report.VCP.V00433.2001-10-17.Supplementary RAWP Addendum

IVI
ENVIRONMENTAL, INC.
Environmental Engineers

October 17, 2001

Thomas Gibbons
Project Manager
New York State Department of Environmental Conservation
Division of Environmental Remediation, 11th Floor
Bureau of Eastern Remedial Action
625 Broadway
Albany, New York 12233-7015
(518) 402-9622 (tel)
(518) 402-9022 (fax)

Re: IVI Project No.: E1066016
Remedial Action Workplan Addendum Comment Letter
Barrier Industries Site (Waters Edge)
Port Jervis, New York

Dear Mr. Gibbons:

IVI Environmental (IVI) has reviewed the New York State Department of Environmental Conservation (NYSDEC) comment letter dated October 16, 2001, regarding IVI's Supplementary Voluntary Investigation Report /Remedial Action Workplan Addendum (SVIR/RAWA) for the Barrier Industries site located in Port Jervis, New York (Subject) dated September 21, 2001. Based on our review, IVI has prepared the following responses to the comments raised in the NYSDEC letter which is provided in Attachment A (NYSDEC comments are shown in italics).

- *Page 1, Executive Summary*

  In the second paragraph, metals are listed as a site-related contaminant related to historical manufacturing operations. Filtered water samples collected during the site investigation indicated that metals were a negligible problem at the site, not requiring any remedial response. This should be made clear in the document. The document suggests that metals are a problem, however, no remedial action is being recommended. Please address similar discussions throughout the work plan.

  Discussion of metals in groundwater has been removed from the executive summary as metals contamination in groundwater is not considered an issue requiring remedial action.

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In the middle of the second paragraph it states that the highest concentrations of VOCs onsite appears to be located in the northwest-central portion of the site. I believe there is enough data to state conclusively that the highest concentrations of VOCs are located in the northwest-central portion of the site. Please correct similar statements in this report.

The SVIR/RAWA has been revised to read that "The area of highest contamination is located on the northwest-central portion of the site."

In the last sentence of the second paragraph, rather than state that there has been a 50% reduction from the original estimated plume size, it would be better to state that, based on supplemental plume characterization, the area of the plume was redefined to be approximately 0.5 acres in area rather than the original estimate of 1 acre.

All references to the percent reduction of the plume size have been removed from the SVIR/RAWA.

- *Page 5, Section 1.2.3*

In the last paragraph of this page, please reference previous discussions/correspondence regarding filtered vs. non-filtered metals data from this site. Also see comment Page 1, Executive Summary above. The metals data from the Phase II assessment are non-filtered and not representative of natural groundwater conditions.

IVI has clarified that the groundwater samples collected during the Phase II assessment were unfiltered samples, and refers discussion of metals in groundwater to the Remedial Investigation Summary in Section 1.2.4 of the SVIR/RAWA.

- *Page 17, Section 6.1*

Monitoring well PMW-5 should be shifted as close to the northern property boundary as possible to monitor groundwater quality in this area during and after remedial action has taken place.

IVI will install PMW-5 as close to the northern property boundary as physically possible.

- *Page 17, Section 6.1 and Page 20, Section 6.2.4*

  Is adequate data being collected for baseline, performance and post-treatment monitoring to determine the effectiveness of the treatment? The work plan calls for VOC data (along with limited groundwater quality parameters including DO, pH, conductivity and temperature) to be collected prior to, and two weeks to 1 year following, injection. Additional parameters, included on Table 3, are to be monitored during active remediation. The work plan has no provision for sampling soil (sorbed contaminants) to monitor contaminant mass destruction.

  The proposed sampling parameters, both during the active remediation and the pre and post remediation monitoring phases, will be adequate to determine the effectiveness of the treatment. No VOCs were ever detected in any of the soil samples collected on-site, as such, the remedial action was never intended to treat the subsurface soils. Therefore, there is no reason to conduct soil sampling.

I thought this was an issue w/ chem of OX.

- *Page 18, Section 6.2.1*

  What is the basis for the number, spacing, location and construction of the injection points. None of these parameters are described in detail in the work plan nor does there appear to be the necessary lithologic and hydrologic data to develop an injection plan. How will an injection point (as opposed to an injection interval) address a plume with significant vertical distribution given the likely limited vertical permeability? Figure 4 is not included in the report.

  Section 6.2.1 has been revised to include information used to determine the number, spacing and location of the injection points. Moreover, IVI has obtained significant amounts of lithologic and hydrologic data, during the on-site investigation. This information is present within Sections 5.0 and 4.0 of the VIR/RAW and the SVIR/RAWA respectively. Based on previous experience, IVI has observed a minimum of a 5' vertical radius of influence, from the fracture. This radius of influence was observed within clays, which exhibited very low hydraulic conductivity. Please refer to our press release regarding these cleanups, which has been included with this package. Figure 4 has also been included within this response.

- *Page 19, Section 6.0*

  It states in the second paragraph that the extent of the propagations will be measured with survey equipment. How is this done? How is an optimal hydraulic fracture network achieved? Given the lack of aquifer data, how are the various fracture parameters (pressure, injection rate, volume of propping agent, etc.) determined? Care must be taken to ensure that soil fracture pressure is controlled such that fractures do not move toward non-target zones or breach the ground surface. Please discuss this aspect of the remedial plan in more detail.

  Section 6.0 has been revised to detail the confirmation of the propagation extent, utilizing Geoprobe equipment. The pressure, injection rate, and volume of propping agent, have been calculated to provide a fracture approximately 2 cm in thickness and 60' in radius.

  There is one sentence in the work plan devoted to describing the delivery of the oxidizing chemicals into the aquifer. There needs to be considerable detail devoted to this element of the work plan. Information such as injection rate at each injection point, number of injections, volume of chemicals, concentrations of chemicals, radius of influence. There is no discussion of the various aquifer properties (concentration/mass/nature of contaminants, percent of organic matter, COD, pH and alkalinity of soil and groundwater, hydraulic conductivity, soil characterization (including Fe content), dissolved oxygen, oxidation/reduction potential, etc.) and how they guide/affect the treatment of contamination in the aquifer.

  Additional information regarding the injection rates, and the volume and concentration of chemicals has been added to Section 6.0. Further, IVI explains the use of a factor to compensate for scavengers, such as naturally occurring organics, and alkalinity, and for mass transfer and reaction inefficiency.

  No Health and Safety Plan (HASP) has been included in the work plan. In particular, the safety requirements for handling and mixing the oxidants and measures needed if contact with chemicals occur.

  A Health and Safety Plan has been prepared and is included in this response.

  In the fourth paragraph, what field analytical equipment will be used to conduct real time monitoring of the remediation? In particular, how are CVOC in water and vapor going to be analyzed?

  Section 6.0 has been revised to include information regarding the field monitoring equipment to be used.

In the fifth paragraph it states that if the remediation goal of 500 ppb is not achieved after the first injection, other remedial actions (such as an additional injection of an oxidizing agent or a co-metabolite solution) will be implemented. While the area being targeted for remediation includes VOC concentrations greater than 500 ppb, the cleanup goal is considerably lower (50 ppb).

IVI understands that the 500 ppb plume area represents the targeted remedial area, with a remedial goal of 50 ppb.

- *Page 28, Section 9.0*

  Reference to Appendix D should be changed to Appendix E.

  The reference to Appendix D in Section 9.0 has been changed to Appendix E

Sincerely,

IVI Environmental, Inc.

Charles B. Mulligan Jr
Project Manager

Attachment: A – NYSDEC Comment Letter to IVI dated October 16, 2001

cc: John S. Hicks, City of Port Jervis, Corporate Counsel

K:\Projects\E1066016 Phase III Waters Edge Remediation\Correspondence\Gibbons Response 10-17-01.doc

New York State Department of Environmental Conservation

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October 16, 2001

Mr. David R. Lent, C.P.G.
IVI Environmental, Inc.
105 Corporate Park Drive, Suite 115
White Plains, NY 10604

Dear Mr. Lent:

Re: Barrier Industries Site
Site ID # V00433-3
Supplemental Voluntary Investigation
Remedial Action Work Plan Comments

The New York State Department of Environmental Conservation (NYSDEC) has reviewed the draft Supplementary Voluntary Investigation Remedial Action Work Plan Addendum dated September 21, 2001 for the Barrier Industries Voluntary Cleanup Site (ID # V00433-3). We will be able to approve this Remedial Action Work Plan Addendum once the following comments (which we discussed in a conference call on October 11, 2001) are addressed and we receive concurrence on this plan from the New York State Department of Health:

Page 1, Executive Summary

In the second paragraph, metals are listed as a site-related contaminant related to historical manufacturing operations. Filtered water samples collected during the site investigation indicated that metals were a negligible problem at the site, not requiring any remedial response. This should be made clear in the document. The document suggests that metals are a problem, however, no remedial action is being recommended. Please address similar discussions throughout the work plan.

In the middle of the second paragraph it states that the highest concentrations of VOCs onsite *appears* to be located in the northwest-central portion of the site. I believe there is enough data to state conclusively that the highest concentrations of VOCs are located in the northwest-central portion of the site. Please correct similar statements in this report.

In the last sentence of the second paragraph, rather than state that there has been a 50% reduction from the original estimated plume size, it would be better to state that, based on supplemental plume characterization, the area of the plume was redefined to be approximately 0.5 acres in area rather than the original estimate of 1 acre.

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Page 17, Section 6.1

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Is adequate data being collected for baseline, performance and post-treatment monitoring to determine the effectiveness of the treatment? The work plan calls for VOC data (along with limited groundwater quality parameters including DO, pH, conductivity and temperature) to be collected prior to, and two weeks to 1 year following, injection. Additional parameters, included on Table 3, are to be monitored during active remediation. The work plan has no provision for sampling soil (sorbed contaminants) to monitor contaminant mass destruction.

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What is the basis for the number, spacing, location and construction of the injection points. None of these parameters are described in detail in the work plan nor does there appear to be the necessary lithologic and hydrologic data to develop an injection plan. How will an injection point (as opposed to an injection interval) address a plume with significant vertical distribution given the likely limited vertical permeability? Figure 4 is not included in the report.

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There is one sentence in the work plan devoted to describing the delivery of the oxidizing chemicals into the aquifer. There needs to be considerable detail devoted to this element of the work plan. Information such as injection rate at each injection point, number of injections, volume of chemicals, concentrations of chemicals, radius of influence. There is no discussion of

the various aquifer properties (concentration/mass/nature of contaminants, percent of organic matter, COD, pH and alkalinity of soil and groundwater, hydraulic conductivity, soil characterization (including Fe content), dissolved oxygen, oxidation/reduction potential, etc.) and how they guide/affect the treatment of contamination in the aquifer.

No Health and Safety Plan (HASP) has been included in the work plan. In particular, the safety requirements for handling and mixing the oxidants and measures needed if contact with chemicals occur.

In the fourth paragraph, what field analytical equipment will be used to conduct real time monitoring of the remediation? In particular, how are CVOC in water and vapor going to be analyzed?

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Page 28, Section 9.0

Reference to Appendix D should be changed to Appendix E.

Please incorporate the above comments into a final Supplementary Voluntary Investigation Remedial Action Work Plan Addendum and submit the affected sections to the Department for final review. If you have any questions, don't hesitate to call me at (518) 402-9622.

Sincerely,

Thomas Gibbons
Project Manager
Bureau of Eastern Remedial Action
Division of Environmental Remediation

cc: R. Cozzy/File
K. Carpenter
F. Woodward/T. LeBarron
D. Bendell (Reg. 3)
S. Bates/G. Laccetti (DOH)
J. Hicks (C. Port Jervis)

IVI Environmental News

Vol. 11 No. 8 AUGUST 2001

IVI Environmental, Inc. Successfully Remediates Contaminated Dry Cleaner Properties Using Innovative In-Situ Chemical Remediation Technology

IVI Environmental, Inc. (IVI) has successfully remediated chlorinated solvent-contaminated soil and groundwater utilizing an innovative in-situ chemical remediation technology at three shopping centers with on-site dry cleaners located in Plano, Richardson, and Arlington, Texas. Specifically, IVI successfully reduced levels of the dry cleaning solvent tetrachloroethylene, also referred to as perchloroethylene (Perc or PCE), and its degradation products trichloroethylene (TCE) and cis-1,2-dichloroethylene (DCE) in groundwater to meet the Texas Natural Resource Conservation Commission (TNRCC) Risk Reduction Standard No. 3 closure criteria. As a result, these sites are on-track to receive regulatory closure in the form of a Certificate of Completion (COC) following completion of approximately three post-remediation groundwater monitoring events. Moreover, the sites will not require engineering or institutional controls (deed restrictions).

According to the TNRCC Voluntary Cleanup Program (VCP) database, a total of 205 VCP applications for dry cleaners have been received by the TNRCC to date. Of those, 48 have been issued a final Certificate of Completion (COC) and only 7, including these three sites remediated by IVI, or approximately 3%, were remediated to levels not requiring engineering or institutional controls. Therefore, IVI's successful remediation of these three sites accounts for 43% of the Texas dry cleaner contaminated sites, which have been remediated below applicable TNRCC Standards not requiring engineering or institutional controls.

