COOPERVISION VCA REMEDIATION WORK PLAN
711 NORTH ROAD
SCOTTSVILLE, NEW YORK

by

Haley & Aldrich of New York
Rochester, New York

for

Wallace King Marraro & Branson
Washington, DC

File No. 70665-005
February 2001

HALEY & ALDRICH

UNDERGROUND
ENGINEERING &
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5 February 2001
File No. 70665-005

Wallace King Marraro & Branson
1050 Thomas Jefferson St., N.W.
Washington, DC 20007

Attention: Mr. Chris Marraro, Esq.

Subject: REVISED CooperVision VCA Remediation Work Plan
711 North Road
Scottsville, New York

Ladies and Gentlemen:

This document comprises the Revised Work Plan for Remediation Activities at the CooperVision, Inc. Scottsville facility. Note that this Work Plan is revised from earlier versions submitted to NYSDEC, dated 23 June 2000 and 24 July 2000, based on NYSDEC's comments on those Work Plans dated 14 July 2000, 1 August 2000, a phone conversation on 10 November 2000, and a letter dated 21 January 2001. In addition, we understood the 14 July letter didn't include comments from David Napier (NYSDOH) and Kelly Cloyd (NYSDEC). We solicited comments from both individuals by phone and have incorporated them with this Revised Plan.

This Work Plan contains the following:

- presents a summary of previously gathered data that was obtained in conjunction with a Voluntary Cleanup Agreement (VCA) between the New York State Department of Environmental Conservation (NYSDEC) and CooperVision Corporation at the above-listed property;
- a summary of various remediation technologies that were evaluated for use at the site;
- a summary of the basis for selection of the preferred remedial technology;
- a design plan of the selected remediation technology;
- a reporting, notification and scheduling information related to the work.

Please contact the undersigned with any questions you may have and thank you for the opportunity to continue assisting with this project.

Coopervision understands that the final Remediation Work Plan is required to go through a month-long public review and comment period. It is Coopervision's desire to start the public review and comment period as soon as possible so that we may complete the remediation mobilization and injection in early spring 2001. We are ready to assist NYSDEC as may be needed to facilitate the desired schedule.

Sincerely yours,
HALEY & ALDRICH OF NEW YORK

Nichole L. Case
Hydrogeologist

Vincent B. Dick
Vice President

Stanley E. Walker, P.E.
Vice President

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Letter of Transmittal

Date	5 February 2001
File Number	70665-005
From	Nichole Case
To	Wallace King Marraro & Branson, PLLC 1050 Thomas Jefferson St., N.W. Washington, DC 20007
Attention	Chris Marraro and John Kampman
Copy to	NYSDEC- Mary Jane Peachey & Frank Sowers NYSDEC- Andrew English NYSDEC- James Charles NYSDOH- Mark Van Valkenburg MCDOH- Richard Elliot NYSDOH- Dave Napier The Cooper Companies- Carol Kaufman Coopervision, Inc.- Dennis Snyder Coopervision- John Calcagno
Subject	CooperVision Remediation Work Plan

Copies	Date	Description
1	2/5/2001	Remediation Work Plan for CooperVision Site

Transmitted via ☒ First class mail ☐ Overnight express ☐ Hand delivery ☐ Other

Remarks

Ladies & Gentlemen,

Enclosed is the Final Remediation Work Plan for the Coopervision facility in Scottsville, New York.

Please feel free to call me at 716.321.4239 or Vince Dick at 716.321.4207 with any questions or comments.

Regards,
Niki Case

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I. INTRODUCTION

1.1 Project Background

CooperVision, Inc. (Coopervision) submitted a report entitled "Revised Report on VCA Investigations, Coopervision, 711 North Road, Scottsville, New York". This report summarized the investigations completed at the site in 1999 under a Voluntary Cleanup Agreement (VCA) between Coopervision and the New York State Department of Environmental Conservation (NYSDEC). The VCA Investigation Report summarizes site conditions based on investigations completed under the VCA and made recommendations as to a remediation technology for use at the site.

The data and conclusions that were generated from 1997 and 1998 investigations, contributed to the development of the work scope for the investigations that took place in 1999. The investigations that took place in 1999 were intended to further define the Site contaminant plume, both laterally and vertically; to determine if there are apparent offsite contaminant issues related to the Site; to determine if there are apparent exposure pathways, and to recommend additional work, including remediation if warranted, at the site.

Haley & Aldrich made preliminary recommendations in their 1998 report for possible site remediation design and implementation (reactive walls or enhanced bioremediation). At that time, NYSDEC declined to comment on the recommended remediation, stating that more site information was needed to select a remediation technology. Based on the additional data and conclusions generated from the 1999 investigations, potential remediation design and implementation was revisited and discussed in the Summary of Investigation & Recommendations section of the VCA Investigation Report.

This document summarizes review of remedial technologies potentially applicable to the site, provides basis for selection of a preferred technology, and provides design and work plan for implementation and monitoring of the selected remediation technology.

1.2 Site History

The CooperVision facility is located on a parcel of land of about 5.4 acres. The property includes an original building with additions having a total area of approximately 50,000 sq. ft. (See Figure 1). Soil and groundwater on some portions of the property have been found to be impacted primarily by 1,1,1-trichloroethane ("TCA"), possibly from activities of a former owner who, beginning in the mid-1970's, occupied the property and used it for manufacturing of contact lenses. A summary of site environmental conditions related to historical release of TCA is provided in Section II below. Additional details on site history can be found in the VCA Investigation Report under Section 1.2, "Site History".

1.3 Project Objectives

The primary objectives of this design work plan are listed below:

- summarize the findings of the VCA investigation;
- discuss selection of various potential remediation technologies for use at the site;

- discuss the selected technology that satisfies the criteria of Section 375-1.10 of the Environmental Conservation Rules and Regulations, Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York 6 NYCRR;

- discuss the remediation design and implementation methods that will minimally disrupt facility operations;

- describe a monitoring program that will track the remediation implementation progress of anaerobic conditions and changes in VOC concentrations.

A summary of relevant site conditions appears in Section II.

Remediation technologies screened for potential application at the site are summarized in Section III, along with an evaluation of the technologies against NYSDEC screening criteria found in Section 375-1.10 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York 6 NYCRR.

A design and work plan for implementation of the preferred technology, Enhanced Bioremediation, is provided in Section IV.

Project reporting and scheduling is summarized in Section V.

II. SUMMARY OF VCA INVESTIGATION FINDINGS

2.1 Source Area Characterization

The data collected during the 1999 VCA investigation, as well as data collected from previous investigations, indicates that the source area appears to be confined to the area of the compressor room, specifically highest in the area outside the compressor room door. Past soil vapor sampling and borings performed in 1997 and 1998 indicate the lateral extent of the source area consists primarily of the courtyard outside the Compressor Room. Primary site contaminants include 1,1,1-trichloroethane, 1,1-dichloroethene, and 1,1-dichloroethane.

Information on apparent vertical and lateral extent of contamination is provided below in Sections 2.2 and 2.3, respectively. The base area assumed for remediation purposes is described in Section 2.3.

2.2 Affected Media, Fate & Transport

Subsurface soil, groundwater and, to a lesser extent, soil vapor are affected by site compounds. Soil concentrations in the source area range from less than 10 ppb to greater than 3-ppm total CVOCs. Groundwater contains up to 690 ppm CVOCs in the source area. Laterally groundwater diminishes to low ppb or non-detect at the most direct downgradient property line.

Vertically, groundwater contains CVOCs up to approximately 46 feet beneath the source area. The VCA investigation included installing a deep groundwater monitoring well in the apparent source zone area to estimate vertical extent of the plume. Previously installed wells went to a maximum depth of 34 feet below ground surface (bgs). The newly installed well (MW-401) was drilled to a depth of 46.5 feet bgs and the screen was set at a depth of 46 feet bgs. The deeper well was installed to determine the vertical extent of the plume in the source area. VOCs were detected to approximately 46 feet bgs in the source area, however we do not believe these readings represent the actual vertical extent of the plume. Through much of the boring, loose wet material was present in the spilt spoon that did not appear to be associated with the other denser material in the spoon. In addition, screening of well development water over 2 weeks of development for initial sampling in October 1999 indicated significant reduction of soluble VOCs over time. This indicates water quality was probably affected by the material that infiltrated the augers during drilling.

The first round of groundwater samples collected from MW-401 in October 1999 showed that CVOCs were present in the groundwater at a concentration of 0.77 ppm. The compounds in the groundwater were found to be 1,1,1-TCA, 1,1-DCE, and 1,1-DCA. Based on the concentrations of VOCs, NYSDEC requested installation of a deeper, bedrock well in the vicinity of MW-401.

With agreement of NYSDEC, additional development was completed and a second round of groundwater samples was collected from MW-401 in April 2000. The CVOC concentration dropped to 0.11 ppm in this recent event. Again, the compounds were found to be 1,1,1-TCA, 1,1-DCE, and 1,1-DCA. This decline appears to confirm that water quality in the initial sampling event was affected by the material that infiltrated the augers during drilling. Because of this, we do not recommend any further action on the requested bedrock well installation.

Based on groundwater elevations, groundwater flow direction has consistently been towards the east-southeast from several dates of observation over several years. Hydraulic conductivities in the 400 series wells were measured using falling and rising head tests and were calculated to range from 3.0 x 10^{-4} cm/sec to 9.1 x 10^{-7} cm/sec, which is consistent with conductivity values previously calculated from other site wells; ranging from 2.3 x 10^{-6} cm/sec to 4.6 x 10^{-7} cm/sec.

2.3 Area Assumed for Technology Evaluation

Based on the site characterization, including apparent groundwater flow direction and apparent locations of CVOCs in groundwater, the overall remediation is assumed to be the courtyard outside the compressor room doors and core area of the plume extending from the compressor room downgradient to the area of wells MW-3 and MW-403 near loading dock #2. This overall remediation and dimension is approximately 150 feet in east-west dimension and 40 feet in north-south dimension.

Note that for purposes of HRC application and design, this overall area had to be subdivided into four parts, with 2 main areas and 2 sub-areas. The main areas for HRC design are the apparent source zone located outside the compressor room door, designated as Area 1, and the area adjacent to loading dock #2, in the vicinity of MW-3 and MW-403, designated as Area 2 (see Figure 2). Area 1 is defined as an area of approximately 35 feet by 55 feet. Area 2 is approximately 35 feet by 40 feet. The sub-area associated with Area 1, designated as Area 3, is located south of the Molding Stores room and is approximately 30 feet by 20 feet in size. The sub-area associated with Area 2, designated as Area 4, is located east of the Molding Stores room- this sub-area is essentially a line parallel to the east wall of the building.

2.4 On/Off Site Exposures

A health risk assessment was completed by Haley & Aldrich in 1998 as part of that Site Investigation. NYSDEC requested that health exposure assessment be revisited during the 1999 investigations. This Exposure Assessment included evaluation of groundwater, vapor and surface water pathways. Sampling of soil, groundwater, surface water, and soil vapor, and utility evaluation was performed to assess apparent completeness of pathways. The assessment concluded there are no apparent complete pathways at this time based on current activities at the site.

III. EVALUATED REMEDIATION TECHNOLOGIES

The remedial alternatives discussed in the following sections have been evaluated on the basis of their ability to meet the following seven criteria, in accordance with Section 375-1.10:

1. Compliance with applicable and relevant New York State Standards, Criteria or Guidance (SCGs);
2. Overall protectiveness of public health and the environment;
3. Short-term effectiveness;
4. Long-term effectiveness;
5. Reduction of toxicity, mobility, and volume with treatment;
6. Feasibility; A feasible remedy is one that is suitable to site conditions, capable of being successfully carried out with available technology, and that considers, at a minimum, implementability and cost-effectiveness;
7. Community acceptance.

Sub-criteria of the above criteria (e.g. SCGs and reduction of toxicity, mobility, and volume) were evaluated if relevant to the technologies discussed below.

The following section discusses the identified options in light of the first six criteria; community acceptance is determined through regulatory agency review and public comments.

A total of five remediation technologies were evaluated for potential use at the Coopervision site:

- Excavation
- 2-PHASE Extraction®
- Steam Stripping
- Permeable Reactive Barrier (PRB) using reactive iron
- Enhanced Bioremediation using Hydrogen Release Compound (HRC)

3.1 Excavation

Excavation of the contaminated soil within the courtyard portion of the source zone was evaluated. This option would require excavation to 12 to 15 ft. depth to remove soils that appear to exceed NYSDEC TAGM 4046. Soils near the building footprint outside the compressor room would require sloping or stabilization to prevent undermining the building. Because a portion of the source zone is located adjacent to and beneath the slab of the site building, it would not be possible to effectively excavate source soils. Therefore, because a portion of the source zone would be left in place, this option's ability to meet SCGs to the extent of other options, its environmental effectiveness, and cost would render it infeasible.

3.2 2-PHASE Extraction®

A 2-PHASE Extraction system employs high vacuum through a straw placed in a conventional well so as to recover groundwater and soil vapor simultaneously. In the process, separate phase VOC mass near the well is aspirated, residual VOC mass is volatilized into soil vapor, the soil vapor is extracted at high rates, and the groundwater is extracted in slugs along with the soil vapor under optimum conditions. A large capture zone in groundwater is typically created due to the rapid groundwater extraction. The VOCs in the recovered groundwater are stripped into the vapor phase. Liquids are separated out of the flow, and VOCs are captured on activated carbon.

For 2-Phase to be a viable remediation technology at a site, the hydraulic conductivity of the soil has to be high enough for the vacuum to create a reasonably-sized capture zone; the larger the capture zone the fewer wells required to remediate a source. The lower the hydraulic conductivity of the site, the more recovery wells that are required to create the optimum large capture area. Given the low hydraulic conductivities at the Coopervision site, an unacceptably high number of wells would be required to obtain the necessary capture zone for site adequate remediation.

A 2-Phase pilot test was completed at the site in 1997 and was not considered to be a success. The pilot test consisted of putting a vacuum on a site well for a 8 hour period. This was completed on three of the wells at the site (MW-1, MW-2 and MW-205). During the tests several parameters were recorded including the vacuum on the well, water levels, vapor contaminant concentrations, vacuum levels around the extraction well, and groundwater contaminant concentrations. The system never achieved a good drawdown or vapor influence. Based on the pilot test results potential extraction well spacing may be as little as 10 – 15 ± ft. on center.

For implementation over the plume area the wells, piping, and equipment required for effective remediation would occupy a large portion of the Coopervision northern parking lot and entranceways.

Although this technology is a mature one and has been implemented at numerous sites, it was not selected because it did not meet several of the criteria of Section 375-1.10. Primarily implementation of the technology would have significant short and possibly long-term (several years) impact on operations at Coopervision. Further, the pilot test did not provide sufficiently successful results to adequately determine well spacing, design and costs.

3.3 Steam Stripping

Steam stripping is a process by which steam is injected into the subsurface in an effort to raise the temperature of the soil and groundwater to the point of boiling thereby vaporizing the volatile organic compounds from the soil and groundwater. This technology has been used at relatively few sites and is not considered a mature technology.

Steam stripping is most effective in highly permeable soils since the steam moves most readily by advection. In lower permeability soils, such as those at Coopervision, the steam cannot readily flow through the finer, more dense material, therefore the heat from the steam moves more by conduction. This form of heat transfer would require a closely spaced grid of injection and extraction wells, at least on the same order as the preliminary estimate for 2-PHASE Extraction above.

This technology was determined unacceptable for the Coopervision site, for the same reasons as 2-PHASE Extraction, discussed above.

3.4 Reactive Iron Wall

The EnviroMetal Process is an in situ method of treating groundwater contaminated with volatile organic compounds (VOCs). In the presence of metallic iron surfaces, several dissolved chlorinated VOCs in groundwater degrade to non-toxic products such as ethene, ethane, methane and chloride ions. The process is abiotic dehalogenation, with the metal serving to lower the solution redox potential and as the electron source in the reaction. Two competing pathways, sequential hydrogenolysis and reductive beta-elimination, each lead to ethene and ethane as final products. Using granular iron, degradation rates may be several orders of magnitude higher than those measured under natural conditions. To date, several laboratory and field scale projects have demonstrated the applicability of zero valent iron to degrade chlorinated solvents and their breakdown products, the type of compounds present at the Coopervision facility. A permeable reactive barrier (PRB) using iron could be implemented at Coopervision although it would significantly disrupt a large area of the parking lot during installation.

A PRB would meet most of the criteria in Section 375-1.10 (short and long-term effectiveness, reduction of contaminant toxicity and mobility, overall protectiveness of the public). It would not reduce contaminant mass in the source area but would instead serve as a reactive barrier downgradient of the source area. Its capital costs were estimated at $275 to $375k depending on field configuration, which is greater than the estimated HRC remediation cost (below).

3.5 Hydrogen Release Compound

Hydrogen Release Compound (HRC) represents a potential remediation solution to the contaminant source at the CooperVision facility. HRC is a proprietary, environmentally safe, food quality, polylactate ester specially formulated for slow release of lactic acid upon hydration. The HRC is injected into the subsurface contaminant plume and then left in place where it passively works to stimulate contaminant degradation. The process by which HRC operates is a complex series of chemical and biologically mediated reactions. Initially, sugars contained in HRC stimulate aerobic population "overgrowth" that ultimately consumes oxygen and promotes onset or enhancement of anaerobic conditions. When in contact with subsurface moisture, the HRC slowly releases lactic acid. Indigenous anaerobic microbes metabolize the lactic acid producing consistent low concentrations of dissolved hydrogen. The resulting hydrogen is then used by other subsurface microbes (reductive dehalogenators) to strip solvent molecules of their chlorine atoms and allow for further biological degradation. When in the subsurface, HRC continues to operate in this fashion for a period of time, which varies with site conditions.

