

**REPORT**

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***MCP Phase III Remedial Action Plan and  
Phase IV Remedy Implementation Plan***

***Former Vinyl Chloride Gas Holder Area  
RTN-1-11901***

**Solutia Inc.  
Springfield, Massachusetts**

**August 2003**

**BBL<sup>®</sup>**  
BLASLAND, BOUCK & LEE, INC.  
engineers & scientists

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# **1. Purpose, Scope, and Organization**

## **1.1 Purpose of Report**

This *Phase III Remedial Action Plan (Phase III RAP) and Phase IV Remedy Implementation Plan (Phase IV RIP) – Former Vinyl Chloride Gas Holder Area* summarizes the activities conducted on behalf of Solutia Inc. (Solutia) to identify, evaluate, select, and implement remedial actions for partially polymerized polyvinylchloride (PVC) identified in soils associated with former PVC manufacturing located in the eastern portion of the Solutia Indian Orchard Plant at 730 Worcester Street in Springfield, Massachusetts (Figure 1; identified as the Former Vinyl Chloride Gas Holder Area [FGHA]). Vinyl chloride (VC) was detected in soil at concentrations above current upper concentration limits (UCLs), and remediation was required pursuant to the provisions of Massachusetts Contingency Plan (MCP) 310 Code of Massachusetts Regulation (CMR) 40.0000 (MADEP, 1999). The *MCP Phase II Comprehensive Site Assessment (CSA) Report (Phase II CSA)* (BBL, 2000a) submitted to the Massachusetts Department of Environmental Protection (MADEP) in February 2000, found the concentrations of VC in subsurface soils unacceptable to maintaining a level of “no significant risk of harm to human health.” Since completing the Phase II CSA, Solutia implemented its MADEP-approved Release Abatement Measure (RAM) Plan (BBL, 2000b) to reduce VC concentration in soils. Although assessment, evaluation, and remedial implementation activities were previously performed through the RAM, this Phase III RAP and Phase IV RIP Report was prepared to satisfy the requirement contained in 310 CMR 40.0850 to identify, evaluate, and select remedial action alternatives. This report also identifies the preferred remedial action and implementation plan (previously identified in the MADEP-approved RAM Plan) that would eliminate the potentially unacceptable future risk to a construction and utility worker.

The FGHA is identified by Release Tracking Number (RTN) 1-11901, and is classified as a “Tier II” site under the MCP. The required Bureau of Waste Site Cleanup (BWSC) transmittal form for the MCP Phase III and Phase IV submissions is provided in Appendix A (BWSC-108: original copy).

## **1.2 Scope of Report**

The Phase III RAP and Phase IV RIP Report addresses the presence of VC in the form of a partially polymerized PVC in an area of approximately 3,500 square feet for subsurface soils 4 to 7 feet below grade. This report also evaluates several remedial action alternatives to eliminate the potentially unacceptable risk to a future construction worker exposed to soils or utility worker to soil and groundwater.

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### 1.2.1 Organization of Report

The remainder of this document is organized into eight sections. The title and content of each section are summarized as follows:

**Section 2 – Background:** Summarizes information regarding the site, including an MCP compliance history.

**Section 3 – Identification of Remedial Action Alternatives:** Summarizes the remedial action objectives and identifies the potential remedial action alternatives subject to detailed evaluation.

**Section 4 – Description of Remedial Action Alternatives:** Describes the remedial action alternatives and the target evaluation areas associated with each alternative.

**Section 5 – Comparative Evaluation of Remedial Action Alternatives:** Provides details regarding the basis for selecting the preferred remedial action alternative.

**Section 6 – Remedial Design and Implementation Plan:** References the MADEP conditionally approved RAM.

**Section 7 – Activity and Use Limitation:** Describes the likely permitted and restricted uses of the property to maintain a level of no significant risk.

**Section 8 – Summary and Completion Statement:** Summarizes the Licensed Site Professional's (LSP's) position and statement regarding completion of the performance standard pursuant to the MCP for a Phase III and IV and a RAM completion statement.

**Section 9 – References:** Lists the documents that support this Phase III RAP and Phase IV RIP.

## **2. Background**

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### **2.1 Introduction**

As discussed in Section 1, the FGHA is a Tier II classified site located on the Solutia portion of the Indian Orchard Plant, near a former aboveground process vessel (gas holder) that formerly recycled VC. VC was used in the gas holder tank in the southern portion of the site at former Building 85 during PVC manufacturing from 1946 to 1975. Volatile organic compounds (VOCs), consisting primarily of VC, exist in a layer of fine, white granular material (partially polymerized PVC) approximately 4 to 7 feet below ground surface (bgs) (Environmental Research Institute [ERI], 1999). The source of VC detected in soil and groundwater is likely associated with the VC vapor condensation holder tank, which contained residual and partially polymerized PVC as part of former manufacturing operations. The layer of white material (presumed to be off-specification, standard-grade PVC or partially polymerized PVC) exhibits concentrations of VC up to approximately 450 milligrams per kilogram (mg/kg), which is above current MCP UCLs, with lesser concentrations of trichloroethene (TCE), 1,2-dichloroethene (DCE), and 1,2-dichloroethane (DCA) detected above MCP-reportable concentrations, but below UCLs.

Groundwater flow direction at the FGHA is southwest, as presented in the Phase II CSA (BBL, 2000a). The dissolved VC plume in groundwater has been defined and is within the Solutia property boundaries (BBL, 2000a). The plume does not extend to the Chicopee River, which is located more than 700 feet hydraulically downgradient from the edge of the plume (BBL, 2000a; BBL, 2001a).

### **2.2 MCP Compliance History**

The FGHA was identified by Solutia during an investigation to evaluate the extent of styrene and ethylbenzene associated with a release by others identified as RTN 1-10793. On June 30, 1997, Solutia notified the MADEP within 120 days of knowledge of the VC in soil. An MCP Phase II CSA (BBL, 2000a) was completed on February 4, 2000, and a RAM Plan (BBL, 2000b) was prepared on April 13, 2000. Per 310 CMR 40.0443, approval was presumed, as neither written approval nor denial was received within 21 days of the RAM submission to the MADEP. The initial 120-day RAM Status Report (BBL, 2000c) was submitted on August 15, 2000, and since that date, semiannual status reports have been prepared in accordance with the MCP (BBL, 2001a; BBL, 2001b; BBL, 2002a; BBL, 2002b; BBL, 2003a).

A Notice of Noncompliance (NON), dated March 7, 2003, was issued by the MADEP for missing the deadline for submittal of a Phase IV Remedy Implementation Plan, although the technical justification for deferring the Phase III and Phase IV was previously discussed with the MADEP on July 10, 2002 and January 21, 2003 (as identified in the semiannual status reports). The compliance history is further summarized in Table 2-1 below.

**Table 2-1  
Compliance History Summary**

Area Name	Compliance History			Planned Compliance Activities Outcome*
	Notification Type/Date	Tier Class and Date	Phase II, Phase III, Phase IV, and RAM Report Due Date/Status*	
Former VC Gas Holder Area (RTN 1-11901)	120-day June 30, 1997	Tier II July 7, 1998  Tier II Extension Requested April 30, 2003	<ul style="list-style-type: none"> <li>- MCP Phase II Report submittal, completed February 4, 2000.</li> <li>- RAM Plan submitted April 13, 2000.</li> <li>- MCP RAM 120-Day Status Report, completed August 15, 2000.</li> <li>- Semiannual status reports completed February 2001 to February 2003 (see list below)</li> <li>- MCP Phase III Report due date, August 15, 2000 (per the delay in compliance letter, dated June 6, 2000); additional delay requested.</li> <li>- MCP Phase IV Report due date July 7, 2001; delay requested. Completion date to be scheduled.</li> </ul>	<ul style="list-style-type: none"> <li>- <i>Phase III RAP and Phase IV RIP or Completion Report due on August 15, 2003.</i></li> <li>- <i>Remediation of soils completed and confirmed by (to be determined).</i></li> <li>- <i>Activity Use Limitation (AUL) before (to be determined).</i></li> <li>- <i>Continue groundwater monitoring after expected response action outcome (RAO).</i></li> </ul>

**Note:**

Outstanding items shown in italics.

\*Date based on date of MADEP notice of responsibility letter for RTN 1-11901, dated July 7, 1997.

**2.2.1 List of Semiannual Status Reports Submitted to the MADEP**

BBL. 2000b. MCP Release Abatement Measure letter for the Former Gas Holder Area, RTN 1-11901 prepared for Solutia Inc, Indian Orchard Plant, to Mr. David Slowick on April 13, 2000.

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BBL. 2000c. *MCP Release Abatement Measure 120-Day Status Report for RTN 1-11901, Solutia Inc. Indian Orchard Plant*, dated August 15, 2000.

BBL. 2001a. *First Semi-Annual RAM Status Report for RTN 1-11901 for Solutia Inc, Indian Orchard Plant*, Springfield Massachusetts, February 15, 2001.

BBL. 2001b. *Second Semi-Annual RAM Status Report for RTN 1-11901 for Solutia Inc, Indian Orchard Plant*, Springfield Massachusetts, August 2001.

BBL. 2002a. *First Semi-Annual RAM 2002 Status Report, RTN 1-11901 for Solutia Inc, Indian Orchard Plant*, Springfield Massachusetts, February 2002.

BBL. 2002b. *Second Semi-Annual RAM Status Report, RTN 1-11901 for Solutia Inc, Indian Orchard Plant*, Springfield Massachusetts, August 2002.

BBL. 2003. *MCP First Semi-Annual RAM 2003 Status Report, RTN 1-11901 for Solutia Inc, Indian Orchard Plant*, Springfield Massachusetts, February 2003.

## **3. Identification of Remedial Action Alternatives**

### **3.1 Introduction**

This section summarizes the process by which remedial action alternatives for VC in soils were identified for further consideration. Beginning with a broad base for remedial technologies (e.g., nonintrusive site controls, removal, treatment, containment), technologies were identified based on several MCP- and site-specific considerations. Using the remedial action objectives identified for the FGHA (Section 3.3) the technologies were further defined, resulting in the identification of four remedial action alternatives for subsequent evaluation in Sections 4 and 5 of this Phase III RAP.

### **3.2 Initial Screening of Remedial Technologies**

As indicated in 310 CMR 40.0856, screening of remedial technologies is conducted to “...*identify remedial action alternatives for further evaluation which are reasonably likely to be feasible based on the oil and hazardous material present, media contaminated and site characteristics.*”

310 CMR 40.0856 further identifies two criteria in this initial screening:

- ability to achieve an acceptable MCP outcome; and
- availability of expertise to effectively implement the technology.

Neither of these two criteria reduces the range or type of remedial technology available to address the VC in soil. Therefore, site-specific considerations were used to screen potential remedial technologies.

Table 3-1 presents the four basic potential remedial technologies that could be used at the FGHA. Within these technologies, alternatives that are proven and reliable, can be readily implemented, are not overly complex, and can be cost effective were retained for further consideration in this Phase III RAP. Specifically, these include:

- site controls;
- engineered barrier;

- 
- excavation and offsite disposal; and
  - in-situ treatment.

The remedial alternatives, using each of these technologies, were developed based on several potential remedial action objectives. These remedial action objectives are discussed below in Section 3.3 and the remedial action alternatives are discussed in Section 3.4.

### **3.3 Potential Remedial Action Objective(s)**

The goal of the remedial actions for the FGHA is to achieve either a “Permanent Solution” (Class A or B Response Action Outcome [RAO]) or a “Temporary Solution” (Class C RAO). The MCP identifies a numerical standard that provides a basis for the remedial action objectives and thus a guide to select an applicable remedial action.

#### **3.3.1 Permanent Solution**

A Permanent Solution indicates that a condition of “no significant risk” exists. Permanent solutions can be either a Class A or Class B. Both classes, however, require that the source of the VC be eliminated or controlled. A Class A RAO applies when remedial actions were conducted, whereas a Class B RAO indicates that, through assessment, a condition of no significant risk exists and, therefore, no remedial actions are necessary. Because a remedial action is required to maintain a level of no significant risk at the FGHA, a Class A RAO could be applicable; however, a Class B RAO is not applicable to the FGHA. Per the MCP 310 CMR 40.1035, there are four categories of a Class A RAO. These include: Class A-1 RAO, Class A-2 RAO, Class A-3 RAO, and Class A-4 RAO.

Class A-4 applies to a condition where oil and/or hazardous material (OHM) is located greater than 15 feet below grade. This condition does not apply; thus a Class A-4 RAO is not applicable to the FGHA and was not considered in this Phase III RAP. The remaining three categories of Class A RAOs are further discussed below.

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### 3.3.1.1 Class A-1 RAO

A Class A-1 RAO applies to the following four conditions:

- A permanent solution was achieved.
- Remediation has reduced VC concentrations to background conditions. (For this Phase III RAP, it is assumed that background would require that both soil and groundwater concentrations be nondetectable at detection limits of 0.01 milligrams per kilogram [mg/kg] and 0.01 milligrams per liter [mg/L], respectively);
- Threats of a release are eliminated.
- No release of VC to the environment occurred.

Because the partially polymerized PVC has allowed VC to slowly leach to groundwater, a release to the environment has occurred. Normally, VC would behave differently in soil, as pure VC is highly soluble (2,763 mg/L; Howard, 1989, 1991, 1993) with a high vapor pressure (2,660 millimeters mercury [mm Hg].) Given these chemical and physical characteristics, VC is expected to readily dissolve into groundwater and then volatilize. However, because the VC is partially polymerized, the VC is adhering to the polymer and not dissolving into the water as expected. Assuming a maximum concentration in soil between 200 mg/kg and 600 mg/kg (BBL, 2000a) and a total organic carbon of 2,500 mg/kg (BBL, 2000a), the modeled hypothetical groundwater concentration should be on the order of 270 mg/L to 2,700 mg/L. The maximum detected concentration in groundwater is only 0.17% of the solubility limit with a maximum observed concentration ranging between 2.2 mg/L and 4.7 mg/L. Therefore, because the observed concentrations are lower than modeled and expected concentrations in the groundwater, it is concluded that the VC is adhering to the partially polymerized PVC in the subsurface and the effective solubility of the polymerized VC is lower as a result of the polymerization.

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### 3.3.1.2 Class A-2 RAO

A Class A-2 RAO applies to the following three conditions:

- A permanent solution was achieved.
- Concentrations of VC are **not** reduced to background.
- AULs are **not** needed to maintain a level of “no significant risk”. Based on the MCP numerical standards, the soil criteria established by the MADEP to be protective of public welfare and the environment without an AUL is 0.3 mg/kg.

### 3.3.1.3 Class A-3 RAO

A Class A-3 RAO applies to the following four conditions:

- A permanent solution was achieved.
- Concentrations of VC are **not** reduced to background.
- One or more AULs were implemented to maintain a level of no significant risk.
- VC does **not** exceed the MCP UCLs for soil or groundwater. The UCL for VC is 20 mg/kg for soil and 0.6 mg/L for groundwater, as established by the MADEP to be protective of public welfare and the environment.

### 3.3.2 Temporary Solution

The MCP identifies conditions under which a Class C RAO (Temporary Solution) is an appropriate remedy outcome. A Class C RAO can be attained when remedial actions have eliminated any “substantial hazard” as defined in 40.0006, “*a hazard which would pose a significant risk of harm to health, safety, public welfare or the environment if it continues to be present for several years.*”

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A temporary solution assumes that a plan is developed and implemented with “definitive and enterprising steps” to achieve a permanent solution, and assumes a study is conducted every fifth year to evaluate the feasibility for achieving a Permanent Solution.

A Temporary Solution can only be applied after completing an MCP Phase II CSA and Phase III RAP.

### **3.4 Remedial Action Alternative(s)**

Various remedial action alternatives were developed based on the remedial technologies identified in Section 3.2 and the remedial action objectives identified in Section 3.3. Each alternative is identified below and further described in Section 4:

- Alternative 1 – Site Controls – Class C RAO.
  
- Alternative 2 – Engineered Barrier:
  - Alternative 2A – Class C RAO; and
  - Alternative 2B – Class C RAO.
  
- Alternative 3 – Excavation and Offsite Disposal:
  - Alternative 3A – Class A-1 RAO;
  - Alternative 3B – Class A-2 RAO; and
  - Alternative 3C – Class A-3 RAO.
  
- Alternative 4 – In-Situ Chemical Oxidation Treatment:
  - Alternative 4A – Class A-1 RAO;
  - Alternative 4B – Class A-2 RAO; and
  - Alternative 4C – Class A-3 RAO.

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Each alternative is described in Section 4. Table 3.2 summarizes the remedial action alternatives and corresponding remedial action objectives selected for this Phase III evaluation.

## ***4. Description of Remedial Action Alternatives***

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### **4.1 Introduction**

This section describes the remedial action alternatives (i.e., site controls, engineered barrier, excavation with offsite disposal, and in-situ chemical oxidation treatment) identified for further evaluation, and includes the anticipated scope and preliminary estimates concerning the implementation and duration costs. The information presented for each alternative highlights key differences among the alternatives in terms of their effectiveness, reliability, complexity, effectiveness, implementability, cost, timeliness, benefits, and risks.

### **4.2 Alternative 1–Site Controls**

#### **4.2.1 General Description**

This remedial action alternative would involve maintaining the existing level of access restrictions (e.g., perimeter fencing and security), establishing an AUL, and performing maintenance and monitoring activities. These activities would eliminate potential substantial hazards to health, safety, public welfare, and the environment for at least 5 years, plus the time since notification in June 1997 (therefore at least 11 years). However, this alternative would not achieve a level of no significant risk for the foreseeable future. Therefore, this alternative would be sufficient to attain a Temporary Solution (i.e., Class C RAO). The components of this alternative are further described below.

##### **4.2.1.1 Perimeter Fencing and Security**

Currently, Solutia maintains fencing around the entire perimeter of the property and access is restricted via security gates maintained 24 hours per day by security guards. During the Class C RAO, the fencing and access restriction through the security gates would be monitored annually to verify the integrity of the fencing, which is anticipated to continuously reduce the potential for trespassers.