The in-situ chemical remediation technology (technology) used by IVI has been accepted by regulatory authorities in numerous states, and has successfully treated various soil and groundwater contaminants such as dry cleaning solvents, gasoline, fuel oil, PCBs and pesticides. The primary advantages of the technology over traditional soil and groundwater remediation technologies such as air sparging/soil vapor extraction (AS/SVE) are its timeliness, feasibility and cost. Remediation projects that once took approximately one to three years using AS/SVE can now be completed in approximately two weeks to two months, depending on site-specific conditions. In addition, the technology is not limited by low permeability soils such as AS/SVE. Furthermore, in addition to being more effective than AS/SVE, the technology can cleanup soil and groundwater for a lower cost because it eliminates the high long-term operation and maintenance costs associated with these other technologies.

The technology involves a sequential application of physical and chemical methods to degrade organic contaminants (such as dry cleaning solvents) in soil and groundwater into carbon dioxide, water and minerals. Specifically, the Process consists of the following three stages: 1) a physical method to enhance the disbursement of chemical reagents into the contaminated area, 2) a chemical method involving the injection of a proprietary biodegradable surfactant mixture to enhance the availability of target contaminants, and 3) a chemical method involving the injection of an oxidation mixture to degrade target contaminants. These stages are applied through injection points within the contaminated media.

IVI first became involved with the above-referenced sites in 1997, when retained to perform Phase I Environmental Site Assessments on these properties. remedial investigation (RI) activities which delineated the extent of contaminated soil and groundwater at each site. IVI also performed a feasibility study consisting of an in-situ-chemical remediation bench-scale test, which demonstrated that this technology would effectively treat the chlorinated solvent contamination.

The results of the RIs indicated that subsurface soils on each of the properties consist of low permeable clays. The volume of contaminated soil in excess of applicable TNRCC standards was approximately 150-200

Continued...

AUGUST 2001

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cubic yards (CY), 110 CY, and 500 CY on the Plano, Richardson, and Arlington properties, respectively. The contaminated groundwater plumes above applicable TNRCC standards on the Plano, Richardson, and Arlington properties were approximately 0.74 acres, 0.41, and 0.52 acres in size, respectively.

IVI completed the first two stages of in-situ chemical remediation on the three sites in June 2000. The oxidation stage of the in-situ chemical remediation activities was applied on the three sites within a two week period at each site, during September and October, 2000. All remedial activities were conducted with no impacts to dry cleaners and other on-site businesses. Based on post-remediation sample results, IVI reduced total volatile organic compounds (VOCs) in groundwater by an average of 94.2%, 97.8%, and 90% at the Plano, Richardson, and Arlington sites, respectively. IVI reduced total VOCs in soils by an average of 99.9 % and 99% at the Plano and Richardson sites, respectively. IVI is awaiting the analytical results for soil samples collected in August 2001 from the Arlington site. The VOC concentrations achieved by IVI are well below the applicable TNRCC standards at all three sites.

Project Synopsis

Project Data	Parkwood Square Shopping Center	Green Oaks Village Square Shopping Center	Richwood Shopping Center
Services Provided and Associated Costs	• Phase I Environmental Site Assessment - $2,500	• Phase I Environmental Site Assessment - $2,500	• Phase I Environmental Site Assessment - $2,500
	• Phase II Remedial Investigation - $60,300	• Remedial Investigation - $70,600	• Phase II Remedial Investigation - $64,000
	• Phase III Soil and Groundwater Remediation - $153,700	• Soil and Groundwater Remediation - $168,000	• Phase III Soil and Groundwater Remediation - $103,600
Soil Type	Low Permeable Clay	Low Permeable Clay	Low Permeable Clay
Depth to Bedrock	16′ - 18′ below ground surface	>40′ below ground surface	7′ - 12′ below ground surface
Maximum Total VOC Concentration in Soils	47,350 ug/kg	19,890 ug/kg	44,590 ug/kg
Volume of Contaminated Soil Above Applicable TNRCC Standards	150 - 200 cubic yards	500 cubic yards	110 cubic yards
Maximum Total VOC Concentration in Groundwater	3,800 ug/L	113,290 ug/L	676 ug/L
Area of Groundwater Contamination Above Applicable TNRCC Standards	0.74 acres	0.52 acres	0.41 acres
Average Percent Reduction of Total VOCs in Soils	99.9%	Analytical Results Pending	99.0%
Range and Average of Percent Reducton of Total VOCs in Groundwater	Range= 83.2 to 110% Average= 94.2%	Range= 67 to 100% Average= 90%	Range= 95.4 to 100% Average= 90%

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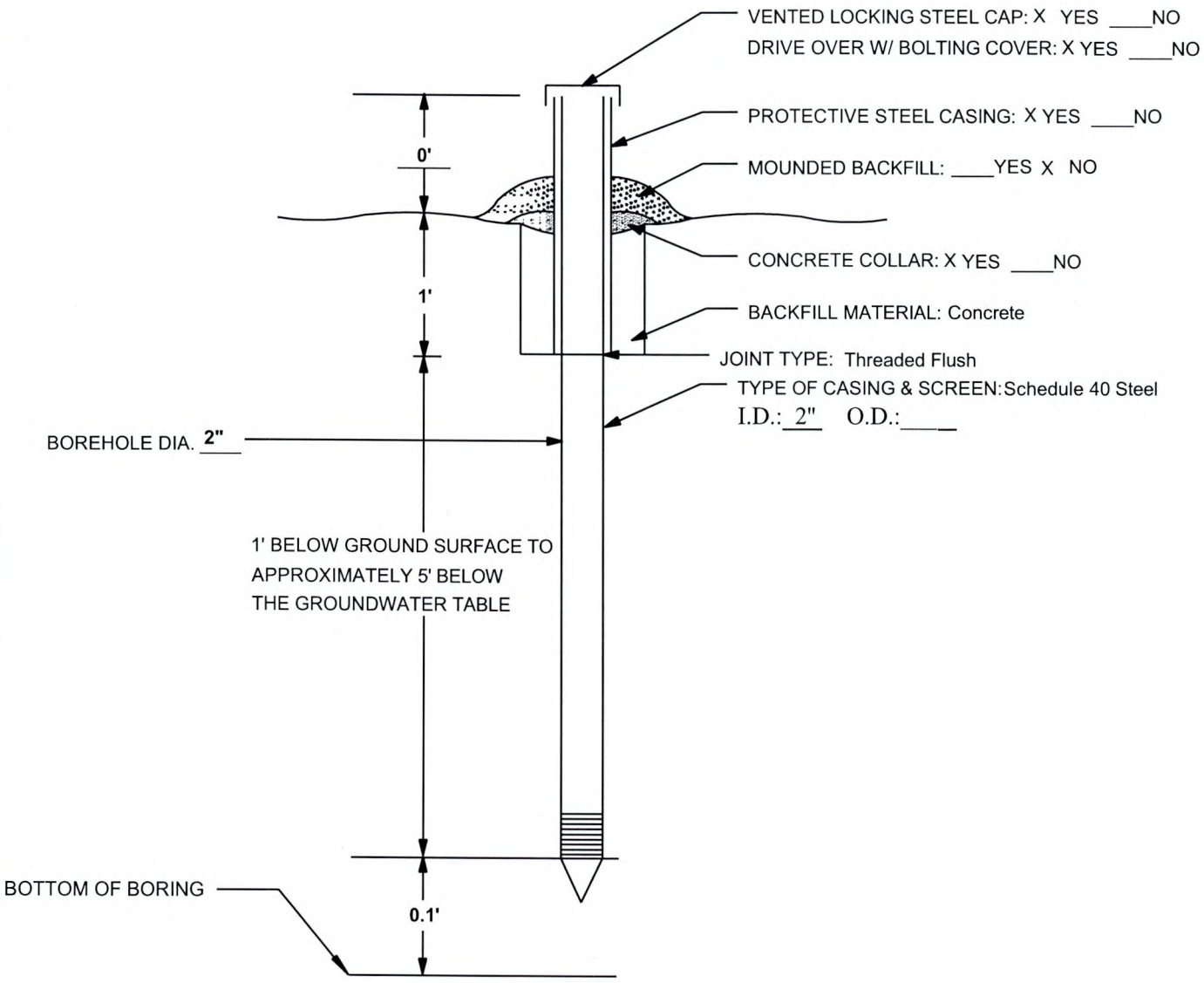

FIGURE 4 - INJECTION POINT CONSTRUCTION DETAILS

INJECTION POINT NO.: PROJECT NAME: Waters Edge	IVI ENVIRONMENTAL, INC. 105 CORPORATE PARK DRIVE WHITE PLAINS, NY 10604 (914) 694-9600(tel) (914) 694-1335(fax)	DATE INSTALLED:
IVI PROJECT NUMBER: E1015676		DRILLER:

EXECUTIVE SUMMARY

IVI Environmental Inc. (IVI) has prepared this Supplemental Voluntary Investigation Report/Remedial Action Workplan Addendum (SVIR/RAWA) on behalf of the City of Port Jervis (City) to address groundwater contamination at the Waters Edge property located at 200 East Main Street, Orange County, Port Jervis, New York (Subject). This SVIR/RAWA was prepared in accordance with the Scope of Work presented in IVI's Voluntary Investigation Report/Remedial Action Workplan (VIR/RAW) dated March 30, 2001, revised April 27, 2001, which was approved by the New York State Department of Environmental Conservation (NYSDEC) in a letter dated April 30, 2001.

The VIR/RAW indicated that the Subject's groundwater has been contaminated by chlorinated volatile organic compounds (VOCs) as a result of historical manufacturing operations conducted by Barrier Industries at the Subject. Specifically, there is a chlorinated VOC contaminated groundwater plume containing levels of 1,1,1 trichloroethane (TCA), trichloroethylene (TCE) and cis-1,2, dichloroethylene (DCE), all above their respective NYSDEC Groundwater Quality Standards (GQSs), beneath the Subject. This plume is approximately 4.43 acres in size and appears to be migrating in the direction of suspected groundwater flow towards the Neversink River. The area of highest contamination is located on the northwest-central portion of the site. Based upon the results of this SVIR, the estimated area of the chlorinated VOC plume in excess of the NYSDEC mandated 500 part per billion (ppb) clean-up level for the Subject has been redefined to be approximately 0.5-acres in size from the original estimate of 0.99-acres.

This SVIR/RAWA was designed to supplement the results of all previous environmental assessments and investigations on the Subject. Specifically, the purpose of the Supplemental Investigation was to further define the contaminant plume identified in the VIR/RAW, in order to optimize remedial activities. In addition, pursuant to the NYSDEC Comment letter dated April 26, 2001, regarding the VIR/RAW, this SVIR/RAWA provides further details regarding the In-Situ Physical Bio-Chemical Remediation (Remediation) proposed in the VIR/RAW.

The scope of this Supplemental Investigation included the following tasks: 1) the advancement of eight additional Geoprobe borings, 2) collection of groundwater samples from each Geoprobe boring and laboratory analysis for VOCs; and 3) collection of a groundwater sample from an existing monitoring well and laboratory analysis for VOCs.

Based on the results of this Supplemental Investigation, a Remedial Action Plan consisting of the following activities is recommended to address this contamination: 1) the installation of monitoring wells to further monitor the chlorinated VOC contaminated groundwater plume; 2) the installation of in-situ bio-chemical remediation injection points; 3) full scale in-situ bio-chemical remediation; 4) a monitoring well and injection point survey; 5) performance of four post-remediation groundwater sampling events; and 6) preparation of a Remedial Action Report following the completion of the monitoring program, which summarizes the overall findings of this program.

EXECUTIVE SUMMARY- continued

This SVIR/RAWA is divided into nine sections. Section 1.0 includes a discussion of the site location and history, and provides a summary of previous environmental assessments and investigations on the Subject. The objectives of the Supplemental Investigation are given in Section 2.0. Section 3.0 provides a description of the Supplemental Investigation field activities. The Supplemental Investigation results are discussed in Section 4.0. IVI's summary and conclusions regarding the Supplemental Investigation are provided in Section 5.0. The RAWA is given in Sections 6.0-8.0. Specifically, Section 6.0 provides a description of the remedial action workplan addendum. Section 7.0 provides the Quality Assurance Project Plan (QAPP). Section 8.0 gives a description of the remedial action report to be prepared following completion of the remediation described in this SVIR/RAWA and the VIR/RAW. Finally, a schedule which includes the Supplemental Investigation and remediation tasks is given in Section 9.0.

1.0 INTRODUCTION – continued

1.2.3 Phase II Environmental Site Assessment (ESA), dated November 27, 2000, prepared by IVI Environmental, Inc. on behalf of the Community Preservation Corporation.

IVI conducted a Phase II ESA on the Subject in November 2000 to address the areas of environmental concern identified in the Phase I ESA described above. This Assessment consisted of the advancement of five borings and the collection and analysis of five soil samples and three groundwater samples. The soil samples were analyzed for VOCs and semi-volatile organic compounds (SVOCs) in accordance with EPA Methods 8260 and 8270 (base neutrals only), respectively.

Additionally, three of the five soil samples were also analyzed for SVOCs (acid extractables) and pesticides, via EPA Methods 8270 and 8081, respectively. The groundwater samples were analyzed for VOCs, SVOCs, pesticides, priority pollutant metals (PPMs), and pH in accordance with EPA Methods 8260, 8270, 8081, 200.7 (245 for mercury), and 305, respectively.