HRC has provided positive treatment of chlorinated compounds at other sites where it has been applied, although it is a relatively new technology. Until recently Regenesis, the producers of HRC, had not developed data on effectiveness of the product on soil areas with concentrations of chlorinated compounds similar to concentrations found at the Scottsville facility. Therefore, during the October 1999 fieldwork, Regenesis was supplied with samples of soil and groundwater from within the apparent source zone so that they could conduct microcosm experiments to evaluate the efficacy of HRC application for this site.

Representative and relatively undisturbed soil and groundwater samples from the source zone area were collected and shipped to Regenesis so that they could conduct microcosm studies on the samples. The studies are used to help determine if HRC is a viable option. Microcosm studies consist of laboratory experiments conducted on soil and groundwater from the site. They generally include experiments used to determine the viability of microorganisms in the contaminated soil and water, as well as estimate potential contaminant degradation processes and estimated rates with and without HRC.

The microcosm studies for the CooperVision facility were performed by Applied Power Concepts (APC) of Anaheim California. The microcosm uses representative samples from the site to evaluate presence and viability of microorganisms capable of biodegrading chlorinated VOCs, particularly when stimulated with application of HRC. APC's reports of the microcosm results are attached as an Appendix in the Revised Report on VCA Investigations for the CooperVision facility.

Initial microcosm testing included testing degradation of TCE in the Site's soil/groundwater sample at low (10 ppm) and moderate (25 ppm) concentrations. TCE is used initially because it is the standard protocol for Regenesis treatability testing and because biodegradation of TCE requires generation and destruction of daughter products through DCE, VC and finally ethene. Degradation of TCA does not produce significant VC as a daughter product.

Therefore, TCE testing is used as a "threshold" test to determine capability to degrade all the way through a VC daughter.

The results of the initial study showed the following:

- Viable populations of microorganisms capable of CVOC degradation are present in the site source area soils collected, and can be stimulated by HRC application.
- Degradation of TCE in the "low" concentration samples (10 ppm) ranged up to 75±% after 28 days. DCE and VC as daughter products were produced in the samples, but also diminished in concentration over the period of testing.
- Degradation of TCE in the "moderate" concentration samples (25ppm) ranged up to 80±% after 28 days. Again, DCE and VC were produced as daughter products, but tended to diminish over the duration of the test.

A second treatability study was completed by APC which included testing degradation of TCA in the Site's soil/groundwater samples at low (25 ppm) and high (250 ppm) concentrations.

The results of the second treatability study showed the following:

- Viable populations of microorganisms capable of CVOC degradation are present in the site source area soils collected, and can be stimulated by HRC application.
- Degradation of TCA in the "low" concentration samples (25 ppm) ranged up to 79±% in 28 days. DCA as a daughter product was produced in the samples.
- Degradation of TCA in the "high" concentration samples (250 ppm) ranged up to 92±% in 28 days. Again, DCA as a daughter product was produced in the samples.

Our experience applying HRC at other sites, in full-scale field applications, indicates that typical degradation is not a linear function. Daughter products in particular will exhibit a "saw tooth" pattern of increased, then decreased concentration over time caused by changing activity rates of the microorganisms, seasonal variation of water quality, desorption variation from soil, etc.

In summary, APC concluded that the site is appropriate for a field application using HRC.

Based on the criteria in Section 375-1.10, HRC appears to be an acceptable remediation technology at the Coopervision site. Its installation period is relatively short and, once installed, does not markedly affect surface use, a requisite feature for Coopervision's confined operations on site. It can be applied across the assumed treatment area, reducing mass where applied. Capital costs are estimated to be less than $250k.

In response to NYSDEC's questions regarding potential health and environmental impacts of using HRC as well as potential physical hazards or special handling or monitoring that might be required, we contacted Regenesis to address these questions. Regenesis confirmed that explosive levels of hydrogen cannot be achieved using HRC- the hydrogen released by the HRC process (breakdown of lactic acid) is dissolved phase hydrogen. The slow release aspect is meant to keep the hydrogen concentrations below 10 nanomolar for the reductive dechlorinators which is both too low a concentration and in a non-gaseous phase precluding potential explosive conditions. Therefore no special monitoring is required. Regarding the potential health and safety issues associated with future excavations in the injection areas, HRC is a food grade material that dissolves and is consumed by microorganisms over time. It is not expected to pose any danger with future excavations.

3.6 Selected Remediation Technology

Based on the above discussion, HRC is the preferred remediation technology for the CooperVision Scottsville facility. The following table illustrates which technologies meet which criteria from Section 375-1.10:

Technology	Compliance w/SGCs	Protectiveness	Short-term	Long-term	Reduction	Feasibility	Acceptance
Excavation	?	?	x	?		2	3
2-Phase	x	x	x	x	x	2	3
Steam Stripping	x	x	x	x	x	2	3
Reactive Fe	1	x	x	x	x	x	3
HRC	x	x		x	x	x	3

1. Not at source area.
2. Not feasible due to space constraints at site.
3. Acceptance determined by Agency review and public comments.

Excavation is not feasible primarily because a portion of the source zone would not be removed where it falls immediately adjacent to and under the site building. The 2-Phase Extraction and steam stripping would simply require too many injection/extraction points to be cost-effective and would cause too much site disruption. Reactive iron meets much of the criteria, but is more costly to apply and does not reduce the source area contaminant mass. Based on the above, it is concluded that HRC is the most desirable remediation technology for the Coopervision site.

IV. REMEDIATION DESIGN

4.1 Remediation Objective

The remedy selected shall eliminate or mitigate the Site's "significant threat to the environment" as defined by 6 NYCRR Part 375-1.4 presented by the hazardous wastes at the Site through the proper application of scientific and engineering principles and be protective of human health and the environment.

The contemplated use for the Site is the continued operation of a facility for the manufacture of contact lenses or other industrial or commercial uses but excluding child/day care, health care facilities and hospitals. The remedial objectives are to:

- Reduce, control or eliminate soil contamination to meet all applicable Standards, Criteria and Guidance (SCGs) to the extent practicable;

- Eliminate or mitigate the potential for direct exposure to contaminated soils;

- Mitigate the impacts of contaminated groundwater to human health and the environment; and

- Provide for the attainment of SCGs for groundwater quality to the extent practicable.

4.2 Grid Design

Based on groundwater contaminant concentrations measured in October 1999, two main areas of interest have been called out for HRC injection at the site with two sub-areas associated with the main areas. The main areas are the apparent source zone located outside the compressor room door, designated as Area 1, and the area adjacent to loading dock #2, in the vicinity of MW-3 and MW-403, designated as Area 2 (see Figure 2). For the purposes of the remediation design, Area 1 is defined as an area of approximately 35 feet by 55 feet. Area 2 is approximately 35 feet by 40 feet. The sub-area associated with Area 1, designated as Area 3, is located south of the Molding Stores room and is approximately 30 feet by 20 feet in size. The sub-area associated with Area 2, designated as Area 4, is located east of the Molding Stores room; this sub-area of injection will consist of a line of injections points parallel to the building.

The Regenesis HRC design software was used for determining the design of the HRC injection including the injection grid spacing and the amount of HRC to inject per hole. Inputs on specific site information including hydraulic conductivity, soils type, contaminant concentrations, area of contaminated zone(s), as well as other groundwater parameters (DO, conductivity, etc.) were used. The software was run separately for each area of interest at the site, with the exception of Area 4 (see details below) because the Areas have different properties from each other, most significantly to the design software being groundwater CVOC concentrations. Copies of the input/output sheets for each area are in Appendix B. These sheets provide the details of each Area including the input data (those stated above) as well as calculated output data (number of injection points, the amount of HRC required per injection point).

Based on the above, it has been determined that a 7-foot grid spacing would be most appropriate for Area 1 while a 10 foot grid spacing would be most appropriate for Areas 2 and 3. Area 4 will consist of a line of injection points running north-south against the wall of the Molding Stores room (see Figure 2). This spacing and grid area will result in a total of approximately 40 injection points in Area 1, 14 injection points in Area 2, 7 injection points in Area 3, and 4 injection points in Area 4.

AREA 2 INJECTION - The software also calculates the amount of HRC (pounds/ft of borehole) estimated to result in "non-detect" groundwater contaminant concentrations. Since groundwater concentrations are relatively low in Area 2, (13.4 ppm in MW-3 and 0.0059 ppm in MW-403) designing the injection grid and HRC required was relatively simple. Using the software, based on a 10-foot grid spacing in Area 2 and using the groundwater concentrations from MW-3, it has been determined that 14 injections points, each with approximately 2 lbs./ft. of HRC, will be completed in Area 2. The software recommended 16 injection points, however based on the position of Area 2 in relation to the nearby loading dock, 14 injection points were determined to be feasible (see Figure 2).

The injection interval for Area 2 will be from approximately 5 feet below ground surface (depth to water) to approximately 25 feet below ground surface. The injection interval is based on VOC concentrations in groundwater in the area- MW-3, which is screened from 3-10 feet below ground surface, showed a total VOC concentration of 13.4 ppm while MW-403, which is screened from 38.5 to 43.5 feet below ground surface, showed a total VOC concentration of 0.0059 ppm. Based on these concentrations and screened intervals, it appears that the majority of contamination in this area is located closer to the ground surface. Therefore, the injection interval is concentrated closer to the ground surface.

AREA 3 INJECTION - Additional assumptions were made in designing the Area 3 injection. Because there are no groundwater wells directly in the area, a groundwater concentration had to be assumed. Although this area is in close proximity to the source area, it is downgradient and we therefore assumed decreased groundwater concentrations; assumed 30 ppm DCA and 1 ppm TCA. Using these assumptions the software calculated that, using a 10-foot grid spacing, approximately 2.4 lbs./ft. of HRC was required in 6 injection points.

The injection interval for Area 3 will be from approximately 5 feet below ground surface (depth to water) to approximately 38 feet below ground surface. This interval is based on VOC concentrations in groundwater in the area as well as FID readings recorded during drilling activities in this area. Although MW-401 does not fall within the bounds of Area 3, we believe it is close enough to Area 3 for purposes of comparison. During the installation of MW-401, FID readings were shown to decrease substantially from 34 feet below ground surface to 36 feet below ground surface (from 408 ppm to 263 ppm), and again from 36 feet to 38 feet below ground surface (from 263 ppm to 7.8 ppm). It therefore appears that the most significantly contaminated zone does not go deeper than 38 feet below ground surface.

AREA 1 INJECTION - The source area, Area 1, was somewhat more complicated to design. Because groundwater concentrations are relatively high in this area, it is not reasonable to assume that one HRC injection would result in groundwater concentrations of zero. It is also unlikely that if the amount of HRC that the software calculated to be required to reach non-detect concentrations was injected in this area, that the HRC would be efficiently used.

Please note that the HRC software was developed for sites with significantly lower groundwater concentrations than those encountered in Area 1 of the Coopervision facility. If the groundwater concentrations found in Area 1 are input into the design software, a flag opens up recommending the user to contact Regensis directly. Based on that inherent design and the assumptions that the software makes (assumes final groundwater concentrations at non-detect after one injection), Regensis modified the software for the Coopervision site to assume relatively low (< 1-10 ppm) but detectable concentrations after injection. Accordingly, and with Regensis assistance, different concentrations of CVOCs were used for injection design.

After those modifications were made and pertinent Area 1 data input, it was determined that approximately 5 lbs./ft. of HRC will be injected into 40 injection points this area.

Using the same rationale and assumptions that were used for Area 3, the injection interval for Area 1 will be from approximately 5 feet below ground surface (depth to water) to approximately 38 feet below ground surface.

The injection for Area 1, as well as the other areas, has been designed as a single injection event. Potential future injections will depend on the results that are observed from the first injection- it can take as long as 6 to 12 months to evaluate the data and determine what the effectiveness of the HRC is.

AREA 4 INJECTION - The software was not used to design the injection in Area 4 because this Area is really a line of injection points, not an area. As such, based on nearby groundwater concentrations, a 7-foot spacing was used. Only four points will be placed in this area simply because of lack of access closer to the building (a drill rig necessary for the injection cannot get any closer to the building). The injection interval for Area 4 will be similar to Areas 1 and 3, from approximately 5 feet below ground surface (depth to water) to approximately 36 feet below ground surface.

The area between Area 4 and Area 2 will not be directly injected with HRC because the HRC from Area 4 will indirectly treat the area between Areas 4 and 2- the source area is well established within Area 1 which therefore means the contamination observed in Area 2 is a result of contamination migrating in the groundwater from Area 1 to Area 2. Using the same rationale for Area 4 (immediately east and downgradient of Area 1), we can assume that contamination within Area 4 also migrates to Area 2. Since HRC also moves with the groundwater (similar to dissolved phase contamination), HRC injected within Area 4 (as well as Area 1) will migrate to Area 2, treating the area between Areas 4 and 2.

NYSDEC requested that the injection points within Areas 1,3, and 4 extend into the sand layer identified in the investigation report. The "sand" layer is an apparent sandy glacial till lens that was reported to be present approximately 10 feet above bedrock, situated within the very dense sandy silt which is otherwise present across the site. As described in the report dated 6 May 2000, although this lens has the potential to act as a conduit for contaminant migration, it appears unlikely based on the following; in the soil classification system, the difference between a silty SAND and a sandy SILT could be as little as 5-10% difference in apparent sand content. The classification system works such that the descriptor (sandy or silty) makes up 20-50% of the total sample while the major constituent (SAND or SILT) makes up >50% of the total sample. Further, the density of the soil did not change through this interval- N values obtained throughout this interval were all greater than 100, indicating a very dense material. Additionally, field VOC readings did not change significantly from the sandy SILT to the silty SAND. It therefore appears that this sandy lens is unlikely to act as a preferential pathway over the primary soil matrix. However, since this layer was observed from approximately 32 to 36 feet below ground surface at MW-403 (Area 2) and from approximately 34 to 36 feet below ground surface at MW-401 (Area 1), the proposed injection will penetrate the sand layer.

Copies of the input/output sheets are in Appendix B.

AREAS OF NON-INJECTION -There are some areas on the site that contain concentrations of CVOCs dissolved in groundwater, but are not being directly injected. This however does not mean that those areas will not be treated. In particular, NYSDEC requested clarification as to how HRC will be delivered beneath the building in the source zone without injection points beneath the building. The processes described below apply to the zone beneath the building slab of the compressor room, as well as impacted areas deeper than the injection interval, and downgradient areas from the injection locations (Areas 1 and 3).

As discussed above in the section on the Area 4 injection, the injected HRC dissolves and releases hydrogen, which moves via advection, dispersion, and diffusion, processes. Primarily advection and dispersion will deliver the HRC constituents to the downgradient locations that have low CVOC concentrations (specifically OW-304). Since the HRC moves much like a dissolved phase plume moves, we can assume that if the CVOCs migrated from the source zone to the downgradient location, then the HRC will migrate there as well.

The CVOC concentrations beneath the building slab have been observed to be relatively low compared to those in the outside area (on the order of 0.25-ppm total CVOCs). The majority of contaminant mass resides at and immediately down gradient of the courtyard source areas where the planned injection grid covers. Additionally, through the proposed injection, HRC can be delivered immediately adjacent to the building foundation. The HRC is expected to be forced to some extent laterally into the formation because it will be injected under pressure (see Section 4.3 below for details on pressure). Further, because HRC dissolves into groundwater, it will migrate away from the injection points via advection, dispersion, and diffusion of the HRC. Because hydraulic gradients and hydraulic conductivity values are relatively low, lateral migration via diffusion is expected to play a significant role in lateral hydrogen transport from injection points in directions that advective processes don't significantly affect migration.

Regenesis has provided Haley & Aldrich with a draft Technical Bulletin (expected to published on the internet shortly) that illustrates the roll of diffusion of HRC through both theoretical and experimental data.

In terms of theoretical demonstration, Fick's First Law is the basis of diffusive migration; it states:

$$C\ (x,t) = Co * \text{erf c}\ (x/2(D*t)^{0.5})$$

where C is the final concentration at distance x, Co is the initial concentration, erf c is the complimentary error function, D is the diffusion coefficient, and t is time. Regenesis has determined that a reasonable minimum target effective concentration of lactic acid (the initial breakdown product of HRC) is 20 ppm. If we assume an initial concentration of 1000 ppm (injection concentration), a desired final concentration of 20 ppm, and a diffusion coefficient of 0.0022 cm2/sec, then the above equation can be solved for x (distance) at various times. Solving the above equation at various time intervals shows that an effective concentration of lactic acid (HRC) will be present 28 feet radially from the point source after a time interval of 1 year. It is important to note that the above equation does not take into account the effects of biological or chemical consumption, or aquifer matrix tortuosity.

If we apply Fick's First Law to the area near and beneath the compressor room, we can calculate the time required to achieve an effective concentration of lactic acid at a given distance. Based on the relatively low VOC concentrations found to be present beneath the compressor room slab and the size of the compressor room, we used a distance of 10 feet (half the length of the compressor room). Solving for time (using the same concentrations and diffusion coefficient as above), it will take approximately 45 days for the lactic acid to diffuse approximately 10 feet into the compressor room and be present at an effective concentration of 20 ppm. Again, note that this calculation does not take into account the effects of biological or chemical consumption or aquifer matrix tortuosity.

