Level C Protection
OVA, HNU[2], Photovac Microtip	Organic Vapors	Background 3 ppm > background or lowest OSHA permissible exposure limit, whichever is lower, or as modified for this task (see Section C in 2.2.2) 50 ppm over background unless lower values required due to respirator protection factors	Level D Level C, site evacuation may be necessary for specific compounds (see Section C in 2.2.2) Level B[3]
Explosimeter[4]	Explosive Atmosphere	10% Scale Reading 10-15% Scale Reading > 15% Scale Reading	Proceed with work Monitor with extreme caution Evacuate site
O_2 Meter[5]	Oxygen Deficient Atmosphere	19.5% O_2 19.5% - 25% O_2 < 19.5% O_2 > 22% O_2	Monitor with caution Continue with caution Evacuate site; oxygen deficient Evacuate site; fire hazard
Radiation Meter[6]	Ionizing Radiation	0.1 Millirem/Hour ≥ 1 Millirem/Hour	If > 0.1, radiation sources may be present[7] Evacuate site; radiation hazard
Draeger Tube	Vapors/Gases	Species Dependent > 1 ppm Vinyl Chloride > 1 ppm benzene > 1 ppm 1,1-DCE	Consult manual for concentration/toxicity/detection data. Upgrade to Level C and evacuate. Upgrade to Level B if concentrations of compounds exceed thresholds shown at left.
GC	Organic Vapors	3 ppm > background or lowest OSHA permissible exposure limit, whichever is lower > 1 ppm Vinyl Chloride > 1 ppm Benzene	On site monitoring or tedlar bag sample collection for laboratory analysis Upgrade to Level B, contact H&S Representative

Notes:
1. MONITOR BREATHING ZONE
2. CAN ALSO BE USED TO MONITOR SOME INORGANIC SPECIES.
3. POSITIVE PRESSURE DEMAND SELF CONTAINED BREATHING APPARATUS
4. LOWER EXPLOSIVE LIMIT (LEL) SCALE IS 0-100%. LEL FOR MOST GASSES IS 15%.
5. NORMAL ATMOSPHERIC OXYGEN CONCENTRATION AT SEA LEVEL IS ~ 20%.
6. BACKGROUND GAMMA RADIATION IS ~ 0.01 - 0.02 MILLIREMS/HOUR.
7. CONTACT HALEY & ALDRICH OF NEW YORK HEALTH AND SAFETY STAFF IMMEDIATELY.

III. GENERAL HEALTH & SAFETY PROCEDURES

3.1 ADMINISTRATIVE CONTROLS

A. Initial Health and Safety Training

Personnel will not be permitted to participate in or supervise field activities until they have been trained to a level required by their job function and responsibility. Delphi employees, contractors, subcontractors, and consultants who have the potential to be exposed to contaminated materials or physical hazards must complete the training described in the following sections.

B. 40-Hour Health and Safety Training

This basic course provides instruction on the nature of hazardous waste work, protective measures, proper use of personal protective equipment, recognition of signs and symptoms which might indicate exposure to hazardous substances, and decontamination procedures. It is required for all personnel working on-site, such as equipment operators, general laborers, electricians, plumbers, supervisors, management, etc. who may be potentially exposed to hazardous substances, health hazards, or safety hazards consistent with 29 CFR 1910.120. The course must be conducted by a qualified instructor in accordance with 29 CFR 1910.120.

C. 8-hour Annual Refresher Training

Personnel with 40-hour health and safety training are required to attend an annual 8-hour refresher course to remain current in their training. This course must also be conducted by a qualified instructor in accordance with 29 CFR 1910.120.

D. 8-Hour Supervisor Training

On-site management and supervisors directly responsible for or who supervise employees engaged in hazardous waste operations must have eight additional hours of Supervisor training in accordance with 29 CFR 1910.120. This course includes, but is not limited to, elements appropriate to supervising hazardous waste related projects (e.g., accident reporting/investigation, regulatory compliance, work practice observations, auditing, emergency response procedures, etc.).

E. Additional Training for Specific Projects

Contractors will ensure their personnel have received additional training on specific instrumentation, equipment, confined space entry, construction hazards, etc., as necessary to perform their duties. This specialized training will be provided to personnel before engaging in the specific work activities.

F. Documentation of Training

The Contractor/Consultant Project Manager will be responsible for maintaining and providing to Delphi documentation of its employees' compliance with required training. Haley & Aldrich/Delphi will only allow properly trained and qualified personnel to perform work at the site.

3.2 MEDICAL SURVEILLANCE PROGRAM

A. Purpose

The Medical Surveillance Program is conducted to provide an initial baseline of the worker's health. Subsequent medical exams are used to monitor the worker's continued well being. The implementation of a medical surveillance program is the responsibility of the contractor/subcontractor employer.

B. Requirements

Medical surveillance is required by the Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120 (f): Hazardous Waste Site Operations and Emergency Response. The Contractor/Consultant's medical surveillance program must meet or exceed these regulatory requirements.

These regulatory requirements include the determination by a physician that the individual being examined is physically able to use respiratory protection and is able to perform the work defined within the specific job description. The capability of an individual to perform the specified work will be determined from examinations that may include:

- Medical and occupational history, and past gastrointestinal, hematologic, renal, cardiovascular, reproductive, immunological, and neurological problems as well as a history of respiratory disease and personal smoking habits;
- Physical examination, including blood pressure measurements;
- Pulmonary function test (FVC and FEV1);
- Chest x-ray;
- ECG (Electrocardiogram);
- Eye examination and visual acuity;
- Audiometry;
- Urinalysis; and
- Blood chemistry: Hematology, serum analyses, heavy metals toxicology.

C. Periodic Monitoring

All personnel are required to have a physical examination within the 12 months prior to the beginning of their work on-site. This period may be shortened if the Contractor/Consultant Medical Consultant deems this appropriate. The physician performing the physical will insure the requirements of 29 CFR 1910.120(f) are fulfilled. Documentation attesting to current medical monitoring compliance must be maintained on-site by the Contractor/Consultant Safety Officer.

3.3 SITE CONTROLS

A. Work Site Access Control

Access to client property is dependent upon site-specific conditions under owner permission and will be controlled by the Delphi Project Manager. It will be the Contractor/Consultant Project Manager's responsibility to control access to a site by means of temporary barriers such as flagging tape or fencing. The barrier will be inspected daily for integrity and adequacy by the Contractor/Consultant Site Coordinator.

For sites requiring Level C to Level A personal protective equipment the area of field operations will be subdivided into three distinct areas. The extent of these areas is task and location specific. Access to each zone will be controlled with fencing and/or plastic flagging tape. The three areas are defined as:

- <u>Exclusion Zone</u>

  The exclusion zone is the area where the highest potential for exposure by dermal or inhalation routes exists. Personal protective equipment is required and a daily log will be kept of all personnel entering this zone. The exclusion zone will be marked off with barricades or barrier tape which will be placed a minimum of 50 feet from the active work area. This 50 foot minimum may be altered in the Task-Specific Health & Safety Requirements (Section II) depending upon actual site layout. During field operations this boundary may be expanded by the Contractor/Consultant Site Coordinator based upon observations and/or monitoring measurements. Whenever possible, all field work should be performed upwind from potential contaminant sources.

- Contamination Reduction Zone

  The contamination reduction zone is the area immediately adjacent to the exclusion zone. The probability of dermal and inhalation exposure is lower than in the exclusion zone. Typically, contamination reduction zones include facilities for personnel or equipment decontamination. Personal protective equipment worn in the exclusion zone may not be worn outside the contamination reduction zone except during emergencies.

- Support Zone

  Support zones cover all areas outside the contamination reduction zone. Typically, the support area includes facilities for a lunch area, office spaces, and clean equipment and material storage. Protective clothing worn in the exclusion zone may not be worn in a support zone except in emergencies. Emergency contacts are listed immediately following the Table of Contents.

B. Visitors:

- Visitors and subcontractors entering the site are subject to the same requirements as contractor and consultant personnel and will only be permitted in the immediate area of active operations (i.e., exclusion zone) after receiving written approval from the Contractor/Consultant Project Manager, and supplying a written agreement to comply with this HASP.

- A visitors log will be kept by the Contractor/Consultant Site Coordinator or other designated person.

- Visitor vehicles are restricted to support zones.

C. Unauthorized Personnel

All established procedures and actions are designed to prohibit unauthorized entry to the work sites. However, if security is violated, the following actions will be taken:

- Unauthorized personnel found within any active site will be reported to the Contractor/Consultant Project Manager, Safety Officer, and Site Coordinator, Rick Eisenman Project Manager, and Gary Elliott Operations Safety Representative.

- Unauthorized personnel found in the exclusion zone will be escorted through the contamination reduction zone and will be subject to all decontamination procedures established in the project-specific HASP.

- Any unauthorized personnel entering an active site will be escorted from the facility by Delphi Security. No re-entry will be permitted.

3.4 ENGINEERING CONTROLS

Engineering controls will be the method of preference to control health and safety hazards. Examples of engineering controls are:

- □ The use of excavation equipment to take samples from trenches;
- □ The use of cover material (soil) to suppress vapor emissions;
- □ The use of air conditioning in heavy equipment cabs to mitigate operator heat stress; and
- □ The use of ventilation equipment to eliminate hazardous atmospheres from confined spaces.

Administrative controls and personal protective equipment will be used where engineering controls are not feasible or are inadequate. Administrative controls include the exclusion of unnecessary personnel from hazardous areas. It should be noted that scheduled job rotation is not an acceptable administrative control to reduce employee exposure to airborne chemicals.

The hazard control methods to be employed must be described in the task-specific health & safety requirements where they deviate from those described here. As a project progresses, changes to these methods may be necessary. All such changes will be documented as addenda to the task-specific health & safety procedures.

A. Standard Safe Work Practices

Standard safe work practices applicable to most site activities are listed below. Additional safe work practices unique to specific site tasks must be included in the task-specific health & safety requirements

1. All field personnel must inform the Contractor/Consultant Site Coordinator or designated representative before entering work areas so that their presence can be recorded.

2. Workers must utilize the "buddy system": at least two members of the field crew (including subcontractor personnel) must be in visual contact with each other on-site whenever work is to be performed. If this is not possible, two-way radios will be used.

3. Eating, drinking, chewing gum or tobacco, smoking, or any other activity that increases the probability of hand-to-mouth transfer of contaminated material will not be permitted at the work site.