The analytical results of the soil samples indicated that no VOCs, SVOCs, or pesticides were present above laboratory MDLs in the soil samples collected. The analytical results of the groundwater samples indicated that six VOCs were present above their respective laboratory MDLs in the samples collected. Specifically, 1,1,1-TCA at 30 parts per billion (ppb), 1,1-dichloroethane (DCA) at 3 ppb, chloroform at 3 ppb, p&m xylenes at 2 ppb, PCE ranging from 2 to 12 ppb, and TCE ranging from 5 to 67 ppb were detected in the Subject's groundwater. In addition, the concentrations of 1,1,1-TCA, PCE, and TCE exceeded their respective NYSDEC Groundwater Quality Standard (GQS) of 5 ppb given in 6 NYCRR Chapter X Part 703. Only one SVOC, diethylphthalate at 13 ppb, was detected in the groundwater samples. However, the concentration of diethylphthalate detected was below its NYSDEC GQS of 50 ppb.

Additionally, eleven metals were detected in the Subject's groundwater, seven of which exceeded their respective NYSDEC GQS. However, these results were obtained from unfiltered groundwater samples. Subsequent analysis of filtered groundwater samples have indicated only minor exccedances of the GQS. Refer to Section 1.2.4 for additional discussion of metals in groundwater.

1.0 INTRODUCTION – continued

This contamination was attributed to the small quantity of fill noted in this area. Additionally, minor metals exceedances, less than one order of magnitude above applicable RSCOs, were detected within localized areas of the Subject.

Additionally, a chlorinated VOC contaminated groundwater plume containing levels of 1,1,1 TCA, TCE and cis-1,2, DCE, all above their respective GQSs, was identified on-site. This plume was estimated to be approximately 4.43 acres in size and appeared to be migrating in the direction of groundwater flow towards the Neversink river. The area of highest contamination is located on the northwest-central portion of the site. No SVOC contamination in excess of the NYSDEC GQSs was detected on-site. Additionally, minor metals contamination was detected within the Subject's groundwater. Specifically, aluminum, antimony, cobalt, iron, and manganese concentrations were detected above their respective GQSs. With the exception of manganese, the metals were detected at concentrations of less than one order of magnitude above their respective GQSs. Further, the pH of the Subject's groundwater was found to be slightly lower than its GQS in ten of the twelve groundwater samples collected.

Based on the results of this Investigation, IVI concluded that the Subject's groundwater has been contaminated by chlorinated volatile organic compounds (VOCs) and metals as a result of historical manufacturing operations conducted by Barrier Industries at the Subject.

A VIR/RAW was submitted to the NYSDEC on March 30, 2001 and was revised for final approval on April 27, 2001, based on NYSDEC Comment letters dated April 6, 2001, and April 26, 2001, which requested the following: 1) that the remedial system should be designed to address the chlorinated VOC contamination in excess of 500 ppb; 2) further vertical and horizontal delineation of the 500 ppb plume; and 3) additional information detailing the in-situ bio-chemical remediation process. The NYSDEC approved the VIR/RAW in a letter dated April 30, 2001.

5.0 SUPPLEMENTAL INVESTIGATION SUMMARY AND CONCLUSIONS

Based on the results of this Supplemental Investigation and previous investigations on the Subject, there is a chlorinated VOC contaminated groundwater plume containing levels of 1,1,1-TCA, TCE, PCE, and cis-1,2-DCE above their respective GQSs beneath the Subject. The area of highest contamination is located on the northwest portion of the site. The area of chlorinated VOC contamination in excess of the NYSDEC mandated 500 ppb clean up level for the Subject is approximately 0.5 acres. A map showing total chlorinated VOC concentrations is provided as Figure 3 in Appendix A.

6.0 REMEDIAL ACTION WORKPLAN ADDENDUM

Pursuant to the VIR/RAW and the April 26, 2001 NYSDEC Comment Letter, this RAWA has been prepared to incorporate the results of the Supplemental Investigation and provide additional details regarding the in-situ bio-chemical remediation technology (technology).

The remediation will consist of the following activities: 1) monitoring well installation; 2) injection point installation; 3) in-situ bio-chemical remediation; 4) injection point survey and; 5) post-remediation confirmation samples. These activities are detailed below:

6.1 Monitoring Well Installation

IVI will install six overburden-monitoring wells on the Subject to allow for groundwater monitoring during and following the application of the technology. Proposed monitoring well locations are provided on Figure 3 in Appendix A. The well borings will be advanced from the ground surface to a depth of approximately 10' below the soil/groundwater interface utilizing a truck-mounted hollow-stem auger drill rig.

Monitoring wells will be screened from a depth of 5' above the soil/groundwater interface to the bottom of the well. Screen slot size and well packing material will be determined based on the geological observations of the soil samples collected during the advancement of the Geoprobe and monitoring well borings. Each well will be constructed using 2" diameter, Schedule 40 PVC screen and riser with a flush-mounted cover and lockable casing. Well installation will be conducted in conformance with good engineering and customary practice. An engineer/geologist representing IVI will be on-site at all times to supervise well installations, screen and collect soil samples (as necessary), and prepare boring logs and well installation details.

Each monitoring well will be developed following installation and allowing sufficient time for the grout in the annular space of the well to cure (approximately 24 hours). Development will involve the removal and surging of groundwater in each well. A minimum of five well volumes will be removed from each well during the development process. Following this removal, development water will be screened for water quality parameters using a water quality analyzer. Development in each well will continue until water quality parameters such as dissolved oxygen (DO), pH, conductivity, and temperature have stabilized (successive readings between well volume purges are within ten percent). The purpose of the well development is to eliminate fine-grained sediments from the area of the well screen and allow for the collection of a groundwater sample which is free of suspended materials and representative of the aquifer conditions.

6.0 REMEDIAL ACTION WORKPLAN ADDENDUM - continued

Following installation of the wells, IVI will have the well locations surveyed to an accuracy of one-tenth of a second of latitude and longitude. Additionally, IVI will survey the elevations of the top of the casings of each of these wells to the nearest hundredth (.01) foot. After development and prior to collecting groundwater samples, IVI will measure the static groundwater elevation in each of the wells. These results will be used to prepare a groundwater contour map indicating the direction of groundwater flow and the hydraulic gradient across the site.

Following development of the monitoring wells, IVI will purge the newly installed wells of three to five well volumes to obtain groundwater samples that are representative of the aquifer conditions.

IVI will collect water quality parameter readings including DO, pH, conductivity, and temperature, prior to purging, and following the second and all subsequent well volume purges. Purging will continue until successive readings are within ten percent.

Groundwater samples will be transferred to appropriate sample containers, packed on ice in a cooler, and sent for analysis to a certified laboratory. Samples will be analyzed for VOCs in accordance with NYS ASP 95-1. The groundwater sampling results will be tabulated and isopleth concentration maps will be prepared for contaminants exceeding applicable NYSDEC GQSs using Surfer contouring software to finalize proper injection point locations.

6.2 In-Situ Bio-Chemical Remedial Action Plan

6.2.1 Injection Point Installation

Based on our experience with applying this technology, a radius of influence of treatment of 60' is typically achieved. Given the size of the contaminated groundwater plume requiring treatment, approximately 0.5-acres, four injection points will be necessary to remediate the area. Therefore, IVI will install four 2" inside diameter (I.D.) stainless steel injection points inside or within close proximity to the 500 ppb total chlorinated VOCs contour area, as shown on Figure 3, in Appendix A. These injection points will be advanced using a pneumatic hammer to depths of approximately 5' below the soil/groundwater interface, approximately 24' to 30' bgs. Following advancement of the injection points, their respective drive points will be dislodged to allow for the transfer of reagents associated with the in-situ bio-chemical remediation process into the groundwater and saturated zone soils. A typical injection point construction detail is shown on Figure 4 in Appendix A.

6.0 REMEDIAL ACTION WORKPLAN ADDENDUM - continued

6.2.2 In-Situ Bio-Chemical Remediation

The technology will consist of the application of physical, chemical, and biological methods to the Subject's chlorinated VOC contaminated groundwater. These methods will be applied to degrade the chlorinated VOC contamination in the groundwater into carbon dioxide and water.

Specifically, the technology consists of the following three stages: 1) a physical method to enhance the disbursement of chemical reagents into the contaminated area, 2) a chemical method involving the injection of an oxidation mixture to degrade chlorinated VOC contaminants, and 3) a biological method including the injection of a biodegradable co-metabolite solution, which serves to create an anaerobic environment, to complete the degradation process and to restore subsurface conditions. These stages will be applied through the injection points discussed above.

The physical method will involve the creation of propagations for transference of reagents associated with the chemical stage of the remediation. The propagations will be advanced using a hydraulic fracturing technology which will involve the injection of high pressure water into the injection points. Following the advancement of the propagations, a coarse sand slurry will be injected into the points to prop the fractures and create precise preferential pathways with a high hydraulic conductivity inside the in-situ volume to be treated. The extent of the propagations will be confirmed utilizing Geoprobe equipment. Specifically, borings will be advanced radially at 10', 20', 40', and 60' intervals from the injection point. The collected soil samples will be inspected to confirm the presence and depth of the sand slurry.

The chemical method will involve the injection of a proprietary catalyst into each injection point, followed by an oxidation mixture consisting of a proprietary acid and a 10%-15% hydrogen peroxide solution. The solution will injected at a rate of approximately 2 to 3.5 gallons per minute, depending on field conditions. The acid is utilized to lower the pH of the treatment area to approximately 5, to enhance the efficiency of the reaction. A total of approximately 2,700 to 4,000 gallons of acid/hydrogen peroxide solution will be injected. This quantity is based on the estimated contaminant mass, and a factor utilized to account for scavengers present in the subsurface, such as naturally occurring organics, and alkalinity, and for mass transfer and reaction inefficiency.

TOTAL ORGANIC CARBON + ALKALINITY

what factor ?

6.0 REMEDIAL ACTION WORKPLAN ADDENDUM – continued

Total VOCs, air and water quality parameters, combustible gas indicator parameters, and groundwater elevation will be analyzed in the soil vapor and groundwater in surrounding monitoring wells periodically throughout the course of the chemical stage using field analytical equipment to monitor the real time progress of the remediation and ensure the remedial goals are achieved. A PhotoVac photoionization detector and a ORS chemsensor, will be utilized to monitor for VOCs in the soil vapor and water respectively. A downgradient monitoring well outside of the treatment area will also be monitored to ensure that the application of the aforementioned chemicals has no adverse affect upon the aquifer conditions downgradient of the treatment area. A summary of all monitoring parameters is included as Table 3 in Appendix B.

The biological method will only be utilized if residual concentrations of contaminants are found in the groundwater following the chemical stage at levels higher than the remedial goal of 500 ppb, and it is determined that an additional injection of chemical reagents is unnecessary. This method will involve the injections of a biodegradable co-metabolite solution to create an anaerobic environment, to complete the degradation process, and restore subsurface conditions.

6.2.3 Injection Point Survey

Following installation of the injection points, IVI will have the injection point locations surveyed to an accuracy of one-tenth of a second of latitude and longitude. Additionally, IVI will survey the elevations of the top of the injection point casings to the nearest (.01) foot.

6.2.4 Post-Remediation Confirmation Sampling Plan

IVI will conduct four post-remediation groundwater sampling events following completion of the Remediation. Groundwater samples will be collected from the six wells to be installed by IVI and existing wells MW-1 and MW-2, installed by others. The first sampling event will be scheduled approximately two weeks following the completion of remedial activities. Subsequent post-remediation groundwater monitoring events will be performed on a quarterly basis.

Prior to purging the wells, the static water level in each well will be measured to the nearest hundredth of a foot using an electronic water level indicator. Purging will be performed using dedicated polyethylene bailers or a submersible pump connected the dedicated polyethylene tubing.

6.0 REMEDIAL ACTION WORKPLAN ADDENDUM - continued

IVI will collect water quality parameter readings, including DO, pH, conductivity, and temperature, prior to purging, and following the second and all subsequent well volume purges. Purging will continue until successive readings are within ten percent to ensure that groundwater samples obtained are representative of groundwater conditions. A minimum of three well volumes will be removed from each well during purging activities.

Groundwater samples will be collected directly into 40 ml glass vials in such a way that no air bubbles or head-space will be present. Following sample collection, the sample containers will be packed on ice in a cooler, sent for analysis to a certified laboratory, and analyzed for VOCs in accordance with NYS ASP 95-1. A cumulative summary of contaminant-specific groundwater sampling results will be tabulated following each sampling event and concentration distribution maps will be prepared using Surfer contouring software. Based on the results of the confirmation samples, additional injection of reagents will be performed, if necessary, to address any residual contamination.

6.3 Waste Management

The following wastes will be generated as part of this Remediation: 1) purge water; 2) decontamination water; and 3) disposable sampling equipment.

6.3.1 Groundwater

Purge water from monitoring wells sampled within the chlorinated VOC contaminated plume will be transferred into DOT-approved 55-gallon labeled drums and stored on-site until groundwater samples are analyzed. The label will include a description and source of the contents of each drum. Based on the groundwater sampling results, the drummed water will be disposed of in accordance with all applicable regulations.

6.3.2 Decontamination Water

Wastewater generated from the cleaning of probing and injection equipment and field screening equipment, such as the water quality analyzer and electronic water level indicator, will be collected and transferred into labeled DOT-approved 55-gallon labeled drums.

The drums will be stored on-site until groundwater samples are analyzed. The label will include a description and source of the contents of each drum. Based on the sampling results, the drummed wastewater will be disposed of in accordance with all applicable regulations.

6.0 REMEDIAL ACTION WORKPLAN ADDENDUM - continued

6.3.3 Disposable Sampling Equipment

All disposable sampling equipment, including latex gloves and disposable bailers, will be collected and sealed in plastic trash bags, and stored on-site until groundwater samples are analyzed. The label will include a description and source of the contents of each bag. Based on the sampling results, the bagged sampling equipment will be disposed of in accordance with all applicable regulations.