As experimental demonstration, Regenesis also ran column experiments to determine the effects of diffusion in a closed system. To establish the experiments, soil samples with active populations of TCE degraders were homogenized and packed into a series of 6.0-foot long aquifer simulator columns. A solution of 25 ppm TCE was passed through the columns to make the concentration of TCE constant throughout. A total of four columns were set up; two were packed with 10% loam and 90% clay while the other two columns were packed with 10% loam and 90% sand. One column in each of the soil systems was injected with injectable quality HRC (viscosity of 20,000 cP) and the other was injected with implant quality HRC (viscosity of 200,000 cP). Both viscosity materials were used because Regenesis wanted to determine the differences in diffusion rates with varying viscosities. The HRC was injected into the columns and movement away from the injection point as a result of diffusion was measured (i.e. there was zero differential head across the column). Sampling ports were located at various distances from the injection point on the columns. The ports were sampled at regular intervals to determine the concentration of HRC and its breakdown products. Analyses indicated that the rate of diffusion in all of the columns, regardless of soil conditions and HRC viscosity, was between 3-4 in/day. This data was compared to an equation referenced by Segol (Groundwater Simulations, 1994) used for diffusion in a cylinder rather than from a point source, as shown below:

$$0.6= Dt/r2$$

where D is the diffusion coefficient in cm2/sec, t is time in seconds, r is the radius of diffusion in cm. Using the experiment-derived data (again with an initial concentration of 1000 ppm and desired target minimum of 20 ppm) the data was fitted, converted to English units, and using an average value from the experiments of 1 foot in 3 days, resulted in an effective diffusion coefficient of 0.2 ft2/day. The diffusion rule derived thereof is:

$$t=3x2$$

where t is the time in days it takes the front to move out a distance in x feet. Applying this to the Coopervision site would indicate that approximately 300 days would be required for the front to reach the midway point of the compressor room, with effects of biologic consumption, an allowance for aquifer tortuosity, etc.

The same diffusion migration to areas downgradient will also happen, although advective transport will play a role in addition to diffusion and dispersion.

In regards to the CVOC impacted intervals beneath the injections, we believe that the HRC injected at higher intervals in the formation will also treat the lower intervals. In general, the site hydraulic gradient is downward which will facilitate the transport of the HRC downward to the intervals that were not directly injected. Additionally, diffusion and dispersion processes will also support migration in a vertical direction.

4.3 Injection

HRC is typically introduced to the subsurface in a grid-like manner using Geoprobe-type direct push methods, however because of the required depth of injection for this site and the high density of the soils, it is likely that a rotary injection method will be required to reach the desired injection depth, the deepest being approximately 38 feet below ground surface. A field test with a more powerful Geoprobe rig took place at the site on 8 July 2000. This field test, completed by Zebra Environmental Services, under the observation of Haley & Aldrich, was completed to determine if a more powerful direct-push rig was capable of reaching the desired injection depth. The rig was only able to penetrate to approximately 10 feet below ground surface. Based on this field test, it appears that a combination rotary injection- direct push technique will be required for the HRC injection.

The combination rotary injection-direct push technique method would involve advancing a tri-cone rotary bit or narrow diameter solid-stem auger from the ground surface to the desired depth. Once the desired depth is reached the bit/auger will be removed from the hole and a direct-push tool will be inserted into the hole and will act as the injector. HRC will be injected through the tool tip under pressure using a Rupe Pump, or equivalent, as the tip is slowly removed from the borehole base. In a normal direct-push type injection, pressure is achieved and maintained in the boreholes by friction between the injection tools and the formation. Pressure is measured directly at the pump. For this project, several options have been proposed by the driller, each of which has been designed to address potential problems in the field. The first hole will be attempted as follows: a pilot hole will be completed prior to the injection using a bit/auger as described above. Injection will follow by inserting an injection tip or tool whose diameter matches the pilot hole as tightly as possible. Because there will be a pilot hole, there is a potential for loss of some friction between the tool and the formation. To help mitigate this, the tool used to create the pilot hole will match the injection tool in diameter as closely as possible so as to maintain the most friction possible. Again, the pressure will be measured directly at the pump. If blowback occurs near the surface the injection will be terminated and another hole will be completed adjacent to the first hole. The second hole will be advanced using direct push methods only, creating a hole with the injection tool and injecting as the tool is retracted from the hole. By doing this a greater amount of friction will be created between the injection tool and the formation, thereby creating a better seal in the hole, facilitating the injection of HRC into the formation rather than to the ground surface. If blowback is observed at depth then the hole will be repeated using a smaller bit, attempting to find the "best fit" for the hole and create a better seal between the injection tool and the formation. If we find that neither of the initial approaches work then a pilot hole will be drilled with a tri-cone bit while driving casing. The injection will take place through the casing as the casing is being retracted from the hole. Inflatable packers may also be used to create a better seal between the casing and injection tool. Injection will proceed from the target depth to approximately 5 feet below ground surface, the approximate high water mark.

The volume of HRC that will be injected in each hole will be calculated by the driller prior to the start of injection. The volume of HRC to be injected into each hole is calculated by determining the volume of HRC delivered with each stroke of the pump. The volume is then converted into weight using a conversion table provided by Regenesis. This calculation and conversion determines the pounds of HRC delivered in each stroke of the pump.

4.4 Additional Groundwater Wells

To monitor groundwater conditions after the HRC injection, two additional monitoring wells will be installed; one immediately east of the molding stores areas near MW-2 (shown as MW-502 on Figure 2) and one approximately 20 feet south of the molding stores area (shown as MW-501 on Figure 2). The well east of the molding stores area will be installed to a depth of approximately 35 feet below ground surface with a screened interval from approximately 35 to 30 feet below ground surface. NYSDEC requested that the screened interval for this well include the sand layer identified in the investigation report which was observed from approximately 542 feet above sea level to approximately 538 feet above mean sea level. At this location the well screen as proposed will include the interval. The well south of the molding stores area will be installed to a depth of approximately 20 feet below ground surface with a screen interval from approximately 20 to 15 feet below ground surface. The proposed screened intervals were selected after review of the other screened intervals in the area - these two intervals (15-20 feet below ground surface and 30 to 35 feet below ground surface) are the two intervals that have not yet been discreetly monitored in the area, yet will be affected by the HRC treatment.

Each of the boreholes will be drilled with a 2 ¼ in. hollow-stem auger. The boreholes will be continuously split-spoon sampled until the desired depth is reached. Soil samples in the split spoons will be screened with a field FID. The well riser and screen will consist of 1.25 inch PVC and the well screen will be no longer than 5 feet in length. Quartz sand will be placed around the well screen and up to 6 inches above and below the well screen. Approximately two feet of hydrated bentonite pellets will be placed above the sand pack and a cement/bentonite grout will be used to seal the hole up to a depth of approximately 3 feet below ground surface. The well will then be completed with a flush-mount road box held in place with a concrete seal.

The newly installed wells will be developed several times over the period of the HRC injection (2-3 weeks). The development will be completed using a Watera footvalve and tubing. The Watera will be used to help facilitate the removal of sediment from the completed well. Each time the wells are purged groundwater parameters, such as conductivity, pH, Eh, temperature, and dissolved oxygen, will be measured and recorded. Well development logs will be maintained for each development event and will be provided in the final report.

NYSDEC requested that we discuss the need or lack thereof for bedrock wells in or near the source area. In our Revised Report on VCA Investigations, dated 6 May 2000, we discussed that the elevated CVOC concentrations in groundwater at MW-401 (the deepest site well, which was drilled to top of bedrock and is screened from 44-46 feet below ground surface) appeared to be due to loose, wet soils falling from higher elevations to the base of the borehole during well installation. To better determine if this had occurred, Haley & Aldrich performed additional development of well MW-401, using a Watera footvalve and tubing, over a two-week period of time in April 2000 and then re-sampled the well to determine if groundwater concentrations did in fact decrease with increased purging/development. As shown in Table 1, total CVOC concentrations at MW-401 decreased from 0.44 ppm to 0.11 ppm. We believe this drop in concentration is a direct result of the well development and supports the theory that the detected concentrations near the top of rock are due to contaminated soils falling from higher elevations within the borehole. It is also important to note that, during the well installation, there was no indication of contamination, either visual or instrumental (FID) near the top of rock. Further discussion of this issue is below, in Section 4.5.

All down-hole tools and equipment will be cleaned before (steam cleaned) and between (Alconox and distilled water) sampling runs and successive boring locations (steam cleaned).

Field logs will be completed including classification of materials and results of field observations.

4.5 Groundwater Monitoring

Prior to the HRC injection, several baseline parameters were measured in the groundwater. Parameters included dissolved oxygen (DO), conductivity, temperature, pH, and oxidation reduction potential (ORP or Eh). The Monitored Natural Attenuation document produced by the EPA states that these parameters help to determine the conditions of the groundwater aquifer. Table 2 lists all of the parameters and the purposes for measuring those parameters that the EPA recommends for natural attenuation monitoring. Several of these parameters were collected at wells located both in the source zone, the area adjacent to loading dock #2, as well as at wells that have historically been non-detect for site contaminants. The measured parameters are reported in Table 3.

The parameters recently measured indicate that the groundwater, particularly in Area 1, is in a reducing environment- low DO and ORP. Reducing environments are generally encountered within CVOC plumes due to stimulation of anaerobic bacterial activity brought on by the presence of the contaminants. A reducing environment provides the type of conditions that are desired for an HRC injection - reductive dechlorination (the process by which HRC ultimately breaks down the CVOCs), is best facilitated in anaerobic (reducing) environments.

Regarding NYSDEC's request for the need or lack thereof of a bedrock well in or near the source zone (continued from Section 4.3 above), Table 3 shows the DO readings for the 302 nest located south of the source zone. This set of nested wells has four 1-foot screened intervals- 13-14 feet bgs, 21-22 feet bgs, 29.5-30.5 feet bgs, and 32.5-33.5 feet bgs. Note that the DO readings in the shallower screened intervals are relatively low, similar to those observed in the source zone, indicating that reducing conditions are present. The reducing conditions result from the presence of CVOCs. The DO reading at the deepest screened interval is significantly higher than the DO readings at the shallower screened intervals. This indicates that reducing conditions are not as prevalent deeper in the aquifer, reflecting the diminished concentrations of CVOCs with depth in the aquifer. Based on these data, and the discussion in Section 4.3, we do not believe separate installation and monitoring of site bedrock is necessary.

The presence of apparent elevated metals concentrations in the source area may also be related to the reducing conditions observed in the source zone. Metals were detected at elevated concentrations in groundwater at MW-205 (source zone - Area 1). The Revised Report on VCA Investigations, dated December 2000, discussed that the metals observed in groundwater, particularly within the source zone, were likely a result of one or a combination of sediment in the sample and/or the reducing conditions encountered within the source zone. Low ORP (chemically reducing conditions) produced in a CVOC source area can result in localized dissolution of naturally-occurring metals. If this is occurring at the site, the elevated metals concentrations cannot persist beyond the plume limits because depressed ORP, which is necessary for metals to dissolve, would not occur in areas outside the CVOC plume limits. The ORP readings within and outside the source zone support these conditions being present. Additionally, as Tables 3 and 4 indicate, when the sample had a lower turbidity (April 2000 result), the metals concentrations dropped significantly. We therefore do not believe that the metals observed within the source area are an issue of concern. Elevated metals concentrations, if caused by localized source zone reducing conditions, would not persist outside the reducing environment (source zone). Further, the decreased turbidity of the water in separate sampling events has also been shown to result in lower metals concentrations, indicating the apparent elevated concentrations may only be a sampling artifact. Please note that no historical metals usage has occurred at this site.

Prior to HRC injection the above-listed parameters will again be measured and will continued to be measured throughout the project. In addition to the above-listed parameters, several other parameters will be measured during the injection and will also be measured throughout the project. Those parameters include soluble organic carbon (SOC), nitrate, Iron (II), methane, ethane, ethene, alkalinity, and sulfate. The schedule of sampling events, the wells to be sampled, and the parameters that will be measured at each event are listed in Table 5.

To sample the groundwater, wells will be purged using dedicated Watera tubing and footvalves. The Watera will be connected to a YSI Flow-Through Cell where field parameters can be measured including DO, ORP, conductivity, temperature, and pH. The YSI instruments will be read and readings recorded until the parameters have stabilized. Once the parameters have stabilized, the groundwater will be sampled with the Watera into the designated sampling containers. The samples will be placed into a cooler with ice and transported to Columbia

Analytical Services in Rochester, New York for other ELAP-qualified lab for appropriate analyses.

Although trip blanks, MS/MSD samples, and Category B deliverable will not be required for quarterly or semi-annual sampling events, we understand that these items will be collected upon NYSDEC request. Category B deliverables and DUSRs will be required for samples used to define the nature and extent of contamination and to verify the success of remediation.

4.6 Waste Management Plan

All soil cuttings and groundwater produced during the drilling process will be drummed and properly stored onsite until it can be removed by a certified waste handler. All personal protective equipment, such as disposable gloves and Tyvek suites, will be disposed of in onsite dumpsters.

4.7 Health & Safety

A Health and Safety plan for the work described herein is contained in Appendix C. A Community Air Monitoring Plan has been attached to the Health & Safety Plan.

4.8 Institutional Controls

It is anticipated that site compounds will remain on the property but at levels not unacceptable related to human health and environmental risk. Certain institutional controls will be necessary for ongoing site management and completion of the VCA obligations. These items include the following:

<u>Deed Restrictions</u> – Within 30 days of NYSDEC approving the final engineering report, Coopervision will record an instrument with the Monroe County Clerk stating the following:

- The Site will not be used for purposes other than for the contemplated use unless approved by NYSDEC;
- Prohibit the use of groundwater underlying the site without treatment rendering it safe;
- Coopervision or successors will continue any engineering or institutional control required by the work plan.

<u>Completion of Soil Management Plan</u> – a Soil Management Plan (SMP) will be completed following the submittal and approval of the final engineering report. The SMP must be approved by NYSDEC and will apply to excavation or other soil handling in the affected areas of the site.

The type and extent of deed restrictions, SMP, and other institutional controls will be based on the level of effectiveness of remediation.

V. REPORTING & SCHEDULING

The fieldwork to implement the HRC injection, additional groundwater well installation, and baseline groundwater sampling will commence within 1 week of the completion of the public review and comment period, which we understand is required to last for 1 month. The public comment period will start after NYSDEC's approval of this work plan.

Based on the proposed injection grid, need for additional wells and baseline groundwater parameters, it is expected that the injection and supporting fieldwork will take approximately 2-3 weeks, including weekends.

Progress reports will be completed and distributed in accordance with the schedule and requirements contained in the Remediation Agreement. Groundwater sampling will be conducted on a quarterly basis for the first year and semi-annual basis for the following years. The results of the sampling events will be included in the appropriate monthly or quarterly reports, as determined by the Remediation Agreement (the monthly or quarterly report following the receipt of and review of the data).

Timing for the completion and submission of a final report for the site remediation cannot be determined at this time as the performance of the remediation technology has yet to be evaluated. It is expected that a minimum of one year will be required before conclusive data is available for the first report.

COOPERVISION
711 North Road, Scottsville New York
Chemical Testing Results
Updated 5/17/2000

TABLE 1

GROUNDWATER ANALYTICAL RESULTS

UPGRADIENT WELL

ANALYTE	Sample No.	MW - 201		T.O.G.S. Standard Values
	Well Screen Interval (ft)	9.8-20.0		
	Date Sampled	7/10/1997	6/2/1999	
	Dilution	NR	1	
Acetone		ND	ND	0.05**
1,1 - Dichloroethane		ND	ND	0.005
1,1 - Dichloroethene		ND	ND	0.005
1,1,1 - Trichloroethane		ND	ND	0.005
Tetrachloroethene		ND	ND	0.005
Trichloroethene		ND	ND	0.005
Chloroethane		ND	ND	0.005
1,2 - Dichloroethane		ND	ND	0.0006
2 - Butanone		ND	ND	NS
Bis(2 - ethylhexyl) phthalate		NA	NA	0.005

SOURCE WELLS

ANALYTE	Sample No.	OWD-302D			OWD-302D*	OWS-302S	OWS-302S	OWS-302S"	OWS-302S"*	OWD-302S	OWS-302D			OWD-303S	OWD-303D	OWS-303S	MW -1		MW - 205			OW-401	OW-401"	OW-401"	OW-401	T.O.G.S. Standard Values
	Well Screen Interval (ft)	32.5-33.5			32.5-33.5	13.0-14.0	13.0-14.0	13.0-14.0	13.0-14.0	21-22	29.5-30.5			19.5-20.5	31.0-32.0	12.5-13.5	4.0-14.0		21.2-28.0			44.0-46.0	44.0-46.0	44.0-46.0	44.0-46.0	
	Date Sampled	6/1/1999	10/26/1999	4/28/2000	6/1/1999	6/1/1999	4/28/2000	6/1/1999	6/1/1999	4/28/2000	6/1/1999	10/26/1999	4/28/2000	6/1/1999	6/1/1999	6/1/1999	4/16/1997	6/2/1999	7/10/1997	6/2/1999	6/2/1999	10/26/1999	10/26/1999	10/26/1999	4/28/2000	
	Dilution	250	10	5	1000	500	2000	10	500	100	10	2000	200	1	1	1		2500	5000	5000	500[1]	2	1	2	1	
Acetone		ND	NA	NA	ND	ND	ND	0.300B	***1.8 DJB***	ND	ND	NA	ND	***0.18***	0.073	***0.16***	ND	ND	ND	ND	ND	NA	NA	0.004 DJB	ND	0.05**
1,1 - Dichloroethane		***52 E***	***1.0***	***0.63***	***54***	***49***	***390***	***25E***	***61 D***	***350***	***1.5***	***220***	***23***	ND	ND	ND	***36***	ND	***153***	***190***	***210E***	***0.22***	***0.36 E***	***0.37 D***	***0.09***	0.005
1,1 - Dichloroethene		ND	ND	ND	ND	ND	ND	***0.022J***	ND	ND	ND	ND	ND	ND	ND	ND	***12***	***13***	ND	ND	ND	***0.014***	***0.019***	***0.02 D***	***0.009***	0.005
1,1,1 - Trichloroethane		***100 E***	***0.021***	ND	***110***	ND	ND	***0.94***	ND	***2.4***	***0.22***	ND	***8.8***	ND	ND	ND	***370***	***320***	***421***	***480***	***450E***	***0.21***	***0.38 E***	***0.38 D***	***0.017***	0.005
Tetrachloroethene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005
Trichloroethene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005
Chloroethane		ND	ND	ND	ND	ND	ND	***0.056J***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005
1,2 - Dichloroethane		ND	ND	ND	ND	ND	ND	***0.020J***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0006
2 - Butanone		ND	ND	ND	ND	ND	ND	0.063J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS
Bis(2 - ethylhexyl) phthalate		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	***0.016***	ND	NA	NA	NA	NA	0.005