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#### **4.2.1.2 Groundwater Monitoring**

In addition to the perimeter fencing and security component of this remedial action alternative, annual groundwater monitoring for VC would be conducted at select monitoring wells to evaluate the plume extent during the Class C RAO.

#### **4.2.1.3 Activity and Use Limitation**

An AUL would be placed in the property deed to maintain fencing, maintain security, and restrict excavations in the FGHA without a soil management plan and health and safety plan. The AUL would:

- provide property owners and others (e.g., easement owners) with notice regarding the site conditions, including the location and type of constituents remaining onsite;
- identify permitted site uses and activities to maintain a Class C RAO;
- identify restricted site uses and activities without appropriate precautions; and
- identify property owner obligations to maintain the objectives of the AUL.

#### **4.2.2 Site Application**

Based on the Phase II CSA (BBL, 2000a), a potentially unacceptable risk to a potential construction worker was determined assuming future commercial/industrial uses; however, there are no unacceptable short-term risks assuming restrictions on excavation and continuation of existing access restrictions in the future.

##### **4.2.2.1 Perimeter Fencing and Security**

Additional security gates are anticipated to be placed onsite, as appropriate. No additional fencing or security would be needed to restrict access; however, it is anticipated that certain fencing located along the perimeter of the facility would need to be replaced/repaired. The current level of fencing and 24-hour security, in conjunction with fence maintenance and annual monitoring, would reduce short-term risks associated with a

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potential trespasser during potential future property improvements involving excavation. Given that the VC in soils is located between 4 to 7 feet below the asphalt paved ground surface, the potential for direct contact is minimal.

#### **4.2.2.2 Groundwater Monitoring**

Annual groundwater monitoring would be conducted at 10 existing monitoring wells around the perimeter of the existing plume and at the source area consistent with previous monitoring events. If the concentrations and extent of the VC plume is consistent with previous monitoring events, then the monitoring frequency may be reduced. If VC plume concentrations increase or the plume extent expands, then additional response actions may be considered in addition to annual monitoring.

#### **4.2.2.3 Activity and Use Limitation**

Assuming a site control remedial action alternative, the AUL is anticipated to include the following permitted activities:

- continued commercial/industrial use that does not result in direct contact with subsurface soils at the FGHA;
- short-term excavation, assuming such activity is conducted in accordance with a soil management plan and health and safety plan;
- other activities that do not cause any greater risk of harm to health, safety, public welfare, and the environment.

In addition to the site control, the AUL would likely maintain the following restrictions:

- use of the site as a residence, school, nursery, daycare, recreational facility, or other use at which a child's presence is likely;
- movement or relocation of VC-impacted soils without a soil management plan or health and safety plan; and

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- movement or relocation of VC-impacted soils that could result in changes in overall site characterization or risk-based determinations.

As shown in Table 4-1, the cost estimate to prepare an AUL and to conduct fence maintenance and security gate installation activities with annual fence monitoring and annual groundwater monitoring conducted for 10 years is approximately \$120,000. The time estimate to complete this alternative is 6 weeks.

### **4.3 Alternative 2 – Engineered Barrier**

#### **4.3.1 General Description**

An engineered barrier remedy may be either used as a stand-alone alternative or used in combination with another technology. A stand-alone alternative would not likely be applicable to VC in soils because the VC in soil is located approximately two to four feet below the average water-table elevation and is subject to continued leaching to groundwater. In addition, because VC concentrations in soils are currently above the MCP's soil UCL, an engineered barrier (only) alternative would only be sufficient to attain a Temporary Solution (i.e., Class C RAO) and not a Permanent Solution. In addition, an engineered barrier with vertical controls placed in a manner to collect and treat groundwater would also only achieve a Temporary Solution unless, as a result of groundwater pumping, the soil VC concentrations are reduced to below UCLs. Given the polymerized state of the VC, reducing VC concentrations in soil via groundwater pumping is not expected.

#### **4.3.2 Site Application**

Considering the MADEP's Draft Public Comment "Guidance on the Use, Design, Construction and Monitoring of Engineered Barriers", dated November 2002, several barrier types are applicable to the FGHA. However, to maintain the current use of the property at the FGHA, the uncontaminated/overburden soils up to a depth of 15 inches below grade would need to be removed to allow for the installation of an engineered barrier. In addition, construction considerations would need to be made for the protection and/or relocation of existing utilities located adjacent to and/or above the FGHA.

An engineered barrier would further restrict direct contact of workers to VC in the subsurface soil. An engineered barrier itself, however, would not control VC from leaching to the groundwater because the source

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materials are 2 to 4 feet below the water table. In addition, the concentration of the VC source material is above the MCP's soil UCL and would remain in the subsurface following barrier installation (Alternative 2A). Therefore, a vertical barrier cut-off wall would be placed in addition to the engineered barrier to contain groundwater. Groundwater removal and treatment would be required to address groundwater contained within the vertical barrier cut-off wall (Alternative 2B).

#### **4.3.2.1 Class C RAO**

For Alternative 2A, the cost estimate to prepare an AUL, install an engineered barrier, and conduct barrier maintenance with annual barrier monitoring, and annual groundwater monitoring conducted for 10 years is approximately \$226,000 (Table 4-2). The time estimate to complete Alternative 2A is eight weeks.

#### **4.3.2.2 Class C RAO**

For Alternative 2B, the cost estimate to prepare an AUL, install an engineered barrier with vertical control and groundwater treatment, and conduct barrier and groundwater treatment maintenance with annual barrier monitoring and annual groundwater monitoring conducted for 10 years is approximately \$2,450,000 (Table 4-3). The time estimate to complete Alternative 2B is 10 weeks.

### **4.4 Alternative 3 – Excavation with Offsite Disposal**

#### **4.4.1 General Description**

Given the depth and volume of VC-impacted soils, an excavation remedy could be applicable for achieving a Class A-2 or Class A-3 RAO (Permanent Solution). Although the size of the FGHA is relatively small, access for excavation activities is limited. The maximum extent of VC greater than detection in soils is approximately 5,500 square feet to potentially achieve background conditions (less than detection of 0.01 mg/kg) and 3,500 square feet to achieve an average of less than 0.3 mg/kg (Figure 2). However, due to active manufacturing, building and equipment structures, and underground utilities, the limits of excavation are such that residual VC is anticipated to remain, allowing for either a potential Class A-2 or A-3 RAO. The FGHA is in an active manufacturing area, and the access restrictions necessary for excavation for a Class A-2 or A-3 RAO would terminate manufacturing activities for at least 3 weeks. Therefore, this alternative should only be considered if manufacturing could be terminated or shut down for at least 3 weeks.

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## 4.4.2 Site Application

Although the source area is small and relatively shallow (a maximum depth of approximately 7 feet bgs), the shallow depth to water, presence of underground utilities and an existing building, and manufacturing operations limit the area available for excavation. Therefore, achieving a Class A-1 RAO is not possible given the location of structures and utilities relative to the limits of the area available for excavation. In addition, excavation would disrupt ongoing manufacturing operations in an unacceptable manner.

The following considerations would also need to be addressed prior to implementing an excavation remedy:

- physical hazard potential to excavation workers and general plant workers during excavation of an active process area of the plant;
- physical damage potential to existing structures, (e.g., building foundations, process area foundations, underground and aboveground utilities);
- chemical exposure hazards to excavation workers and general plant workers during excavation and potential stockpiling for disposal;
- handling, treatment, and disposal permitting of groundwater during dewatering for excavation;
- handling, treatment, and disposal of soil following excavation; and
- duration of excavation activities and impacts to ongoing manufacturing.

### 4.4.2.1 Class A-1 RAO

A Class A-1 RAO represents a Permanent Solution that would achieve or approach background conditions. For this Phase III evaluation, a Class A-1 Permanent Solution would be achieved if VC concentrations in soils are less than detection at 0.01 mg/kg.

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A Class A-1 RAO would not likely be possible following excavation because the limits of the excavation to achieve a background concentration in soil (i.e., less than 0.01 mg/kg of VC) are not accessible due to underground utilities, buildings, and manufacturing structures. The maximum extent of VC in soils is approximately 5,500 square feet (Figure 2). The volume of soils above 0.01 mg/kg of VC is approximately 800 cubic yards, and there are approximately 600 cubic yards of nonimpacted soil above the VC-impacted soil. Due to the presence of buildings and underground utilities, the limits of excavation are such that residual VC would remain, allowing for either a potential Class A-2 or A-3 RAO. The underground utilities observed in and along the southern and western borders potentially included VC-impacted soils, likely exceeding background at 0.01 mg/kg (Figure 2).

#### **4.4.2.2 Class A-2 RAO**

A Class A-2 RAO could be achieved if the average concentration and extent of soils is reduced to less than 0.3 mg/kg. The approximate extent of less than 0.3 mg/kg in soil is 3,500 feet square (Figure 2). The volume of soil above 0.3 mg/kg of VC is approximately 380 cubic yards. The cleanup objective (less than 0.3 mg/kg) in soil was selected based on the MCP's most stringent soil criteria, assuming potential future accessible residential use.

Given the location of the existing buildings and structures and the depth of the excavation, sheetpiling is needed to maintain the structural integrity of the subsurface supporting the buildings and structures, as well as to provide for safe excavation conditions. If the sheetpiling is driven to a lower hydraulic conductivity unit (glacial till), the sheetpiling may also limit the amount of dewatering from the excavation, as the maximum depth of the excavation is expected to be at least 3 feet below the water table. Such excavation and soil management would need to be performed by a 40-hour OSHA-trained contractor and personnel. Implementing this alternative is anticipated to achieve a less than 0.3 mg/kg VC average in depths greater than 4 feet.

For Alternative 3B, the cost estimate to prepare an AUL, excavate soils within the source area and dispose (as appropriate), and conduct site maintenance with annual site monitoring conducted for 10 years is approximately \$489,000 (Table 4-4). The time estimate to complete Alternative 3B is 8 weeks.

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#### **4.4.2.3 Class A-3 RAO**

A Class A-3 RAO could be achieved if the extent of soils and average concentrations in soil are reduced to less than 20 mg/kg (i.e., the current MCP UCL for VC) within the FGHA (Figure 2). The general removal limits to achieve less than 20 mg/kg VC in soils are relatively similar to the removal limits to achieve 0.3 mg/kg VC in soils for the Class A-2 RAO alternative (Figure 2). This excavation remedy would only be applicable if the limits of excavation were restricted by utilities and structures, resulting in average soil concentrations greater than 0.3 mg/kg but less than 20 mg/kg. Because the limits of the 0.3 mg/kg area and the 20 mg/kg area are nearly the same, there would not be a cost benefit for a Class A-3 over a Class A-2 RAO for an excavation remedy (see Table 4-5).

As shown on Table 4-5 (Alternative 3C), since the area is nearly the same as Alternative 3B, the cost estimate to prepare an AUL, excavate soils within the source area and dispose (as appropriate), and conduct site maintenance with annual site monitoring conducted for 10 years is approximately \$476,000. The time estimate to complete Alternative 3C is 8 weeks.

#### **4.5 Alternative 4 – In-Situ Chemical Oxidation Treatment**

##### **4.5.1 General Description**

In-situ chemical oxidation uses oxidants to oxidize organic compounds. Sodium permanganate is an oxidant that would be applicable for the degradation and destruction of VC in the off-specification PVC. The sodium permanganate oxidant as a solid contains sodium, potassium, manganese, and trace inorganic elements well below the most stringent MCP reportable concentrations for soils for the volume of sodium permanganate calculated to adequately treat the area (BBL, 2000c).

An in-situ chemical oxidation treatment remedial technology is relatively simple, limited in scope, and could be applied on a relatively small scale. The size of the FGHA is relatively small. The field installation is comparable to that of an air sparging system in that multiple, closely-spaced injection points are used. However, unlike air sparging, off-gas discharge and treatment are not necessary.

The injection of the sodium permanganate oxidant would not result in exposing workers to the source material because the treatment is conducted in-situ. The sodium permanganate oxidant is not anticipated to impede

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future remedial actions, which include the natural attenuation (NA) of VC in groundwater downgradient of the source area.

#### **4.5.2 Site Application**

Based on a bench-scale treatability study, sodium permanganate was effective in destroying VC in the PVC to below detection limits (ERI, 1999). The by-products anticipated in this process include carbon dioxide gas, water, and manganese dioxide precipitate. A pilot study and an evaluation of the soil properties (including hydraulic conductivity, porosity, and grain size) and groundwater properties (alkalinity and pH) were also completed to facilitate the design of the sodium permanganate oxidant injection system (BBL, 2000a).

The bench-scale study was performed by ERI at the University of Connecticut from 1989 to 1999 to further characterize the source of VC and to test the application and effectiveness of in-situ chemical oxidation on the soils. The source material (a white, fine-grained material) is characterized as partially polymerized PVC. Based on the bench-scale column study, the source material effluent VC concentrations following flushing with sodium permanganate ( $\text{NaMnO}_4$ ) were reduced to below method detection limits within 17 days of application. After this treatment, the treated soil concentrations still contained some VC suggesting a longer contact time with the oxidant may be required for complete destruction. The soil oxygen demand of native soils was relatively high at concentrations between 11.7 and 13.5 g  $\text{NaMnO}_4/\text{kg}$  likely due to a background total organic carbon of 2.6%.

A pilot study was subsequently performed from July to October 1999 (XDD, 1999). The results of the pilot study indicated that VC was reduced to below the UCL of 20 mg/kg to a radius of 1 to 2 feet beyond the injection point throughout the full thickness of the PVC layer target material.  $\text{NaMnO}_4$  was not detected beyond 5 feet of the injection points due to the low permeability of the target material. It was concluded that in-situ chemical oxidation using  $\text{NaMnO}_4$  would be highly effective in remediating to below the UCL; however, the low permeability of the PVC target material may limit the delivery system. Therefore, a tight spacing of injection points will be required to effectively distribute the  $\text{NaMnO}_4$ . The results of the pilot study were also presented in the RAM Plan submitted to the MADEP on April 13, 2000, proposing full-scale chemical oxidation treatment in situ.

Based on these studies, the subsurface conditions are favorable for use of oxidant as a remedial alternative.

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A RAM using in-situ chemical oxidation was implemented after completing the Phase II CSA Report (BBL, 2000a), a RAM Plan (BBL, 2000b), RAM Plan modifications dated August 15, 2000 (BBL, 2000c), and a *120-Day Status Report* (BBL, 2000c) for the FGHA (Release Tracking Number [RTN] 1-11901). The RAM involved introducing a chemical oxidant ( $\text{NaMnO}_4$ ) as a remedial additive to the VC source within the subsurface soils. The partially polymerized (off-specification) PVC contains VC at concentrations above UCLs for soils. VC is leaching to groundwater at concentrations below UCLs, but above MCP-reportable concentrations. The specific objectives of the RAM were to:

- degrade the VC average concentration below UCLs as part of an MCP Permanent Solution RAO within the source area;
- mitigate the potential for VC to leach to groundwater; and
- demonstrate the adequacy of NA mechanisms in groundwater in support of a monitored NA remedy downgradient of the source area, which is part of the MCP Permanent Solution RAO for the FGHA.

The RAM Plan was assumed approved 21 days after submission. Full-scale Phase I and Phase II chemical oxidation injection was conducted in May 2000, April 2000, and March 2001. In total, 80 injection wells were used for Phase I and Phase II oxidant solution injection to achieve tight spacing (i.e., approximately 8 feet for Phase I and 4 feet for Phase II) between injection points.

Approximately 35,712 liters (9,435 gallons) of dilute (20 to 40 gallons per liter [g/L]) oxidant solution were injected in the treatment area during Phase I and Phase II operations. The total mass of  $\text{NaMnO}_4$  injected in the treatment area during the entire injection process was approximately 1,123 kg.

Post-injection soil sampling was performed on October 12 and 13, 2000, approximately 5 months after the initial injection, to determine the effect of  $\text{NaMnO}_4$  oxidant injection on VC concentrations in soil following Phase I operations (Figure 2). The average VC concentration within the hotspot in soil in October 2000 following treatment was approximately 51 mg/kg.

Post-injection soil sampling was performed again on June 25, 2001, following the second round of injection, to determine the effect of additional oxidant injection on soil VC concentrations following Phase II operations

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(Figure 2). The concentrations of VC in subsurface soil collected from the hotspot (5 to 7 feet bgs) ranged from 0.34 to 870 mg/kg and averaged 223 mg/kg.

Based on the two rounds of confirmation post-injection soil samples in October 2000 and June 2001, the average VC concentration in soil was approximately 113 mg/kg (below the December 2001 MADEP proposed UCL of 200 mg/kg).

#### **4.5.2.1 Class A-1 RAO**

A Class A-1 RAO represents a Permanent Solution if the site soils achieve or approach background conditions. For this Phase III evaluation, a Permanent Solution would be achieved if VC concentrations in soils were reduced to less than 0.01 mg/kg.

The size of the area to receive treatment to achieve VC concentrations less than 0.01 mg/kg is approximately 5,500 square feet. The volume of soil requiring treatment is approximately 800 cubic yards of soils, approximately 4 to 8 feet below grade and below the water table.

The amount of oxidant to achieve the less than background (less than detection of VC) was not estimated. Given the rate of degradation, due to low permeability of the target material, background conditions would not likely be achieved using the existing system after 10 years of annual application.

#### **4.5.2.2 Class A-2 RAO**

A Class A-2 RAO represents a Permanent Solution that would attain an average soil concentration of 0.3 mg/kg in soil based on the MCP's most stringent soil criteria for potential future accessible residential use, such that no AULs are required to maintain a level of no significant risk.

The size of the area to receive treatment to achieve VC concentrations less than 0.3 mg/kg is approximately 3,500 square feet. The volume of soil requiring treatment is approximately 400 cubic yards, approximately 4 to 7 feet below grade and below the water table.

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The amount of oxidant to achieve the less than 0.3 mg/kg VC is estimated to be 3,300 kg; however, the use of the oxidant by the target material is dependant on the effectiveness of the delivery system to penetrate the low permeable granular off-specification PVC in the subsurface. Given the current rate of degradation with the existing delivery system, it is anticipated that at least three additional injection rounds would be needed to reduce average VC concentrations to less than 0.3 mg/kg.