9.0 SCHEDULE

A detailed project schedule of the remedial action activities, including supplemental investigation tasks, response actions, and post-remediation activities is provided in Appendix E.

SITE HEALTH AND SAFETY PLAN

Waters Edge (Proposed Senior Housing)
200 East Main Street
Port Jervis, New Jersey

Prepared for
Town of Port Jervis
Port Jervis, New York

Prepared by:
IVI Environmental, Inc.
White Plains, New York 10460

IVI Project No. E1015676
October 7, 2001

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1.0 INTRODUCTION

This section of the Site Health and Safety Plan (HASP) document defines general applicability and general responsibilities with respect to compliance with Health and Safety programs.

1.1 Scope and Applicability of the Site Health and Safety Plan

The purpose of this Site Health and Safety Plan is to define the requirements and designate protocols to be followed at the Site during investigation and remediation activities. Applicability extends to all Government employees, contractors, subcontractors, and visitors.

All personnel on site, contractors and subcontractors included, shall be informed of the site emergency response procedures and any potential fire, explosion, health, or safety hazards of the operation. This HASP summarizes those hazards in Table 3.1 and defines protective measures planned for the site.

This plan must be reviewed and an agreement to comply with the requirements must be signed by all personnel prior to entering the exclusion zone or contamination reduction zone.

During development of this plan, consideration was given to current safety standards as defined by the Environmental Protection Agency (EPA)/Occupational Health and Safety Administration (OSHA)/National Institute of Occupational Safety and Health (NIOSH), health effects and standards for known contaminants, and procedures designed to account for the potential for exposure to unknown substances. Specifically, the following reference sources have been consulted:

- OSHA 29 CFR 1910.120 and EPA 40 CFR 311
- USEPA, Office of Emergency and Remedial Response, Emergency Response Team, Standard Operating Safety Guides
- NIOSH/OSHA/USCG/EPA Occupational Health and Safety Guidelines
- American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values

1.2 Visitors

All visitors entering the contamination reduction zone and exclusion zone at the Site will be required to read and verify compliance with the provisions of this HASP. In addition, visitors will be expected to comply with relevant OSHA requirements such as medical monitoring (Sec. 6.0), training (Sec. 4.0), and respiratory protection (if applicable). Visitors will also be expected to provide their own protective equipment.

2.0 KEY PERSONNEL/IDENTIFICATION OF HEALTH AND SAFETY

In the event that a visitor does not adhere to the provisions of the HASP, he/she will be requested to leave the work area. All nonconformance incidents will be recorded in the site field log.

2.1 Key Personnel

The following personnel and organizations are critical to the planned activities at the Site. The organizational structure will be reviewed and updated periodically by the site supervisor.

Field Investigation Team (FIT) Representatives:

David R. Lent, C.P.G.
Jerry F. Vorbach, P.E., C.H.M.M.
Charles B. Mulligan Jr.
Peter Biolchini
Steven Gustems

2.2 Site Specific Health and Safety Personnel

The Site Health and Safety Officer (HSO) has total responsibility for ensuring that the provisions of this HASP are adequate and implemented in the field. Changing field conditions may require decisions to be made concerning adequate protection programs. Therefore, it is vital that personnel assigned as HSO be experienced and meet the additional training requirements specified by OSHA in 29 CFR 1910.120 (see Section 4.0 of this HASP). The HSO is also responsible for conducting site inspections on a regular basis in order to ensure the effectiveness of this plan.

The HSO at the site is Jerry F. Vorbach, P.E., C.H.M.M.

Designated alternates include:

David Lent, CPG.

2.0 KEY PERSONNEL/IDENTIFICATION OF HEALTH AND SAFETY

2.3 Organizational Responsibility

Field Investigation Team (FIT): The FIT is responsible for performing the sample collection activities delineated in the Workplan including the soil and groundwater sampling and the in-situ bio-chemical remediation.

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS

3.1 Historical Overview of Site

This HASP defines the hazards and methods to protect personnel from those hazards identified in previous site work or background information. For a thorough overview of historical information concerning the Subject, see the following documents:

- Phase I Environmental Assessment Water's Edge, Port Jervis, New York, dated August 21, 2000, prepared by IVI on behalf of Community Preservation Corporation, Inc.

- Phase II Environmental Site Assessment Water's Edge, Port Jervis, New York, prepared by IVI on behalf of Community Preservation Corporation, dated November 27, 2000.

- Voluntary Investigation Report/ Remedial Action Workplan, revised April 27, 2001, prepared by IVI Environmental, Inc., on behalf of the City of Port Jervis.

The property, which is situated in a suburban area characterized by residential and commercial retail and office development, consists of a 5.4-acre parcel improved with an approximately 80-year-old, 100,000 SF vacant industrial facility. Barrier Industries manufactured industrial janitorial chemicals on-site from 1978 until December 1993. The site was first developed prior to 1921 with a silk mill and several storage and residential buildings.

Based on the results of assessments and investigations conducted by IVI, the Subject's groundwater has been impacted by chlorinated solvents and priority pollutant metals, likely due to the historical manufacturing operations conducted on-site.

This Health and Safety Plan (HASP) cover the following activities, which will be performed as part of the Remedial Action of the Subject: soil and groundwater sampling and in-situ bio chemical remediation.

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS - continued

3.2 Task by Task Risk Analysis

The evaluation of hazards is based upon the knowledge of the site background presented in Section 3.1 above, and anticipated risks posed by the specific tasks to be performed. The following subsections describe each task/operation in terms of the specific hazards associated with it. In addition, the protective measures to be implemented during completion of those tasks are also identified.

Table 3.1 provides a summary of task analysis and chemical hazards for each task to be performed at the Subject.

TABLE 3.1
TASK ANALYSIS
CHEMICAL HAZARDS OF CONCERN

Contaminant	TLV/IDLH	Source/Concentration	Routes of Exposure
Soil and Groundwater Sampling			
Tetrachloroethylene	50 ppm/ Not applicable, potential human carcinogen (NIOSH, 1987)	Groundwater/0-73 ug/l	Inhalation, Ingestion and Contact
Trichloroethylene	50 ppm /IDLH: Not applicable, potential human carcinogen (NIOSH 1987)	Groundwater/0- 2,700 ug/l	Inhalation, Ingestion and Contact
1,1,1 Trichloroethylene	50 ppm /IDLH: Not applicable, potential human carcinogen (NIOSH 1987)	Groundwater/0- 80 ug/l	Inhalation, Ingestion and Contact
Chloroform	2ppm /2 ppm: potential human carcinogen (NIOSH 1987)	Groundwater/0- 8 ug/l	Inhalation, Ingestion and Contact
p&m Xylenes	100 ppm /IDLH: Not applicable, (NIOSH 1987)	Groundwater/0- 5 ug/l	Inhalation, Ingestion and Contact
1,1 Dichloroethane	100 ppm /IDLH: Not applicable, (NIOSH 1987)	Groundwater/0- 29 ug/l	Inhalation, Ingestion and Contact
In-Situ Bio-Chemical Remediation			
Hydrogen Peroxide	1 ppm/75 ppm	Not Applicable	Inhalation, Ingestion and Contact

Notes:
1. TLV = Threshold Limit Value
2. IDLH = Immediately Dangerous to Life and Health
3. (C) = ACGIH designated carcinogen
4. ACGIH = American Conference of Governmental Industrial Hygienists
5. NIOSH = National Institute of Occupational Safety and Health

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS - continued

3.3 Task Hazard Descriptions

3.3.1 Soil and Groundwater Sampling

A. Hazard Identification

Hazards generally encountered during soil and groundwater sampling include the following:

- Exposure to vapors of volatile organics when the well head or sampling devices is initially opened.
- Back strain due to lifting bailers or pumps from down-well depths and moving equipment (generators) to well locations.
- Slipping on wet, muddy surfaces created by spilled water.
- Electrical hazards associated with use of electrical equipment around water or wet surfaces.
- Possible water splashing in eyes during sampling.

B. Hazard Prevention

- To minimize exposure to volatiles when the well head is initially opened, a field monitoring instrument (Photoionization Detector (PID) should be placed near the opening to monitor organic levels. The breathing zone should also be monitored. The action levels on the instruments should be chosen before site work begins, and should be outlined in the safety plan. To prevent contact with contaminated groundwater, or product material, provide adequate protective equipment.
- Employing proper lifting and bailing techniques can prevent back strain. Heavy equipment, such as pumps and generators, should be only lifted with the legs, preferably using two or three personnel.
- Placing all purged water in drums for removal can prevent slipping on wet surfaces. Also, if the area is wet, wear boots with good treads and be alert of where personnel are walking to decrease the chance of slipping.

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS - continued

- Ground fault interrupters should be used in the absence of properly grounded circuitry or when pumps are used around wet conditions.
- Electrical extension cords should be protected or guarded from damage (i.e., cuts from other machinery) and be maintained in good condition.
- Eye protection should be worn as appropriate to prevent water splashing into eyes.

3.3.2 In-Situ Bio-Chemical Remediation Application

A. Hazard Identification

General hazards frequently encountered during in-situ bio-chemical remediation. Application includes:

- Chemical hazards associated with the application of chemical oxidizing reagents.

B. Hazard Prevention

- Handle all chemical reagents in accordance with manufacturers recommendations.
- Utilize appropriate personal protective equipment when handling or working near chemical reagents, i.e. chemical resistant suit, chemical resistant gloves and boots, safety goggles with side shields.

3.4 Physical Hazards

3.4.1 General Description

Tetrachloroethylene - Tetrachloroethylene, also called perchloroethylene, is a clear colorless volatile liquid having an ether-like odor. It is used as dry cleaning solvent, a vapor degreasing solvent, drying agent for metals, and for the manufacture of other chemicals. It is non-combustible, insoluble in water and its vapors are heavier than air. ((C) AAR, 1986)

Trichloroethylene - Trichloroethylene is a clear colorless volatile liquid having a chloroform-like odor. It is used as a solvent, fumigant, in the manufacture of other chemicals, and for many other uses. It is heavier than water and is slightly soluble in water. It is non-combustible. ((C) AAR, 1986)

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS - continued

1,1,1 Trichloroethane- 1,1,1-Trichloroethane is a colorless liquid with a sweet, chloroform-like odor. It is used as a solvent for fats, oils, waxes, resins and other products. It may be irritating to skin, eyes and mucus membranes; and in high concentrations the vapors may have a narcotic effect. It is moderately flammable at high temperatures and, when involved in fire, may emit highly toxic and irritating fumes. (NOAA, 1987)

1,1 Dichloroethane- Oily liquid; colorless; chloroform-like ethereal odor. Sinks and mixes with water. (USCG, 1985)

Chloroform- Is a clear colorless heavy liquid with a characteristic odor. It is used as a solvent, to make other chemicals, as fumigant, and for other uses. It is heavier than water and slightly soluble in water. ((C)AAR, 1986)

P&m Xylenes- Xylene is a clear colorless liquid with a characteristic aromatic odor. It is used as a solvent for paints and adhesives, and to make other chemicals. It has a flash point of 81-90 deg F. Its vapors are heavier than air. ((C) AAR, 1986)

Hydrogen Peroxide (Aqueous)-Hydrogen Peroxide, is a colorless liquid with a slightly sharp odor. It is non-combustible, miscible in water and is a powerful oxidizer. (NIOSH 1987).

3.4.2 Health Hazards

Tetrachloroethylene - Vapor: Irritating to eyes, nose and throat. If inhaled, will cause difficult breathing, or loss of consciousness. Liquid: Irritating to skin and eyes. Harmful if swallowed. (USCG, 1985)

Trichloroethylene – Vapor is irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, difficult breathing, or loss of consciousness. Liquid: Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, difficult breathing, or loss of consciousness. (USCG, 1985)

1,1,1 Trichloroethane- Vapor: Irritating to eyes, nose and throat. If inhaled, will cause dizziness or difficult breathing. Liquid: Irritating to skin and eyes. If swallowed, may produce nausea. (USCG, 1985)

1,1 Dichloroethane- If swallowed may cause nausea, vomiting and faintness. Irritating to skin and eyes. (USCG, 1985)

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS - continued

Chloroform- If swallowed may cause nausea, vomiting and faintness. Irritating to skin and eyes. (USCG, 1985)

P&m Xylenes - May be poisonous if inhaled or absorbed through skin. Vapors may cause dizziness or suffocation. Contact may irritate or burn skin and eyes. Fire may produce irritating or poisonous gases. Runoff from fire control or dilution water may cause pollution. (DOT, 1984)

Hydrogen Peroxide(Aqueous)- Vapor: Irritating to eyes, nose and throat. If inhaled, will cause difficult breathing, or loss of consciousness. Liquid: Irritating to skin and eyes. Harmful if swallowed. (NIOSH 1987).