MID-GRADIENT WELLS

ANALYTE	Sample No.	MW - 2		MW -3			OW-403	OW-403"	T.O.G.S. Standard Values
	Well Screen Interval (ft)	2.0-10.0		3.0-10.0			38.5-43.5	38.5-43.5	
	Date Sampled	4/16/1997	6/2/1999	6/18/1997	6/2/1999	10/26/1999	10/26/1999	10/26/1999	
	Dilution	NR	20	NR	50	100	1	1	
Acetone		ND	ND	ND	ND	NA	NA	**0.062 B**	0.05**
1,1 - Dichloroethane		***0.372***	***0.10***	***2.0***	***2.9***	***3.2***	**0.0059**	0.001 J	0.005
1,1 - Dichloroethene		***0.182***	***0.41***	***0.63***	***1.8***	***2.2***	ND	ND	0.005
1,1,1 - Trichloroethane		***0.519***	***3.7***	***3.3***	***10***	***8.0***	ND	0.001 J	0.005
Tetrachloroethene		***0.006***	ND	ND	ND	ND	ND	ND	0.005
Trichloroethene		***0.039***	ND	ND	ND	ND	ND	ND	0.005
Chloroethane		ND	ND	ND	ND	ND	ND	ND	0.005
1,2 - Dichloroethane		ND	ND	ND	ND	ND	ND	ND	0.0006
2 - Butanone		ND	ND	ND	ND	ND	ND	0.005 J	NS
Bis(2 - ethylhexyl) phthalate		NA	NA	NA	NA	NA	NA	NA	0.005

NOTES:

1. Results expressed in milligrams per liter (ppm).
2. "E" - indicates compounds whose concentrations exceed the calibration range.
3. " ** " - indicates that Guidance values were used when a Standard Value was not listed.
4. Groundwater samples collected by Haley and Aldrich on date shown, unless indicated sampled by NYSDEC.
5. Groundwater samples analyzed at Columbia Analytical Services, Rochester, New York
6. " * " - indicates dilution was performed on this sample due to sample exceedence of calibration range.
7. A sample for well #3020W-D-S was not submitted due to lack of sufficent water.
8. " NA " - indicates sample was not analyzed for that compound.
9. " " " - indicates samples that were collected by NYS Department of Environmental Conservation and analyzed by Columbia Analytical Services, Rochester, New York.
10. "J" - indicates an estimated value. The flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicate the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit but greater than zero.
11. "D" - indicates all compounds identified in an analysis at a secondary dilution factor.
12. "B" - indicates compound was found in the associated blank as well as in the sample.
13. "NS" - indicates no Standard Value was listed for compound in the Division of Water Technical and Operational Guidance Series.
14. "NR"- indicates dilution not reported.
15. Results in bold and italics indicate result greater than T.O.G.S. Standard Values.
16. [1] - indicates sample was undiluted to determine if Vinyl Chloride was present. No Vinly Chloride was detected.

g:\projects\70665\005\gw table.xls

DOWNGRADIENT WELLS

ANALYTE	Sample No.	B304-OW	B304-OW"	B305-OW	B306-OW	MW - 202			MW -203		MW - 204		OW-402	OW-402"	T.O.G.S. Standard Values
	Well Screen Interval (ft)	4.0-14.0	4.0-14.0	4.0-14.0	4.0-14.0	10.1-20.3			9.8-20.0		9.8-20.0		38.5-43.5	38.5-43.5	
	Date Sampled	6/1/1999	6/1/1999	6/2/1999	6/2/1999	7/10/1997	6/2/1999	10/26/1999	7/10/1997	6/2/1999	7/10/1997	6/2/1999	10/26/1999	10/26/1999	
	Dilution	1	1	1	1	NR	1	1	NR	1	NR	1	1	1	
Acetone		ND	0.002JB	ND	ND	0.027	ND	ND	***0.118***	ND	ND	ND	ND	0.004 JB	0.05**
1,1 - Dichloroethane		***0.012***	***0.012***	ND	ND	***0.008***	ND	ND	ND	ND	ND	ND	ND	**0.007 J**	0.005
1,1 - Dichloroethene		***0.006***	***0.007J***	ND	ND	***0.018***	ND	ND	ND	ND	ND	ND	ND	ND	0.005
1,1,1 - Trichloroethane		***0.036***	***0.032***	ND	ND	***0.061***	ND	ND	0.003	ND	0.003	ND	ND	ND	0.005
Tetrachloroethene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005
Trichloroethene		ND	ND	ND	ND	***0.008***	ND	ND	ND	ND	***0.015***	ND	ND	ND	0.005
Chloroethane		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005
1,2 - Dichloroethane		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0006
2 - Butanone		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS
Bis(2 - ethylhexyl) phthalate		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.005

Analytical Protocol
Table 2

Soil and Groundwater Analytical Protocol					
Matrix	**Analysis**	**Method/Reference**	**Data Use**	**Sample Volume, Sample Container, Sample Preservation**	**Field or Fixed-Base Laboratory**
Soil	Volatile Organic Compounds	SW8260A	Data is used to determine the extent of soil contamination	Collect 100 g of Soil in a glass container with Teflon-lined cap; cool to 4°C	Fixed-base laboratory
Soil	Total Organic Carbon (TOC)	SW9060 modified for soil samples	The amount of TOC in the aquifer matrix influences contaminant migration and biodegration	Collect 100 g of Soil in a glass container with Teflon-lined cap; cool to 4°C	Fixed-base laboratory
Water	Volatile Organic Compounds	SW8260A	Method of analysis for BTEX and chlorinated solvents / byproducts	Collect water samples in a 40 mL VOA vial; cool to 4°C; add HCl to pH 2	Fixed-base laboratory
Water	Oxygen	Dissolved Oxygen Meter or Hach DO Field Kit Model OX-2P	Concentrations less than 1 mg/L generally indicate an anerobic pathway	Measure dissolved oxygen on site using a flow-through cell or HACH Kit	Field
Water	Nitrate	IC Method E300 Anion Method	Substrate for microbial respiration if oxygen is depleted	Collect up to 40 mL of water om a glass or plastic container, add H_2SO_4 to pH less than 2, cool to 4°C	Fixed-base laboratory
Water	Iron (II) (Fe^{+2})	Colorimetric HACH Method #8146	Indicative of iron (III) reduction	Collect 100 mL of water in a glass container	Field
Water	Sulfate (SO_4^{-2})	IC method E300 or HACH Method #8051	Substrate for anaerobic microbial respiration	Collect up to 40 mL of water in a glass or plastic container, cool to 4°C	E300 = Fixed base lab; HACH Method = Field
Water	Methane, ethane, and ethene	Kampbell *et aL*, 1989 or SE3810 Modified	The presence of CH_4 suggests biodegration or organic carbon via methanogenesis. Ethane and ethene are produced during reductive dechlorination	Collect water samples in 50 mL glass serum bottles with butyl gray/Teflon-lined caps; and H_2SO_4 to pH less than 2, cool to 4°C	Fixed base laboratory
Water	Alkalinity	HACH Alkalinity test kit model AL AP MG-L	Water quality parameter used to measure the buffering capacity of groundwater	Collect 100mL of water in glass container	Field

Soil and Groundwater Analytical Protocol (continued)					
Matrix	**Analysis**	**Method/Reference**	**Data Use**	**Sample Volume, Sample Container, Sample Preservation**	**Field or Fixed-Base Laboratory**
Water	Oxidation-reduction potential (ORP)	A2580B	The ORP of groundwater influences and is influenced by biodegredation	Collect 100-250 mL of water in a glass container, analyze immediately	Field
Water	pH	Field probe with direct reading meter	Aerobic and anaerobic process are pH-sensitive	Collect 100-200 mL of water in a glass or plastic container, analyze immediately	Field
Water	Temperature	Field probe with direct reading meter	Well development	Not Applicable	Field
Water	Conductivity	E120.0/SW9050, direct reading meter	Well development	Collect 100-250 mL of water in a glass or plastic container	Field
Water	Chloride	Mercuric nitrate titration A4500-Cl^- C or HACH Chloride test kit model 8-P	Final product of chlorinated solvent reduction	Collect 250 mL of water in a glass container	Fixed-base laboratory or Field (Hach method)
Water	Soluble Organic Carbon	SW9060	Used to determine if anaerobic metabolism of chlorinated solvents is possible in the absence of anthropogenic carbon	Collect and field filter 100 mL of water in a glass container, cool	Fixed-base laboratory

Reference: Wiedemeier *et aL*., GWMR, Summer 1996

COOPERVISION
711 North Road, Scottsville New York
Groundwater Parameters
5/12/2000
TABLE 3

WELL ID	SAMPLE DATE	TEMPERATURE (degrees C)	PH	CONDUCTIVITY (mhos)	TURBIDITY (NTU)	DO (mg/l)	DO Remeasure (mg/L)*	ORP (mV)	GALLONS PURGED	PERSONNEL
OWS-303D	4/28/2000	13.7	7.85	1.91		3.18		-9	0.5 TO DRY	JM/DMN
OWS-303S	4/28/2000	13	7.95	1.08		4.07		13	0.2 TO DRY	JM/DMN
OWD-303D	4/28/2000	13.5	8.26	2.25		2.59		3	0.5	JM/DMN
OWD-303S	4/28/2000	12.8	8.49	2.21		1.63		52	0.4	JM/DMN
OWS-302S	4/28/2000	14.7	7.25	1.67		5.43	0.11*	123	3	JM/DMN
OWS-302D	4/28/2000	14.3	8.75	7.45		2.53	0.32*	0.67	0.3	JM/DMN
OWD-302S	4/28/2000	13.1	7.46	3.6		2.7	0.17*	-99	0.5 O DRY	JM/DMN
OWD-302D	4/28/2000	13.9	9.21	1.37		2.69	2.91*	0.44	0.5 TO DRY	JM/DMN
MW-401	4/28/2000	14.9	7.53	2.56		0.7		0.35	5+	JM/DMN
MW-205	4/28/2000	15.5	7.58	2.78	76	6.74	0.12*	82	6	JM/DMN
MW-3	5/3/2000	--	--	--	--	--	--	--	INSUFFICIENT WATER	NCH/DCA
MW-403	5/3/2000	14.9	7.55	1.97		0.14		-20	7.5	NCH/DCA
MW-202	5/3/2000	11.4	7.89	1.83		2.13		20	4.5	NCH/DCA
MW-201	5/3/2000	10.6	7.51	1.06		0.52	1.13*	-12	5	NCH/DCA
OW-304	5/3/2000	12.7	7.84	1.75		7.56		25	4	NCH/DCA

Notes:
1. Sampled water was removed from wells with a Watera footvalve and tubing.
2. Water was gently purged from the wells into a YSI flow-thru cell where each of the meters were placed to measure parameters.
3. * indicates that DO reading was re-measured on 20 July 2000 due to perceived inconsistencies of these data with the remainder of the data set originally collected.

COOPERVISION
711 North Road, Scottsville New York
Chemical Testing Results
5/23/2000

TABLE 4

GROUNDWATER ANALYTICAL RESULTS - METALS

ANALYTE	**SAMPLE LOCATION**							
Sample No.	MW - 201		MW - 202		MW - 205			
Well Screen Interval (ft)	9.8-20.0		10.1-20.3		21.2-28.0			T.O.G.S.
Date Sampled	7/10/1997	6/2/1999	7/10/1997	6/2/1999	7/10/1997	6/2/1999	4/28/2000	Standard Values
Aluminum	NA	13.90	NA	10.10	NA	103.00	0.797	NS
Antimony	NA	ND	NA	ND	NA	***0.0148***	ND	0.003
Arsenic	NA	ND	NA	ND	NA	0.0140	ND	0.025
Barium	NA	0.176	NA	0.0806	NA	0.968	0.237	1.00
Cadmium	NA	ND	NA	ND	NA	***0.00544***	ND	0.005
Calcium	NA	156.00	NA	291.00	NA	735.00	197	NS
Chromium	NA	0.0204	NA	0.0114	NA	***0.312***	ND	0.050
Cobalt	NA	ND	NA	ND	NA	0.0599	ND	NS
Copper	NA	ND	NA	ND	NA	0.187	ND	0.200
Iron	NA	***23.60***	NA	***14.40***	NA	***160.00***	**1.65**	0.300
Lead	NA	0.0101	NA	0.00553	NA	***0.0867***	ND	0.025
Magnesium	NA	***92.30***	NA	***97.30***	NA	***333.00***	**154**	35.00**
Manganese	NA	***0.593***	NA	***0.365***	NA	***4.60***	0.183	0.300
Nickel	NA	ND	NA	ND	NA	***0.155***	ND	0.100
Potassium	NA	7.01	NA	7.65	NA	29.90	9.19	NS
Selenium	NA	0.00978	NA	***0.0155***	NA	***0.0381***	ND	0.01
Sodium	NA	***79.10***	NA	***61.9***	NA	***78.20***	**82.8**	20.00
Vanadium	NA	ND	NA	ND	NA	0.216	ND	NS
Zinc	NA	0.0528	NA	0.0453	NA	0.478	ND	2.00**

NOTES:

1. Results expressed in milligrams per liter (ppm).
2. " ** " - indicates that Guidance values were used when a Standard Value was not listed.
3. Groundwater samples collected by Haley and Aldrich on July 10, 1997, June 2, 1999, & April 28, 2000.
4. Groundwater samples analyzed at Columbia Analytical Services, Rochester, New York
5. " NA "- indicates that sample was not analyzed for that compound.
6. " NS" - indicates that a Standard Value is not available.

Coopervision Incorporated
Scottsville, New York Facility
Remediation Groundwater Monitoring Schedule

Table 5

YEAR 1

Q1

WELL ID	Dissolved Gases	VOCs	Anion List	Cation List	SOC	Metabolic Acids	Field Parameters*
MW-202		x					x
MW-203		x					x
MW-204		x					x
MW-205	x	x	x	x	x		x
MW-2		x					x
MW-304		x					x
MW-401		x					x
MW-402		x					x
MW-3	x	x	x	x	x		x
MW-501	x	x	x	x	x		x
MW-502	x	x	x	x	x		x
OWD-302-D	x	x	x	x	x		x
OWS-302-S	x	x	x	x	x		x

Q2

WELL ID	Dissolved Gases	VOCs	Anion List	Cation List	SOC	Metabolic Acids	Field Parameters*
MW-202		x					x
MW-203		x					x
MW-204		x					x
MW-205	x	x				x	x
MW-2		x					x
MW-304		x					x
MW-401		x					x
MW-402		x					x
MW-3	x	x				x	x
MW-501	x	x				x	x
MW-502	x	x				x	x
OWD-302-D	x	x				x	x
OWS-302-S	x	x				x	x

Q3

WELL ID	Dissolved Gases	VOCs	Anion List	Cation List	SOC	Metabolic Acids	Field Parameters*
MW-202		x					x
MW-203		x					x
MW-204		x					x
MW-205		x					x
MW-2		x					x
MW-304		x					x
MW-401		x					x
MW-402		x					x
MW-3		x					x
MW-501		x					x
MW-502		x					x
OWD-302-D		x					x
OWS-302-S		x					x

Q4

WELL ID	Dissolved Gases	VOCs	Anion List	Cation List	SOC	Metabolic Acids	Field Parameters*
MW-202		x					x
MW-203		x					x
MW-204		x					x
MW-205	x	x	x	x	x		x
MW-2		x					x
MW-304		x					x
MW-401		x					x
MW-402		x					x
MW-3	x	x	x	x	x		x
MW-501	x	x	x	x	x		x
MW-502	x	x	x	x	x		x
OWD-302-D	x	x	x	x	x		x
OWS-302-S	x	x	x	x	x		x