4. All personal safety equipment and protective clothing will be worn in conformance with Section 3.7 of this HASP.

5. Disposable outer coveralls, boots and gloves will be secured at the wrists and legs, and there will be closure of the suit around the neck.

6. Individuals getting wet to the skin with chemically contaminated liquids must remove clothing and wash the affected area immediately at a location to be identified in the task-specific health & safety requirements. Clothes wet with such liquids, must be changed. Any skin contact with such liquids, whether considered safe or not, will be dealt with immediately and as completely as possible. Medical attention should be sought as necessary.

7. Hands must be washed before eating, drinking, smoking and before using toilets at the facilities provided.

8. Avoid contact with surfaces either suspected or known to be contaminated, such as puddles, mud, or other discolored surfaces. Store equipment on elevated or protected surfaces to reduce the potential of incidental contamination.

9. Only remove personal protective equipment in the contamination reduction zone per Section A of Section 3.3.

10. Place all disposable coveralls, gloves, and cartridges in appropriate receptacles at the end of every shift or sooner, as directed by the Contractor/Consultant Site Coordinator.

11. Inspect all non-disposable clothing (i.e. hard hat liner, work gloves, cotton overalls) for contamination in the contamination reduction zone. Any clothing found to be contaminated will be decontaminated or disposed of in a manner approved by the Contractor/Consultant Site Coordinator.

12. Report all injuries to the Contractor/Consultant Site Coordinator, Haley & Aldrich Project Manager, and Delphi Medical. An accident report, or equivalent must be completed by the Contractor/Consultant Site Coordinator and submitted to the Delphi Operations Safety Representative or Project Manager for appropriate follow-up.

13. The presence or consumption of alcoholic beverages or illicit drugs on Delphi property or during the work day is strictly forbidden.

14. Spillage or splashing of contaminated materials must be prevented. Spills must be contained and follow up calls made as appropriate for the release.

15. Be alert to unsafe conditions or acts and notify the Contractor/Consultant Site Coordinator.

16. Workers need to be familiar with the work area and surroundings, including:

- ☐ Wind direction in relation to the work area;
- ☐ Accessibility of associates, equipment, vehicles;
- ☐ Available communications;
- ☐ Hot zone (areas of known or suspected contamination);
- ☐ Site access;
- ☐ Nearest water sources.

17. The number of personnel and equipment in the exclusion zone must be kept to a minimum.

18. Wastes generated during work activities must be disposed of in accordance with state, federal, and local, regulations.

B. Safe Work Permits/Hot Work Permits

Safe Work Permits are to be obtained from the Delphi Operations Safety Representative before any work is done that involves:

- ☐ Entering vessels, tanks, pits, trenches, manholes, or other confined spaces.
- ☐ Exposure to toxic or infectious material or to abnormal temperatures or pressures when such exposures are outside the employee's daily routine.
- ☐ Using explosives for blasting or demolition.
- ☐ Using flammable or combustible coatings inside buildings. Application of combustible paints by brush or roller is excluded.
- ☐ Excavating and trenching.
- ☐ Working in elevated areas such as roofs.
- ☐ Using temporary heating devices.
- ☐ Working in designated safe work permit areas.

Hot Work Permits are to be obtained from the Delphi maintenance department before any work is done that involves:

- ☐ Operating gasoline powered vehicles or equipment inside buildings.
- ☐ Cutting, welding, lead burning, tar kettles, or similar work involving open flames or very high temperatures. In explosion prone areas, this includes any potential source of ignition, such as electric hand tools.

C. Working in Confined Spaces

A confined space, as defined by OSHA, is any space having a limited means of egress which is subject to the accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere.

Confined spaces are also areas where occupants are rendered isolated from help in case of need. Confined spaces include, but are not limited to: Ovens, tanks, vessels, bins, boilers, ducts, sewers, pipe chases, manholes, underground utility vaults, tunnels, pipelines, excavations, and trenches.

If waste activities require entrance into a confined space, strict Health and Safety protocol must be followed. Prior to any confined space work activities, written authorization must be obtained (see Section B of Section 3.4).

1. Confined Space Entry

   - A Safe Work Permit will be issued by Delphi prior to entry into the confined space. This permit must be completed including the signatures of the Contractor/Consultant Safety Officer and Delphi Operations Safety Representative.

   - Only authorized, trained personnel may enter a confined space.

   - Open flame devices will not be used to open frozen or otherwise shut manhole covers, hatches or doors. Hot water or steam will be used to remove ice and snow holding such openings closed.

2. Confined Space Ventilation

   The confined space will be ventilated to prevent the accumulation of:

   - Flammable vapors above 10% of the Lower Explosive Limit.

   - Concentrations of combustible dust.

   - Toxic and other contaminants in the atmosphere above one half of the TLV.

3. Safety Concerns

   A standby employee will be stationed outside the entrance to the confined space to observe or communicate with the employee at all times. Communications (visual, voice, or signal line) will be maintained between all individuals present. The standby employee will be trained and equipped to initiate rescue operation.

D. Utility Clearance

Utility clearance will be obtained by the Contractor/Consultant Project Manager from Delphi Facilities personnel and any local utilities, and the appropriate Town or Village authority before the start of any drilling or excavation conducted at the site.

- Other local utility clearance can be obtained by calling the toll-free hotline Dig Up Alert at (800)962-7962 and record the "reference number" for possible future use.

- All utilities in the work area should be staked at least two weeks prior to the start of work.

- All activities must be explained in detail to the respective utility by the Contractor/Consultant Site Coordinator. For some activities, such as blasting, the utility may request to have a representative at the site to expedite emergency response.

3.5 DRILLING SAFETY

Drilling and sampling activities present several potential hazards. Minimizing these hazards requires strict adherence to safe operating procedures.

A. Drill Crews

Drillers will be responsible for the safe operation of the drill rig as well as their crew's adherence to the requirements of the project-specific HASP. The driller must ensure that all safety equipment is in proper condition and is properly used. The members of the drill crew will follow all instructions of the driller, wear all appropriate personal protective equipment, and be aware of the hazards and applicable control procedures.

B. Rig Inspection

Each day, prior to the start of work, the drill rig and associated equipment will be inspected by the driller. The following checks will be made:

- <u>Vehicle condition:</u> Check proper operation of brakes, lights, steering mechanism, and horn.

- <u>Equipment storage:</u> All equipment such as auger flights, split spoon samplers, hammers, hand tools, etc. will be properly stored in an appropriate location and will be secured before moving the rig.

- <u>Wire rope, Cat Line:</u> All wire rope, cable and Cat Line will be inspected for signs of wear such as broken wires, a reduction in rope diameter, abrasion, or signs of rust. Worn, frayed, or otherwise damaged wire, rope or cable will be replaced.

- <u>Safety equipment:</u> Each rig will have at least one fire extinguisher (Type B/C) and one First Aid Kit.

C. Rig Set-Up

Each drill rig will be properly blocked and leveled prior to raising the derrick. The rig will be moved only after the derrick has been lowered. The leveling jacks will not be raised until the derrick has been lowered.

Blocking provides a more stable drilling structure by evenly distributing the weight of the rig. Proper blocking ensures that a differential settling of the rig does not occur. Wooden blocks, at least 12 by 12 inches and four to eight inches thick, are recommended and should be placed between the jack swivels and the ground. The emergency brake will be engaged and the wheels that are on the ground chocked.

Site drilling will comply with the following rules:

- Before drilling, the Contractor/Consultant Site Coordinator will ensure an adequate safety zone around the drill rig and associated operations.

- Before drilling, the existence of underground utilities in the work area will be determined and conspicuously marked (See Section D of Section 3.4).

- If drilling is conducted in the vicinity of overhead power lines, proper distance will be maintained between the drill rig and the lines as per OSHA 29 CFR 1926, Subpart N. The proper distance or shielding technique will be stated in the project-specific HASP.

D. General Operating Procedures

The operator of the drill rig will only operate from the position of the controls. If the operator must leave this position, the transmission must be in neutral.

When working on the derrick platform, the drill crew should not guide drill rods or pipe into racks by taking hold of a moving line. Materials should not be stored or transported within the derrick. Pipe, drill rods, auger flights, hammers, and other drilling tools should be stored in racks and chained in place. During drilling, penetration hammers will be placed at a safe location on the ground.

E. Emergency Procedure for Electrical Contact

If a drill rig contacts an electrical line, it may or may not be insulated from the ground by its tires. Death or serious injury will result if a person touches the rig and the ground simultaneously.

- Under most circumstances, the operator and other personnel on the seat of the vehicle should remain seated and not leave the vehicle. Do not move or touch any part, particularly a metallic part, of the vehicle or drill rig.

- If it is determined that the rig should be vacated, all personnel should jump clear and as far as possible from the rig. Do not step off--jump off, and do not hang on the vehicle or any part of the rig when jumping clear.

- If you are on the ground, stay away from rig and do not let others get near the vehicle. Seek assistance immediately by calling the local emergency services contact. Emergency phone numbers are listed on page iii of this HASP.

3.6 EXCAVATION AND TRENCHING SAFETY

A. General Excavation and Trenching Safety

The following is a list of minimum requirements for trenching and excavating. Each excavation/trench/shoring project is different, therefore the Contractor/Consultant Project Manager is responsible for evaluating site specific conditions and making appropriate provisions in the task-specific health and safety requirements (Section II) in conformance with 29 CFR 1926 Subpart P - Excavations.

- Contact the proper utilities to obtain clearance. Prior to work, review the utilities in the area and be sure they have been staked properly (See Section D of Section 3.4). Before work begins, a Safe Work Permit must be obtained from Delphi Operations Safety Representative as per Section B of Section 3.4.

- Be aware that trenches and excavations deeper than four feet are considered confined spaces and require additional safety precautions, such as shoring. If an excavation exceeds four feet in depth, contact the Delphi Operations Safety Representative to review the original Safe Work Permit and ensure that it is adequate.

- The walls and faces of all excavations and trenches more than four feet deep, in which an employee is exposed to danger from moving ground, will be guarded by a shoring system, sloping of the ground, or some other equivalent means. The design of shoring systems must be done by a registered Professional Engineer as per 29 CFR 1926 Subpart P.

- For excavations or trenches in which an employee may be required to enter, excavated or other material will be effectively stored and retained at least two feet or more from the edge of the excavation or trench.