3.4.3 Fire/Explosion Hazards

Tetrachloroethylene - Not flammable. Poisonous gases are produced when heated. Toxic, irritating gases may be generated in fires. (USCG, 1985)

Trichloroethylene - Combustible. Poisonous gases are produced in fire. Toxic and irritating gases are produced in fire situations. (USCG, 1985)

1,1,1 Trichloroethane- Combustible. Poisonous gases are produced in fire. Toxic and irritating gases are generated in fires. (USCG, 1985)

1,1 Dichloroethane- Flammable. Poison gas may be produced in fire or when heated. Containers may explode in fire. When heated to decomposition, emits highly toxic fumes to phosgene. Explosion hazard. (USCG, 1985)

Chloroform- It is nonflammable under most conditions, but it will burn under extreme fire conditions. (USCG, 1985)

P&m Xylenes Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water. (USCG, 1985)

Hydrogen Peroxide(Aqueous)-Non-flammable in liquid form. May spontaneously combust when in contact with combustible materials. (NIOSH, 1987)

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS - continued

3.4.4 Fire Fighting

Tetrachloroethylene - Extinguish fire using agent suitable for type of surrounding fire (material itself does not burn or burns with difficulty). ((C) AAR, 1986)

Trichloroethylene - Extinguish fire using agent suitable for type of surrounding fire (material does not burn or burns with difficulty). ((C) AAR, 1986)

1,1,1 Trichloroethane- Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Extinguish fire using agent suitable for type of surrounding fire (material itself does not burn or burns with difficulty). Keep run-off water out of sewers and water sources. ((C) AAR, 1986)

1,1 Dichloroethane- Extinguish with alcohol foam, carbon dioxide, or dry chemical. Water may be ineffective on fire. (USCG, 1985)

Chloroform- Extinguish with alcohol foam, carbon dioxide, or dry chemical. When heated it liberates phosgene; hydrogen chloride, chlorine and toxic and corrosive oxides of carbon and chlorine. It develops acidity from prolonged exposure to air and light. Chloroform explodes when in contact with aluminum powder or magnesium powder or with alkali metals and dinitrogen tetroxide. (EPA, 1986)

P&m Xylenes Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water. (USCG, 1985)

Hydrogen Peroxide(Aqueous)- Use water in flooding quantities. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Do not use foams, carbon dioxide or dry chemicals. Use water spray to absorb vapors. (DOT, 1996)

3.4.5 Non-Fire Response

Tetrachloroethylene - Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without hazard. Land Spill: Dig a pit, pond, lagoon, or holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash or cement powder. Water Spill: If dissolved, apply activated carbon at ten times the spill amount in region of 10 ppm or greater concentration. Remove trapped material with suction hoses. Air Spill: Apply water spray or mist to knock-down vapors. Vapor knockdown water is corrosive or toxic and should be diked for containment. ((C) AAR, 1986)

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS - continued

Trichloroethylene - Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Land Spill: Dig a pit, pond, lagoon, or holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash or cement powder. Water Spill: Use natural barriers or oil spill control booms to limit spill motion. If dissolved, apply activated carbon at ten times the spill amount in region of 10 ppm or greater concentration. Remove trapped material with suction hoses. Use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates. ((C) AAR, 1986)

1,1,1 Trichloroethane- Keep material out of water sources and sewers. Attempt to stop leak if without hazard. Use water spray to knock-down vapors. Land Spill: Dig a pit, pond, lagoon or holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash, cement powder, sawdust, or commercial sorbents. Water Spill: Use natural barriers or oil spill control booms to limit spill motion. Use natural deep water pockets, excavated lagoons, or sand bag barriers to trap material at bottom. Remove trapped material with suction hoses. ((C) AAR, 1986)

1,1 Dichloroethane- Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Keep people away. Shut off ignition sources. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies. (USCG, 1985)

Chloroform- Utilize protective clothing to handle all materials. Stop discharge if possible. Prevent entry to sewers, waterways, and confined spaces.

P&m Xylenes - Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without hazard. Use water spray to knock-down vapors. Land Spill: Dig a pit, pond, lagoon, or holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash, cement power, sawdust, or commercial sorbents. Apply "universal" gelling agent to immobilize spill. Apply fluorocarbon-water foam to diminish vapor and fire hazard. Water Spill: Use natural barriers or oil spill control booms to limit spill motion. Use surface active agent (e.g. detergent, soaps, alcohols) to compress and thicken spilled material. Inject "universal" gelling agent to solidify enriched spill and increase effectiveness of booms. If dissolved, apply activated carbon at ten times the spilled amount in region of 10 ppm or greater concentration. Remove trapped material with suction hoses.

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS - continued

Hydrogen Peroxide(Aqueous)- Keep combustibles away from spilled material. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Absorb spilled material with non-combustible material (i.e. sand, earth, or vermiculite). Following product recovery flush area with water. (DOT, 1996).

3.4.6 First Aid

Tetrachloroethylene - If this chemical comes in contact with the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. If this chemical comes in contact with the skin, promptly wash the contaminated skin with soap and water. If this chemical penetrates through the clothing, promptly remove the clothing and wash the skin with soap and water. Get medical attention promptly. If a person breathes in large of amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible. If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1987)

Trichloroethylene - If this chemical comes in contact with the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. If this chemical comes in contact with the skin, immediately wash the contaminated skin with soap and water. If this chemical penetrates through the clothing, immediately remove the clothing, wash the skin with soap and water, and get medical attention promptly. If a person breathes in large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible. If this chemical has been swallowed, get medical attention immediately (NIOSH, 1987).

1,1,1 Trichloroethane- If this chemical comes in contact with the eyes, immediately wash the eyes with large amounts of water occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. If this chemical penetrates through the clothing, promptly remove the clothing and wash the skin with soap and water. Get medical attention promptly. If a person breathes in large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible. If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1987)

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS - continued

1,1 Dichloroethane- If this chemical comes in contact with the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. If this chemical comes in contact with the skin, promptly flush the contaminated skin with soap and water. If this chemical penetrates through the clothing, promptly remove the clothing and flush the skin with water. If irritation persists after washing, get medical attention. If a person breathes in large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible. If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1987)

Chloroform- If this chemical comes in contact with the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. If this chemical comes in contact with the skin, promptly wash the contaminated skin and soap and water. If this chemical penetrates through the clothing, promptly remove the clothing and wash the skin with soap and water. Get medical attention promptly. If a person breathes in large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Do not administer mouth to mouth, if victim has ingested or inhaled the substance, utilize pocket mask with a one way valve. Keep the affected person warm and at rest. Get medical attention as soon as possible. If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1987)

P&m Xylenes - If this chemical comes in contact with the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. If this chemical comes in contact with the skin, promptly wash the contaminated skin and soap and water. If this chemical penetrates through the clothing, promptly remove the clothing and wash the skin with soap and water. Get medical attention promptly. If a person breathes in large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible. If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1987)

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS - continued

Hydrogen Peroxide(Aqueous)- If this chemical comes in contact with the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. If this chemical comes in contact with the skin, immediately flush the contaminated skin with water. If this chemical penetrates the clothing, immediately remove the clothing and flush the skin with water. Get medical attention promptly. If a person breathes in large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible. If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1987)

4.0 PERSONNEL TRAINING REQUIREMENTS

Consistent with OSHA's 29 CFR 1910.120 regulation covering Hazardous Waste Operations and Emergency Response, all site personnel are required to be trained in accordance with the standard. At a minimum, all personnel are required to be trained to recognize the hazards on-site, the provisions of this HASP, and the responsible personnel.

4.1 Preassignment and Annual Refresher Training

Prior to arrival on site, each employer will be responsible for certifying that his/her employees meet the requirements of preassignment training, consistent with OSHA 29 CFR 1910.120 paragraph (e)(3). The employer should be able to provide a document certifying that each general site worker has received 40 hours of instruction off the site, and 24 hours of training for any workers who are on site only occasionally for a specific task. If an individual employee has work experience and/or training that is equivalent to that provided in the initial training, an employer may waive the 40-hour training so long as that equivalent experience is documented or certified. All personnel must also receive 8 hours of refresher training annually.

4.2 Site Supervisors Training

Consistent with OSHA 29 CFR 1910.120 paragraph (e)(8), individuals designated as site supervisors require an additional 8 hours of training.

The following individuals are identified as site supervisors:

Name	Title/Responsibility
David R. Lent	Assistant Manager, Phase II-III Department

4.3 Training and Briefing Topics

The following items will be discussed by a qualified individual at the site pre-entry briefing(s) or periodic site briefings.

TABLE 4.1
TRAINING AND BRIEFING TOPICS SUMMARY

Training	Frequency
Air Monitoring, Sec. 7.0; [29 CFR 1910.120(h)]	Periodic
Chemical Hazards, Table 3.1	Periodic

4.0 PERSONNEL TRAINING REQUIREMENTS – continued

Training	Frequency
Engineering Controls and Work Practices	Periodic
Handling Drums and Containers, [29 CFR 1910.120(j)]	Periodic
Overhead and Underground Utilities	Periodic
Personnel Protective Equipment, Sec. 5.0	Periodic
Site Control, Sec. 8.0; [29 CFR 1910.120(d)]	Periodic
Site Characterization and Analysis, Sec. 3.0	Periodic
Spill Containment, Sec. 12.0; [29 CFR 1910.120(b)(4)(j)]	Periodic
Training Requirements, Sec. 4.0; [29 CFR 1910.120(e)]	Periodic

5.0 PERSONAL PROTECTIVE EQUIPMENT TO BE USED

This section describes the general requirements of the EPA designated Levels of Protection (A-D), and the specific levels of protection required for each task at the Site.

5.1 Levels of Protection

Personnel wear protective equipment when response activities involve known or suspected atmospheric contamination, vapors, gases, or particulates may be generated by site activities, or when direct contact with skin-affecting substances may occur. Full facepiece respirators protect lungs, gastrointestinal tract, and eyes against airborne toxicants. Chemical-resistant clothing protects the skin from contact with skin-destructive and absorbable chemicals.

The specific levels of protection and necessary components for each have been divided into four categories according to the degrees of protection afforded:

Level A: Should be worn when the highest level of respiratory, skin, and eye protection is needed.

Level B: Should be worn when the highest level of respiratory protection is needed, but a lesser level of skin protection. Level B is the primary level of choice when encountering unknown environments.

Level C: Should be worn when the criteria for using air-purifying respirators are met, and a lesser level of skin protection is needed.

Level D: Should be worn only as a work uniform and not in any area with respiratory or skin hazards. It provides minimal protection against chemical hazards.

Modifications of these levels are permitted, and routinely employed during site work activities to maximize efficiency. For example, Level C respiratory protection and Level D skin protection may be required for a given task. Likewise the type of chemical protective ensemble (i.e., material, format) will depend upon contaminants and degrees of contact.

The Level of Protection selected is based upon the following:

- Type and measured concentration of the chemical substance in the ambient atmosphere and its toxicity.
- Potential for exposure to substances in air, liquids, or other direct contact with material due to work being done.
- Knowledge of chemicals on-site along with properties such as toxicity, route of exposure, and contaminant matrix.

5.0 PERSONAL PROTECTIVE EQUIPMENT TO BE USED – continued

In situations where the type of chemical, concentration, and possibilities of contact are not known, the appropriate Level of Protection must be selected based on professional experience and judgment until the hazards can be better identified.

5.2 Level A Personnel Protective Equipment:

- Supplied air respirator approved by the Mine Safety and Health Administration (MSHA) and National Institute for Occupational Safety and Health (NIOSH). Respirators may be positive pressure-demand, self-contained breathing apparatus (SCBA), or positive pressure-demand, airline respirator (with escape bottle for Immediately Dangerous to Life and Health (IDLH) or potential for IDLH atmosphere)
- Fully encapsulating chemical-resistant suit
- Coveralls
- Long cotton underwear
- Gloves (inner)
- Boots, chemical-resistant, steel toe and shank (depending on suit construction, worn over or under suit boot)
- Hard hat (under suit)
- Disposable gloves and boot covers (worn over fully encapsulating suit)
- Cooling unit
- 2-way radio communications (intrinsically safe)

5.3 Level B Personnel Protective Equipment:

- Supplied-air respirator (MSHA/NIOSH approved). Respirators may be positive pressure-demand, self-contained breathing apparatus (SCBA), or positive pressure-demand, airline respirator (with escape bottle for IDLH or potential for IDLH atmosphere)
- Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one or two-piece chemical-splash suit; disposable chemical-resistant, one-piece suits)
- Long cotton underwear
- Coveralls
- Gloves (outer), chemical-resistant
- Gloves (inner), chemical-resistant
- Boots (outer), chemical-resistant, steel toe and shank
- Boot covers (outer), chemical-resistant (disposable)
- Hard hat (face shield)
- 2-way radio communications (intrinsically safe)

5.0 PERSONAL PROTECTIVE EQUIPMENT TO BE USED – continued

5.4 Level C Personnel Protective Equipment:

- Air-purifying respirator, full-face, cartridge-equipped (MSHA/NIOSH approved)
- Chemical-resistant clothing (coveralls; hooded, one-piece or two-piece chemical splash suit; chemical-resistant hood and apron, disposable chemical-resistant coveralls)
- Coveralls
- Long cotton underwear
- Gloves (outer), chemical-resistant
- Gloves (inner), chemical-resistant
- Boots (outer), chemical-resistant, steel toe and shank
- Boot covers (outer), chemical-resistant (disposable)
- Hard hat (face shield)
- Escape mask
- 2-way radio communications (intrinsically safe)

5.5 Level D Personnel Protective Equipment:

- Coveralls
- Gloves
- Boots/shoes, leather or chemical-resistant, steel toe and shank
- Safety glasses
- Hard hat

5.6 Reassessment of Protection Program

The Level of Protection provided by PPE selection shall be upgraded or downgraded based upon a change in site conditions or findings of investigations. When a significant change occurs, the hazards should be reassessed. Some indicators of the need for reassessment are:

- Commencement of a new work phase, such as the start of drum sampling or work that begins on a different portion of the site.
- Change in job tasks during a work phase.
- Change of season/weather.
- When temperature extremes or individual medical considerations limit the effectiveness of PPE.
- Contaminants other than those previously identified are encountered.
- Change in work scope, which effects the degree of contact with contaminants.