Remaining Annual Schedule

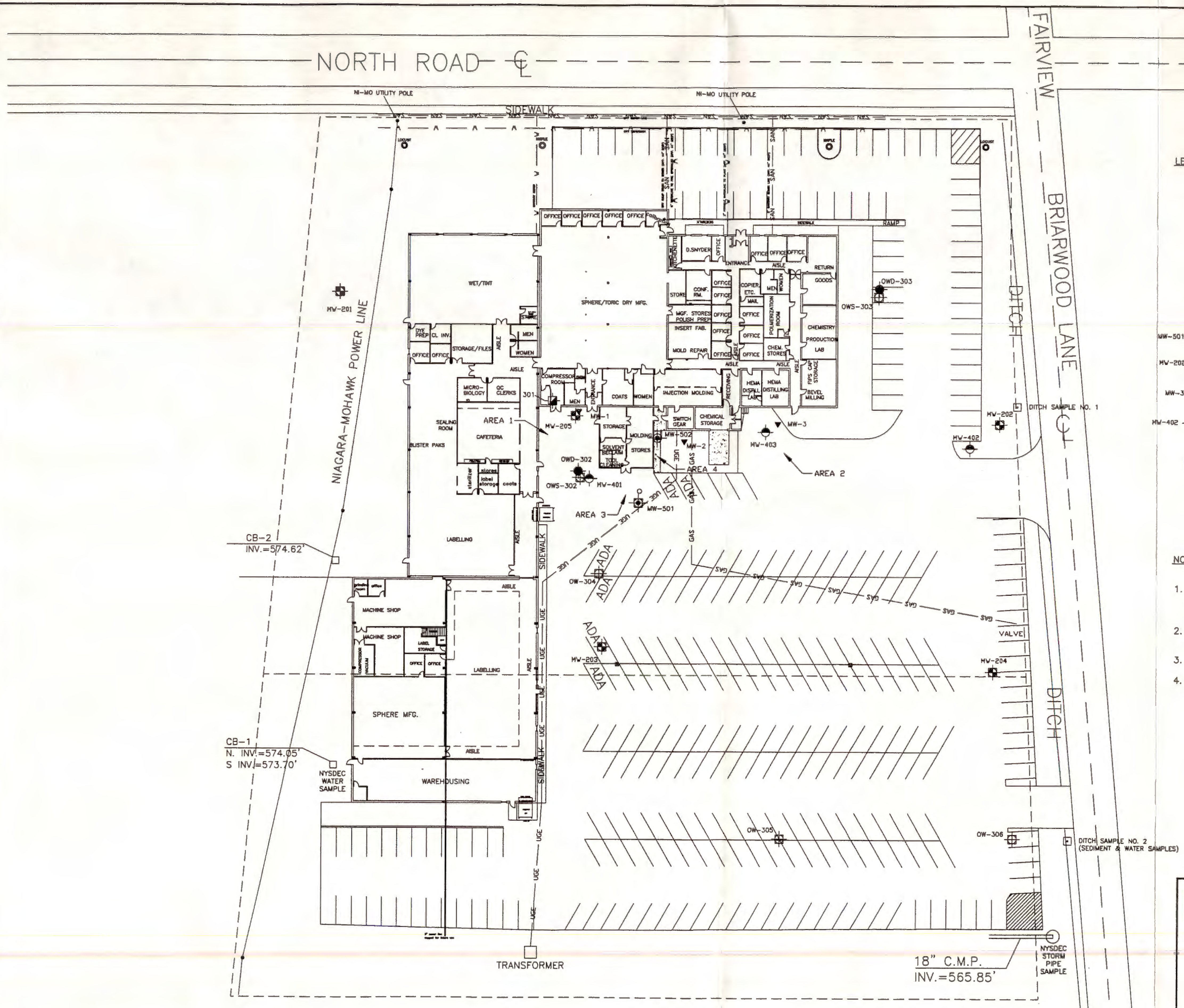
Q2

WELL ID	Dissolved Gases	VOCs	Anion List	Cation List	SOC	Metabolic Acids	Field Parameters*
MW-202		x					x
MW-203		x					x
MW-204		x					x
MW-205	x	x	x	x	x		x
MW-2		x					x
MW-304		x					x
MW-401		x					x
MW-402		x					x
MW-3	x	x	x	x	x		x
MW-501	x	x	x	x	x		x
MW-502	x	x	x	x	x		x
OWD-302-D	x	x	x	x	x		x
OWS-302-S	x	x	x	x	x		x

Q4

WELL ID	Dissolved Gases	VOCs	Anion List	Cation List	SOC	Metabolic Acids	Field Parameters*
MW-202		x					x
MW-203		x					x
MW-204		x					x
MW-205	x	x				x	x
MW-2		x					x
MW-304		x					x
MW-401		x					x
MW-402		x					x
MW-3	x	x				x	x
MW-501	x	x				x	x
MW-502	x	x				x	x
OWD-302-D	x	x				x	x
OWS-302-S	x	x				x	x

Notes:
1. Dissolved Gases include methane, ethane, and ethene
2. VOCs will be analyzed by EPA Method 8260
3. The Anion List includes sulfate, sulfide, nitrate, nitrite, chloride, and alkalinity
4. The Cation List includes ferrous and total iron
5. Metabolic Acids include lactic, acetic, proprionic, pyruvic, and butyric
6. Field Parameters include dissolved oxygen, temperature, conductivity, oxidation-reduction potential, and pH
7. * indicates that some field parameters will be monitored at least monthly (potentially more frequently) for the first year.



LEGEND:

- SHALLOW GROUND WATER MONITORING WELL, INSTALLED BY NOTHNAGLE DRILLING, 22-23 MAY 1999, UNDER OBSERVATION OF HALEY & ALDRICH OF NEW YORK.
- DEEP GROUND WATER MONITORING WELL, INSTALLED BY NOTHNAGLE DRILLING, 22-23 MAY 1999, UNDER OBSERVATION OF HALEY & ALDRICH OF NEW YORK.
- ANGLE BORING COMPLETED BY NOTHNAGLE DRILLING 22 MAY 1999, UNDER OBSERVATION OF HALEY & ALDRICH OF NEW YORK.
- MW-501 PROPOSED WELL LOCATION TO BE COMPLETED DURING HRC INJECTION.
- MW-202 SUBSURFACE BORING AND WELL INSTALLED UNDER THE OBSERVATION OF HALEY & ALDRICH OF NEW YORK, JULY 1997.
- MW-3 GEOPROBE EXPLORATION AND WELL INSTALLED UNDER THE OBSERVATION OF LABELLA ASSOCIATES.
- MW-402 SUBSURFACE BORING & WELL INSTALLED BY NOTHNAGLE DRILLING, OCTOBER 1999, UNDER OBSERVATION OF HALEY & ALDRICH OF NEW YORK.
- SEDIMENT & WATER SAMPLES COLLECTED BY HALEY & ALDRICH ON 15 SEPTEMBER, 1998.

NOTES:

1. PLAN BASED ON "ALTA/ASCM LAND TITLE SURVEY MAY" PREPARED BY RONALD W. STAUB LAND SURVEYORS, ROCHESTER, NEW YORK, DATED 12/17/96.
2. FACILITY INTERIOR USES ACCURATE AS TO DATE OF SURVEY, BUT MAY CHANGE OVER TIME.
3. SEE REPORT TEXT FOR FURTHER INFORMATION.
4. EXPLORATION LOCATIONS ARE APPROXIMATE.

0 30 60 90 120
SCALE IN FEET

HALEY & ALDRICH
UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

COOPERVISION FACILITY INVESTIGATION
711 NORTH ROAD
SCOTTSVILLE, NEW YORK

SITE PLAN

SCALE: AS SHOWN
MAY 2000

FILENAME: HRC_R.DWG

FIGURE 1

70665-005

APPENDIX A

NYSDEC Comment Letters

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 8
6274 East Avon-Lima Road, Avon, New York 14414-9519
Phone: (716) 226-5353 · **FAX:** (716) 226-8696
Website: www.dec.state.ny.us

John P. Cahill
Commissioner

January 31, 2001

Christopher H. Marraro
Wallace King Marraro & Branson, PLLC
1050 Thomas Jefferson Street, N.W.
Washington, DC 20007

Dear Mr. Marraro:

RE: CooperVision, Inc. Scottsville Facility
Site #V00175-8
Comments to December 2000 Revised Remediation Work Plan

Thank you for submitting the above-referenced remediation work plan for the CooperVision facility located at 711 North Road, Scottsville, NY, 14546. The Department has completed its review of the above-referenced work plan and offers the following comments.

1. The Department appreciates the use of bold and italic text in the draft report to highlight responses to the Department's comments. In the final report, please use a consistent font (except for section headings and sub-headings).

2. Please address the handwritten editorial changes on the attached pages.

3. Section 4.2, AREAS OF NON-INJECTION: Please provide me with a copy of the Regenesis Technical Bulletin referenced in the work plan when it is published.

4. Table 2 references to Total Organic Carbon (TOC) need to be changed to Soluble Organic Carbon (SOC). Additionally, please verify that the analytical method and other information referenced for TOC is also correct for SOC.

5. The Department still does not believe it is appropriate to use a TCA groundwater concentration of 8 ppm for the Area 1 HRC Grid Design when TCA groundwater concentrations up to 480 ppm have been detected in Area 1; however, the Department believes that the remedy can be implemented as specified in the work plan. Monitoring will be performed to evaluate the effectiveness of the remedy and to determine if additional remedial activities are needed to achieve the remediation objectives identified in the work plan.

6. The Department believes that the work plan presents an overly optimistic projection for treating the area under the compressor room. The Department understands that the diffusion estimates presented in the work plan are based on research performed by Regenesis. Regenesis estimated a diffusion

coefficient for hydrogen in groundwater of $2.2x10^{-3}$ square centimeters per second. The Regenesis result does not appear to agree with other published data. For example, Fetter (1988) reports a range of diffusion coefficients for electrolytes in water between $1x10^{-9}$ to $2x10^{-9}$ square meters per second ($1x10^{-5}$ to $2x10^{-5}$ square centimeters per second). A similar diffusion coefficient might be expected for hydrogen. While the Department is concerned that the remedy to will not be able to actively treat the area under the compressor room, the remedy can be implemented as specified in the work plan. Monitoring will be performed to evaluate the effectiveness of the remedy and to determine if additional remedial activities are needed to achieve the remediation objectives identified in the work plan.

7. The Department agrees that bedrock wells are not necessary at the site at this time. The Department will continue to evaluate the groundwater monitoring results to determine if bedrock wells are needed in the future.

Please complete the above-referenced changes and submit the bound, "final" work plan, certified by a New York state professional engineer, as follows:

- Mark VanValkenberg (2 copies)
  State of New York Department of Health
  Bureau of Environmental Exposure Investigation
  Flanigan Square
  574 River Street
  Troy, New York 12180

- David Napier (1 copy)
  State of New York Department of Health
  Bureau of Environmental Exposure Investigation
  Bevier Building
  42 S. Washington Street
  Rochester, New York 14608-2099

- Mary Jane Peachey (1 copy)
  New York State Department of Environmental Remediation
  Division of Environmental Remediation
  6274 East Avon-Lima Road
  Avon, New York 14414

Additional copies will be requested upon the Department of Health's approval of the work plan. Please contact me at (716) 226-5357 if you have any questions regarding these comments.

Sincerely,

Frank Sowers
Environmental Engineer I
Division of Environmental Remediation

File No: 70665-005

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 8
6274 East Avon-Lima Road, Avon, New York 14414-9519
Phone: (716) 226-5353 • **FAX:** (716) 226-8696
Website: www.dec.state.ny.us

Environmental Conservation 30 YEARS
John P. Cahill
Commissioner

July 14, 2000

Christopher H. Marraro
Wallace King Marraro & Branson, PLLC
1050 Thomas Jefferson Street, N.W.
Washington, DC 20007

Dear Mr. Marraro:

RE: CooperVision, Inc. Scottsville Facility
Site #V00175-8
Preliminary Comments to June 2000 Remediation Work Plan

Thank you for submitting the above referenced remediation work plan for the CooperVision facility located at 711 North Road, Scottsville, NY, 14546. The Department is has not yet completed its review of the work plan, but, at the request of Haley and Aldrich of New York, the following preliminary comments are offered.

1. The revised work plan must be certified by a professional engineer in New York State.

2. In the revised work plan please include all of the sample analytical results and field parameter measurements collected at the site in April 2000. The revised work plan also needs to include a discussion of these data with respect to the following:

   - the need (or lack thereof) for bedrock wells;
   - the nature and extent of metals in the groundwater and the need (or lack thereof) for the remedy to address metals; and
   - the anticipated impact of the field parameters (Eh, pH, dissolved oxygen, etc.) on the design and performance of the remedy.

3. The work plan does not contain specific, measurable, objectives for the remedy. The remedial objectives specified in the revised work plan must include specific cleanup objectives. The objectives contained in the second paragraph of Section 2.4 are unacceptably vague.

4. The revised work plan must include a waste management plan.

5. In Section 4.1 please explain why there is a gap in the HRC points proposed between Area 4 and Area 2.

6. In Section 4.1 it is not clear if a single or multiple injections of HRC are proposed for Area 1. Please clarify.

7. Section 4.2 indicates that the deepest injection depth will be approximately 38 feet below ground surface. This suggests that the borings will have different injection depths. In the revised work plan, please specify the injection depth for each boring provide the rationale for the injection depth chosen.

8. In Section 4.3 of the revised work plan, please provide the rationale for the proposed screening interval for the proposed new monitoring wells.

9. Section 4.3 states that "hydrated bentonite will be used to seal the hole up to a depth of approximately 3 feet below ground surface." Typically, a 2-ft. thick bentonite seal is placed on top of the sand pack and the rest of the hole is filled with a cement/bentonite grout to a depth of approximately 3 feet below ground surface. Please provide clarification on this issue in the revised work plan.

10. Table 2 seems to suggest that the groundwater monitoring will continue for a period of 4 years. The Department does not accept any arbitrary time limits to stop groundwater monitoring, rather the decision on when to stop groundwater monitoring will be based on the measured effectiveness of the remedy.

11. In Table 2, please add MW-204 to the groundwater monitoring schedule.

Additional comments on the work plan are expected and will be forwarded to you when the Department has completed its review. Please contact me at (716) 226-5357 if you have any questions regarding these comments.

Sincerely,

Mary Jane Peachey for

Frank Sowers
Environmental Engineer I
Division of Environmental Remediation

cc:
M.J. Peachey
A. English
D. Foster
J. Albert
D. Napier
K. Cloyd
J. Charles
V. Dick

File No: 70665-005

RECEIVED
AUG 0 3 2000
H & A OF NEW YORK

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 8
6274 East Avon-Lima Road, Avon, New York 14414-9519
Phone: (716) 226-5353 • **FAX:** (716) 226-8696
Website: www.dec.state.ny.us

Environmental Conservation 30 YEARS
John P. Cahill
Commissioner

August 1, 2000

Christopher H. Marraro
Wallace King Marraro & Branson, PLLC
1050 Thomas Jefferson Street, N.W.
Washington, DC 20007

Dear Mr. Marraro:

RE: CooperVision, Inc. Scottsville Facility
Site #V00175-8
Comments to July 2000 Remediation Work Plan

Thank you for submitting the above referenced remediation work plan for the CooperVision facility located at 711 North Road, Scottsville, NY, 14546. The Department is has completed its review of the above-referenced work plan and offers the following comments. These comments are provided in addition to the Department's preliminary comments of July 14, 2000. Please note that the Department's letter of July 14, 2000 specifically indicated that the Department's review was not yet complete, that preliminary comments were being offered at the request of Haley and Aldrich of New York, and that additional comments were expected.

1. Section 2.4: Please delete the second paragraph in the revised work plan.

2. Section 2.4: Please modify the last sentence of the first paragraph to read "The assessment concluded there are no complete pathways at this time based on current activities at the site."

3. Section 3: On page 5 the paragraph that states "Sub-criteria of the above criteria (e.g. SCGs add reduction of toxicity, ...)", the phrase " SCGs add reduction of toxicity" does not make sense.

4. Section 3.3: The Department does not propose any changes to this section, but please be aware that a recent steam stripping application reportedly indicated that steam stripping may be effective in dense materials.

5. Section 3.5: Section 3.1 of the work plan indicates that a portion of the source zone is located beneath the slab of the site building. In the revised work plan, please explain how HRC will treat that portion of the source zone located beneath the slab of the site building where no injection points are proposed.

6. Section 3.5: Please provide additional information on how HRC works in the revised work plan. In particular, please explain:

- What is HRC and how does it work?;
- How does HRC get into the groundwater formation given the very dense soils at the site?;
- What, if any, short term and long term (on-site and off-site) human health and environmental impacts might be possible with the amount of HRC proposed at this site? Include additional information (beyond the MSDS) as to the potential hazards associated with HRC. Can explosive levels of hydrogen be produced? Are any special monitoring or handling procedures required? Include in this discussion any potential health and safety issues associated with future excavations in the areas injected with HRC.

7. Section 4: In the revised work plan, please discuss the compounds, locations, and concentrations that will not be treated by the proposed remedy and why. Please pay particular attention to CVOCs located below the HRC injection zones and under the site building.

8. Section 4.1: The Department proposes modifying the remedial objectives as follows:

- Soil: Reduction of soil VOC concentrations to a level that is protective of human health and the environment for the present and intended use of the property. For purposes of this objective, the recommended soil cleanup objectives in NYSDEC TAGM 4046 shall be the goal. Progress against this objective will be measured as follows:

  a) collection of soil samples for analysis at a future date (number of samples, sample locations, and timing to be determined by NYSDEC) after bioremediation monitoring indicates effective treatment has occurred; and
  b) continued periodic groundwater monitoring (number of samples, sample locations, and sampling frequency to be determined by NYSDEC), after bioremediation monitoring indicates effective treatment has occurred, to evaluate if residual soil contamination represents a continuing threat to human health or the environment.

- Groundwater at the property line: Maintenance of VOC groundwater concentrations below NYS ambient water quality standards and guidance values (as summarized in NYSDEC TOGS 1.1.1) at the property line. This will be measured through post injection monitoring of groundwater as summarized elsewhere in this plan.

- On-Site Groundwater: Reduction of groundwater VOC concentrations to a level that is protective of human health and the environment for the present and intended use of the property. For purposes of this objective, attaining NYS ambient water quality standards and guidance values (as summarized in NYSDEC TOGS 1.1.1) shall be the goal. Groundwater concentrations will be monitored after injection, as described in this plan, and evaluated for progress. It is anticipated that groundwater concentrations will decrease after the HRC injection. The concentration/mass reduction achieved will be reviewed by CooperVision and NYSDEC relative to the remedial goal to evaluate the need, if any, for additional injections or the implementation of additional remedial measures.

9. Section 4.3: Please explain in the revised work plan how the necessary pressure is achieved, maintained, and measured in the boreholes.

10. Section 4.2: The Department does not understand why the concentration data for well MW-403 (screened 38.5 to 43.5 feet below ground surface with a total VOC concentration of 0.0059 ppm)

were used as the basis for design given that the work plan proposes an HRC injection interval of 5 to 25 feet below ground surface in Area 2. According to the work plan, the 5 to 25 foot interval was specified because groundwater monitoring results indicated that this was the most contaminated interval in Area 2 (14.7 ppm total VOCs at MW-3 on June 2,1999). The Department believes that the injection system must be designed to treat the contaminant levels detected in the target interval. That is, a concentration of 14.7 ppm needs to be used as the basis for design in Area 2 instead of 0.0059 ppm. If CooperVision continues to believe that 0.0059 ppm is the appropriate design concentration, the revised work plan must contain a clear and detailed explanation supporting that position.