- Daily inspections of excavations will be made by the Contractor/Consultant Site Coordinator. If evidence of possible cave-ins or slides is apparent, all work in the excavation will cease until the necessary precautions have been taken to safeguard employees.

- Trenches more than four feet deep will have ladders or steps located so as to require no more than 25 feet of lateral travel.

- Hard hats and other personal protective equipment will be worn at all times during any type of excavating or trenching operation.

3.8 AIR MONITORING

A. Air Monitoring Scope

The Contractor/Consultant Site Coordinator will ensure periodic air monitoring is conducted during site operations. Should any monitoring indicate concentrations in excess of established action levels, the Contractor/Consultant Site Coordinator will notify Contractor/Consultant Safety Officer and will implement appropriate action to protect project personnel, Delphi employees, and the nearby community.

Periodic air monitoring for volatile compounds will be performed during the activities for which inhalation has been identified as a potential exposure route. These activities include, but are not limited to:

- Drilling and soil sampling.
- Excavation of contaminated soil for remediation.
- Construction activities involving excavation in areas of known or potential soil or groundwater contamination.
- Pump tests where organic vapors were detected during well installation or water samples.
- Well sampling and hand bailing.

The Contractor/Consultant Site Coordinator should make use of both real time direct reading instruments and laboratory analysis of samples obtained by either grab, filter, sorbent, or wet contaminant collection techniques to measure chemical concentrations. Specific equipment is described in Section D in Section 3.8 of these Requirements.

B. Sample Locations

1. Personal Monitoring

   Personal monitoring will take place at times proposed by the Contractor/Consultant Safety Officer or Site Coordinator and specified in the task-specific health & safety requirements. In scheduling personal monitoring, consideration will be given to collecting samples at times of maximum potential exposure. Samples will be collected in the employees' breathing zone (9 inch radius hemisphere centered at the nose and forward of the shoulders) utilizing direct reading instruments, flow controlled personal sampling pump, or diffusion type dosimeters.

   Scheduled personal samples utilizing sampling pump/sorbent tubes or diffusion type dosimeters should be used to collect full-shift exposure data. If the active operations do not require a full shift work schedule, the sample should be collected for the duration of the active operations. Emphasis should be placed on sampling employees in the exclusion zone, however, employees involved in decontamination procedures will be sampled as well. Additional requirements for personal sampling will be specified in the task-specific health and safety requirements.

Non-scheduled personal samples will be collected as directed by the Contractor/Consultant Safety Officer.

2. Perimeter Monitoring

Real-time air monitoring for volatile organic compounds will also be conducted on a regular basis (e.g., hourly) at the downwind site perimeter (exclusion zone as described in Section A in Section 3.3). If total organic vapor concentrations attributable to excavation, drilling or other activities conducted at the site, exceed 1 ppm, work activity must be halted and monitoring continued. If organic vapor concentrations remain sustained at the perimeter, work activities will remain halted and air samples taken to determine the chemical species present. The air samples may be analyzed on-site with a portable GC. Work activities at the site will proceed only after the following conditions are met:

- □ Sustained organic vapor levels at the perimeter fall below 1 ppm, or

- □ The concentration of the organic compounds obtained from the air sampling are within their TLV's.

C. Sample Methods

1. Integrated Sampling

The Contractor/Consultant Safety Officer will determine if there is a project specific need for integrated sampling and include a detailed sampling plan in the task-specific health & safety requirements.

2. Real Time Sampling

Real time monitoring will be conducted with a photoionization detector equipped with an 11.7 eV lamp or a flame ionization detector as specified in the task-specific Health & Safety section (see Section C in Section 2.2). These instruments are capable of detecting the volatile organic chemical compounds identified in Table 1 to an approximate lower detection limit of 1 ppm. The OSHA TLV's for the compounds listed in Table 1 are at or above the detection limit of the proposed equipment. The rapid response of these instruments allows for quick determination of airborne concentrations and therefore, subsequent changes in the safety procedures can be implemented if needed (See Section D in Section 3.8). Refer to Section C in Section 2.2 for frequency of environmental monitoring.

D. Air Monitoring Equipment

1. Direct Reading Instruments

The instruments used for air monitoring activities may include, but are not limited to, those listed below. The Contractor/Consultant Safety Officer will make the decision as to which instruments must be on a project specific basis.

- A flame ionization detector (FID) equal or superior to Foxboro organic vapor analyzer (OVA) Model 128.

- A photoionization detector (PID) equal or superior to HNU 101. Due to the general contaminant mix at the site the 10.2 eV probe will be utilized during site investigations.

- A combustible gas indicator/oxygen meter equal or superior to MSA Model 260 or 360.

  Note: During environmental activities, the potential for creating a flammable atmosphere will be monitored, (e.g., prior to confined space entry, initial operations with atmospheres having the potential to exceed IDLH.) Please refer to Table 2 of this HASP for Action Levels.

Each instrument must be intrinsically safe where warranted. Each will be calibrated and maintained in accordance with the manufacturer's recommendations. Calibration records will be maintained in a daily field logbook.

2. Integrated Sampling Equipment/Techniques

Variable flow, belt mounted personal sampling pumps may be used in conjunction with the appropriate sample media to provide exposure estimates where real time analysis is inadequate. The following equipment/techniques may be used:

- Diffusion or Permeation Type Dosimeters

- Analysis of Sorbents

3. Specialized Monitoring Equipment and Analyses

Specialized sampling instruments and analyses (e.g.,H_2S monitors, solid sorbents, sampling bags) will be used on project sites on an "as needed" basis as determined by the site conditions, sampling history at the site, and the type of work to be performed. The Contractor/Consultant Safety Officer will determine the need for specialized equipment or analyses on a project specific basis and include thorough descriptions of sampling plans/procedures and equipment operation and maintenance in the task-specific health & safety requirements.

4. Spare Monitoring Equipment

Appropriate spare monitoring equipment will be made available either on the Project Site or at a location in the project area, as determined by the Contractor/Consultant Safety Officer. The location of spare equipment will be included in the task-specific health & safety requirements. Field activities will be suspended if the properly calibrated field monitoring instrumentation is not available.

E. Record Keeping

A Field Logbook will be maintained by the Contractor/Consultant Site Coordinator. It will be updated daily. The entries will include:

- □ Task description and date
- □ Location of work site
- □ Personnel involved:
  - ➤ Name
  - ➤ Function
  - ➤ Level of personal protection (any change in level of protection will be recorded at the time of implementation)
- □ Health and Safety instrumentation calibration:
  - ➤ Instrument name (OVA, LEL, etc.)
  - ➤ Serial number
  - ➤ Calibration information (i.e. calibration gas)
  - ➤ Instrument setting (OVA span set)
  - ➤ Time of calibration
- □ Meteorological information
  - ➤ Type of day (sunny, cloudy, rain, etc.)
  - ➤ Wind speed and direction (estimate)
  - ➤ Temperature
- □ Events of the day in chronological order.
- □ Health and safety instrumentation readings
  - ➤ Breathing zone concentrations
  - ➤ Time
  - ➤ Sample concentration with corresponding identification number
- □ Any unusual occurrences, problems or observations
- □ Signature of writer

Field Logbook Health and Safety entries, data sheets, etc. will be reviewed by the Contractor/Consultant Safety Officer on a regular basis. Upon review, each log book will be signed to demonstrate that the data has been reviewed and approved.

F. Summary of Action Levels

Project action levels will be determined by the Contractor/Consultant Safety Officer based upon site conditions and information and will be presented in the task-specific health & safety requirements. The levels defined in Tables 1 and 2 of this HASP will serve as guidelines for project action levels.

3.9 HEAT AND COLD STRESS

A. Heat Stress

Heat stress occurs in several forms. By order of increasing severity, they are:

1. Heat Rash
2. Heat Cramps
3. Heat Exhaustion
4. Heat Stroke

The potential for a worker to develop heat stress is related to the ambient temperature, relative humidity, and the nature of the work being performed. The Contractor/Consultant Safety Officer must include project specific information on heat stress identification, care and prevention procedures in the task-specific health & safety requirements (Section 2).

B. Cold Stress

Cold stress, as well as heat stress, occurs in different forms. By order of increasing severity, they are:

1. Trench Foot
2. Frostbite
3. Hypothermia

The potential for a worker to develop cold stress is related to the ambient temperature, wind chill, protective clothing, and the nature of the work being performed. The Contractor/Consultant Safety Officer must include project specific information on cold stress identification, care and prevention procedures in the task-specific health & safety requirements (Section 2).

3.10 DECONTAMINATION

Personnel and equipment are subject to decontamination procedures when exiting the exclusion zone. No contaminated material will be removed from the exclusion zone without undergoing proper decontamination procedures.

A. Personnel Decontamination

No personal protective equipment will be removed from the exclusion zone without proper decontamination or placement in a disposal receptacle.

Specific personal decontamination procedures must be detailed in the task-specific health & safety requirements (Section 2). The following are guidelines for developing personnel decontamination procedures contained in the task-specific health & safety requirements (Section 2):

1. Tools, etc. will be dropped off onto a plastic sheet in the exclusion zone for subsequent re-use or decontamination.

2. The boot wash station will consist of two plastic or metal tubs, two garden sprayers, and a boot brush. One sprayer will contain a detergent water mixture, the other will contain clean water.

3. The outer layer of disposable protective clothing will be removed by removing outer boots, outer gloves, hood, tape, etc., and placed in a receptacle for disposal. Clothing will be removed by "peeling" off while turning it inside-out. This will minimize contact with possible contamination on the outer surface.

4. Respirators will be removed and cartridges placed in a receptacle for disposal.

5. Inner gloves will be removed by rolling off the hand while turning them inside-out and placed in a receptacle for disposal.

6. If highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present, personnel must shower before exiting the site.

   NOTE: The Contractor/Consultant Site Coordinator will ensure established personnel decontamination procedures are properly implemented and enforced.

B. Equipment Decontamination

Equipment, including drill rigs, will arrive at the site free of debris and contamination. Equipment will be cleaned and decontaminated before departure from the site. Decontamination chemically contaminated equipment will be performed at a minimum of Level C protection for steam cleaning and hydro-washing.

Specific equipment decontamination procedures will be based upon the type of work being performed and anticipated levels of contamination. The following items are guidelines for the establishment of equipment decontamination procedures to be included in the task-specific health & safety requirements:

1. All equipment that has been in the exclusion zone or the contamination reduction zone will be visually inspected and/or wipe sampled to assess the extent of contamination.

