U.S. ENVIRONMENTAL PROTECTION AGENCY REGION 1

RECORD OF DECISION AMENDMENT

Davis Liquid Waste Superfund Site
Smithfield, Rhode Island

September 30, 2010

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RECORD OF DECISION (ROD) AMENDMENT
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DAVIS LIQUID WASTE SUPERFUND SITE

PART 1: THE RECORD OF DECISION AMENDMENT – DECLARATION

A. SITE NAME AND LOCATION

Davis Liquid Waste Superfund Site
Smithfield, Rhode Island
EPA Site ID Code: RID980523070
Operable Unit 2

B. STATEMENT OF BASIS AND PURPOSE

This decision document presents an amendment to the selected remedial action for Operable Unit 2 of the Davis Liquid Waste Site (the Site) in Smithfield, Rhode Island, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 USC § 9601 et seq., and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) as amended, 40 CFR Part 300. The Director of the Office of Site Remediation and Restoration (OSRR) has been delegated the authority to approve this Record of Decision Amendment.

This decision was based on the Administrative Record, which has been developed in accordance with Section 113 (k) of CERCLA, and which is available for review at the Greenville Public Library, Greenville, Rhode Island and at the United States Environmental Protection Agency (EPA), Region 1, Office of Site Remediation and Restoration (OSRR) Records Center in Boston, Massachusetts. The Administrative Record Index (Appendix B to this ROD Amendment) identifies each of the items comprising the Administrative Record upon which the selection of the amended remedial action is based.

The State of Rhode Island concurs with the selected remedy.

C. RATIONALE FOR AMENDMENT

The 1987 ROD selected the extraction and treatment of contaminated groundwater. This ROD Amendment changes this requirement and now requires in-situ chemical and enhanced biodegradation to address contaminated groundwater in the release area (former Source Area) and in the downgradient plume. This ROD Amendment is based on information developed as part of the original remedy selection process, as well as new information obtained as part of the remedial design.

Based on the information available at the time of the 1987 ROD, the selected remedy consisted of three actions: 1) installation of a new water line (alternate water supply) for current and future residents (Operable Unit (OU) 1); 2) extraction and treatment of contaminated groundwater and recirculating the treated water into the contaminated saturated soil to enhance the flushing of the remaining contaminants sorbed to the saturated soil (OU 2); and 3) excavation and on-site thermal treatment of contaminated soil (above the water table) and wastes, and interment of the treated residuals in an onsite RCRA Subtitle C landfill (OU 3). OU 1 was completed in 1997 while OU 3 was completed in 2003.

Various pre-design investigations were completed between 1992 through 1997 to evaluate the hydrogeology and to develop the information for the design of the groundwater extraction, treatment, and recirculation system. The results of the investigation indicated that the subsurface of the former Source Area did not have the capacity to accept the reinjected treated groundwater. During the design phase, alternate options for the disposition of the treated water were considered including discharge into Latham Brook. [1]

Between 2001 and 2008, a group of potentially responsible parties (PRPs) continued to collected groundwater data for overburden and bedrock aquifer units. EPA evaluated the new data and determined that while natural attenuation processes were ongoing and degrading the chlorinated VOCs, the process has slowed down or ceased because subsurface geochemical conditions no longer favor reductive dechlorination in the groundwater plumes. The subsurface is already in a chemically reduced condition; however, available electron donors have been depleted.

Because the 1987 ROD could not be implemented as originally envisioned because treated groundwater could not be injected into the subsurface to create a flushing/recirculation cell to remove contaminants adsorbed to saturated soil, EPA determined that other remedial alternatives should be evaluated. In addition, new remediation technologies such as in-situ chemical reduction and oxidation processes, in-situ thermal treatment, and in-situ biodegradation have been developed since the 1987 ROD that can aid in the degradation of VOCs. Specifically, reductive dechlorination has been demonstrated in numerous studies to be an effective process for the degradation of chlorinated VOCs in the subsurface. New treatment techniques have also been developed that can effectively address chlorinated VOCs in groundwater. EPA evaluated a number of these technologies in a Focused Feasibility Study (FFS) based on site-specific conditions and the Site contaminants. The remedy selected in this ROD Amendment was included in this evaluation.

D. ASSESSMENT OF THE SITE

The response action selected in this ROD Amendment is necessary to protect human health and the environment from actual or threatened releases of hazardous substances into the environment.

[1] *Final Criteria Summary Report. Perform Predesign Investigation and Developing Design Criteria at Davis Liquid Waster Superfund Site, Smithfield, RI*. Ebasco Services, Inc. 1994.

E. DESCRIPTION OF THE ROD AS AMENDED

The 1987 selected remedy consisted of installation of a network of extraction wells that captured contaminated groundwater that would then be transferred to an on-site treatment system. The extracted groundwater would be subjected to various treatment processes to remove organic and metal contaminants. The treated groundwater was then to be reinjected into the former release area (the former Source Area), and enhance flushing of contaminated saturated soil (present below the water table). The contaminated water resulting from the enhanced flushing would then be captured by the extraction wells and treated.

This ROD Amendment will employ in-situ chemical reduction and enhanced biodegradation to degrade VOCs present in the saturated soil of the former Source Area and a portion of the overburden plume situated downgradient of the former Source Area outside of the wetlands. Because the subsurface is already in a chemically reduced condition, the reductive dechlorination process can be enhanced. Treatment reagents will be injected into the subsurface to promote reductive dechlorination through both chemical and biological processes. This ROD Amendment will achieve the cleanup goals set forth in the 1987 ROD and will also achieve other cleanup goals established in the ROD Amendment for other contaminants based on evaluation of human health risks and applicable and relevant and appropriate requirements. The ROD Amendment is a fundamental change to the primary treatment method specified in the 1987 ROD.

F. STATUTORY DETERMINATIONS

In-situ chemical treatment and enhanced biodegradation will be protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate, is cost effective, and uses permanent solutions and alternative treatment technologies to the maximum extent practicable.

In-situ chemical treatment and enhanced biodegradation will provide a high degree of overall protection, will be effective in the long-term, and be permanent by degrading contaminants in-situ that could pose a threat to human health.

In-situ chemical treatment and enhanced biodegradation satisfy the statutory preference for treatment as a principal element of the remedy and addresses saturated soil, a principal threat waste. The selected remedy results in the treatment of an estimated 14,300,000 gallons of contaminated overburden groundwater, which pose a risk to human health if used for potable use. The preference for treatment is met by stimulating the ongoing reductive dechlorination through chemical and biological processes.

Based on the assessment of the trade-offs among alternatives in terms of: 1) long-term effectiveness and permanence; 2) reduction of toxicity, mobility or volume through treatment; 3) short-term effectiveness; 4) implementability; and 5) cost, EPA finds that the selected remedy provides the best balance of trade-offs between the alternatives. In balancing these factors, EPA has also considered the support of the community and the State for the selected alternative. Because this remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure, groundwater and land use restrictions will be necessary until cleanup levels are met and a review will be conducted within 5 years after initiation of remedial action and every 5 years to ensure that the remedy continues to be protective.

Section 404 of the Clean Water Act and Executive Order 11990 (Protection of Wetlands) require a determination be made that there is no practical alternative to federal actions involving dredging and filling activities or activities in wetlands before such action can be selected. EPA, after soliciting and receiving public comment, hereby makes the determination that: (1) some construction activities need to be conducted in the wetlands (monitoring wells installation) because there is no practicable alternative; and (2) the selected remedy is the least damaging practicable alternative. Actions must be taken to minimize adverse impacts on wetlands, wildlife, and habitat consistent with Federal and State requirements. Because wetlands will be impacted during well installation, mitigation measures may be required to restore or replicate wetlands consistent with the requirements of the Federal and State wetlands protection laws.

G. AMENDED ROD DATA CERTIFICATION CHECKLIST

The following information and relevant updates are included in the Decision Summary section of this Amended Record of Decision. Additional information can be found in the Administrative Records for this Site:

- Decisive factors that led to amending the original 1987 ROD;
- Remedial Action Objectives and cleanup criteria;
- Human health risk;
- Cleanup levels established and the bases for the levels;
- Current and future land and groundwater use assumptions used in the risk evaluation and ROD;
- Amended Remedy components; and
- Estimated capital, operation and maintenance (O&M), and total present worth costs.

Additional information can be found in the Administrative Records for this Site.

H. AUTHORIZING SIGNATURES

This ROD Amendment documents the selected remedy for contaminated groundwater at the former Source Area and the overburden and bedrock plumes at the Davis Liquid Waste Site in Smithfield, Rhode Island. This remedy was selected by the EPA with concurrence of the Rhode Island Department of Environmental Management.

U.S. Environmental Protection Agency

By: James T Owens III Date: 9/30/10

James T. Owens III
Director
Office of Site Remediation and Restoration
U.S. EPA New England, Region 1

PART 2: THE RECORD OF DECISION AMENDMENT – DECISION SUMMARY

A. INTRODUCTION TO THE SITE AND STATEMENT OF PURPOSE

1. SITE NAME

Davis Liquid Waste Superfund Site,
Smithfield, Rhode Island
CERCLIS I.D. No. RID980523070
Operable Unit 2

2. SITE LOCATION

The Davis Liquid Waste Superfund Site (the Site), a former waste disposal facility, is located between Tarkiln Road and Log Road in the northwestern corner of the Town of Smithfield, Providence County, Rhode Island (Figure 1). The 7-acre former Source Area is defined as the area where past disposal and releases of hazardous substances originally occurred and is bounded approximately by the excavation footprint of the source control remedial action initiated in 1999 and completed in 2001 (Figure 2). The Site is bounded on the east and west by forested uplands and on the north and south by wetlands and swamp areas of the Nipsachuck Swamp.

A large portion of the Site is located on Lot 9, Plat 50 of the Town of Smithfield Tax Assessor's maps (Figure 3). Additionally, a portion of the Site is located on the abutting parcel, Lot 29, Plat 50. Access to the Site is from Tarkiln Road on an unpaved roadway/easement west of the Site and a right-of-way to Log Road located north of the Site (Smithfield, 2006; Smithfield, 2008a). The Site consists of primarily undeveloped land that is vegetated by shrubs, trees, and wetlands flora.

More complete descriptions of the Site may be in Sections 1 and 2 of the Remedial Investigation Report and Section 1.0 of the Focused Feasibility Study.

3. LEAD AND SUPPORT AGENCIES

Lead Agency: **U. S. Environmental Protection Agency – Region I**
Office of Site Remediation and Restoration
Contact: Byron Mah
Remedial Project Manager
(617) 918-1249

Support Agency: **Rhode Island Department of Environmental Protection (RIDEM)**
Division of Site Remediation
Contact: Gary Jablonski
Project Manager

(401) 222-2797

4. STATEMENT OF PURPOSE

An Amendment to the September 29, 1987 Record of Decision (1987 ROD) is necessary because of a fundamental change to the extraction and treatment of contaminated groundwater component of the selected remedy. This ROD Amendment documents the basis for this fundamental change. This ROD Amendment is issued in accordance with Section 117 of CERCLA and 40 CFR 300.435(c)(2)(ii) of the National Oil and Hazardous Substances Contingency Plan (NCP).

5. AVAILABILITY OF DOCUMENTS

The ROD Amendment and supporting documentation will become part of the Administrative Record for the Site, in accordance with the NCP 40 CFR 300.825 (a)(2). The Administrative Record Index is presented in Appendix B to this ROD Amendment. Information pertinent to EPA's decision-making process in selecting the cleanup plan in this ROD Amendment is available for public viewing at the information repositories at the following locations:

U. S. EPA Records Center
5 Post Office Square, Suite 100
Mail Code: OSRR02-3
Boston, MA 02109-3912
(617) 918-1440
Hours: Monday through Friday 9:00 a.m.-5:00 p.m.

Greenville Public Library
573 Putnam Pike
Greenville, RI 02828
(401) 949-3630
Hours: Monday through Thursday: 10 a.m. to 8 p.m.
Friday and Saturday: 10 a.m. to 5 p.m.
Sunday (September – May): 1 p.m. to 5 p.m.

Information is also available for review on-line at:
http://yosemite.epa.gov/r1/npl_pad.nsf/f52fa5c31fa8f5c885256adc0050b631/DAE0F2B3C378472D8525692D0061823E?OpenDocument

B. SITE DESCRIPTION, HISTORY AND CONTAMINATION, AND SELECTED REMEDY

1. SITE DESCRIPTION

The Site, a former waste disposal facility, is primarily located on the property of William Eleanor Real Estate, Inc., Lot 9, Plat 50 and on Lot 29, Plat 50. The Site was reportedly used for a 5-year period in the 1960s and early 1970s for the disposal of municipal solid wastes by the Town of Smithfield. Between 1976 and 1977, the owner, William Davis, used the Site to dispose of a variety of liquid and solid wastes containing hazardous substances. Wastes were directly discharged from tank trucks into unlined lagoons and seepage pits. Drums containing chemicals and laboratory containers were buried onsite or were crushed. Wastes and contaminated soil were reportedly excavated from the lagoons and pits, and were dumped at several onsite locations and covered with available soil. Additionally, construction debris was also reportedly burned at the Site.

Minimal records were available concerning waste disposal; therefore, it is not possible to determine the quantity of waste disposed of at the Site. Other onsite operations included the collection of salvaged vehicles and machine parts, tire storage/disposal, metal recycling, and tire shredding.

The Site is situated within the Nipsachuck Swamp (Figure 1), which constitutes the headwaters of Latham Brook. The Brook drains into the Stillwater Reservoir (not a drinking water supply) and the Woonasquatucket River, and eventually into Narragansett Bay at Providence. Much of the Site is located within a 100-year flood zone. Land within a 1-mile radius of the Site is mostly semi-rural in nature with some low-density residential dwellings situated nearby. Residential development in the area has increased and has included the construction of larger subdivisions.

2. SITE HISTORY AND CONTAMINATION

In 1978, approximately 23 off-site drinking water supply wells were identified as having been contaminated with hazardous substances including VOCs. The Rhode Island Superior Court (the Court) ordered the prohibition of further disposal of hazardous substances at the Site by the owner.

The Court further ruled in 1980 that RIDEM should conduct a comprehensive environmental investigation at the Site. Surface water and groundwater samples collected from the Site indicated the presence of tetrachloroethene (PCE), chloroform, trichloroethene (TCE), and benzene. Six residences with private drinking water wells were provided with bottled water, as the sample results from these wells were in excess of EPA health advisory concentrations in effect at the time.

In March 1985, the owner, William Davis, was also ordered by the Court to restore the wetlands that had been filled in.

State Actions

From 1985 to 1986, RIDEM provided bottled water to residences with contaminated water supplies. Between 1994 and 1995, the State of Rhode Island entered into an agreement with the property owner to remove stored tires from the property.

Between 1997 and 2000, RIDEM funded the removal of an estimated 6 million scrap tires from the Site. While conducting this operation, the property owner notified EPA and RIDEM officials of the discovery of nine drums of waste materials (later found to be hazardous) in various stages of decay. These drums were removed and disposed of by EPA in April 1995. However, the removal of the tires was not fully completed until 2000.

Federal Actions

A Preliminary Assessment and a Site Inspection, two initial evaluation steps required by the NCP, were completed in March and October of 1981, respectively. An evaluation of the Site under the Hazard Ranking System was completed on December 1, 1982. EPA proposed the Site for listing to the National Priorities List (NPL) in December 1982, and the Site was listed on the NPL on September 8, 1983.

Between 1984 and 1987, a Remedial Investigation and Feasibility Study (RI/FS) was conducted. The 1986 RI identified extensive contamination of soil and overburden and bedrock groundwater at the Site as well as an extensive tire pile (estimated at that time to be between 10 and 30 million tires). Contamination of each media consisted primarily of VOCs including PCE, TCE, ethylbenzene, benzene, toluene, and xylene. The RI also identified elevated concentrations of semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, and metals in environmental media.

In 1986, after the observation of leaking drums of hazardous materials at the Site, EPA implemented an immediate response action and removed and disposed of approximately 600 drums.

In 1987, the FS was completed, which developed a range of source control and management of migration remedial alternatives. Information developed during the RI/FS was used to develop remedial options to address contaminated private wells, contaminated soil and waste at the Site, and contaminated groundwater.

On September 29, 1987, the ROD documenting the selected remedy was signed by EPA. The ROD specified a source control component and a management of migration component. The source control component required on-site incineration of contaminated soil and creation of an on-site capped hazardous waste landfill for the treated soil. The management of migration action required that residences with contaminated wells would be connected to a new waterline. In addition, an on-site groundwater extraction and treatment system would be constructed to prevent the further migration of contaminated groundwater. A key component of this portion of the cleanup plan was that treated groundwater would be reinfiltrated into the former Source Area to flush contaminants from subsurface soil that were not excavated and incinerated as part of the source control component of the 1987 ROD. A more detailed discussion of the remedy selected in the 1987 ROD is included in Section B.3 of this ROD Amendment.

On July 19, 1996, EPA issued an Explanation of Significant Differences (ESD), based on new performance and cost information, which changed the source control component of the remedial action from on-site incineration to on-site low-temperature thermal desorption. Contaminated soil and waste that could not be treated could be sent to an off-site disposal facility rather than being placed in an on-site hazardous waste landfill. This work (OU 3) was completed by the PRPs in 2003.

In 1997, a new water distribution system was completed by EPA and RIDEM that served 127 lots along Forge Road, Log Road, Burlingame Road, and Bayberry Road. This response action constituted OU 1 for the Site.

In March 2010, EPA completed the Focused Feasibility Study (FFS), which evaluated available information and risk evaluations to develop a range of remedial alternatives to address the contaminated groundwater at the Site. The alternatives evaluated in detail in the FFS are discussed in Section D of this ROD Amendment.

Potentially Responsible Party (PRP) Actions

A pre-design engineering investigation (PDEI) was completed in 1991 by a group of potentially responsible parties (PRPs) to further characterize contaminant presence in the former Source Area and to provide additional data to assist in the design of a groundwater extraction and treatment system.

Between 1997 and 2000, a group of PRPs removed tires from areas of the Site that were thought to be contaminated. By December 2000, approximately 6.4 million tires had been removed from the Site. Excavation of buried drum was initiated in July 1997 and continued through December 2000. In total, approximately 1,400 drums and 15,000 laboratory containers were excavated, repackaged and disposed of off-site. A pre-design investigation (PDI) was completed by a group of PRPs in 1997 and included a grid-approach soil sampling program to determine the extent of soil contamination in excess of the ROD's remedial goal of 2 mg/Kg of total VOCs.

Between 1999 and 2001, a group of PRPs excavated and treated approximately 78,000 tons of contaminated soil using an on-site low-temperature thermal desorption system housed in temporary buildings constructed on the Site. Treatment consisted of placing contaminated soil on heated radiant floor panels, mechanical turning of the soil over several days, and vapor recovery. Samples were collected from each treatment batch to assure treatment goals were met, and were also evaluated to determine whether metals leached in excess of the Toxicity Characteristic Leaching Protocol (TCLP). After successful treatment (total VOCs less than 2 mg/Kg), which in several samples included PCE at concentrations approaching 2 mg/Kg, the soil was removed from the treatment building and used to backfill the excavation. The approximate extent of the soil excavation footprint is depicted in Figure 2.

Approximately 20,000 tons of soil that failed to meet the VOC treatment standard or failed to meet the 40 CFR 261.24 toxicity criteria (metals leaching in excess of allowable standards using the TCLP test) and other contaminated materials were transported off-site for proper disposal. After completion of the soil treatment, the buildings were decontaminated and dismantled, and the work area was regraded. The excavation was backfilled with a layer of clean bank-run gravel that was overlain by treated soil. Once graded, the entire disturbed area was covered with a 6-inch layer of topsoil. The disturbed areas were then planted with grass and over 300 trees to help stabilize the Site and restore the wildlife habitat value. The tree planting consisted mainly of native species ranging in size from small saplings to large established plants.

Additional sampling was performed by a group of PRPs in 2008 to better characterize the contaminated soil located beneath the water table underlying the former Source Area. Groundwater sampling was also performed by the PRPs between 2001 and 2008 to develop data that were used to better define contaminant nature and extent at the Site following the source control remedial actions.

3. ORIGINAL (1987) ROD SELECTED REMEDY

The 1987 ROD included the following response actions for three Operable Units (OUs):

Source Control Component (OU 3)

- Approximately 25,000 cubic yards of raw waste and contaminated soils in the unsaturated zone would be excavated and treated onsite in a mobile incineration facility. All soils and wastes with VOC concentrations above 2 ug/Kg (or ppm) would be excavated and treated by incineration to reduce total VOC concentrations to below the 2 mg/Kg cleanup level. Treated soils would then be tested for Extraction Procedure (EP) toxicity. Soils with concentrations that are below the EP toxicity levels would be used to back fill excavated areas. The soils with concentrations above the EP toxicity levels would be placed in an onsite RCRA Subtitle C landfill.

  An Explanation of Significant Differences was issued in 1996 that replaced incineration with thermal desorption as the primary treatment method.

Management of Migration Components – The two components included:

- Alternate Water Supply (OU 1) - The design and construction of an alternative water supply (OU 1) to serve those residents affected by groundwater contamination from the Site, as well as those areas that were downgradient from the contaminated plume that could potentially be affected.

- Groundwater Remediation (OU 2) - The active restoration of the overburden and bedrock aquifers (OU 2) using onsite treatment involving air stripping, carbon adsorption, and reinfiltration (recirculation) of treated water to the aquifer to enhance flushing of contaminants in saturated soil.

  The groundwater treatment components were to consist of: groundwater extraction and treatment and a soil flushing system. The groundwater would be extracted from wells located in areas of high contamination, passed through the treatment facility, and discharged via a distribution system over contaminated subsurface soils. The soils within the recirculation area would be flushed by this process, thus reducing the levels of organic compounds in the soils.

This component of the selected remedy also included the collection of the on-site surface drainage stream which runs through the tire storage pile, which would then be pumped to the groundwater treatment facility. As the result of the source control action, this site contamination issue was eliminated.

The estimated cost to implement the 1987 ROD remedy for OU 2 was $9.58 million in 1987 dollars, which is approximately equivalent to $19.2 million in 2010 dollars when adjusted for inflation.

C. BASIS FOR THE ROD AMENDMENT

An Amendment to the September 29, 1987 ROD is necessary because a fundamental change to the extraction and treatment of contaminated groundwater component of the selected remedy is needed. This Amendment documents the basis for the fundamental change.

The selected remedy in the 1987 ROD consisted of three actions: 1) installation of a new water line (alternate water supply) for current and future residents (Operable Unit (OU) 1); 2) extraction and treatment of contaminated groundwater and recirculating the treated water into the contaminated saturated soil to enhance the flushing of the remaining contaminants sorbed to the saturated soil (OU 2); and 3) excavation and on-site thermal treatment of contaminated soil (above the water table) and wastes, and interment of the treated residuals in an onsite RCRA Subtitle C landfill (OU 3). OU 1 was completed in 1997 while OU 3 was completed in 2003.

Since the 1987 ROD and the completion of two of the Operable Units (water line installation and on-site soil thermal treatment) at the Site, new information has been collected to support a change from the technology selected in the 1987 ROD.

This information is summarized as follows and discussed in more detail below:

- New hydrogeologic data indicating technical difficulties with the groundwater, extraction, and recirculation.
- The nature and extent of contamination related to groundwater/saturated soil has been updated.
- Risk assessment has been updated.
- New alternatives evaluated in a Focused Feasibility Study (FSS).

1. NEW HYDROGEOLOGIC DATA

In 1994, EPA completed a hydrogeologic investigation to support the design of the ROD-designated groundwater extraction, treatment, and soil flushing system. Hydrogeologic evaluations and pumping tests were completed to assess the viability of capturing contaminated overburden and bedrock groundwater and reinfiltrating the extracted groundwater. While the investigations determined that an extraction well system pumping 25 gallons per minute (gpm) could capture contaminated groundwater in the former Source Area, the testing determined that it was not possible to reinfiltrate treated groundwater at this rate. The direct discharge of the treated groundwater to Latham Brook was incorporated into a preliminary design of an extraction and treatment system. Because reinfiltration of treated groundwater at the former Source Area was not possible, the groundwater flushing recirculation cell envisioned in the 1987 ROD could not be implemented. Therefore, the 1987 ROD Remedy could not be implemented as originally anticipated.

2. UPDATED NATURE AND EXTENT OF CONTAMINATION

The following sections describe the nature and extent of contaminants in the areas investigated from 1999 through 2008 that are addressed under this ROD Amendment. Contaminated media present at the Site are summarized in Table 1 and include:

a. Saturated Unexcavated Soil – Saturated soil (below the water table) in the Source Area currently constitutes the core of the groundwater plume and is a continuing source of groundwater contamination. Samples were collected in 2008 from below the footprint of the former Source Area excavation. These soils were not part of the OU 3 source control remedial action as they were situated below the water table and are, instead, part of the groundwater response action. Table 2 presents a summary of the 2008 saturated soil data and identifies the VOCs that were detected at concentrations that exceed leaching screening values (MCL-SSL, Risk-SSL, or RIDEM GA Objectives). Ten VOCs exceeded the leaching screening values, which suggested that these VOCs are present in soil at concentrations that when leached could result in groundwater concentrations that exceed MCLs, the RIDEM's Remediation Regulations GA Groundwater Objectives (also referred to as RIDEM GA Objectives), or exceed risk-based concentrations that are protective of human health.

   Of the 10 soil VOCs identified in Table 2 as potential threats to groundwater quality, five VOCs were identified in groundwater at concentrations that exceeded either the MCLs, the RIDEM GA Objectives, or the EPA risk screening level including: cis-1,2-DCE; PCE; TCE; vinyl chloride; and 1,1-DCA.

   These results indicate that at least five VOCs, present in the saturated soil underlying the former Source Area, are continuing sources of contamination and are likely to migrate into and degrade groundwater quality.

   Based on data developed in 2008 by the PRPs, approximately 805 pounds of residual VOCs mass is estimated to be present in the subsurface underlying the former Source

Area. Of this residual mass, an estimated 315 pounds may consist of chlorinated VOCs. This residual mass of VOCs represents a continuing source of groundwater contamination and is considered a principal threat waste.

b. Groundwater Contamination - The most recent 2008 analytical results were evaluated and screened against the federal Maximum Contaminant Levels (MCLs), the RIDEM GA Objectives, or the EPA's tap water Regional Screening Levels (RSLs) to assess the current extent of groundwater contamination in the overburden and the bedrock aquifers. Results of the VOCs screening are presented in Table 3 and Table 4 and are depicted in Figure 4 and Figure 5 for overburden and bedrock groundwater samples, respectively.

VOCs – VOCs that were most frequently detected and exceeded screening values included six compounds: tetrachloroethene (PCE); trichloroethene (TCE); cis-1,2-dichloroethene (cis-1,2 DCE); vinyl chloride; benzene; and 1,1-dichloroethane (1,1-DCA). These six VOCs are representative of all VOCs detected in the overburden and bedrock groundwater at the Site and which pose potential health risks. The 2008 groundwater analytical data for each of the identified contaminants with exceedances of screening criteria are summarized as follows:

- Tetrachloroethene (PCE) - In the overburden, PCE concentrations that exceed the 5 micrograms per liter (µg/L) MCL or RIDEM GA Objectives extend approximately 350 feet north and downgradient of the former Source Area to monitoring well OW-51. In bedrock, PCE appears to be localized in two areas: in the former Source Area and in the area bounded approximately by monitoring wells OW-007, OW-112-R, OW-36, and by OW-33. PCE exceeding the MCL or RIDEM GA Objectives extends to the north and approximately 1700 feet downgradient of the former Source Area.

- Trichloroethene (TCE) - In the overburden, TCE concentrations that exceed the 5 µg/L MCL extend approximately 800 feet northeast and downgradient of the former Source Area to monitoring well OW-043, at the northern limit of the mapped wetland areas. In bedrock, the TCE distribution mimics that of PCE; two areas of TCE contamination are present with detected concentrations ranging between 1 µg/L (OW-007) and 570 µg/L (OW-094-R). TCE was detected approximately 1650 feet downgradient of the former Source Area.

- Cis-1,2-Dichloroethene (cis-1,2-DCE) - In the overburden, cis-1,2-DCE concentrations exceeding the MCL extend approximately 1,100 feet northeast and downgradient of the former Source Area to between monitoring wells OW-043 and OW-046. The distribution of cis-1,2-DCE concentrations in bedrock groundwater that exceed the MCL is limited to the former Source Area. In bedrock, cis-1,2-DCE was detected approximately 1400 feet downgradient of the Northern Disposal Area (NDA).

- Vinyl Chloride - In the overburden, vinyl chloride concentrations exceeding the MCL extend northeast and approximately 800 feet downgradient of the former Source Area to slightly beyond OW-038.

- Benzene – In the overburden, benzene was detected in two wells; neither benzene concentration exceeded either the MCL or the RIDEM GA Objectives. In the bedrock aquifer, benzene concentrations exceeded the MCL and the RIDEM GA Objectives in two wells (OW-101-R and OW-041).

- 1,1-Dichloroethane - The distribution of 1,1-DCA RSL exceedances in overburden groundwater resembles the distribution of vinyl chloride in overburden groundwater in that it extends northeast and downgradient of the former Source Area to slightly beyond OW-038. The downgradient limit of 1,1-DCA detections in the overburden aquifer extends approximately 1,000 feet downgradient of the NDA. Detected 1,1-DCA concentrations ranged between 1 J µg/L (OW-034 and OW-103-O) and 64 µg/L (OW-043). The limit of 1,1-DCA concentrations in bedrock groundwater that exceed the EPA RSL is greater than the extent of 1,1-DCA in the overburden aquifer, and extends north and downgradient of the former Source Area to monitoring well OW-007. Detected concentrations range between 2 J µg/L (OW-007) and 160 µg/L (OW-094-R). 1,1-DCA was detected in the bedrock aquifer up to 1,600 feet downgradient of the NDA.

SVOCs - The most recent groundwater SVOCs data are from 2003 (ESS, 2004). SVOCs that were frequently detected include bis(2-chloroethyl)ether (BCEE) and naphthalene. Figure 6 and Figure 7 depict the positive detections of BCEE and naphthalene. In the overburden, the majority of the SVOCs detected were associated with monitoring well OW-094-O, which is located in the former Source Area. Naphthalene was detected frequently (3/20) and exceeded the RSL; none of the detections exceeded the RIDEM GA Objective (there is no naphthalene Federal MCL).

In bedrock groundwater, while several SVOCs were infrequently detected, BCEE was detected in 4 of 21 samples, exceeding the EPA tap water RSL (0.14 ug/L). BCEE was detected in bedrock monitoring wells situated downgradient of the former Source Area. Review of RI groundwater data indicated that BCEE was detected in samples collected from monitoring wells located in the former Source Area, and is site-related.

Pesticides/PCBs – The most recent groundwater pesticide and PCBs (aroclor) data were collected in 2003 (ESS, 2004). Several pesticides (aldrin, dieldrin, and heptachlor) were detected, but not PCBs. There are no MCLs or RIDEM GA Objectives for aldrin and dieldrin; however, these two pesticides exceeded the EPA tap water RSLs. The single detection of heptachlor exceeded the tap water RSL, but not its MCL.

Metals – The metals data considered for this evaluation were obtained during groundwater sampling rounds completed in 2003 and 2005. In overburden groundwater, arsenic, cobalt, iron, manganese and mercury exceeded their tap water RSLs; arsenic and mercury also exceeded the MCLs. In bedrock groundwater, arsenic, iron, and manganese exceeded the tap water RSL; only arsenic exceeded the MCL of 50 ppb set at the time of the 1987 ROD (Note: the arsenic MCL has been subsequently lowered to 10 ug/L (or ppb)). Figure 8 and Figure 9 depict the detections of arsenic and manganese in overburden and bedrock groundwater, respectively. Arsenic was detected frequently in groundwater at concentrations that exceeded the MCL, the RIDEM GA Objectives, or the tap water RSL. Manganese was also detected frequently and exceeded the tap water RSL. Mercury and cobalt were each detected in one sample in only one sampling round. The elevated arsenic and manganese groundwater concentrations are attributed to the reducing conditions present in the aquifer due to the ongoing reductive dechlorination of chlorinated VOCs.

Conceptual Site Model – The Conceptual Site Model is a three-dimensional "picture" of Site conditions that illustrates contaminant sources, release mechanisms, exposure pathways, migration routes, and potential human and ecological receptors. It documents potential future Site conditions and shows what is known about human and environmental exposure through contaminant release and migration to potential receptors. The current risk assessment, risk evaluation, and response action for the contaminated saturated soil and groundwater is based on this Conceptual Site Model.

Figure 10 shows an updated Conceptual Site Model of soil and groundwater contamination for the Site based on recent data collected following the source control remedial actions undertaken at the Site, and the current and potential use of the Site. The Site is currently undeveloped and used primarily for storage of private property owned by William Davis. In the Site’s vicinity, the land use is mostly semi-rural with low-density residential dwellings. Groundwater underlying the Site and adjacent areas is classified as GA by RIDEM, which is suitable as a potable supply. Currently, groundwater underlying the Site is not used as a potable supply. There are no known water supply wells installed in the overburden and bedrock groundwater plumes. The Conceptual Site Model allowed EPA to consider the relative risks and potential actions to be taken for contaminants of varying toxicity or mobility.