As shown in Table 4-7, the cost estimate to treat VC-impacted soil and to monitor groundwater to demonstrate NA, conducted for 10 years, is approximately \$655,000. The time estimate to complete up to three oxidant treatment applications is 4 years.

#### **4.5.2.3 Class A-3 RAO**

A Class A-3 RAO represents a Permanent Solution that would attain an average soil concentration of less than 20 mg/kg VC in soil, the MCP's UCL in soil for VC.

The size of the area to receive treatment to achieve a VC concentration of less than 20 mg/kg VC is slightly smaller than for the Class A-2 RAO extent (approximately 2,100 square feet). The volume of soil requiring treatment is less, approximately 250 cubic yards of soils approximately 4 to 7 feet below grade and below the water table.

The amount of oxidant to achieve the less than 20 mg/kg is estimated to be 2,200 kg; however, the use of the oxidant by the target material is dependant on the effectiveness of the delivery system to penetrate the granular off-specification PVC.

Following reduction of VC in soil, the groundwater will be monitored to demonstrate an NA remedy. Monitored NA parameters were collected and establish a pretreatment baseline.

As shown in Table 4-8, the cost estimate to treat VC-impacted soil and to monitor groundwater to demonstrate NA, conducted for 10 years, is approximately \$416,000. The time estimate to complete up to three oxidant treatment applications is 2 years.

# **5. Comparative Evaluation of Remedial Action Alternatives**

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## **5.1 Introduction**

This section presents a comparative evaluation among the alternatives under consideration. The bases for the comparative evaluation are the criteria presented at Section 40.0858 of the MCP:

- effectiveness;
- short-term and long-term reliability;
- implementability;
- implementation costs;
- short- and long-term risks;
- benefits;
- timeliness; and
- nonpecuniary interests.

Review of the various alternatives against the above criteria indicates the relative strengths and weaknesses among the alternatives (see Tables 5-1 and 5-2). The results of this assessment served as the basis for selecting the remedial action alternative (further discussed in Section 5.2).

## **5.2 Basis of Selection of Remedial Action Alternative**

The selection of the preferred remedial action alternative for the FGHA considered each of the MCP evaluation criteria identified above and discussed in Table 5-2. However, these criteria were “weighted” based on several factors related to the FGHA and its current conditions. Three of the MCP evaluation criteria were considered most significant with respect to selecting the preferred remedial action for the FGHA:

- implementability;
- implementation costs;
- short- and long-term risks.

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Although each of the remaining MCP evaluation criteria were considered in selecting the preferred remedial action for the FGHA, they were determined to be less significant in the selection process for one or both of the following reasons:

1. the alternatives were comparable for a given evaluation criteria (e.g., benefits, nonpecuniary interests); and/or
2. current conditions and factors negate the applicability of certain criteria or do not facilitate a comparative evaluation between the alternatives at this time (e.g., effectiveness, short- and long-term reliability, and timeliness).

The results of the assessment and comparative analysis of remedial action alternatives, presented in Tables 5-1 and 5-2, indicate the following:

- Alternative 1 – Site Controls: Able to achieve an MCP Temporary Solution (Class C RAO) but has no long-term potential to achieve a Permanent Solution. For this reason, this alternative was eliminated.
- Alternative 2A – Engineered Barrier: Similar to Alternative 1 (Site Controls), although able to achieve an MCP Temporary Solution (Class C RAO), this alternative has no long-term potential to achieve a Permanent Solution. For this reason, Alternative 2A was eliminated.
- Alternative 2B – Engineered Barrier with Vertical Control: Although this alternative has the potential to achieve an MCP Permanent Solution, Alternative 2B is not easily implemented with existing facility operations due to sheetpiling installation and the costs associated with long-term operation, maintenance, and monitoring of the groundwater treatment system. For these reasons, this alternative was eliminated.
- Alternative 3A and 3B – Excavation with Offsite Disposal: This alternative has the potential to achieve an MCP Permanent Solution. However, considering the risks involved in implementing this solution, as well as the significant disruption to ongoing operations at the facility, Alternatives 3A and 3B were eliminated.
- Alternative 4A – In-Situ Chemical Oxidation Treatment: Although this alternative has the potential to achieve an MCP Permanent Solution, Alternative 4A is not feasible due to the lack of access for installing injection points in the process equipment building and structures without terminating operations. In

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addition, the low permeability of the target material could require more than 10 years of injection to potentially achieve background. For these reasons, this alternative was eliminated.

- Alternatives 4B and 4C – In-Situ Chemical Oxidation: These alternatives have the potential to achieve an MCP Permanent Solution. The selection of Alternative 4C instead of Alternative 4B is based on the cost-effectiveness of the delivery of NaMnO<sub>4</sub> solution into the highly porous, yet low-permeable, target material.

The comparative analysis is summarized in Table 5-2.

### **5.3 Selection of Remedial Action Alternatives**

The selection of a remedial action alternative considers each of the MCP evaluation criteria presented in Sections 5.1 and 5.2. The results of this criteria evaluation serve as the basis for selecting Alternative 4C (In-Situ Chemical Oxidation) as the preferred remedial action alternative for the site.

As shown in Table 5.1, Alternative 4C – In-Situ Chemical Oxidation has the highest score, with Alternative 4B only slightly lower. Therefore, based on this Phase III evaluation, the ongoing remedial alternative implemented in accordance with the RAM Plan (BBL, 2000b) will continue to be implemented.

## ***6. Remedial Design and Implementation Plan***

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### **6.1 Introduction**

This section presents the Phase IV in-situ chemical oxidation remedial design and implementation plan and describes the continued Phase V operation and monitoring activities associated with this innovative technology.

### **6.2 Remedial Design, Implementation Plan, and Release Abatement Measure**

Based on the Phase III assessment and comparative analysis, Alternative 4C – In-Situ Chemical Oxidation Treatment will continue to be implemented to achieve the remedial goal to eliminate potentially unacceptable risk to a construction worker or a utility worker, assuming that an AUL is applied to the site.

The remedial design and implementation plan was previously reported to the MADEP as an MCP Release Abatement Measure (RAM) (BBL, 2000b). This RAM Plan is included as Appendix B. As-built construction reporting was presented in the RAM 120-Day Status Report (BBL, 2000c) and subsequent RAM semiannual status reports (BBL,2001a; BBL, 2001b; BBL, 2002a; BBL, 2002b; BBL, 2003a). The RAM 120-Day Status Report is provided in Appendix C. The Health and Safety Plan dated April 2000 was prepared for the RAM. applies to the RIP This HASP will be updated semi-annually upon modification to the RIP.

The RAM Plan (BBL, 2000b) and subsequent reports achieve the performance standards for a Phase IV remedial design and implementation plan. However, modifications to the delivery system in the Phase IV may be considered in the future to enhance the delivery of the oxidant to the target material, if necessary. If modifications are necessary, an addendum to the Phase IV would be prepared and forwarded to the MADEP.

The RAM Plan (BBL, 2000b) included monitoring to evaluate the effectiveness of the oxidant. This monitoring included confirmation soil sampling and groundwater sampling. Confirmation soil sampling may be implemented upon completing an injection of the oxidant. Groundwater monitoring will continue annually, as there were seven previous monitoring events (at least one in each season). These activities would be continued as part of Phase V operation and maintenance activities, and would be reported semiannually, consistent with 310 CMR 40.0890 of the MCP, until the remedial goal set forth in the RAM has been met.

## ***7. Activity and Use Limitation***

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### **7.1 Introduction**

Upon achieving the remedial goals set forth in the Phase IV and RAM Plan (BBL, 2000b), an AUL will be filed with the MADEP, pursuant to 310 CMR 40.1070, per MADEP Guidance on Implementing Activity and Use Limitations dated May 1999.

The AUL provides site-specific information including location of property, names of the property owners, MADEP release tracking number, and descriptions of the permitted, prohibited, and obligations and condition for conducting the permitted site activities.

### **7.2 Anticipated Contents of AUL**

For the FGHA, permitted activities will likely include the following (however, these AUL activities are contingent upon the confirmation soil and groundwater sampling and may be modified):

- Commercial and industrial activities including nonintrusive lawn care, paving, or maintaining structures that do not cause and/or result in direct contact with or disturbance of and/or release of chemicals of concern associated with soil found at 3 feet or greater below the surface grade.
- Construction of building(s) intended for storage of raw material or product and/or manufacturing.
- Construction of building(s) intended for human occupancy, provided an LSP renders an opinion that states that the building is consistent with maintaining a condition of no significant risk.

The restricted activities will likely include:

- Use of the portion of property as a residence, school, nursery, daycare, recreational area, and/or other such use at which a child's presence is likely on a chronic (or daily) basis.

- 
- Relocating soil affected by identified chemicals of concern (partially polymerized PVC) located at depths greater than 3 feet below grade to a shallower depth, unless activity is first evaluated by an LSP who renders an opinion, which states that such relocation is consistent with maintaining a condition of no significant risk.
  - If identified chemicals of concern (VC or visual PVC white granular material) are found in the area via soil sample analysis, any short-term (6 months or less) or long-term (6 months or greater) activity including, but not limited to, excavation that is likely to disturb soils containing identified chemicals of concern located at depths beneath the ground surface cover (pavement, containment pad, or foundation) or greater without prior development and implementation of a soil management plan and a health and safety plan in accordance with obligations of this opinion.

The obligations and conditions of the AUL would likely include:

- A soil management plan to be prepared by an LSP and implemented prior to commencing any activity that is likely to disturb soils affected by the identified chemicals of concern (partially polymerized PVC or VC) at depths of below the ground surface cover (pavement, containment pad, or foundation) or greater in the FGHA.
- A health and safety plan to be prepared by a Certified Industrial Hygienist for the area or an other qualified individual sufficiently trained in worker health and safety requirements and implemented prior to commencing any activity that is likely to disturb soils associated with the identified chemicals of concern at depths of below the ground surface cover (pavement, containment pad, or foundation) and greater, if VC is found in soils via soil sample analysis.
- Owner agrees to maintain fencing and security systems to restrict unauthorized entrance to facility.

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- The soil associated with the VC, if found at depths of greater than 3 feet below surface grade must remain at depth and may not be relocated, unless such activity is first appropriately evaluated by a LSP who renders an opinion that states that such relocation is consistent with maintaining a condition of no significant risk.

### **7.3 AUL Development Process**

The following five steps will be completed for an AUL and to support a Permanent Solution RAO at the FGHA:

- Record survey and plan of AUL area with Registry of Deeds;
- Prepare descriptions of AUL (Exhibits B and C), Transmittal Forms 113 and 114, and record AUL with the Registry of Deeds;
- Submit certified AUL to the MADEP;
- Public notifications; and
- RAO Completion Statement.

## ***8. Summary and Completion Statements***

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### **8.1 Summary**

### **8.2 Phase III RAP Completion Statement**

The Phase III RAP has been completed to meet the requirements and performance standards per the MCP 310 CMR 40.0850 through 40.086, and includes an evaluation of the feasibility to achieve background conditions (Appendix B). Selecting the in-situ chemical oxidation treatment alternative is expected to achieve at least a Class A-3 RAO. The BWSC Form 108 Completion Statement Form is presented in Appendix A.

### **8.3 Phase IV RIP Completion Statement**

The Phase IV RIP was previously implemented in the form of a Release Abatement Measure Plan (BBL, 2000b) (Appendix B). The Phase IV – As-Built Construction and Final Inspection Report components were reported in the RAM 120-Day Status Report (BBL, 2000C) (Appendix C). These RAM plans and reports are considered applicable to meet the requirement and performance standards of the MCP 310 CMR 40.0870 through 40.0879. The BWSC Form Completion Statement for the Phase IV RIP, As-Built Construction Report, Phase IV Final Inspection Report, and Completion Statement for RTN 1-11901 is provided in Appendix A.

Phase V – Operation, Maintenance, and Monitoring (OM&M) activities are required at the site to meet remedial objectives.

### **8.4 RAM Completion Statement**

Completing the Phase III RAP and Phase IV RIP adequately regulates the FGHA. Therefore, activities that would have been conducted under the RAM will be conducted under a Phase V – OM&M and reported in semiannual reports. A RAM Completion Statement is provided in Appendix D.

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## 8.5 Public Notification

Public notification of this submission will be made to the Environmental Monitor and public officials on how and where to get copies of the remedial action plan, remedial design, and implementation plan. If subsequent addendums are made to the design or implementation of the chemical oxidation system, public notice will be completed at least 3 days in advance of implementation to local public officials.

## 9. References

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# ***Tables***

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TABLE 2-2

SOLUTIA INC.  
 FORMER VINYL CHLORIDE GAS HOLDER AREA  
 INDIAN ORCHARD PLANT  
 SPRINGFIELD, MASSACHUSETTS

SUMMARY OF PHASE III REMEDIAL ACTION ALTERNATIVES

Remediation Technology	Description of Remedial Action Alternative	Anticipated MCP Response Action Outcome (RAO)	Vinyl Chloride Remedial Action Objective (ppm) <sup>1,3</sup>
			Subsurface Soils
1. Site Controls	Maintain fencing and security to control access to 730 Worcester Street, groundwater monitoring and establish Activity and Use Limitations. <sup>2</sup>	Class C	--
2. Physical Barrier	Pump and treat contained groundwater, maintain asphalt pavement, and install a containment barrier to confining unit to achieve < 2 ppm average in remaining, uncontained subsurface soils.	Class C	--
3. Excavation with Off-Site Disposal	3A. Soil removal to achieve background conditions, and monitored natural attenuation for groundwater.	Class A-1	< 0.01
	3B. Soil removal to achieve < 2 ppm VC average concentration and monitored natural attenuation for groundwater.	Class A-2	0.3
	3C. Soil removal to achieve < 100 ppm VC average in depths > 3 feet, monitored natural attenuation for groundwater and establish Activity and Use Limitation.	Class A-3	< 20
4. In-Situ Treatment	4A. Soil treatment to achieve background conditions and monitored natural attenuation for groundwater.	Class A-1	< 0.01
	4B. Soil treatment to achieve < 2 ppm VC average concentration and monitored natural attenuation for groundwater.	Class A-2	< 0.3
	4C. Soil removal to achieve < 20 ppm VC average in depths > 3 feet, monitored natural attenuation for groundwater and establish Activity and Use Limitation. <sup>5</sup>	Class A-3	< 20

**Notes:**

1. VC-based remedial action objective corresponds to exposure point concentrations estimated using a mean. Objectives correspond to anticipated post-remedy site conditions.
2. AUL - Activity and Use Limitation (310 CMR 40.1000).
3. Remedial action objectives serve as basis for Phase III evaluations; they do not represent cleanup standards associated with the targeted RAO.
4. Subsurface soils refer to soils present at depths greater than 3 feet.
5. Subsurface soils defined as soils present between 3 and 15 feet (maximum) below grade.

TABLE 4-1

**SOLUTIA INC.  
FORMER VINYL CHLORIDE GAS HOLDER AREA  
INDIAN ORCHARD PLANT  
SPRINGFIELD, MASSACHUSETTS**

**PRELIMINARY PHASE III REMEDIAL ACTION COSTS:  
ALTERNATIVE 1 - SITE CONTROLS**

*Description: Maintain chain-link fence around the Indian Orchard Plant, owned by Solutia. Establish Activity and Use Limitations (AUL) for relevant portions of the Indian Orchard Plant property.*

Remedial Component	Units	Unit Cost (\$)	Estimated Quantity	Cost (\$)
<b>I. CAPITAL COSTS</b>				
<b>Construction Activities</b>				
1. Mobilization/Demobilization	LS	\$2,000	1	\$2,000
2. Site Preparation (i.e., clearing)	LS	\$1,000	1	\$1,000
3. Maintain/Repair Chain-link Fence	LF	\$10	1,200	\$12,000
4. Installation of Security Access Gates	EA	\$1,000	3	\$3,000
5. Miscellaneous Site Restoration	LS	\$1,000	1	\$1,000
<b>Other Construction-Related Activities</b>				
6. Site Survey	LS	\$3,500	1	\$3,500
7. AUL Preparation	LS	\$9,000	1	\$9,000
8. Submittal/Filing	LS	\$1,500	1	\$1,500
<b>Subtotal (Item Nos. 1 to 8):</b>				<b>\$33,000</b>
<b>Contingency (20%):</b>				<b>\$6,600</b>
<b>Engineering, Permits &amp; Oversight (15%):</b>				<b>\$4,950</b>
<b>TOTAL ESTIMATED CONSTRUCTION COST:</b>				<b>\$44,550</b>
<b>II. OPERATION AND MAINTENANCE (O&amp;M)</b>				
9. Fence Repair/Replacement	LS	\$1,000	1	\$1,000
<b>III. MONITORING</b>				
10. Annual Fence Monitoring	LS	\$2,000	1	\$2,000
11. Annual Groundwater Monitoring	LS	\$6,000	1	\$6,000
<b>Subtotal (Item Nos. 9 to 11):</b>				<b>\$9,000</b>
<b>Contingency (20%):</b>				<b>\$1,800</b>
<b>Annual Subtotal (Item Nos. 9 to 11):</b>				<b>\$10,800</b>
<b>10-Year Present Worth O&amp;M and Monitoring Cost:</b>				<b>\$75,859</b>
<b>TOTAL ESTIMATED ALTERNATIVE 1 COST:</b>				<b>\$120,409</b>
<b>ROUNDED TO:</b>				<b>\$120,000</b>

**Notes:**

*Units Key: LS = Lump Sum; LF = Linear Feet; EA = Each*

1. AUL preparation in accordance with 310 CMR 40.1000 of the MCP and related MADEP guidance.
2. Implementation timeframe for preparation and submittal/filing of an AUL is estimated to be 6 weeks.
3. Mobilization/demobilization assumed to consist of contractor equipment and labor, as necessary.
4. Site preparation assumes removal of trees/understory to facilitate access for construction-related activities.
5. It has been assumed that fence repair/replacement and semi-annual fence inspection and groundwater monitoring activities will be necessary to ensure that this alternative is meeting its response action objective.
6. The 10-year present worth O&M and monitoring cost assumes a 7% discount factor and 0% inflation over a 10 year period.