2. Sensitive instrumentation should be handled in a manner which will minimize the potential of exposure to hazardous soils and liquids. This care in handling will greatly reduce the amount of decontamination required. Should the conditions in the exclusion zone present an extreme potential for contamination, instrumentation may be wrapped in plastic.

3. All hand tools, safety equipment, and heavy equipment will be decontaminated before leaving the site. (e.g. high pressure, low volume hot water washed, steam cleaned, brushed with low phosphate detergent, and water rinsed.)

4. Heavy equipment must have visible residues removed in the exclusion zone. Wheels, wheel wells and cabs of vehicles must be cleaned before equipment is removed from the exclusion zone. The equipment may then be moved to a more centrally located decontamination pad for more extensive decontamination. This move must be accomplished in a manner that will prevent the spread of contamination along the travel path. A detailed plan for necessary equipment relocation must be included in the task-specific health & safety requirements (Section 2).

5. If warranted and required by the Project Work Plan, samples such as equipment blanks will be taken and submitted for project related analysis to confirm the decontamination procedures.

C. Location of Decontamination Areas

Decontamination areas for project equipment and personnel will be designated by the Haley & Aldrich Project Manager by the following guidelines:

- ☐ Each decontamination area will be sited to have access to water and electrical (GFCI protected) supplies as necessary for the decontamination process.
- ☐ Access to the decontamination area(s) will be limited and controlled.
- ☐ The specific decontamination area(s) for each project will be clearly defined in the task-specific health & safety requirements.

APPENDIX E

Monitoring Well Installation Procedures

HALEY & ALDRICH

APPENDIX E

Monitoring Well Installation Procedures

A. Soil Sampling

At each well installation or soil test boring location, an auger boring will be advanced to the depth desired, typically to the top of bedrock, using standard drilling techniques. The diameter of the augers is typically 2-3/4 to 10-1/4-inches; 2-3/4-inch to 4-1/4-inch for test borings only and 4-1/4-inch or larger for well installations, depending on the depth of the well to be installed. The depth to top of bedrock across the site ranges from approximately 5 to 25 feet below grade. Continuous split-spoon soil sampling, where required, will be performed using standard techniques at locations where wells are to be installed. Sampling will be conducted in accordance with Standard Penetration Test (SPT) protocol as outlined in ASTM-1586-84.

Split-spoon samples will be visually examined and field-screened with an organic-vapor monitoring device to identify whether apparent soil contamination is present, and soil types and conditions will be recorded on a geologic log in accordance with a modified USCS soil classification system. The examination and logging of soil conditions will be performed by experienced personnel. Should evidence of soil contamination be observed, apparently- or potentially-contaminated soil samples may be collected and submitted to the project laboratory for analysis of compounds to be determined on a case-by-case basis.

The determination of which samples will be submitted for analysis is dependent upon such factors as soil conditions, depth within the stratigraphic column, and other factors. Typically, unless a specific zone of soil stratum is known beforehand to require sampling and analysis, the soil sample which has exhibited the highest field-screening VOC measurement will be submitted for analysis; field-screening is accomplished using a portable PID or FID volatile organic compound analyzer. Filed-screening may be conducted by either 1) direct measurement of the soil sample within the split spoon sampler as it is withdrawn from the subsurface or 2) by measuring VOCs within soil vapor headspace collected from soil placed in sealed jars (soil headspace method).

The soil headspace method is conducted on soil samples which have been sealed in jars, warmed, and field-screened using a portable VOC analyzer. This permits a qualitative measure of the degree of contamination present in the soil samples being screened. The procedure is as follows:

Several ounces of soil is placed in soil jars, covered with a "membrane", and capped with a lid, creating a near-airtight seal. The "membrane" will consist of a penetrable material such as aluminum foil or plastic wrap, which may be sealed over by the jar's lid. The seal must be penetrable by the field-screen instrument tip without compromising the concentration of VOCs in the headspace soil by mixing, loss, or perturbation of the headspace soil vapor VOCs to or with the atmosphere.

A similar amount of soil should be collected for all samples, placed in similar-sized jars, and warmed to 70°F or more using a warm water bath or a warm air source so as to promote volatilization of VOCs from the soil matrix into the vapor phase. The soil may be shaken during the warming process but all sample jars should be agitated comparably to ensure uniformity between samples. Instruments used for measuring VOC concentrations should be calibrated at least once (daily at a minimum) during the screening process. The jar lid will be removed and the screening instrument will be introduced into the soil vapor headspace by penetrating the membrane/seal slowly. Measurements of organic vapor levels will be observed and the maximum value observed will be recorded for that sample. Soil headspace measurements will be conducted by an experienced field technician.

Soil sampling may also be conducted by using direct-push technology, such as Geoprobe® or Macrocore, whereby a small-diameter soil sampling probe is advanced through the subsurface by simply forcing the probe down with a pneumatic hammer. Hollow-stem augers and split-spoon samplers are not used to advance the borehole, according to ASTM standards.

Soil samples are collected using this method in much the same way as standard soil sampling: a soil retrieval probe is placed on the end of the drill rods and advanced to the depth required. Soil sampling may be continuous whereby all of the soil column is sampled as the probe is advanced, or the probe may be advanced to a desired depth without sampling using a non-sampling probe tip. The desired depth is then sampled using the sampling probe tip. Variations on this technology usually involve different probe diameters, which typically range from one to two inches in diameter, and pneumatic hammer variations.

B. Abandonment of Boreholes

If necessary, the abandonment of boreholes will be accomplished using the following procedure:

- The depth to bottom of the boring will be measured and an approximately 2-foot bentonite plug will be placed in the bottom of the borehole (bentonite pellets or chips will be tremied to the bottom of the hole.

- A cement/bentonite slurry will be placed from the top of the bentonite plug to within 2 to 5 feet of ground surface. The slurry will consist of 3 to 5 pounds bentonite, 2 pounds of calcium chloride, and 6.5 gallons of water per sack of Portland cement. After allowing the grout to set for at least 12 hours the remainder of the borehole will be filled with concrete so as to promote runoff away from the borehole. Any settling will be refilled with concrete to ground surface.

- A Borehole Abandonment Report will be completed by the field representative for each abandoned borehole.

C. Installation of Overburden Monitoring Wells

Overburden monitoring wells to be installed within overburden boreholes will be completed as follows. A 2-inch diameter, 10-foot length (or other length as determined by field conditions) of PVC or stainless-steel, 10-slot (0.010 inch) wellscreen attached to a riser section will be installed, using centralizers, within the completed borehole at the depth desired. Sufficient solid riser pipe will be used to complete the well at ground surface or as a stick-up casing approximately 2 feet above ground surface. The well construction will include installation of a sand filter pack around the well screen extending approximately 2 feet above the top of the screen, a (hydrated) bentonite-pellet seal approximately 2 feet thick above the sand pack, and bentonite/cement grout to ground surface. A protective, lockable, flush-mounted or stick-up casing will be secured into place using concrete.

C. Bedrock Coring

At each location where well installation requires advancement into the bedrock, a boring will be advanced in bedrock using standard drilling techniques. Continuous core-sampling of bedrock, in accordance with ASTM-2113-70 (1976), will be performed at locations, as required, where wells are to be installed. Bedrock coring will be conducted using HQ, NX or other approved core barrel size. Bedrock coring operations will be conducted by an experienced driller.

Bedrock cores retrieved from well borings will be placed in core boxes. Cores will be visually examined and bedrock types and conditions will be recorded on a geologic log. The examination and logging of bedrock cores will be performed by experienced personnel.

D. Installation of Shallow-bedrock Monitoring Wells

Shallow-bedrock wells will be installed by advancing a 6-inch nominal-diameter rotary boring (either instead of or after core-sampling) to approximately 7 to 10 feet below the top-of-bedrock. At each location the augers or a temporary steel casing will be seated into the bedrock through the overburden to seal off soils during coring operations. The augers or casing will be cleaned of any soil material left inside. A 10-foot length (or other length as determined by field conditions) of PVC or stainless-steel, 10-slot (0.010 inch) wellscreen attached to a riser pipe section will be installed to complete the well at or above ground surface.

The well construction will include installation of a sand filter pack around the screened interval to approximately 2 feet above the top of the screen, a (hydrated) bentonite-pellet seal approximately 2 feet thick above the sand pack, and bentonite/cement grout to ground surface, as well as a protective, lockable, flush-mounted or stick-up casing.

Well installation will be followed by development to remove water lost to the formation during core drilling operations and further development by surging or over-pumping to reduce well-water turbidity.

E. Installation of Intermediate-bedrock Monitoring Wells

At each well installation location, the augers will be seated at the top of bedrock or the augers will be withdrawn and a temporary 8-inch casing will be installed to seal off the overburden. The augers or casing will be cleaned of any soil material left inside, and a core boring or rotary boring will then be advanced using standard techniques to approximately 15 feet below the top of bedrock. Clean water will be used as the drilling fluid for all coring and rotary drilling activities.

If cored, the core boring will be reamed to a nominal 8-inch diameter with a rotary bit to approximately 15 feet below the top of bedrock. A 4-inch inside-diameter black-iron or steel casing equipped with centralizers will be installed to within 6 inches of the bottom of the borehole and pressure-grouted in place. The grout will consist of Portland Cement with 3 to 5 pounds of powdered bentonite and 2 pounds of calcium chloride added per sack of cement. The grout will be mixed with 6.5 gallons of potable water per sack of cement. The casing will be grouted in place utilizing one of the following two methods:

- o Haliburton single-plug displacement grouting technique: Approximately 1.5 times the total annular space volume of grout will be mixed. The grout will be placed inside the casing and a drillable plug will be placed on top of the grout. Freshwater will be injected under pressure into the casing, forcing the plug to the bottom of the casing and grout into the annular space. A valve on the freshwater line will be closed to maintain pressure on the plug and the grout will be allowed to set. The temporary casing or auger assembly will be gradually withdrawn during the grouting process.