5.0 PERSONAL PROTECTIVE EQUIPMENT TO BE USED – continued

5.7 Work Mission Duration

Before the workers actually begin work in their PPE ensembles, the anticipated duration of the work mission should be established. Several factors limit mission length, including:

- Air supply consumption (SCBA use).
- Suit/Ensemble permeation and penetration rates for chemicals (section 5.8.).
- Ambient temperature and weather conditions (heat stress/cold stress).
- Capacity of personnel to work in PPE.

5.8 Personal Protective Equipment Recommended for Site

The following specific clothing materials are recommended for the site:

A. Soil and Groundwater Sampling – Level D: safety goggles and chemical resistant gloves.

B. In-Situ Bio-Chemical Remediation – Level D: safety goggles and chemical resistant gloves.

5.9 SOP for Personal Protective Equipment

Proper inspection of PPE features several sequences of inspection depending upon specific articles of PPE and it's frequency of use. The different levels of inspection are as follows:

- Inspection and operation testing of equipment received from the factory or distributor.
- Inspection of equipment as it is issued to workers.
- Inspection after use or training and prior to maintenance.
- Periodic inspection of stored equipment.
- Periodic inspection when a question arises concerning the appropriateness of the selected equipment, or when problems with similar equipment arise.
- The primary inspection of the PPE in use for activities at the Subject will occur prior to immediate use and will be conducted by the user. This ensures that the specific device or article has been checked-out by the user and that the user is familiar with its use.

5.0 PERSONAL PROTECTIVE EQUIPMENT TO BE USED - continued

TABLE 5.1
SAMPLE PPE INSPECTION CHECKLIST

CLOTHING

Before use:

- Determine that the clothing material is correct for the specified task at hand.
- Visually inspect for:
  - imperfect seams
  - non-uniform coatings
  - tears
  - malfunctioning closures
- Hold up to light and check for pinholes.
- Flex product:
  - observe for cracks
  - observe for other signs of shelf deterioration
- If the product has been used previously, inspect inside and out for signs of chemical attack:
  - discoloration
  - swelling
  - stiffness

During the work task:

- Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind, however, that chemical permeation can occur without any visible effects.
- Closure failure.
- Tears.
- Punctures.
- Seam Discontinuities.

GLOVES

Before use:

- Visually inspect for:
  - imperfect seams
  - tears
  - non-uniform coating
  - pressurize glove with air; listen for pin-hole leaks.

5.0 PERSONAL PROTECTIVE EQUIPMENT TO BE USED - continued

5.10 SOP for Respiratory Protection Devices

The following subsections define standard operating procedures for air purifying respirators and self-contained breathing apparatus.

5.10.1 Cleaning and Disinfecting Air Purifying Respirators and Self Contained Breathing Apparatus

The backpiece is cleaned with cleaning solution and a brush. For Self-Contained Breathing Apparatus (SCBA), the facepiece is combined with the regulator following cleaning and an operational check is performed.

5.10.2 SCBA Inspection and Checkout

A. Monthly Inspection

1. Check cylinder label for current hydrostatic test date.
2. Inspect cylinder for large dents or gouges.
3. Inspect cylinder gauge for damage.
4. Complete routine inspection
5. Fill out the appropriate records with results and recommendations.

B. Routine Inspection

Perform immediately prior to donning or after cleaning. Before proceeding, check the following equipment:

1. Valves

   - By-pass valve is closed.
   - Mainline valve is closed

2. Backpack and Harness Assembly

   - Visually inspect straps for wear, damage, and completeness.
   - Check wear and function of belt.
   - Check packplate and cylinder holder for damage.

5.0 PERSONAL PROTECTIVE EQUIPMENT TO BE USED - continued

3. Cylinder and High Pressure Hose Assembly

- High-pressure hose connector is tight on cylinder fitting.
- Check cylinder to assure that it is firmly attached to backplate.
- Open cylinder valve; listen or feel for leakage around packing and hose connection.
- Check high-pressure hose for damage or leaks.

4. Regulator

- Regulator outlet is not covered or obstructed.
- Cover regulator outlet with palm of hand.
- Open mainline valve.
- Note stoppage of airflow after positive pressure builds.
- Close mainline valve.
- Remove hand from regulator outlet.
- Open by-pass valve slowly to assure proper function
- Close by-pass valve.
- Open mainline valve.
- Note pressure reading on regular gauge.
- Close cylinder valve while keeping hand over regulator outlet.
- Slowly remove hand from outlet and allow air to flow.
- Note pressure when low-pressure warning alarm sounds; it should be between 550-650 psi.
- Remove hand from regulator outlet.
- Close mainline valve.
- Check regulator for leaks by blowing air into regulator for 5-10 seconds. Draw air from outlet for 5-10 seconds. If a positive pressure or vacuum cannot be maintained there is a leak. DO NOT USE SCBA.

5. Facepiece and Corrugated Breathing Hose

- Inspect hand harness and facepiece for damage, serrations, and deteriorated rubber.
- Inspect lens for damage and proper seal in facepiece. Inspect exhalation valve for damage and dirt build-up.
- Stretch breathing hose and carefully inspect for holes and deterioration.
- Inspect connector for damage and presence of washer.
- Perform negative pressure test with facepiece donned.

5.0 PERSONAL PROTECTIVE EQUIPMENT TO BE USED - continued

6. Storage

- Refill cylinder to 2216 psi.
- Close cylinder valve.
- Tightly connect high-pressure hose to cylinder.
- Bleed pressure from high-pressure hose by opening mainline valve.
- Close by-pass valve.
- Close mainline valve.
- Fully extend all straps.
- Store facepiece in a clean plastic bag for protection.

5.11 Specific Levels of Protection Planned for the Site

The following levels of protection will be utilized during activities at the Subject:

- Level D

Table 5.2 presents the level of protection planned for the completion of each task.

Table 5.2
SPECIFIC LEVELS OF PROTECTION PLANNED FOR EACH TASK TO BE CONDUCTED AT THE SITE

- LEVEL D Tasks:
  - Soil and Groundwater Sampling
  - In-Situ Bio Chemical Remediation

6.0 MEDICAL SURVEILLANCE REQUIREMENTS

Medical monitoring programs are designed to track the physical condition of employees on a regular basis as well as survey preemployment or baseline conditions prior to potential exposures. The medical surveillance program is a part of each employer's Health and Safety program.

6.1 Baseline or Preassignment Monitoring

Prior to being assigned to a hazardous or a potentially hazardous activity involving exposure to toxic materials, employees must receive a preassignment or baseline physical. The contents of the physical is to be determined by the employer's medical consultant. As suggested by NIOSH/OSHA/USCG/EPA's Occupational Safety & Health Guidance Manual for Hazardous Waste Site Activities, the minimum medical monitoring requirements for work at the Site is as follows:

- Complete medical and work histories.
- Physical examination.
- Pulmonary function tests (FVC and FEV1).
- Chest X-ray (every 2 years)
- EKG.
- Eye examination and visual acuity.
- Audiometry.
- Urinalysis.
- Blood chemistry and heavy metals toxicology.

The preassignment physical should categorize employees as fit-for-duty and able to wear respiratory protection.

6.2 Periodic Monitoring

In addition to a baseline physical, all employees require a periodic physical within the last 12 months unless the advising physician believes a shorter interval is appropriate. The employer's medical consultant should prescribe an adequate medical, which fulfills OSHA 29 CFR 1910.120 requirements. The preassigned medical outlined above may be applicable.

All personnel working in contaminated or potentially contaminated areas at the Subject will verify currency (within 12 months) with respect to medical monitoring. This is done by indicating date of last physical on the safety plan agreement form.

6.0 MEDICAL SURVEILLANCE REQUIREMENTS - continued

6.3 Exposure/Injury/Medical Support

As a follow-up to an injury or possible exposure above established exposure limits, all employees are entitled to and encouraged to seek medical attention and physical testing. Depending upon the type of exposure, it is critical to perform follow-up testing within 24-48 hours. It will be up to the employer's medical consultant to advise the type of test required to accurately monitor for exposure effects.

6.4 Exit Physical

At termination of employment or reassignment to an activity or location, which does not represent a risk of exposure to hazardous substances, an employee shall require an exit physical. If his/her last physical was within the last 6 months, the advising medical consultant has the right to determine adequacy and necessity of exit exam.

7.0 FREQUENCY AND TYPES OF AIR MONITORING/SAMPLING

This section explains the general concepts of an air monitoring program and specifies the surveillance activities that will take place during project completion at the Subject.

The purpose of air monitoring is to identify and quantify airborne contaminants in order to verify and determine the level of worker protection needed. Initial screening for identification is often qualitative, i.e., the contaminant, or the class to which it belongs, is demonstrated to be present but the determination of its concentration (quantification) must await subsequent testing. Two principal approaches are available for identifying and/or quantifying airborne contaminants:

- The on-site use of direct-reading instruments.
- Laboratory analysis of air samples obtained by a gas sampling bag, collection media (i.e., filter, sorbent) and/or wet-contaminant collection methods.

7.1 Direct-Reading Monitoring Instruments

Unlike air sampling devices, which are used to collect samples for subsequent analysis in a laboratory, direct-reading instruments provide information at the time of sampling, enabling rapid decision-making. Data obtained from the real-time monitors are used to assure proper selection of personnel protection equipment, engineering controls, and work practices. Overall, the instruments provide the user the capability to determine if site personnel are being exposed to concentrations which exceed exposure limits or action levels for specific hazardous materials.

Of significant importance, especially during initial entries, is the potential for IDLH conditions or oxygen deficient atmospheres. Real-time monitors can be useful in identifying any IDLH conditions, toxic levels of airborne contaminants, flammable atmospheres, or radioactive hazards. Periodic monitoring of conditions is critical, especially if exposures may have increased since initial monitoring or if new site activities have commenced.

Table 7.1. Excerpted from Occupational Safety and Health Guidelines for Hazardous Waste Site Activities, provides an overview of available monitoring instrumentation and their specific operating parameters.

7.0 FREQUENCY AND TYPES OF AIR MONITORING/SAMPLING - continued

TABLE 7.1
DIRECT-READING INSTRUMENTS FOR GENERAL SURVEY

- **Instrument: Combustible Gas Indicator (CGI)**

  Hazard Monitored: Combustible gases and vapors.

  Application: Measures the concentration of a combustible gas or vapor.
  Detection Method: A filament, usually made of platinum, is heated by burning the combustible gas of vapor. The increase in heat is measured. Gases and vapors are ionized in a flame. A current is produced in proportion to the number of carbon atoms present.
  General Care/Maintenance: Recharge or replace battery. Calibrate immediately before use.
  Typical Operating Time: Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.

- **Instrument: Flame Ionization Detector (FID) with Gas Chromatography Option. Example: Foxboro OVA.**

  Hazard Monitored: Many organic gases and vapors.
  Application: In survey mode, detects the concentration of many organic gases and vapors. In gas chromatography (GC) mode identifies and measures specific compounds. In survey mode, all the organic compounds are ionized and detected at the same time. In GC mode, volatile species are separated.
  General Care/Maintenance: Recharge or replace battery. Monitor fuel and/or combustion air supply gauges. Perform routine maintenance as described in the manual. Check for leaks.
  Typical Operating Time: 8 hours, 3 hours with strip chart recorder.

- **Instrument: Portable Infrared (IR) Spectrophotometer**

  Hazard Monitored: Many gases and vapors.

  Application: Measures concentration of many gases and vapors in air. Designed to quantify one or two component mixtures.

  Detection Method: Passes different frequencies of IR through the sample. The frequencies absorbed are specific for each compound.

  General Care/Maintenance: As specified by manufacturer.

7.0 FREQUENCY AND TYPES OF AIR MONITORING/SAMPLING - continued

TABLE 7.1 (Continued)

- **Instrument: Ultraviolet (UV) Photoionization Detector (PID)**

  Example: Photovac 20/20.

  Hazard Monitored: Many organic and some inorganic gases and vapors.
  Application: Detects total concentration of many organic and some inorganic gases and vapors. Some identification of compounds are possible if more than one probe is measured.
  Detection Method: Ionizes molecules using UV radiation; produces a current that is proportional to the number of ions.
  General Care/Maintenance: Recharge or replace battery. Regularly clean lamp window. Regularly clean and maintain the instrument and accessories.
  Typical Operating Time: 10 hours. 5 hours with strip chart recorder.

- **Instrument: Direct Reading Colorimetric Indicator Tube**

  Hazard Measured: Specific gases and vapors.

  Application: Measures concentration of specific gases and vapors.

  Detection Method: The compound reacts with the indicator chemical in the tube, producing a stain whose length or color change is proportional to the compound's concentration.
  General Care/Maintenance: Do not use a previously opened tube even if the indicator chemical is not stained. Check pump for leaks before and after use. Refrigerate before use to maintain a shelf life of about 2 years. Check expiration date of tubes. Calibrate pump volume at least quarterly. Avoid rough handling, which may cause channeling.

- **Instrument: Oxygen Meter**

  Hazard Monitored: Oxygen (0_2)

  Application: Measures the percentage of 0_2 in the air.

  Detection Method: Uses an electrochemical sensor to measure the partial pressure of 0_2 in the air, and converts that reading to 0_2 concentration.

  General Care/Maintenance: Replace detector cell according to manufacturer's recommendations. Recharge or replace batteries prior to expiration of the specified interval. If the ambient air is more than 0.5% CO_2, replace the detector cell frequently.