TABLE 4-2

**SOLUTIA INC.**  
**FORMER VINYL CHLORIDE GAS HOLDER AREA**  
**INDIAN ORCHARD PLANT**  
**SPRINGFIELD, MASSACHUSETTS**

**PRELIMINARY PHASE III REMEDIAL ACTION COSTS:**  
**ALTERNATIVE 2A - ENGINEERED BARRIER**

*Description: Excavate approximately 15 inches of overburden material to facilitate the installation of approximately 5,000 square feet of engineered barrier (asphalt surface cover) within the Indian Orchard Plant property. From bottom to top, engineered barrier consists of geotextile fabric, 6 inches of gravel subbase, geotextile fabric, flexible membrane liner, geosynthetic drainage composite, and 8 inches of asphalt materials. Establish Activity and Use Limitations (AUL) for 3,500 square feet of impacted soil and protect and replace subsurface utilities, as necessary.*

Remedial Component	Units	Unit Cost (\$)	Estimated Quantity	Cost (\$)
<b>I. CAPITAL COSTS</b>				
<b>Construction Support Activities</b>				
1. Mobilization/Demobilization	LS	\$5,000	1	\$5,000
2. Site Preparation (i.e., clearing)	LS	\$1,000	1	\$1,000
3. Survey Control	DAYS	\$1,000	2	\$2,000
4. Erosion Controls (hay bales and silt fence)	LF	\$3	500	\$1,500
5. Temporary Fencing/Security	LF	\$5	1,200	\$6,000
6. Surface Grading/Grubbing	SY	\$6	1,500	\$9,000
7. Remediation Support for Project Duration	WEEK	\$5,000	2	\$10,000
8. Miscellaneous Site Restoration	LS	\$2,000	1	\$2,000
<b>Engineered Barrier</b>				
9. Excavate and Load Overburden Materials	CY	\$20	230	\$4,600
10. Transport Overburden Materials to Stockpile Area	CY	\$4	230	\$920
11. Geotextile Fabric	SF	\$0.50	10,000	\$5,000
12. Gravel Subbase (6 inches)	CY	\$10	100	\$1,000
13. Flexible Membrane Liner (FML)	SF	\$1	5,000	\$5,000
14. Geosynthetic Drainage Composite (GDC)	SF	\$1	5,000	\$5,000
15. Asphalt (8-inch layer)	SF	\$4	5,000	\$20,000
<b>Other Construction-Related Activities</b>				
16. Permitting/Approvals	LS	\$5,000	1	\$5,000
17. Additional Sampling and Analysis	LS	\$2,000	1	\$2,000
18. Activity and Use Limitations (Table 4-1)	LS	\$14,000	1	\$14,000
<b>Subtotal (Item Nos. 1 to 18):</b>				<b>\$99,020</b>
<b>Contingency (20%):</b>				<b>\$19,804</b>
<b>Engineering &amp; Oversight (15%):</b>				<b>\$14,853</b>
<b>TOTAL ESTIMATED CONSTRUCTION COST:</b>				<b>\$133,677</b>
<b>II. OPERATION AND MAINTENANCE (O&amp;M)</b>				
19. Engineered Barrier Repair/Replacement	LS	\$3,000	1	\$3,000
<b>III. MONITORING</b>				
20. Annual Engineered Barrier Monitoring	LS	\$2,000	1	\$2,000
21. Annual Groundwater Monitoring	LS	\$6,000	1	\$6,000
<b>Subtotal (Item Nos. 19 to 21):</b>				<b>\$11,000</b>
<b>Contingency (20%):</b>				<b>\$2,200</b>
<b>Annual Subtotal (Item Nos. 19 to 21):</b>				<b>\$13,200</b>
<b>10-Year Present Worth O&amp;M and Monitoring Cost:</b>				<b>\$92,717</b>
<b>TOTAL ESTIMATED ALTERNATIVE 2A COST:</b>				<b>\$226,394</b>
<b>ROUNDED TO:</b>				<b>\$226,000</b>

see Notes on Page 2

TABLE 4-2

SOLUTIA INC.  
FORMER VINYL CHLORIDE GAS HOLDER AREA  
INDIAN ORCHARD PLANT  
SPRINGFIELD, MASSACHUSETTS

**PRELIMINARY PHASE III REMEDIAL ACTION COSTS:**  
**ALTERNATIVE 2A - ENGINEERED BARRIER**

**Notes:**

*Units Key:* LS = Lump Sum; LF = Linear Feet; SY = Square Yard; CY = Cubic Yard; SF = Square Foot

1. AUL preparation in accordance with 310 CMR 40.1000 of the MCP and related MADEP guidance.
2. Implementation timeframe for preparation and submittal/filing of an AUL is estimated to be 6 weeks.
3. Additional sampling and analysis is assumed to include the collection of additional soil samples to support remedial design and implementation (e.g., delineation of final cover limits).
4. Mobilization/demobilization assumed to consist of contractor equipment and labor, as necessary.
5. Site preparation assumes removal of trees/understory to facilitate access for construction-related activities.
6. It has been assumed that approximately 15 inches of overburden material will be removed to facilitate placement of the engineered barrier. Such overburden materials will be transported to an on-site stockpile area and are assumed to be reusable (on-site) at a later time.
7. The engineered barrier is assumed to consist of, from bottom to top, geotextile fabric, 6 inches of gravel subbase, geotextile fabric, flexible membrane liner, geosynthetic drainage composite, and 8 inches of asphalt materials.
8. Asphalt layer consists of 6 inches of binder course and 2 inches of top course.
9. It has been assumed that engineered barrier repair/replacement and semi-annual engineered barrier inspection and groundwater monitoring activities will be necessary to ensure that this alternative is meeting its response action objective.
10. The 10-year present worth O&M and monitoring cost assumes a 7% discount factor and 0% inflation over a 10 year period.

TABLE 4-3

SOLUTIA INC.  
 FORMER VINYL CHLORIDE GAS HOLDER AREA  
 INDIAN ORCHARD PLANT  
 SPRINGFIELD, MASSACHUSETTS

**PRELIMINARY PHASE III REMEDIAL ACTION COSTS:  
 ALTERNATIVE 2B - ENGINEERED BARRIER WITH VERTICAL CONTROL**

*Description: Excavate approximately 15 inches of overburden material to facilitate the installation of approximately 5,000 square feet of engineered barrier (asphalt surface cover) within the Indian Orchard Plant property. From bottom to top, engineered barrier consists of geotextile fabric, 6 inches of gravel subbase, geotextile fabric, flexible membrane liner, geosynthetic drainage composite, and 8 inches of asphalt materials. Establish Activity and Use Limitations (AUL) for 3,500 square feet of impacted soil and protect and replace subsurface utilities, as necessary. Establish vertical barrier such that groundwater migration is minimized; collect and treat groundwater within vertical barrier via air stripping followed by GAC filtration.*

Remedial Component	Units	Unit Cost (\$)	Estimated Quantity	Cost (\$)
<b>I. CAPITAL COSTS</b>				
<b>Construction Support Activities</b>				
1. Mobilization/Demobilization	LS	\$30,000	1	\$30,000
2. Site Preparation (i.e., clearing, utility protection)	LS	\$10,000	1	\$10,000
3. Survey Control	DAYS	\$1,000	4	\$4,000
4. Erosion Controls (hay bales and silt fence)	LF	\$3	500	\$1,500
5. Temporary Fencing/Security	LF	\$5	1,200	\$6,000
6. Surface Grading/Grubbing	SY	\$6	1,500	\$9,000
7. Remediation Support for Project Duration	WEEK	\$5,000	4	\$20,000
8. Miscellaneous Site Restoration	LS	\$4,000	1	\$4,000
<b>Engineered Barrier</b>				
9. Excavate and Load Overburden Materials	CY	\$20	230	\$4,600
10. Transport Overburden Materials to Stockpile Area	CY	\$4	230	\$920
11. Geotextile Fabric	SF	\$0.50	10,000	\$5,000
12. Gravel Subbase (6 inches)	CY	\$10	100	\$1,000
13. Flexible Membrane Liner (FML)	SF	\$1	5,000	\$5,000
14. Geosynthetic Drainage Composite (GDC)	SF	\$1	5,000	\$5,000
15. Asphalt (8-inch layer)	SF	\$4	5,000	\$20,000
<b>Vertical Barrier</b>				
16. Drive Sheetpile Barrier Wall	SF	\$30	12,000	\$360,000
17. Extraction Well Installation	EACH	\$5,000	1	\$5,000
18. Air Stripper	EACH	\$65,000	1	\$65,000
19. Carbon System	EACH	\$150,000	1	\$150,000
20. Electrical Installation	LS	\$20,000	1	\$20,000
21. Instrumentation and Control System	LS	\$25,000	1	\$25,000
22. Plumbing Materials and Installation	LS	\$80,000	1	\$80,000
23. Submersible Pumps	EACH	\$4,000	2	\$8,000
24. Booster Pumps	EACH	\$8,000	2	\$16,000
25. Pre-Engineered Metal Building and Pad	SF	\$70	1,500	\$105,000
<b>Other Construction-Related Activities</b>				
26. Permitting/Approvals	LS	\$20,000	1	\$20,000
27. Additional Sampling and Analysis	LS	\$2,000	1	\$2,000
28. Activity and Use Limitations (Table 4-1)	LS	\$14,000	1	\$14,000
<b>Subtotal (Item Nos. 1 to 28):</b>				<b>\$996,020</b>
<b>Contingency (20%):</b>				<b>\$199,204</b>
<b>Engineering &amp; Oversight (15%):</b>				<b>\$149,403</b>
<b>TOTAL ESTIMATED CONSTRUCTION COST:</b>				<b>\$1,344,627</b>

Remedial Component	Units	Unit Cost (\$)	Estimated Quantity	Cost (\$)
<b>II. OPERATION AND MAINTENANCE (O&amp;M)</b>				
29. Engineered Barrier Repair/Replacement	LS	\$3,000	1	\$3,000
30. Air Stripper Maintenance	LS	\$4,000	1	\$4,000
31. Carbon Vessel Maintenance	lb	\$1	60,000	\$60,000
32. Power Consumption for Air Stripper	MONTH	\$1,500	12	\$18,000
33. Power Consumption for Extracting Groundwater	MONTH	\$200	12	\$2,400
34. Power Consumption for Pumping Groundwater through Carbon Vessels	MONTH	\$2,000	12	\$24,000
35. System Sample Collection	MONTH	\$1,000	12	\$12,000
<b>III. MONITORING</b>				
36. Annual Engineered Barrier Monitoring	LS	\$2,000	1	\$2,000
37. Annual Groundwater Monitoring	LS	\$6,000	1	\$6,000
<b>Subtotal (Item Nos. 29 to 37):</b>				<b>\$131,400</b>
<b>Contingency (20%):</b>				<b>\$26,280</b>
<b>Annual Subtotal (Item Nos. 29 and 37):</b>				<b>\$157,680</b>
<b>10-Year Present Worth O&amp;M and Monitoring Cost:</b>				<b>\$1,107,544</b>
<b>TOTAL ESTIMATED ALTERNATIVE 2B COST:</b>				<b>\$2,452,171</b>
<b>ROUNDED TO:</b>				<b>\$2,450,000</b>

See Notes on Page 2.

TABLE 4-3

SOLUTIA INC.  
FORMER VINYL CHLORIDE GAS HOLDER AREA  
INDIAN ORCHARD PLANT  
SPRINGFIELD, MASSACHUSETTS

**PRELIMINARY PHASE III REMEDIAL ACTION COSTS:**  
**ALTERNATIVE 2B - ENGINEERED BARRIER WITH VERTICAL CONTROL**

**Notes:**

*Units Key:* LS = Lump Sum; LF = Linear Feet; SY = Square Yard; CY = Cubic Yard; SF = Square Foot; lb = Pound

1. AUL preparation in accordance with 310 CMR 40.1000 of the MCP and related MADEP guidance.
2. Implementation timeframe for preparation and submittal/filing of an AUL is estimated to be 6 weeks.
3. Additional sampling and analysis is assumed to include the collection of additional soil samples to support remedial design and implementation (e.g., delineation of final cover limits).
4. Mobilization/demobilization assumed to consist of contractor equipment and labor, as necessary.
5. Site preparation assumes removal of trees/understory to facilitate access for construction-related activities.
6. It has been assumed that approximately 15 inches of overburden material will be removed to facilitate placement of the engineered barrier. Such overburden materials will be transported to an on-site stockpile area and are assumed to be reusable (on-site) at a later time.
7. The engineered barrier is assumed to consist of, from bottom to top, geotextile fabric, 6 inches of gravel subbase, geotextile fabric, flexible membrane liner, geosynthetic drainage composite, and 8 inches of asphalt materials.
8. Asphalt layer consists of 6 inches of binder course and 2 inches of top course.
9. It has been assumed that approximately 40 foot long sheets will need to be driven along 300 linear feet to establish a vertical barrier.
10. The estimated flow rate for the air stripper has been assumed to be 120 gallons per minute.
11. It has been assumed that one 20,000 lb vessel will be required for liquid phase and one 20,000 lb vessel will be required for vapor phase.
12. For the submersible pumps, it has been assumed that one 40 gpm pump with one spare will be used.
13. For the booster pumps, it has been assumed that one 120 gpm pump with one spare will pump water existing the air stripper through the carbon system.
14. The pre-engineered metal building is assumed to be 1,500 square feet to be placed upon a poured concrete pad.
15. Air stripper maintenance assumed to consist of annual cleaning, including cleaning supplies and equipment.
16. It has been assumed that approximately 60,000 pounds of carbon will be used per year.
17. The treatment system is assumed to be operated 12 months per year.
18. Power consumption costs per month based on the following: for air stripper - operation of a 25 horsepower (hp) motor (95% efficient)/blower units; for submersible pumps - operation of a 10 hp pump; and for booster pumps - operation of a 30 hp water pump.
19. System sample collection is assumed to be required once per month for permit compliance.
20. It has been assumed that engineered barrier repair/replacement and semi-annual engineered barrier inspection and groundwater monitoring activities will be necessary to ensure that this alternative is meeting its response action objective.
21. The 10-year present worth O&M and monitoring cost assumes a 7% discount factor and 0% inflation over a 10 year period.

TABLE 4-4

SOLUTIA INC.  
 FORMER VINYL CHLORIDE GAS HOLDER AREA  
 INDIAN ORCHARD PLANT  
 SPRINGFIELD, MASSACHUSETTS

**PRELIMINARY PHASE III REMEDIAL ACTION COSTS:  
 ALTERNATIVE 3B - EXCAVATION WITH OFF-SITE DISPOSAL**

*Description: Remove overburden materials; excavate and dispose off-site approximately 380 cubic yards of vinyl chloride-containing materials to achieve a less than 0.3 ppm vinyl chloride average in depths greater than 3 feet. Establish Activity and Use Limitations (AUL) for 3,500 square feet of impacted soil and protect and replace subsurface utilities, as necessary.*

Remedial Component	Units	Unit Cost (\$)	Estimated Quantity	Cost (\$)
<b>I. CAPITAL COSTS</b>				
<b>Construction Support Activities</b>				
1. Mobilization/Demobilization	LS	\$15,000	1	\$15,000
2. Site Preparation (i.e., clearing, utility protection)	LS	\$10,000	1	\$10,000
3. Survey Control	DAYS	\$1,000	10	\$10,000
4. Erosion Controls (hay bales and silt fence)	LF	\$3	500	\$1,500
5. Temporary Fencing/Security	LF	\$5	1,200	\$6,000
6. Surface Grading/Grubbing	SY	\$6	1,500	\$9,000
7. Remediation Support for Project Duration	WEEK	\$5,000	2	\$10,000
8. Miscellaneous Site Restoration	LS	\$5,000	1	\$5,000
<b>Remedial Activities</b>				
9. Excavation Sheetpile Installation	SF	\$20	4,000	\$80,000
10. Excavate and Load Overburden Materials	CY	\$20	500	\$10,000
11. Transport Overburden Materials to Stockpile Area	CY	\$4	500	\$2,000
12. Excavate and Load Vinyl Chloride-containing Materials	CY	\$20	380	\$7,600
13. Transport Vinyl Chloride-containing Materials to Dewatering Area	CY	\$4	380	\$1,520
14. Construct Dewatering Area	LS	\$7,500	1	\$7,500
15. Water Treatment	GAL	\$1	13,500	\$13,500
16. Dispose Vinyl Chloride-containing Materials	TON	\$200	465	\$93,000
17. Replace Overburden Materials	CY	\$6	500	\$3,000
18. Purchase and Place Backfill Materials	CY	\$20	380	\$7,600
<b>Other Construction-Related Activities</b>				
19. Permitting/Approvals	LS	\$10,000	1	\$10,000
20. Additional Sampling and Analysis	LS	\$2,000	1	\$2,000
21. Activity and Use Limitations (Table 4-1)	LS	\$14,000	1	\$14,000
<b>Subtotal (Item Nos. 1 to 21):</b>				<b>\$318,220</b>
<b>Contingency (20%):</b>				<b>\$63,644</b>
<b>Engineering &amp; Oversight (15%):</b>				<b>\$47,733</b>
<b>TOTAL ESTIMATED CONSTRUCTION COST:</b>				<b>\$429,597</b>
<b>II. OPERATION AND MAINTENANCE (O&amp;M)</b>				
22. Site Restoration	LS	\$1,000	1	\$1,000
<b>III. MONITORING</b>				
23. Annual Site Monitoring	LS	\$6,000	1	\$6,000
<b>Subtotal (Item Nos. 22 and 23):</b>				<b>\$7,000</b>
<b>Contingency (20%):</b>				<b>\$1,400</b>
<b>Annual Subtotal (Item Nos. 22 and 23):</b>				<b>\$8,400</b>
<b>10-Year Present Worth O&amp;M Cost:</b>				<b>\$59,002</b>
<b>TOTAL ESTIMATED ALTERNATIVE 3A COST:</b>				<b>\$488,599</b>
<b>ROUNDED TO:</b>				<b>\$489,000</b>

See Notes on Page 2.