- Pressure grouting: A temporary tremmie pipe will be installed to the depth of the bottom of the 4-inch casing in the annular space between the 4-inch casing and the 8-inch borehole wall. Grout will be pumped through the pipe until undiluted grout return is noted at the ground surface in the annular space between the 4-inch casing and the temporary casing or augers. The temporary casing or auger assembly will then be gradually withdrawn: the tremmie pipe will be disconnected from the grout pump without removing it from the bottom of the borehole, temporary-casing sections or auger flights will be withdrawn one at a time, the tremmie pipe will be reconnected, and additional grout will be pumped until grout return is again observed at the ground surface inside and outside the temporary casing or augers. This procedure will be repeated until the temporary casing or auger string has been completely withdrawn. Additional grout will then be pumped through the tremmie pipe if necessary to achieve and maintain undiluted grout at ground surface outside the 4-inch casing. The tremmie pipe will then be withdrawn from the borehole.

The grout will be allowed to set a minimum of 12 hours prior to the resumption of drilling operations. At most locations, after the casing-grout has set, an HQ or NX-core boring will be advanced approximately 10 feet below the 4-inch casing seat. The cored interval will be left to serve as the monitoring interval for most locations, or the corehole may be reamed to a nominal 4-inch diameter. In some instances a 2-inch-diameter stainless-steel well screen equal in length to the cored interval may be inserted with an attached stainless-steel riser pipe. In such cases the annular space between the well screen and corehole will be filled with a sandpack of appropriate size, and seals of bentonite and grout will be installed above the sandpack to fill the annular space between the 2-inch riser and 4-inch casing.

In all cases, at unprotected locations the 4-inch riser will be finished at grade with locking flush-mounted protective surface-casing completions. At protected locations, the 4-inch casing will extend to 2.5 feet above ground surface, and a locking steel outer casing and two or three protective bollards will be installed.

Well installation will be followed by development which will include purging by pumping or bailing to remove water lost to the formation during drilling and additional purging with surging or over-pumping to reduce well-water turbidity. Bailing, surging, and over-pumping will be limited if LNAPL is encountered in a well.

F. Installation of Deep Monitoring Wells

Installation of deep bedrock monitoring wells is similar to that for intermediate-bedrock wells except for the following procedures:

- Bedrock drilling or core boring, if required, will be advanced to the top of bedrock. A temporary 12-inch steel casing will be installed on or slightly into the top of bedrock surface within a minimum 12-inch borehole.

- A permanent 8-inch diameter steel casing will be grouted in place within a nominal 12-inch diameter bedrock borehole which has been cored and reamed to approximately 30 feet below the top of bedrock.

- A permanent 4-inch diameter steel casing will be grouted in place within a nominal 8-inch diameter bedrock borehole which has been cored and reamed to approximately 10 feet below the bottom of the 8-inch casing (40 feet below the top of bedrock).

- An NX corehole will be advanced 10 to 20 feet below the bottom of the 4-inch casing (50 to 60 feet below the top of bedrock). The corehole will serve as the monitoring interval, or the corehole may be tri-cone roller-reamed to a nominal 4-inch diameter.

Well installation will be followed by brief development by surging and over-pumping to reduce well-water turbidity along the total length of the well screen.

G. Decontamination and Handling of Drilling-related Wastes

Drilling and sampling equipment will be decontaminated by steam cleaning before entering the site as well as before and after each exploration. Steam cleaning will be performed at the Delphi facility on a concrete-lined pad with drains connected to Delphi's wastewater pre-treatment facility. Soil and rock cuttings will be placed in tubs and decanted drilling and development water will be placed in drums. Tubs and drums will be provided, staged, and handled by trained Delphi personnel before and after they are filled. Solid wastes such as discarded personnel protective equipment will typically be placed in Delphi's solid waste container unless field conditions warrant managing these materials as being potentially hazardous. Delphi will dispose of solid and liquid drilling wastes using laboratory analysis of soil, groundwater, or LNAPL samples collected as a basis for determining the appropriate disposal method.

Groundwater and LNAPL sampling protocol are contained in Appendix F and slug testing protocol of newly-installed monitoring wells is contained in Appendix G.

H&A OF NEW YORK, ROCHESTER, NEW YORK Consulting Geotechnical Engineers, Geologists and Hydrogeologists	TEST BORING REPORT	BORING NO.

PROJECT:
CLIENT:
CONTRACTOR:

FILE NO.
SHEET NO. OF
LOCATION:

ITEM	CASING	DRIVE SAMPLER	CORE BARREL	DRILLING EQUIPMENT & PROCEDURES
TYPE INSIDE DIAMETER (IN) HAMMER WEIGHT (LB) HAMMER FALL (IN)				RIG TYPE: BIT TYPE: DRILL MUD: OTHER:

ELEVATION:
DATUM:
START:
FINISH:
DRILLER:
H&A REP:

DEPTH (FT)	MICRO-TIP (PPM)	SAMPLER BLOWS PER 6 IN	SAMPLE NUMBER & RECOVERY	SAMPLE DEPTH (FT)	STRATA CHANGE (FT)	VISUAL CLASSIFICATION AND REMARKS
5						
10						
15						
20						
25						

WATER LEVEL DATA					
DATE	TIME	ELAPSED TIME (HR)	DEPTH (FT) TO: BOTTOM OF CASING	BOTTOM OF HOLE	WATER

SAMPLE IDENTIFICATION

O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon

SUMMARY

OVERBURDEN (LIN FT):
ROCK CORED (LIN FT):
SAMPLES:
BORING NO.

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	HEADSPACE ANALYSES	File No.

PROJECT:
CLIENT:
LOCATION:
INSTRUMENT USED: LAMP: eV
DATE INSTRUMENT CALIBRATED*: CALIBRATED BY:
TEMPERATURE OF SOIL:

Page No.: of
Date Sampled:
Date Analyzed:
Analyst:

Exploration Number	Sample Number	Depth (ft.)	Sample Type	Sample Reading (ppm)**	Background Reading (ppm)**	Remarks

* Instrument was calibrated in accordance with manufacturer's recommended procedure using a calibration gas approved by the manufacturer.

** PPM represents concentration of detectable volatile and gaseous compounds in parts per million of air.

H & A OF NEW YORK, ROCHESTER, NEW YORK Consulting Geotechnical Engineers, Geologists and Hydrogeologists	CORE BORING REPORT	BORING NO. FILE NO. SHEET NO. OF

DEPTH (FT)	DRILLING RATE (MIN./FT.)	CORE NO. / DEPTH (FT)	RECOVERY/RQD IN.	RECOVERY/RQD %	WEATH-ERING	STRATA CHANGE (FT)	VISUAL CLASSIFICATION AND REMARKS
15							
20							
25							
30							
35							

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	OVERBURDEN GROUNDWATER MONITORING WELL REPORT

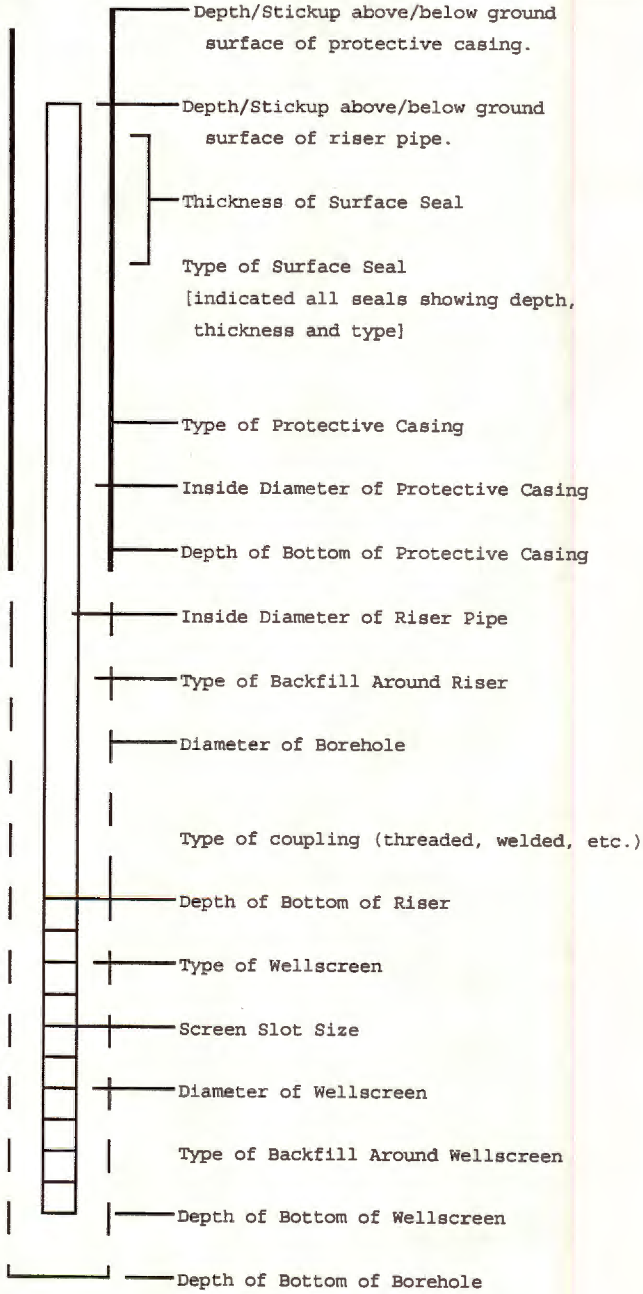
PROJECT: LOCATION: CLIENT: CONTRACTOR: DRILLER: RIG TYPE: INSTALLATION DATE:	FILE NO.: WELL NO.: LOCATION: SHEET: OF INSPECTOR:

Survey
Datum

Ground
Elevation:

SUMMARIZE SOIL CONDITIONS

not to scale



Remarks:

Well No.