11. Section 4.2 and Appendix A: The work plan does not adequately explain the basis for design for Area 1. The HRC Grid Design calculation sheet for Area 1, located in Appendix A, indicates the following initial concentrations of CVOCs:

    - DCE 8.8 ppm;
    - TCA 8.0 ppm; and
    - DCA 220 ppm.

    The work plan does not explain why these concentrations were selected. The Department believes that the DCA and DCE concentrations identified above are reasonable. The Department does not understand why a TCA concentration of 8 ppm was assumed when the highest detected concentration of TCA in the source area was 480 ppm. The Department believes that the injection system must be designed to treat the maximum contaminant levels in a specified area. That is, a TCA concentration of 480 ppm needs to be used as the basis for design in Area 1 instead of 8 ppm. If CooperVision continues to believe that 8 ppm is the appropriate design concentration for TCA in Area 1, the revised work plan must contain a clear and detailed explanation supporting that position.

    Similarly, the work plan does not explain why a hydraulic conductivity of 0.85 ft/day was used for the Area 1 design. The value of 0.85 ft/day was obtained from well MW-401 which is screened from 44 to 46 feet below ground surface. Shallower wells located in Area 1 have much lower hydraulic conductivities. The hydraulic conductivity for MW-1was reported as 0.00652 ft/day and the hydraulic conductivity for MW-205 was reported as 0.0013 ft/day. The work plan specifies that the HRC boreholes in Area 1 will extend to approximately 38 feet below ground surface. Given that well MW-401 is screened below the bottom of the proposed injection interval and that wells MW-1 and MW-205 are screened within the proposed injection interval and contain high concentrations of CVOCs, the Department believes that a more realistic hydraulic conductivity value must be used for the Area 1 design. If CooperVision continues to believe that 0.85 ft/day is the appropriate design conductivity for in Area 1, the revised work plan must contain a clear and detailed explanation supporting that position.

12. Section 4.2: The revised work plan must specify that the injection borings for Areas 1,3,and 4 will, at a minimum, extend into the sand layer identified in the investigation report.

13. Section 4.4: The revised work plan must specify that the screened interval for well MW-502 will include the sand layer identified in the investigation report.

14. Section 4.4: Please include procedures in the revised work plan, including completion of well development logs, for developing the two new wells.

15. Section 4.5: Trip blanks, MS/MSD samples, and Category B deliverables will not generally be required for the quarterly and semi-annual sampling events, but the work plan needs to indicate these

items will be collected upon NYSDEC request. Category A deliverables will be required for the quarterly and semi-annual sampling events. Category B deliverables and a Data Usability Summary Report will be required for samples used to define the nature and extent of contamination and to verify the success of remediation.

16. Section 4.5 and Table 5: Section 4.5 indicates that total organic carbon (TOC) will be one of the parameters measured throughout the project. TOC is not included on Table 5, but SOC (soluble organic carbon?) is. Please use consistent terms in the revised work plan.

17. Section 5: Please replace the third paragraph with the following sentence, "Progress reports will be completed and distributed in accordance with the schedule and requirements contained in the Remediation Agreement."

18. Table 5: Please substitute well MW-3 for well MW-403 in the quarterly sampling plan. Well MW-3 is a more appropriate sample location since it is screened within the Area 2 target interval and MW-403 is not.

19. Health and Safety Plan: A more complete Health and Safety Plan, which includes a Community Air Monitoring Plan, must be provided which fully describes potential hazards at the site, types of monitoring and frequency, response actions, and a notification list.

20. Deed Restrictions: In addition to the use of HRC, the remedy must also include institutional controls. The revised work plan must include a section specifying that Deed restrictions will be imposed in accordance with the Remediation Agreement. Additionally, the work plan must specify that the Deed restrictions will accomplish the following:

    - prohibit the Site from ever being used for purposes other than for the Contemplated Use (as defined in the Remediation Agreement);
    - prohibit the use of the groundwater underlying the Site without treatment rendering it safe for drinking water or industrial purposes;
    - require Department notification prior to any excavations at the Site; and
    - require Volunteer and Volunteer's successors and assigns to continue in full force and effect those engineering and/or institutional controls required by the Work Plan.

    The work plan must include provisions for the completion of a Soil Management Plan to be followed during future excavations at the site. The work plan must specify that the Soil Management Plan, including future modifications and addendums, must be approved by the Department and that compliance with the Soil Management Plan is a required institutional control.

Please contact me at (716) 226-5357 if you have any questions regarding these comments.

Sincerely,

Frank Sowers

Frank Sowers
Environmental Engineer I
Division of Environmental Remediation

cc:
M.J. Peachey
A. English
D. Foster
J. Albert
D. Napier
K. Cloyd
J. Charles
V. Dick

APPENDIX B

HRC Design Input/Output Sheets

REGENESIS
Technical Support (949) 366-8000

HRC Grid Design
Version 1

Site Name: CooperVision- Area 1
Location: Scottsville, NY
Consultant: Haley & Aldrich

Basic Site Characteristics

Width of plume (intersecting flow)		35	ft
Length of plume		55	ft
Depth to contaminated zone		5	ft
Thickness of contaminated saturated zone		33	ft
Nominal aquifer soil (gravel, sand, silty sand, silt, clay)		silt	
Porosity		0.1	
Hydraulic conductivity, Kh		0.019	ft/day
Hydraulic gradient		0.005	ft/ft
Seepage velocity	0.001 ft/day =	0.3	ft/yr
Treatment Zone Pore Volume (cu. ft.)		6,353	ft^3

Dissolved Phase Groundwater VOC Concentrations: Cgw in mg/L

PCE	0.00
TCE	0.00
DCE	8.80
VC	0.00
Carbon tetrachloride	0.00
Chloroform	0.00
TCA	8.00
DCA	220.00

Sorbed Phase VOC Mass:

Soil bulk density		1	kg/L
Fraction of organic carbon: foc		0.005	
(Values are estimated using Soil Conc=foc*Koc*Cgw)	**Koc**	**Soil Conc.**	
(Adjust Koc as nec. to provide realistic estimates)	(L/kg)	(mg/kg)	
PCE	263	0.00	
TCE	107	0.00	
DCE	80	3.52	
VC	2.5	0.00	
Carbon tetrachloride	110	0.00	
Chloroform	34	0.00	
TCA	183	7.32	
DCA	40	44.00	

Competing Electron Acceptor (CEA) Concentrations:

	(mg/L)
Oxygen	0.70
Nitrate	1.00
Manganese reduction potential	0.00
Iron reduction (potential amount of Fe2+ that can be formed)	10.00
Sulfate reduction	50.00

Microbial Demand Factor	**3**	Recommend 3-4x
Additional Demand Factor	**2**	Recommend 2-3x

Injection Point Spacing	**Rec.**	Min.	Max.
Nominal injection spacing (ft)	7.0	5	15
# points in row(w/desired spacing)	5	7	2
Actual spacing between columns (ft)	7.0	5.0	17.5
# rows (w/desired spacing)	8	11	4
Actual spacing between rows (ft)	6.9	5.0	13.8
Advective travel time bet. rows (days)	7237	5263	14474
Number of points in grid	40	77	8

HRC Injection Amount			
Minimum req. HRC per foot (lbs/ft)	5.0	3.7	36.0
Feasibility of above HRC per foot:	(ok)	(ok)	(high)

Proposed HRC Grid Specifications	
Proposed number of HRC delivery points (adjust above rec. # as nec. for site)	40
Proposed HRC applic. rate lbs/foot (adjust above rec. # as nec. for site)	5.0
Corresponding amount of HRC per point (lbs)	165
Buckets per injection point	5.5
Total Buckets	220
Total Amt of HRC (lbs)	6,600

Notes:
1. Hydraulic conductivity value was based on a geometric mean of hydraulic conductivities of all measured wells in the Area, including MW-1, MW-205, and MW-401.
2. Dissolved phase groundwater VOC concentrations were altered from actual laboratory measurements for purpsoes of using the software effectivly. See Work Plan text for details.

REGENESIS

Technical Support (949) 366-8000

HRC Grid Design

Version 1

Site Name: CooperVision- AREA 2
Location: Scottsville, NY
Consultant: Haley & Aldrich

Basic Site Characteristics

Width of plume (intersecting flow)	35	ft
Length of plume	40	ft
Depth to contaminated zone	5	ft
Thickness of contaminated saturated zone	20	ft
Nominal aquifer soil (gravel, sand, silty sand, silt, clay)	silt	
Porosity	0.1	
Hydraulic conductivity, Kh	0.099	ft/day
Hydraulic gradient	0.013	ft/ft
Seepage velocity (0.013 ft/day =)	4.7	ft/yr
Treatment Zone Pore Volume (cu. ft.)	2,800	ft^3

Microbial Demand Factor	3	Recommend 3-4x
Additional Demand Factor	2	Recommend 2-3x

Injection Point Spacing

	Rec.	Min.	Max.
Nominal injection spacing (ft)	10.0	5	15
# points in row(w/desired spacing)	4	7	2
Actual spacing between columns (ft)	8.8	5.0	17.5
# rows (w/desired spacing)	4	8	3
Actual spacing between rows (ft)	10.0	5.0	13.3
Advective travel time bet. rows (days)	777	389	1036
Number of points in grid	16	56	6

HRC Injection Amount

Minimum req. HRC per foot (lbs/ft)	2.0	2.0	4.7
Feasibility of above HRC per foot:	(ok)	(ok)	(ok)

Dissolved Phase Groundwater VOC Concentrations: Cgw in mg/L

PCE	0.00
TCE	0.00
DCE	2.20
VC	0.00
Carbon tetrachloride	0.00
Chloroform	0.00
TCA	8.00
DCA	3.20

Proposed HRC Grid Specifications

Proposed number of HRC delivery points (adjust above rec. # as nec. fo	16
Proposed HRC applic. rate lbs/foot (adjust above rec. # as nec. for site)	2.0
Corresponding amount of HRC per point (lbs)	40
Buckets per injection point	1.3
Total Buckets	22
Total Amt of HRC (lbs)	640

Sorbed Phase VOC Mass:

Soil bulk density	1	kg/L
Fraction of organic carbon: foc	0.005	

(Values are estimated using Soil Conc=foc*Koc*Cgw)
(Adjust Koc as nec. to provide realistic estimates)

	Koc (L/kg)	Soil Conc. (mg/kg)
PCE	263	0.00
TCE	107	0.00
DCE	80	0.88
VC	2.5	0.00
Carbon tetrachloride	110	0.00
Chloroform	34	0.00
TCA	183	7.32
DCA	40	0.64

Competing Electron Acceptor (CEA) Concentrations:

	(mg/L)
Oxygen	0.14
Nitrate	1.00
Manganese reduction potential	0.00
Iron reduction (potential amount of Fe2+ that can be formed)	10.00
Sulfate reduction	50.00

Notes:
1. Hydraulic conductivity value was based on a rising head test completed at MW-403. No other wells within the Area had a measured hydraulic conductivity value.
2. Dissolved phase groundwater VOC concentrations were used for the most recent data available for the area- 10/26/99 data for MW-3.

REGENESIS
Technical Support (949) 366-8000

HRC Grid Design

Version 1

Site Name: CooperVision- Area 3
Location: Scottsville, NY
Consultant: Haley & Aldrich

Basic Site Characteristics

Width of plume (intersecting flow)		30	ft
Length of plume		20	ft
Depth to contaminated zone		5	ft
Thickness of contaminated saturated zone		33	ft
Nominal aquifer soil (gravel, sand, silty sand, silt, clay)		silt	
Porosity		0.1	
Hydraulic conductivity, Kh		0.85	ft/day
Hydraulic gradient		0.005	ft/ft
Seepage velocity	0.043 ft/day =	15.5	ft/yr
Treatment Zone Pore Volume (cu. ft.)		1,980	ft^3

Dissolved Phase Groundwater VOC Concentrations: Cgw in mg/L

PCE	0.00
TCE	0.00
DCE	2.00
VC	0.00
Carbon tetrachloride	0.00
Chloroform	0.00
TCA	3.00
DCA	20.00

Sorbed Phase VOC Mass:

Soil bulk density		1	kg/L
Fraction of organic carbon: foc		0.005	

(Values are estimated using Soil Conc=foc*Koc*Cgw)
(Adjust Koc as nec. to provide realistic estimates)

	Koc (L/kg)	Soil Conc. (mg/kg)
PCE	263	0.00
TCE	107	0.00
DCE	80	0.80
VC	2.5	0.00
Carbon tetrachloride	110	0.00
Chloroform	34	0.00
TCA	183	2.75
DCA	40	4.00

Competing Electron Acceptor (CEA) Concentrations:

	(mg/L)
Oxygen	2.00
Nitrate	1.00
Manganese reduction potential	0.00
Iron reduction (potential amount of Fe2+ that can be formed)	10.00
Sulfate reduction	50.00

Microbial Demand Factor	3	Recommend 3-4x
Additional Demand Factor	2	Recommend 2-3x

Injection Point Spacing

	Rec.	Min.	Max.
Nominal injection spacing (ft)	10.0	5	15
# points in row(w/desired spacing)	3	6	2
Actual spacing between columns (ft)	10.0	5.0	15.0
# rows (w/desired spacing)	2	4	1
Actual spacing between rows (ft)	10.0	5.0	20.0
Advective travel time bet. rows (days)	235	118	471
Number of points in grid	6	24	2

HRC Injection Amount

	Rec.	Min.	Max.
Minimum req. HRC per foot (lbs/ft)	2.4	2.0	7.3
Feasibility of above HRC per foot:	(ok)	(ok)	(ok)

Proposed HRC Grid Specifications

Proposed number of HRC delivery points (adjust above rec. # as nec. for site)	6
Proposed HRC applic. rate lbs/foot (adjust above rec. # as nec. for site)	2.4
Corresponding amount of HRC per point (lbs)	80
Buckets per injection point	2.7
Total Buckets	16
Total Amt of HRC (lbs)	479

Notes:
1. Hydraulic conductivity value is based on a rising head test completed at MW-401- the only monitoring well with a measured hydraulic conductivity in the vicinity of this injection Area.
2. Dissolved phase groundwater VOC concentrations are based in part on interpolation and in part on assumption because there are no wells loacted within Area 3-
The concentrations were calculated based on the geometric mean of all total CVOC values observed at the OW-302 cluster through time and at MW-3. Values for Area 3 were interpolated based on concentrations at the OW-302 cluster and the distance of the cluster from MW-3.

APPENDIX C

Health & Safety Plan

HALEY &
ALDRICH

Project/File No
70665-005

HALEY & ALDRICH, INC.
HEALTH & SAFETY PROGRAM

SITE SPECIFIC HEALTH & SAFETY PLAN FOR

Project Name: Coopervision Remediation

Location: 711 North Road, Scottsville, NY

Site Contact: Glen Byers

This Health and Safety Plan provides site specific descriptions and work procedures. General work practices, training, medical monitoring, compliance programs and record keeping procedures are included in the Haley & Aldrich Corporate Health and Safety Program Manual issued to all employees.

INDIVIDUAL COMPLETING THIS QUESTIONNAIRE: Niki Hoy

DATE FIELD WORK IS SCHEDULED TO BEGIN: September 2000

Date Submitted:7/19/2000
Date of Health and Safety Briefing:
Revision Dates:

APPROVALS:

The following signatures constitute approval of this Health & Safety Plan. This plan should not be deviated from without prior written or verbal approval.

REVISIONS:

APPROVED: INITIAL DATE

Signature: NA
Name: DATE
CORPORATE H&S MANAGER
(Required for Sustained Level C and all Level B work)

Signature: Margaret B Holt 7/20/00
Name: Margaret B. Holt DATE
H&A BRANCH H&S MANAGER

Signature: [signature] 7/24/00
Name: [signature] DATE
SITE/PROJECT MANAGER

PRE-SITE HEALTH & SAFETY BRIEFING:

I HAVE READ, UNDERSTOOD, AND AGREE TO FOLLOW THIS HEALTH & SAFETY PLAN. EMERGENCY RESPONSE NUMBERS AND HOSPITAL MAP ARE ON THE NEXT PAGE.

REVISIONS:

			INITIAL/DATE
NAME	SIGNATURE	DATE	
NAME	SIGNATURE	DATE	
NAME	SIGNATURE	DATE	
NAME	SIGNATURE	DATE	

Copy and attach with the plan if more team members are working on the project.