TABLE 4-4

SOLUTIA INC.  
FORMER VINYL CHLORIDE GAS HOLDER AREA  
INDIAN ORCHARD PLANT  
SPRINGFIELD, MASSACHUSETTS

**PRELIMINARY PHASE III REMEDIAL ACTION COSTS:**  
**ALTERNATIVE 3B - EXCAVATION WITH OFF-SITE DISPOSAL**

**Notes:**

*Units Key:* LS = Lump Sum; LF = Linear Feet; SY = Square Yard; CY = Cubic Yard; SF = Square Foot; GAL = Gallon

1. AUL preparation in accordance with 310 CMR 40.1000 of the MCP and related MADEP guidance.
2. Implementation timeframe for preparation and submittal/filing of an AUL is estimated to be 6 weeks.
3. Additional sampling and analysis is assumed to include the collection of additional soil samples to support remedial design and implementation (e.g., delineation of final cover limits).
4. Mobilization/demobilization assumed to consist of contractor equipment and labor, as necessary.
5. Site preparation assumes removal of trees/understory to facilitate access for construction-related activities.
6. Sheetpiling is assumed to be necessary to provide excavation stability to perform removal activities. The sheetpiling unit cost is based upon 20 feet long sheets along the removal boundary.
7. Mechanical excavation is assumed to be required for removal of materials within a 60 foot by 40 foot area to achieve a less than 2 ppm vinyl chloride average in subsurface soils.
8. It has been assumed that materials will be direct loaded and transported to an area within the facility for stockpiling or dewatering, as appropriate.
9. It has been assumed that vinyl chloride-containing materials are located between 4 to 7 feet below ground surface.
10. Dewatering area assumed to consist of a bermed/lined stockpile area with a collection sump.
11. It has been assumed that approximately 50 gallons of water per cubic yard of impacted soil removal will require treatment.
12. A factor of 1.5 tons per cubic yard has been used to calculate the amount of material to be disposed off-site. In addition, a 15% bulking factor has been applied.
13. It has been assumed that non-impacted overburden materials will be used as backfill materials.
14. It has been assumed that site restoration and semi-annual site inspection activities will be necessary to ensure that this alternative is meeting its response action objective.
15. The 10-year present worth O&M and monitoring cost assumes a 7% discount factor and 0% inflation over a 10 year period.

TABLE 4-5

SOLUTIA INC.  
 FORMER VINYL CHLORIDE GAS HOLDER AREA  
 INDIAN ORCHARD PLANT  
 SPRINGFIELD, MASSACHUSETTS

**PRELIMINARY PHASE III REMEDIAL ACTION COSTS:  
 ALTERNATIVE 3C - EXCAVATION WITH OFF-SITE DISPOSAL**

*Description: Remove overburden materials; excavate and dispose off-site approximately 270 cubic yards of vinyl chloride-containing materials to achieve a less than 20 ppm vinyl chloride average in depths greater than 3 feet. Establish Activity and Use Limitations (AUL) for 3,500 square feet of impacted soil and protect and replace subsurface utilities, as necessary.*

Remedial Component	Units	Unit Cost (\$)	Estimated Quantity	Cost (\$)
<b>I. CAPITAL COSTS</b>				
<b>Construction Support Activities</b>				
1. Mobilization/Demobilization	LS	\$15,000	1	\$15,000
2. Site Preparation (i.e., clearing, utility protection)	LS	\$10,000	1	\$10,000
3. Survey Control	DAYS	\$1,000	10	\$10,000
4. Erosion Controls (hay bales and silt fence)	LF	\$3	500	\$1,500
5. Temporary Fencing/Security	LF	\$5	1,200	\$6,000
6. Surface Grading/Grubbing	SY	\$6	1,500	\$9,000
7. Remediation Support for Project Duration	WEEK	\$5,000	2	\$10,000
8. Miscellaneous Site Restoration	LS	\$5,000	1	\$5,000
<b>Remedial Activities</b>				
9. Excavation Sheetpile Installation	SF	\$20	4,000	\$80,000
10. Excavate and Load Overburden Materials	CY	\$20	360	\$7,200
11. Transport Overburden Materials to Stockpile Area	CY	\$4	360	\$1,440
12. Excavate and Load Vinyl Chloride-containing Materials	CY	\$20	270	\$5,400
13. Transport Vinyl Chloride-containing Materials to Dewatering Area	CY	\$4	270	\$1,080
14. Construct Dewatering Area	LS	\$7,500	1	\$7,500
15. Water Treatment	GAL	\$1	13,500	\$13,500
16. Dispose Vinyl Chloride-containing Materials	TON	\$200	465	\$93,000
17. Replace Overburden Materials	CY	\$6	360	\$2,160
18. Purchase and Place Backfill Materials	CY	\$20	270	\$5,400
<b>Other Construction-Related Activities</b>				
19. Permitting/Approvals	LS	\$10,000	1	\$10,000
20. Additional Sampling and Analysis	LS	\$2,000	1	\$2,000
21. Activity and Use Limitations (Table 4-1)	LS	\$14,000	1	\$14,000
<b>Subtotal (Item Nos. 1 to 21):</b>				<b>\$309,180</b>
<b>Contingency (20%):</b>				<b>\$61,836</b>
<b>Engineering &amp; Oversight (15%):</b>				<b>\$46,377</b>
<b>TOTAL ESTIMATED CONSTRUCTION COST:</b>				<b>\$417,393</b>
<b>II. OPERATION AND MAINTENANCE (O&amp;M)</b>				
22. Site Restoration	LS	\$1,000	1	\$1,000
<b>III. MONITORING</b>				
23. Annual Site Monitoring	LS	\$6,000	1	\$6,000
<b>Subtotal (Item Nos. 22 and 23):</b>				<b>\$7,000</b>
<b>Contingency (20%):</b>				<b>\$1,400</b>
<b>Annual Subtotal (Item Nos. 22 and 23):</b>				<b>\$8,400</b>
<b>10-Year Present Worth O&amp;M Cost:</b>				<b>\$59,002</b>
<b>TOTAL ESTIMATED ALTERNATIVE 3B COST:</b>				<b>\$476,395</b>
<b>ROUNDED TO:</b>				<b>\$476,000</b>

see Notes on Page 2.

TABLE 4-5

SOLUTIA INC.  
FORMER VINYL CHLORIDE GAS HOLDER AREA  
INDIAN ORCHARD PLANT  
SPRINGFIELD, MASSACHUSETTS

PRELIMINARY PHASE III REMEDIAL ACTION COSTS:  
ALTERNATIVE 3C - EXCAVATION WITH OFF-SITE DISPOSAL

Notes:

*Units Key:* LS = Lump Sum; LF = Linear Feet; SY = Square Yard; CY = Cubic Yard; SF = Square Foot; GAL = Gallon

1. AUL preparation in accordance with 310 CMR 40.1000 of the MCP and related MADEP guidance.
2. Implementation timeframe for preparation and submittal/filing of an AUL is estimated to be 6 weeks.
3. Additional sampling and analysis is assumed to include the collection of additional soil samples to support remedial design and implementation (e.g., delineation of final cover limits).
4. Mobilization/demobilization assumed to consist of contractor equipment and labor, as necessary.
5. Site preparation assumes removal of trees/understory to facilitate access for construction-related activities.
6. Sheetpiling is assumed to be necessary to provide excavation stability to perform removal activities. The sheetpiling unit cost is based upon 20 feet long sheets along the removal boundary.
7. Mechanical excavation is assumed to be required for removal of materials within a 60 foot by 40 foot area to achieve a less than 20 ppm vinyl chloride average in subsurface soils.
8. It has been assumed that materials will be direct loaded and transported to an area within the facility for stockpiling or dewatering, as appropriate.
9. It has been assumed that vinyl chloride-containing materials are located between 4 to 7 feet below ground surface.
10. Dewatering area assumed to consist of a bermed/lined stockpile area with a collection sump.
11. It has been assumed that approximately 50 gallons of water per cubic yard of impacted soil removal will require treatment.
12. A factor of 1.5 tons per cubic yard has been used to calculate the amount of material to be disposed off-site. In addition, a 15% bulking factor has been applied.
13. It has been assumed that non-impacted overburden materials will be used as backfill materials.
14. It has been assumed that site restoration and semi-annual site inspection activities will be necessary to ensure that this alternative is meeting its response action objective.
15. The 10-year present worth O&M and monitoring cost assumes a 7% discount factor and 0% inflation over a 10 year period.

TABLE 4-6

**SOLUTIA INC.  
FORMER VINYL CHLORIDE GAS HOLDER AREA  
INDIAN ORCHARD PLANT  
SPRINGFIELD, MASSACHUSETTS**

**PRELIMINARY PHASE III REMEDIAL ACTION COSTS:  
ALTERNATIVE 4B - IN-SITE CHEMICAL OXIDATION**

*Description: Install injection points and treat subsurface soil containing vinyl chloride from partially polymerized PVC in-situ using chemical oxidation (sodium permanganate), and confirm effectiveness.*

Remedial Component	Units	Unit Cost (\$)	Estimated Quantity	Cost (\$)
<b>I. CAPITAL COSTS</b>				
<b>Pre-Treatment Activities</b>				
1. Pre-injection Sampling and Analysis	LS	\$5,000	1	\$5,000
<b>System Design and Fabrication Activities</b>				
2. Bench Scale Study	LS	\$25,000	1	\$25,000
3. Utility Clearance	DAYS	\$1,500	3	\$4,500
4. Pilot Study	LS	\$40,000	1	\$40,000
5. System design drawings and specifications	LF	\$8,000	1	\$8,000
6. Fabrication of pump system	LF	\$15,000	1	\$15,000
<b>Remedial Activities</b>				
7. Mobilization/Demobilization	LS	\$1,000	3	\$3,000
8. Well Point Installation	LF	\$200	100	\$20,000
9. Oxidant Injection and Monitoring	LS	\$80,000	3	\$240,000
10. Post-Injection Monitoring	DAYS	\$1,000	18	\$18,000
11. Confirmatory Soil Sampling	LS	\$12,000	2	\$24,000
12. NA Groundwater Monitoring	LS	\$10,000	1	\$10,000
13. Injection Point Abandonment and Site Restoration	LS	\$5,000	1	\$5,000
<b>Other Construction-Related Activities</b>				
14. Permitting/Approvals	LS	\$10,000	1	\$10,000
15. Activity and Use Limitations (Table 4-1)	LS	\$14,000	1	\$14,000
<b>Subtotal (Item Nos. 1 to 15):</b>				<b>\$441,500</b>
<b>Contingency (20%):</b>				<b>\$88,300</b>
<b>Engineering &amp; Oversight (15%):</b>				<b>\$66,225</b>
<b>TOTAL ESTIMATED CONSTRUCTION COST:</b>				<b>\$596,025</b>
<b>II. OPERATION AND MAINTENANCE (O&amp;M)</b>				
16. Well Point Maintenance	LS	\$1,000	1	\$1,000
<b>III. MONITORING</b>				
17. Annual Groundwater Site Monitoring	LS	\$6,000	1	\$6,000
<b>Subtotal (Item Nos. 16 and 17):</b>				<b>\$7,000</b>
<b>Contingency (20%):</b>				<b>\$1,400</b>
<b>Annual Subtotal (Item Nos. 16 and 17):</b>				<b>\$8,400</b>
<b>10-Year Present Worth O&amp;M and Monitoring Cost:</b>				<b>\$59,002</b>
<b>TOTAL ESTIMATED ALTERNATIVE 4A COST:</b>				<b>\$655,027</b>
<b>ROUNDED TO:</b>				<b>\$655,000</b>

**Notes:**

*Units Key:* LS = Lump Sum; LF = Linear Feet

1. AUL preparation in accordance with 310 CMR 40.1000 of the MCP and related MADEP guidance.
2. Implementation timeframe for preparation and submittal/filing of an AUL is estimated to be 6 weeks.
3. A single application of chemical oxidant is assumed and is estimated to take two weeks.
4. Mobilization/demobilization assumed to consist of contractor equipment and labor, as necessary.
5. Site preparation assumes removal of trees/understory to facilitate access for construction-related activities.
6. It has been assumed that well point maintenance and annual groundwater monitoring activities will be necessary to ensure that this alternative is meeting its response action objective.
7. The 10-year present worth O&M and monitoring cost assumes a 7% discount factor and 0% inflation over a 10 year period.
8. Annual groundwater monitoring includes up to 10 monitoring wells for VOCs.
9. Does not include reporting.

TABLE 4-7

**SOLUTIA INC.  
FORMER VINYL CHLORIDE GAS HOLDER AREA  
INDIAN ORCHARD PLANT  
SPRINGFIELD, MASSACHUSETTS**

**PRELIMINARY PHASE III REMEDIAL ACTION COSTS:  
ALTERNATIVE 4C - IN-SITE CHEMICAL OXIDATION**

*Description: Install injection points and treat subsurface soil containing vinyl chloride from partially polymerized PVC in-situ using chemical oxidation (sodium permanganate), and confirm effectiveness.*

Remedial Component	Units	Unit Cost (\$)	Estimated Quantity	Cost (\$)
<b>I. CAPITAL COSTS</b>				
<b>Pre-Treatment Activities</b>				
1. Pre-injection Sampling and Analysis	LS	\$5,000	1	\$5,000
<b>System Design and Fabrication Activities</b>				
2. Bench Scale Study	LS	\$25,000	1	\$25,000
3. Utility Clearance	DAYS	\$1,500	3	\$4,500
4. Pilot Study	LS	\$40,000	1	\$40,000
5. System design drawings and specifications	LF	\$8,000	1	\$8,000
6. Fabrication of pump system	LF	\$15,000	1	\$15,000
<b>Remedial Activities</b>				
7. Mobilization/Demobilization	LS	\$1,000	2	\$2,000
8. Well Point Installation	LF	\$200	80	\$16,000
9. Oxidant Injection and Monitoring	LS	\$80,000	1	\$80,000
10. Post-Injection Monitoring	DAYS	\$1,000	12	\$12,000
11. Confirmatory Soil Sampling	LS	\$12,000	2	\$24,000
12. NA Groundwater Monitoring	LS	\$10,000	1	\$10,000
13. Injection Point Abandonment and Site Restoration	LS	\$5,000	1	\$5,000
<b>Other Construction-Related Activities</b>				
14. Permitting/Approvals	LS	\$10,000	1	\$10,000
15. Activity and Use Limitations (Table 4-1)	LS	\$14,000	1	\$14,000
<b>Subtotal (Item Nos. 1 to 15):</b>				<b>\$270,500</b>
<b>Contingency (20%):</b>				<b>\$54,100</b>
<b>Engineering &amp; Oversight (15%):</b>				<b>\$40,575</b>
<b>TOTAL ESTIMATED CONSTRUCTION COST:</b>				<b>\$365,175</b>
<b>II. OPERATION AND MAINTENANCE (O&amp;M)</b>				
16. Well Point Maintenance	LS	\$0	1	\$0
<b>III. MONITORING</b>				
17. Annual Groundwater Site Monitoring	LS	\$6,000	1	\$6,000
<b>Subtotal (Item Nos. 16 and 17):</b>				<b>\$6,000</b>
<b>Contingency (20%):</b>				<b>\$1,200</b>
<b>Annual Subtotal (Item Nos. 16 and 17):</b>				<b>\$7,200</b>
<b>10-Year Present Worth O&amp;M and Monitoring Cost:</b>				<b>\$50,573</b>
<b>TOTAL ESTIMATED ALTERNATIVE 4B COST:</b>				<b>\$415,748</b>
<b>ROUNDED TO:</b>				<b>\$416,000</b>

**Notes:**

*Units Key:* LS = Lump Sum; LF = Linear Feet

- AUL preparation in accordance with 310 CMR 40.1000 of the MCP and related MADEP guidance.
- Implementation timeframe for preparation and submittal/filing of an AUL is estimated to be 6 weeks.
- A single application of chemical oxidant is assumed and is estimated to take two weeks.
- Mobilization/demobilization assumed to consist of contractor equipment and labor, as necessary.
- Site preparation assumes removal of trees/understory to facilitate access for construction-related activities.
- It has been assumed that well point maintenance and annual groundwater monitoring activities will be necessary to ensure that this alternative is meeting its response action objective.
- The 10-year present worth O&M and monitoring cost assumes a 7% discount factor and 0% inflation over a 10 year period.
- Annual groundwater monitoring includes up to 10 monitoring wells for VOCs.
- Does not include reporting.

TABLE 5-1

SOLUTIA INC.  
 FORMER VINYL CHLORIDE GAS HOLDER AREA  
 INDIAN ORCHARD PLANT  
 SPRINGFIELD, MASSACHUSETTS

ASSESSMENT OF REMEDIAL ACTION ALTERNATIVES

MCP Evaluation Criteria	Key Components of Evaluation Criterion	Evaluation of Remedial Action Alternatives							
		Site Controls	Physical Barrier	Excavation/Offsite Disposal			In-Situ		
				Class A-1 RAO	Class A-2 RAO	Class A-3 RAO	Class A-1 RAO	Class A-2 RAO	Class A-3 RAO
1. Effectiveness	<ul style="list-style-type: none"> <li>Achieve Permanent or Temporary Solution</li> <li>Reuse, recycle, destroy, detoxicity, treat OHM</li> <li>Achieve or approach background</li> </ul>	1	2	5	4	3	5	4	4
2. Short- and Long-Term Reliability	<ul style="list-style-type: none"> <li>Degree of certainty of success</li> <li>Effectively manage OHM remaining at site</li> </ul>	3	3	3	5	5	3	4	4
3. Implementability	<ul style="list-style-type: none"> <li>Technical complexity of implementation</li> <li>Availability of materials, equipment, specialists</li> <li>Availability of off-site services/locations</li> <li>Future monitoring and maintenance</li> </ul>	5	5	2	3	3	2	3	3
4. Implementation Costs	<ul style="list-style-type: none"> <li>Costs for remedial action</li> <li>Environmental restoration costs</li> <li>Consumption of energy resources</li> </ul>	5	1	1	1	4	1	2	4
5. Risks	<ul style="list-style-type: none"> <li>Short-term risks during implementation</li> <li>Long-term risks during remedy attainment</li> <li>Risks related to remaining OHM at site</li> </ul>	4	4	1	1	1	4	5	5
6. Benefits	<ul style="list-style-type: none"> <li>Reuse of site</li> <li>Lost value of site</li> </ul>	4	4	4	4	4	4	4	4
7. Timeliness	<ul style="list-style-type: none"> <li>Eliminating uncontrolled OHM</li> <li>Achieving "no significant risk"</li> </ul>	1	1	5	5	4	3	4	4
8. Non-Pecuniary Interests	<ul style="list-style-type: none"> <li>Aesthetic value</li> <li>Disruption to site/area during implementation</li> </ul>	5	1	1	1	2	1	4	4
<b>TOTAL</b>		28	21	22	24	26	23	30	32

Notes:

- MCP evaluation criteria found at 310 CMR 40.0858.
- The assessment of each alternative has considered its overall compliance with the evaluation criteria, and the extent to which each alternative "favorably" addresses the criteria. Qualitative rating is from 1 (low) to 5 (high).
- OHM = Oil and Hazardous Materials.