H&A OF NEW YORK CONSULTING GEOTECHNICAL ENGINEERS GEOLOGISTS AND HYDROGEOLOGISTS	BEDROCK MONITORING WELL REPORT

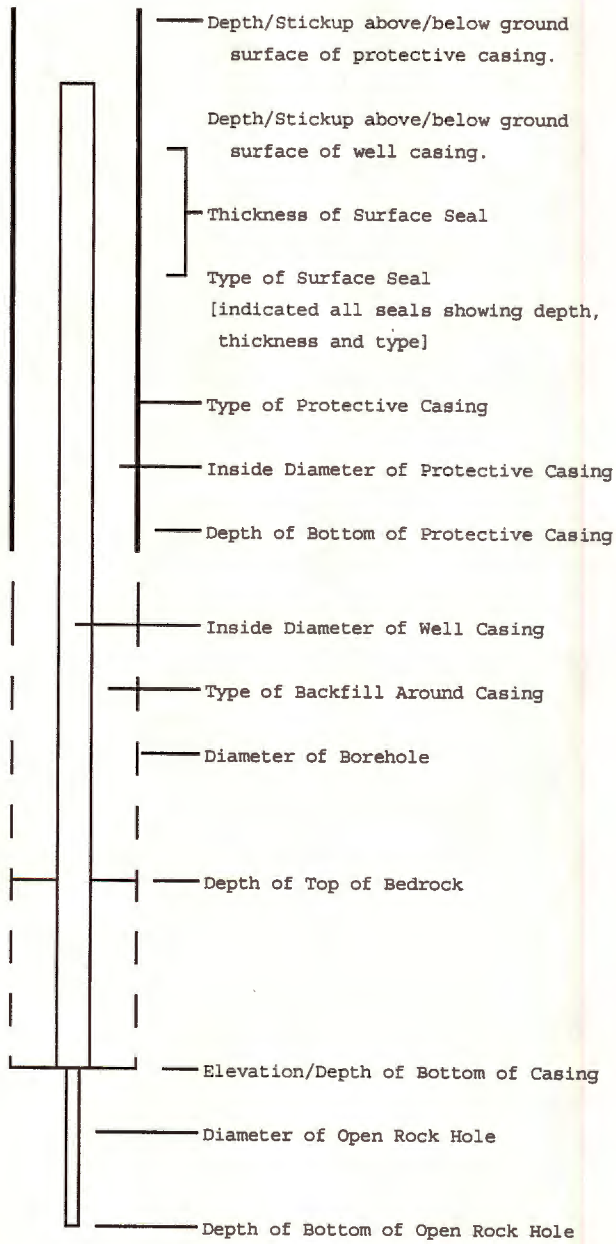
PROJECT: LOCATION: CLIENT: CONTRACTOR: DRILLER: RIG TYPE: INSTALLATION DATE:	FILE NO.: WELL NO.: LOCATION: SHEET: OF INSPECTOR:

Survey
Datum

Ground
Elevation:

SUMMARIZE SOIL CONDITIONS

not to scale



Method and Materials used to grout casings:

Remarks:

Well No.

H & A OF NEW YORK

MONITORING WELL DEVELOPMENT AND PERMEABILTY TESTING REPORT

PROJECT: ____________________

LOCATION: ____________________

CLIENT: ____________ FILE NO.: ____________

WELL NO.: ____________

H&A REP.: ____________

INTALLATION DATE ____________ CONSTRUCTED WELL DEPTH ________ FT.

ESTIM. VOLUME FLUID LOST DURING DRILLING ________ GAL.

ESTIM. VOLUME FLUID LOST DURING W.P. TEST ________ GAL.

DEPTHS MEASURED FROM: ____________

DEVELOPMENT

DATE	DEPTH TO WATER(FT.)		DEPTH TO BOTTOM(FT.)		VOL. REMOVED	REMARKS, METHOD, ETC.
	BEFORE	AFTER	BEFORE	AFTER		

PERMEABILITY TESTING

TEST NO. 1 DATE ____________
H&A REP. ____________

STATIC WATER LEVEL (DEPTH IN FT.) ____________

TEST NO. 2 DATE ____________
H&A REP. ____________

STATIC WATER LEVEL (DEPTH IN FT.) ____________

TIME	ELAPSED TIME	DEPTH TO WATER	TIME	ELAPSED TIME	DEPTH TO WATER

COMPUTED K1 ____________

COMPUTED K2 ____________

REMARKS ____________________

APPENDIX F

Groundwater Sampling Procedures

HALEY & ALDRICH

APPENDIX F

Groundwater Sampling Procedures

Groundwater-level monitoring and groundwater-quality sampling will be performed in accordance with the "Procedure for Groundwater Quality Sampling" for the site which was presented in Appendix E of "Hydrogeologic Report, AC Rochester Lexington Avenue Facility, Rochester, New York, Volume II (H&A of New York, February, 1990). A summary of groundwater monitoring and sampling procedures is presented below.

Pre-Sampling Procedures

Groundwater and LNAPL levels in monitoring wells will be measured prior to each sampling event. Selected wells will be checked for a sinking product (DNAPL) layer as discussed below. The depth to groundwater will be measured with an electronic oil/water interface probe. The probe will be lowered into the well until the meter indicates oil or water is encountered. The probe will be raised above the oil or water level and slowly lowered again until a reading is indicated. In wells to be checked for DNAPL the probe will be lowered to the base of the well until bottom can be verified. The interface probe will indicate the presence or absence of oil on the base of the well. The cable will be held against a rule placed across the top of the protective outer casing at the point designated for water-level measurements, and a depth reading will be taken. This procedure will be followed three times or until a consistent value is obtained for both oil and water levels. The value will be recorded to the nearest 0.01 feet. The probe and length of cable that was wetted in the well will be decontaminated with a paper toweling wipe, a clean water rinse, and a second paper toweling wipe.

Prior to every sampling event, a routine inspection of the condition of the protective casing and surface seal will be performed. The protective casing will be inspected for the integrity of the locking cap and the surface seal. In addition, each well will be checked for any other signs of damage or inadvertent entry. Observations of any irregularities will be noted in the field logbook as well as the well number, date, and time. The Delphi Project Manager will also be notified.

Purging and Sampling Procedures

The wells will be purged with a teflon or polypropylene disposable bailer attached to a polypropylene or nylon line. A number of the deeper bedrock wells may be purged using dedicated bladder pump systems present in the wells. All wells will be checked for floating product (LNAPL) and selected wells will be checked for a sinking product (DNAPL) layers.

In the event a floating layer of free product is determined to be present within the well, the bailer will be lowered in the well until the top of the water column is encountered, and the bailer will be slowly and partially submerged to allow any floating product present at the top of the water column to enter the bailer. The bailer will be carefully withdrawn and checked for a floating product layer which, if present, will be sampled as appropriate.

Wells to be checked for DNAPL include all newly installed wells and wells which are located near potential organic solvent source areas and have contained elevated levels of VOCs in groundwater or LNAPL. At present, these wells include:

- VM-210
- VM-211
- VM-212
- VM-218
- VM-223
- SR-216
- SR-230

DNAPL will be checked by lowering the oil/water interface probe through the water (and LNAPL if present) column to the bottom of the well. If DNAPL is present the probe will sound in the same manner as when LNAPL is present. DNAPL presence may also be checked by lowering a bottom-feeding bailer to the base of the well, retrieving the bailer, and observing the bailer contents for denser-than-water liquids. Such bailers must preclude LNAPL, if present, from preferentially being captured and retained by the bailer. The selected wells will be checked for DNAPL for two consecutive quarters only if DNAPL is not detected during either quarter or, if DNAPL is detected, on a quarterly basis until DNAPL is no longer detected. If DNAPL is found to be present the sample of DNAPL will be collected and submitted for analysis.

If no product is present, the well will then be bailed to dryness or until 3 well volumes have been purged.

Groundwater quality samples will be obtained after sufficient purging of the well. Samples for volatile organic compounds, if required, will be sampled immediately after purging if sufficient volume is present; other parameters will be subsequently sampled for as required. If the sample volume for the other parameters is insufficient, the well will be sampled when sufficient volume is present at an elapsed time of no greater than 24 hours after well purging.

A portion of the groundwater collected during the sampling procedures will be subjected to the field parameter tests of temperature, specific electrical conductance, and pH. Tests for field parameters will be conducted after all sample containers have been filled. Groundwater for these tests will be collected in a glass container with a minimum volume of 125 milliliters.

A groundwater sampling record will be used during sampling procedures to record the following information:

- Well number
- Static water level (depth to water) and depth to LNAPL if encountered
- Depth to bottom of the well
- Calculated well volume
- Actual evacuation volume
- Analyses to be performed
- Date and time
- Field-meter calibration data
- Sample temperature, pH, specific conductivity, and other parameters
- General remarks (weather conditions, etc.)

All entries will be made in indelible ink. Entry errors will be crossed out with a single line, dated and initialed by the person making the correction.

Duplicate samples of groundwater will be collected at the same time and location as field samples and will be collected at a frequency of one per matrix/method per day. The samples sample collection procedure. Duplicates will be collected in immediate succession using identical sampling techniques, sample storage, transportation, and analysis. Duplicates will be evenly split from the same bailer volume and equally proportioned into each sample vessel for the split duplicate.

Trip blanks will also accompany each shipment of sample vessels from the laboratory to the site and from the site to the laboratory. Trip blanks will be analyzed for VOCs to ensure cross-contamination does not occur during the shipping and handling process.

Post-Sampling Procedures

A chain-of-custody form will be completed after sample collection. The chain-of-custody forms will accompany the samples to the laboratory at the end of each day. A sample transfer will be completed when the sampling team relinquishes the samples to laboratory personnel by signing the chain-of-custody form.

All non-disposable, non-dedicated sampling equipment (excluding pH/temperature and conductivity meters), if any, will be decontaminated between sampling events using appropriate procedures. Disposable sampling equipment and water purged from wells during sampling activities will be containerized and handled in the same manner as wastes produced during drilling and well-development activities.

Laboratory Analysis Procedures

Soil, groundwater, and LNAPL samples will be analyzed by the project laboratory in accordance with Free-Col's "General Requirements for Laboratory Protocol for Sampling and Analysis Plan" which were presented in Appendix E of "Hydrogeologic Report, AC Rochester Lexington Avenue Facility, Rochester, New York, Volume II (H&A of New York, February, 1990), updated by incorporation of procedures and methods specified by the most recent edition of U.S. EPA's SW-846 test methods for the evaluation of solid waste.