3. UPDATED RISK ANALYSIS

The baseline risk assessment and a subsequent supplemental risk evaluation estimate what risks the Site poses if no action were taken. They provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD Amendment summarizes the results of the baseline risk assessment for this Site and a streamlined human health risk evaluation, completed as part of the FFS. Since risks from potential future residential exposure to groundwater used as drinking water provide the basis for action under this ROD Amendment, the following discussion focuses on the evaluation of these risks.

a. Human Health Risks

The baseline human health risk assessment for the Davis Liquid Waste Site was completed over 20 years ago, in 1986 in support of the RI, and before the publication of current EPA risk assessment guidance entitled “Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Parts A, B, C, D, and E).” As such, the methodology used in the

1986 RI risk assessment, while following standard practice at the time, differs in many aspects from accepted practices used today in risk assessments. Because of the age of the data and the changes to risk evaluation, a streamlined human health risk assessment focusing on exposure to groundwater was completed as part of the FFS using the most recent VOC data. Potential exposures to SVOCs, pesticides, PCBs, and metals in groundwater were also evaluated using data collected prior to 2008. The methods used and results of the risk evaluation are presented in the Conceptual Site Model Technical Memorandum Addendum.

In the streamlined risk evaluation, all VOCs detected in 2008 in overburden or bedrock groundwater were included in the quantitative evaluation of risks and all SVOCs, metals, and pesticides detected in recent sampling of overburden or bedrock groundwater were included in the qualitative evaluation of risks. These contaminants can be found in Tables 1-4 through 1-10 of the Focused Feasibility Study.

Although the Site groundwater is not currently used for potable water, the risk evaluation conservatively assumed that groundwater could potentially be used as a potable water source by future residents on-site. The risk evaluation quantified potential risks to future on-site residents from exposures to contaminants in groundwater if groundwater was used as a potable supply. Ingestion of potable water was evaluated quantitatively. Dermal contact and inhalation exposure to potable water were evaluated qualitatively by setting the dermal contact plus inhalation risks for contaminants equal to the risk calculated for the ingestion pathway.

Because the 2008 samples were only analyzed for VOCs, review of groundwater data collected prior to 2008 was also performed to evaluate risks from non-VOCs. Limited SVOCs, pesticide, PCBs, and metals groundwater data, collected during 2003 and 2004 monitoring, were qualitatively used to estimate drinking water risks from non-VOCs through a ratio approach based on comparison of maximum groundwater concentrations to risk-based screening criteria (EPA RSLs for tap water, which consider ingestion of groundwater as drinking water and inhalation of volatiles during household water use). These rough qualitative risk estimates for the most current groundwater non-VOCs data are presented in the FFS, Tables 1-6 through 1-10.

Risks from exposures to contaminants in groundwater were evaluated separately for overburden and bedrock groundwater data collected in 2008. Ingestion of potable water was evaluated quantitatively using maximum contaminant concentrations and standard reasonable maximum exposure assumptions for residential drinking water exposure scenarios. Dermal contact and inhalation exposure to potable water were evaluated as recommended by EPA, by setting the dermal contact plus inhalation risks for contaminants equal to the risk calculated for the ingestion pathway.

Table 5 provides cancer risk estimates for future residential exposure to overburden or bedrock groundwater as a drinking water source. These risk estimates are based on reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a resident's exposure to groundwater used as drinking water, as well as the toxicity of the contaminants. The total cancer risks from direct exposure to overburden groundwater as a potential drinking water source at this Site to a future resident is estimated to be $1.2x10^{-2}$. The contaminants contributing most to this risk level are: vinyl chloride, PCE, arsenic, TCE, and BCEE, but other contaminants contribute as well. The total cancer risks from direct exposure to bedrock groundwater as a potential drinking water source at this Site to a future resident is estimated to be 1.0×10^{-2}. The contaminants contributing most to this risk level are vinyl chloride, BCEE, arsenic, PCE, and TCE. These risk levels indicate that if no clean-up action is taken and future residents use either the overburden or bedrock groundwater for drinking water purposes, an individual resident would have an increased probability of 1 in 100 of developing cancer as a result of Site-related exposure to the groundwater.

Table 6 provides hazard quotients (HQs) for each contaminant and the hazard index (HI) (sum of HQs) for future residential exposure to overburden or bedrock groundwater as a potential drinking water source. The Risk Assessment Guidance for Superfund (RAGS) states that, generally, an HI greater than 1 indicates the potential for adverse non-cancer effects. The estimated HI of 30.8 for overburden groundwater and 24.2 for bedrock groundwater indicates that the potential for adverse non-cancer effects could occur from exposure to contaminated groundwater for drinking water purposes. Vinyl chloride and cis-1,2-DCE are the greatest contributors to the total Site HI in both overburden and bedrock groundwater.

b. Ecological Risks

The ecological risk assessment performed during the 1986 RI was limited to a comparison of surface water concentrations of 7 “indicator” contaminants to Ambient Water Quality Criteria to evaluate potential effects on freshwater aquatic life and a qualitative examination of wetlands. This risk assessment concluded that plants and wetlands both on-site and off-site were stressed. No further evaluation of potential ecological risks at the Site was conducted for this Amended ROD. Currently, contaminated groundwater continues to migrate from the former Source Area and discharges into the wetlands and Latham Brook. Additional sampling and evaluation of surface water and sediments that may be affected by the Site groundwater and other site-related activities will be required to determine whether additional actions may be needed.

D. DESCRIPTION OF CLEANUP ALTERNATIVES CONSIDERED

Between 2001 and 2008, a group of potentially responsible parties (PRPs) continued to collect groundwater data for overburden and bedrock aquifer units to develop information that would be used to prepare a Remedial Design to address contaminated groundwater, OU 2. The samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and metals. In addition, groundwater samples were also analyzed for geochemical parameters to assess whether natural attenuation was occurring in groundwater to degrade the chlorinated VOCs.

The PRPs conducted additional soil sampling in 2008 to provide a more current assessment of subsurface contaminant conditions. EPA evaluated the new data and determined that while natural attenuation processes were ongoing and were degrading the chlorinated VOCs, the process has slowed down or ceased because subsurface geochemical conditions no longer favor reductive dechlorination in the groundwater plumes. The subsurface is already in a chemically reduced condition; however, available electron donors have been depleted.

Since the 1987 ROD, advancements have been made in the understanding of how chlorinated VOCs degrade in the natural environment. Biological processes (such as reductive dechlorination) in the subsurface can cause chlorinated VOCs such as tetrachloroethene and trichloroethene to degrade to compounds such as cis-1,2dichloroethene and vinyl chloride. However, due to the lack of electron donors in the subsurface at the Site, the reductive dechlorination process appears to have slowed down or stalled in the plume.

Because the 1987 ROD could not be implemented as originally envisioned as treated groundwater could not be injected into the subsurface to create a flushing/recirculation cell to remove contaminants adsorbed to saturated soil, EPA determined that other remedial alternatives should be evaluated.

New remediation technologies such as in-situ chemical reduction and oxidation processes, in-situ thermal treatment, and in-situ biodegradation have been developed since the 1987 ROD that can aid in the degradation of VOCs. Specifically, reductive dechlorination has been demonstrated in numerous studies to be an effective process for the degradation of chlorinated VOCs in the subsurface. New treatment techniques have also been developed that can effectively address chlorinated VOCs in groundwater. These technologies include in-situ chemical treatment (reduction or chemical oxidation), in-situ biodegradation (aerobic, anaerobic) and in-situ thermal treatment (electrical resistive heating, steam, etc.).

EPA considered a number of these technologies in a Focused Feasibility Study (FFS) based on Site-specific conditions and the Site contaminants.[2]

<u>Alternative GW1 – No Action</u>

The No Action alternative is required to be evaluated by EPA's Superfund regulations and is used as a baseline for comparison to other cleanup alternatives. This alternative would not include any further cleanup action. There are no costs associated with Alternative GW1. Times to attain cleanup goals (including federal and state drinking water standards) in the overburden and bedrock plumes are estimated to be 100 years and 80 years, respectively.

<u>Alternative GW2 – Limited Action - Institutional Controls, Long-Term Monitoring, Natural Attenuation[3], and Five-Year Reviews</u>

[2] The Proposed Plan published in June 2010 included alternatives that incorporated natural attenuation to address contamination found in the bedrock. Upon further evaluation, EPA has determined that it has insufficient information to render a decision with regards to the contaminated bedrock plume. Please see Section K for more information.

[3] The FFS used the term "Monitored Natural Attenuation" and "MNA" to describe what is actually "natural attenuation," and as such, the text in this ROD describing the alternatives evaluated in the FFS has been revised to correct this error for Alternatives GW2, GW3B, GW3B, and GW5. Monitored Natural Attenuation requires specific determinations from EPA before natural processes in groundwater qualify as MNA. Those determinations or lines of evidence have not been established for overburden groundwater at this Site and, as a result, the limited reductions through natural processes that are occurring at the Site should be designated as "natural attenuation." To the extent the term Monitored Natural Attenuation or MNA was used to describe alternatives in the FFS, this was in error, and is revised by this ROD Amendment.

Alternative GW2 was developed as an alternative that involves no treatment, but uses limited actions to prevent or control potential exposures to contaminated groundwater:

- Institutional Controls - Use of contaminated groundwater will be prohibited through use restrictions until contaminant concentrations have reached safe levels.

- Natural Attenuation – Contaminants in the contaminated saturated soil and groundwater will gradually diminish over time as the result of natural ongoing biological and geochemical processes. In time, groundwater contaminants will reach safe levels.

- Long-term Monitoring – Monitoring of groundwater and surface water and sediment will be performed to verify that natural attenuation of contaminants is ongoing and to evaluate where contaminated groundwater is migrating.

- Five-Year Reviews – Because contaminants have been left in place on the Site above safe levels, the Superfund law requires that a review of site conditions be performed every 5 years to assess the protectiveness of this alternative.

Times to attain cleanup goals (including federal and state drinking water standards) in overburden and bedrock groundwater are estimated to be 100 years and 80 years, respectively. The estimated cost of GW2 is $5.3 million (as a present value, also called net present value).

Alternative GW3A - In-Situ Chemical Treatment, Enhanced Biodegradation (Core), Natural Attenuation (Plumes), Institutional Controls, and Five-Year Reviews

Alternative GW3A uses active treatment of saturated soil in overburden groundwater at the former Source Area (plume core) and natural attenuation in the remainder of the overburden and bedrock groundwater. GW3A consists of the following:

- Pre-design Investigations – Studies and on-site investigations will be performed to obtain information to support the design and implementation of this alternative.

- In-Situ Chemical Treatment – Treatment reagents will be used to provide electron donors so that the reductive dechlorination process in the subsurface can be enhanced. Electron donors commonly used include: very pure iron filings, molasses, sodium lactate, vegetable oil, or other organic carbon sources. The treatment reagents will be injected into saturated soil in overburden groundwater at the former Source Area (plume core). One bedrock well, OW-94, will also be treated because this is where the highest bedrock groundwater contamination occurs. Electrons are released which chemically help to break down the chlorinated VOCs. By reducing VOCs in the plume core, the levels of VOCs in overburden groundwater will decrease. Arsenic and manganese are naturally occurring soil minerals that have been mobilized due to the presence of VOCs in groundwater. Once VOCs are degraded, the groundwater will return to normal conditions and the levels of arsenic and manganese in groundwater will also decrease.

The treatment reagent, in conjunction with other chemicals, can also be effective in degrading other non-VOC chemicals including BCEE, aldrin, and dieldrin.

- Enhanced Biodegradation – The liquid used to deliver the treatment reagent contains nutrients and other chemicals that will promote the growth of naturally occurring microbes in soil and groundwater. These microbes are capable of biologically degrading the VOCs through reductive dechlorination, which will accelerate the achievement of cleanup goals.

- Natural Attenuation – For the overburden and bedrock plumes not directly addressed by treatment, contaminants will be naturally degraded by ongoing biological and geochemical processes.

- Institutional controls – Similar to Alternative GW2, use of contaminated groundwater will be prohibited through use restrictions until contaminant concentrations have reached safe levels.

- Long-term Monitoring – Monitoring of groundwater will be performed to evaluate groundwater in the former Source Area after treatment; verify that contaminants are being degraded; that groundwater contamination is not migrating to other parcels; and that the cleanup is effective in the long term after all treatment has been completed. Long-term sediment (including wetlands) and surface water monitoring will also be conducted.

- Five-Year Reviews – Similar to Alternative GW2, because contaminants have been left in place on the Site above safe levels a review of site conditions will be performed every 5 years to assess the protectiveness of this alternative.

Times to attain cleanup goals in overburden and bedrock groundwater are estimated to be 45 years and 80 years, respectively. The estimated cost of GW3A is $9.9 million as a present value.

Alternative GW3B - In-Situ Chemical Treatment, Enhanced Biodegradation (Core and Overburden Plume), Natural Attenuation (Bedrock Plume), Institutional Controls, and Five-Year Reviews (EPA's selected alternative)

The selected remedy for this ROD Amendment will use the in-situ chemical treatment and enhanced biodegradation to address contaminants in the plume core (saturated soil in the former Source Area) and a portion of the overburden plume, coupled with natural attenuation of the remaining untreated portion of the overburden plume and the bedrock plume.

This alternative is discussed in detail in Section F.

Alternative GW4 - Groundwater Extraction, Treatment, Discharge, Institutional Controls, Long-Term Monitoring, and Five-Year Reviews

Alternative GW4 is comparable to the alternative EPA selected in the 1987 ROD, but was updated to reflect current Site conditions and cost. The alternative requires extraction and treatment of contaminated groundwater. This alternative originally relied partially upon being able to reinject treated groundwater back into the former Source Area to flush additional contamination from the saturated soil thereby reducing the time until cleanup objectives could be met. However, results of additional investigations after the 1987 ROD was issued indicated that it will be difficult to reinject treated groundwater to flush VOCs in the saturated soil. Alternative GW4 now provides that treated groundwater would be discharged directly to Latham Brook rather than reinjected and consists of:

- Pre-design Investigations – Studies and on-Site investigations will be performed to obtain information to support the design and implementation of this alternative.

- Groundwater Extraction – 23 extraction wells, pumping an estimated 30 gallons per minute, would be installed in both the overburden and aquifer plumes. Highly contaminated groundwater will be captured in the former Source Area to prevent its migration into downgradient areas. Extraction wells located at the plumes' periphery will keep contaminated groundwater from migrating further towards private homes.

- Groundwater Treatment – A treatment system will be constructed in the former Source Area to remove VOCs, SVOCs, metals, and pesticides from the extracted water. The treated groundwater will then be discharged into Latham Brook, in compliance with discharge standards.

- Institutional controls – Similar to Alternative GW2.

- Long-term Monitoring – Groundwater will be monitored to assess contaminant status and to verify that contaminated groundwater is not migrating beyond the capture zone of the extraction wells.

- Five-Year Reviews – Because contaminants are being left in place on the Site above safe levels a review of site conditions will be performed every 5 years to assess the protectiveness of this alternative.

Times to attain cleanup goals in the overburden and bedrock groundwater are estimated to be less than 100 years and 80 years, respectively. The estimated cost of GW4 is $16.2 million as a present value.

Alternative GW5 - In-Situ Thermal Treatment (Core), Natural Attenuation (Plumes), Institutional Controls, and Five-Year Reviews

Alternative GW5 uses a thermal treatment process to desorb the organic contaminants (VOCs and SVOCs) from the saturated soil in the overburden groundwater at the former Source Area. Once the VOC and SVOC mass is removed from saturated soil, contaminants in the overburden and bedrock groundwater will dissipate faster through natural attenuation. GW5 consists of the following:

- Pre-design Investigations – Studies and on-site investigations will be performed to obtain information to support the design and implementation of this alternative.

- In-Situ Thermal Treatment - A series of electrodes and vapor extraction wells would be installed throughout the former Source Area. An electrical current would be applied that passes through the natural materials generating heat due to electrical resistance. The subsurface is heated until steam is generated, which dissolves and vaporizes VOCs and other organic contaminants in the soil and groundwater. Thermal treatment reduces the VOCs and SVOCs in saturated soil in the former Source Area and prevents them from further contaminating groundwater, allowing the groundwater to reach cleanup goals sooner. Similar to GW3A and GW3B, once VOCs are removed by treatment (plume core) or degraded through natural attenuation, the groundwater will return to normal conditions and the arsenic and manganese levels will decrease.

- Soil Vapor Extraction (SVE) – SVE wells will be installed throughout the former Source Area to vacuum and collect the heated gases (VOCs and organics) generated by the in-situ thermal treatment.

- Ex-Situ Treatment – The recovered gases will be condensed and the liquid will be treated using granular activated carbon (GAC) to capture the VOCs. The recovered VOCs and spent GAC will be disposed of offsite.

- Natural Attenuation – For the bedrock plume and the overburden plume outside of the former Source Area, the contaminants will be naturally degraded by ongoing biological and geochemical processes.

- Institutional controls – Similar to Alternative GW3A.

- Long-term Monitoring – Similar to Alternative GW3A.

- Five-Year Reviews – Similar to Alternative GW3A.

Times to attain cleanup goals in the overburden and bedrock plumes are estimated to 45 years and 80 years, respectively. The estimated cost of GW5 is $28.7 million as a present value.

E. EVALUATION OF CLEANUP ALTERNATIVES

Section l2l(b)(1) of CERCLA presents several factors that, at a minimum, EPA is required to consider in its assessment of remedial alternatives. Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives.

It should be noted that the selected remedy no longer addresses bedrock contamination because additional investigation is required for this portion of the Site particularly as it relates to the appropriateness of using Monitored Natural Attenuation. Monitored Natural Attenuation in bedrock was a component of Alternatives GW2, GW3A, GW3B, and GW5 evaluated in the FS. As a result, the evaluation of these alternatives under the nine criteria assumes that bedrock is no longer a component of these alternatives.

The nine criteria are summarized as follows:

1. THRESHOLD CRITERIA

The two threshold criteria described below must be met in order for the alternatives to be eligible for selection in accordance with the NCP:

a. **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

b. **Compliance with applicable or relevant and appropriate requirements (ARARs)** addresses whether or not a remedy will meet all Federal environmental and more stringent State environmental and facility siting standards, requirements, criteria or limitations, unless a waiver is invoked.

2. PRIMARY BALANCING CRITERIA

The following five criteria are utilized to compare and evaluate the elements of one alternative to another that meet the threshold criteria:

a. **Long-term effectiveness and permanence** addresses the criteria that are utilized to assess alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that they will prove successful.

b. **Reduction of toxicity, mobility, or volume through treatment** addresses the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site.

c. **Short-term effectiveness** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

d. **Implementability** addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

e. **Cost** includes estimated capital and operation and maintenance (O&M) costs, as well as present value costs.

3. **MODIFYING CRITERIA**

The modifying criteria are used as the final evaluation of remedial alternatives, generally after EPA has received public comment on the RI/FS and Proposed Plan:

a. **State acceptance** addresses the State's position and key concerns related to the preferred alternative and other alternatives, and the State's comments on ARARs or the proposed use of waivers.

b. **Community acceptance** addresses the public's general response to the alternatives described in the RI/FS and the Proposed Plan.

Because this is an Amendment to the 1987 ROD, only that part of the remedial action which is proposed for change (i.e., groundwater remediation – OU 2) will be evaluated in this section. Those portions (OU 1 and OU 3) of the 1987 ROD which are not being changed remain in effect under the 1987 ROD. Both OU 1 and OU 3 have been completed.

4. **COMPARATIVE ANALYSIS**

The following is a summary of the comparison of each alternative's strength and weakness with respect to the nine evaluation criteria noted above. This comparative analysis includes a comparison of the remedy selected in the 1987 ROD as modified by current site conditions and cost (Alternative GW4) to the remedy selected in this ROD Amendment, Alternative GW3B.

Overall Protection of Human Health and the Environment

Alternative GW1 provides the least amount of protection of human health and the environment because no actions will be taken to reduce the risk presented by contamination in groundwater. Alternative GW1 would not meet this threshold criterion of the NCP.

Alternative GW2 relies on institutional controls to prevent human exposure to contaminated groundwater. While Alternative GW2 provides some degree of protection of human health, it does not address the possible groundwater contamination threat to sediment, wetlands and/or surface water because contaminated groundwater will continue to discharge into the wetlands and surface water adjacent to the former Source Area and migrate unimpeded over a very long period of time. Therefore, Alternative GW2 may not provide adequate environmental protection in the long term.

Alternatives GW3A and GW3B provide overall protection of human health and the environment by chemical reduction and enhanced biodegradation of VOCs in groundwater to safe levels. GW3B will address both the plume core (former Source Area) and the downgradient contaminated overburden groundwater, will be more protective than GW3A and will attain the RAOs sooner. Because both GW3A and GW3B will cause the degradation of the chlorinated VOCs, both alternatives will help to decrease the quantity of contaminated groundwater discharging into the wetland that adjoins the former Source Area. In the long term, Alternatives GW3A and GW3B will be protective of the environment.

Alternative GW4 provides overall protection of human health and the environment through the extraction and treatment of contaminated groundwater until safe levels are attained. GW4 also prevents the further migration of contaminated groundwater from discharging into the wetlands.

Alternative GW5 provides overall protection of human health and the environment through the thermal desorption and removal of VOCs from the saturated untreated soil (plume core) in the former Source Area. Once GW5 is completed, overburden groundwater in the former Source Area will be returned to safe levels. Elimination of the VOCs source will result in the faster natural attenuation of contaminants in the overburden plume. By removing contaminants from the former Source Area, contaminated groundwater discharge into the adjacent wetlands and the brook will be decreased.

Compliance with ARARs

Compliance with ARARs are summarized in Table 5-2A through Table 5-4B of the Focused Feasibility Study. Table 5-2A and Table 5-2B of the FFS present the assessment of the alternatives' compliance with chemical-specific ARARs. Table 5-3A and Table 5-3B of the FFS present the assessment of the alternatives' compliance with the location-specific ARARs. Table 5-4A and Table 5-4B of the FFS present the assessment of the alternatives' compliance with the action-specific ARARs. Alternatives GW1 and GW2 will not meet the chemical-specific ARARs including the RIDEM GA Groundwater Objectives, MCLs, non-zero MCLGs, or reduce potential health risks to acceptable levels in a reasonable time frame as they rely on natural attenuation processes to gradually diminish the contaminant mass in overburden and bedrock groundwater.

Alternatives GW3A, GW3B, GW4, and GW5 will meet RIDEM GA Groundwater Objectives, MCLs, and non-zero MCLGs through active remediation. Both GW3A and GW5 will address the contaminated saturated soil and overburden groundwater in the plume core, and will comply with the chemical-specific ARARs for the former Source Area after completion of the remedial actions. GW3B will address greater contaminant extent in the overburden aquifer than GW3A or GW5 and will comply with the action-specific ARARs. GW4 will address both overburden and bedrock plumes and will comply with the chemical-specific ARARs in the long term.

Installation of monitoring wells under GW2, GW3A, GW3B, GW4, and GW5 may require limited construction in the wetlands**;** some monitoring wells will need to be installed in wetland areas because there is no practical alternative for collecting monitoring data elsewhere. Actions will be required for all alternatives to minimize impacts. Implementation of GW4 and GW5 may result in additional unavoidable impacts to the wetlands and, therefore, these alternatives would not be the least damaging practicable alternative.

Implementation of Alternatives GW2, GW3A, GW3B, GW4, and GW5 will comply with the action-specific ARARs. Alternatives GW3A, GW3B, GW4, and GW5 will comply with Federal and State regulations that govern the use, handling, treatment, or storage of chemicals during implementation of remedial actions. Monitoring wells installed under GW2 and all four active remediation alternatives, and injections wells installed under GW3A and GW3B will comply with State regulations. Treatment systems used to capture and consolidate extracted groundwater contaminants or vapors for the active remediation alternatives will comply with State and federal action-specific regulations.

Long-Term Effectiveness and Permanence

Alternative GW1 provides the least long-term effectiveness and permanence because no actions will be taken to control exposure over time or to permanently reduce the level of contaminants in groundwater in the long term. While natural attenuation processes would likely eventually reduce the contaminant mass in groundwater, the residual risk that remains is significant over a very long time.

Alternative GW2 relies on institutional controls in the long term to prevent potential exposures to contaminated groundwater. No actions will be taken to permanently reduce the contaminant concentrations in groundwater in a reasonable timeframe although some natural attenuation of contaminants will occur. The residual risk remains great as the contaminant mass is unaddressed for an extended period. This alternative is dependent on the proper implementation, monitoring, and enforcement of institutional controls coupled with periodic reviews of land use at the Site and adjacent parcels to remain effective in the long term. As a result, the long-term effectiveness is only as good as the measures taken to ensure the reliability of controls.

Alternatives GW3A, GW3B, GW4, and GW5 provide permanent reduction in the contaminant mass, and therefore will reduce risks to acceptable levels in the long term. Alternatives GW3A and GW3B use in-situ chemical treatment and enhanced biodegradation to address groundwater VOCs plume mass. Because GW3B will treat a larger portion of the overburden plume than GW3A, the magnitude of the residual risk for GW3B will be lower than for GW3A in the near term. Alternative GW4 uses physical groundwater extraction and treatment to permanently decrease contaminant concentrations in both the overburden and bedrock groundwater until safe levels are attained. GW5 will address the plume core, and will have the same risk reduction over the same timeframe as GW3A. In the interim until cleanup levels are achieved, all active remediation alternatives rely on institutional controls to prevent use of contaminated groundwater. All active remediation alternatives are dependent on the proper implementation, monitoring, and enforcement of institutional controls, coupled with periodic reviews of land use at the Site and adjacent parcels, to remain effective in the short term.

Alternatives GW3A, GW3B, GW4, and GW5 are expected to attain cleanup goals. However, Alternatives GW3A, GW3B, and GW5 do not actively treat significant portions of the bedrock aquifer, as the treatment only affects the overburden groundwater. For GW3A and GW3B, any bedrock groundwater treatment would be incidental and likely due to injections at the weathered bedrock/overburden contact.[4] Alternative GW4 includes bedrock groundwater extraction and effectively reduces risk associated with both overburden and bedrock groundwater contamination. Alternative GW4 adds an additional control measure because the extraction wells can also prevent further migration of the overburden and bedrock plumes.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative GW1 provides no treatment processes and therefore does not reduce toxicity, mobility or volume through treatment. Natural abiotic and biotic processes may gradually degrade and decrease the contaminant mass in the long term. However, lack of monitoring will prevent any determination of cleanup progress.

Similar to GW1, Alternative GW2 does not reduce toxicity, mobility or volume through treatment. Natural abiotic and biotic processes (passive treatment) will gradually degrade and decrease the contaminant mass in the long term, but not within an acceptable time frame. Long-term monitoring of groundwater and surface water will provide the necessary data to determine the effectiveness and progress of the natural attenuation process.

Alternatives GW3A, GW3B, GW4, and GW5 all employ active treatment processes to address the groundwater contaminants, and thus reduce toxicity, mobility or volume through treatment. Alternatives GW3A and GW3B include chemical treatment of the dissolved overburden groundwater plume mass coupled with enhanced biodegradation to reduce toxicity, mobility, and volume. The dissolved bedrock aquifer is not actively treated by GW3A and GW3B. Alternative GW4 relies on physical extraction and treatment of both dissolved overburden and bedrock contamination to reduce contaminated groundwater volume. GW5 will remove VOCs from the plume core through in-situ thermal treatment thereby reducing toxicity, mobility, and volume.

Once remedial actions are implemented, reductions in toxicity, mobility or volume would be permanent and irreversible for GW3A, GW3B, GW4, and GW5 because contaminants will be degraded or removed from the aquifer. Treatment residuals associated with Alternatives GW3A and GW3B include iron complexes, dissolved gases (oxygen, carbon dioxide, hydrogen, methane, ethane, and ethene), and an increased population of halo-respiring bacteria in overburden groundwater. It is anticipated that the bacteria will slowly die off as the contaminant mass is depleted. Incomplete biologic degradation of chlorinated ethenes can lead to an accumulation of vinyl chloride; however, proper engineering of these alternatives could minimize or eliminate the formation of vinyl chloride, and will not be expected to pose residual risks. Treatment residuals associated with GW4 (Groundwater Extraction/Treatment) include captured VOCs from treated air emissions, spent vapor-phase and liquid-phase activated carbon,

[4] See discussion in Section K. Because additional investigation/data is required, the selected remedy no longer addresses bedrock.

and sludge from metals precipitation. Annually, an estimated 16,000 pounds of granular activated carbon will require removal and either recharge or disposal, and an estimated 8 cubic yards (approximately 16,000 pounds) of sludge will require treatment or disposal. The in-situ thermal treatment residuals associated with GW5 include other organic compounds (such as acetone) that result from the degradation of natural organic matter. These residuals are not expected to be long-lived and should dissipate due to groundwater advection. The exsitu treatment residuals associated with GW5 include captured VOCs, and spent activated carbon, which will require treatment or disposal.

Short-Term Effectiveness

No active remedial actions are associated with groundwater alternative GW1 (No Action), therefore no risks to the community, site workers, or the environment from implementation of this alternative. Based on an analytical model of groundwater contaminant decay, overburden groundwater will achieve RAOs and cleanup goals in approximately 100 years.

For Alternative GW2, implementation of this alternative will not impact the community as no actions other than the installation of monitoring wells are required. Site workers will use proper personal protection equipment and appropriate health and safety protocols will be followed when installing the monitoring wells. Some monitoring wells will need to be installed in wetland areas because there is no practical alternative for collecting monitoring data elsewhere.

Alternatives GW3A and GW3B include active in-situ chemical treatment and enhanced biodegradation, but are not expected to have an impact on the community in the short term because the Site is relatively isolated from nearby populations (nearest resident is at least 1,000 feet away), and treatment will be performed in-situ. The pressurized injection of treatment reagents increases the on-site worker's risk of exposure to the treatment reagents. However, the risk of harm to the on-site worker can be ameliorated through implementation of proper engineering controls and health and safety procedures. Administrative and engineering controls, and communication with local officials will ensure the safe transportation, storage, and injection of these materials, and will be included as part of the remedial design and project planning. The potential risks to on-site workers and the community are expected to be minimal with proper controls. Short-term environmental impacts may include the temporary mobilization of some naturally occurring metals in soils, such as arsenic and manganese, which will be subjected to chemical reduction. Increased dissolved iron concentrations will also occur as the reagent becomes oxidized. However, once the groundwater oxidation-reduction potential in the groundwater plumes return to normal, the naturally occurring arsenic and manganese will no longer be soluble and concentrations will decrease. Some monitoring wells will need to be installed in wetland areas because there is no practical alternative for collecting monitoring data elsewhere.

Under Alternative GW4 there will be minimal risk to on-site workers and the environment from installation of extraction and monitoring wells, similar to Alternative GW3A. Construction of the active groundwater extraction, treatment, and discharge system poses minimal risks to onsite workers and the community. Risks will generally be consistent with typical construction projects. Additional potential risk due to exposure to groundwater contaminants during drilling of extraction wells and operations and maintenance of the treatment system is present, but is also minimal with the proper implementation of a health and safety program. Some monitoring wells will need to be installed in wetland areas because there is no practical alternative for collecting monitoring data elsewhere.

Alternative GW5's in-situ thermal treatment is not expected to have an impact on the community in the short term because the Site is relatively isolated from nearby populations (nearest resident is at least 1,000 feet away), and treatment will be performed in-situ. Construction of the electrical resistive heating array, the vapor recovery system, use of electrical equipment, heat resulting from treatment implementation, and operation of the vapor recovery system and handling of recovered VOCs could present a risk to Site workers during implementation of GW5. However, the risk of harm to the on-site worker can be minimized through implementation of proper engineering controls and health and safety procedures.

Environmental impacts to the wetlands resulting from monitoring wells installation for all alternatives other than GW1 are expected to be minimal. As needed, mitigation will be performed to address unavoidable impacts during well installation. Except for monitoring wells, all construction for Alternatives GW3A, GW3B, GW4, and GW5 will occur outside of wetland areas and will not affect the wetlands. Implementation of GW4, groundwater extraction, may have potential impacts to wetlands because the water table discharging to the wetlands could be depressed, decreasing the volume of groundwater feeding the wetlands. Air emissions and water discharges under GW4 and GW5 are expected to be below allowable limits.

Through in-situ treatment and biodegradation under Alternatives GW3A and GW3B, the subsurface geochemistry may be temporarily altered. Similarly, under Alternative GW5, the subsurface temperature will be temporarily elevated. Alternatives GW3A, GW3B, and GW5 will have temporary impacts greater than those for GW1 or GW2. However, once in-situ chemical, biological, or thermal treatment stops, the subsurface conditions are expected to gradually return to ambient conditions.

Implementation of GW1 will require no time while 1 year is required to implement GW2. For both GW1 and GW2, based on analytical modeling, natural attenuation will result in the attainment of safe levels in approximately 100 years for overburden groundwater.

Implementation of GW3A and GW3B will require approximately 4 to 5 years (including preremedial design, bench/pilot-scale testing, design, implementation of four injections, and follow-up confirmation soil sampling). For GW3A, after the plume core is remediated, safe levels in the overburden groundwater will be attained in approximately 45 years. For GW3B, after the plume core and a portion of the overburden plume are remediated, safe levels in the untreated portions of overburden plume will be naturally attenuated in approximately 40 years to 45 years because the in-situ chemical treatment of groundwater will only be performed in the non-wetland areas. A portion of the overburden plume will attain remediation goals after completion of the in-situ treatment. Elevated concentrations remain in the untreated portion of the overburden plume for some time.