EMERGENCY RESPONSE RESOURCES

(Copy MUST be immediately available to field personnel)

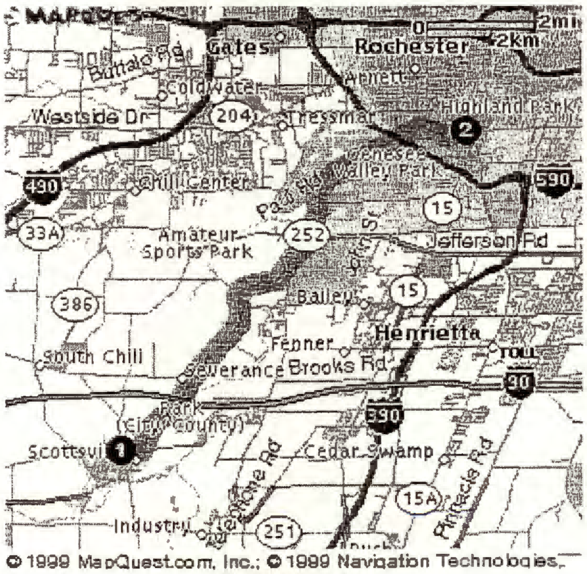
*Nearest Hospital: Address: Phone Number:	Strong Memorial Hospital 601 Elmwood Avenue Rochester, New York Emergency Dept. (map next page)
Emergency Response Number: Ambulance, Fire, Police, Environmental Emergency	**911**
Enter Local Emergency Response Number if not on 911 system:	
Occupational Health Physician: Address: Phone Number: Emergency Phone Number:	Dr. Bruce Barron Strong Memorial Hospital 601 Elmwood Avenue Rochester, New York 275-7795
Haley & Aldrich Project Manager: Phone Number: Emergency Phone Number: Client Project Manager: Phone Number: Emergency Phone Number:	Vince Dick 716.327.5507 716.734.6838 (cell) Glen Byers 716.264.3204
Other: Address: Phone Number:	CHEMTREC (Chemical Transportation Emergency Center) 2501 M Street, NW Washington, DC 20037 800.424.9300

How will Evacuation Alarms and/or Emergency Information be communicated on site:
Voice communication If other, describe:

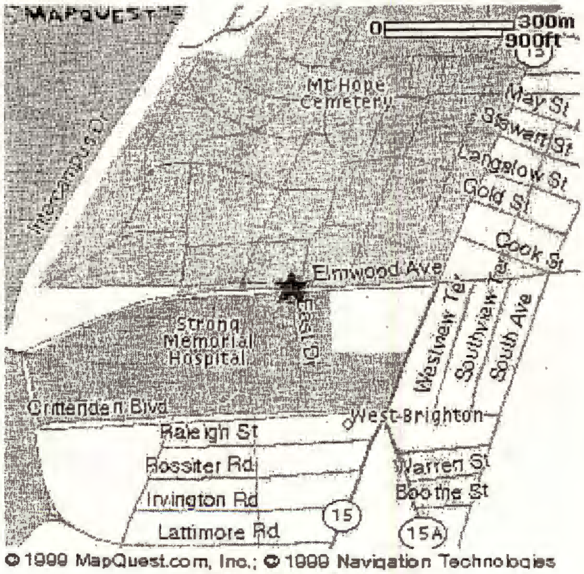
How will Emergency Services be notified: On-site phone If other, describe:

Starting From:	Arriving At:	Distance:	Approximate Travel Time:	
711 North Road Scottsville, NY 14546-1238	601 Elmwood Avenue Rochester, NY 14642-0001	10.4 miles	27 mins	Reverse Driving Directions

Directions	Miles
1. Start out going East on NORTH RD towards BROWNS AVE by turning right.	0.4
2. Turn LEFT onto SCOTTSVILLE RD/NY-383.	9.1
3. Turn SLIGHT RIGHT onto ELMWOOD AVE.	1.0
4. Turn LEFT onto EAST DR.	0.0
5. Turn LEFT onto ELMWOOD AVE.	0.0



Full Route



Destination

Nearest Hospital: Route to Hospital:	Strong Memorial
Contact Number:	275-7795

SITE DESCRIPTION AND WORK AREAS:

(Please provide site plan or sketch. Include site history/usage, type of facility and investigation.)

Prior sampling data available: ☒ Yes. ☐ No. ▪ If yes, attach copy of results or reference location, summarize below. ▪ If no, list any known or suspected hazardous materials or contamination at the site. ▪ Include a description of any known or potential hazards on the site. i.e. – excavation, confined space entry, utilities, traffic, railroad, client procedures, specific concerns, etc.
List of hazardous materials: TCA, DCA, TCE, DCE Site Description: Contact lens manufacturer

POTENTIALLY IMPACTED ENVIRONS

☒ Soil ☐ Air ☒ Groundwater ☐ Surface water

SOURCES OF INFORMATION

☐ Geologic References
☐ Water Reports
☒ Previous Reports
☒ Other
☐ City Directories
☐ Agency Files (DEC, DEP, etc.)
☐ Sanborn Maps

COOPERVISION
711 North Road, Scottsville New York
Chemical Testing Results
Updated 5/17/2000

TABLE 3

GROUNDWATER ANALYTICAL RESULTS

UPGRADIENT WELL

ANALYTE	Sample No.	MW - 201		T.O.G.S. Standard Values
	Well Screen Interval (ft)	9.8-20.0		
	Date Sampled	7/10/1997	6/2/1999	
	Dilution	NR	1	
Acetone		ND	ND	0.05**
1,1 - Dichloroethane		ND	ND	0.005
1,1 - Dichloroethene		ND	ND	0.005
1,1,1 - Trichloroethane		ND	ND	0.005
Tetrachloroethene		ND	ND	0.005
Trichloroethene		ND	ND	0.005
Chloroethane		ND	ND	0.005
1,2 - Dichloroethane		ND	ND	0.0006
2 - Butanone		ND	ND	NS
Bis(2 - ethylhexyl) phthalate		NA	NA	0.005

SOURCE WELLS

ANALYTE	Sample No.	OWD-302D			OWD-302D*	OWS-302S	OWS-302S	OWS-302S"	OWS-302S"*	OWD-302S	OWS-302D			OWD-303S	OWD-303D	OWS-303S	MW -1		MW - 205			OW-401	OW-401*	OW-401*	OW-401	T.O.G.S. Standard Values
	Well Screen Interval (ft)	32.5-33.5			32.5-33.5	13.0-14.0	13.0-14.0	13.0-14.0	13.0-14.0	21-22	29.5-30.5			19.5-20.5	31.0-32.0	12.5-13.5	4.0-14.0		21.2-28.0			44.0-46.0	44.0-46.0	44.0-46.0	44.0-46.0	
	Date Sampled	6/1/1999	10/26/1999	4/28/2000	6/1/1999	6/1/1999	4/28/2000	6/1/1999	6/1/1999	4/28/2000	6/1/1999	10/26/1999	4/28/2000	6/1/1999	6/1/1999	6/1/1999	4/16/1997	6/2/1999	7/10/1997	6/2/1999	6/2/1999	10/26/1999	10/26/1999	10/26/1999	4/28/2000	
	Dilution	250	10	5	1000	500	2000	10	500	100	10	2000	200	1	1	1		2500	5000	5000	500 [1]	2	1	2	1	
Acetone		ND	NA	NA	ND	ND	ND	0.300B	***1.8 DJB***	ND	ND	NA	ND	***0.18***	0.073	***0.16***	ND	ND	ND	ND	ND	NA	NA	0.004 DJB	ND	0.05**
1,1 - Dichloroethane		***52 E***	***1.0***	***0.63***	***54***	***49***	***390***	***25E***	***61 D***	***350***	***1.5***	***220***	***23***	ND	ND	ND	***36***	ND	***153***	***190***	***210E***	***0.22***	***0.36 E***	***0.37 D***	***0.09***	0.005
1,1 - Dichloroethene		ND	ND	ND	ND	ND	ND	***0.022J***	ND	ND	ND	ND	ND	ND	ND	ND	***12***	***13***	ND	ND	ND	***0.014***	***0.019***	***0.02 D***	***0.009***	0.005
1,1,1 - Trichloroethane		***100 E***	***0.021***	ND	***110***	ND	ND	***0.94***	ND	***2.4***	***0.22***	ND	***8.8***	ND	ND	ND	***370***	***320***	***421***	***480***	***450E***	***0.21***	***0.38 E***	***0.38 D***	***0.017***	0.005
Tetrachloroethene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005
Trichloroethene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005
Chloroethane		ND	ND	ND	ND	ND	ND	***0.056J***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005
1,2 - Dichloroethane		ND	ND	ND	ND	ND	ND	***0.020J***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005
2 - Butanone		ND	ND	ND	ND	ND	ND	0.063J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0006
Bis(2 - ethylhexyl) phthalate		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	***0.016***	ND	ND	ND	ND	ND	NS
																						NA	NA	NA	NA	0.005

MID-GRADIENT WELLS

ANALYTE	Sample No.	MW - 2		MW -3			OW-403	OW-403"	T.O.G.S. Standard Values
	Well Screen Interval (ft)	2.0-10.0		3.0-10.0			38.5-43.5	38.5-43.5	
	Date Sampled	4/16/1997	6/2/1999	6/18/1997	6/2/1999	10/26/1999	10/26/1999	10/26/1999	
	Dilution	NR	20	NR	50	100	1	1	
Acetone		ND	ND	ND	ND	NA	NA	**0.062 B**	0.05**
1,1 - Dichloroethane		***0.372***	***0.10***	***2.0***	***2.9***	***3.2***	**0.0059**	0.001 J	0.005
1,1 - Dichloroethene		***0.182***	***0.41***	***0.63***	***1.8***	***2.2***	ND	ND	0.005
1,1,1 - Trichloroethane		***0.519***	***3.7***	***3.3***	***10***	***8.0***	ND	0.001 J	0.005
Tetrachloroethene		***0.006***	ND	ND	ND	ND	ND	ND	0.005
Trichloroethene		***0.039***	ND	ND	ND	ND	ND	ND	0.005
Chloroethane		ND	ND	ND	ND	ND	ND	ND	0.005
1,2 - Dichloroethane		ND	ND	ND	ND	ND	ND	ND	0.005
2 - Butanone		ND	ND	ND	ND	ND	ND	ND	0.0006
Bis(2 - ethylhexyl) phthalate		ND	ND	ND	ND	ND	ND	0.005 J	NS
		NA	NA	NA	NA	NA	NA	NA	0.005

NOTES:
1. Results expressed in milligrams per liter (ppm).
2. "E" - indicates compounds whose concentrations exceed the calibration range.
3. " ** " - indicates that Guidance values were used when a Standard Value was not listed.
4. Groundwater samples collected by Haley and Aldrich on date shown, unless indicated sampled by NYSDEC.
5. Groundwater samples analyzed at Columbia Analytical Services, Rochester, New York
6. " * " - indicates dilution was performed on this sample due to sample exceedence of calibration range.
7. A sample for well #3020W-D-S was not submitted due to lack of sufficent water.
8. " NA " - indicates sample was not analyzed for that compound.
9. " " " - indicates samples that were collected by NYS Department of Environmental Conservation and analyzed by Columbia Analytical Services, Rochester, New York.
10. "J" - indicates an estimated value. The flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicate the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit but greater than zero.
11. "D" - indicates all compounds identified in an analysis at a secondary dilution factor.
12. "B" - indicates compound was found in the associated blank as well as in the sample.
13. "NS" - indicates no Standard Value was listed for compound in the Division of Water Technical and Operational Guidance Series.
14. "NR"- indicates dilution not reported.
15. Results in bold and italics indicate result greater than T.O.G.S. Standard Values.
16. [1] - indicates sample was undiluted to determine if Vinyl Chloride was present. No Vinly Chloride was detected.

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DOWNGRADIENT WELLS

ANALYTE	Sample No.	B304-OW	B304-OW"	B305-OW	B306-OW	MW - 202			MW -203		MW - 204		OW-402	OW-402"	T.O.G.S. Standard Values
	Well Screen Interval (ft)	4.0-14.0	4.0-14.0	4.0-14.0	4.0-14.0	10.1-20.3			9.8-20.0		9.8-20.0		38.5-43.5	38.5-43.5	
	Date Sampled	6/1/1999	6/1/1999	6/2/1999	6/2/1999	7/10/1997	6/2/1999	10/26/1999	7/10/1997	6/2/1999	7/10/1997	6/2/1999	10/26/1999	10/26/1999	
	Dilution	1	1	1	1	NR	1	1	NR	1	NR	1	1	1	
Acetone		ND	0.002JB	ND	ND	0.027	ND	ND	***0.118***	ND	ND	ND	ND	0.004 JB	0.05**
1,1 - Dichloroethane		***0.012***	***0.012***	ND	ND	***0.008***	ND	ND	ND	ND	ND	ND	ND	**0.007 J**	0.005
1,1 - Dichloroethene		***0.006***	***0.007J***	ND	ND	***0.018***	ND	ND	ND	ND	ND	ND	ND	ND	0.005
1,1,1 - Trichloroethane		***0.036***	***0.032***	ND	ND	***0.061***	ND	ND	0.003	ND	0.003	ND	ND	ND	0.005
Tetrachloroethene		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005
Trichloroethene		ND	ND	ND	ND	***0.008***	ND	ND	ND	ND	***0.015***	ND	ND	ND	0.005
Chloroethane		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005
1,2 - Dichloroethane		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005
2 - Butanone		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0006
Bis(2 - ethylhexyl) phthalate		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS
		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.005

PROJECT HAZARD ASSESSMENT

(Check those that may apply)

- ☐ Confined Space
- ☐ Excavation
- ☐ Mist
- ☐ Gases
- ☐ Carcinogen
- ☐ Active Construction Site
- ☐ Cold
- ☐ Heavy Metals
- ☐ Noise (dB)
- ☐ Fire/Explosion
- ☐ Drilling/Heavy Equipment
- ☐ Fume
- ☐ Acid
- ☐ Fuels
- ☐ Asbestos
- ☐ Heat
- ☐ Pesticides
- ☐ Other
- ☐ Dust
- ☐ Remote location
- ☐ Vapor
- ☐ Base
- ☐ Uncertain Utility Location
- ☐ Biohazard
- ☐ Inorganics
- ☒ Solvents

Comments/Special Concerns

List Required Tasks and Potential Hazards for Each

Description of Task 1:

HRC Injection

Potential Hazards

-(MSDS's attached to back of H&S Plan)

-high pressure pump used to inject HRC under pressure

Description of Task 2:

Monitoring well installation

Potential Hazards

-Contaminant contact with skin while examining soil samples

-drilling hazards; falling equipment, noise

Description of Task 3:

Groundwater sampling

Potential Hazards

-Contaminant contact with skin

<u>Required Personal Protective Equipment(PPE)/Clothing/Etc. by Task Number (s)</u> 1 & 2
(Selected PPE can be applicable to one or more tasks)

Protection Level: ☒ D ☐ C ☐ B   Modified? ☒ Yes. ☐ No.
Check all that is required:

☒ Eyes/Face/Glasses/Shield	☐ Boots, Rubber	☒ Steel Toed Boots
☒ Inner Gloves(PVC/Nitrile)	☐ Outer Gloves	☒ Hardhat
☐ Duct Tape	☐ Fire Extinguisher	☐ First Aid Kit
☒ Earmuffs/Plugs	☐ Tyvek Coverall	☐ Respirator
☐ Boot Covers, Disposable	☐ Saranex Coverall	Cartridge Type
☐ Flashlight	☐ Other, specify	
☐ Air Horn/Signaling Device		

<u>Required Personal Protective Equipment(PPE)/Clothing/Etc. by Task Number (s)</u>
(Selected PPE can be applicable to one or more tasks)

Protection Level: ☐ D ☐ C ☐ B ☐ A   Modified? ☐ Yes. ☐ No.
Check all that is required:

☒ Eyes/Face/Glasses/Shield	☐ Boots, Rubber	☐ Saranex Coverall
☒ Inner Gloves (PVC)	☐ First Aid Kit	☒ Hardhat
☐ Duct Tape	☐ Fire Extinguisher	☐ Outer Gloves
☒ Earmuffs/Plugs	☐ Tyvek Coverall	☐ Respirator
☐ Boot Covers, Disposable	☐ Air Horn/Signaling Device	Cartridge Type
☐ Flashlight	☐ Other, specify	

<u>Refer to Tables 1&2 for exposure guidelines and PPE/monitoring upgrade requirements.</u>

Required Personal Protective Equipment(PPE)/Clothing/Etc. by Task Number (s) 3
(Selected PPE can be applicable to one or more tasks)

Protection Level: ☒ D ☐ C ☐ B   Modified? ☒ Yes. ☐ No.

Check all that is required:

☒ Eyes/Face/Glasses/Shield	☐ Boots, Rubber	☐ Steel Toed Boots
☒ Inner Gloves(PVC/Nitrile)	☒ Outer Gloves	☐ Hardhat
☐ Duct Tape	☐ Fire Extinguisher	☐ First Aid Kit
☐ Earmuffs/Plugs	☐ Tyvek Coverall	☐ Respirator
☐ Boot Covers, Disposable	☐ Saranex Coverall	Cartridge Type
☐ Flashlight	☐ Other, specify	
☐ Air Horn/Signaling Device		

Required Personal Protective Equipment(PPE)/Clothing/Etc. by Task Number (s)
(Selected PPE can be applicable to one or more tasks)

Protection Level: ☐ D ☐ C ☐ B ☐ A   Modified? ☐ Yes. ☐ No.

Check all that is required:

☒ Eyes/Face/Glasses/Shield	☐ Boots, Rubber	☐ Saranex Coverall
☒ Inner Gloves (PVC)	☐ First Aid Kit	☐ Hardhat
☐ Duct Tape	☐ Fire Extinguisher	☐ Outer Gloves
☐ Earmuffs/Plugs	☐ Tyvek Coverall	☐ Respirator
☐ Boot Covers, Disposable	☐ Air Horn/Signaling Device	Cartridge Type
☐ Flashlight	☐ Other, specify	

Refer to Tables 1&2 for exposure guidelines and PPE/monitoring upgrade requirements.

EQUIPMENT/INSTRUMENTATION

Monitoring/Field Screening Equipment

☐ HNu ☐ 10.2eV ☐ 11.7eV	☐ Hydrogen Cyanide Meter (Monitor)
☐ OVA	☐ Photovac Micro Tip , 10.6eV
☐ Confined Space Meter - LEL/O_2/H_2S/CO	☐ Dust/Aerosol/Fiber Count
☐ Explosimeter (LEL)	☐ Photovac GC
☐ Radiation Meter	☐ Draeger Tubes
☒ Other (Specify) FID	Specify

Description of Monitoring Requirements: include frequency and location by Task number

Breathing zone monitoring every 15 minutes during injection and drilling.

Air monitoring every 15 minutes up and down wind of drilling/injection.

Exposure Guidelines for common contaminants are listed in Table 1. Requirements for PPE upgrades based on monitoring are covered in Table 2. Record monitoring data and PPE upgrades on attached Record of Field Monitoring, maintain with project files.

Decontamination Equipment

☒ Distilled Water	☐ Tap Water
☐ Hexane	☐ Methanol
☒ Alconox Soap	☐ Acetone
☒ Brushes	☐ Wash Tubs (specify #
☒ Plastic Sheeting	☐ Disposal Bags
☒ Steam Cleaner	☐ Other (Specify)

Decontamination and Waste Disposal Procedures: (specify type and location of decontamination and plans for disposal of generated waste products)

PPE and sampling equipment will be disposed of in on-site dumpsters.
Drillers will decon equipment between runs with Alconox and water.
Drillers will decon equipment between locations with steam cleaner at temporary decon pad.