HALEY & ALDRICH

Haley & Aldrich of New York
189 North Water Street
Rochester, New York 14604

GROUNDWATER SAMPLING RECORD

Sampe Date:______________________

Page ____ of ____

FILE NO.	NR	CLIENT			PROJECT		
WELL NO.							
DEPTH TO PRODUCT(FT)							
DEPTH TO WATER (FT)							
PRODUCT THICKNESS (FT)							
DEPTH OF WELL(FT)							
WELL DIAMETER							
WELL VOLUME (GAL)							
PURGING DEVICE							
CONTAINMENT DEVICE							
PUMP RATE (gpm)							
PURGE TIME (MIN)							
GALLONS PURGED							
SAMPLE TIME							
SAMPLING DEVICE							
PUMP DECON							
BAILER DECON							
FIELD PARAMTERS							
pH MEASUREMENT							
TURBIDITY (ntu)							
TEMPERATURE (C)							
CONDUCTIVITY (uS)							
DISSOLVED OXYGEN (mg/L)							
REDOX (eH)							
FIELD METER CALIBRATION							

Calibration Buffers

pH METER	Meter	Seriel No.	Cal. 4.0	Cal. 7.0	Cal. 10.0	Exp. Date	Lot No.
	Corning	5874					
	Corning	5869					
	Soil Test	57-905					
	Soil Test	57-904					
SPECIFIC CONDUCTANCE	Corning	120016					
	Corning	12002					
	Extech	1-8546/889					
	Extech	2-85461/889					
		Seril No.	Calibrant	True Value	% Recovery	Exp. Date	Lot No. Vendor
DISSOLVED OXYGEN	Corning	3612					
	Corning	H082					
REDOX Meter							
Comments:							
Signature:							

Containment

1. Drums 2. Tank 3. Tanker Truck 4. Sewer Discharge 5. Not Required

Decon Procedures

1. Alconox, portable water, DI Water
2. Methanol, Potable Water, Alconox, Portable Water, DI Water
3. Steam Cleaning

APPENDIX G

Slug Testing Procedures

HALEY & ALDRICH

APPENDIX G

Slug Testing Procedures

In order to determine the in-place hydraulic conductivity of geologic material which occurs in the screened interval of newly installed wells, a rising head permeability test (slug test) will be performed by a qualified geologist or hydrogeologist. The test involves lowering the water level in the well, using a slug or a bailer to withdraw water, and measuring the change in head with respect to time as the water level recovers. In wells which are slow to recover the test will be conducted such that the measurements in these wells will be taken manually. Wells which recover too quickly for this method will be tested and measured by means of an electronic pressure transducer system.

Falling head tests may also be employed, as warranted by field conditions. Falling head tests are conducted by introducing potable water to the well and then measuring the fall in water level with time.

Wells which contain a floating product layer will not be permeability tested. This is because oil is assumed to occupy an unknown amount of soil pore space or bedrock fracture space which would otherwise permit water to flow through. The nature (degree and extent) of the oil presence within the subsurface is not a readily-known variable and evaluating a test on such a well makes an erroneous and inaccurate estimation of conductivity likely.

Each test which is conducted will be evaluated using the Bouwer and Rice method of slug test data evaluation (Bouwer, H., and R.C. Rice, 1976, A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with completely or Partially Penetrating Wells Water Resour. Res., 12, pp. 423-428; and Bouwer, H., 1989, The Bouwer and Rice Slug Test - An Update, Ground Water, 27, pp. 262-268).

A new or pre-cleaned bailer designated to a single well will be used in the rising head testing. All equipment entering the well, such as the transducer and transducer cable, will be cleaned prior to reuse. Water bailed from wells during slug testing activities will be containerized and handled in the same manner as water removed during well development.

Wells with Slow Recovery Rates

For wells with slow recovery rates the following procedure will be used:

- The static water level will be measured prior to slug testing using an electronic water level indicator probe. The static water level will be recorded.

- A bailer will then be submerged below the water level surface and the water level surface allowed to recover to its static level.

- The bailer is removed instantaneously and water level measurements collected by hand using an electronic water level indicator. It is a primary goal in a recovery test to "instantaneously" remove a volume of water that will result in a measurable head decline, the recovery of which (to static conditions) can be monitored over time. Such an instantaneous withdrawal results in recovery due to contributions of flow from the surrounding formation; this flow is controlled by its hydraulic conductivity and not other factors such as storage effects.

- Measurements are made at a frequency which will provide approximately 15 to 20 data points during recovery. The test will continue for a period of one (1) hour or until 90% recovery is achieved based on the static water level, if feasible. The test may be continued for a longer period of time if recovery has not reached 90%, if time allows. Water level measurements will be recorded on permeability testing forms.

Wells with Rapid Recovery Rates

The rising head tests for wells with rapid recovery rates will be conducted as follows:

- The static water level in the well to be tested will be measured and recorded using an electronic water level indicator probe prior to slug testing.

- The pressure transducer will be placed in the well to a minimum depth of three feet below the static water level.

- Readings will be made using the data logger or a water level indicator probe until the water level surface is back to its static level (return to equilibrium).

- The data logger will then be calibrated to read 0.00 feet at static conditions. Following the installation and calibration of the pressure transducer, a new or pre-cleaned bailer will be lowered into the well and the top of the bailer will be placed just below the water surface.

- Water level measurements will again be made until the water level returns to static conditions following introduction of the bailer. If static conditions are not reached within a reasonable amount of time (15 to 30 minutes) following introduction of the bailer the well will be tested using the procedures described for slow recovery wells.

- Once static conditions are re-established, the bailer will be rapidly removed from the water column. Coincident with the instantaneous withdrawal of the bailer, automatic logging of the water levels will be initiated using the data logger.

- The water level measurements will continue until water levels recover to within a minimum of 10 percent of the original static level (90 percent recovery), or an elapsed time of one hour. If after one hour the well has not recovered to the above criteria at the discretion of the hydrogeologist, the test may be extended, if time permits, or the transducer may be removed and the well will be tested at a later date using the procedures described for slow recovery wells.

Data recorded on permeability testing forms and/or stored in the data logger will be transferred to a computerized calculation spreadsheet which evaluates the data and calculates hydraulic conductivity using the aquifer evaluation method described above.

In all cases care shall be taken to mitigate the potential for introduction of foreign materials or contaminants into the well which may exacerbate contamination already present, if any, in groundwater at the well location.

H & A OF NEW YORK

MONITORING WELL DEVELOPMENT AND PERMEABILTY TESTING REPORT

PROJECT: ______________________

LOCATION: ______________________

CLIENT: ______________ FILE NO.: ______________

WELL NO.: ______________

H&A REP.: ______________

INTALLATION DATE ______________ CONSTRUCTED WELL DEPTH ________ FT.

ESTIM. VOLUME FLUID LOST DURING DRILLING ________ GAL.

ESTIM. VOLUME FLUID LOST DURING W.P. TEST ________ GAL.

DEPTHS MEASURED FROM: ______________

DEVELOPMENT

DATE	DEPTH TO WATER(FT.)		DEPTH TO BOTTOM(FT.)		VOL. REMOVED	REMARKS, METHOD, ETC.
	BEFORE	AFTER	BEFORE	AFTER		

PERMEABILITY TESTING

TEST NO. 1 DATE ______________

H&A REP. ______________

STATIC WATER LEVEL (DEPTH IN FT.) ______________

TEST NO. 2 DATE ______________

H&A REP. ______________

STATIC WATER LEVEL (DEPTH IN FT.) ______________

TIME	ELAPSED TIME	DEPTH TO WATER	TIME	ELAPSED TIME	DEPTH TO WATER

COMPUTED K1 ______________

COMPUTED K2 ______________

REMARKS ______________

RJM\MISC\DEVPERM

APPENDIX H

Soil-Vapor Testing Procedures

APPENDIX H

Soil-Vapor Screening Procedures

This appendix presents protocol for the screening of soil-vapor samples collected during field investigations at the Delphi site. Soil-vapor sample analysis will consist of screening samples with a gas chromatograph (GC) to provide a measurement of levels of volatile organic compounds (VOCs) within a soil-vapor sample, and thus indirectly ascertain subsurface soil and groundwater conditions.

Soil-vapor samples will be screened in a manner consistent with past surveys conducted for the site. Surveys may also be conducted using the Gore-Sorber™ method described below.

Soil-Vapor Sample Collection and Screening

In short, soil-vapor sample collection is conducted using a small diameter stainless-steel probe. The probe is installed into the soil and the hole sealed at the ground surface with bentonite clay to seal the hole. Soil-vapor is drawn up through the probe using a small vacuum pump or evacuation chamber connected to the probe using Teflon and Tygon tubing at the surface. The sample is contained in a Tedlar® bag for screening within a 24-hour period, as described below. A initial sample from each sample point will be screened using a Photovac MicroTIP organic vapor meter (or equivalent) to obtain an initial estimate of vapor concentrations. Soil-vapor samples are collected into clean, one-liter Tedlar® bags by filling to near-full capacity.

Air samples from remedial vapor-extraction systems can also be collected directly from sample ports into a Tedlar® bag and screened on the GC.

Sample screening for VOCs is conducted in Haley & Aldrich's laboratory using a Hewlett Packard 5890 Series II GC or in the field using a Photovac 10s50 portable GC. The portable GC is equipped with a 10-meter CPSIL5 capillary column and a 10.6 eV ultraviolet lamp detector source. The GC column is housed in an isothermal oven capable of maintaining analytical temperatures at 40°C. The Hewlett-Packard GC is equipped with a 30-meter VOCOL capillary column and a flame-ionization detector. The GC column is housed in a temperature-programmable oven. In general, the Photovac portable GC will be used to screen samples from areas where chlorinated solvent vapors may be present such as the former degreaser areas and the Hewlett-Packard GC will be used for screening samples collected from the former Stoddard solvent or test-fuels flow-testing areas.

Air samples are manually injected onto the GC into a carrier gas stream of ultra-pure zero grade air with a purity of less than 0.1 ppm total hydrocarbons. Volatile compounds introduced into the carrier gas are separated on the column and detected at the detector source. Typical injection volumes vary between 2 to 250 microliters depending on the anticipated VOC concentrations present in the sample. Syringes used for the sample injections are Hamilton series 1700 gas-tight (or equivalent) with teflon plunger tip in sizes of 25, 50, 100, 250, and 500 microliters. Sampling syringes are purged with clean carrier gas between samples and periodic injections of blank carrier gas from the sampling syringes are screened as a quality-control check. Dedicated syringes are kept for instrument calibrant standards.