GW4 will require an estimated 2 years to design and implement. Once extraction and treatment are initiated, overburden groundwater will achieve RAOs in a period less than 100 years. Implementation of GW5 will require approximately 20 months (including pre-remedial design, pilot-scale testing, design, implementation and follow-up soil sampling). For GW5 (In-Situ Thermal Treatment (Core)), after the plume core is remediated, safe levels in the overburden groundwater will be attained in approximately 45 years.

Implementability

With no proposed actions, Alternative GW1 is the easiest to implement, when compared with Alternatives GW2, GW3A, GW3B, GW4, and GW5.

Alternative GW2 includes institutional controls and long-term monitoring, which are readily implementable. The natural attenuation process requires no implementation. The sole construction activity associated with GW2 is the installation of additional monitoring wells, which can be easily constructed by a number of firms. Typically there are administrative implementability issues associated with implementing institutional controls. However, none of these issues is significant or would prevent implementation of these actions. GW2 is implementable, and only slightly more difficult to implement than GW1. In addition, there are no limitations in availability firms, equipment, or materials that would limit the implementation of this remedial alternative.

GW3A and GW3B will require firms with specialized experience, equipment and reagents to implement the in-situ chemical reduction treatment. A number of firms are available that can provide this remediation service, and the necessary equipment and reagents (or their components) are commercially available. GW3A and GW3B require minimal construction (aside from monitoring well installations). Temporary direct-push injection boreholes are advanced in the treatment zone, and there are no permanent features remaining. GW3A and GW3B are implementable, and are more difficult to implement than GW2.

GW4 will require the construction of access roads, a groundwater extraction system, a groundwater treatment facility, groundwater discharge conduit, and all associated aboveground and underground utilities. Extensive upgrades to the nearby electrical system may be required to implement the GW4 alternative. Fluctuations in the electrical supply or power failures can limit the reliability of GW4. Multiple vendors are available to design, construct, and operate the groundwater extraction and treatment system. While implementable, GW4 is slightly more difficult to implement than GW3A or GW3B.

GW5 also requires firms with specialized experience and equipment. The number of firms with experienced personnel and equipment to perform the work is limited. Extensive upgrades to the nearby electrical system may be required to implement the in-situ electrical resistive heating. Because GW5 has a high power demand, fluctuations in the electrical supply or power failures can limit its reliability. GW5 is more difficult to implement than GW4.

Once the GW3A or GW3B in-situ chemical treatment or GW5's in-situ thermal treatment is completed, no additional operations or maintenance will be required; continued monitoring of the aquifer will be needed. Alternative GW4 will require operations, maintenance, and monitoring for approximately 45 years after construction is complete. Typically, naturally occurring dissolved metals can foul groundwater extraction and treatment equipment and can be addressed through the use of a robust pre-treatment step, which is included in GW4. Insufficient pre-treatment of the waste stream commonly limits the reliability and effectiveness of the air stripping treatment. GW3A and GW3B are more easily implemented than GW4 or GW5.

Additional actions can be easily implemented under all alternatives because contaminants, at varying degrees remain in the aquifer for extended periods. However, GW3A, GW3B, and GW5 cause temporary alterations in subsurface conditions (i.e., geochemistry or temperature) that will deter additional remedial actions until subsurface conditions return to ambient conditions. Implementation of GW4 would not inhibit or preclude performance of additional remedial actions, as the subsurface geochemistry would remain unaltered.

Technologies used in GW3A, GW3B, GW4, and GW5 have been implemented and demonstrated to be effective at other sites with similar contamination. Monitoring requirements for all alternatives are easily implemented and are mostly the same for all alternatives, with the exception of GW1. The same long-term monitoring network can be used to evaluate natural attenuation progress GW2, effectiveness of treatment and progress in the attenuation of the remaining overburden plumes (GW3A, GW3B, GW5, or to monitor the progress and effectiveness of groundwater extraction and status of the overburden and bedrock plumes GW4).

Implementation of Alternative GW4 or GW5 will result in generation of wastes (accumulated VOCs, spent activated carbon, etc.). Facilities capable of managing wastes associated with implementation of these two alternatives are readily available. There are no significant administrative feasibility issues associated with GW3A, GW3B, or GW4 other than those related to institutional controls.

Cost

Alternatives Cost Estimates

Alternative	Capital Costs	Total Present Value (30 years at 7% discount rate)
GW1	$0	$0
GW2	$235,000	$5,330,000
GW3A	$4,379,000	$9,866,000
GW3B	$6,153,000	$11,280,000
GW4	$3,364,000	$16,214,000
GW5	$23,598,000	$28,693,000

State/Lead Agency Acceptance

State acceptance is a modifying criterion that allows for final evaluation and modification of the proposed remedial approach following State review. The State of Rhode Island concurs with the ROD Amendment remedy. See Appendix C for the State concurrence letter.

Community Acceptance

Community acceptance is a modifying criterion that allows for final evaluation and modification of the selected remedial approach following community review. The Town of Smithfield reviewed the proposed changes to the 1987 ROD, specifically the change from groundwater extraction treatment, and recirculation to in-situ chemical treatment and enhanced biodegradation and has indicated its support for this change.

During the public comment period, the community expressed its support for the proposed alternative. The National Audubon Society, an abutter, concurred with the remedy, as amended. However, they expressed concern that there is not a current ecological risk assessment for Latham Brook. Residences with private drinking water wells located to the east and southeast of the Site were concerned about the potential migration of contaminated groundwater to their wells because groundwater has an easterly component of flow.

Finally, the PRPs commented that they did not support the selected remedy but instead, expressed support for GW2 (Natural attenuation).

Appendix D, the Responsiveness Summary to the ROD Amendment provides responses to specific comments received during the 56-day public comment period.

F. RATIONALE FOR SELECTION OF THE 2010 ROD AMENDMENT SELECTED REMEDY

The Selected Remedy is Alternative GW3B, which includes In-Situ Chemical Treatment, Enhanced Biodegradation (Core and Overburden Plume), Natural Attenuation, Institutional Controls, and Five-Year Reviews.

Alternative GW3B is similar to GW3A; however, GW3B will use the in-situ chemical treatment and enhanced biodegradation to address the VOCs in the plume core (saturated soil in the former Source Area) and a portion of the overburden plume, coupled with natural attenuation of the remaining untreated portion of the overburden plume.

The selected remedy consists of the following components:

1. Pre-Design Investigation (PDI) – A PDI will be performed to ensure that the plume core contamination does not extend outside of the former Source Area. The PDI will also assess the potential contaminant presence in the treated soil backfill in the former Source Area to determine whether residual contaminants in soil pose potential leaching threats to groundwater quality.

   Surface water samples and sediment samples will be collected to assess whether groundwater contaminants are migrating into the wetlands and Latham Brook or whether other Site-related activities have impacted this area of the Site. Surface water samples from designated locations will be analyzed for VOCs, SVOCs, and metals. Sediment samples, co-located with the surface water samples, will be analyzed for VOCs, SVOCs, pesticides, PCBs, and metals to assess whether there is degraded surface water and sediment quality.

   Additional sampling and evaluation of surface water and sediments that may have been affected by Site groundwater as well as other Site-related activities will be required to determine whether additional actions may be needed.

2. Bench-Scale/Pilot Testing - Concurrent with the performance of the PDI, bench-scale testing using soil and groundwater samples will be performed to select the optimal reducing agent for chemical treatment and substrate for microbial growth for a field-scale pilot test. The field-scale pilot tests will be performed to ascertain the ability to distribute the reagent in the formation (i.e. variable permeability soils or high water table) and the effectiveness in addressing contaminants in the overburden plume core.

3. In-Situ Chemical Reduction and Enhanced Biodegradation – Chemical reduction was selected as the representative chemical treatment process option in the FFS for cost estimating purposes. Much of the plume is already in a chemically reduced state; therefore the selected remedy requires enhancing this electrochemical condition through the addition of a reducing agent and electron donor to enhance chemical reduction of chlorinated organic compounds. Amendments to address SVOCs (BCEE), pesticides

(aldrin and dieldrin), and arsenic should be evaluated and used to the maximum extent practicable.

In an anaerobic environment, the natural degradation of chlorinated hydrocarbons follows the reductive dechlorination pathway. Organic substrate material such as emulsified vegetable oils, lactic acid, or molasses extracts can be added to enhance the growth of reductive dechlorinating microbes. In-situ enhanced biodegradation can be completed in conjunction with the in-situ chemical reduction or as a stand-alone injection. A slightly buffered solution should be added to assist in the neutralization of any acids that form from reduction processes.

The chemical reduction and enhanced biodegradation can be combined into a single treatment. The organic substrate that promotes microbial growth and reductive dechlorination shall be used as the delivery liquid for the reagent into the plume core (saturated soils and groundwater in the former Source Area) and the overburden plume.

4. Saturated Soil (Plume Core) and Plume Treatment - The treatment reagent will be injected in approximately four applications into the plume core and the portion of the overburden plume underlying areas situated outside of the wetlands, as generally depicted in Figure 11. Figure 12 depicts a conceptual injection approach. An estimated 170,000 yd^3 of contaminated saturated soil in the former Source Area and an estimated 9,862,000 gallons of contaminated overburden groundwater are anticipated to be treated.

   Applications would be conducted approximately 1 year apart. None of the chemical reagent injections will be performed in the wetlands. The treatment reagent will be injected using direct-push injection points throughout the plume core and the downgradient dissolved overburden plume outside of the wetlands.

   Follow-up confirmation groundwater sampling and soil sampling shall be required to ensure that remediation goals are attained.

   The plume core is expected to reach interim cleanup levels in approximately 4 years after initiation of treatment. The portions of the overburden plume that remain untreated will require an estimated 40 to 45 years to naturally attenuate.

5. Institutional Controls – Legal restrictions shall be placed on properties within the limits of the overburden and bedrock contaminant plumes, encompassing four parcels (50-9, 50-29, 50-27, and 50-27A) as well as any areas where installation of new wells has the potential to hydraulically influence the movement of contaminated water from the Site. The restrictions would prohibit the use of contaminated groundwater (that exceed drinking water criteria or risk-based concentrations) and/or restrict the installation of new wells or modification of existing wells until contaminant concentrations have diminished to the Site clean-up goals.

6. Natural Attenuation – Although active remediation would occur at the former Source Area and portions of the downgradient overburden plume under this remedy, the selected

remedy requires that contaminant concentrations in the untreated portions of the overburden aquifer gradually diminish over time through natural attenuation. Both biotic and abiotic natural degradation processes shall gradually attenuate the contaminate mass over an extended period, until all groundwater concentrations are decreased to below clean-up goals. Once groundwater conditions return to normal geochemical conditions and reductive dechlorination has ceased, metal concentrations will return to ambient levels.

7. Long-Term Monitoring - To monitor natural attenuation processes and to evaluate conditions in environmental media, groundwater, surface water, and sediment shall be sampled and analyzed on a triennial basis for the first 5 years, and annually thereafter. Groundwater samples shall be collected from the plume core and the downgradient portions of the plume, and surface water and sediment samples shall be collected from wetlands adjacent to the former Source Area and from Latham Brook. Samples shall be collected from approximately 43 existing monitoring wells (as was completed during the Phase 4 groundwater monitoring event conducted in October 2008), and new overburden and bedrock wells. The exact number and location of monitoring wells shall be determined during the pre-design investigation. Samples shall be analyzed for VOCs, SVOCs, pesticides, metals, and geochemical parameters (chloride, sulfate, sulfide, nitrate, nitrite, alkalinity, total organic carbon, ethene, ethane, methane, and hydrogen) as well as additional contaminants that have not been sampled previously at the Site. Because 1,4-dioxane was commonly used as a preservative in 1,1,1-trichloroethane (TCA), this VOC will also be evaluated because TCA has been consistently detected in Site groundwater. The lateral and vertical contaminant migration in the overburden and bedrock aquifers will be monitored. Periodic residential well monitoring will also be required.

    a. To provide a more fully characterized bedrock aquifer, approximately four additional deep bedrock monitoring wells shall be installed in areas that are down-dip of the former Source Area. These wells shall complement the existing monitoring well network. Approximately four new overburden and bedrock monitoring well pairs shall be installed at the downgradient periphery of the overburden and bedrock plumes to provide a network of sentry wells between the plumes and residences along Log Road.

    b. Surface water and sediment sampling locations in the adjacent wetlands and Latham Brook shall be monitored to assess the existence and the potential migration of Site-related contaminants. The sample stations and number of samples shall be determined during the pre-design investigation. Surface water samples shall be analyzed for VOCs, SVOCs, and metals. Sediment samples, co-located with the surface water samples, shall be collected and analyzed for VOCs, SVOCs, pesticides, PCBs, and metals to assess whether contaminated groundwater discharge from the former Source Area or other Site-related activities may have resulted in degraded sediment quality.

c. The frequency of monitoring, types of monitoring and contaminants analyzed shall be adjusted based on findings of the Five-Year Reviews.

d. A vapor intrusion assessment and response plan shall be prepared to assess the potential for vapor intrusion threats from groundwater for a future residential scenario as there are currently no buildings over the groundwater plume. As appropriate, additional response actions may be required to address the vapor intrusion exposure.

8. Five-Year Reviews - Contaminants remain in groundwater above concentrations acceptable for unlimited Site use and unlimited exposure. As a result, a review of Site conditions and risks shall be conducted every 5 years, as required by CERCLA.

Cost Estimate for Amended Selected Remedy

The total present value cost (2010 dollars) for the amended, selected groundwater remedy is $11,280,000, with a further breakdown of this total cost estimate as follows:

Cost Category	
Capital Costs	$6,153,000
O&M Costs	$5,127,000
Total Present Value (30 yrs @ 7% Discount Rate)	$11,280,000

Based on the results of the Remedial Investigation, the human health and ecological risk assessments, and the assessment of current groundwater data, and review of the Feasibility Study, EPA has selected this groundwater cleanup plan for the Davis Liquid Waste Superfund Site because EPA believes it achieves the best balance among EPA's nine criteria used to evaluate various alternatives. Alternative GW3B will help to enhance and accelerate the ongoing reductive dechlorination process, a process that has already been effective at this Site for the VOCs, which will hasten degradation of groundwater contaminants. The treatment reagents are non-toxic, and pose little threat to workers, nearby residents, or the environment. All treatment will be performed in-situ (below the ground surface) and treatment byproducts stay underground. GW3B would not generate treatment byproducts that will require more handling or disposal. Because Alternative GW3B would also address a much larger portion of the overburden groundwater, cleanup goals will be reached in a shorter timeframe in a larger portion of the overburden than the other Alternatives including Alternative GW3A, which addresses only the former Source Area.

G. DESCRIPTION OF FUNDAMENTAL CHANGES BETWEEN ORIGINAL (1987) ROD REMEDY AND 2010 ROD AMENDMENT SELECTED REMEDY

The 1987 ROD remedy and the remedy selected in this ROD Amendment were described in detail previously in Sections D and F, respectively. Both remedies are summarized below in Sections G.1 and G.2. The primary treatment method under the 1987 ROD is groundwater extraction, treatment, and recirculation while the 2010 ROD Amendment employs in-situ chemical treatment and enhanced biodegradation. A change in the primary treatment method to address contaminated groundwater constitutes the fundamental change resulting in this ROD Amendment.

1. 1987 ROD REMEDY

- Groundwater Extraction
- Groundwater Treatment
- Treated Water Discharge and Recirculation
- Interim Monitoring
- Contaminated Run-off Capture (previously addressed)
- Institutional Controls

2. 2010 ROD AMENDMENT SELECTED REMEDY

- Pre-Design Investigations and Pilot Testing
- In-Situ Chemical Treatment
- Enhanced Biodegradation
- Long-Term Monitoring
- Institutional Controls
- Five-Year Reviews

3. REMEDIAL ACTION OBJECTIVES

a. 1987 ROD RAOs

Remedial Action Objectives (RAOs) to address management of migration contaminated groundwater were developed for the 1987 ROD and included:

- Preventing or mitigating migration of contaminants beyond their current extent; and
- Eliminating or minimizing the threat posed to the public health, welfare, and the environment from the current extent of contaminant migration.

Target levels for remediating groundwater were specified in applicable or relevant and appropriate federal and state public health laws and regulations identified at that time. These included MCLs, RCRA Subpart F corrective action requirements, and state standards and requirements.

b. 2010 ROD AMENDMENT RAOs

Groundwater RAOs were developed to address the anticipated future use of groundwater at the Site and surrounding parcels. The RAOs include:

Protection of Human Health Groundwater RAOs

- Prevent exposure to groundwater with contaminants that exceed MCLs, non-zero Maximum Contaminant Level Goals (MCLGs), the RIDEM GA Objective, or pose excess cancer risk of $1E^{-06}$ or a non-carcinogenic risk exceeding an HI of 1.0; and

- Restore groundwater quality to below MCLs, non-zero MCLGs, the RIDEM GA Objective, or chemical concentrations that result in excess cancer risk of $1E^{-06}$ or less, or a non-carcinogenic HI of 1.0 or less.

Protection of the Environment Groundwater RAO

- Prevent, to the extent practicable, contaminated groundwater discharge to nearby surface water bodies (i.e., wetlands and Latham Brook).

4. CHANGES IN EXPECTED OUTCOMES

Both the 1987 ROD and the ROD Amendment theoretically reach the same end result with respect to overburden groundwater: restoration of overburden groundwater to levels safe for human exposure. As a result, there is no change to the expected outcome for overburden groundwater in making this change from the 1987 ROD. It should be noted that the1987 ROD also addressed bedrock contamination. A decision on bedrock will be made in a subsequent decision document. In addition, the cleanup action required by this ROD Amendment, unlike the 1987 ROD, is consistent with updated risk assessment requirements as well as all current federal and state ARARs and TBC requirements. Finally, the remedy selected in this ROD Amendment will reach these safe levels and at a lower cost than the alternative selected in the 1987 ROD. This ROD Amendment changes only the portion of the 1987 ROD that addressed overburden groundwater. All other requirements of the 1987 ROD remain in effect.

Interim groundwater cleanup levels have been established, and are presented below.

Interim Groundwater Cleanup Levels

Because the aquifer under the Site is a Class GA aquifer, which is a potential source of drinking water, interim cleanup levels have been set based on the most stringent of the following ARARs:

MCLs and non-zero MCLGs established by EPA and the Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases (the Remediation Regulations) established by RI DEM. Generally the MCLs and the RI DEM Remediation Regulations are the same. Table 7 summarizes the interim groundwater cleanup levels for this Site. This list also includes all compounds in groundwater that exceed a federal MCL, a non-zero MCLG, or were found to pose a cancer risk in excess of 10^{-6} or a non-cancer HI > 1. Periodic assessment of the protection afforded by remedial actions will be made as the remedy is being implemented and at the completion of the remedial action. Interim groundwater cleanup levels also include all chemical specific ARARs (all contaminants identified under these regulations).

At the time that interim groundwater cleanup levels identified in this ROD Amendment, ARARs, and newly promulgated ARARs and modified ARARs which call into question the protectiveness of the remedy have been achieved and have not been exceeded for a period of 3 consecutive years, a risk assessment shall be performed on all residual groundwater contamination to determine whether the remedial action is protective. This risk assessment of the residual groundwater contamination shall follow EPA procedures and will assess the cumulative carcinogenic and non-carcinogenic risks posed by all contaminants (including but not limited to the contaminants identified in Table 7) via relevant exposure pathways. If, after review of the risk assessment, the remedial action is not determined to be protective by EPA, the remedial action shall continue until either protective levels are achieved, and are not exceeded for a period of 3 consecutive years, or until the remedy is otherwise deemed protective or is modified. These protective residual levels shall constitute the final cleanup levels for this ROD and shall be considered performance standards for this remedial action.

All interim groundwater cleanup levels identified in this ROD, ARARs, and newly promulgated ARARs and modified ARARs that call into question the protectiveness of the remedy and the protective levels determined as a consequence of the risk assessment of residual contamination, must be met at the completion of the remedial action at the points of compliance. At this Site, interim cleanup levels must be met throughout the contaminated groundwater overburden plume.

The following groundwater remediation goals are established for this ROD Amendment:

TABLE 7
Interim Groundwater Remediation Goals

Chemical	Value	Chemical	Value
1,1-Dichloroethane	6 µg/L	Bis(2-chloroethyl)ether	0.03 µg/L
Benzene	5 µg/L	Aldrin	0.002 µg/L
Cis-1,2-dichloroethene	70 µg/L	Dieldrin	0.002 µg/L
Tetrachloroethene	5 µg/L	Arsenic	10 µg/L
Trichloroethene	5 µg/L	Manganese	300 µg/L
Vinyl chloride	2 µg/L		

In addition, all chemical-specific ARARs/TBCs (including RIDEM's leachability standards for soil) are remediation goals for this ROD Amendment.

H. SUPPORT AGENCY COMMENTS

The Rhode Island Department of Environmental Management has reviewed the proposed remedy change for the Site and concurs with the remedy selected in this ROD Amendment described in Section F of this ROD Amendment. A copy of the state concurrence letter is attached as Appendix C.

I. STATUTORY DETERMINATIONS

CERCLA Section 121, 42 U.S.C. § 9621 and the NCP, 40 C.F.R. § 300.430 require that remedies selected for Superfund sites are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as a principal element. The following sections discuss how this ROD Amendment meets these legal requirements, is consistent with CERCLA Section 121 and, to the extent practicable, the NCP. This ROD Amendment is protective of human health and the environment, attains ARARs, or invokes an appropriate waiver, and is cost-effective.

1. The Selected Remedy in this ROD Amendment is Protective of Human Health and the Environment

The remedy selected in this ROD Amendment will adequately protect human health and the environment by eliminating, reducing, or controlling exposures to human and environmental receptors through treatment, institutional controls, and long-term monitoring. More specifically in-situ chemical reduction and enhanced biodegradation of subsurface contaminants will decrease contaminant mass in the plume core (former Source Area) and in the overburden plume, while natural attenuation will gradually decrease contaminant levels in the bedrock aquifer to safe levels. Institutional controls and long-term monitoring will reduce the threat posed by the potential use of contaminated groundwater until safe levels are reached.

The remedy selected in this ROD Amendment will reduce potential human health risk levels such that they do not exceed EPA's acceptable risk range of 10^{-4} to 10^{-6} for incremental carcinogenic risk. The remedy will ensure that the non-carcinogenic hazard is below a level of concern because the calculated HI will not exceed 1. In addition, groundwater will be restored to acceptable levels.

Implementation of the selected remedy will not pose any unacceptable short-term risks or cause any cross-media impacts.

2. The Selected Remedy in this ROD Amendment Complies With ARARs

Appendix A to the ROD Amendment summarizes the various ARARs for the selected remedy and their impact on remedial activities. The selected remedy will comply with the Federal MCLs and non-zero MCLGs, and the State GA Groundwater Objectives through active remediation. The remedy will also comply with Federal and State regulations that govern the use, handling, treatment, or storage of chemicals during implementation of remedial action. Monitoring wells and injections wells will be installed in compliance with applicable State regulations.

Section 404 of the Clean Water Act and Executive Order 11990 (Protection of Wetlands) require a determination be made that there is no practical alternative to federal actions involving dredging and filling activities or activities in wetlands before such action can be selected. EPA, after soliciting and receiving public comment, hereby makes the determination that: 1) some construction activities need to be conducted in the wetlands (monitoring wells installation) because there is no practicable alternative; and (2) the selected remedy is, along with Alternative GW3A, the least damaging practicable alternative. Actions must be taken to minimize adverse impacts on wetlands, wildlife, and habitat consistent with Federal and State requirements. Because wetlands will be impacted during well installation, mitigation measures may be required to restore or replicate wetlands consistent with the requirements of the Federal and State wetlands protection laws.

3. The Selected Remedy in this ROD Amendment is Cost-Effective

In EPA's judgment, the selected remedy, as amended, is cost effective because the remedy's costs are proportional to its overall effectiveness (see 40 CFR 300.430(f)(1)(ii)(D)). This determination was made by evaluating the overall effectiveness of the selected remedy that satisfied the threshold criteria (i.e., that are protective of human health and the environment and comply with all federal and any more stringent state ARARs, or as appropriate, waive ARARs).

EPA has determined that the remedy selected in this ROD Amendment is cost effective as it meets both threshold criteria and is reasonable given the relationship between the overall effectiveness afforded by the other alternatives and costs compared to other available options.

Although Alternatives GW1 and GW2 cost significantly less than the other alternatives, Alternatives GW1 and GW2 do not meet the threshold criteria and, therefore, are not cost effective. Alternatives GW4 and GW5 provide similar protection to GW3A and GW3B but at greater costs. Both GW3A and GW3B are cost effective as their costs are proportionate to their overall effectiveness with GW3B providing slightly greater effectiveness with a modest increase in cost.

4. The Selected Remedy in this ROD Amendment Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable

The Focused Feasibility Study evaluated remedial alternatives. The evaluation considered a range of alternatives ranging from no action to in-situ treatment, groundwater extraction and treatment, and in-situ thermal treatment. Once alternatives that attain ARARs and that are protective of human health and the environment were identified, EPA determined which alternative utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This determination was made by deciding which one of the identified alternatives provided the best balance of trade-offs among alternatives in terms of: 1) long-term effectiveness and permanence; 2) reduction of toxicity, mobility or volume through treatment; 3) short-term effectiveness; 4) implementability; and 5) cost. The balancing test emphasized long-term effectiveness and permanence and the reduction of toxicity, mobility and volume through treatment; and considered the preference for treatment as a principal element, the bias against off-site land disposal of untreated waste; and community and state acceptance.

The remedy selected in this ROD Amendment provides significant long-term effectiveness and permanence by reducing the contaminant mass in the plume core and addressing the contaminants in the overburden plume. The selected remedy employs in-situ treatment methods that result in the permanent degradation of the contaminants of concern in the plume core and the overburden plume thereby reducing toxicity, mobility or volume through treatment. The byproducts of degradation cannot reform or be converted to more toxic forms, and therefore the selected remedy's remedial action represents a permanent solution to Site contamination. Active treatment and degradation of contaminants prevent future migration of these contaminants in groundwater. Once groundwater geochemical conditions return to normal conditions, the naturally occurring arsenic and manganese would not be mobilized into groundwater.

The remedy selected in this ROD Amendment will permanently reduce the levels of contaminants in overburden groundwater to safe levels. It is anticipated that the remedy selected in this ROD Amendment will attain the cleanup goals sooner or in an equivalent time frame when compared to the other active alternatives because the majority of VOCs mass will be degraded within 4 to 5 years.

Based on our assessment of the trade-offs among remedial alternatives considered in the Focused Feasibility Study in terms of: 1) long-term effectiveness and permanence; 2) reduction of toxicity, mobility or volume through treatment; 3) short-term effectiveness; 4) implementability; and 5) cost, EPA finds that the remedy selected in this ROD Amendment (GW3B of the FFS) provides the best balance of trade-offs between the alternatives. The remedy selected in this ROD Amendment provides comparable long-term effectiveness with similar permanence with similar or fewer short-term impacts and implementability issues at a lower cost than most other active remediation alternatives. In balancing these factors, EPA has also considered the support of the community and the State for the remedy selected in this ROD Amendment. Based upon this evaluation, EPA finds that the remedy selected in this ROD Amendment uses permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable.

5. The Selected Remedy in this ROD Amendment Satisfies the Preference for Treatment as a Principal Element

Saturated soil in the Source Area is a principal threat waste. Table 8 summarizes the principal threat wastes to be addressed under this ROD Amendment. The principal element of the remedy selected in this ROD Amendment is the use of in-situ treatment to address the principal threat saturated soil as well as overburden groundwater contamination. The remedy selected in this ROD Amendment therefore satisfies the statutory preference for treatment as a principal element by employing chemical reduction and enhanced biodegradation to degrade contaminants in saturated soil in the former Source Area and in the overburden plume. By eliminating contaminant mass in the plume core (former Source Area), contaminants are prevented from migrating into the downgradient portion of the overburden plume and the bedrock plume, allowing faster recovery of groundwater quality. By treating the saturated soil and contaminated groundwater, the selected remedy permanently reduces the toxicity and mobility of contaminants, and reduces the volume of contaminated media to attain the cleanup levels.

6. Five-Year Reviews of the Selected Remedy in this ROD Amendment are Required

Because the remedy selected in this ROD Amendment will result in hazardous substances remaining onsite above levels that allow for unlimited use and unrestricted exposure, a review will be conducted within 5 years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

The five-year reviews for the Site will also evaluate potential health risks (residential drinking water wells and vapor intrusion) posed by groundwater based on periodic monitoring results, updated toxicity factors for contaminants of concern, status of natural attenuation progress in the untreated portions of the overburden and bedrock plumes, and groundwater discharges to the wetlands and Latham Brook.

J. PUBLIC PARTICIPATION

Overall, EPA has maintained close contact with the Town of Smithfield and other interested parties involved with the Site. Throughout the Site's history, community concern and involvement have been moderate**.** EPA has kept the community and other interested parties apprised of Site activities through informational meetings, fact sheets, press releases and public meetings. Below is a brief chronology of recent public outreach efforts for the Site regarding the groundwater contamination (OU2):

- On May 26, 2010, EPA published a public notice of EPA's proposal to amend the 1987 ROD.

- On June 2, 2010, EPA made the Administrative Record and Proposed Plan available for public review at EPA's offices in Boston and at the Greenville Public Library**.** At the same time, the availability of the Proposed Plan was advertised by the posting of signs on bulletin boards at the Greenville Public Library, and by advertising in the local newspapers.

- On June 3, 2010, EPA held a public informational meeting at the Smithfield Town Hall to discuss the proposed cleanup plan for contaminated Site groundwater.

- From June 2, 2010 to July 30, 2010, EPA held a public comment period to accept public comment on the alternatives presented in the Focused Feasibility Study and the Proposed Plan and on any other documents previously released to the public.

- On June 29, 2010, EPA held a Public Hearing to discuss the Proposed Plan and to accept any oral comments. A transcript of this meeting, the comments received, and EPA's response to comments are included in the Responsiveness Summary, which is Appendix D of this Amended Record of Decision.

- At the request of the PRPs, the public comment period was extended through July 30, 2010.

The public participation requirements set forth in the NCP 40 CFR300.435 (c)(2)(ii) have been met.

K. DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN

The Proposed Plan (dated June 2010) to amend the 1987 ROD included alternatives that incorporated natural attenuation to address contamination found in the bedrock. Upon further evaluation, EPA has determined that it has insufficient information to render a decision with regards to the contaminated bedrock plume. The historical groundwater and soil chemistry data does not demonstrate a clear and meaningful trend of decreasing contaminant mass and concentration over time at appropriate monitoring or sampling points.

Although the hydrogeologic and geochemical data demonstrates indirectly that natural attenuation processes are active at the Site, it is unclear at what rate the attenuation is occurring. Furthermore, there have not been any field or microcosm studies performed at the Site. Thus, the bedrock components included in the proposed remedy have been removed from the selected remedy, pending further evaluation, and will be addressed in a separate operable unit, OU 4. Other than this, no significant change has been made to the selected remedy from that in the Proposed Plan. The treatment technologies remain the same. In addition, EPA has included additional monitoring requirements to address residential wells near the Site based upon comments received during the comment period. EPA has prepared a Responsiveness Summary, which is attached in Appendix D.