COMMENTS/PROCEDURES/SPECIAL CONCERNS/SAFE WORK PRACTICES

TABLE 1
HAZARD MONITORING

(CIRCLE CONTAMINANTS OF CONCERN, WRITE ADDITIONAL CONTAMINANTS AND EXPOSURE GUIDELINES ON LAST PAGE)

CONTAMINANTS OF CONCERN	ROUTES OF EXPOSURE	IDLH	PEL	TLV	PID	FID	ODOR THRESHOLD	IRRITATION THRESHOLD	ODOR DESCRIP-TION
Acetone	R, I, C	2500	1000	500 Cv 750	9.69	60	13	---	Chem, sweet, pungent
Ammonia	R, A, I, C	300	50	25 Cv 35	---	---	0.5-2	10	Pungent suffocating oder
Benzene	R,A,I,C	Ca	1	SK 0.5	9.25	150	4.68	---	Solvent
Carbon tetrachloride (Tetrachlormethane)	R,A,I,C	Ca	2 Cv 25 200: 5 min peak	SK 5 Cv 10	11.47	10	50	---	Sweet, pungent
Chlorobenzene	R,I,C	1000	75	10	9.07	200	0.68	---	Almond like
Chloroform	R,I,C	Ca	2	10	11.42	65	50	---	Sweet
Cyanides (CN salts)	R,A,I,C	50 mg/m³	5 mg/m³	SK Cv 5 mg/m³	---	---	---	---	Faint almond odor
o-Dichlorobenzene	R,A,I,C	200	Cv 50	25 Cv 50	9.06	50	0.3	E 20-30	Pleasant, aromatic
p-Dichlorobenzene	R,I,C	150	Cv 75	10	8.94	---	0.18	E 80-160	Distinct, aromatic mothball-like
Dichlorodifluoromethane (Freon 12)	R,C	15000	1000	1000	11.97	15	---	---	---
1,1-Dichloroethane	R,I,C	3000	100	100	---	80	200	---	Distinct
1,2-Dichloroethane	R,I,A,C	Ca	50 Cv 100	10	11.12	80	88	---	Chloroform
1,1-Dichloroethylene (Vinylidene chloride, 1,1-DCE	R,I	Ca	-	5 Cv 20	*	40	190	---	---
1,2-Dichloroethylene	R,I,C	1000	200	200	9.65	50	0.085	---	Ether-like, acrid
Ethanol	R,A,I,C	---	1000	1000	10.48	25	10	---	Sweet
Ethylbenzene	R,I,C	800	100	Cv 125 100	8.76	100	2.3	E 200	Aromatic
Ethylene Glycol vapor	R,A,I,C	---	Cv 50	Cv 50	---	---	---	---	---
Formaldehyde	I,C	Ca	0.75	Cv 0.3	10.88	---	0.83	E 0.5	Hay
Gasoline	R,I,C	Ca	-	300	---	---	---	---	Petroleum
Hexane, n-isomer	R,I,C	--	50	50	10.18	70	130	E.T 1400-1500	Mild, gasoline-like
Hydrogen Cyanide (as CW)	R,A,I,C	50	10	SK Cv-4.7	13.69	---	0.58	---	Bitter almonds
Hydrogen peroxide	R,I,C	75	1	1	11	---	---	---	Sharp
Methanol	R,I,C	25000	Sk 200	SK 200	10.84	12	1000	---	Sweet

CONTAMINANTS OF CONCERN	ROUTES OF EXPOSURE	IDLH	PEL	TLV	PID	FID	ODOR THRESHOLD	IRRITATION THRESHOLD	ODOR DESCRIPTION
MEK peroxide	R,I,C	—	Cv 0.7	Cv 0.2	—	—	—	—	—
Methyl Chloroform (1,1,1-TCA)	R,I,C	700	350	350	**	105	20-100	—	Chloroform-like
Methylene Chloride (Dichloromethane, Methylene dichloride)	R,I,C	Ca	25	50	11.35	100	25-50	E 5000	Ether-like
Methyl Mercaptan	R,C	150	Cv 0.5	0.5	9.44	—	—	—	Garlic, Rotten Cabbage
MIBK (Hexone)	R,I,C	500	100	50 Cv 75	—	—	—	—	Pleasant
Naptha (coal tar)	R,I,C	1000	100	400	—	—	—	—	Aromatic
Naphthalene	R,A,I,C	250	10	10	8.14	—	0.3	E 15	Mothball-like
Octane	R,I,C	750	500	300 Cv 375	9.9	80	48	—	Gasoline-like
Pentachlorophenol	R,A,I,C	Ca 2.5 mg/m³	0.5mg/m³sk	SK 0.5mg/m³	—	—	—	—	Pungent when hot
Phenol	R,A,I,C	250	Sk5	Sk5	8.5	—	0.04	E.N.T 68	Medicinal
Propane	R,C	2100	1000	2500	10.95	80	16000	—	Natural gas odor
Stoddard Solvent (Mineral Sprits)	R,CI,I	20,000 mg/m³	500	100	*	—	1	E 400	Kerosene-like
1,1,2,2-Tetrachloroethane	R,A,I,C	Ca (100)	Sk 5	1	11.1	100	1.5	—	—
Tetrachloroethylene (Perchloroethylene)	R,I,C	Ca	25	25	9.32	70	4.68	N.T513-690	Ether, Chloroform-like
Toluene	R,A,I,C	500	200	50	8.82	110	2.14	E 300-400	Mothballs
Trichloroethylene	R,I,C	Ca (1000)	50	50	9.47	70	21.4	—	Solventy, chloroform-like
Turpentine	R,A,I,C	800	100	100	—	—	200	E.N 200	Pine like
Vinyl Chloride	R	Ca	2	2	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
DUSTS, MISTS AND MISCELLANEOUS COMPOUNDS									
Asbestos	R	Ca	0.1 fibr/cc	Species dependent	—	—	—	—	—
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	700	100	20	8.47	85	0.047	E 200-400	Rubber, solvent
Aluminum- metal	R,I,C	—	15mg/m³	10mg/m³	—	—	—	—	—

CONTAMINANTS OF CONCERN	ROUTES OF EXPOSURE	IDLH	PEL	TLV	PID	FID	ODOR THRESHOLD	IRRITATION THRESHOLD	ODOR DESCRIP-TION
dust - soluble salts	R,I,C	—	2mg/m^3	2mg/m^3	—	—	—	—	—
Arsenic	R,A,I,C	Ca	0.01mg/m^3	0.2mg/m^3	—	—	—	—	—
Barium:soluble compounds	R,I,C	250mg/m^3	0.5mg/m^3	0.5mg/m^3	—	—	—	—	—
Cadmium dusts	R,I	Ca	0.005mg/m^3	0.01mg/m^3	—	—	—	—	—
Chromium: Species Dependent	R,I,A,C	25mg/m^3	Spec Dep	Spec Dep	—	—	—	—	
Copper - dust & mist	R,I,C	—	1mg/m^3	1mg/m^3	—	—	—	—	—
Lead - arsenate	R,I,C	Ca	0.05mg/m^3	0.15mg/m^3	—	—	—	—	—
- inorg. dust & fume	R,I,C	—	0.05mg/m^3	0.15mg/m^3	—	—	—	—	—
- chromate	R,I,C	—	—	0.05mg/m^3	—	—	—	—	—
Manganese & compounds	R,I	500 mg/m^3	Cv-5mg/m^3	0.2mg/m^3	—	—	—	—	—
Mercury & inorg. comp.	R,A,C	10 mg/m^3	Cv0.1mg/m^3	0.1mg/m^3		—	—	—	—
- (organo) alkyl comp.	R,A,I,C	2 mg/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	—	—	—	—	—

Table 1 - Hazard Monitoring

Notes: All units in ppm unless otherwise noted.

R = Respiratory (Inhalation)
I = Ingestion
SK = Skin
Cv = Ceiling value
Ca = Carcinogen

A = Skin Absorption
C= Skin and/or Eye Contact

* = Use 10.2 eV lamp
**= Use 11.7 eV lamp

Additional Contaminants:	Exposure Guidelines:
1,1,1-Trichloroethane	R, I, SK, Ca, IDLH: 100 ppm; sweet, chloroform-like odor
________________	________________
________________	________________

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. Sustained for >3 sec in the breathing zone 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 Level B[3]
Explosimeter[4] (LEL)	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	20% O_2 20% - 23.5% O_2 < 19.5% O_2 > 23.5% 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 Table 1 or other resources 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	On site monitoring or tedlar bag sample collection for laboratory analysis

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 H&A HEALTH AND SAFETY STAFF IMMEDIATELY.

RECORD OF FIELD MONITORING

Project Number:_ ____________________ Date: ____________________

Project Description: ____

Task Description: ____

Instrument Type: ______________________________ Serial Number: ____________
(OVA, LEL, PID, etc)

Calibration and/or operational check completed as per manufacturers instructions: yes ____ no ____

Time completed: ______________ Weather conditions: ____________________

Reading Type: Breathing Zone-BZ Perimeter-P Surface-S	**Level:** (ppm or indicate units)	**Time:**	**PPE Level*:**

* EPA Levels B, C or D

Comments: __ ____

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The following information should be maintained for all projects requiring air monitoring.

MATERIAL SAFETY DATA SHEET

Last Revised: January 27, 1998

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Section 1 - Material Identification

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Supplier:	Applied Power Concepts, Inc. 411 East Julianna St. Anaheim, CA 92801
Telephone:	(714) 282-6140
Facsimile:	(714) 282-6139
Chemical Name:	Propanoic acid, 2-[2-[2-(2-hydroxy-1-oxopropoxy)-1-oxopropoxy]-1-oxopropoxy]-1,2,3-propanetriyl ester
Chemical Family:	Organic Chemical
Trade Name:	Glycerol tripolylactate

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For large quantities involved in a fire, one should wear full protective clothing and a NIOSH approved self contained breathing apparatus with full face piece operated in the pressure demand or positive pressure mode as for a situation where lack of oxygen and excess heat are present.

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Section 5 - Toxicological Information

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Acute Effects: May be harmful by inhalation, ingestion, or skin absorption. May cause irritation. To the best of our knowledge, the chemical, physical, and toxicological properties of the glycerol tripolylactate have not been investigated. Listed below are the toxicological information for glycerol and lactic acid.

RTECS#: MA8050000
Glycerol

Irritation data:	SKN-RBT 500 MG/24H MLD	85JCAE-,207,1986
	EYE-RBT 126 MG MLD	BIOFX* 9-4/1970
	EYE-RBT 500 MG/24H MLD	85JCAE-,207,1986
Toxicity data:	ORL-MUS LD50:4090 MG/KG	FRZKAP (6),56,1977
	SCU-RBT LD50:100 MG/KG	NIIRDN 6,215,1982
	ORL-RAT LD50:12600 MG/KG	FEPRA7 4,142,1945
	IHL-RAT LC50: >570 MG/M3/1H	BIOFX* 9-4/1970
	IPR-RAT LD50: 4420 MG/KG	RCOCB8 56,125,1987
	IVN-RAT LD50:5566 MG/KG	ARZNAD 26,1581,1976
	IPR-MUS LD50: 8700 MG/KG	ARZNAD 26,1579,1978
	SCU-MUS LD50:91 MG/KG	NIIRDN 6,215,1982
	IVN-MUS LD50: 4250 MG/KG	JAPMA8 39,583,1950
	ORL-RBT LD50: 27 GM/KG	DMDJAP 31,276,1959
	SKN-RBT LD50:>10GM/KG	BIOFX* 9-4/1970
	IVN-RBT LD50: 53 GM/KG	NIIRDN 6,215,1982
	ORL-GPG LD50: 7750 MG/KG	JIHTAB 23,259,1941

Target Organ data: Behavioral (headache), gastrointestinal (nausea or vomiting), Paternal effects (spermatogenesis, testes, epididymis, sperm duct), effects of fertility (male fertility index, post-implantation mortality).

RTECS#: OD2800000
Lactic acid

Irritation data:	SKN-RBT 5MG/24H SEV	85JCAE -,656,86
	EYE-RBT 750 UG SEV	AJOPAA 29,1363,46
Toxicity data:	ORL-RAT LD50:3543 MG/KG	FMCHA2-,C252,91
	SKN-RBT LD50:>2 GM/KG	FMCHA2-,C252,91
	ORL-MUS LD50: 4875 MG/KG	FAONAU 40,144,67
	ORL-GPG LD50: 1810 MG/KG	JIHTAB 23,259,41
	ORL-QAL LD50: >2250 MG/KG	FMCHA2-,C252,91

Only selected registry of toxic effects of chemical substances (RTECS) data is presented here. See actual entry in RTECS for complete information on lactic acid and glycerol.

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Section 6 - Health Hazard Data

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Handling: Avoid continued contact with skin.
Avoid contact with eyes.

In any case of any exposure which elicits a response, a physician should be consulted immediately.

First Aid Procedures:

Inhalation: Remove to fresh air. If not breathing give artificial respiration. In case of labored breathing give oxygen. Call a physician.

Ingestion: No effects expected. Do not give anything to an unconscious person. Call a physician immediately.

Skin Contact: Flush with plenty of water. Contaminated clothing may be washed or dry cleaned normally.

Eye contact: Wash eyes with plenty of water for at least 15 minutes lifting both upper and lower lids. Call a physician.

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Section 7 - Reactivity Data

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Conditions to Avoid: Strong oxidizing agents, bases and acids
Hazardous Polymerizatic None known
Further Information: Hydrolyses in water to form Lactic Acid and Glycerol.

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Section 8 - Spill, Leak or Accident Procedures

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After Spillage or Leakage Neutralization is not required. This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber.

Disposal: Laws and regulations for disposal vary widely by locality. Observe all applicable regulations and laws. This material, may be disposed of in solid waste. Material is readily degradable and hydrolyses in several hours.

No requirement for a reportable quantity (CERCLA) of a spill is known.

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Section 9 - Special Protection or Handling

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Should be stored in plastic lined steel, plastic, glass, aluminum, stainless steel, or reinforced fiberglass containers.

Protective Gloves:	Vinyl or Rubber
Eyes:	Splash Goggles or Full Face Shield Area should have approved means of washing eyes.
Ventilation:	General exhaust.
Storage:	Store in cool, dry, ventilated area. Protect from imcompatible materials.

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Section 10 - Other Information

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This material will degrade in the environment by hydrolysis to lactic acid and glycerol. Materials containing reactive chemicals should be used only by personnel with appropriate chemical training.

The information contained in this document is the best available to the supplier as of the time of writing. Some possible hazards have been determined by analogy to similar classes of material. No separate tests have been performed on the toxicity of this material. The items in this document are subject to change and clarification as more information becomes available.

In the event that total organic vapor levels in the breathing zone of field personnel exceeds 5 parts per million (ppm) above background, real-time air monitoring for volatile compounds at the perimeter of the Site will be required. The community air monitoring plan includes the following criteria:

If total organic vapor levels exceed 5 ppm above background at the perimeter of the Site, work activities must be halted and monitoring continued under the provisions of a Minor or Major Vapor Emission Response Plan, as detailed herein. All readings will be recorded and be available for NYSDEC and NYSDOH personnel to review.

Minor Vapor Emissions Response Plan

If the ambient air concentration of organic vapors attributable to exploration activities exceeds 5 ppm above background at the perimeter of the Site, activities will be halted and monitoring continued. If the vapor levels decrease below 5 ppm above background, work activities can resume. If the organic vapor levels are greater than 5 ppm but less than 25 ppm over background at the site perimeter, activities can resume provided:

1) the organic vapor level 200 feet downwind of the Site or one-half the distance to the nearest downwind residential or commercial structure, whichever is less, is below 5 ppm over background; AND

2) the vinyl chloride level (as measured with a drager tube) at the perimeter of the Site is less than 0.5 ppm; AND

3) more frequent intervals of monitoring, as directed by the project safety officer, are conducted.

If the total organic vapor level is above 25 ppm, or the vinyl chloride level is over 0.5 ppm at the perimeter of the Site, activities must be stopped. Downwind monitoring will be continued to minimize the potential impact to the nearest downwind residential or commercial structure at the levels specified in the Major Vapor Emissions Response Plan described below.

Major Vapor Emissions Response Plan

If the total organic vapor levels measured 200 feet downwind of the site, or one-half the distance to the nearest downwind residential or commercial structure (whichever is less) is more than 5 ppm over background, air monitoring must be performed within 20 ft. of these structures ("20 ft. Zone").

All active exploration or sampling operations at the Site shall cease and remain down if any of the following vapor levels are observed within the 20 ft. Zone:

1) Total organic vapors at 5 ppm or greater over background; OR

2) vinyl chloride levels greater than 0.5 ppm.

If, following cessation of work activities on the Site, efforts to abate the emission source are unsuccessful, and any of the above levels persist for more than 30 minutes in the 20 ft. zone, the Major Vapor Emissions Response Plan (MVERP) shall be placed into effect. In addition, any of the following conditions *in the 20 ft. Zone* will necessitate activation of the MVERP:

- sustained organic vapor levels greater than 10 ppm over background; or

- vinyl chloride levels over 1 ppm.

Major Vapor Emissions Response Plan Activation

Upon *MVERP* activation, the following activities will be undertaken:

1. The Safety Officer will be notified; all Emergency Response Contacts listed in the Health and Safety Plan will be contacted, including the local police authorities; AND

2. Air monitoring will be conducted at 30-minute intervals within the 20-ft. Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Safety Officer.

All project employees will be briefed with regard to the details of the Minor and Major Vapor Emission Response Plans, including anticipated hazards, safety practices, emergency procedures, and communication pathways, prior to initiating Site activities.