TABLE 5-2

SOLUTIA INC.  
 FORMER VINYL CHLORIDE GAS HOLDER AREA  
 INDIAN ORCHARD PLANT  
 SPRINGFIELD, MASSACHUSETTS

COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES

Alternative	Effectiveness	Short- and Long-Term Reliability	Implementability	Implementation Costs	Short- and Long-Term Risks	Benefits	Timeliness	Nonpecuniary Interests
Site Controls	<ul style="list-style-type: none"> <li>- Inability to achieve a Permanent Solution</li> <li>- OHM not reused, recycled, destroyed, detoxified, or treated</li> <li>- Inability to reduce levels of untreated OHM at the site</li> </ul>	<ul style="list-style-type: none"> <li>- Not reliable in its ability to achieve a long-term Permanent Solution</li> <li>- Acceptable in achieving a short-term Temporary Solution</li> </ul>	<ul style="list-style-type: none"> <li>- Ability to be easily integrated with existing facility operations</li> <li>- Necessary equipment and materials readily available</li> </ul>	<ul style="list-style-type: none"> <li>- \$120,000, including long-term operation, maintenance, and monitoring</li> </ul>	<ul style="list-style-type: none"> <li>- On- and off-site risks are minimum due to the minimal extent of disruption required to implement</li> <li>- Reduces short-term risk to a potential trespasser</li> </ul>	<ul style="list-style-type: none"> <li>- Does not involve disruption to natural resources</li> <li>- Achieves a Temporary Solution in a minimal timeframe</li> </ul>	<ul style="list-style-type: none"> <li>- 6 weeks to complete</li> <li>- 10 years operation, maintenance, and monitoring</li> </ul>	<ul style="list-style-type: none"> <li>- Would cause limited, if any, disruption to "normal" routines within the facility or surrounding area</li> <li>- Limited, if any, aesthetic modifications</li> </ul>
Engineered Barrier	<ul style="list-style-type: none"> <li>- Inability to achieve a Permanent Solution with engineered barrier itself.</li> <li>- OHM not reused, recycled, destroyed, detoxified, or treated</li> <li>- Inability to reduce levels of untreated OHM at the site</li> </ul>	<ul style="list-style-type: none"> <li>- Not reliable in its ability to achieve a long-term Permanent Solution</li> <li>- Acceptable in achieving a short-term Temporary Solution</li> </ul>	<ul style="list-style-type: none"> <li>- Ability to be easily integrated with existing facility operations</li> <li>- Necessary equipment and materials readily available</li> </ul>	<ul style="list-style-type: none"> <li>- \$226,000, including long-term operation, maintenance, and monitoring</li> </ul>	<ul style="list-style-type: none"> <li>- On- and off-site risks are minimum due to the minimal extent of disruption required to implement</li> <li>- Minimal short-term risk to a construction worker during implementation</li> </ul>	<ul style="list-style-type: none"> <li>- Involves limited disruption to natural resources due to clearing of vegetation, and disruption of soils</li> </ul>	<ul style="list-style-type: none"> <li>- 8 weeks to complete</li> <li>- 10 years operation, maintenance, and monitoring</li> </ul>	<ul style="list-style-type: none"> <li>- Would cause limited disruption to "normal" routines within the facility</li> <li>- Limited aesthetic modifications given the manufacturing nature of the facility</li> </ul>

TABLE 5-2

SOLUTIA INC.  
 FORMER VINYL CHLORIDE GAS HOLDER AREA  
 INDIAN ORCHARD PLANT  
 SPRINGFIELD, MASSACHUSETTS

COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES

Alternative	Effectiveness	Short- and Long-Term Reliability	Implementability	Implementation Costs	Short- and Long-Term Risks	Benefits	Timeliness	Nonpecuniary Interests
Engineered Barrier with Vertical Control	<ul style="list-style-type: none"> <li>- Ability to achieve a Permanent Solution</li> <li>- OHM in soils not reused, recycled, destroyed, detoxified, or treated; however, OHM in groundwater is treated</li> <li>- Inability to reduce levels of untreated OHM in soils at the site</li> </ul>	<ul style="list-style-type: none"> <li>- Ability to achieve a Permanent Solution</li> <li>- Acceptable in achieving a short- and long-term Permanent Solution</li> </ul>	<ul style="list-style-type: none"> <li>- May not easily integrated with existing facility operations due to sheetpiling installation and long-term groundwater treatment</li> <li>- Necessary equipment and materials readily available</li> </ul>	<ul style="list-style-type: none"> <li>- \$2,450,000, including long-term operation, maintenance, and monitoring</li> </ul>	<ul style="list-style-type: none"> <li>- Onsite and offsite risks are considered moderate due to the extent of disruption required to implement</li> <li>- Minimal short-term risk to a construction worker during implementation</li> </ul>	<ul style="list-style-type: none"> <li>- Involves limited disruption to natural resources due to clearing of vegetation, disruption of soils, construction of treatment equipment, and depression of the groundwater table</li> </ul>	<ul style="list-style-type: none"> <li>- 10 weeks to complete</li> <li>- 10-years operation, maintenance, and monitoring</li> </ul>	<ul style="list-style-type: none"> <li>- Would cause disruption to "normal" routines within the facility</li> <li>- Limited aesthetic modifications given the manufacturing nature of the facility</li> </ul>
Excavation with Offsite Disposal	<ul style="list-style-type: none"> <li>- Ability to achieve a Permanent Solution</li> <li>- OHM in soils removed</li> </ul>	<ul style="list-style-type: none"> <li>- Ability to achieve a Permanent Solution</li> <li>- Acceptable in achieving a short- and long-term Permanent Solution</li> </ul>	<ul style="list-style-type: none"> <li>- Not easily integrated with existing facility operations due to sheetpiling installation and materials handling</li> <li>- Necessary equipment and materials readily available</li> </ul>	<ul style="list-style-type: none"> <li>- \$476,000 to \$489,000, including long-term operation, maintenance, and monitoring</li> </ul>	<ul style="list-style-type: none"> <li>- Onsite and offsite risks are considered significant due to the extent of disruption required to implement</li> <li>- Moderate short-term risk to a construction worker during implementation</li> </ul>	<ul style="list-style-type: none"> <li>- Involves limited disruption to natural resources due to clearing of vegetation, and disruption of soils</li> </ul>	<ul style="list-style-type: none"> <li>- 8 weeks to complete</li> <li>- 10-years operation, maintenance, and monitoring</li> </ul>	<ul style="list-style-type: none"> <li>- Would cause significant disruption to "normal" routines within the facility</li> <li>- Limited, if any, aesthetic modifications</li> </ul>

TABLE 5-2

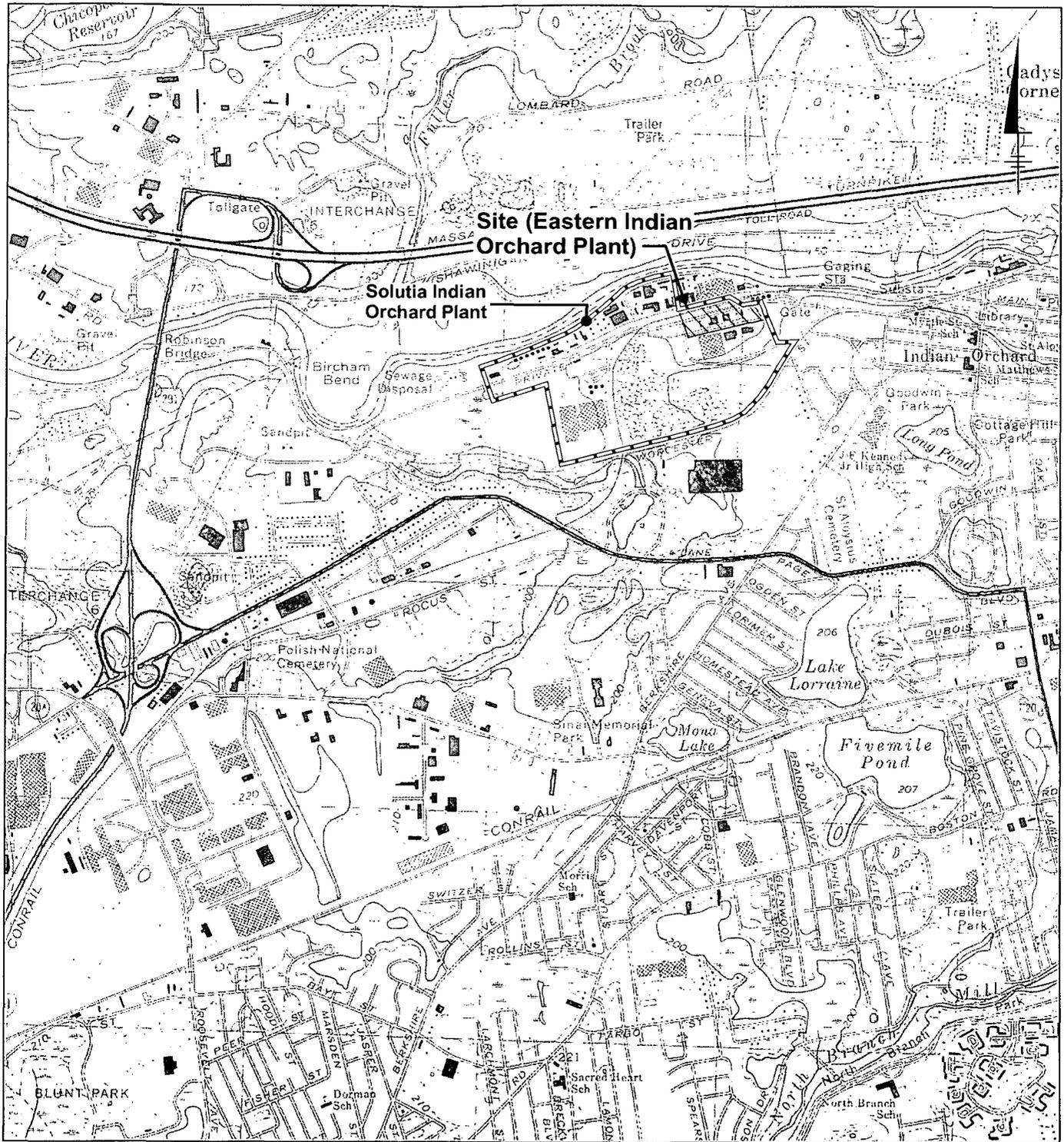
SOLUTIA INC.  
 FORMER VINYL CHLORIDE GAS HOLDER AREA  
 INDIAN ORCHARD PLANT  
 SPRINGFIELD, MASSACHUSETTS

COMPARATIVE ANALYSIS OF REMEDIAL ACTION ALTERNATIVES

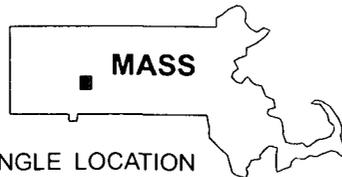
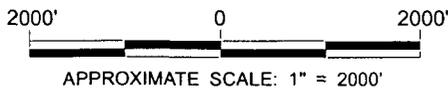
Alternative	Effectiveness	Short- and Long-Term Reliability	Implementability	Implementation Costs	Short- and Long-Term Risks	Benefits	Timeliness	Nonpecuniary Interests
In-Situ Chemical Oxidation	<ul style="list-style-type: none"> <li>- Ability to achieve a Permanent Solution</li> <li>- OHM in soils and groundwater removed</li> </ul>	<ul style="list-style-type: none"> <li>- Ability to achieve a Permanent Solution</li> <li>- Acceptable in achieving a short-term and long-term Permanent Solution</li> </ul>	<ul style="list-style-type: none"> <li>- Can be easily integrated with existing facility operation</li> <li>- Necessary equipment and material required purchase and fabrication</li> </ul>	<ul style="list-style-type: none"> <li>- \$416,000 to \$655,000, including long-term operation and maintenance</li> </ul>	<ul style="list-style-type: none"> <li>- Onsite and offsite risks are considered minimal due to the minimal disruption required to implement</li> <li>- Minimal short-term risk to remedy operator and onsite workers during implementation</li> </ul>	<ul style="list-style-type: none"> <li>- Does not involve disruption to natural resources</li> </ul>	<ul style="list-style-type: none"> <li>- 6 months to 2 years to complete</li> <li>- 10 years operation, maintenance, and monitoring</li> </ul>	<ul style="list-style-type: none"> <li>- Would cause limited, if any, disruption to "normal" routines within the facility or surrounding area</li> <li>- Limited, if any, aesthetic modifications</li> </ul>

# *Figures*

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REFERENCE: Base Map USGS 7.5 Min. Series Quads., Springfield North, Massachusetts, Photorevised 1979.



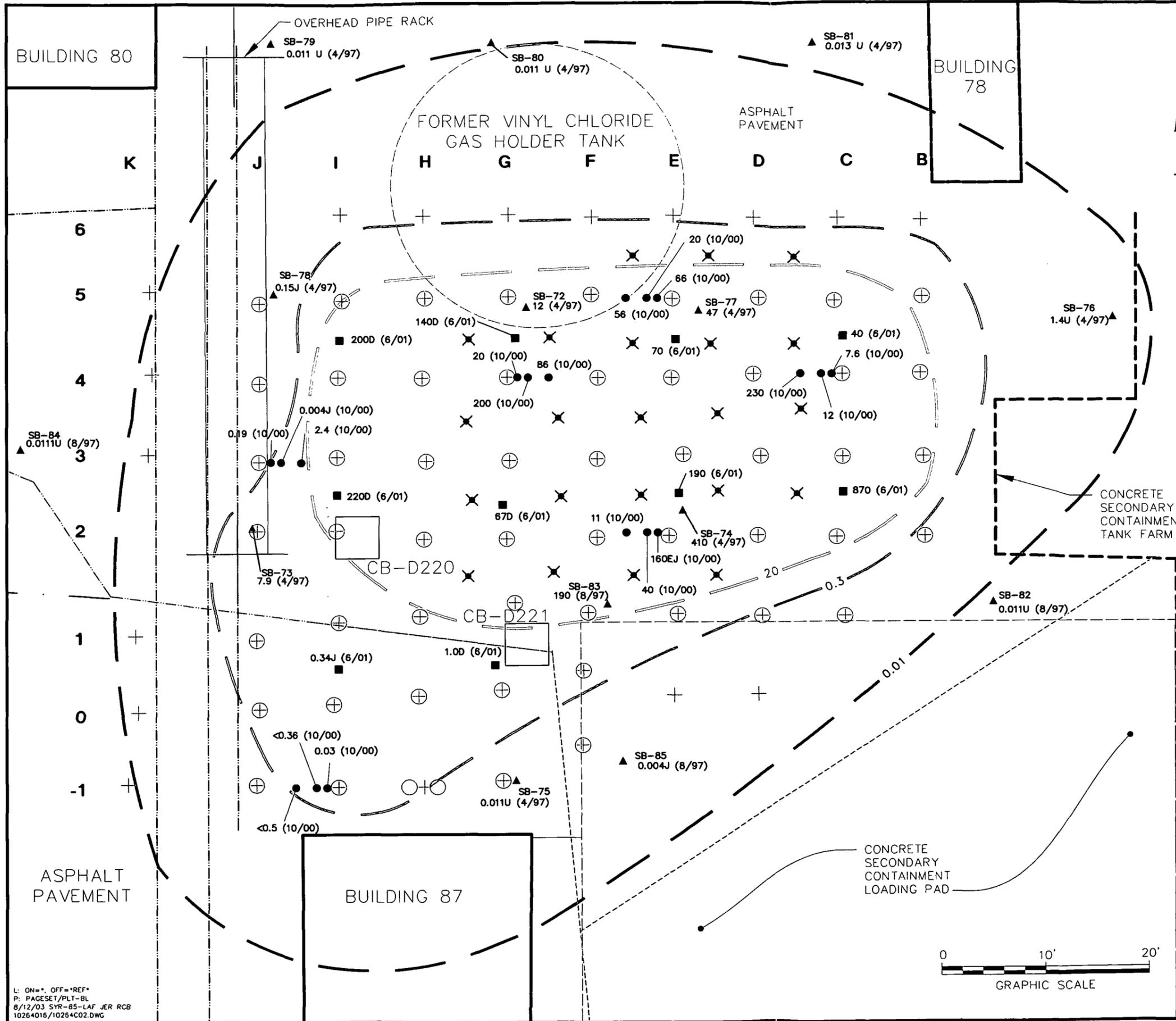
QUADRANGLE LOCATION

SOLUTIA INC.  
EASTERN INDIAN ORCHARD PLANT  
SPRINGFIELD, MASSACHUSETTS  
MCP PHASE III REMEDIAL ACTION PLAN RTNF11901

## SITE LOCATION PLAN

**BBL**<sup>®</sup>  
BLASLAND, BOUCK & LEE, INC.  
engineers & scientists

FIGURE  
**1**



**LEGEND**

- POST FULL SCALE CONFIRMATION SOIL BORING LOCATION (2001)
- POST FULL SCALE CONFIRMATION SOIL BORING (2000)
- ▲ SB-76 DELINEATION SOIL BORING (17) (1997)
- + DELINEATION SOIL BORING (74) (2000)
- PHASE I CHEM-OX INJECTION POINT (55) (2000)
- ✕ PHASE II CHEM-OX INJECTION POINT (25) (2001)
- UTILITY MANHOLE
- UNDERGROUND WATER LINE
- - - - UNDERGROUND SEWER OR DRAIN

VINYL CHLORIDE CONCENTRATION IN SUBSURFACE SOIL WITHIN 4 TO 7 FOOT ZONE BELOW GRADE (6/01) MONTH/YEAR OF SAMPLE COLLECTION.