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TABLES

2010 RECORD OF DECISION AMENDMENT
DAVIS LIQUID WASTE SUPERFUND SITE
SMITHFIELD, RHODE ISLAND

Table 1

Nature and Extent of Contamination

Contaminated Media	Contaminant(s)	Release or Transport Mechanisms	Contaminant Volume or Areal Extent
Saturated soil (in former Source Area, plume core)	1,2-dichloroethane, benzene, cis-1,2-dichlrorethene, tetrachloroethene, trichloroethene, vinyl chloride	Infiltration, percolation, advection, dispersion, diffusion	Estimated 170,000 cubic yards (yd^3); estimated 237 Kg of VOCs
Overburden Groundwater	1,2-dichloroethane; cis-1,2-dichloroethene; tetrachloroethene; trichloroethene; vinyl chloride; bis(2-chloroethyl)ether; aldrin, arsenic, manganese	Advection, dispersion	Estimated 14,300,000 gallons; 24 Kg of VOCs
Bedrock Groundwater	1,1-dichloroethane; benzene; tetrachloroethene; trichloroethene; vinyl chloride; bis(2-chloroethyl)ether; dieldrin, arsenic, manganese	Advection, dispersion	Estimated 9,000,000 gallons (upper 30 feet of weathered rock); 144 kg of VOCs

Source: Table 1-1, 2-1A, and 2-1B, Focused Feasibility Study (Nobis, 2010)

Table 2
Summary of 2008 Saturated Unexcavated Soil VOCs Data
Davis Liquid Waste Superfund Site
Smithfield, Rhode Island

CAS Number	Chemical	Minimum Conc. [1]	Maximum Conc. [1]	Units	Detection Frequency	Soil Leachability Screening [2]				
						RIDEM GA Leachability Criteria		EPA Soil Screening Levels		
						Screening Value (ug/Kg)	Freq. above RIDEM GA LC	Screening Value (ug/Kg)	Screening Value Source [2]	Freq. above EPA Screening Level
75-34-3	**1,1-Dichloroethane**	74	660	ug/Kg	4/79	NL	--	0.7	EPA Risk-SSL	**4/79**
120-82-1	**1,2,4-Trichlorobenzene**	86	930	ug/Kg	6/79	140,000	0/79	110	EPA MCL-SSL	**4/79**
95-50-1	**1,2-Dichlorobenzene**	68	5400	ug/Kg	3/79	NL	--	660	EPA MCL-SSL	**1/79**
106-46-7	**1,4-Dichlorobenzene**	44	500	ug/Kg	6/79	NL	--	81	EPA MCL-SSL	**3/79**
67-64-1	Acetone	610	2100	ug/Kg	3/79	NL	--	4,400	EPA Risk-SSL	0/79
75-15-0	Carbon disulfide	110	250	ug/Kg	4/79	NL	--	270	EPA Risk-SSL	0/79
108-90-7	Chlorobenzene	60	60	ug/Kg	1/79	3,200	0/79	75	EPA MCL-SSL	0/79
156-59-2	**cis-1,2-Dichloroethylene**	47	270	ug/Kg	12/79	1,700	0/79	21	EPA MCL-SSL	**12/79**
100-41-4	**Ethylbenzene**	56	5100	ug/Kg	12/79	27,000	0/79	890	EPA MCL-SSL	**3/79**
103-65-1	**Isopropylbenzene**	59	4300	ug/Kg	5/79	NL	--	NL	--	--
127-18-4	**Tetrachloroethylene**	52	9500	ug/Kg	12/79	100	**7/79**	2.4	EPA MCL-SSL	**12/79**
108-88-3	Toluene	150	240	ug/Kg	3/79	32,000	0/79	760	EPA MCL-SSL	0/79
79-01-6	**Trichloroethylene**	75	330	ug/Kg	6/79	200	**2/79**	1.9	EPA MCL-SSL	**6/79**
75-01-4	**Vinyl chloride**	55	130	ug/Kg	2/79	300	0/79	0.7	EPA MCL-SSL	**2/79**
1330-20-7	**Xylene (total)**	140	17000	ug/Kg	14/79	540,000	0/79	11000	EPA MCL-SSL	**1/79**

Notes:

1. Data provided by ESS, Inc. in the *Draft Phase 4 Supplemental Field Investigation Report (Fall 2008)* , (ESS, 2009).
2. Screening Values derived from the following sources:
   - EPA MCL-SSL: MCL-Based Soil Screening Level (SSL) from EPA Regional Screening Levels. Source: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm
   - EPA Risk-SSL: Risk-Based SSL (Cancer Risk =1E-06 or Hazard Index =1.0) from EPA Regional Screening Levels. Source: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm.
   - RIDEM GA LC - Rhode Island Department of Environmental Management Rules and Regulations for the Investigation and Remediation of Hazardous Materials Releases; Leachability Criteria GA Category
   - NL - no limit established

Exceedances of soil screening criteria in yellow background.

All soil data presented were collected from the saturated zone.

Table 3
Summary of 2008 Overburden Groundwater VOCs Data and Risk Estimates
Davis Liquid Waste Superfund Site
Smithfield, Rhode Island

CAS Number	Chemical	Minimum Concentration [1]	Maximum Concentration [1]	Units	Location of Maximum Concentration	Detection Frequency	ARAR/TBC-Based Screening			Risk Summary[3]	
							Screening Value (ug/L)	Screening Value Source [2]	Frequency above Screening Value	Total Hazard Index	Total Cancer Risk
71-55-6	1,1,1-Trichloroethane	1	150	ug/L	OW-094-O	15/27	200	MCL/RIDEM-GA	0/27	0.01	---
79-00-5	1,1,2-Trichloroethane	0.9	2	ug/L	OW-301-O	7/27	5	MCL/RIDEM-GA	0/27	0.06	**3.4E-06**
75-34-3	1,1-Dichloroethane	1	64	ug/L	OW-043	16/27	2.4	EPA RSLs	**12/27**	0.04	**1.1E-05**
75-35-4	1,1-Dichloroethylene	0.9	4	ug/L	OW-045	8/27	7	MCL/RIDEM-GA	0/27	0.01	---
120-82-1	1,2,4-Trichlorobenzene	1	2	ug/L	OW-304-O	3/27	70	MCL/RIDEM-GA	0/27	0.03	2.2E-07
95-50-1	1,2-Dichlorobenzene	1	19	ug/L	OW-043	11/27	600	MCL/RIDEM-GA	0/27	0.03	---
541-73-1	1,3-Dichlorobenzene	1	1	ug/L	OW-051	1/27	600	MCL/RIDEM-GA	0/27	0.001	---
106-46-7	1,4-Dichlorobenzene	3	8	ug/L	OW-051	6/27	75	MCL/RIDEM-GA	0/27	---	**1.3E-06**
71-43-2	Benzene	0.6	2	ug/L	OW-043	6/27	5	MCL/RIDEM-GA	0/27	0.06	**3.3E-06**
108-90-7	Chlorobenzene	1	3	ug/L	OW-051	6/27	100	MCL/RIDEM-GA	0/27	0.02	---
75-00-3	Chloroethane	2	10	ug/L	OW-301-O	6/27	21000	EPA RSLs	0/27	---	---
67-66-3	Chloroform	0.9	0.9	ug/L	OW-094-O	2/27	80	MCL*	0/27	0.01	8.3E-07
156-59-2	cis-1,2-Dichloroethylene	0.8	390	ug/L	OW-045	19/27	70	MCL/RIDEM-GA	**9/27**	**5.0**	---
60-29-7	Diethyl ether	18	18	ug/L	OW-043	1/27	7300	EPA RSLs	0/27	0.01	---
100-41-4	Ethylbenzene	11	500	ug/L	OW-300-O	8/27	700	MCL/RIDEM-GA	0/27	0.6	**1.6E-04**
103-65-1	Isopropylbenzene	1	25	ug/L	OW-300-O	9/27	NL	--	--	0.03	---
127-18-4	Tetrachloroethylene	3	52	ug/L	OW-094-O	12/27	5	MCL/RIDEM-GA	**6/27**	0.7	**8.4E-04**
109-99-9	Tetrahydrofuran	8	98	ug/L	OW-043	2/27	NL	--	--	---	---
108-88-3	Toluene	0.9	61	ug/L	OW-300-O	9/27	1000	MCL/RIDEM-GA	0/27	0.1	---
156-60-5	trans-1,2-Dichloroethylene	1	11	ug/L	OW-045	12/27	100	MCL/RIDEM-GA	0/27	0.07	---
79-01-6	Trichloroethylene	1	480	ug/L	OW-301-O	15/27	5	MCL/RIDEM-GA	**8/27**	---	**1.9E-04**
75-01-4	Vinyl chloride	4	460	ug/L	OW-051	13/27	2	MCL/RIDEM-GA	**13/27**	**19.6**	**9.9E-03**
1330-20-7	Xylene (total)	3	990	ug/L	OW-300-O	8/27	10000	MCL/RIDEM-GA	0/27	0.6	---
									Total VOCs Risks	**27**	**1.1E-02**

Notes:

1. Data provided by ESS, Inc. in the *Draft Phase 4 Supplemental Field Investigation Report (Fall 2008)*, (ESS, 2009).
2. Screening Values derived from the following sources:
   - MCL - Federal Maximum Contaminant Level
   - MCL* - Federal Maximum Contaminant Level for total trihalomethanes
   - RIDEM-GA - Rhode Island Department of Environmental Management Rules and Regulations for the Investigation and Remediation of Hazardous Materials Releases; GA Groundwater Objectives. The GA Groundwater Objectives for these VOCs are identical to EPA MCLs.
   - EPA RSLs - EPA Regional Screening Levels; Tapwater Scenario obtained from: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm
3. Risk summary = calculated risks based on residential drinking water exposures to the **maximum** detected concentrations. See CSM Addendum, Appendix B (Nobis 2009).

Exceedances of screening values highlighted by yellow background, and exceedance of E-06 cancer risk or HI of 1 highlighted by red text.

Table 4
Summary of 2008 Bedrock Groundwater VOCs Data and Risk Estimates
Davis Liquid Waste Superfund Site
Smithfield, Rhode Island

CAS Number	Chemical	Minimum Concentration [1]	Maximum Concentration [1]	Units	Location of Maximum Concentration	Detection Frequency	ARAR/TBC-Based Screening			Risk Summary[3]	
							Screening Value (ug/L)	Screening Value Source [2]	Frequency Above Screening Value	Total Hazard Index	Total Cancer Risk
71-55-6	1,1,1-Trichloroethane	2	560	ug/L	OW-094-R	5/20	200	MCL/RIDEM-GA	1/20	0.04	---
79-00-5	1,1,2-Trichloroethane	0.9	6	ug/L	OW-094-R	2/20	5	MCL/RIDEM-GA	1/20	0.19	**1.0E-05**
75-34-3	1,1-Dichloroethane	2	160	ug/L	OW-094-R	8/20	2.4	EPA-RSL	7/20	0.10	**2.7E-05**
75-35-4	1,1-Dichloroethylene	1	45	ug/L	OW-094-R	4/20	7	MCL/RIDEM-GA	1/20	0.12	---
120-82-1	1,2,4-Trichlorobenzene	2	2	ug/L	OW-101-R	1/20	70	MCL/RIDEM-GA	0/20	0.03	2.2E-07
95-50-1	1,2-Dichlorobenzene	13	57	ug/L	OW-094-R	4/20	600	MCL/RIDEM-GA	0/20	0.08	---
107-06-2	1,2-Dichloroethane	1	2	ug/L	OW-101-R	3/20	5	MCL/RIDEM-GA	0/20	0.01	**5.4E-06**
541-73-1	1,3-Dichlorobenzene	1	1	ug/L	OW-101-R	1/20	600	MCL/RIDEM-GA	0/20	0.00	---
106-46-7	1,4-Dichlorobenzene	2	8	ug/L	OW-101-R	2/20	75	MCL/RIDEM-GA	0/20	---	**1.3E-06**
78-93-3	2-Butanone	17	17	ug/L	OW-094-R	1/20	7100	EPA-RSL	0/20	0.00	---
67-64-1	Acetone	6	100	ug/L	OW-094-R	4/20	22000	EPA-RSL	0/20	0.01	---
71-43-2	Benzene	0.7	11	ug/L	OW-041	5/20	5	MCL/RIDEM-GA	2/20	0.35	**1.8E-05**
75-15-0	Carbon disulfide	2	2	ug/L	OW-041	1/20	1000	EPA-RSL	0/20	0.00	---
56-23-5	Carbon tetrachloride	91	91	ug/L	OW-094-R	1/20	5	MCL/RIDEM-GA	1/20	**16.62**	**3.5E-04**
108-90-7	Chlorobenzene	1	3	ug/L	OW-101-R	2/20	100	MCL/RIDEM-GA	0/20	0.02	---
75-00-3	Chloroethane	2	61	ug/L	OW-112-R	4/20	21000	EPA-RSL	0/20	---	---
67-66-3	Chloroform	1	1	ug/L	OW-112-R	1/20	80	MCL*	1/20	0.01	9.3E-07
156-59-2	cis-1,2-Dichloroethylene	1	1700	ug/L	OW-094-R	8/20	70	MCL/RIDEM-GA	1/20	**21.74**	---
60-29-7	Diethyl ether	4	130	ug/L	OW-041	8/20	7300	EPA RSLs	0/20	0.08	---
100-41-4	Ethylbenzene	1	78	ug/L	OW-101-R	4/20	700	MCL/RIDEM-GA	0/20	0.10	**2.6E-05**
103-65-1	Isopropylbenzene	2	21	ug/L	OW-101-R	3/20	NL	MCL/RIDEM-GA	--	0.03	---
75-09-2	Methylene chloride	13	13	ug/L	OW-112-R	1/20	5	MCL/RIDEM-GA	1/20	0.03	**2.9E-06**
127-18-4	Tetrachloroethylene	0.8	17	ug/L	OW-112-R	7/20	5	MCL/RIDEM-GA	4/20	0.22	**2.7E-04**
109-99-9	Tetrahydrofuran	19	830	ug/L	OW-112-R	8/20	NL	MCL/RIDEM-GA	--	---	---
108-88-3	Toluene	0.7	50	ug/L	OW-094-R	3/20	1000	MCL/RIDEM-GA	0/20	0.08	---
156-60-5	trans-1,2-Dichloroethylene	3	45	ug/L	OW-094-R	4/20	100	MCL/RIDEM-GA	0/20	0.29	---
79-01-6	Trichloroethylene	1	570	ug/L	OW-094-R	8/20	5	MCL/RIDEM-GA	4/20	---	**2.2E-04**

Table 4
Summary of 2008 Bedrock Groundwater VOCs Data and Risk Estimates
Davis Liquid Waste Superfund Site
Smithfield, Rhode Island

CAS Number	Chemical	Minimum Concentration [1]	Maximum Concentration [1]	Units	Location of Maximum Concentration	Detection Frequency	ARAR/TBC-Based Screening			Risk Summary[3]	
							Screening Value (ug/L)	Screening Value Source [2]	Frequency Above Screening Value	Total Hazard Index	Total Cancer Risk
75-01-4	Vinyl chloride	0.5	340	ug/L	OW-094-R	5/20	2	MCL/RIDEM-GA	4/20	14.49	7.3E-03
1330-20-7	Xylene (total)	4	66	ug/L	OW-094-R	4/20	10000	MCL/RIDEM-GA	0/20	0.04	---
									Total VOCs Risks	54	8.2E-03

Notes:

1. Data provided by ESS, Inc. in the *Draft Phase 4 Supplemental Field Investigation Report (Fall 2008)*, (ESS, 2009).
2. Screening Values derived from the following sources:
   - MCL - Federal Maximum Contaminant Level
   - MCL* - Federal Maximum Contaminant Level for total trihalomethanes
   - RIDEM-GA - Rhode Island Department of Environmental Management Rules and Regulations for the Investigation and Remediation of Hazardous Materials Releases; GA Groundwater Objectives. The GA Groundwater Objectives are identical to EPA Maximum Contaminant Levels (MCLs)
   - EPA RSLs - EPA Regional Screening Levels; Tapwater Scenario obtained from: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm
3. Risk summary = calculated risks based on residential drinking water exposures to the **maximum** detected concentrations. See CSM Addendum, Appendix B (Nobis 2009).

Exceedances of screening values highlighted by yellow background, and exceedance of E-06 cancer risk or HI of 1 highlighted by red text.

Table 5

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: On-Site Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk		
				Ingestion	Dermal plus Inhalation*	Exposure Routes Total*
Groundwater	Overburden Groundwater	Drinking Water Well	1,1-Dichloroethane	5.4E-06	5.4E-06	1.1E-05
			cis-1,2-Dichloroethylene	---	---	---
			Tetrachloroethylene	4.2E-04	4.2E-04	8.4E-04
			Trichloroethylene	9.3E-05	9.3E-05	1.9E-04
			Vinyl chloride	4.9E-03	4.9E-03	9.9E-03
			Bis(2-chloroethyl)ether			1.7E-04
			Arsenic			4.3E-04
			Manganese			---
			Aldrin			3.0E-06
Overburden Groundwater Risk Total =						1.2E-02
Groundwater	Overburden Groundwater	Drinking Water Well	1,1-Dichloroethane	1.4E-05	1.4E-05	2.7E-05
			Benzene	9.0E-06	9.0E-06	1.8E-05
			Tetrachloroethylene	1.4E-04	1.4E-04	2.7E-04
			Trichloroethylene	1.1E-04	1.1E-04	2.2E-04
			Vinyl chloride	3.7E-03	3.7E-03	7.3E-03
			Bis(2-chloroethyl)ether			2.1E-03
			Arsenic			3.9E-04
			Manganese			---
			Dieldrin			1.7E-06
Bedrock Groundwater Risk Total =						1.0E-02

Key
NE - Not evaluated.
N/A - Not applicable. Summing of bedrock and shallow groundwater risks is not applicable since remedial decisions are based on risk estimates for each aquifer.
-- Contaminant is not a carcinogen.
* - Exposure Route specific risks were not calculated. For VOCs, total risks were calculated quantitatively, assuming inhalation plus dermal risks to be equivalent to ingestion risks. For non-VOCs, risks were estimated from a ratio of site data to EPA Regional screening levels, which were developed to include ingestion and inhalation pathways.

Table 6

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: On-Site Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient		
					Ingestion	Dermal plus Inhalation*	Exposure Routes Total*
Groundwater	Overburden Groundwater	Drinking Water Well	1,1-Dichloroethane	N/A	0.02	0.02	0.04
			cis-1,2-Dichloroethylene	N/A	2.5	2.5	5.0
			Tetrachloroethylene	Liver	0.33	0.33	0.7
			Trichloroethylene	---	---	---	---
			Vinyl chloride	Liver	9.8	9.8	19.6
			Bis(2-chloroethyl)ether	---			---
			Arsenic	Skin			NE
			Manganese	Nervous system			5.4
			Aldrin	Liver			---
Overburden Groundwater Hazard Index Total =							30.8
Liver Hazard Index =							20.3
Skin Hazard Index =							NE
Nervous System Hazard Index =							5.4
Groundwater	Overburden Groundwater	Drinking Water Well	1,1-Dichloroethane	N/A	0.05	0.05	0.1
			Benzene	Blood	0.2	0.2	0.4
			Tetrachloroethylene	Liver	0.1	0.1	0.2
			Trichloroethylene	---	---	---	---
			Vinyl chloride	Liver	7.2	7.2	14.5
			Bis(2-chloroethyl)ether	---			---
			Arsenic	Skin			NE
			Manganese	Nervous system			9.1
			Dieldrin	Liver			---
Bedrock Groundwater Hazard Index Total =							24.2
Blood Hazard Index =							0.4
Liver Hazard Index =							14.7
Skin Hazard Index =							NE
Nervous System Hazard Index =							9.1

Key
NE - Not evaluated.
N/A - Toxicity criteria are not available to quantitatively address this route of exposure
-- No primary target organ information available.
* -Exposure Route specific risks were not calculated. For Vocs, total risks were calculated quantitatively, assuming inhalation plus dermal risks to be equivalent to ingestion risks. For non-VOCs, risks were estimated from a ratio of site data to EPA Regional screening levels, which were developed to include ingestion and inhalation pathways.

Table 8

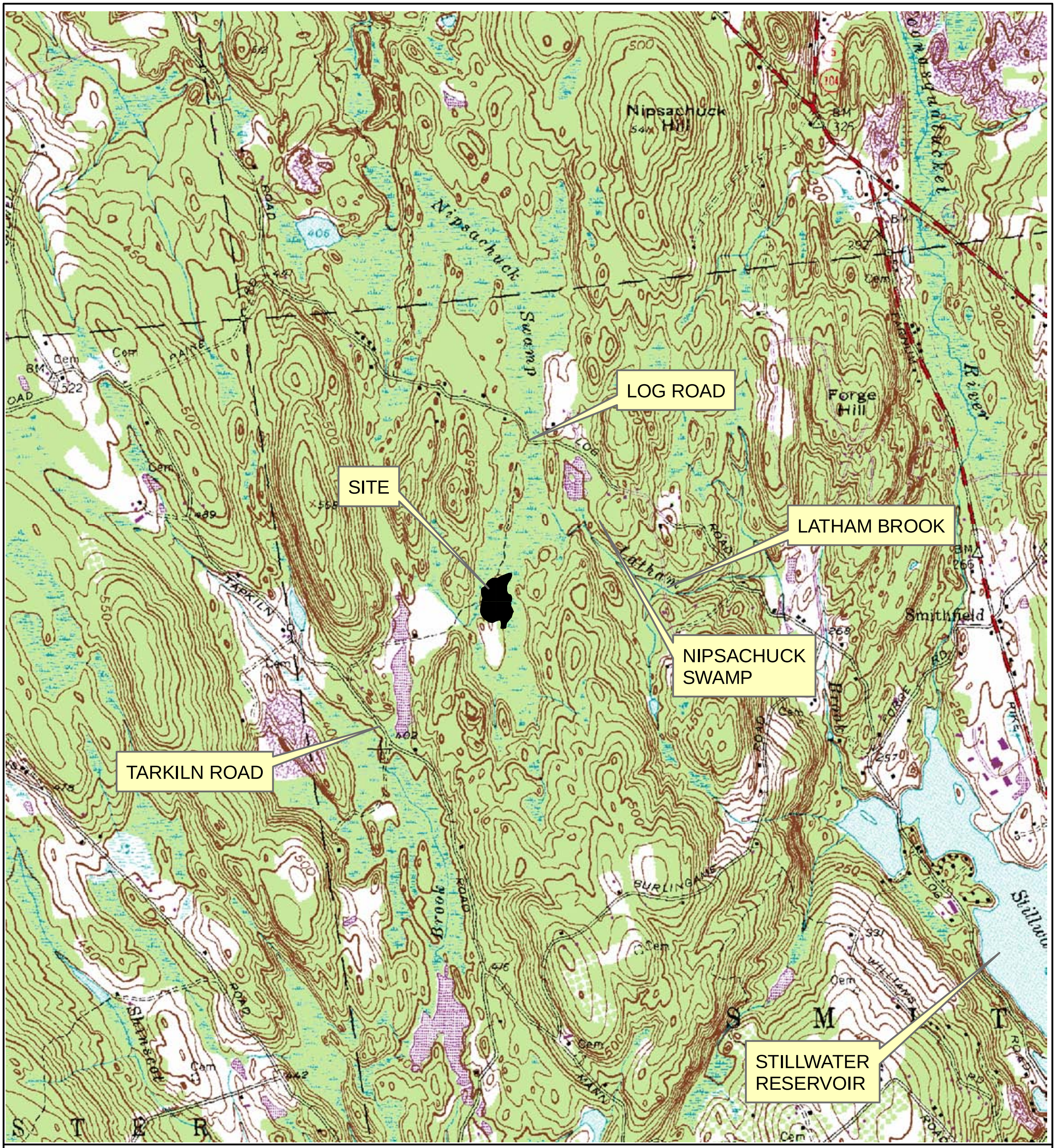
Principal Threats, Concentrations, and Receptors

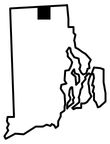
Source Media	Affected Media	Contaminant(s)	Reasons	Concentration Range (positive detects)	Receptors and Primary Threats	Actions to be Taken
Contaminated saturated soil (plume core in former Source Area)	Groundwater	VOCs 1,1-dichloroethane benzene cis-1,2-dichloroethene tetrachloroethene trichloroethene vinyl chloride SVOCs bis(2-chloroethyl)ether Pesticides aldrin dieldrin Metals arsenic manganese	Toxicity	 74 - 660 µg/L 0.7 – 11 µg/L 0.8 – 390 µg/L 0.8 – 52 µg/L 1 – 570 µg/L 4 -460 µg/L 3 - 25 µg/L 0.0018 – 0.012 µg/L 0.0016 - 0.0072 µg/L 11.8 – 17.6 µg/L 13.3 – 7960 µg/L	Future residents Contaminated groundwater contact, ingestion, and inhalation	In-situ chemical and biological treatment (VOCs, SVOCs), institutional controls, natural attenuation (SVOCs, pesticides, metals) and long-term monitoring.

Abbr: µg/L – microgram/liter

FIGURES

2010 RECORD OF DECISION AMENDMENT
DAVIS LIQUID WASTE SUPERFUND SITE
SMITHFIELD, RHODE ISLAND





Quadrangle Location

USGS TOPOGRAPHIC MAP

GEORGIAVILLE, RHODE ISLAND

1954; (Photo-revised 1970, 1975)

APPROXIMATE SCALE
1" = 2,000 FEET

FIGURE 1	DAVIS LIQUID WASTE SITE SMITHFIELD, RHODE ISLAND LOCUS PLAN	Nobis Nobis Engineering, Inc. 585 Middlesex Street Lowell, MA 01851 (978) 683-0891 www.nobisengineering.com	DATE: 09/27/10 REV. 00 PROJECT NO. 80028 PREPARED BY: D. McGRATH CHECKED BY: L. CHU	N

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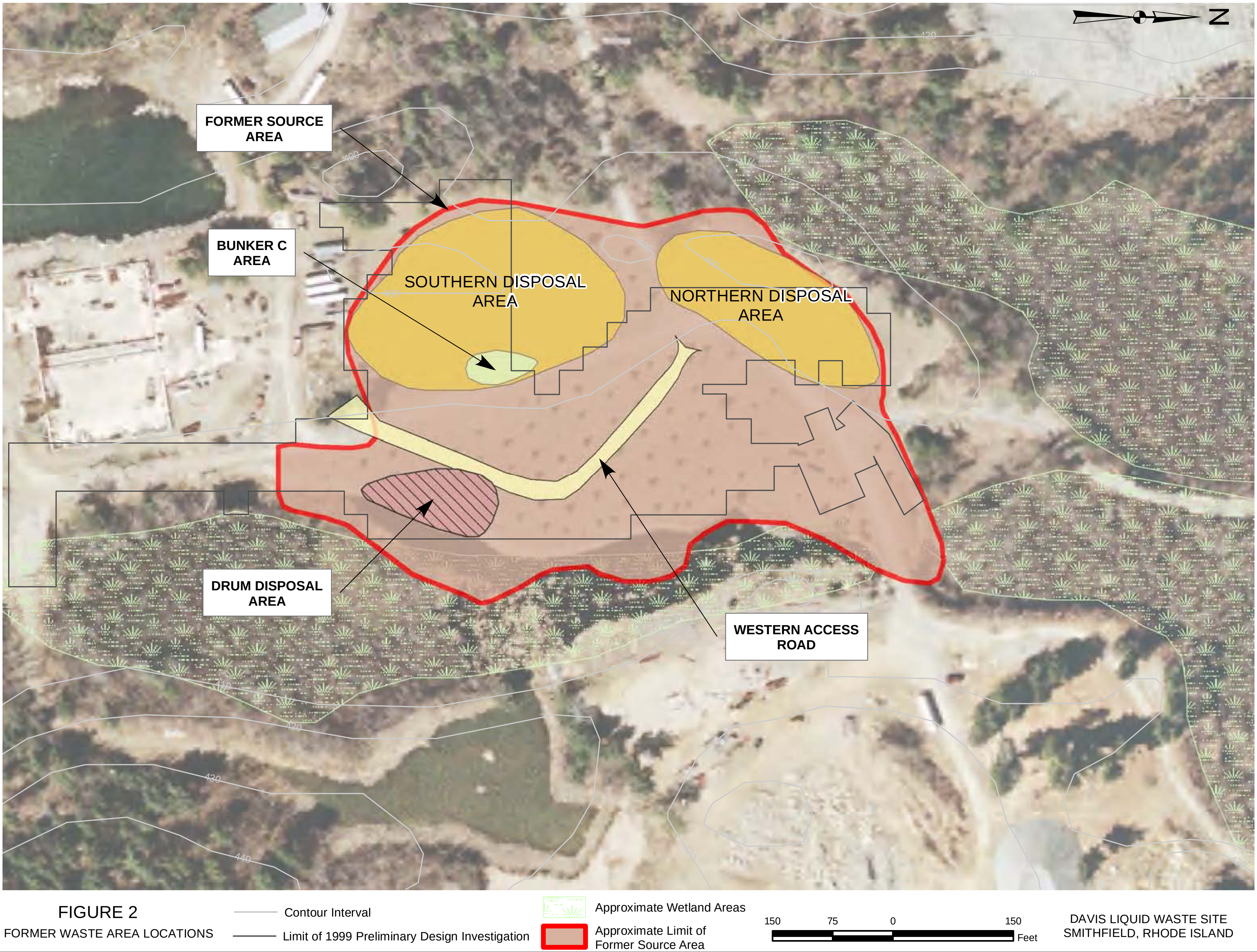


FIGURE 2
FORMER WASTE AREA LOCATIONS

DAVIS LIQUID WASTE SITE
SMITHFIELD, RHODE ISLAND

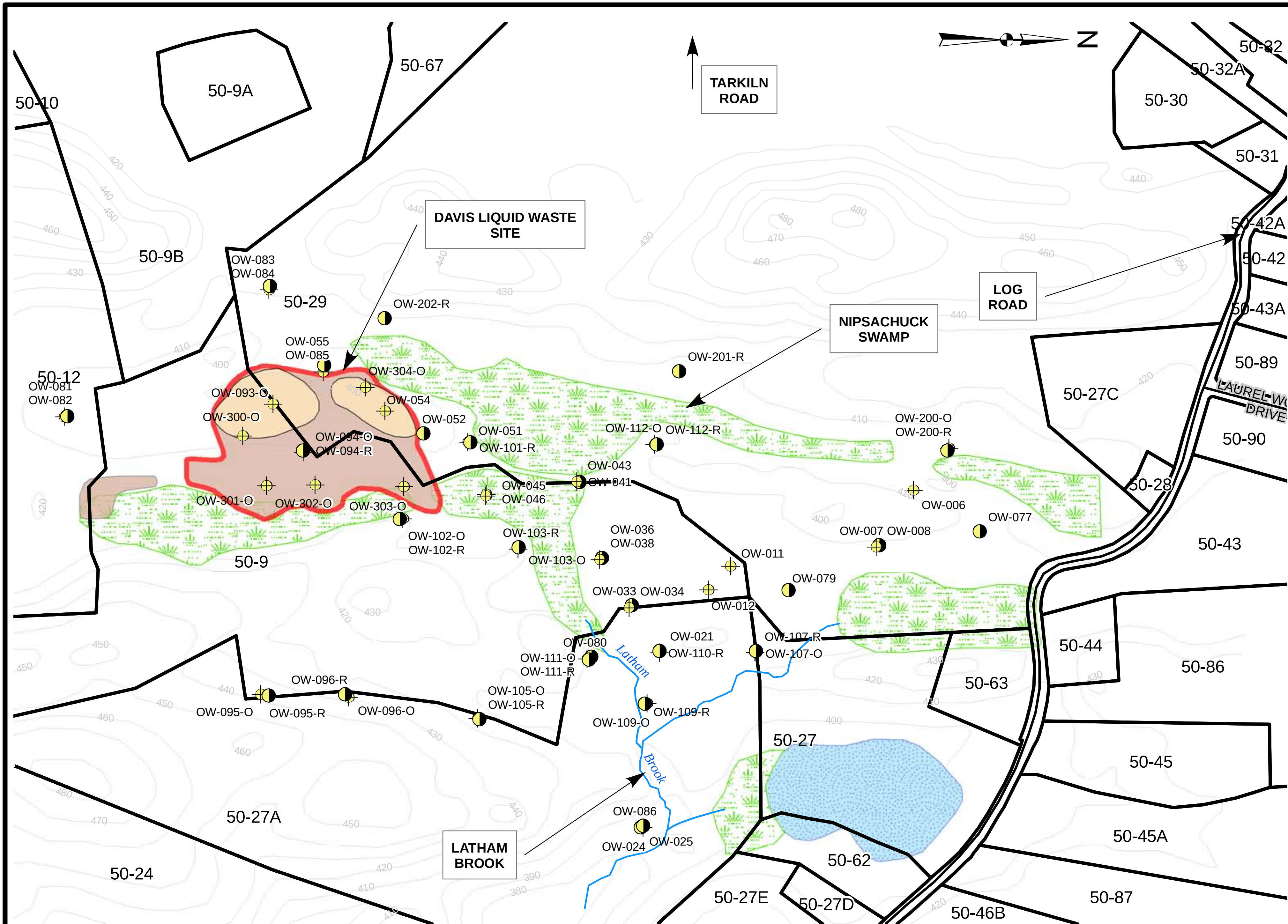


FIGURE 3

SITE AND SURROUNDING AREA

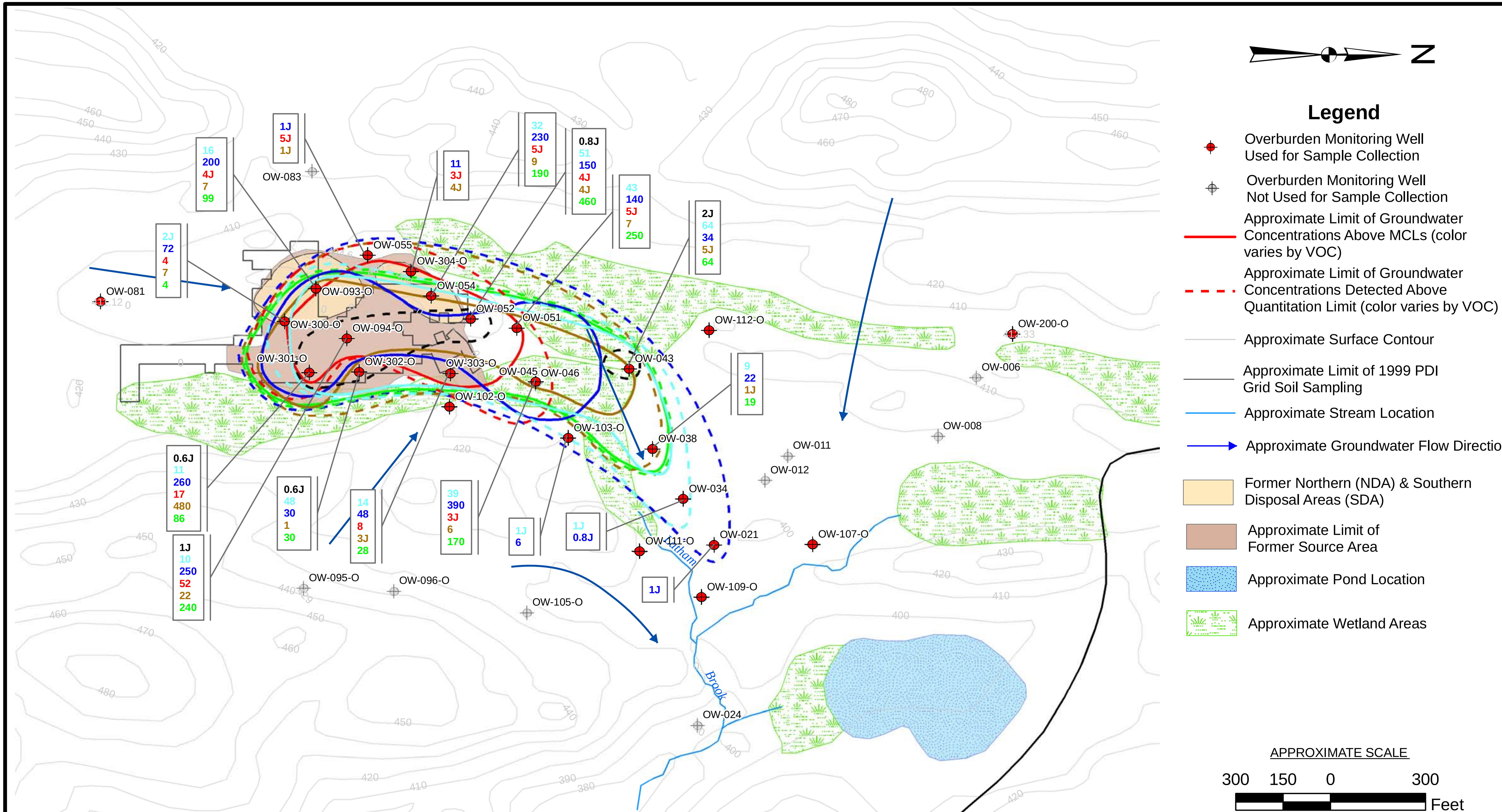
Overburden Monitoring Well

Bedrock Monitoring Well

50-87 Approximate Lot Boundary
Assessor's Map 18 Lot Nos. Shown

400 200 0 400 Feet

DAVIS LIQUID WASTE SITE
SMITHFIELD, RHODE ISLAND



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NOTES:
1. Surface contours based on Round 6 Report (ESS, 2007).
2. Limit of disposal areas are based on Remedial Action Report (LEA, 2001).
3. VOC concentration interpretations based on groundwater data collected during ESS' Phase 4 monitoring event in October 2008 (ESS, 2009).
4. 1,1-Dichloroethane does not have an MCL value. EPA Regional Screening Concentration for the Tapwater Scenario of 2.4 ug/L was used for screening.
Maximum Contaminant Level (MCL) and Regional Screening Level (RSL) values obtained from http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