7.0 FREQUENCY AND TYPES OF AIR MONITORING/SAMPLING – continued

TABLE 7.1 (Continued)

Typical Operating Time: 8-12 hours.

- **Instrument: Real Time Aerosol Monitor**

  Hazard Monitored: Particulates

  Application: Measures total particulates in air.

  Detection Method: Uses an internal light source. The particulates defract the light beam and the amount of diffraction is converted into a concentration (mg/m_3).

  General Care/Maintenance: Recharge batteries. Replace desiccant when necessary.

  Typical Operating Time: 8-12 hours.

- **Instrument: Monitox**

  Hazard Monitored: Gases and Vapors

  Application: Measures specific gases and vapors

  Detection Method: Electrochemical sensor relatively specific for the chemical species in question.

  General Care/Maintenance: Moisten sponge before use; check the function switch; change the battery when needed.

- **Instrument: Gamma Radiation Survey Instrument**

  Hazard Monitored: Gamma Radiation

  Application: Environmental radiation monitor

  Detection Method: Scintillation detector

  General Care/Maintenance: Must be calibrated annually at a specialized facility.

  Typical Operating Time: Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.

7.0 FREQUENCY AND TYPES OF AIR MONITORING/SAMPLING - continued

After site mitigation activities have commenced, the selective monitoring of high-risk workers, i.e., those who are closest to the source of contaminant generation, is essential. Personal monitoring samples should be collected in the breathing zone and, if workers are wearing respiratory protective equipment, outside the facepiece.

Those employees working closest with the source have the highest likelihood of being exposed to concentrations which exceed established exposure limits. Representative sampling approaches emphasizing worst case conditions, those employees with the greatest risk of exposure, is acceptable. However the sampling strategy may change if the operation or tasks change on site or if exposures potentially increase.

7.2 Site Air Monitoring and Sampling Program

A. Air Monitoring Instruments

Photoionization Detector ("PID") – Monitoring wells will be screened for VOCs utilizing a PID upon opening and periodically throughout the in-situ bio-chemical remediation process.

B. Action Levels

TABLE 7.2

SITE AIR MONITORING AND SAMPLING PROGRAM SUMMARY

Hazard Monitored	Action Level	Action
Organic gases and vapors	Action level depends on PEL/REL/ TLV for each contaminant. Action Level is 1/2 the current standards. See Table 3.1.	Activities in the vicinity of the area where action levels are exceeded will be discontinued until the concentrations of all organic gases and vapors fall below their respective action levels. If the concentration(s) of an organic gas(es) and vapor(s) continues to exceed its respective action level(s), then the level of protection will be upgraded to include appropriate respiratory protection.

Notes: LEL = Lower Explosive Limit
PEL = Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit
REL = National Institute of Occupational Safety and Health (NIOSH) Recommended Exposure Limit
TLV = American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value

what about clean-of air monitoring?

7.0 FREQUENCY AND TYPES OF AIR MONITORING/SAMPLING – continued

C. Reporting Format

- Air Monitoring Log

7.3 Site Ambient Air Sampling

A. Sampling Criteria

A site ambient air sampling program will be considered if the following criteria are met:

1. Meteorological conditions –

   Winds sufficient to cause dispersion.

2. Health and safety observations -

   Vapor and/or particulate levels are two to three times above background.

3. Site specific activities –

   Site activity increases airborne contaminant(s) exposure potential.

8.0 SITE CONTROL MEASURES

The following section defines measures and procedures for maintaining site control. Site control is an essential component in the implementation of the site health and safety program.

8.1 Buddy System

During all Level B activities or when some conditions present a risk to personnel, the implementation of a buddy system is mandatory. A buddy system requires at least two (2) people to work as a team; each looking out for each other. Level B operations generally require three people. Table 8.1 lists those tasks which require a buddy system and any additional site control requirements.

TABLE 8.1
PERSONNEL REQUIREMENTS

Task	Control Measures
In-Situ Bio-Chemical Remediation	Line of sight, buddy system
Soil and groundwater Sampling	Line of sight, buddy system

8.2 Site Communications Plan

Successful communications between field teams and contact with personnel in the support zone is essential. The following communications systems will be available during activities at the Subject.

- Hand Signals
- Direct Vocal Communication
- For hand signal communications, the following definitions will apply during activities at the Subject:

TABLE 8.2
HAND SIGNAL DEFINITIONS

Signal	Definition
Hands clutching throat	Out of air/cannot breath
Hands on top of head	Need assistance
Thumbs up	OK/I am all right/I understand
Thumbs down	No/Negative
Arms waving upright	Send backup support
Grip partners wrist	Exit area immediately

8.3 Work Zone Definition

The three general work zones established at the Site are the Exclusion Zone, Contamination Reduction Zone, and Support Zone.

8.0 SITE CONTROL MEASURES - continued

The Exclusion Zone is defined as the area where contamination is either known or likely to be present, or because of activity, will provide a potential to cause harm to personnel. Entry into the Exclusion Zone requires the use of personnel protective equipment.

The Contamination Reduction zone is the area where personnel conduct personal and equipment decontamination. It is essentially a buffer zone between contaminated areas and clean areas. Activities to be conducted in this zone will require personal protection as defined in the decontamination plan.

The Support Zone is situated in clean areas where the chance to encounter hazardous materials or conditions is minimal. Personal protection equipment is therefore not required.

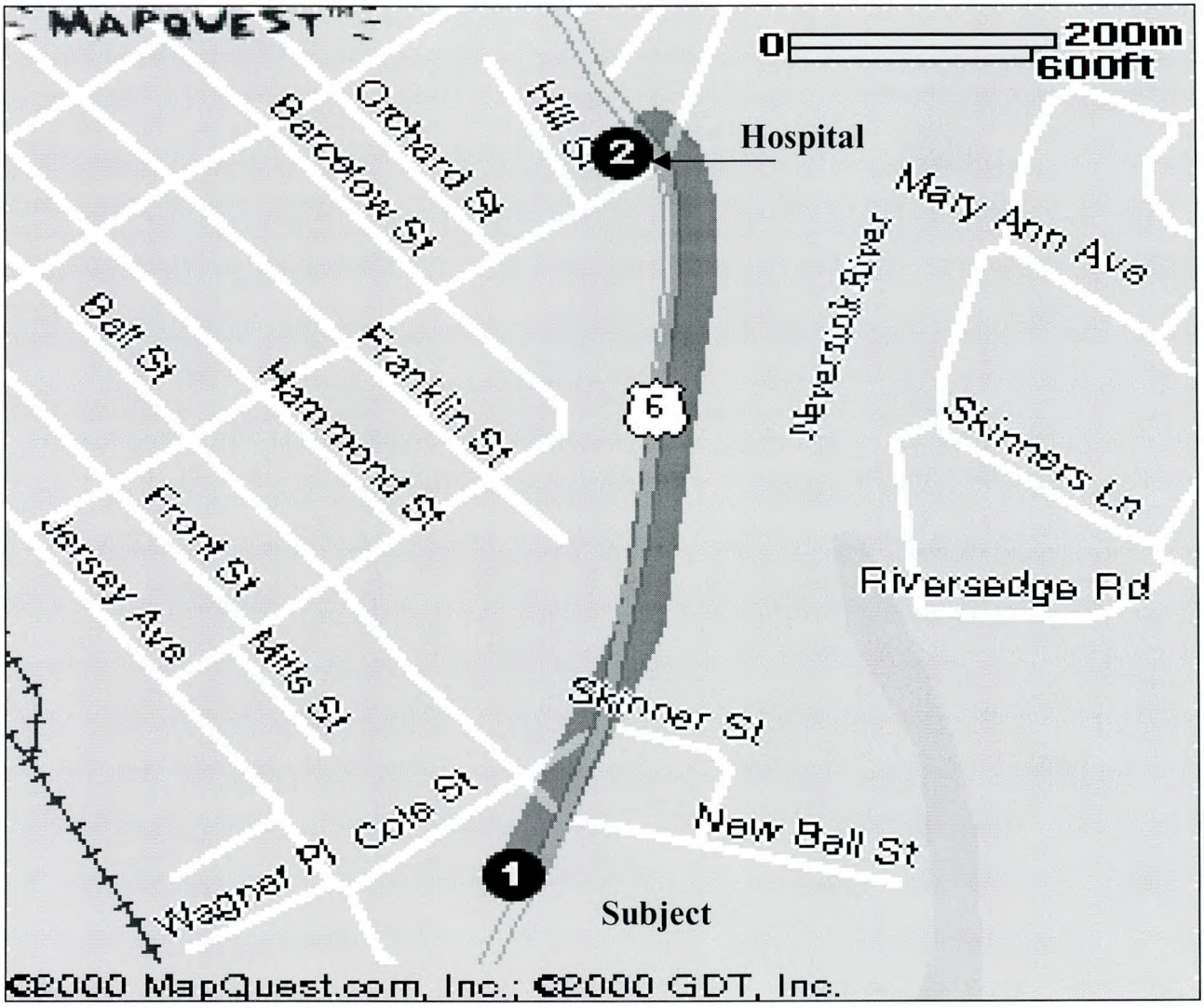
8.4 Nearest Medical Assistance

Figure 8.1 shows a map of the route to the nearest hospital, which can provide emergency care for individuals who may experience an injury or exposure on site. The route to the hospital should be verified by the HSO, and should be familiar to all site personnel.

8.0 SITE CONTROL MEASURES – continued

FIGURE 8.1

NEAREST HOSPITAL ROUTE



Directions

1. Make right out of Subject, head north on East Main St. approximately 0.5 mile

8.0 SITE CONTROL MEASURES - continued

8.5 Safe Work Practices

Table 8.3 provides a list of standing orders for the Exclusion Zone.
Table 8.4 provides a list of standing orders for the Contamination Reduction Zone.

8.6 Emergency Alarm Procedures

The warning signals described in section 10.4 "Evacuation Routes and Procedures," will be deployed in the event of an emergency. Communication signals will also be used according to section 8.2.

TABLE 8.3
STANDING ORDERS FOR EXCLUSION ZONE

- No smoking, eating, or drinking in this zone.
- No horse play.
- No matches or lighters in this zone.
- Check-in on entrance to this zone.
- Check-out on exit from this zone.
- Implement the communications system.
- Line of sight must be in position.
- Wear the appropriate level of protection as defined in the Safety Plan.

TABLE 8.4
STANDING ORDERS FOR CONTAMINATION REDUCTION ZONE

- No smoking, eating, or drinking in this zone.
- No horse play.
- No matches or lighters in this zone.
- Wear the appropriate level of protection.

9.0 DECONTAMINATION PLAN

Table 5.2 lists the tasks and specific levels of protection required for each task. Consistent with the levels of protection required, the Decontamination Table(s) provides a step by step representation of the personnel decontamination process. These procedures should be modified to suit site conditions and protective ensembles in use.

9.1 Standard Operating Procedures

Decontamination involves the orderly controlled removal of contaminants. Standard decontamination sequences are presented in the Decontamination Table. All site personnel should minimize contact with contaminants in order to minimize the need for extensive decon.

9.2 Levels of Decontamination Protection Required for Personnel

The levels of protection required for personnel assisting with decontamination will be Level D. The Site Safety Officer is responsible for monitoring decontamination procedures and determining their effectiveness.

9.3 Equipment Decontamination

Sampling equipment will be decontaminated in accordance with procedures as defined in the Workplan (see Section 8.3 of Remedial Action Workplan)

9.4 Disposition of Decontamination Wastes

(See Section 8.3 of Remedial Action Workplan)).

TABLE 9.1	
LEVEL D DECONTAMINATION STEPS	
Step 1	Remove outer garments (i.e., coveralls)
Step 2	Remove gloves
Step 3	Wash hands and face

10.0 EMERGENCY RESPONSE/CONTINGENCY PLAN

This section describes contingencies and emergency planning procedures to be implemented at the Subject. This plan is compatible with local, state and federal disaster and emergency management plans, as appropriate.

10.1 Pre-Emergency Planning

During the site briefing held periodically/daily, all employees will be trained in and reminded of provisions of the emergency response plan, communication systems, and evacuation routes. Table 10.1 identifies potential hazards associated with site activities, along with the available emergency prevention/control equipment and its location. The plan will be reviewed and revised, if necessary, on a regular basis by the HSO. This will ensure that the plan is adequate and consistent with prevailing site conditions.

TABLE 10.1

EMERGENCY RECOGNITION/CONTROL MEASURES

HAZARD	PREVENTION/CONTROL	LOCATION
Fire/Explosion	Fire Extinguisher	IVI Vehicle
Spill	Sorbent Materials	IVI Vehicle
Air Release	Evacuation Routes	Not Applicable

10.2 Personnel Roles and Lines of Authority

The Site Supervisor has primary responsibility for responding to and correcting emergency situations. This includes taking appropriate measure to ensure the safety of site personnel and the public. Possible actions may involve evacuation of personnel from the site area, and evacuation of adjacent residents. He/she is additionally responsible for ensuring that corrective measures have been implemented, appropriate authorities notified and follow-up reports completed. The HSO may be called upon to act on the behalf of the site supervisor, and will direct responses to any medical emergency. The individual contractor organizations are responsible for assisting the project manager in his/her mission within the parameters of their scope of work.

10.0 EMERGENCY RESPONSE/CONTINGENCY PLAN - continued

The Site Supervisor is: David R. Lent, C.P.G.