- 0.01 U VC SOIL EXTENT
- 0.3 VC SOIL EXTENT
- 20 VC SOIL EXTENT

- NOTES:**
1. BASE MAP PREPARED FROM "BUILDING DESIGNATION PLAN" SUPPLIED BY SOLUTIA INC. 1993, AT A SCALE OF 1"=200'.
  2. INJECTION WELLS WERE INSTALLED APPROX. 8' O.C. WELLS CONSTRUCTED OF 1" SCH. 40 PVC RISER AND 10-SLOT SCREEN.
  3. THE LOCATION OF BORINGS AND WELLS, ARE SURVEYED BY BBL, BASED ON GRID COORDINATES SUPPLIED BY SOLUTIA INC. EXCEPT FOR FOUNDATION.
  4. ELEVATIONS OF WELLS AND SOIL BORINGS ARE BASED ON SOLUTIA/NOVA CHEMICALS PLANT DATUM (SPD) WHICH IS 0.45' HIGHER THAN USGS NATIONAL GEODETIC VERTICAL DATUM OF 1929..
  5. RESULTS ARE IN MILLIGRAMS PER KILOGRAM UNITS (MG/KG).
  6. DRAWING MODIFIED FROM XPERT DESIGN AND DIAGNOSTICS, LLC DRAWING ENTITLED "POST PHASE I CHEM-OX INJECTION CONFIRMATORY SOIL SAMPLING" DATED 11/29/00.

SOLUTIA INC.,  
 EASTERN INDIAN ORCHARD PLANT  
 SPRINGFIELD, MASSACHUSETTS  
**MCP PHASE III REMEDIAL ACTION PLAN RTN 1-11901**

**TREATMENT  
 AREA LIMITS**

**BBL**  
 BLASLAND, BOUCK & LEE, INC.  
 engineers & scientists

FIGURE  
**2**



L: ON=\*, OFF=\*,REF\*  
 P: PAGESET/PLT-BL  
 8/12/03 SYR-85-LAF\_JER\_RCB  
 10264016/10264C02.DWG

# *Appendices*

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# **Appendix A**

## **BWSC 108**



**COMPREHENSIVE RESPONSE ACTION TRANSMITTAL  
FORM & PHASE I COMPLETION STATEMENT**

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

Release Tracking Number

1 - 11901

**A. SITE LOCATION:**

Site Name: (optional) Solutia Inc.

Street: 730 Worcester Street Location Aid: \_\_\_\_\_

City/Town: Springfield ZIP Code: 01151-1089

Related Release Tracking Numbers that this Form Addresses: \_\_\_\_\_

Tier Classification: (check one of the following)  Tier IA  Tier IB  Tier IC  Tier II  Not Tier Classified

If a Tier I Permit has been issued, state the Permit Number: \_\_\_\_\_

**B. THIS FORM IS BEING USED TO:** (check all that apply)

- Submit a Phase I Completion Statement, pursuant to 310 CMR 40.0484 (complete Sections A, B, C, G, H, I and J).
- Submit a Phase II Scope of Work, pursuant to 310 CMR 40.0834 (complete Sections A, B, C, G, H, I and J).
- Submit a final Phase II Comprehensive Site Report and Completion Statement, pursuant to 310 CMR 40.0836 (complete Sections A, B, C, D, G, H, I and J).
- Submit a Phase III Remedial Action Plan and Completion Statement, pursuant to 310 CMR 40.0862 (complete Sections A, B, C, G, H, I and J).
- Submit a Phase IV Remedy Implementation Plan, pursuant to 310 CMR 40.0874 (complete Sections A, B, C, G, H, I and J).
- Submit an As-Built Construction Report, pursuant to 310 CMR 40.0875 (complete Sections A, B, C, G, H, I and J).
- Submit a Phase IV Final Inspection Report and Completion Statement, pursuant to 310 CMR 40.0878 and 40.0879 (complete Sections A, B, C, E, G, H, I and J).
- Submit a periodic Phase V Inspection & Monitoring Report, pursuant to 310 CMR 40.0892 (complete Sections A, B, C, G, H, I and J).
- Submit a final Phase V Inspection & Monitoring Report and Completion Statement, pursuant to 310 CMR 40.0893 (complete Sections A, B, C, F, G, H, I and J).

You must attach all supporting documentation required for each use of form indicated, including copies of any Legal Notices and Notices to Public Officials required by 310 CMR 40.1400.

**C. RESPONSE ACTIONS:**

Check here if any response action(s) that serves as the basis for the Phase submittal(s) involves the use of Innovative Technologies. (DEP is interested in using this information to create an Innovative Technologies Clearinghouse.)

Describe Technologies: In-situ treatment of vinylchloride in soil using oxidant.

**D. PHASE II COMPLETION STATEMENT:**

Specify the outcome of the Phase II Comprehensive Site Assessment:

- Additional Comprehensive Response Actions are necessary at this Site, based on the results of the Phase II Comprehensive Site Assessment.
- The requirements of a Class A Response Action Outcome have been met and a completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.
- The requirements of a Class B Response Action Outcome have been met and a completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.
- Rescoring of this Site using the Numerical Ranking System is necessary, based on the results of the final Phase II Report.

**E. PHASE IV COMPLETION STATEMENT:**

Specify the outcome of Phase IV activities:

- Phase V operation, maintenance or monitoring of the Comprehensive Response Action is necessary to achieve a Response Action Outcome. (This site will be subject to a Phase V Operation, Maintenance and Monitoring Annual Compliance Fee.)
- The requirements of a Class A Response Action Outcome have been met. No additional operation, maintenance or monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.
- The requirements of a Class C Response Action Outcome have been met. No additional operation, maintenance or monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

SECTION E IS CONTINUED ON THE NEXT PAGE



COMPREHENSIVE RESPONSE ACTION TRANSMITTAL  
FORM & PHASE I COMPLETION STATEMENT

Release Tracking Number

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

1 - 11901

E. PHASE IV COMPLETION STATEMENT: (continued)

The requirements of a Class C Response Action Outcome have been met. Further operation, maintenance or monitoring of the remedial action is necessary to ensure that conditions are maintained and that further progress is made toward a Permanent Solution. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

Indicate whether the operation and maintenance will be Active or Passive. (Active Operation and Maintenance is defined at 310 CMR 40.0006.):

Active Operation and Maintenance  Passive Operation and Maintenance

(Active Operation and Maintenance makes the Site subject to a Post-RAO Class C Active Operation and Maintenance Annual Compliance Fee.)

F. PHASE V COMPLETION STATEMENT:

Specify the outcome of Phase V activities:

The requirements of a Class A Response Action Outcome have been met and a completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

The requirements of a Class C Response Action Outcome have been met. No additional operation, maintenance or monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

The requirements of a Class C Response Action Outcome have been met. Further operation, maintenance or monitoring of the remedial action is necessary to ensure that conditions are maintained and that further progress is made toward a Permanent Solution. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

Indicate whether the operation and maintenance will be Active or Passive. (Active Operation and Maintenance is defined at 310 CMR 40.0006.):

Active Operation and Maintenance  Passive Operation and Maintenance

(Active Operation and Maintenance makes the Site subject to a Post-RAO Class C Active Operation and Maintenance Annual Compliance Fee.)

G. LSP OPINION:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with the information contained in this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and (iii) the provisions of 309 CMR 4.03(5), to the best of my knowledge, information and belief,

> if Section B indicates that a Phase I, Phase II, Phase III, Phase IV or Phase V Completion Statement is being submitted, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> if Section B indicates that a Phase II Scope of Work or a Phase IV Remedy Implementation Plan is being submitted, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> if Section B indicates that an As-Built Construction Report or a Phase V Inspection and Monitoring Report is being submitted, the response action(s) that is (are) the subject of this submittal (i) is (are) being implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal.

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

LSP Name: Caron Koll LSP #: 6889

Telephone: 315-446-2570 Ext.: 148

FAX: (optional) 315-446-8053

Signature: Caron Koll

Date: 8/5/03

Stamp:





COMPREHENSIVE RESPONSE ACTION TRANSMITTAL  
FORM & PHASE I COMPLETION STATEMENT

Release Tracking Number

1 - 11901

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

H. PERSON UNDERTAKING RESPONSE ACTION(S):

Name of Organization: Solutia Inc.  
Name of Contact: Roy P. Hart Title: Supervisor - Environmental Protection  
Street: 730 Worcester Street  
City/Town: Springfield State: MA ZIP Code: 01151-1089  
Telephone: 413-730-2682 Ext.: \_\_\_\_\_ FAX: (optional) 413-730-3299

Check here if there has been a change in the person undertaking the Response Action.

I. RELATIONSHIP TO SITE OF PERSON UNDERTAKING RESPONSE ACTION(S): (check one)

- RP or PRP Specify:  Owner  Operator  Generator  Transporter Other RP or PRP: \_\_\_\_\_
- Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G. c. 21E, s. 2)
- Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))
- Any Other Person Undertaking Response Action Specify Relationship: \_\_\_\_\_

J. CERTIFICATION OF PERSON UNDERTAKING RESPONSE ACTION(S):

I, \_\_\_\_\_, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

By: \_\_\_\_\_ Title: Supervisor - Environmental Protection  
(signature)  
For: Solutia Inc. Date: \_\_\_\_\_  
(print name of person or entity recorded in Section H)

Enter address of the person providing certification, if different from address recorded in Section H:  
Street: \_\_\_\_\_  
City/Town: \_\_\_\_\_ State: \_\_\_\_\_ ZIP Code: \_\_\_\_\_  
Telephone: \_\_\_\_\_ Ext.: \_\_\_\_\_ FAX: (optional) \_\_\_\_\_

YOU MUST COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.



RELEASE & UTILITY-RELATED ABATEMENT  
MEASURE (RAM & URAM) TRANSMITTAL FORM

Release Tracking Number

Pursuant to 310 CMR 40.0444 - 0446 and 310 CMR 40.0462 - 0465 (Subpart D)

1 - 11901

A. SITE LOCATION:

Site Name: Solutia Inc.  
Street: 730 Worcester Street Location Aid: \_\_\_\_\_  
City/Town: Springfield ZIP Code: 01151-1089

Check here if a Tier Classification Submittal has been provided to DEP for this Release Tracking Number.

Related Release Tracking Numbers That This RAM or URAM Addresses: \_\_\_\_\_

B. THIS FORM IS BEING USED TO: (check all that apply)

- Submit a RAM Plan (complete Sections A, B, C, D, E, F, J, K, L and M).  
 Check here if this RAM Plan is an update or modification of a previously approved written RAM Plan. Date Submitted: \_\_\_\_\_
- Submit a RAM Status Report (complete Sections A, B, C, E, J, K, L and M).
- Submit a RAM Completion Statement (complete Sections A, B, C, D, E, G, J, K, L and M).
- Confirm or Provide URAM Notification (complete Sections A, B, H, K, L and M).
- Submit a URAM Status Report (complete Sections A, B, C, E, J, K, L and M).
- Submit a URAM Completion Statement (complete Sections A, B, C, D, E, I, J, K, L and M).

You must attach all supporting documentation required for each use of form indicated, including copies of any Legal Notices and Notices to Public Officials required by 310 CMR 40.1400.

C. SITE CONDITIONS:

- Check here if the source of the Release or Threat of Release is known.  
If yes, check all sources that apply:  UST  Pipe/Hose/Line  AST  Drums  Transformer  Boat  
 Tanker Truck  Vehicle  Other Specify: Pre-1975 Former Above Ground Process Tank
- Identify Media and Receptors Affected: (check all that apply)  Air  Groundwater  Surface Water  Sediments  Soil  
 Wetlands  Storm Drain  Paved Surface  Private Well  Public Water Supply  Zone 2  Residence  
 School  Unknown  Other Specify: \_\_\_\_\_

Identify Release and/or Threat of Release Conditions at Site: (check all that apply)

- 2 and 72 Hour Reporting Condition(s)  120 Day Reporting Condition(s)  Other Condition(s)

Describe Measurement in soil above MCP Reportable Concentration; no NAPL in subsurface; not an imminent hazard

RAMs may be conducted concurrently with an IRA only with written DEP approval  
URAMs may not be conducted if any 2 or 72 Hour conditions exist at the site.

- Identify Oils and Hazardous Materials Released: (check all that apply)  Oils  Chlorinated Solvents  Heavy Metals  
 Others Specify: Vinyl chloride, off spec polyvinylchloride (PVC)

D. DESCRIPTION OF RESPONSE ACTIONS: (check all that apply)

- Assessment and/or Monitoring Only  Deployment of Absorbant or Containment Materials
- Excavation of Contaminated Soils  Temporary Covers or Caps
- Re-use, Recycling or Treatment  Bioremediation
- On Site  Off Site Est. Vol.: \_\_\_\_\_ cubic yards  Soil Vapor Extraction
- Describe: \_\_\_\_\_  Structure Venting System
- Store  On Site  Off Site Est. Vol.: \_\_\_\_\_ cubic yards  Product or NAPL Recovery

SECTION D IS CONTINUED ON THE NEXT PAGE.



RELEASE & UTILITY-RELATED ABATEMENT  
MEASURE (RAM & URAM) TRANSMITTAL FORM

Release Tracking Number

Pursuant to 310 CMR 40.0444 - 0446 and 310 CMR 40.0462 - 0465 (Subpart D)

1 - 11901

D. DESCRIPTION OF RESPONSE ACTIONS (continued):

- Landfill     Cover     Disposal Est. Vol.: \_\_\_\_\_ cubic yards     Groundwater Treatment Systems
  - Removal of Drums, Tanks or Containers     Air Sparging
  - Describe: \_\_\_\_\_     Temporary Water Supplies
  - Removal of Other Contaminated Media     Temporary Evacuation or Relocation of Residents
  - Specify Type and Volume: \_\_\_\_\_     Fencing and Sign Posting
  - Other Response Actions Describe: In-situ chemical oxidation
- See 310 CMR 40.0442 for limitations on the scope and type of RAMs.  
See 310 CMR 40.0464 for performance standards for URAMs.
- Check here if this RAM or URAM involves the use of Innovative Technologies. DEP is interested in using this information to aid in creating an Innovative Technologies Clearinghouse.
  - Describe Technologies: In-situ treatment using oxidant injection

E. TRANSPORT OF REMEDIATION WASTE: (if Remediation Waste has been sent to an off-site facility, answer the following)

Name of Facility: \_\_\_\_\_

Town and State: \_\_\_\_\_

Quantity of Remediation Waste Transported to Date: No remediation wastes

F. RAM PLAN:

- Check here if this RAM Plan received previous oral approval from DEP as a continuation of a Limited Removal Action (LRA).  
Date of Oral Approval: \_\_\_\_\_
- If a RAM Compliance Fee is required, check here to certify that the fee has been submitted. You MUST attach a photocopy of the payment. See 310 CMR 40.0444(2) to learn when a fee is not required.
- Check here if the RAM Plan is proposed for a Transition Site. If this is the case, you may need to attach an LSP Evaluation Opinion prior to undertaking the RAM, if not previously provided. See 310 CMR 40.0600 for further information about Transition Sites.

G. RAM COMPLETION STATEMENT:

- If a RAM Compliance Fee is required in connection with submission of the RAM Completion Statement, check here to certify that the fee has been submitted. You MUST attach a photocopy of the payment. You owe this fee when submitting a RAM Completion Statement if you received oral approval of a RAM that continued an LRA, and have NOT previously submitted a RAM Plan and accompanying fee.
- If any Remediation Waste will be stored, treated, managed, recycled or reused at the site following submission of the RAM Completion Statement, you must submit a Phase IV Remedy Implementation Plan, along with the appropriate transmittal form, as an attachment to the RAM Completion Statement.

H. URAM NOTIFICATION:

- Identify Location Type: (check all that apply)     Public Right of Way     Utility Easement     Private Property
- Identify Utility Type: (check all that apply)     Sanitary/Combined Sewerage     Water     Drainage     Natural Gas
- Telephone     Steam Lines     Telecommunications     Electric     Other    Specify: \_\_\_\_\_
- Check here if you provided DEP with previous oral notification of this URAM. Date of Oral Notice: \_\_\_\_\_
  - Check here if the property owner was NOT contacted prior to initiation of the URAM. If this is the case, you must attach an explanation of why the owner was not contacted, including the date and time when contact ultimately occurred.
  - Check here if this URAM will occur in connection with the construction of new public utilities. If this is the case, document the nature and extent of encountered contamination, the scope and expense of necessary mitigation and the benefits and limitations of project alternatives.
- With the exception stated below, the person undertaking the URAM must provide the name and license number of an LSP engaged or employed in connection with the URAM:
- LSP Name: \_\_\_\_\_ LSP License Number: \_\_\_\_\_

LSP information is not required if the URAM is limited to the excavation and/or handling of not more than 100 cubic yards of soil contaminated by Oil, or not more than 20 cubic yards of soil contaminated either by a Hazardous Material or a mixture of a Hazardous Material and Oil.



RELEASE & UTILITY-RELATED ABATEMENT  
MEASURE (RAM & URAM) TRANSMITTAL FORM

Release Tracking Number

Pursuant to 310 CMR 40.0444 - 0446 and 310 CMR 40.0462 - 0465 (Subpart D)

1 - 11901

I. URAM COMPLETION STATEMENT:

Check here if this URAM was limited to the excavation and/or handling of not more than 100 cubic yards of soil contaminated by Oil, or not more than 20 cubic yards of soil contaminated by either a Hazardous Material or a mixture of a Hazardous Material and Oil.

If any Remediation Waste will be stored, treated, managed, recycled or reused at the site following submission of the URAM Completion Statement, you must submit either a Release Abatement Measure (RAM) Plan or a Phase IV Remedy Implementation Plan, along with the appropriate transmittal form, as an attachment to the URAM Completion Statement.