Substance	MCL	RSL
Benzene	5	0.41
1,1-Dichloroethane	--	2.4
cis-1,2-Dichloroethene	70	370
Tetrachloroethene	5	0.11
Tichloroethene	5	1.7
Vinyl Chloride	2	0.016

VOC Data Color Scheme
All data in ug/L

11	Benzene
32	1,1-Dichloroethane
230	cis-1,2-Dichloroethene
5J	Tetrachloroethene
9	Trichloroethene
190	Vinyl Chloride

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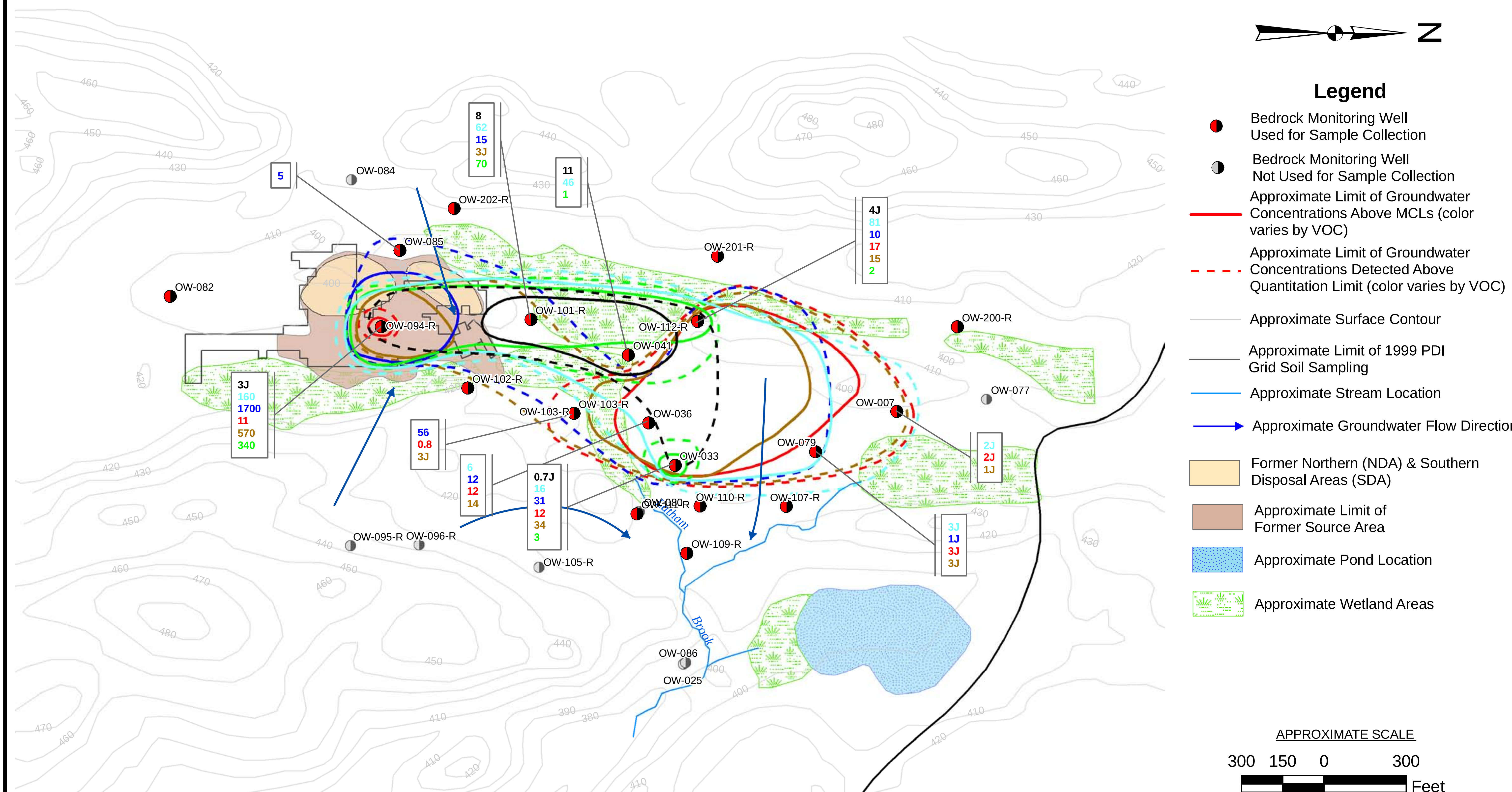
FIGURE 4

EXTENT OF 2008 VOCs IN OVERBURDEN GROUNDWATER
DAVIS LIQUID WASTE SITE
SMITHFIELD, RHODE ISLAND

PREPARED BY: DFM	CHECKED BY: LC
PROJECT NO. 80028	DATE: 09/27/10 Rev. 00



NOTES:
1. Surface contours based on Round 6 Report (ESS, 2007).
2. Limit of disposal areas are based on Remedial Action Report (LEA, 2001).
3. VOC concentration interpretations based on groundwater data collected during ESS' Phase 4 monitoring event in October 2008 (ESS, 2009).
4. 1,1-Dichloroethane does not have an MCL value. EPA Regional Screening Concentration for the Tapwater Scenario of 2.4 ug/L was used for screening.
Maximum Contaminant Level (MCL) and Regional Screening Level (RSL) values obtained from http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

Substance	MCL	RSL
Benzene	5	0.41
1,1-Dichloroethane	--	2.4
cis-1,2-Dichloroethene	70	370
Tetrachloroethene	5	0.11
Tichloroehtene	5	1.7
Vinyl Chloride	2	0.016

VOC Data Color Scheme
All data in ug/L

11	Benzene
32	1,1-Dichloroethane
230	cis-1,2-Dichloroethene
5J	Tetrachloroethene
9	Trichloroethene
190	Vinyl Chloride

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FIGURE 5

EXTENT OF 2008 VOCs IN BEDROCK GROUNDWATER
DAVIS LIQUID WASTE SITE
SMITHFIELD, RHODE ISLAND

PREPARED BY: DFM | CHECKED BY: LC
PROJECT NO. 80028 | DATE: 09/27/10 Rev. 00

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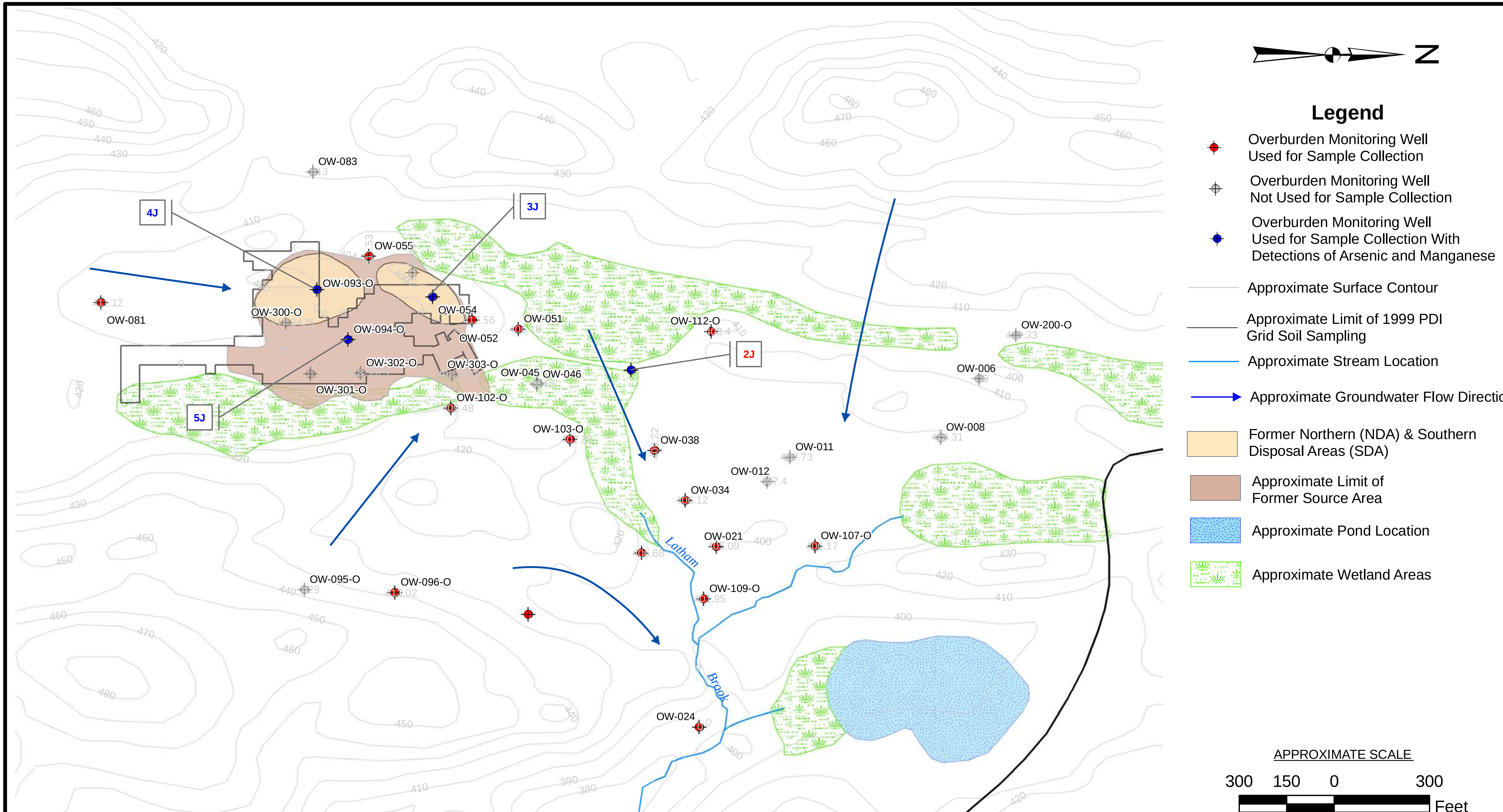

NOTES:
1. Surface contours based on Round 6 Report (ESS, 2007).
2. Limit of disposal areas are based on Remedial Action Report (LEA, 2001).
3. SVOC data obtained from Spring 2003 round of groundwater sampling.
4. Regional Screening Levels (RSL) obtained from http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

Substance	MCL	RSL
bis(2-Chloroethyl)ether	--	0.012
Naphthalene	--	0.14

SVOCs Data Color Scheme
All data in ug/L

25 bis(2-Chloroethyl)ether
6J Naphthalene

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FIGURE 6

EXTENT OF SPRING 2003 SVOCS IN OVERBURDEN GROUNDWATER
DAVIS LIQUID WASTE SITE
SMITHFIELD, RHODE ISLAND

PREPARED BY: DFM | CHECKED BY: LC
PROJECT NO. 80028 | DATE: 09/27/10 Rev. 00

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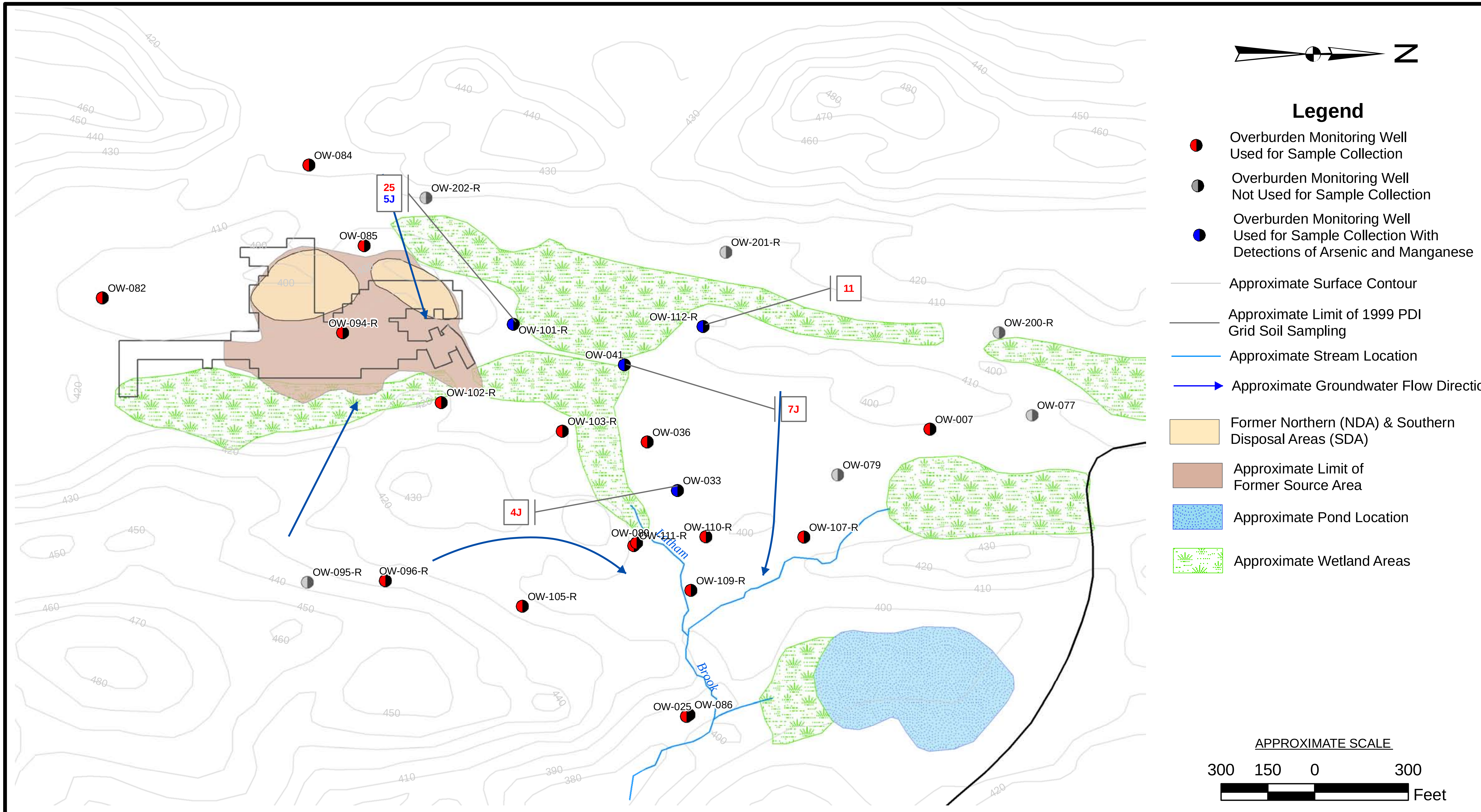

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NOTES:
1. Surface contours based on Round 6 Report (ESS, 2007).
2. Limit of disposal areas are based on Remedial Action Report (LEA, 2001).
3. SVOC data obtained from Spring 2003 round of groundwater sampling.
4. Regional Screening Levels (RSL) obtained from
http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm

Substance	MCL	RSL
bis(2-Chloroethyl)ether	--	0.012
Naphthalene	--	0.14

SVOCs Data Color Scheme
All data in ug/L

25 bis(2-Chloroethyl)ether
6J Naphthalene

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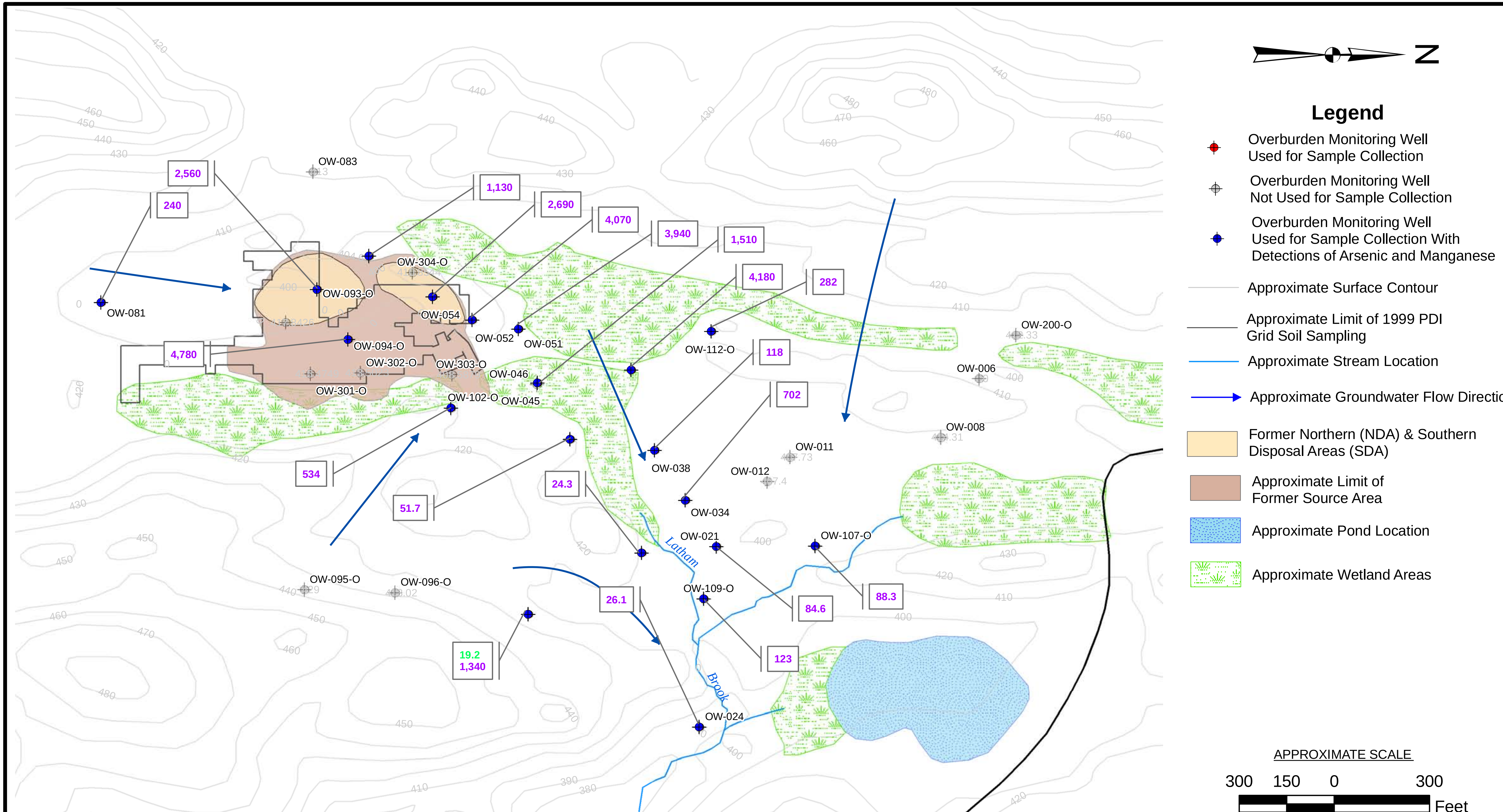
FIGURE 7

EXTENT OF SPRING 2003 SVOCS IN BEDROCK GROUNDWATER
DAVIS LIQUID WASTE SITE
SMITHFIELD, RHODE ISLAND

PREPARED BY: DFM	CHECKED BY: LC
PROJECT NO. 80028	DATE: 09/27/10 Rev. 00



NOTES:
1. Surface contours based on Round 6 Report (ESS, 2007).
2. Limit of disposal areas are based on Remedial Action Report (LEA, 2001).
3. Arsenic and manganese data obtained from Fall 2004 round of groundwater sampling.
4. Maximum Contaminant Limit (MCL) and Regional Screening Level (RSL) values obtained from http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm
5. MCL value cited for Manganese is a secondary drinking water value, not a primary MCL.

Substance	MCL	RSL
Arsenic	10	0.045
Manganese	50	880

Metals Data Color Scheme
All data in ug/L

19.2 Arsenic
1,340 Manganese

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FIGURE 8

EXTENT OF FALL 2004 METALS IN OVERBURDEN GROUNDWATER
DAVIS LIQUID WASTE SITE
SMITHFIELD, RHODE ISLAND

PREPARED BY: DFM | CHECKED BY: LC
PROJECT NO. 80028 | DATE: 09/27/10 Rev. 00

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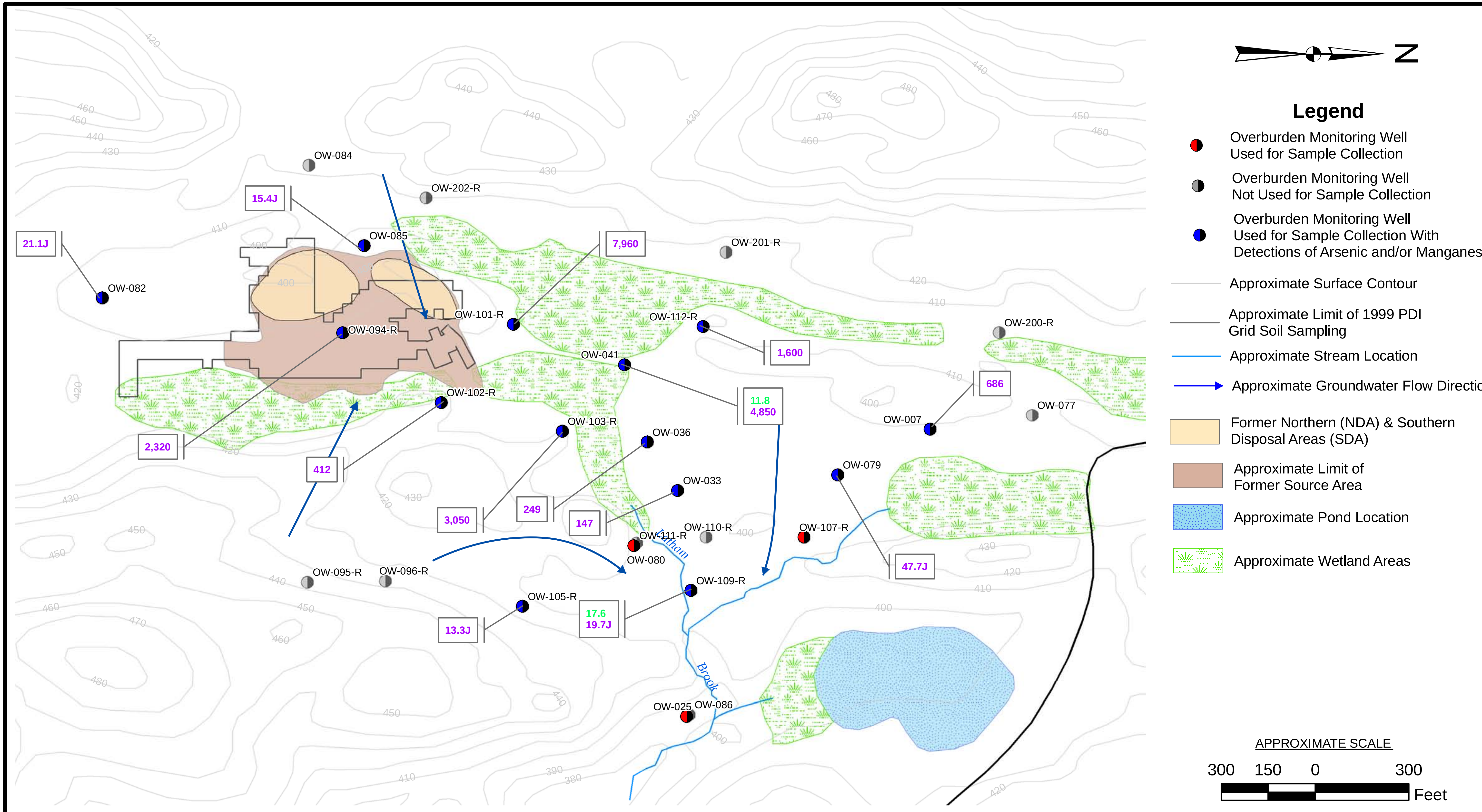

NOTES:
1. Surface contours based on Round 6 Report (ESS, 2007).
2. Limit of disposal areas are based on Remedial Action Report (LEA, 2001).
3. Arsenic and manganese data obtained from Fall 2004 round of groundwater sampling.
4. Maximum Contaminant Limit (MCL) and Regional Screening Level (RSL) values obtained from http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm
5. MCL value cited for Manganese is a secondary drinking water value, not a primary MCL.

Substance	MCL	RSL
Arsenic	10	0.045
Manganese	50	880

Metals Data Color Scheme
All data in ug/L

19.2 — Arsenic
1,340 — Manganese

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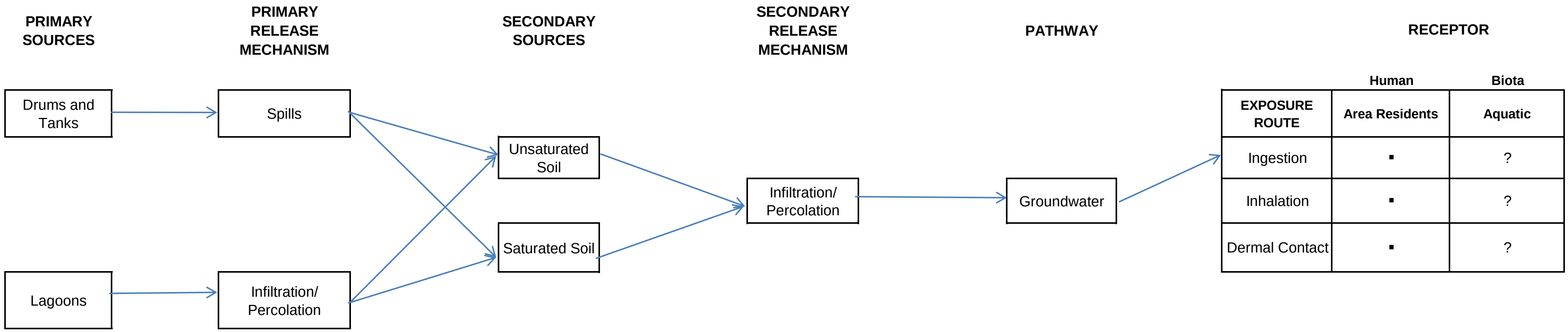
FIGURE 9

EXTENT OF FALL 2004 METALS IN BEDROCK GROUNDWATER
DAVIS LIQUID WASTE SITE
SMITHFIELD, RHODE ISLAND

PREPARED BY: DFM	CHECKED BY: LC
PROJECT NO. 80028	DATE: 09/27/10 Rev. 00

FIGURE 10
CONCEPTUAL SITE MODEL FOR CONTAMINATED GROUNDWATER
DAVIS LIQUID WASTE SITE



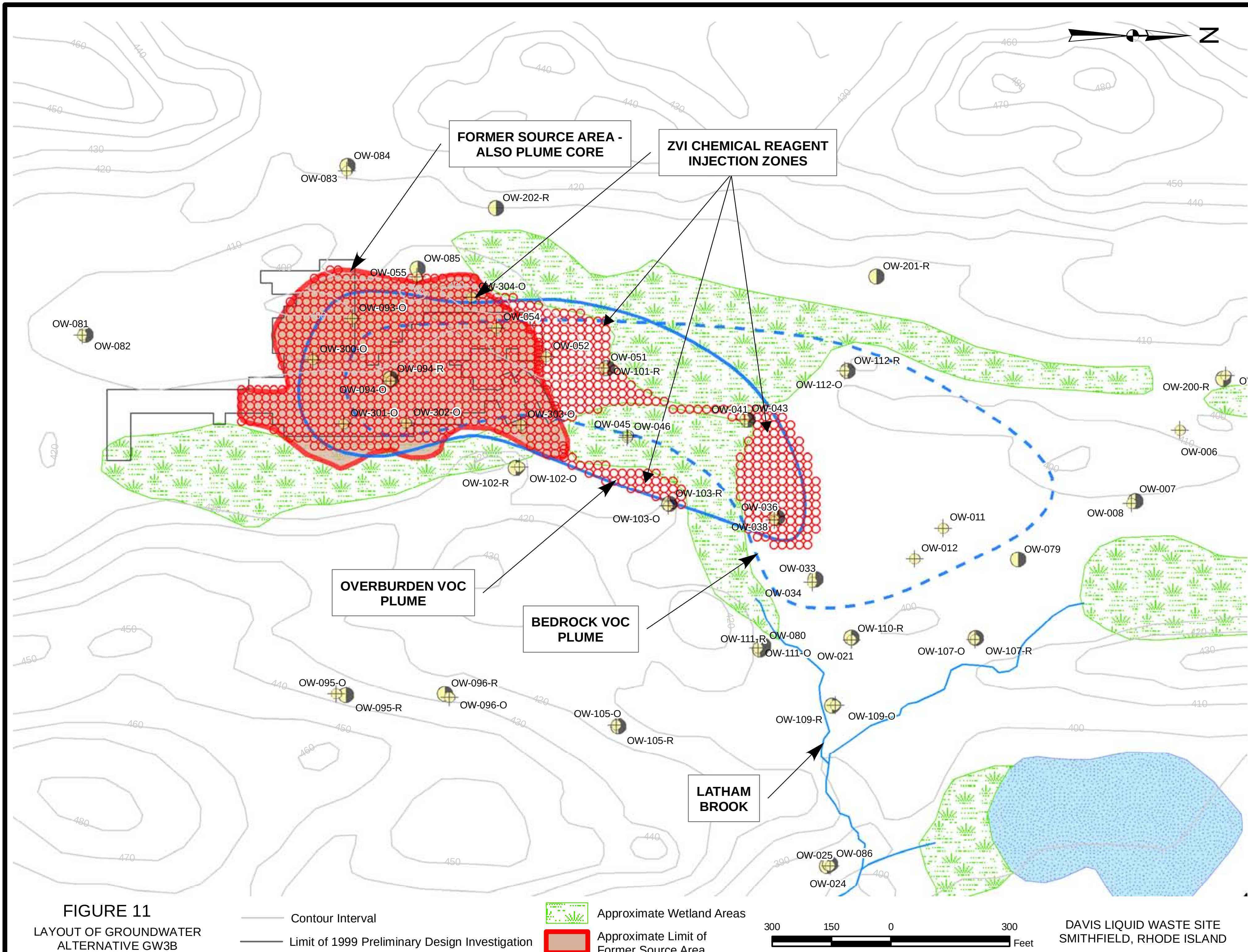
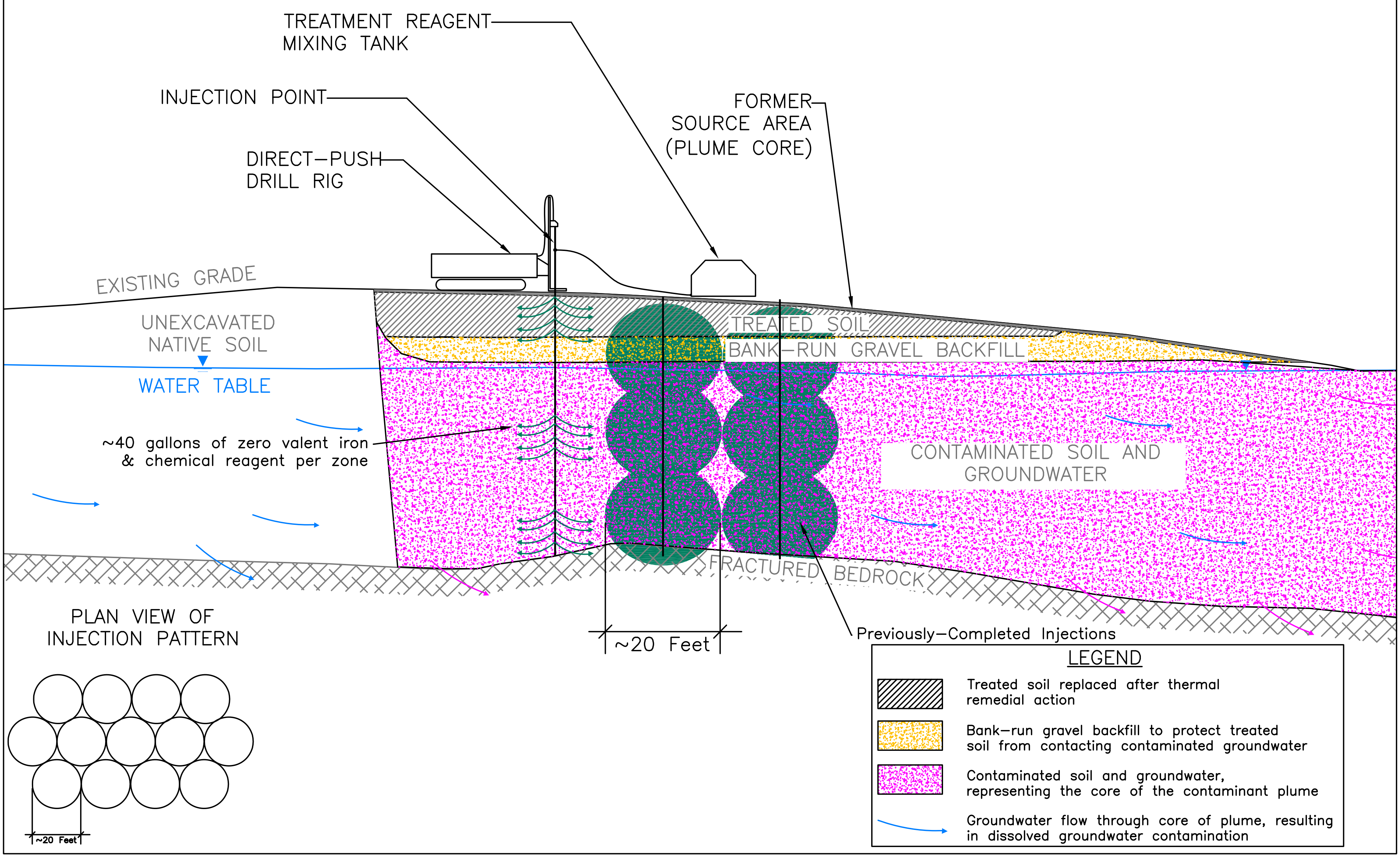


FIGURE 11

LAYOUT OF GROUNDWATER ALTERNATIVE GW3B

DAVIS LIQUID WASTE SITE
SMITHFIELD, RHODE ISLAND

FIGURE 12
AMENDED REMEDY
CONCEPTUAL IN-SITE CHEMICAL AND ENHANCED BIODEGRADATION INJECTIONS



APPENDIX A

APPLICABLE OR RELEVANT

AND

APPROPRIATE REQUIREMENTS

2010 RECORD OF DECISION AMENDMENT

DAVIS LIQUID WASTE SUPERFUND SITE

SMITHFIELD, RHODE ISLAND

Table A-1
Chemical-Specific ARARs and TBCs
Record of Decision Amendment
Davis Liquid Waste Superfund Site
Smithfield, Rhode Island

Requirement	Status	Requirement Synopsis	Action To Attain ARAR
Federal Regulatory Requirements			
Safe Drinking Water Act - Maximum Contaminant Levels (MCLs) (40 CFR 141.11-141.16) and Maximum Contaminant Level Goals (MCLGs) (40 CFR 141.50-141.55	Relevant and Appropriate	MCLs and non-zero MCLGs have been promulgated for a number of common organic and inorganic contaminants to regulate the concentration of contaminants in public drinking water supply systems. MCLs and non-zero MCLGs may be relevant and appropriate for the Davis Liquid Waste Site groundwater because the aquifer underlying the Site and downgradient is a drinking water supply.	MCLs and non-zero MCLGs were used to derive groundwater remediation goals for human health protection. In-situ chemical reduction will decrease contaminant levels to MCLs and non-zero MCLGs in the former Source Area and the overburden plume and will comply with this ARAR.