The typical standards used for previous investigations at the Delphi Lexington Avenue Facility consist of the following compounds:

- Vinyl Chloride
- Methylene Chloride
- Trichloroethene (TCE)
- Tetrachloroethene (PCE)
- 1,1,1-Trichloroethane (1,1,1-TCA)
- 1,1-Dichloroethene (1,1-DCE)
- trans-1,2-Dichloroethene (t-1,2-DCE)
- cis-1,2-Dichloroethene (c-1,2-DCE)
- Benzene
- Toluene
- Xylenes
- Stoddard solvent

Field screening with the Photovac 10S50 GC will be accomplished in accordance with the procedures described in the Degreaser Investigation Work Plan dated April 1991. Aqueous calibrant standards are prepared from stock solutions of the target compounds on a daily basis. Stock solutions are diluted with distilled water to specific concentrations ranging from 0.50 parts per million (ppm) to 20 ppm, depending on chemical properties of the compound and the sample concentrations encountered. The aqueous standards are contained in 40-mL septum vials. Aqueous standard headspace air is injected at the beginning of each day and periodically thereafter to calibrate the GC, check instrument response, and monitor or bracket sample retention times. Instrument sensitivities are decreased to lower gains for samples with elevated levels of volatile organic compounds to establish reliable chromatography and on-scale peaks. Vapor-phase standards are prepared from stock solutions of the target compounds on a daily basis. Duplicate analyses are performed periodically on approximatley 20 % of the samples. The concentrations of compounds detected in the sample analyses are calculated according to peak area and reported as referenced to the aqueous standards.

The vapor-phase standards may also be prepared by injecting minute volumes of neat solvents into a 2-liter glass dilution ball filled with zero-grade air. In this case, sample results would be calculated according to peak area and reported as referenced to the vapor concentrations in parts-per-million by volume in air (ppmV).

Duplicate analyses performed at small injection volumes may be required for samples with high concentrations of volatile organic compounds. Unknown chromatogram peaks are quantified by summing the unidentified peak areas and expressed in equivalent units of a surrogate compound (typically toluene) using the detector response factor of the surrogate.

Groundwater samples may also be screened by collecting into standard 40-ml septum-vials to approximately three-quarter capacity to allow VOCs to partition from the water into the headspace air for sampling. Samples are equilibrated at the same temperature as the reference standards to negate temperature-dependant variations in the vapor phase of the samples. In general, higher temperatures favor stronger partitioning of volatile organic compounds to the vapor phase and into the headspace air. A thermal water bath may be used for groundwater sample heating. Headspace air is collected for analysis by piercing the septum vial and withdrawing a known volume with the gas-tight sampling syringe.

The GC identifies volatile compounds by comparison of sample retention times with those of known standards. Actual compound identities may differ and must be confirmed with other methods such as laboratory analysis by gas chromatography/mass spectrometry. Detection limits of most common volatile organic compounds on the HP 5890 Series II GC is approximately 0.1 ppmV, expressed in relation to the vapor-phase standard. Detection limits on the Photovac 10S50 GC are approximately 0.01 ppm, expressed in relation to the aqueous satndards. The detection limits of individual compounds vary depending on their ionization potential, vapor pressure, water solubility and boiling point. The testing is intended to provide qualitative information relative to contaminant concentrations in the vapor phase, but the results are not identical to laboratory analyses of specific soil or groundwater samples.

Quality control procedures followed throughout the testing include blank injections of carrier gas after approximately every fifth sample, and after sampling where high levels of VOCs are detected to evaluate possible contamination of the sampling syringe. The syringe bore is purged with the ultra-pure carrier grade air between samples. Duplicates are run for approximately 20 % of the samples. Reported sample concentrations are based on the daily average signal response of target compounds in the calibration standard. Apparent identities of compounds detected in the sample chromatograms are determined across a 2 percent retention time window for each target compound in the calibration standard referenced to the nearest standard run.

Ambient Air Screening

Ambient air above well-bores or in work area breathing zones may be tested with the HP 5890 Series II GC or a Photovac portable GC to assess the presence of low threshold limit value organic compounds such as benzene, 1,1-dichloroethylene and vinyl chloride. Primary volatile organic solvent compounds including trichloroethylene, or any of the previously listed standard compounds, may also be screened for field screening purposes.

Samples will be collected into Tedlar® air bags and screened by withdrawing small volumes from the bag septum by means of clean, blank 250 or 500-microliter gas-tight sampling syringe and analyzed by direct injection into the GC. A Gillian 530 model high-flow air sampling pump, capable of pumping 0.75 to 5 liters/minute, will be used for collecting the Tedlar® bag air samples. Air samples may also be collected using a manual, hand-operated vacuum pump (e.g. Pelican box) to collect samples without the use of a battery-operated, mechanical pump. Sample chromatograms will be scanned against a target compound library stored in the instrument memory, and compound concentrations will be calculated automatically by the instrument microprocessor.

Calibration gas standards will be prepared in air-tight, one-liter, glass vessels using GC carrier gas (volatile free air) and small volumes of high purity neat solvent injected through the vessel septum port using a 10-microliter syringe. Compound concentrations by volume in air are calculated using the Ideal Gas Law and the known volume, density, and molecular weight of the compounds) introduced. Standard concentrations will typically range from 75 to 125 ppm, depending on the compound properties listed. Analysis may include the utilization of commercially prepared calibration gas standards of specific target compounds including vinyl chloride and methane.

Gore Sorber® Screening

Soil-vapor screening may also be conducted through the use of passive soil-vapor collection modules, such Gore-Sorber® modules. Gore-Sorber® modules consist of small adsorptive modules contained within a "string" of Gore-Tex® material; the Gore-Tex® material repels water but allows free passage of volatile organic vapors. The modules are are emplaced in the soil at a shallow depth and allowed to remain for two weeks. Volatile organic constituents, if present within the soil-vapor, are passively adsorbed onto the modules. The adsorptive portion of the module is then later retrieved and sent to the laboratory for contaminant analysis and quantification by gas chromatography/mass spectrometry.

Gore Sorber® installation, retrieval, and analysis procedures are summarized in the following two pages.

GORE
Creative Technologies Worldwide

W. L. GORE & ASSOCIATES, INC.

100 CHESAPEAKE BLVD., P.O. BOX 10 • ELKTON, MARYLAND 21922-0010 • PHONE: 410/392-7600
FAX: 410/506-4780

GORE-SORBER® EXPLORATION SURVEY
GORE-SORBER® SCREENING SURVEY

DESCRIPTION OF SERVICE

Screening Survey Applications

GORE-SORBER® Screening Surveys employing GORE-SORBER® Screening Modules (patented passive soil vapor sampling devices) have been used successfully at many sites for determining subsurface areas impacted by VOCs and SVOCs. Organic compounds commonly detected include fluorinated and chlorinated solvents, straight- and branched chain aliphatics, aromatics, and polycyclic aromatic hydrocarbons (PAHs). Many of these compounds are associated with a wide range of petroleum products, including gasoline, mineral spirits, heating oils, creosotes, and coal tars. GORE-SORBER Screening Surveys have also been used successfully to screen for nitroaromatic explosives.

Common applications include detection of soil vapor analytes to trace soil, and ground water plumes in porous and fractured media, monitor progress of subsurface in-situ remedial actions, and to provide baseline data for real estate transfer assessments. Prudent use of this technology can optimize and reduce soil and groundwater sampling efforts resulting in significant cost savings over the life of site assessment and remedial action programs.

Description Of GORE-SORBER Screening Modules

A typical GORE-SORBER Screening Module consists of several separate GORE-SORBER® Passive Sorbent Collection Devices (sorbers). A typical sorber contains a suitable granular adsorbent material depending on the specific compounds to be detected. Typically, polymeric and carbonaceous resins are used for their affinity for a broad range of VOCs and SVOCs. The sorbers are sheathed in the bottom of a length of vapor-permeable insertion and retrieval cord. This construction is termed a GORE-SORBER module. Both the retrieval cord and sorbent container are constructed solely of inert, hydrophobic, microporous GORE-TEX® expanded polytetrafluoroethylene (ePTFE, similar to Teflon® brand PTFE).

A unique feature of ePTFE membranes are that they are hydrophobic and exclude liquid water, yet they do not retard vapor transfer, thus allowing VOC and SVOC vapors to freely penetrate the module and collect on the adsorbent material. This ability to protect the sorbent media from contact with ground and soil pore water without retarding soil vapor diffusion facilitates the application of GORE's soil vapor screening methods in very low permeability and poorly drained soils.

Screening Survey Installation And Retrieval Procedures

Modules are shipped to customer and installation of the modules is performed by the customer. Although GORE-SORBER modules can be installed to any depth, a slam bar or electric rotary hammer-drill is typically used to auger a 3/4 to 1-inch diameter pilot hole for the deployment of the modules to an average depth of two (2) to three (3) feet below grade. This installation depth minimizes the potential for near surface interference that could have an adverse impact on the soil gas results.

After the pilot hole is completed, modules are inserted into the completed boreholes, using the stainless steel insertion rod supplied by GORE. The top of each cord is typically fastened to a cork, which is tamped flush with the ground surface to assist in retrieval of the module, and to seal the annulus of the boring. An additional percentage of modules are included as trip blanks to document impact to the collectors during shipment to and from the site, storage of the modules away from Gore's facility, and during installation. Field blanks are also available upon request. The trip blanks are to remain unopened through all phases of the survey.

After an exposure period of 14 days, the modules are retrieved from the field. Module retrieval requires that field personnel locate the module, remove the cork, grasp the retrieval cord and manually pull the module from each location. Corks are separated from the module and discarded. The exposed modules are resealed in their respective designated shipping vials and placed immediately on ice in the supplied coolers. In addition, trip blanks and water temperature control blanks (provided by GORE) are also returned. Coolers are returned along with the Chain-of-Custody (COC) form to GORE's laboratory in Elkton, MD via overnight carrier.

Analytical Procedures

Analytical instrumentation consists of a thermal desorption unit coupled with a gas chromatograph and mass selective detector. The samples are analyzed using modified EPA 8260A/8270B methods for the target analytes requested. Laboratory QC is maintained throughout all phases of analysis. Calibration and tuning criteria must be met before an analysis is allowed to proceed. Method blanks are analyzed periodically throughout the sequence to document adverse impact to the soil gas results during the analytical run.

All manufacturing and analytical procedures are adhered to in accordance with the Screening Module Laboratory Operating Procedures and Methods manual. The Screening Module Laboratory conforms with the National Environmental Laboratory Accreditation Conference standards (NELAC) sponsored by the USEPA.

Reporting of Results

The results of the GORE-SORBER Screening Survey will be summarized in a brief report which will include the chain of custody, laboratory analytical data summary tables, total ion chromatograms, and color contour maps. A laboratory analytical data deliverables package incorporating results of samples, standards and blanks, chromatograms, and mass spectra compared to standards for all detects can be provided as an option.

APPENDIX I

Site Utility Plans

HALEY & ALDRICH

APPENDIX J

Revised Storage Tank Plot Plan

HALEY & ALDRICH