10.3 Emergency Recognition/Prevention

Table 3.1 provides a listing of chemical and physical hazards on-site. Additional potential hazards associated with site activities are listed in Table 10.1, along with the available emergency prevention/control equipment and its location. Personnel will be familiar with techniques of hazard recognition from preassignment training and site specific briefings. The HSO is responsible for ensuring that prevention devices and equipment are available to personnel.

10.4 Evacuation Routes/Procedures

In the event of an emergency which necessitates an evacuation of the site, the following alarm procedures will be implemented:

- Insure that a predetermined location is identified off-site in case of an emergency, so that all personnel can be accounted for.

- Personnel will be expected to proceed to the closest exit with your buddy, and mobilize to the safe distance area associated with the evacuation route. Personnel will remain at that area until the re-entry alarm is sounded or an authorized individual provides further instructions.

10.5 Emergency Contact/Notification System

The following list provides names and telephone numbers for emergency contact personnel. In the event of a medical emergency, personnel will take direction from the HSO and notify the appropriate emergency organization(s). In the event of a fire or spill, the site supervisor will notify the appropriate local, state and federal agencies.

TABLE 10.2
List of Emergency Contacts

Organization	Contact	Telephone
Police	Port Jervis Police Department	(845) 856-5101
Fire	Port Jervis Fire Department	(845) 858-4066
Hospital 1	Mercy Hospital	(845) 858-5634
Hospital 2	Horton Memorial Medical Center	(845) 343-2424
EPA Emergency Response Team		908-321-6660
State Authority	NYSDEC	(845) 256-3000
National Response Center		800-424-8802
Center for Disease Control		404-488-4100
Chemtrec		800-424-9555

10.0 EMERGENCY RESPONSE/CONTINGENCY PLAN - continued

10.6 Emergency Medical Treatment Procedures

Any person who becomes ill or injured in the exclusion zone must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, at least partial decontamination should be completed (i.e., complete disrobing of the victim and redressing in clean coveralls or wrapping in a blanket.) First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the project manager.

Any person being transported to a clinic or hospital for treatment should take with them information on the chemical(s) they have been exposed to at the site. This information is included in Table 3.1.

Any vehicle used to transport contaminated personnel will be treated and cleaned as necessary.

10.7 Fire or Explosion

In the event of a fire or explosion, the local fire department should be summoned immediately. Upon their arrival, the project manager or designated alternate will advise the fire commander of the location, nature, and identification of the hazardous materials on site.

If it is safe to do so, site personnel may:

- Use fire fighting equipment available on site to control or extinguish the fire; and,
- Remove or isolate flammable or other hazardous materials, which may contribute to the fire.

10.8 Spill or Leaks

In the event of a spill or a leak, site personnel will:

- Inform their supervisor immediately:
- Locate the source of the spillage and stop the flow if it can be done safely; and,
- Begin containment and recovery of the spilled materials.

10.0 EMERGENCY RESPONSE/CONTINGENCY PLAN - continued

10.9 Emergency Equipment/Facilities

The following emergency equipment/facilities will be utilized on-site.

TABLE 10.3	
LIST OF EMERGENCY EQUIPMENT/FACILITIES	
List of Emergency Equipment/Facilities	**Storage Location**
First Aid Kit	IVI Vehicle
Fire Extinguisher	IVI Vehicle
Spill Kits	IVI Vehicle
Berm Materials	IVI Vehicle
Eye Wash	IVI Vehicle

11.0 CONFINED SPACE ENTRY PROCEDURES

A confined space provides the potential for unusually high concentrations of contaminants, explosive atmospheres, limited visibility, and restricted movement. This section will establish requirements for safe entry into, continued work in, and safe exit from confined spaces. Additional information regarding confined space entry can be found in 29 CFR 1926.21, 29 CFR 1910 and NIOSH 80-106.

11.1 Definitions

Confined Space: A space or work area not designed or intended for normal human occupancy, having limited means of egress and poor natural ventilation; and/or any structure, including buildings or rooms, which have limited means of egress.

Confined Space Entry Permit (CSEP): A document to be initiated by the supervisor of personnel who are to enter into or work in a confined space. The personnel involved in the entry and approved by the HSO before personnel will be permitted to enter the confined space will complete the confined Space Entry Permit (CSEP). The CSEP shall be valid only for the performance of the work identified and for the location and time specified. The beginning of a new shift with change of personnel will require the issuance of a new CSEP.

Confined Space Observer: An individual assigned to monitor the activities of personnel working within a confined space. The confined space observer monitors and provides external assistance to those inside the confined space. The confined space observer summons rescue personnel in the event of an emergency and assists the rescue team.

11.2 General Provisions

- When possible, confined spaces should be identified with a posted sign, which reads: Caution – Confined Space.
- Only personnel trained and knowledgeable of the requirements of these Confined Space Entry Procedures will be authorized to enter a confined space or be a confined space observer.
- A Confined Space Entry Permit (CSEP) must be issued prior to the performance of any work within a confined space. The CSEP will become a part of the permanent and official record of the site.
- Natural ventilation shall be provided for the confined space prior to initial entry and for the duration of the CSEP. Positive/forced mechanical ventilation may be required. However, care should be taken to not spread contamination outside of the enclosed area.
- If flammable liquids may be contained within the confined space, explosion proof equipment will be used. All equipment shall be positively grounded.

11.0 CONFINED SPACE ENTRY PROCEDURES – continued

- The contents of any confined space shall, where necessary, be removed prior to entry. All sources of ignition must be removed prior to entry.
- Hand tools used in confined spaces shall be in good repair, explosion proof and spark proof, and selected according to intended use. Where possible, pneumatic power tools are to be used.
- Hand-held lights and other illumination utilized in confined spaces shall be equipped with guards to prevent contact with the bulb, and must be explosion proof.
- Compressed gas cylinders, except cylinders used for self-contained breathing apparatus, shall not be taken into confined spaces. Gas hoses shall be removed from the space and the supply turned off at the cylinder valve when personnel exit from the confined space.
- If a confined space requires respiratory equipment or where rescue may be difficult, safety belts, body harnesses, and lifelines will be used. The outside observer shall be provided with the same equipment as those working within the confined space.
- A ladder is required in all confined spaces deeper than the employee's shoulders. The ladder shall be secured and not removed until all employees have exited the space.
- Only self-contained breathing apparatus or NIOSH approved airline respirators equipped with a 5-minute emergency air supply (egress bottle) shall be used in untested confined spaces or in any confined space with conditions determined immediately dangerous to life and health.
- Where air-moving equipment is used to provide ventilation, chemicals shall be removed from the vicinity to prevent introduction into the confined space.
- Vehicles shall not be left running near confined space work or near air-moving equipment being used for confined space ventilation.
- Smoking in confined spaces will be prohibited at all times.
- Any deviation from these Confined Space Entry Procedures requires the prior permission of the Site Supervisor.

11.3 Procedure for Confined Space Entry

The HSO and Entry Team shall:

- Evaluate the job to be done and identify the potential hazards before a job in a confined space is scheduled.
- Ensure that all process piping, mechanical and electrical equipment, etc., have been disconnected, purged, blanked-off or locked and tagged as necessary.
- If possible, ensure removal of any standing fluids that may produce toxic or air displacing gases, vapors, or dust.
- Initiate a Confined Space Entry Permit (CSEP) in concurrence with the project manager or designated alternative.

11.0 CONFINED SPACE ENTRY PROCEDURES – continued

- Ensure that any hot work (welding, burning, open flames, or spark producing operation) that is to be performed in the confined space has been approved by the project manager and is indicated on the CSEP.
- Ensure that the space is ventilated before starting work in the confined space and for the duration of the time that the work is to be performed in the space.
- Ensure that the personnel who enter the confined space and the confined space observer helper are familiar with the contents and requirements of this instruction.
- Ensure remote atmospheric testing of the confined space prior to employee entry and before validation/revalidation of a CSEP to ensure the following:

    1. Oxygen content between 19.5% - 23.0%
    2. No concentration of combustible gas in the space. Sampling will be done throughout the confined space and, specifically, at the lowest point in the space.
    3. The absence of other atmospheric contaminants if the space has contained toxic, corrosive, or irritant material.
    4. If remote testing is not possible, Level B PPE is required as referenced in Section 3.

- Designate whether hot or cold work will be allowed. If all remote tests performed above are satisfactory, complete the CSEP listing any safety precautions, protective equipment, or other requirements.
- Ensure that a copy of the CSEP is posted at the work site, a copy is filed with the project supervisor, and a copy is furnished to the project manager. The CSEP shall be considered void if work in the confined space does not start within one hour after the remote tests above are performed or if significant changes within the confined space atmosphere or job scope occurs. The CSEP posted at the work site shall be removed at the completion of the job or the end of the shift, whichever is first.

11.4 Confined Space Observer

- While personnel are inside the confined space, a confined space observer will monitor the activities and provide external assistance to those in the space. The observer will have no duties, which may take his attention away from the work or require him to leave the vicinity of the confined space at anytime while personnel are in the space.
- The confined space observer shall maintain at least voice contact with all personnel in the confined space. Visual contact is preferred, if possible.
- The observer shall be instructed by his supervisor in the method for contacting rescue personnel in the event of an emergency.

11.0 CONFINED SPACE ENTRY PROCEDURES – continued

- If irregularities within the space are detected by the observer, personnel within the space will be ordered to exit.
- In the event of an emergency, the observer must NEVER enter the confined space prior to contacting and receiving assistance from a helper. Prior to this time, he should attempt to remove personnel with the lifeline and to perform all other rescue functions from outside the space.
- A helper shall be designated to provide assistance to the confined space observer in case the observer must enter the confined space to retrieve personnel.

12.0 SPILL CONTAINMENT PROGRAM

The procedures defined in this section comprise the spill containment program in place for activities at the Site.

- All drums and containers used during the clean-up shall meet the appropriate DOT, OSHA, and EPA regulations for the waste that they will contain.
- Drums and containers shall be inspected and their integrity assured prior to being moved. Drums or containers that cannot be inspected before being moved because of storage conditions, shall be positioned in an accessible location and inspected prior to further handling.
- Operations on site will be organized so as to minimize the amount of drum or container movement.
- Employees involved in the drum or container operations shall be warned of the hazards associated with the containers.
- Where spills, leaks, or ruptures may occur, adequate quantities of spill containment equipment (absorbent, pillows, etc.) will be stationed in the immediate area. The spill containment program must be sufficient to contain and isolate the entire volume of hazardous substances being transferred.
- Drums or containers that cannot be moved without failure, shall be emptied into a sound container.
- Fire extinguishing equipment meeting 29 CFR part 1910 Subpart 1 shall be on hand and ready for use to control fires.

13.0 HAZARD COMMUNICATION

In order to comply with 29 CFR 1910.1200, Hazard Communication, the following written Hazard Communication Program has been established. All employees will be briefed on this program, and have a written copy for review.

A. CONTAINER LABELING

All containers received on site will be inspected to ensure the following: (1) all containers will be clearly labeled as to the contents; (2) the appropriate hazard warnings will be noted; and (3) the name and address of the manufacturer will be listed.

All secondary containers will be labeled with either an extra copy of the original manufacturer's label or with generic labels, which have a block for identity and blocks for the hazard warning.

B. MATERIAL SAFETY DATA SHEETS (MSDSs)

Copies of MSDSs for all hazardous chemicals known or suspected to be on-site will be maintained in the work area. MSDSs will be available to all employees for review during each work shift.

C. EMPLOYEE TRAINING AND INFORMATION

Prior to starting work, each employee will attend a health and safety orientation and will receive information and training on the following: (1) an overview of the requirements contained in the Hazard Communication Standard, 29 CFR 1910.1200; (2) chemicals present in their workplace operations; (3) location and availability of a written hazard program; (4) physical and health effects of the hazardous chemicals; (5) methods and observation techniques used to determine the presence or release of hazardous chemicals; (6) how to lessen or prevent exposure to these hazardous chemicals through usage of control/work practices and personal protective equipment; (7) emergency procedures to follow if they are exposed to these chemicals; (8) how to read labels and review MSDSs to obtain appropriate hazard information; (9) location of MSDS file and location of hazardous chemical list.

14.0 REFERENCES

1. *Aldrich Chemical Book*, RTECS
2. *American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values*
3. *Chemical Protective Clothing Performance Index Book,* Forsburg
4. *Dangerous Properties of Industrial Materials*, SAX and Lewis
5. *Emergency Response Guide Book,* DOT P 5800.5, 1990
6. *EPA 40 CFR 311 Health and Safety Regulations*
7. *EPA/Office of Emergency and Remedial Response/Environmental Response Team Standard Operating Safety Guide*
8. *Extremely Hazardous Substances,* EPA, Noyes
9. *Guide to Occupational Exposure Values* – 1992
10. *Guidelines for the Selection of Chemical Protective Clothing*, Little
11. *Handbook of Toxic and Hazardous Chemicals and Carcinogens*, Sittig, np (Noyes)
12. *Hazardous Chemicals Data Book*, G. Weiss, ndc (Noyes)
13. *Hazardous Chemicals Desk Reference*
14. *NIOSH/OSHA/USCG/EPA Occupational Health and Safety Guidelines*
15. *OHMTADS Database*
16. *OSHA 29 CFR 1910.120 Health and Safety Regulations*
17. *The Merck Index, an Encyclopedia of Chemicals, Drugs, and Biologicals*, Merck & Co., Inc.
18. *Threshold Limit Values and Biological Exposure Indices, ACGIH*, 1991-1992
19. *V.S.L.G. Chris Manual*

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