Table A-1
Chemical-Specific ARARs and TBCs
Record of Decision Amendment
Davis Liquid Waste Superfund Site
Smithfield, Rhode Island

Requirement	Status	Requirement Synopsis	Action To Attain ARAR
Federal Criteria, Advisories, and Guidance			
National Recommended Water Quality Criteria - Clean Water Act Section 304(a)(1)	Relevant and Appropriate	Recommended freshwater and salt water criteria, for acute and chronic conditions, for approximately 150 pollutants that are protective of aquatic life and human health.	These guidelines were used to assess whether water quality in the adjacent wetlands and Latham Brook may have been affected by contaminated groundwater discharges. Under this alternative, action will be taken to the extent practical to limit the discharge of contaminated groundwater to surface water and wetlands by treating groundwater contaminants in the plume core and the overburden plume. Monitoring will be conducted to assess effectiveness of this alternative.
EPA Risk Reference Doses (RFDs) and EPA Carcinogen Assessment Group Potency Factors	To Be Considered	A reference dose is an estimated daily oral exposure to a contaminant by humans that is unlikely to have an appreciable risk of non-carcinogenic effects. The cancer potency factor (CPF) is used as qualitative weight-of-evidence judgment as to the likelihood of a chemical being a carcinogen.	RFDs and CPFs were used to evaluate non-carcinogenic and carcinogenic health risks associated with site–related contaminants, and were used to develop media-specific remediation goals.
EPA Carcinogenicity Slope Factors (CSFs)	To Be Considered	Slope factors are developed by EPA from health effects assessments and provide the most current information on cancer risks caused by exposure to contaminants.	CSFs were used to evaluate carcinogenic health risks associated with site–related contaminants, and were used to develop media-specific remediation goals.

Table A-1
Chemical-Specific ARARs and TBCs
Record of Decision Amendment
Davis Liquid Waste Superfund Site
Smithfield, Rhode Island

Requirement	Status	Requirement Synopsis	Action To Attain ARAR
EPA Regional Screening Levels (RSLs) for Chemical Contamination at Superfund Sites (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm)	To Be Considered	Provides risk-based screening levels for various environmental media, for residential and industrial exposure scenarios, and for leaching of contaminants to groundwater.	RSLs were used to evaluate non-carcinogenic and carcinogenic health risks associated with site–related contaminants. The Amended Remedy will be consistent with this TBC in the former Source Area and the overburden plume because in-situ chemical reduction will decrease contaminant concentrations to safe levels.
State Regulatory Requirements			
Rhode Island Rules and Regulation for the Investigation and Remediation of Hazardous Materials Releases (DEM-DSR-01-93) (8.02 (B)(ii))	Applicable	The Method 1 Soil Objectives Leachability Criteria (LC) identify allowable chemical concentrations that when leached from soil, would be protective of human health and the environment.	The Amended Remedy will attain this ARAR by treating contaminated soil in the former Source Area using in-situ chemical reduction.
Rhode Island Rules and Regulation for the Investigation and Remediation of Hazardous Materials Releases (DEM-DSR-01-93) (8.03(B)(i))	Applicable	Groundwater that is classified as GA/GAA, categorized as suitable for drinking without treatment, and contains hazardous substances will need to be remediated to the GA Groundwater Objectives and the Groundwater Quality Regulations.	The Amended Remedy will attain this ARAR in the former Source Area and the overburden aquifer in the short term through remediation using in-situ chemical reduction.

Table A-1
Chemical-Specific ARARs and TBCs
Record of Decision Amendment
Davis Liquid Waste Superfund Site
Smithfield, Rhode Island

Requirement	Status	Requirement Synopsis	Action To Attain ARAR
Rhode Island Rules and Regulation for Groundwater Quality (Mar 2005)	Applicable	Defines requirements to protect and restore groundwater quality to drinking water use or beneficial uses. Provides classification of groundwater throughout the state. Sets groundwater remediation objectives and chemical-specific numerical standards by environmental medium.	The Amended Remedy will attain this ARAR in the former Source Area and the overburden plume in the short term through remediation using in-situ chemical reduction.
RIDEM Water Quality Regulations (Jul 2006, amended Dec 2009)	Applicable	Establishes requirements to protect surface water from pollutants that are detrimental to the value and use of this resource. Provide classification of water bodies for beneficial uses. Establishes allowable numerical criteria, based on classification, for the pollutants under specified flow conditions.	These standards were used to assess whether water quality in the adjacent wetlands and Latham Brook may have been affected by contaminated groundwater discharges. Under this alternative, action will be taken to the extent practical to limit the discharge of contaminated groundwater to surface water and wetlands by treating groundwater contaminants in the plume core and in the overburden plume. Monitoring will be conducted to assess the effectiveness of this alternative.

Table A-2
Location-Specific ARARs and TBCs
Record of Decision Amendment
Davis Liquid Waste Superfund Site
Smithfield, Rhode Island

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO ATTAIN ARAR
Federal Regulatory Requirements			
Protection of Wetlands (Executive Order 11990), Statement of Procedures on Floodplain Management and Wetland Protection (June 5, 1979)	TBC	Federal agencies are required to avoid undertaking or providing assistance for new construction located in wetlands unless there is no practicable alternative and the proposed action includes all practicable measures to minimize harm to wetlands that may result from such use.	Wetlands have been identified adjacent to the former Source Area and in downgradient areas. Well installation (for monitoring or injection) will occur in or near wetlands. Because elevated concentrations of contaminants are in or beneath the wetlands, there is no practicable alternative to performing the required activities. Actions will be taken to minimize potential impacts to the wetlands and damage will be mitigated. Implementation of in-situ chemical treatment will not be performed in the wetland areas, and the Amended Remedy will comply with this TBC.
Floodplain Management (Executive Order 11988), Statement of Procedures on Floodplain Management and Wetland Protection (June 5, 1979)	TBC	Federal agencies are required to avoid impacts associated with the occupancy and modification of a floodplain and avoid support of floodplain development wherever there is a practicable alternative.	Floodplains have been identified in portions of the Site (but not the Source Area). This alternative will be implemented outside of the floodplain. The Amended Remedy will comply with this TBC.

Table A-2
Location-Specific ARARs and TBCs
Record of Decision Amendment
Davis Liquid Waste Superfund Site
Smithfield, Rhode Island

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO ATTAIN ARAR
Clean Water Act (33 U.S.C. 1251 *et seq.*); Section 404, Compensatory Mitigation for Losses of Aquatic Resources (40 CFR 230)	Applicable	Outlines requirements for the discharge of dredged or fill materials into surface waters including wetlands. Such discharges are not allowed if there are practicable alternatives with less adverse impacts.	Wetlands have been identified adjacent to the former Source Area and in downgradient areas. Well installation (for monitoring or injection) will occur in or near wetlands. Because elevated concentrations of contaminants are in or beneath the wetlands, there is no practicable alternative to performing the required activities. Actions will be taken to minimize potential impacts to the wetlands and damage will be mitigated. Implementation of in-situ chemical treatment will not be performed in the wetland areas, and the Amended Remedy will comply with this ARAR.
Endangered Species Act (16 U.S.C. 1531 et seq.; 40 CFR 6.302(h))	Applicable, if endangered species are identified	This statute requires that federal agencies avoid activities that jeopardize threatened or endangered species or adversely modify habitats essential to their survival. Mitigation measures should be considered if a listed species or habitat may be jeopardized.	As part of the pre-design investigation, an evaluation for endangered or threatened species will be performed. If these species are identified onsite, work will be conducted to avoid jeopardizing the listed species or adversely affecting their habitats. The Amended Remedy will comply with this ARAR.
National Historic Preservation Act (16 U.S.C. 470 et seq., 40 CFR 800)	Applicable, if such resources are identified	Pursuant to Sections 106 and 110(f) of the NHPA, as amended, CERCLA response actions are required to take into account the effects of the response activities on any historic property included or eligible for inclusion on the National Register of Historic Places.	If significant historic properties (including prehistoric or archaeological) are identified, then the requirements of the NHPA and its implementing regulations will be followed. The Amended Remedy will comply with this ARAR.

Table A-2
Location-Specific ARARs and TBCs
Record of Decision Amendment
Davis Liquid Waste Superfund Site
Smithfield, Rhode Island

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO ATTAIN ARAR
State Regulatory Requirement			
Rules and Regulations Governing the Administration and Enforcement of the Fresh Water Wetlands Act	Applicable	These regulations outline requirements to preserve, protect, and restore the integrity of fresh water wetlands. Governs increases or deceases of runoff or groundwater that discharges into wetlands. Preference for avoidance or minimization of wetland alterations. If alternations are unavoidable, then mitigation will be required.	Installation of monitoring wells is unavoidable. Actions will be taken to minimize potential impacts and mitigate damage.
RI Historic Preservation Act (RI General Laws 42-45)	Applicable, if such resources are identified	This statute adopts the federal National Historic Preservation Act (and other laws)	If significant historic properties (including prehistoric or archaeological) are identified, then the requirements of this statute will be followed. The Amended Remedy will comply with this ARAR.

Table A-3
Action-Specific ARARs and TBCs
Record of Decision Amendment
Davis Liquid Waste Superfund Site
Smithfield, Rhode Island

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO ATTAIN ARAR
Federal Regulatory Requirements			
Underground Injection Control Regulations (40 CFR Parts 144, 145, 146, and 147)	Applicable	These regulations provide compliance standards for treatment facilities that inject wastes underground. The injection of fluids that allow contaminant migration into water supply aquifers resulting in exceedances of drinking water criteria or risk-based criteria is prohibited.	Injection of chemicals for in-situ treatment of contaminated groundwater under the Amended Remedy will be conducted in accordance with these regulations.
RCRA Groundwater Monitoring Requirements (42 U.S.C. 6901 et seq.) (40 CFR 264.94 and .95, subpart F)	Relevant and Appropriate	The regulation set requirements for groundwater monitoring at facilities that store, treat, or dispose of hazardous wastes. In-situ treatment is similar to the regulated activity.	A groundwater monitoring program will be implemented in accordance with these regulations; the Amended Remedy will comply with this ARAR.
RCRA Corrective Action Program(42 U.S.C. 6901 et seq.); (40 CFR 264.100)	Relevant and Appropriate	These regulations require that corrective actions be taken if the groundwater protection standard is exceeded. A monitoring program will be instituted to demonstrate and report the effectiveness of the corrective action.	If the implementation of in-situ chemical and biological treatment results in the exceedance of groundwater standards, corrective actions will be implemented

Table A-3
Action-Specific ARARs and TBCs
Record of Decision Amendment
Davis Liquid Waste Superfund Site
Smithfield, Rhode Island

REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO ATTAIN ARAR
State Regulatory Requirements			
Rhode Island Rules and Regulation for Groundwater Quality	Applicable	Sets requirements for monitoring well installation and abandonment, subsurface borings, wellhead protection, and methods for the determination of compliance.	All borings and wells will be completed in accordance with these requirements. The Amended Remedy will comply with this ARAR.
Rhode Island Underground Injection Control Program Rules and Regulations	Applicable	These regulations provide compliance standards for treatment facilities that inject wastes underground. The injection of fluids that allow contaminant migration into water supply aquifers resulting in exceedances of drinking water criteria or risk-based criteria is prohibited.	Injection of chemicals for in-situ treatment of groundwater contaminants will be conducted consistent with these regulations. The Amended Remedy will comply with this ARAR.
Rhode Island Air Pollution Control Regulation No. 1, Visible Emissions	Applicable	These standards prohibit emissions from any source equal to or greater than 20 percent opacity for a period or periods aggregating more than 3 minutes in any 1 hour.	All work will be conducted so that these requirements are met.
Rhode Island Air Pollution Control Regulation No. 5, Fugitive Emissions	Applicable	These regulations prohibit the generation of airborne particulate matter beyond the property line during construction activities or during vehicular transport of materials. Reasonable precautions are required to prevent fugitive dust emissions that exceed these requirements.	Work will be performed in accordance with these requirements.

APPENDIX B

ADMINISTRATIVE RECORD INDEX

2010 RECORD OF DECISION AMENDMENT

DAVIS LIQUID WASTE SUPERFUND SITE

SMITHFIELD, RHODE ISLAND

Davis Liquid Waste
NPL Site Administrative Record File
Record of Decision (ROD) Amendment

Operable Unit 2 - Groundwater

Index

ROD Amendment Signed September 2010
Released: October 2010

Prepared by
EPA New England
Office of Site Remediation & Restoration

Introduction to the Collection

This is the administrative record for the Davis Liquid Waste Superfund Site, Smithfield, Rhode Island, Operable Unit 2 - Groundwater, Record of Decision (ROD) Amendment, released October 2010. The file contains site-specific documents and a list of guidance documents used by EPA staff in selecting a response action at the Site.

This record includes the Record of Decision (ROD) Amendment Proposed Plan Administrative Record file distributed in June 2010. This record includes, by reference, the administrative record for the Davis Liquid Waste Record of Decision (ROD), issued September 29, 1987.

The administrative record file is available for review at:

EPA New England Office of
Site Remediation & Restoration
5 Post Office Sq., Suite 100 (OSRR 02-3)
Boston, MA 02109-3912
(by appointment)
617-918-1440 (phone)
617-918-0440 (fax)
www.epa.gov/region01/superfund/resource/records.htm

Greenville Public Library
573 Putnam Pike
Greenville, RI 02828
401-949-3630 (phone)
401-949-0530 (fax)
http://www.yourlibrary.ws

An administrative record file is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

Please note that the compact disc(s) (CD) containing this Administrative Record may include index data and other metadata (hereinafter collectively referred to as metadata) to allow the user to conduct index searches and key word searches across all the files contained on the CD. All the information that appears in the metadata, including any dates associated with creation of the indexing data, is not part of the Administrative Record for the Site under CERCLA and shall not be construed as relevant to the documents that comprise the Administrative Record. This metadata is provided as a convenience for the user and is not part of the Administrative Record.

Questions about this administrative record file should be directed to the EPA New England remedial project manager.

DAVIS LIQUID WASTE
AR Collection: 61612
OU 2 - ROD Amendment AR
AR Collection Index Report
For External Use

Phase 03: REMEDIAL INVESTIGATION (RI)

463014 **TECHNICAL MEMORANDUM FOR CONCEPTUAL SITE MODEL**

Author: NOBIS ENGINEERING INC
Addressee: US EPA REGION 1
Doc Type: REPORT
Doc Date: 02/01/2009 **# of Pages:** 100
File Break: 03.07

466803 **CONCEPTUAL SITE MODEL, TECHNICAL MEMORANDUM ADDENDUM (11/2/2009 TRANSMITTAL LETTER ATTACHED)**

Author: NOBIS ENGINEERING INC
Addressee: US EPA REGION 1
Doc Type: REPORT
Doc Date: 11/01/2009 **# of Pages:** 141
File Break: 03.07

Phase 04: FEASIBILITY STUDY (FS)

466801 **DRAFT FINAL RISK SUMMARY AND RISK SCREENING TECHNICAL MEMORANDUM (5/22/2008 TRANSMITTAL LETTER ATTACHED)**

Author: NOBIS ENGINEERING INC
Addressee: US EPA REGION 1
Doc Type: REPORT
Doc Date: 05/01/2008 **# of Pages:** 47
File Break: 04.04

466802 **EVALUATION OF NON-VOLATILE ORGANIC COMPOUNDS (NON-VOC) DATA**

Author: LIYANG CHU NOBIS ENGINEERING
Addressee: BYRON MAH US EPA REGION 1
Doc Type: CORRESPONDENCE
LETTER
Doc Date: 09/22/2009 **# of Pages:** 26
File Break: 04.02

DAVIS LIQUID WASTE
AR Collection: 61612
OU 2 - ROD Amendment AR
AR Collection Index Report
For External Use

Phase 04: FEASIBILITY STUDY (FS)

465086 **FOCUSED FEASIBILITY STUDY (FS), DAVIS LIQUID WASTE SUPERFUND SITE, SMITHFIELD, RHODE ISLAND**

Author: NOBIS ENGINEERING INC
Addressee: US EPA REGION 1
Doc Type: REPORT
FEASIBILITY STUDY (FS)

Doc Date: 05/01/2010 **# of Pages:** 290
File Break: 04.06

464464 **PROPOSED PLAN**

Author: US EPA REGION 1
Addressee:
Doc Type: PUBLIC INFORMATION
PROPOSED PLAN
REPORT

Doc Date: 06/02/2010 **# of Pages:** 19
File Break: 04.09

Phase 05: RECORD OF DECISION (ROD)

469058 **LETTER REGARDING COMMENTS ON PROPOSED PLAN**

Author: CAROL A AYALA NORTH SMITHFIELD (RI) RESIDENT
Addressee: BYRON MAH US EPA REGION 1
Doc Type: PUBLIC (AND OTHER) COMMENTS
LETTER
CORRESPONDENCE

Doc Date: 01/01/1111 **# of Pages:** 1
File Break: 05.03

295077 **LETTER TRANSMITTING THE RESULTS OF EPA AND RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT'S (RIDEM) REVIEW OF THE DRAFT PRE-DESIGN WORK PLAN (01/15/2001) AND THE DRAFT PROJECT OPERATIONS PLAN (01/18/2001)**

Author: NEIL HANDLER US EPA REGION 1
Addressee: PETER E NANGERONI ENVIRONMENTAL SCIENCE SERVICES INC
Doc Type: LETTER
CORRESPONDENCE

Doc Date: 04/03/2001 **# of Pages:** 21
File Break: 05.03

Phase 05: RECORD OF DECISION (ROD)

471012 **LETTER IN RESPONSE TO COMMENTS ON THE PRE-DESIGN WORK PLAN SUBMITTAL FOR THE PROJECT OPERATION PLAN (FULL YSI PRODUCT MANUAL NOT INCLUDED)**

Author: PETER E NANGERONI ENVIRONMENTAL SCIENCE SERVICES INC
Doc Date: 05/11/2001 **# of Pages:** 95
Addressee: NEIL HANDLER US EPA REGION 1
File Break: 05.03
Doc Type: CORRESPONDENCE
LETTER

295804 **LETTER REGARDING RESOLUTION OF OUTSTANDING COMMENTS ON THE PRE-DESIGN WORK PLAN (08/03/2001) AND THE PROJECT OPERATIONS PLAN (08/03/2001) SUBMITTALS**

Author: NEIL HANDLER US EPA REGION 1
Doc Date: 09/05/2001 **# of Pages:** 1
Addressee: PETER E NANGERONI ENVIRONMENTAL SCIENCE SERVICES INC
File Break: 05.03
Doc Type: LETTER
CORRESPONDENCE

295834 **FAX TRANSMITTAL OF LETTER REGARDING CLARIFICATION OF CORRESPONDENCE OF 09/05/2001 APPROVING PHASE 1 OF THE GROUND WATER STUDY PLAN**

Author: MICHAEL R DILLON MORGAN LEWIS & BOCKIUS
Doc Date: 09/17/2001 **# of Pages:** 2
Addressee: NEIL HANDLER US EPA REGION 1
File Break: 05.03
Doc Type: LETTER
CORRESPONDENCE

471010 **LETTER REGARDING PHASE 1 GROUNDWATER MONITORING PROGRAM**

Author: MATTHEW D BECKER ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Doc Date: 11/29/2001 **# of Pages:** 11
Addressee: PETER E NANGERONI ENVIRONMENTAL SCIENCE SERVICES INC
NEIL E HANDLER US EPA REGION 1
File Break: 05.03
Doc Type: LETTER
CORRESPONDENCE

Phase 05: RECORD OF DECISION (ROD)

471011 **LETTER REGARDING INSTALLATION OF PROPOSED WELLS OW-105 (O, R) (ACCEPTANCE OF ACCESS AGREEMENT CONDITIONS FORM ATTACHED)**

Author: PETER E NANGERONI ENVIRONMENTAL SCIENCE SERVICES INC
Addressee: NEIL E HANDLER US EPA REGION 1
Doc Type: LETTER
CORRESPONDENCE
Doc Date: 01/31/2003 **# of Pages:** 2
File Break: 05.03

471003 **EPA REVIEW OF DRAFT PHASE 2 WORK PLAN (01/29/2003) AND DRAFT PHASE 2 PROJECT OPERATIONS PLAN (TRANSMITTAL ATTACHED) [MARGINALIA]**

Author: NEIL HANDLER US EPA REGION 1
Addressee: PETER E NANGERONI ENVIRONMENTAL SCIENCE SERVICES INC
Doc Type: CORRESPONDENCE
LETTER
WORK PLAN
Doc Date: 03/03/2003 **# of Pages:** 4
File Break: 05.03

471017 **RESPONSE TO 03/03/2003 EPA REVIEW OF 01/29/2003 DRAFT PHASE 2 WORK PLAN AND PROJECT OPERATIONS PLAN (TRANSMITTAL ATTACHED)**

Author: JEFFREY G HERSHBERGER ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: PETER E NANGERONI ENVIRONMENTAL SCIENCE SERVICES INC
NEIL E HANDLER US EPA REGION 1
Doc Type: LETTER
CORRESPONDENCE
WORK PLAN
Doc Date: 03/07/2003 **# of Pages:** 28
File Break: 05.03

295806 **LETTER REGARDING WELL INSTALLATION LOCATIONS AND REQUIREMENTS FOR ACCESS TO WELL INSTALLATION LOCATIONS**

Author: JEFFREY G HERSHBERGER ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: PETER E NANGERONI ENVIRONMENTAL SCIENCE SERVICES INC
NEIL HANDLER US EPA REGION 1
Doc Type: LETTER
CORRESPONDENCE
Doc Date: 03/18/2003 **# of Pages:** 2
File Break: 05.03

Phase 05: RECORD OF DECISION (ROD)

471016 **LETTER REGARDING MANAGEMENT OF INVESTIGATION-DERIVED WASTE (IDW) IN RESPONSE TO 02/26/2003 LETTER**

Author: GARY JABLONSKI RI DEPT OF ENVIRONMENTAL MANAGEMENT
Doc Date: 03/19/2003 **# of Pages:** 1
Addressee: PETER E NANGERONI ENVIRONMENTAL SCIENCE SERVICES INC
File Break: 05.03
Doc Type: LETTER
CORRESPONDENCE

295805 **LETTER REGARDING 01/31/2003 AND 03/18/2003 CORRESPONDENCE FROM ESS**

Author: NEIL HANDLER US EPA REGION 1
Doc Date: 03/31/2003 **# of Pages:** 1
Addressee: PETER E NANGERONI ENVIRONMENTAL SCIENCE SERVICES INC
File Break: 05.03
Doc Type: LETTER
CORRESPONDENCE

244206 **PHASE 2 WORK PLAN**

Author: ENVIRONMENTAL SCIENCE SERVICES INC
Doc Date: 04/07/2003 **# of Pages:** 25
Addressee: NEIL E HANDLER US EPA REGION 1
File Break: 05.03
Doc Type: WORK PLAN

295066 **LETTER CONCERNING RESOLUTION OF OUTSTANDING COMMENTS ON THE04/07/2003 PHASE 2 WORK PLAN AND PROJECT OPERATIONS PLAN SUBMITTALS**

Author: NEIL HANDLER US EPA REGION 1
Doc Date: 04/11/2003 **# of Pages:** 1
Addressee: PETER E NANGERONI ENVIRONMENTAL SCIENCE SERVICES INC
File Break: 05.03
Doc Type: LETTER
CORRESPONDENCE

Phase 05: RECORD OF DECISION (ROD)

295831 LETTER REGARDING PHASE 3 GROUNDWATER MONITORING PROGRAM

Author: MARK W METCALF ASHLAND INC
Addressee: NEIL HANDLER US EPA REGION 1
Doc Type: LETTER
CORRESPONDENCE
Doc Date: 01/25/2004 **# of Pages:** 1
File Break: 05.03

471007 LETTER REGARDING PHASE 3 GROUNDWATER MONITORING PROGRAM

Author: NEIL HANDLER US EPA REGION 1
Addressee: MARK W METCALF ASHLAND INC
Doc Type: LETTER
CORRESPONDENCE
Doc Date: 02/06/2004 **# of Pages:** 1
File Break: 05.03

471005 EPA AND RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT (RIDEM) REVIEW OF DRAFT PHASE 2 PRE-DESIGN SUMMARY REPORT DATED 11/18/2003 (TRANSMITTAL ATTACHED)

Author: NEIL HANDLER US EPA REGION 1
Addressee: PETER E NANGERONI ENVIRONMENTAL SCIENCE SERVICES INC
Doc Type: CORRESPONDENCE
LETTER
REPORT
Doc Date: 02/10/2004 **# of Pages:** 8
File Break: 05.03

471004 EPA AND RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT (RIDEM) REVIEW OF REVISED PHASE 2 PRE-DESIGN SUMMARY REPORT (MAY 2004)

Author: BYRON MAH US EPA REGION 1
Addressee: PETER E NANGERONI ESS GROUP INC
Doc Type: CORRESPONDENCE
LETTER
Doc Date: 05/14/2004 **# of Pages:** 2
File Break: 05.03

Phase 05: RECORD OF DECISION (ROD)

471001 **APPROVAL LETTER FOR REVISED PHASE 2 PRE-DESIGN SUMMARY REPORT (JUNE 2004)**

Author: BYRON MAH US EPA REGION 1
Addressee: PETER E NANGERONI ESS GROUP INC
Doc Type: CORRESPONDENCE
LETTER
Doc Date: 07/08/2004 **# of Pages:** 1
File Break: 05.03

295811 **LETTER REGARDING WELL ABANDONMENT WORK PLAN**

Author: JEFFREY G HERSHBERGER ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: BYRON MAH US EPA REGION 1
Doc Type: LETTER
CORRESPONDENCE
Doc Date: 12/27/2004 **# of Pages:** 3
File Break: 05.03

471002 **LETTER REGARDING EPA APPROVAL OF WELL ABANDONMENT WORK PLAN**

Author: BYRON MAH US EPA REGION 1
Addressee: NIGEL GOULDING ASHLAND INC
Doc Type: LETTER
CORRESPONDENCE
Doc Date: 01/06/2005 **# of Pages:** 1
File Break: 05.03

471014 **PHASE 3 ROUND 1 (SUMMER 2004) PRE-DESIGN SUMMARY REPORT REVISED REPLACEMENT PAGES AND 03/03/2005 MEETING MINUTES (TRANSMITTAL LETTER ATTACHED)**

Author: JEFFREY G HERSHBERGER ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: PETER E NANGERONI ENVIRONMENTAL SCIENCE SERVICES INC
BYRON MAH US EPA REGION 1
Doc Type: LETTER
MEETING RECORD
REMEDIAL DESIGN REPORT
Doc Date: 05/23/2005 **# of Pages:** 7
File Break: 05.03

Phase 05: RECORD OF DECISION (ROD)

471019 **WORK PLAN AND SCOPE OF WORK - PHASE 3 ADDITIONAL WELL INSTALLATIONS - REVISION 1 (LETTERS DATED 02/26/2003 - 03/19/2003 ATTACHED) [MARGINALIA]**

Author: ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: BYRON MAH US EPA REGION 1
Doc Type: WORK PLAN, CORRESPONDENCE, LETTER
Doc Date: 10/05/2005 **# of Pages:** 9
File Break: 05.03

471013 **LETTER DOCUMENTING MODIFICATION OF PHASE 3 GROUNDWATER SAMPLING PROGRAM SCOPE**

Author: JEFFREY G HERSHBERGER ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: BYRON MAH US EPA REGION 1
Doc Type: LETTER, CORRESPONDENCE
Doc Date: 12/06/2005 **# of Pages:** 1
File Break: 05.03

471018 **LETTER DOCUMENTING WELL ABANDONMENT ACTIVITIES CONDUCTED 05/04/2005 - 05/05/2005**

Author: ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: BYRON MAH US EPA REGION 1
Doc Type: LETTER, REPORT, CORRESPONDENCE
Doc Date: 01/27/2006 **# of Pages:** 18
File Break: 05.03

295865 **LETTER REGARDING AGENCY COMMENTS ON GROUNDWATER FATE AND TRANSPORT MODELING DRAFT REPORT OF 07/20/2006**

Author: BYRON MAH US EPA REGION 1
Addressee: NIGEL GOULDING ASHLAND INC
Doc Type: LETTER, CORRESPONDENCE
Doc Date: 12/07/2006 **# of Pages:** 2
File Break: 05.03

Phase 05: RECORD OF DECISION (ROD)

295868 **LETTER REGARDING RESPONSE TO AGENCY LETTER DATED 12/07/2006**

Author: JEFFREY G HERSHBERGER ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: BYRON MAH US EPA REGION 1
Doc Type: LETTER
CORRESPONDENCE
Doc Date: 02/02/2007 **# of Pages:** 8
File Break: 05.03