J. LSP OPINION:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and (iii) the provisions of 309 CMR 4.03(5), to the best of my knowledge, information and belief,

> if Section B of this form indicates that a Release Abatement Measure Plan is being submitted, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> if Section B of this form indicates that a Release Abatement Measure Status Report or a Utility-Related Abatement Measure Status Report is being submitted, the response action(s) that is (are) the subject of this submittal (i) is (are) being implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> if Section B of this form indicates that a Release Abatement Measure Completion Statement or a Utility-Related Abatement Measure Completion Statement is being submitted, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

LSP Name: Caron S. Koll LSP #: 6889 Stamp:

Telephone: 315-446-2570 Ext.: 148

FAX: (optional) 315-446-8053

Signature: Caron Koll

Date: 6/5/03



An LSP Opinion is not required for a Utility-Related Abatement Measure Notification.

An LSP Opinion is not required for a URAM Completion Statement if the URAM is limited to the excavation and/or handling of not more than 100 cubic yards of soil contaminated by Oil, or not more than 20 cubic yards of soil contaminated either by Hazardous Material or a mixture of Hazardous Material and Oil.

K. PERSON UNDERTAKING RAM OR URAM:

Name of Organization: Solutia Inc.

Name of Contact: Roy P. Hart Title: \_\_\_\_\_

Street: 730 Worcester Street

City/Town: Springfield State: MA ZIP Code: 01151-1089

Telephone: 413-730-2682 Ext.: \_\_\_\_\_ FAX: 413-730-3299

Check here if there has been a change in person undertaking the RAM or URAM.



**RELEASE & UTILITY-RELATED ABATEMENT  
MEASURE (RAM & URAM) TRANSMITTAL FORM**

Release Tracking Number

Pursuant to 310 CMR 40.0444 - 0446 and 310 CMR 40.0462 - 0465 (Subpart D)

1 - 11901

**L. RELATIONSHIP TO SITE OF PERSON UNDERTAKING RAM or URAM:** (check one)

- RP or PRP Specify:  Owner  Operator  Generator  Transporter Other RP or PRP: \_\_\_\_\_
- Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G. c. 21E, s. 2)
- Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))
- Any Other Person Undertaking a RAM or URAM Specify Relationship: \_\_\_\_\_

**M. CERTIFICATION OF PERSON UNDERTAKING RAM OR URAM:**

I, \_\_\_\_\_, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

By: \_\_\_\_\_ Title: Super. Environmental Protection  
(signature)

For: Solutia Inc. Date: \_\_\_\_\_  
(print name of person or entity recorded in Section K)

Enter address of person providing certification, if different from address recorded in Section

Street \_\_\_\_\_

City/Town: \_\_\_\_\_ State: \_\_\_\_\_ ZIP Code: \_\_\_\_\_

Telephone: \_\_\_\_\_ Ext.: \_\_\_\_\_ FAX: (optional) \_\_\_\_\_

**YOU MUST COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.**



**COMPREHENSIVE RESPONSE ACTION TRANSMITTAL  
FORM & PHASE I COMPLETION STATEMENT**

Release Tracking Number

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

1 - 11901

**A. SITE LOCATION:**

Site Name: (optional) Solutia Inc.

Street: 730 Worcester Street Location Aid: \_\_\_\_\_

City/Town: Springfield ZIP Code: 01151-1089

Related Release Tracking Numbers that this Form Addresses: \_\_\_\_\_

Tier Classification: (check one of the following)  Tier IA  Tier IB  Tier IC  Tier II  Not Tier Classified

If a Tier I Permit has been issued, state the Permit Number: \_\_\_\_\_

**B. THIS FORM IS BEING USED TO:** (check all that apply)

- Submit a Phase I Completion Statement, pursuant to 310 CMR 40.0484 (complete Sections A, B, C, G, H, I and J).
- Submit a Phase II Scope of Work, pursuant to 310 CMR 40.0834 (complete Sections A, B, C, G, H, I and J).
- Submit a final Phase II Comprehensive Site Report and Completion Statement, pursuant to 310 CMR 40.0836 (complete Sections A, B, C, D, G, H, I and J).
- Submit a Phase III Remedial Action Plan and Completion Statement, pursuant to 310 CMR 40.0862 (complete Sections A, B, C, G, H, I and J).
- Submit a Phase IV Remedy Implementation Plan, pursuant to 310 CMR 40.0874 (complete Sections A, B, C, G, H, I and J).
- Submit an As-Built Construction Report, pursuant to 310 CMR 40.0875 (complete Sections A, B, C, G, H, I and J).
- Submit a Phase IV Final Inspection Report and Completion Statement, pursuant to 310 CMR 40.0878 and 40.0879 (complete Sections A, B, C, E, G, H, I and J).
- Submit a periodic Phase V Inspection & Monitoring Report, pursuant to 310 CMR 40.0892 (complete Sections A, B, C, G, H, I and J).
- Submit a final Phase V Inspection & Monitoring Report and Completion Statement, pursuant to 310 CMR 40.0893 (complete Sections A, B, C, F, G, H, I and J).

You must attach all supporting documentation required for each use of form indicated, including copies of any Legal Notices and Notices to Public Officials required by 310 CMR 40.1400.

**C. RESPONSE ACTIONS:**

- Check here if any response action(s) that serves as the basis for the Phase submittal(s) involves the use of Innovative Technologies. (DEP is interested in using this information to create an Innovative Technologies Clearinghouse.)  
Describe Technologies: In-situ treatment of vinylchloride in soil using oxidant.

**D. PHASE II COMPLETION STATEMENT:**

Specify the outcome of the Phase II Comprehensive Site Assessment:

- Additional Comprehensive Response Actions are necessary at this Site, based on the results of the Phase II Comprehensive Site Assessment.
- The requirements of a Class A Response Action Outcome have been met and a completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.
- The requirements of a Class B Response Action Outcome have been met and a completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.
- Rescoring of this Site using the Numerical Ranking System is necessary, based on the results of the final Phase II Report.

**E. PHASE IV COMPLETION STATEMENT:**

Specify the outcome of Phase IV activities:

- Phase V operation, maintenance or monitoring of the Comprehensive Response Action is necessary to achieve a Response Action Outcome. (This site will be subject to a Phase V Operation, Maintenance and Monitoring Annual Compliance Fee.)
- The requirements of a Class A Response Action Outcome have been met. No additional operation, maintenance or monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.
- The requirements of a Class C Response Action Outcome have been met. No additional operation, maintenance or monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

SECTION E IS CONTINUED ON THE NEXT PAGE



COMPREHENSIVE RESPONSE ACTION TRANSMITTAL  
FORM & PHASE I COMPLETION STATEMENT

Release Tracking Number

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

1 - 11901

E. PHASE IV COMPLETION STATEMENT: (continued)

- The requirements of a Class C Response Action Outcome have been met. Further operation, maintenance or monitoring of the remedial action is necessary to ensure that conditions are maintained and that further progress is made toward a Permanent Solution. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

Indicate whether the operation and maintenance will be Active or Passive. (Active Operation and Maintenance is defined at 310 CMR 40.0006.):

- Active Operation and Maintenance
- Passive Operation and Maintenance

(Active Operation and Maintenance makes the Site subject to a Post-RAO Class C Active Operation and Maintenance Annual Compliance Fee.)

F. PHASE V COMPLETION STATEMENT:

Specify the outcome of Phase V activities:

- The requirements of a Class A Response Action Outcome have been met and a completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.
- The requirements of a Class C Response Action Outcome have been met. No additional operation, maintenance or monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.
- The requirements of a Class C Response Action Outcome have been met. Further operation, maintenance or monitoring of the remedial action is necessary to ensure that conditions are maintained and that further progress is made toward a Permanent Solution. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

Indicate whether the operation and maintenance will be Active or Passive. (Active Operation and Maintenance is defined at 310 CMR 40.0006.):

- Active Operation and Maintenance
- Passive Operation and Maintenance

(Active Operation and Maintenance makes the Site subject to a Post-RAO Class C Active Operation and Maintenance Annual Compliance Fee.)

G. LSP OPINION:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with the information contained in this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and (iii) the provisions of 309 CMR 4.03(5), to the best of my knowledge, information and belief,

> if Section B indicates that a Phase I, Phase II, Phase III, Phase IV or Phase V Completion Statement is being submitted, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> if Section B indicates that a Phase II Scope of Work or a Phase IV Remedy Implementation Plan is being submitted, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> if Section B indicates that an As-Built Construction Report or a Phase V Inspection and Monitoring Report is being submitted, the response action(s) that is (are) the subject of this submittal (i) is (are) being implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal.

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

- Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

LSP Name: Caron Koll LSP #: 6889

Telephone: 315-446-2570 Ext.: 148

FAX: (optional) 315-446-8053

Signature: Caron Koll

Date: 8/5/03

Stamp:





COMPREHENSIVE RESPONSE ACTION TRANSMITTAL  
FORM & PHASE I COMPLETION STATEMENT

Release Tracking Number

1 - 11901

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

H. PERSON UNDERTAKING RESPONSE ACTION(S):

Name of Organization: Solutia Inc.  
Name of Contact: Roy P. Hart Title: Supervisor - Environmental Protection  
Street: 730 Worcester Street  
City/Town: Springfield State: MA ZIP Code: 01151-1089  
Telephone: 413-730-2682 Ext.: \_\_\_\_\_ FAX: (optional) 413-730-3299

Check here if there has been a change in the person undertaking the Response Action.

I. RELATIONSHIP TO SITE OF PERSON UNDERTAKING RESPONSE ACTION(S): (check one)

- RP or PRP Specify:  Owner  Operator  Generator  Transporter Other RP or PRP: \_\_\_\_\_
- Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G. c. 21E, s. 2)
- Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))
- Any Other Person Undertaking Response Action Specify Relationship: \_\_\_\_\_

J. CERTIFICATION OF PERSON UNDERTAKING RESPONSE ACTION(S):

I, \_\_\_\_\_, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

By: \_\_\_\_\_ Title: Supervisor - Environmental Protection  
(signature)

For: Solutia Inc. Date: \_\_\_\_\_  
(print name of person or entity recorded in Section H)

Enter address of the person providing certification, if different from address recorded in Section H:

Street: \_\_\_\_\_  
City/Town: \_\_\_\_\_ State: \_\_\_\_\_ ZIP Code: \_\_\_\_\_  
Telephone: \_\_\_\_\_ Ext.: \_\_\_\_\_ FAX: (optional) \_\_\_\_\_

YOU MUST COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

## **Appendix B**

**Massachusetts Contingency Plan Release  
Abatement Measure Plan,  
Former Gas Holder Area, RTN-1-11901,  
letter, April 13, 2000**

For Appendix B, see MCP RAM Plan FGHA Area RTN1-11901 letter to MADEP dated April 13, 2000 for Solutia Inc., Indian Orchard Plant, Former Gas Holder Area (FGHA) in Springfield, Massachusetts provided as a separate file.

## **Appendix C**

# **RAM 120-Day Status Report, August 2000**

For Appendix C - see 120-day RAM Status Report RTN1-11901 dated August 2000 for Solutia Inc Indian Orchard Plant Former Gas Holder Area (FGHA) in Springfield, Massachusetts provided as separate file

# **Appendix D**

**BWSC 106**



RELEASE & UTILITY-RELATED ABATEMENT  
MEASURE (RAM & URAM) TRANSMITTAL FORM

Release Tracking Number

Pursuant to 310 CMR 40.0444 - 0446 and 310 CMR 40.0462 - 0465 (Subpart D)

1 - 11901

A. SITE LOCATION:

Site Name: Solutia Inc.  
Street: 730 Worcester Street Location Aid: \_\_\_\_\_  
City/Town: Springfield ZIP Code: 01151-1089

Check here if a Tier Classification Submittal has been provided to DEP for this Release Tracking Number.

Related Release Tracking Numbers That This RAM or URAM Addresses: \_\_\_\_\_

B. THIS FORM IS BEING USED TO: (check all that apply)

- Submit a **RAM Plan** (complete Sections A, B, C, D, E, F, J, K, L and M).  
 Check here if this RAM Plan is an update or modification of a previously approved written RAM Plan. Date Submitted: \_\_\_\_\_
- Submit a **RAM Status Report** (complete Sections A, B, C, E, J, K, L and M).
- Submit a **RAM Completion Statement** (complete Sections A, B, C, D, E, G, J, K, L and M).
- Confirm or Provide **URAM Notification** (complete Sections A, B, H, K, L and M).
- Submit a **URAM Status Report** (complete Sections A, B, C, E, J, K, L and M).
- Submit a **URAM Completion Statement** (complete Sections A, B, C, D, E, I, J, K, L and M).

You must attach all supporting documentation required for each use of form indicated, including copies of any Legal Notices and Notices to Public Officials required by 310 CMR 40.1400.

C. SITE CONDITIONS:

- Check here if the source of the Release or Threat of Release is known.  
If yes, check all sources that apply:  UST  Pipe/Hose/Line  AST  Drums  Transformer  Boat  
 Tanker Truck  Vehicle  Other Specify: Pre-1975 Former Above Ground Process Tank
- Identify Media and Receptors Affected: (check all that apply)  Air  Groundwater  Surface Water  Sediments  Soil  
 Wetlands  Storm Drain  Paved Surface  Private Well  Public Water Supply  Zone 2  Residence  
 School  Unknown  Other Specify: \_\_\_\_\_

Identify Release and/or Threat of Release Conditions at Site: (check all that apply)

- 2 and 72 Hour Reporting Condition(s)  120 Day Reporting Condition(s)  Other Condition(s)

Describe Measurement in soil above MCP Reportable Concentration; no NAPL in subsurface; not an imminent hazard

RAMs may be conducted concurrently with an IRA only with written DEP approval  
URAMs may not be conducted if any 2 or 72 Hour conditions exist at the site.

Identify Oils and Hazardous Materials Released: (check all that apply)  Oils  Chlorinated Solvents  Heavy Metals  
 Others Specify: Vinyl chloride, off spec polyvinylchloride (PVC)

D. DESCRIPTION OF RESPONSE ACTIONS: (check all that apply)

- Assessment and/or Monitoring Only
- Excavation of Contaminated Soils
- Re-use, Recycling or Treatment  
 On Site  Off Site Est. Vol.: \_\_\_\_\_ cubic yards  
Describe: \_\_\_\_\_
- Store  On Site  Off Site Est. Vol.: \_\_\_\_\_ cubic yards
- Deployment of Absorbant or Containment Materials
- Temporary Covers or Caps
- Bioremediation
- Soil Vapor Extraction
- Structure Venting System
- Product or NAPL Recovery

SECTION D IS CONTINUED ON THE NEXT PAGE.





RELEASE & UTILITY-RELATED ABATEMENT  
MEASURE (RAM & URAM) TRANSMITTAL FORM

Release Tracking Number

Pursuant to 310 CMR 40.0444 - 0446 and 310 CMR 40.0462 - 0465 (Subpart D)

1 - 11901

I. URAM COMPLETION STATEMENT:

Check here if this URAM was limited to the excavation and/or handling of not more than 100 cubic yards of soil contaminated by Oil, or not more than 20 cubic yards of soil contaminated by either a Hazardous Material or a mixture of a Hazardous Material and Oil.

If any Remediation Waste will be stored, treated, managed, recycled or reused at the site following submission of the URAM Completion Statement, you must submit either a Release Abatement Measure (RAM) Plan or a Phase IV Remedy Implementation Plan, along with the appropriate transmittal form, as an attachment to the URAM Completion Statement.

J. LSP OPINION:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and (iii) the provisions of 309 CMR 4.03(5), to the best of my knowledge, information and belief,

> if Section B of this form indicates that a Release Abatement Measure Plan is being submitted, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> if Section B of this form indicates that a Release Abatement Measure Status Report or a Utility-Related Abatement Measure Status Report is being submitted, the response action(s) that is (are) the subject of this submittal (i) is (are) being implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> if Section B of this form indicates that a Release Abatement Measure Completion Statement or a Utility-Related Abatement Measure Completion Statement is being submitted, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000 and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

LSP Name: Caron S. Koll LSP #: 6889 Stamp:

Telephone: 315-446-2570 Ext.: 148

FAX: (optional) 315-446-8053

Signature: Caron Koll

Date: 6/5/03



An LSP Opinion is not required for a Utility-Related Abatement Measure Notification.

An LSP Opinion is not required for a URAM Completion Statement if the URAM is limited to the excavation and/or handling of not more than 100 cubic yards of soil contaminated by Oil, or not more than 20 cubic yards of soil contaminated either by Hazardous Material or a mixture of Hazardous Material and Oil.

K. PERSON UNDERTAKING RAM OR URAM:

Name of Organization: Solutia Inc.

Name of Contact: Roy P. Hart Title: \_\_\_\_\_

Street: 730 Worcester Street

City/Town: Springfield State: MA ZIP Code: 01151-1089

Telephone: 413-730-2682 Ext.: \_\_\_\_\_ FAX: 413-730-3299

Check here if there has been a change in person undertaking the RAM or URAM.



**RELEASE & UTILITY-RELATED ABATEMENT  
MEASURE (RAM & URAM) TRANSMITTAL FORM**

Release Tracking Number

Pursuant to 310 CMR 40.0444 - 0446 and 310 CMR 40.0462 - 0465 (Subpart D)

1 - 11901

**L. RELATIONSHIP TO SITE OF PERSON UNDERTAKING RAM or URAM:** (check one)

- RP or PRP Specify:  Owner  Operator  Generator  Transporter Other RP or PRP: \_\_\_\_\_
- Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G. c. 21E, s. 2)
- Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))
- Any Other Person Undertaking a RAM or URAM Specify Relationship: \_\_\_\_\_

**M. CERTIFICATION OF PERSON UNDERTAKING RAM OR URAM:**

I, \_\_\_\_\_, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

By: \_\_\_\_\_ Title: Super. Environmental Protection  
(signature)

For: Solutia Inc. Date: \_\_\_\_\_  
(print name of person or entity recorded in Section K)

Enter address of person providing certification, if different from address recorded in Section

Street \_\_\_\_\_  
City/Town: \_\_\_\_\_ State: \_\_\_\_\_ ZIP Code: \_\_\_\_\_  
Telephone: \_\_\_\_\_ Ext.: \_\_\_\_\_ FAX: (optional) \_\_\_\_\_

**YOU MUST COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.**