295863 **LETTER REGARDING ADDITONAL AGENCY COMMENTS ON GROUNDWATER FATE AND TRANSPORT MODELING REPORT OF JULY 2006**

Author: BYRON MAH US EPA REGION 1
Addressee: NIGEL GOULDING ASHLAND INC
Doc Type: LETTER
CORRESPONDENCE
Doc Date: 05/25/2007 **# of Pages:** 5
File Break: 05.03

471008 **LETTER RESPONSE TO 05/25/2007 SUPPLEMENTAL EPA COMMENTS ON JULY 2006 GROUNDWATER FATE AND TRANSPORT MODELING REPORT**

Author: MARK W METCALF ASHLAND INC
Addressee: BYRON MAH US EPA REGION 1
Doc Type: CORRESPONDENCE
LETTER
Doc Date: 08/31/2007 **# of Pages:** 14
File Break: 05.03

471006 **EPA COMMENTS TO THE DRAFT PHASE 4 WORK PLAN SUPPLEMENTAL FIELD INVESTIGATION ACTIVITIES**

Author:
Addressee: US EPA REGION 1
Doc Type: MEMO
CORRESPONDENCE
Doc Date: 09/01/2008 **# of Pages:** 4
File Break: 05.03

Phase 05: RECORD OF DECISION (ROD)

295859 **LETTER REGARDING RESPONSE TO EPA'S COMMENTS ON DRAFT PHASE 4 WORK PLAN SUPPLEMENTAL FIELD INVESTIGATION ACTIVITIES**

Author: JEFFREY G HERSHBERGER ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: BYRON MAH US EPA REGION 1
Doc Type: LETTER
CORRESPONDENCE
Doc Date: 09/11/2008 **# of Pages:** 4
File Break: 05.03

295858 **LETTER REGARDING PHASE 4 FOCUSED FEASIBILITY PROGRAM SUPPLEMENTAL FIELD INVESTIGATION ACTIVITIES**

Author: MARK W METCALF ASHLAND INC
Addressee: BYRON MAH US EPA REGION 1
Doc Type: LETTER
CORRESPONDENCE
Doc Date: 09/17/2008 **# of Pages:** 1
File Break: 05.03

471015 **FINAL PHASE 4 WORK PLAN, SUPPLEMENTAL FIELD INVESTIGATION ACTIVITIES**

Author: ENVIRONMENTAL SCIENCE SERVICES INC
Addressee: US EPA REGION 1
Doc Type: WORK PLAN
Doc Date: 09/17/2008 **# of Pages:** 21
File Break: 05.03

469060 **EMAIL REGARDING COMMENTS ON PROPOSED PLAN**

Author: KEVIN CLEARY SMITHFIELD (RI) TOWN OF
Addressee: BYRON MAH US EPA REGION 1
Doc Type: EMAIL
PUBLIC (AND OTHER) COMMENTS
CORRESPONDENCE
Doc Date: 06/15/2010 **# of Pages:** 3
File Break: 05.03

Phase 05: RECORD OF DECISION (ROD)

469059 **LETTER REGARDING COMMENTS ON PROPOSED PLAN**

Author: ELIZABETH A LEACH SMITHFIELD (RI) - RESIDENT OF
Addressee: JAMES J LEACH SMITHFIELD (RI) RESIDENT
BYRON MAH US EPA REGION 1
Doc Type: PUBLIC (AND OTHER) COMMENTS
LETTER
CORRESPONDENCE
Doc Date: 06/17/2010 **# of Pages:** 2
File Break: 05.03

469057 **LETTER REGARDING COMMENTS ON PROPOSED PLAN [MARGINALIA]**

Author: EUGENIA MARKS AUDUBON SOCIETY OF RHODE ISLAND
Addressee: BYRON MAH US EPA REGION 1
Doc Type: LETTER
CORRESPONDENCE
PUBLIC (AND OTHER) COMMENTS
Doc Date: 06/29/2010 **# of Pages:** 2
File Break: 05.03

469056 **EMAIL REGARDING POSSIBLE LEACHING OF CHEMICALS, YMCA PROPERTY AND UPPER SPRAGUE RESERVOIR, PUBLIC COMMENT ON PROPOSED PLAN (FAX TRANSMITTAL, FAILED E-MAIL TRANSMITTAL AND NEWS CLIPPING ATTACHED)**

Author: CEZAR FERREIRA YMCA
Addressee: BYRON MAH US EPA REGION 1
Doc Type: PUBLIC (AND OTHER) COMMENTS
CORRESPONDENCE
NEWS CLIPPING
EMAIL
Doc Date: 07/12/2010 **# of Pages:** 3
File Break: 05.03

Phase 06: REMEDIAL DESIGN (RD)

463605 **DRAFT PRE-DESIGN ENGINEERING REPORT 2--VOLUME 2 OF 4**

Author: WOODWARD-CLYDE CONSULTANTS INC
Addressee: US DEPT OF ARMY
Doc Type: REPORT
Doc Date: 11/01/1992 **# of Pages:** 239
File Break: 06.04

Phase 06: REMEDIAL DESIGN (RD)

463606 DRAFT PRE-DESIGN ENGINEERING REPORT 2--VOLUME 4 OF 4

Author: WOODWARD-CLYDE CONSULTANTS INC
Addressee: US DEPT OF ARMY
Doc Type: REPORT
Doc Date: 11/01/1992 **# of Pages:** 330
File Break: 06.04

464068 DRAFT PRE-DESIGN ENGINEERING REPORT 2--VOLUME 3 OF 4

Author: WOODWARD-CLYDE CONSULTANTS INC
Addressee: US DEPT OF THE ARMY
Doc Type: REPORT
Doc Date: 11/01/1992 **# of Pages:** 80
File Break: 06.04

463607 PRE-DESIGN ENGINEERING REPORT 1--VOLUME 1 OF 4

Author: WOODWARD-CLYDE CONSULTANTS INC
Addressee: US DEPT OF ARMY
Doc Type: REPORT
Doc Date: 11/25/1992 **# of Pages:** 317
File Break: 06.04

463114 FINAL PRE-DESIGN ENGINEERING REPORT 2--VOLUME 1 OF 4

Author: WOODWARD-CLYDE CONSULTANTS INC
Addressee: US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION
Doc Type: REPORT
Doc Date: 10/22/1993 **# of Pages:** 174
File Break: 06.04

463115 FINAL PRE-DESIGN ENGINEERING REPORT 2--VOLUME 2 OF 4

Author: WOODWARD CLYDE CONSULTANTS
Addressee: US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION
Doc Type: REPORT
Doc Date: 10/22/1993 **# of Pages:** 235
File Break: 06.04

Phase 06: REMEDIAL DESIGN (RD)

463116 **FINAL PRE-DESIGN ENGINEERING REPORT 2--VOLUME 2A OF 4**

Author: WOODWARD-CLYDE CONSULTANTS INC
Addressee: US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION
Doc Type: REPORT
Doc Date: 10/22/1993 **# of Pages:** 250
File Break: 06.04

463117 **FINAL PRE-DESIGN ENGINEERING REPORT 2--VOLUME 3 OF 4**

Author: WOODWARD-CLYDE CONSULTANTS INC
Addressee: US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION
Doc Type: REPORT
Doc Date: 10/22/1993 **# of Pages:** 92
File Break: 06.04

463118 **FINAL PRE-DESIGN ENGINEERING REPORT 2--VOLUME 4 OF 4**

Author: WOODWARD-CLYDE CONSULTANTS INC
Addressee: US ARMY CORPS OF ENGINEERS - NEW ENGLAND DIVISION
Doc Type: REPORT
Doc Date: 10/22/1993 **# of Pages:** 342
File Break: 06.04

464069 **FINAL CRITERIA SUMMARY REPORT--PERFORM PREDESIGN INVESTIGATION AND DEVELOP DESIGN CRITERIA--VOLUME 2A OF 2**

Author: EBASCO SERVICES INC
Addressee:
Doc Type: REPORT
Doc Date: 06/01/1994 **# of Pages:** 422
File Break: 06.04

464070 **FINAL CRITERIA SUMMARY REPORT--PERFORM PREDESIGN INVESTIGATION AND DEVELOP DESIGN CRITERIA--VOLUME 1 OF 2**

Author: EBASCO SERVICES INC
Addressee:
Doc Type: REPORT
Doc Date: 06/01/1994 **# of Pages:** 124
File Break: 06.04

Phase 06: REMEDIAL DESIGN (RD)

464071 FINAL CRITERIA SUMMARY REPORT--PERFORM PREDESIGN INVESTIGATION AND DEVELOP DESIGN CRITERIA--VOLUME 2B OF 2

Author:
Addressee: EBASCO SERVICES INC
Doc Type: REPORT
Doc Date: 06/01/1994 **# of Pages:** 530
File Break: 06.04

463119 PRELIMINARY DESIGN REPORT--VOLUME 2--APPENDICES A THROUGH E

Author: ENSAFE INC
Addressee:
Doc Type: REPORT
Doc Date: 02/06/1998 **# of Pages:** 716
File Break: 06.04

471028 FINAL PRE-DESIGN WORK PLAN (TRANSMITTAL LETTER ATTACHED) [MARGINALIA]

Author: ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: US EPA REGION 1
Doc Type: WORK PLAN
Doc Date: 08/03/2001 **# of Pages:** 33
File Break: 06.06

471024 FINAL PHASE 1 PRE-DESIGN SUMMARY REPORT (TRANSMITTAL LETTER ATTACHED)

Author: ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: US EPA REGION 1
Doc Type: REPORT
Doc Date: 04/23/2002 **# of Pages:** 344
File Break: 06.04

471026 PROJECT OPERATIONS PLAN, APPENDIX B-1, QUALITY ASSURANCE PROJECT PLAN (QAPP)

Author: ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: US EPA REGION 1
Doc Type: WORK PLAN
SAMPLING & ANALYSIS PLAN
Doc Date: 04/07/2003 **# of Pages:** 921
File Break: 06.06

Phase 06: REMEDIAL DESIGN (RD)

471027 **PROJECT OPERATIONS PLAN, APPENDIX B-1, FIELD SAMPLING PLAN**

Author: ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: US EPA REGION 1
Doc Type: WORK PLAN
SAMPLING & ANALYSIS PLAN
Doc Date: 04/07/2003 **# of Pages:** 439
File Break: 06.02

463011 **PHASE 2 PRE-DESIGN SUMMARY REPORT VOLUME 2 OF 2--APPENDICES**

Author: ESS GROUP INC
Addressee:
Doc Type: REPORT
Doc Date: 06/08/2004 **# of Pages:** 2,264
File Break: 06.04

464072 **PHASE 2 PRE-DESIGN SUMMARY REPORT VOLUME 1 OF 2--TEXT, TABLES AND FIGURES**

Author: ESS GROUP INC
Addressee:
Doc Type: REPORT
Doc Date: 06/08/2004 **# of Pages:** 353
File Break: 04.06

471020 **DRAFT PHASE 3 ROUND 1 (SUMMER 2004) PRE-DESIGN SUMMARY REPORT (TRANSMITTAL LETTER ATTACHED)**

Author: ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: US EPA REGION 1
Doc Type: REPORT
Doc Date: 01/07/2005 **# of Pages:** 288
File Break: 06.04

471021 **DRAFT PHASE 3 ROUND 2 (FALL 2004) PRE-DESIGN SUMMARY REPORT (TRANSMITTAL LETTER ATTACHED)**

Author: ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: US EPA REGION 1
Doc Type: REPORT
Doc Date: 07/13/2005 **# of Pages:** 403
File Break: 06.04

Phase 06: REMEDIAL DESIGN (RD)

471025 **DRAFT PHASE 3 ROUND 3 (SPRING 2005) PRE-DESIGN SUMMARY REPORT (TRANSMITTAL LETTER ATTACHED)**

Author: ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: BYRON MAH US EPA REGION 1
Doc Type: REPORT
Doc Date: 10/07/2005 **# of Pages:** 268
File Break: 06.04

471022 **DRAFT PHASE 3 ROUND 4 (FALL 2005) PRE-DESIGN SUMMARY REPORT (TRANSMITTAL LETTER ATTACHED)**

Author: ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: US EPA REGION 1
Doc Type: REPORT
Doc Date: 04/04/2006 **# of Pages:** 329
File Break: 06.04

463015 **GROUNDWATER FATE AND TRANSPORT MODELING**

Author: URS CORPORATION
Addressee: ASHLAND INC
Doc Type: REPORT
Doc Date: 07/20/2006 **# of Pages:** 176
File Break: 06.04

471023 **DRAFT PHASE 3 ROUND 5 (SPRING 2006) PRE-DESIGN SUMMARY REPORT (TRANSMITTAL LETTER ATTACHED)**

Author: ENVIRONMENTAL SCIENCE SERVICES INC (ESS)
Addressee: US EPA REGION 1
Doc Type: REPORT
Doc Date: 08/18/2006 **# of Pages:** 245
File Break: 06.04

463013 **DRAFT PHASE 3 PRE-DESIGN INVESTIGATION REPORT ROUND 6 (FALL 2006) MONITORING EVENT**

Author: ESS GROUP INC
Addressee:
Doc Type: REPORT
Doc Date: 04/20/2007 **# of Pages:** 279
File Break: 06.04

Phase 06: REMEDIAL DESIGN (RD)

471029 **GROUNDWATER FATE AND TRANSPORT MODEL SUPPLEMENT**

Author: URS CORPORATION
Addressee: ASHLAND INC
US EPA REGION 1
Doc Type: REPORT
Doc Date: 10/31/2008 **# of Pages:** 50
File Break: 06.04

463012 **DRAFT PHASE 4 SUPPLEMENTAL FIELD INVESTIGATION REPORT (FALL 2008)**

Author: ESS GROUP INC
Addressee:
Doc Type: REPORT
Doc Date: 02/04/2009 **# of Pages:** 1,033
File Break: 06.04

Phase 07: REMEDIAL ACTION (RA)

64905 **DRAFT REMEDIAL ACTION (RA) REPORT - REPORT AND APPENDICES C THROUGH E**

Author: LOUREIRO ENGINEERING ASSOCIATES INC
Addressee:
Doc Type: REPORT
Doc Date: 08/20/2001 **# of Pages:** 6,091
File Break: 07.05

64906 **DRAFT REMEDIAL ACTION (RA) REPORT - APPENDICES G AND H**

Author: LOUREIRO ENGINEERING ASSOCIATES INC
Addressee:
Doc Type: REPORT
Doc Date: 08/20/2001 **# of Pages:** 5,908
File Break: 07.05

297206 **FINAL REMEDIAL ACTION (RA) REPORT - REPORT THROUGH APPENDIX G**

Author: LOUREIRO ENGINEERING ASSOCIATES INC
Addressee: US EPA REGION 1
Doc Type: REPORT
RA REPORT APPROVAL MEMO
Doc Date: 05/20/2002 **# of Pages:** 9,834
File Break: 07.05

DAVIS LIQUID WASTE
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OU 2 - ROD Amendment AR

AR Collection Index Report
*****For External Use*****

Phase 07: REMEDIAL ACTION (RA)

297207 **FINAL REMEDIAL ACTION (RA) REPORT - APPENDIX H THROUGH APPENDIX M**

Author: LOUREIRO ENGINEERING ASSOCIATES INC
Addressee: US EPA REGION 1
Doc Type: RA REPORT APPROVAL MEMO
REPORT

Doc Date: 05/20/2002 **# of Pages:** 8,320
File Break: 07.05

Phase 13: COMMUNITY RELATIONS

469055 **PUBLIC HEARING TRANSCRIPT**

Author: RONALD M RONZIO ALLIED COURT REPORTERS INC
Addressee:
Doc Type: MEETING RECORD
PUBLIC (AND OTHER) COMMENTS

Doc Date: 06/29/2010 **# of Pages:** 23
File Break: 13.04

Number of Documents in Administrative Record: 76

APPENDIX C

STATE CONCURRENCE LETTER

2010 RECORD OF DECISION AMENDMENT

DAVIS LIQUID WASTE SUPERFUND SITE

SMITHFIELD, RHODE ISLAND

RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
235 Promenade Street, Providence, RI 02908-5767 TDD 401-222-4462

29 September 2010

Mr. James T. Owens, III, Director
U.S. EPA – New England Region
Office of Site Remediation and Restoration
5 Post Office Square
Suite 100 (OSRR 07-3)
Boston, MA 02109-3912

RE: Record of Decision Amendment Concurrence Letter for the Davis Liquid Waste Superfund Site, Smithfield, RI

Dear Mr. Owens:

The Department of Environmental Management (Department) has completed its review of the Record of Decision (ROD) Amendment dated September 2010 for the Davis Liquid Waste Superfund Site located in Smithfield, RI. The U.S. Environmental Protection Agency's (EPA's) amended selected alternative for the groundwater at the Site, as presented in the ROD Amendment, is in-situ chemical and enhanced biodegradation to address contaminated groundwater in the former Source Area and in the downgradient plume to achieve restoration of the groundwater aquifer to drinking water standards.

The Department has worked on this Site with your Agency from the early investigatory stages up through this current decision milestone. Based upon this Department's review of this ROD Amendment and the results of the remedial investigation activities conducted to date, we offer our concurrence on the decision.

The Department wishes to emphasize the following aspects of the ROD Amendment:

- The 1987 ROD selected the extraction and treatment of contaminated groundwater. Because the 1987 ROD groundwater remedy could not be implemented as originally envisioned because treated groundwater could not be injected into the subsurface to create a flushing/recirculation cell to remove contaminants adsorbed to saturated soil, EPA determined that other remedial alternatives should be evaluated;

- It is this Department's understanding that the Responsible Parties will perform a Pre-Design Investigation (PDI) to ensure that the plume core contamination does not extend outside of the former Source Area;

- It is this Department's understanding that the Responsible Parties will implement deed restrictions on groundwater use and land development within the overburden and bedrock contaminant plume boundary on encompassing four parcels (50-9, 50-29, 50-27, and 50-27A) as well as any areas where installation of new wells has the potential to hydraulically influence the movement of contaminated water from the Site. If the deed restrictions are not adopted or are subsequently repealed or amended, the permanency of the remedy may be compromised and it is the responsibility of the Responsible Parties to implement additional institutional controls or other applicable response actions;

- The Responsible Parties will initiate and maintain a long-term monitoring program of sampling and analysis of groundwater, sediment, and surface water at the Site; and
- The Responsible Parties will conduct five-year reviews to ensure that the remedial actions for the Site continue to provide adequate protection of human health and the environment.

Thank you for providing us with an opportunity to review and concur with this important ROD Amendment.

Sincerely,

W. Michael Sullivan, PhD
Director

cc: Terrence Gray, RIDEM
Leo Hellested, RIDEM
Matthew DeStefano, RIDEM
Gary Jablonski, RIDEM
Michael Jasinski, USEPA
Byron Mah, USEPA

ROD Amend RIDEM Conc ltr

APPENDIX D

RESPONSIVENESS SUMMARY

2010 RECORD OF DECISION AMENDMENT

DAVIS LIQUID WASTE SUPERFUND SITE

SMITHFIELD, RHODE ISLAND

Davis Liquid Waste Superfund Site
Smithfield, Rhode Island
2010 Record of Decision Amendment
Responsiveness Summary

PREFACE

The purpose of this Responsiveness Summary is to document EPA's responses to the questions and comments received during the public comment period on the June 2010 Proposed Plan for the Davis Liquid Waste Superfund Site. EPA considered all of the comments summarized in this document before selecting the final remedy to address the highly contaminated groundwater at the Site.

The public hearing was held on June 29, 2010 in the Smithfield Town Hall at 64 Farnum Pike, Smithfield, Rhode Island and a copy of the transcript from the hearing is presented in Attachment A. The transcript contains all original comments submitted by citizens and representatives of the Town of Smithfield, and other parties. Copies of the written comments are included as Attachment B. These documents are included in the Administrative Record.

This Responsiveness Summary addresses comments pertaining to the changes proposed in the June 2010 Proposed Plan to the 1987 Record of Decision (ROD). These comments were received during the public comment period from June 4 to July 30, 2010.

Several individuals and the Town of Smithfield submitted comments to EPA either orally or in writing at the public hearing. At the request of the Potentially Responsible Parties (PRPs), the public comment period was extended through July 30, 2010. Written comments were submitted prior to the close of the public comment period. Comments received from private citizens and the Town were generally in favor of the EPA's proposed changes to the groundwater response action originally selected in the 1987 ROD. The PRPs disagreed with EPA's proposed changes, and instead, advocated natural attenuation as the primary mechanism to address groundwater contaminants.

REMEDY SELECTED IN THE 2010 ROD AMENDMENT FOR GROUNDWATER REMEDIATION

The remedy selected in the 1987 ROD included contaminated groundwater extraction, treatment, and re-injection of the treated water into the former Source Area to flush residual contamination adsorbed to soil present below the water table. However, additional hydrogeologic evaluations subsequent to the 1987 ROD determined that the treated groundwater could not be reinfiltrated into the subsurface due to insufficient porosity. As a result, a fundamental change to the 1987 ROD's selected remedy was required.

The remedy selected in this ROD Amendment is needed to address contaminated groundwater at the Site and is based on Alternative GW3B, which was presented in the Focused Feasibility Study (Nobis, 2010). The remedy consists of several key components: In-Situ Chemical Treatment and Enhanced Biodegradation of the Plume Core and Overburden Plume; natural attenuation of the dilute overburden plume beyond the in-situ treatment zone; Institutional Controls; and Five-Year Reviews to evaluate the effectiveness of cleanup. Specifically, the remedy includes injecting a treatment reagent into the former Source Area (or plume core) and into a portion of the downgradient overburden plume to promote in-situ degradation of chlorinated volatile organic compounds (VOCs) through chemical and biological treatment processes. Residual chlorinated VOCs present in the saturated soils in the plume core constitute the majority of the continuing sources of contaminants to groundwater. These continuing sources are resulting in the groundwater plumes in both the overburden and the bedrock aquifer units. The contamination in saturated soil represents a principal threat waste that is required to be addressed through treatment.

The specific components of the remedy selected in the 2010 ROD Amendment include:

- Pre-Design Investigations and Pilot Testing
- In-Situ Chemical Treatment and Enhanced Biodegradation
- Natural attenuation of the dilute overburden plume for polishing
- Long-Term Monitoring
- Institutional Controls
- Five-Year Reviews

SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES

A number of comments were received from seven parties during the public comment period regarding the proposed change from the groundwater remedy selected in the 1987 ROD to the remedy selected in this ROD Amendment. Comments were provided by private citizens, the Town of Smithfield, the Audubon Society of Rhode Island, the YMCA of Greater Providence, and Kaufman & Canoles, P.C., on behalf of five Potentially Responsible Parties (PRPs). The PRPs include: Ashland, Inc.; AccoBristol, a division of Babcock Industries (for itself and on behalf of Bristol, Inc.); Gar Electroforming; Life Technologies Corporation; and Rohm and Haas Company.

The private citizens and the Town were generally supportive of EPA's selected remedy. The PRPs disagreed with EPA's selected remedy and favored natural attenuation. General themes from all the comments received included:

- Questions regarding the reagents and microorganisms to be used for treatment, and potential impact to humans and the ecological health in the area;

- No current Ecological Risk Assessment of Latham Brook resulting from site contamination was provided;
- Potential impacts to the wetlands during treatment;
- Potential impacts to private drinking water wells and properties resulting from contaminated groundwater migration;
- Implementation of proposed treatment at other sites;
- Use of Institutional Controls;
- Support for the EPA's Preferred Alternative;
- Opposition to EPA's Preferred Alternative;
- Questions regarding the limitations in the modeling performed to support the EPA's Preferred Alternative;
- Limitations to the proposed treatment methods with respect to their efficiency and feasibility;
- Concerns about the cost to implement EPA's Preferred Alternative; and
- Promoting the selection of natural attenuation.

Specific comments regarding the remedy selected in this ROD Amendment are addressed below. Where possible, EPA has grouped similar comments, and prepared a single response.

1. **Comment**: *What are the human health risks associated with introducing reagents and microorganisms into the groundwater?*

    EPA Response: The reagents discussed in the Focused Feasibility Study and the Proposed Plan are one possibility for chemicals that may be used for treatment. Iron filings could be used as a reducing agent to chemically degrade VOCs, and solutions such as lactic acid or molasses could also be used to enhance biological growth and biodegradation processes. These reagents are all non-toxic and non-hazardous. As part of the remedial design, a pre-design investigation will first be conducted to collect additional information regarding site conditions that could affect selection of the actual reagents to be used, and an evaluation of the effectiveness and impact of injected reagents to Site contaminants. After the pre-design investigation and pilot test using various reagents, the reagents to be used will then be selected.

    No new microorganisms will be introduced into the subsurface. Rather, the goal is to stimulate the growth of naturally occurring microbes that are already present in the subsurface and are likely already degrading groundwater contaminants, but at a relatively slower rate than is required. Once stimulated, the existing microbes will increase their degradation of the groundwater contaminants at the Site and ultimately restore the ground water as quickly as possible.

2. **Comment**: *There is no Ecological Risk Assessment as part of the Proposed Plan or in the Record of Decision. The exposure to the VOCs can be especially damaging to*

amphibians. Amphibians burrow into the ground and live underground for extended periods of their lives and could potentially encounter metal and VOC contaminants. Amphibians breed in pools that could be receptors of the contaminants and remediation materials, bacteria, lactic acid and molasses. While we support the concerns for human health that are reflected in the proposed changes, amphibians may be affected by much smaller concentrations of contaminants and remedial materials because of the difference in body mass.

EPA Response: The selected remedy requires sediment and surface water sampling adjacent to the Davis Liquid Site and in Latham Brook. Results of the surface water and sediment sampling and analysis will be compared with available ecological benchmarks to determine whether elevated levels of chemicals or contaminants may be present that pose potential threats to ecological receptors. If elevated contaminant levels are identified, then additional evaluations, including an ecological risk assessment, will be conducted, and additional response actions may be required.

As part of the pre-design investigations, the reagents used for treatment will also be evaluated for potential ecological effects at the Site. The goal of the injections is to allow the treatment reagents to be consumed in groundwater (below the water table). Ideally, all reagents will be depleted before the treated groundwater discharges into any nearby surface water bodies that may be inhabited by amphibians.

3. **Comment**: *Would there be impacts to the wetlands that could result from the EPA's proposed treatment? Would the wetland be protected?*

EPA Response: There is contamination already present in the groundwater underlying the wetlands. All proposed treatment will be performed outside of the wetlands so as to not impair their functions. As part of the pre-design investigation, a pilot test will be performed at the Site to evaluate conditions for contaminant treatment. Results of treatment will be evaluated for impacts to the wetlands so that during the full-scale implementation, impacts to the wetlands are minimized.

4. **Comment:** *The Focused Feasibility Study posted on the EPA's website, Figure 1-5 shows the groundwater flow tending in an easterly direction from the Site, towards Williams Road, where the commenter and other private well owners reside. These residences were not supplied with municipal water as part of the EPA's original plan to protect the public from contaminated well water.*

EPA Response: The easterly flow of groundwater is in the overburden aquifer while most private wells in the area of the Site are in the bedrock aquifer. Monitoring wells will be installed at the Site to monitor the groundwater flow in that direction and to provide information on whether contaminants are migrating beyond their current extent.

5. **Comment**: *Residents on Williams Road and Log Road expressed concern that contamination may be migrating into the private drinking wells of residents on those two streets. Of particular concern is that elevated manganese levels have been found in private drinking water wells on Log Road. This has raised the issue of whether biologic reductive dechlorination is occurring, which tends to make manganese soluble in groundwater, similar to what has been observed at the Davis Superfund Site.*

    EPA Response: Groundwater is migrating from the Site in an easterly direction in the overburden aquifer and to the north in the bedrock aquifer in the vicinity of the Site. One commenter's home is situated approximately 1 mile north of the Site. Considering the distance, EPA believes plume contaminants would be dissipated well before they reached that home.

    Williams Road appears to be at least 7,000 feet southeast of the Davis Liquid Site. It is unlikely that the Williams Road area is downgradient of the Site. However, regional groundwater flow information will be evaluated as part of the pre-design investigation to assess the likelihood for groundwater flow from the Site towards the vicinity of Williams Road.

    Additional monitoring wells will be installed at the Site during the pre-design investigation. Some of these new monitoring wells will be used to monitor the bedrock groundwater to the north and to the south of the current plume. These new sentry wells will provide a means to monitor groundwater flow and to evaluate whether the plume is migrating towards these residences. In addition, some residential well monitoring will also occur as part of pre-design investigations.

    While manganese levels in groundwater near the Site may be temporarily elevated as the result of ongoing reductive dechlorination processes, these reactions are occurring mostly in the overburden aquifer. Many residential wells are drilled into the bedrock and water yielded by these wells will contain various naturally occurring metals including arsenic, iron, or manganese. EPA believes it is likely that the elevated levels of manganese found in residential wells are not site-related. Additional work will be conducted to confirm this statement.

6. **Comment**: *Residents of these two streets are asking for the EPA's help both physically and financially to annually test and monitor the quality of their drinking water, especially for VOCs and other potentially harmful contaminants for privately-owned wells on Williams Road and the portion of Log Road that is not currently*

supplied by public water. This would be considered part of the long term monitoring component of Alternative GW3B proposal.

EPA Response: As indicated previously, EPA will install new monitoring wells on the Site to the north and south/southeast to assess potential migration of contaminants in groundwater from the Site. Residential well monitoring will also occur as part of pre-design investigations. EPA will work with the RI Department of Environmental Management to determine which wells to sample and to evaluate the data collected from this residential well sampling effort.

7. **Comment**: *Although the bedrock monitoring wells east of the site for sampling do not show concentrations of VOCs at this time, we are unsure whether there was an initial plume (prior to the mid-1980s when EPA began its remedial investigations) that passed through and beyond the limits of the Superfund Site area as it is now configured, specifically in an east/southeasterly direction.*

EPA Response: EPA does not have information to indicate whether contamination may or may not have historically migrated towards the vicinity of Williams Road. In fact, historical contamination (as suggested by the commenter) would be impossible to identify today. However, as part of pre-designs investigations, additional work will be conducted to determine if contamination has currently migrated towards this area.

8. **Comment**: *The YMCA runs a youth summer program as well as several adult classes surrounding the Upper Sprague Reservoir, which is southeast of the Davis Property. Could there be contaminates from the Superfund Site leaching into this reservoir and potentially putting these groups at risk?*

EPA Response: The YMCA property in question is Shephard Reservation, located at 71 Colwell Road in Greenville, RI. This parcel is approximately 3.8 miles south of the Davis Liquid Site. It is highly unlikely Site groundwater is migrating in the direction of this parcel. However, as part of the pre-design evaluation, an assessment of regional groundwater flow will be conducted, and as appropriate, additional monitoring wells may be installed to assess potential plume migration towards the south.

9. **Comment**: *The Town of Smithfield inquired about whether similar reagents and microorganisms have been introduced into a groundwater contamination plumes, and also requested that information be forwarded to the Town of Smithfield for review. If there are other cases of this reagent introduction technique being used, what are some of the byproducts of the application(s), their outcomes (pending or complete) that have been observed and any negative effects of the health of the environment, wildlife, and humans that can be reported?*

EPA Response: EPA will provide information of this nature to the Town following the signing of this ROD Amendment. Introduction of chemical reagents to either oxidize or reduce chlorinated solvents has been performed at a number of sites. EPA will conduct a pre-design investigation to evaluate the efficacy of the various treatment reagents and to ensure the selection of the proper reagent for use at the Site.

No microorganisms will be introduced as part of the remediation. Rather, native soil microbes will be stimulated to grow and multiply so that that contaminant degradation can be accelerated. Once the contaminants have been diminished, the microbial population will decline because there will no longer be any chemicals to metabolize.

ZVI (Zero Valent Iron), for example, has been used at a number of sites in New England and throughout the country. As the iron corrodes, chemical reactions occur in the subsurface that can change the geochemistry, and cause some naturally occurring metals present in the soil minerals to temporarily migrate. Prior to full-scale injection, a pilot test (on a very small scale) will be performed at the Site to evaluate test conditions and the byproducts of treatment, as necessary, the design of the full-scale treatment will take the generation of byproducts into consideration to ensure minimal impacts to human health or the environment.

10. **Comment**: *Is it possible to combine the GW3B and the GW4 plan into a hybrid that contains some groundwater extraction to prevent further contaminant migration while still treating the remaining groundwater with microorganisms?*

EPA Response: This combined approach was considered. However, each of the two different approaches may interfere with the effective treatment of the other. For example, chemicals injected into the subsurface under Alternative GW3 depend on contact time between the reagents and the contaminants to react, or for the microbes to grow. Groundwater extraction under Alternative GW4 on the other hand, would remove some of the reagents from the subsurface before they can be used effectively. Extracted groundwater with the reagents will require additional treatment, thus increasing costs and energy consumption. The combined approach would cost more, but would not likely result in increased protection or a reduction of the time needed to achieve cleanup goals.

11. **Comment:** *A resident would like it confirmed that the GW2 plan of action would not be a viable choice because it does not meet DEM protective standards.*

EPA Response: Correct. Alternative GW2 does not meet Federal and State drinking water standards in a reasonable timeframe.

12. **Comment:** *Several commenters requested that institutional controls such as ordinances and Environmental Land Use Restrictions (ELURs) be established and enforced to limit the use of the Site and groundwater.*

> **EPA Response:** EPA will be happy to work with the PRPs, RIDEM, and local officials to develop appropriate institutional controls for the site. As for the ELURs, EPA will support efforts to implement appropriate use restrictions.

13. **Comment:** *Several commenters have expressed their support for the EPA's proposed implementation of Alternative GW 3B, for reevaluating the 1987 ROD, and considering new technologies as they became available. Commenters also thanked EPA for cleaning up the soil at the Davis Liquid Waste Superfund Site 25 years ago and for protecting the surrounding properties with an extensive network of municipal water line.*

> **EPA Response:** EPA appreciates support for its actions at the Site. The State and local government have also played an important role in addressing this Site.

14. **Comment:** *We concur with the portion of EPA's decision to modify the ROD for the Davis Site regarding pump and treat, as modeling conducted by URS (2006, 2008,) on behalf of Ashland, indicated that pump and treat would not restore groundwater quality and/or achieve reductions in plume longevity over that provided by natural processes. Also concur with the EPA's conclusion that there are technical implementability issues with attempting in-situ treatment of the bedrock underlying the Site and, thus, the remediation timeframes within the bedrock are going to be controlled by the natural attenuation process and flow interactions with the overlying unconsolidated deposits.*

> **EPA Response:** These comments are acknowledged. Bedrock groundwater will now be further investigated as part of a separate operable unit to better understand the level of contamination and whether natural attenuation processes are effective or not in this portion of the groundwater.

15. **Comment:** One commenter stated that *GW2 (Monitored Natural Attenuation) is the only approach consistent with the NCP.*

> **EPA Response:** EPA believes that the selected remedy is fully consistent with the NCP.

16. **Comment:** *Against most of the nine [NCP] criteria, GW2 was graded lower than the other more active alternatives, including the preferred alternative, even though the more cost effective MNA alternative is as protective and results in restoration of the groundwater in the same timeframe and is easier to implement, particularly given the access and land ownership conditions at the Site.*

EPA Response: Cost is only one component of the nine criteria used to evaluate alternatives. In addition, EPA does not agree that Alternative GW2 is as protective as the selected remedy. GW2 relies solely on institutional controls to be protective over a much greater timeframe (80 years). Institutional controls are only effective if adequately implemented, monitored and enforced; whereas active treatment required by Alternative GW3B permanently reduces contaminant concentrations to safe levels in a shorter timeframe throughout the overburden plume (40-45 years). In addition, CERCLA expresses a preference for treatment that is met by the selected remedy but not by Alternative GW2.

17. **Comment:** *EPA has stated that groundwater alternative GW2 (MNA) does not contain any measures to reduce the toxicity, mobility and volume of contaminants through treatment. Natural attenuation processes will ultimately lead to reductions in toxicity and volume; thus, remedial efforts are not needed to manage further spreading of groundwater impacts. In the interim, the provision of the alternate water supply prevents any unacceptable exposures and the implementation of institutional controls would prevent future exposure. Equally, the EPA's preferred alternative (GW3B) also relies on these provisions to control risks. On this basis, groundwater alternative GW2 is seen to be equally protective and does provide a means for treatment through natural processes*.

EPA Response: After further review, EPA does not believe there are sufficient lines of evidence to select Monitored Natural Attenuation specifically for the bedrock aquifer at the Site. Instead, additional sampling will need to be conducted to determine if Monitored Natural Attenuation is appropriate for this portion of the Site. EPA did state that Alternative (GW2) does not contain any measures to reduce the toxicity, mobility and volume of contaminants through active treatment. Alternative GW2 relies on contaminant reductions based on natural processes. EPA has determined that this does not constitute treatment for purposes of the evaluation criteria in the NCP. Monitored Natural Attenuation, as referenced by the commenter, is different from the natural processes occurring in Alternative GW2 and requires specific lines of evidence before it can be selected by EPA. Those lines of evidence have not been established for Alternative GW2 and as a result, the limited reductions through natural processes do not constitute Monitored Natural Attenuation. To the extent the term Monitored Natural Attenuation was used to describe Alternative GW2, this was in error, and is revised in the ROD Amendment.

In addition, because the contamination present in the saturated soil underlying the former Source Area is a principal threat waste, treatment is required to meet CERCLA’s statutory preference for treatment. Alternative GW2 does not meet this requirement for treatment. While it is true that the selected remedy also relies on Institutional Controls, it relies on them for a much shorter period of time.

18. **Comment:** *The courts have interpreted the NCP in this regard to require, among other things, that in selecting a remedial action EPA "[examine] the relevant data, [base] its decisions on materials contained in the record, and '[articulate] a rational connection between the facts found and choice made.'" Commonwealth of Massachusetts v. Blackstone Valley Electric Company, et al., 867 F. Supp. 78, 81 (1994). Selection of Alternative GW3B fails this test and the NCP evaluation criteria, without limitation, it*

(i) inexplicably discounts data which indicates natural attenuation is active and ongoing at the Site for the foreseeable future;

(ii) ignores the fact that the benefit to drinking water wells is unchanged and risks are currently mitigated;

(iii) ignores the potential ineffectiveness of the measure proposed and fails to acknowledge the associated reliance on natural processes for restoration;

(iv) ignores the potential for additional harm to be caused by the measure proposed; and

(v) ignores the inability of any party effectively to undertake the proposed action given the current ownership and control of the Site; in a related comment, access and 'security" costs as well as the cost to implement institutional controls have not been adequately accounted for in the selected remedy.

EPA Response: EPA strongly disagrees with the Commenter's assertions for the following reasons:

i) Data regarding natural attenuation have not been disregarded. Groundwater VOC and metal results and geochemical data were reviewed and used in EPA's assessments. EPA acknowledges that while natural attenuation has been ongoing, the question is whether it is sufficient to merit its use as a Monitored Natural Attenuation (MNA) remedial alternative. To evaluate use of MNA as remedial alternative, there are three tiers of site-specific information or "lines of evidence" that need to be considered, as presented in EPA's OSWER Guidance 9200.4-17P, *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites*. Based upon this, EPA has now determined that additional lines of evidence are needed before Monitored Natural Attenuation may be considered for the bedrock portion of the groundwater. As for overburden groundwater, there is not sufficient information to support Monitored Natural Attenuation as the sole mechanism consistent with EPA Guidance.

(1) Historical groundwater and/or soil chemistry data demonstrate a clear and meaningful trend of decreasing contaminant mass and/or concentration over time at appropriate monitoring or sampling points.

(In the case of a groundwater plume, decreasing concentrations should not be solely the result of plume migration.)

EPA reviewed the overburden VOC trend charts presented in Attachment E of comments provided by Kaufman & Canoles on behalf of the Companies, and the bedrock trend charts provided in Appendix L of *Draft Phase 4 Supplemental Field Investigation Report (Fall 2008)* (ESS, 2009). The trend charts depict VOC concentrations for source wells and non-source wells (terminology used in the charts) for PCE, TCE, cis-1,2 DCE, and vinyl chloride. The charts depict VOC trends from approximately 2003 through 2008 for overburden wells and from 1991 through 2008 for bedrock wells.

In the overburden unit, Attachment E charts indicate that cis-1,2 DCE concentrations in both source and non-source wells have generally remained stable. Vinyl chloride in source wells has remained stable while non-source wells show increases of vinyl chloride over time. The Appendix L charts indicate relatively stable concentrations of PCE, TCE, and cis-1,2 DCE concentrations for both source and non-source bedrock wells. While vinyl chloride concentrations have fluctuated in the source bedrock wells, but remained relatively stable. Vinyl chloride was infrequently found in the non-source wells, which indicates that the reductive dechlorination appears to have stalled. These results indicate that while natural attenuation processes are at work, the processes are not sufficiently rigorous to demonstrate consistent decline in VOC concentrations for both parent and degradation compounds. Therefore, demonstration of natural attenuation processes supportive of MNA has not been met for this line of evidence.

(2) Hydrogeologic and geochemical data can be used to demonstrate **indirectly** the type(s) of natural attenuation processes active at site, and the rate at which such processes will reduce contaminant concentrations to required levels. For example, characterization data may be used to quantify the rates of contaminant sorption, dilution, or volatilization, or to demonstrate and quantify the rates of biological degradation processes occurring at the Site.

Hydrological and geochemical data have been gathered to date that do demonstrate natural attenuation processes. However, the rates of biological degradation processes and abiotic attenuation processes have not yet been defined and there is not sufficient data to demonstrate this line of evidence in order to support the selection of

MNA as the sole mechanism to reduce contaminant concentrations at the Site.

(3) Data from field or microcosm studies (conducted in or with actual contaminated site media) which **directly** demonstrate the occurrence of a particular natural attenuation process at the site and its ability to degrade the contaminants of concern (typically used to demonstrate biological degradation processes only).

To date, no field or microcosm studies have been performed to demonstrate the presence of microbes capable of degrading the Site-related chlorinated VOCs and, as a result, there is not sufficient data to demonstrate this line of evidence in order to support the selection of MNA as the sole mechanism to reduce contaminant concentrations at the Site.

ii) EPA needs to consider both current and future risks in selecting a remedy that is protective of human health. EPA has taken into account the fact that contaminated groundwater is not currently be used for drinking water. The FFS and this ROD are primarily based upon the fact that action must be taken to address *future risks* from groundwater. This was considered by EPA through out the FFS process, the preparation of the Proposed Plan and the selection of the cleanup plan for overburden groundwater in this ROD. While risks are mitigated for parcels that have already connected to the water supply line along Log Road, any new development is not restricted from using groundwater. Pumping and extraction of new private water supplies can cause the plume to migrate beyond its current extent and possibly into those new supply wells. The parcel occupied by the Site (Lot 9, Plat 50) is now owned by William Eleanor Real Estate, Inc. and may be redeveloped. Installation of wells to extract water for non-potable use can also cause the contaminant plume to migrate and no longer be stable, especially in the bedrock. Because of this, EPA believes additional measures beyond what is occurring under Alternative GW2 should be taken to reduce the time until safe drinking water levels are reached.

iii) EPA has evaluated the effectiveness of the treatment methods selected and has also fully taken into account natural processes occurring at the Site. This ROD Amendment requires a pre-design investigation to verify the implementability and effectiveness of the in-situ chemical treatment and enhanced biodegradation reagents. In addition, a pilot test will be performed to evaluate site-specific factors so that treatment can be optimized. While natural attenuation processes are evident at the Site, the question is whether reductive dechlorination will continue to occur if there are insufficient electron donors. There are currently insufficient electron donors to enhance contaminant reductions. Therefore, the selected remedy requires that nutrients be provided to stimulate growth and more electron donors are made available to enhance the reductive dechlorination process.

iv) EPA has evaluated the potential for additional harm from the treatment included in the selected remedy including the potential for various naturally occurring metals to be mobilized. These issues will also be further evaluated during the pre-design investigation. As experience with any treatment technology advances, the technology can be optimized. For instance, the potential for decreased pH as the result of reductive dechlorination may be offset by the addition of buffers into the treatment reagent, which can be evaluated in a field pilot test. The treatment technology in the selected remedy has also been used at many other sites without significant harm to the environment.

v) EPA agrees that implementation on the Site may present access issues that will have to be addressed. If necessary, EPA is prepared to go to court to secure the necessary access for this Site so that the selected remedy can be implemented. Costs for implementing the remedy due to access constraints have not been specifically identified but are included in the contingency costs and are considered to be within the FFS cost range.

19. **Comment:** *The presence of inorganics and some recalcitrant organics are a major impediment to aquifer restoration. The EPA proposed remedy (GW3B) will not provide for restoration of groundwater or achievement of acceptable risk levels (1 x 10-5 and a HI of 1) within the aquifer any faster than GW2.*

EPA Response: As presented in the FFS, VOCs represent approximately 98% of the potential health risks in the overburden. The selected remedy reduces contamination in the majority of overburden aquifer so that a large portion of overburden groundwater is within EPA's acceptable risk range of 10^{-4} to 10^{-6} within a very short time frame and the entire overburden aquifer within 40 - 45 years. Also, by focusing on treatment of the contamination in the saturated soil in the former Source Area, it will likely diminish contaminant migration into the bedrock. Under GW2 on the other hand, overburden groundwater is projected to require 80 years to be within EPA's risk range through natural attenuation due to the continuing source within the former Source Area.

20. **Comment:** *The remedy proposed by the EPA does not address bedrock groundwater in a shorter timeframe than MNA and in fact relies on natural attenuation processes to provide restoration. Since any new drinking water wells in the area would be bedrock wells, MNA is as effective as the proposed remedy in restoring the quality of groundwater at the Site to which humans could possibly be exposed.*

EPA Response: Based on concerns about the bedrock, EPA is deferring the selection of a final remedy for contaminated bedrock groundwater at this time until further data is collected and analyzed. Because natural attenuation has not been demonstrated to be sustainable in the bedrock, MNA cannot be selected as the remedy. Additional evaluations will be required to assess the viability of MNA in the bedrock.

While the ROD Amendment remedy does not directly address bedrock groundwater, it is anticipated that reduction of the VOC mass in the former Source Area saturated soils will also reduce potential VOC migration into the bedrock. The proposed injection of treatment reagents near the top of the weathered bedrock surface may promote some limited migration of the reagents into the shallow bedrock. Therefore, it is expected that incidental treatment of the bedrock contamination will occur, which may aid in decreasing the VOC mass in the bedrock.

While new evaluations are ongoing, in the interim, institutional controls will be implemented to prevent installation of any new wells that could cause the plume to migrate or to prevent the use of contaminated groundwater.

21. **Comment:** *Despite the remedy selected, institutional controls have been recommended by the EPA to prevent groundwater use on-site and to manage potential risks associated with vapor intrusion. These institutional controls would be implemented for both the MNA remedy and the remedy selected by EPA to ensure that no unacceptable risks are posed by the Site. On this basis, risks are adequately managed.*

EPA Response: Institutional controls are used in the selected remedy to address risk in the short term until safe drinking water levels are reached. Under GW2, institutional controls are considered both the short and long term actions to reduce risk. Institutional controls are inherently less reliable than actions that require treatment to reduce the levels of contamination to address risk.

22. **Comment:** *The migration of contaminants is already effectively controlled as evidenced by groundwater monitoring data, which indicates that the plume is stable and the extent of impacts has been reduced from its historical extent.*

EPA Response: While the plume extent is somewhat stable, concentrations of vinyl chloride are increasing in the overburden aquifer downgradient of the former Source Area. Regardless, significant contamination still exists in groundwater that presents an unacceptable risk.

23. **Comment:** *On a related front, at recent public hearings EPA implied that the contaminated groundwater plume continues to migrate towards Log Road. This statement is inconsistent with undisputed Site data which reveals that MNA has resulted in a contraction of the plume over the years and that it is currently stable. The misperception created by these inaccurate comments by EPA has resulted in some public comments favoring an active remediation, which appear to have influenced EPA's selection of a proposed plan.*

EPA Response: At the public meeting, EPA did not state that the plume was migrating towards the Log Road. The direction contaminated groundwater is flowing was discussed in response to questions asked at the meeting. EPA did state that an evaluation was performed that compared the footprints of the VOC contaminants of concern prior to and after the 1999 – 2001 source control action. In most cases, the extent of VOCs has diminished since the 1987 ROD. The selected remedy includes additional groundwater monitoring to confirm EPA's understanding of the extent of the groundwater plume.

24. **Comment:** *An MNA remedy can be implemented and approved within the framework of the applicable EPA and RIDEM regulations and the NCP. In fact, MNA has been approved at two other EPA Region 1 Superfund sites in Rhode Island as the Management of Migration component in conjunction with focused source treatment activities.*

In reviewing the facts and circumstances of these sites relative to the ROD amendments adopting MNA, the common factors (which apply to the subject Site) tend to be (i) a previously completed soil remedy, (ii) a determination based on monitoring that the originally proposed active groundwater remedy (e.g., pump and treat) is not necessary to achieve objectives, (iii) the plume no longer extends beyond site boundaries, (iv) the plume is stable, and (v) the use of institutional controls.

EPA Response: While different sites may have somewhat similar characteristics, remedy selection is based on conditions relevant to each site, the risks posed by site contaminants, and other considerations. While MNA may have been appropriate at other sites in Rhode Island, conditions sufficient to make a determination consistent with EPA Guidance at the Davis Site are not present. In addition, as the comment states, focused source treatment activities are needed which are still necessary at the Davis Site.

25. **Comment:** *Given that conditions within some of the organic rich materials are already reducing and that biodegradation processes are also controlled by other factors (pH and nutrient availability), the ostensible benefits to be provided by injection of the reducing agent are speculative, failing to meet the NCP requirement of long term effectiveness and permanence without the degree of certainty required that the alternative will prove successful.*

Achieving 100 % removal of the source mass is unrealistic. Based on case studies, the contaminant removal rates will be considerably lower, and considering this is a supplemental source remedy, the vast majority of the easily accessible mass was removed during the initial source remediation at the Site. The remaining mass is likely contained in relatively inaccessible locations (e.g., peats, silts, and clays); the mass removal rates will likely be lower than is reported in the literature.

There is significant uncertainty in the performance of the selected remedy. While the proposed in-situ chemical treatment approach is innovative, there is an insufficient amount of performance data from other Sites where this technique has been implemented to provide any assurance as to its effectiveness. Further, the performance data is generally limited to sites where this technology is being used as the primary source remedy. Considering that the majority of the mass has already been removed by excavation and that the remaining mass will be mainly confined within inaccessible portions of the formation, the performance of the technology is likely to be even lower.

EPA Response: Treatment using chemical reducing agents is specifically designed to avoid potential interferences by naturally occurring organic carbon. If a chemical oxidizer were to be used, the organic carbon would present a much greater issue. This was considered in the evaluation of chemicals to be injected at the Davis Site as part of the FFS. While factors such as nutrient availability do control microbial actions, the remedy selected in the 2010 ROD Amendment would add nutrients to stimulate microbial growth and promote degradation of chlorinated VOCs. As stated previously, a pre-design investigation would also be conducted to assess these factors, which will be used in the final design of full-scale treatment.

While the technology selected is innovative, we believe there is sufficient information regarding its use at other Sites to support its selection here. Just because a technology is labeled “new” or “innovative” does not mean that it is not an effective technology. In-situ aerobic biodegradation was considered innovative at one time, and is now commonly used. In-situ anaerobic degradation (to stimulate reductive dechlorination) has been used successfully at many sites over the past 10 years, with several companies providing off-the-shelf treatment reagents. Enhancing the ongoing reductive dechlorination at the Davis Site would be beneficial in reducing the source with in the former Source area. The use of in-situ chemical treatment, specifically chemical reduction, while considered to be innovative, is appropriate for use at this Site. In addition, EPA anticipates that it will further refine this technology to increase its effectiveness at this Site through pre-design studies. Each site is different, and site-specific conditions may favor or inhibit effective treatment. Therefore, a pilot test is required under the selected remedy as part of the pre-design investigation to assess the potential effectiveness under site-specific conditions.

EPA agrees that while the majority of the VOC contaminant mass has been already been removed, a significant VOC mass remains in the subsurface that is a continuing source of groundwater contamination. ESS estimates, there may be up to 805 pounds of total VOC mass present in saturated soil, of which 245 pounds are located predominantly in the southeastern portion of the former Source Area [p. 14, *Phase 4 Supplemental Field Investigation Report* (ESS, 2009)]. This residual mass is a principal threat at the Site and the NCP establishes an expectation that principal threats be addressed through treatment, whenever practicable. (40 CFR 300.430(a)(1)(iii)(A)).

26. **Comment:** *Based on our experience with other sites, the variability in geology within the source areas… will pose challenges to distribution of reducing agents and electron donors. The organic peat and fine-grained organic deposits present within the former source areas and underlying the nearby wetland areas will be resistant to treatment and act as ongoing sources of impacts to groundwater. It was been documented in the Remedial Action Report for the Source Remedy (Loureiro Engineering Associates, Inc., 2002) that high levels of contamination were present in the organic deposits associated with the wetlands and that these deposits were resistant to treatment, therefore requiring that materials be transported off-Site for disposal... layers of fine-grained organic deposits were also identified that exhibited elevated concentrations of target compounds and high Fraction Organic Carbon ("foc") concentrations in the percent range... It is highly uncertain if the proposed groundwater remedy can adequately address the contamination that is present within these deposits on the Site. Therefore, the reliability and effectiveness of the remedy in the proposed plan is speculative and the timeframe to meet cleanup standards for the selected remedy, if achievable, will be effectively equal to that of MNA.*

EPA Response: EPA agrees that as with almost all selected remedies under CERCLA there is additional information that needs to be gathered to address uncertainties related to subsurface geologic conditions and treatment performance. As with any active remediation project, the selected remedy typically requires pre-design investigations to better characterize the subsurface conditions and to conduct a pilot study to verify the implementability and effectiveness of treatment.

EPA agrees that there are subsurface geologic materials with high organic carbon onsite. However, review of the soil boring logs from the 2008 investigation conducted by ESS indicates many descriptions of sand; even in the northwest quadrant adjacent to the wetlands. While some peat presence is noted, it is relatively limited. As stated by the Commenter, materials that might be difficult to treat (e.g. high foc) have already been sent offsite for disposal as part of the source control remedy.

27. **Comment:** *The shallow nature of impacts (limited overburden pressures) will limit a) the potential for the contractor to use fraccing to improve the permeability of the soils (prior to injection) and b) the injection pressures that can be used in application of these reagents. This will reduce the radius of influence at each injection point and increase the potential for variability in distribution in the subsurface.*

EPA Response: During the pilot test, the subsurface conditions will be explored and evaluated, and the effectiveness of injection and the radius of influence will be evaluated. The selected remedy already assumed numerous injection points will be needed to provide adequate reagent coverage within the aquifer.

28. **Comment:** *It is important to recognize that in implementation of the preferred alternative (GW3B) with the introduction of ZVI into the formation introduces risk that, rather than ensuring overall protection of human health and the environment as required by the NCP, may actually have the opposite effect)... No evaluations have been completed to demonstrate the efficacy of this technology to remove arsenic and pesticides (aldrin and dieldrin) from groundwater...In addition to the carcinogenic risks posed by arsenic and semi-volatile organics, non-carcinogenic risks prevent the potential beneficial use of groundwater after remediation at this site. A preliminary risk assessment was developed by Nobis as a basis of the remedy selection. On the basis of this risk assessment, Nobis concluded that the concentrations of manganese (a HI of 5.43), and mercury (a HI of 5.81) in the overburden exceed the acceptable non-carcinogenic Hazard Index (HI) of 1 and, in addition, cobalt (a HI of .87) and iron (a HI of .98) (combined exceed acceptable non-carcinogenic risk thresholds for ingestion of groundwater... On the basis of these non-carcinogenic compounds, groundwater at the site is unacceptable for human ingestion and, consistent with the ARARs, cannot be used as a potable drinking water supply. While we do note some technical deficiencies in the risk assessment work conducted by Nobis... we do agree that the elevated levels of iron and manganese (secondary MCLs) will make it undesirable as a drinking water aquifer.*

EPA Response: The proposed remediation is meant to address the greatest contributors to human health risk, which are the VOCs present in groundwater, if the aquifer was used as a potable supply. As presented in the FFS, VOCs represent 99% of the carcinogenic risks in overburden groundwater and 86% of carcinogenic risks in bedrock groundwater. If all VOCs were removed, then the remaining risk may be reduced to within EPA's acceptable risk range (10^{-4} to 10^{-6}, with a goal of 10^{-5} for Davis Liquid Site).

As for the SVOC and pesticides, some ZVI vendors offer amendments that work in conjunction with ZVI to enhance the degradation of these chemicals. During the pre-design investigation and pilot study, these amendments can be tested for their efficacy in addressing SVOCs and pesticides.

The naturally occurring arsenic, iron, and manganese and other contaminants in soil have been mobilized into groundwater at elevated concentrations as the result of geochemical changes to the aquifer resulting from the reductive dechlorination of the chlorinated VOCs. Once remediation is completed, microbial actions will taper off and end, and the elevated levels are expected to return to ambient conditions. As a result, the selected remedy will ultimately meet all remediation goals.

29. **Comment:** *The selected remedy calls for enhancement of anaerobic conditions at the Site through the inclusion of ZVI in the injected fluid. This enhancement has been shown to typically lead to enhanced redox conditions and an increase in pH and may result in increasing concentrations in the groundwater of certain inorganic compounds such as arsenic, iron and manganese. The further dissolution of iron into groundwater and associated degradation of groundwater quality has been identified as a concern by EPA (See attachment C of the Kaufman & Canoles correspondence of July 30, 2010).*

    EPA Response: EPA agrees that the groundwater pH could increase. However, vendors are now offering treatment reagents that incorporate a buffering agent in order to stabilize the pH. As part of the pre-design investigation and the on-site pilot study, the issue of pH increases and addition of buffering agents will be evaluated for their ability to moderate metals mobilization.

    Under current Site conditions, manganese has already been mobilized as demonstrated by the groundwater data provided by ESS in 2008. Manganese was detected in the majority of groundwater samples, many exceeding the EPA's risk-based Regional Screening Levels. Once the in-situ treatment is completed, the subsurface geochemistry is expected to return to ambient conditions as upgradient groundwater flushes through the treatment zone, and the metals present in soil will no longer be mobilized due to changed geochemical conditions in the groundwater.

30. **Comment:** *The use of ZVI may be beneficial for reductive dechlorination of some chlorinated compounds but could also scavenge nutrients within the aquifer (phosphate and nitrate sorbing onto the iron) and inhibit biological degradation rates within the aquifer. In addition to possible sorption onto iron, ZVI has been shown to reduce nitrate into ammonium and, as a result, reduce its bioavailability. This effect could retard the biological degradation process that the EPA considers critical to aquifer restoration.*

In the application proposed by EPA, ZVI will be distributed in a heterogeneous manner with high concentrations present immediately adjacent to injection locations and within more permeable (sandy) units and stringers in the formation. Due to the heterogeneity of the Davis Site, the performance of ZVI will be considerably lower than observed at other sites which are suitable for injection.

Soneji, McFall and Batholome (2008) have identified a number of deficiencies associated with the use of ZVI; these include the gradual corrosion of the iron and associated increases in pH. The effects of corrosion will be important on the Davis Site as the remediation treatment time frames are longer than EPA has estimated.

The changes in pH and redox associated with the injection of ZVI will also have important implications in terms of aquifer geochemistry and the fate and transport of inorganics in groundwater.

EPA Response: As part of the pre-design investigation and the on-site pilot test, the effect of ZVI and enhanced biodegradation interactions will be evaluated based on site-specific conditions. Vendors have developed ZVI reagents that are meant to complement enhanced biodegradation activity.

Pressure injection may follow preferential pathways. Some vendors have developed delivery systems to address heterogeneities in how the reagents will be distributed into the subsurface. Also, using a relatively closely spaced injection pattern, as was assumed in the FFS, will also help to overcome some of the distribution difficulties.

The corrosion of the iron is the desired reaction for the remediation method. As corrosion occurs, the ZVI is gradually converted into ferrous iron and hydrogen, which are both reducing agents and can help degrade the chlorinated solvents abiotically.

31. **Comment:** *It will not be feasible to inject into existing bedrock monitoring well OW-94R as proposed in the selected remedy. The data reveals that the bedrock in this area of the Site, similar to other areas of the Site, is characterized by an extremely low hydraulic conductivity. Monitoring well OW-94R will not even maintain the low flows required during the performance of groundwater monitoring activities at the Site. This aspect of the remedy does not meet the NCP requirement of Implementability because it is not technically feasible.*

EPA Response: EPA agrees with this assessment. The injection into this one bedrock well will be omitted. However, further assessment of the most appropriate remedial action to address bedrock contamination will be conducted and a future decision document will be required.

32. **Comment:** A few commenters stated that although biodegradation is a desirable long-term effect of ZVI injection, stimulating biodegradation alone will not be enough to justify the use of a relatively higher-priced reagent, such as NZVI (Nano Zero Valent Iron). Commenters also identified technical challenges with the use of NZVI.

    EPA Response: The selected remedy does not rely on the use of nano-scale ZVI (NZVI). A macro-scale ZVI was selected as the representative chemical reducing agent for the FFS evaluation progress. However, the final selection of the appropriate chemical reducing agent will be dependent on the pilot test results. One goal of the pilot test is to identify the appropriate chemical treatment reagent for in-situ reduction. ZVI is a good candidate that will be tested to see how well it can be distributed under site-specific conditions. Depending on the reagent delivery system, effectiveness of treating silty or clay soils will be evaluated during the pre-design investigation pilot test.

33. **Comment:** *When insufficient ZVI mass is injected, mildly reducing conditions (ORP < -200 mV) are generated, and this will stimulate slower hydrogenolysis and anaerobic biodegradation of CVOCs and formation of cis-1,2-DCE and VC.*

    Finally, it has been suggested by Nobis that the ZVI can be used to treat in-organics (specifically arsenic) in groundwater. This has primarily been based on column studies and ex-situ treatment techniques…However, Melitas et al (2002) has stated 'although laboratory investigations have demonstrated the short-term effectiveness of zero-valent iron for mediating the reductive precipitation of chromium and arsenic compounds, the long-term effectiveness of the process has not been established, and the conditions favoring arsenic and chromium removal are not well understood.

    EPA Response: EPA agrees with this comment. The loading of sufficient quantities of ZVI and other treatment reagents will be assessed during the pre-design investigation and pilot test to ensure that appropriate subsurface geochemical conditions are attained to ensure proper degradation. Assessing effectiveness of treating arsenic will also be evaluated further.

34. **Comment:** *The reductive dechlorination process relies on the production of hydrogen from the dissociation of water and the corrosion of the iron. The effectiveness of the remedial technology in the unsaturated zone will be limited as the availability of water is limited and oxidation of the iron occurs due to atmospheric diffusion of oxygen into soils.*

    EPA Response: Treatment of the unsaturated soil is not the major focus of the selected remedy as it is assumed that the vast majority of VOCs in unsaturated soil has previously been addressed. During the pre-design investigation, the unsaturated soil will be sampled and analyzed to determine whether there is enough residual contamination to pose threats to groundwater quality. If the data indicate minimal VOC presence, then these soils may not need to be treated. Should the unsaturated zone need to be treated, this approach can and has been implemented at other sites through the addition of more water into the treatment zone.

35. **Comment:** *The preponderance of data supports our analysis that the MNA processes at the site are robust and have resulted in significant declines in contaminant concentrations and a stable plume. Similar conclusions have been provided by Nobis, where it is stated in the FFS that groundwater concentrations in the overburden, in particular the chlorinated aliphatic (PCE and TCE) and aromatic hydrocarbons (i.e. BTEX compounds) appear to have undergone moderate to extensive natural attenuation or biodegradation as indicated by the initial rapid decline in VOC concentrations since the 1980's. Generally the VOC plume extent in the overburden and bedrock appears to have stabilized.*

EPA Response: Most of the BTEX compounds either have been consumed or have been degraded since the 1980s. However, with the disappearance of these aromatic hydrocarbons as a carbon source, the reductive dechlorination processes have diminished or ceased in different parts of the aquifer. Therefore, EPA's selected remedy is designed to enhance the reductive dechlorination process which has stalled. Also, as discussed above, there is a significant difference between "Monitored Natural Attenuation" as defined in EPA guidance and "natural attenuation."

36. ***Comment:*** *It is noted that a more complex, three-dimensional modeling effort was undertaken by URS (2007) and that EPA Technical Staff (Ada, Ok) provided comments on this model before it was finalized and resubmitted to EPA. Despite the rigorous nature of this model and the extensive review undertaken by EPA, EPA and Nobis have strangely chosen not to utilize the findings of this model. This model is considerably more robust than the screening model produced by Nobis, is calibrated to the site and is designed for predictive assessments (estimates of remediation timeframes). In contrast the BIOCHLOR model developed by Nobis was not reviewed by EPA Technical Experts.*

EPA Response: EPA has reviewed the Supplemental Modeling effort prepared by URS on behalf of the PRP group. The review identified several issues that indicate the URS modeling results may not be accurate. Although the three-dimensional model is reportedly more "robust," EPA still has concerns regarding the development of the model including: the model input values appeared to be inconsistent with field data; uncertainty about the accuracy of the model due to the small amount of information provided in the modeling report comparing field data to predicted model data; uncertainty regarding the model calibration procedures; and limited data set available to recalibrate the model for the fate and transport simulations.

In addition, the sizes of the Northern Disposal Area (NDA) and Southern Disposal Area (SDA) as depicted in the URS model report are substantially smaller than depicted in other documents, specifically the Remedial Action Report (LEA, 2001). The model did not incorporate the findings of the 2008 subsurface soil sampling results performed by ESS. In these findings, ESS estimated that up to 805 lbs. of VOCs [of which 315 lbs are chlorinated] remain in the former Source Area. As a result, the URS model appears to have underestimated contaminant mass to arrive at its conclusions. This means that the time to reach clean up goals will take substantially longer than projected by the URS model.

Because of these concerns, a significant effort would have been required to revise the URS model. The conclusions of the BIOCHLOR modeling are generally consistent with the findings of the three dimensional modeling performed by URS, in that the degradation of the source area (i.e. area of maximum soil/groundwater contamination at the beginning of the simulations) dominates the time to achieve remediation. The BIOCHLOR modeling indicated that time to remediate was driven by source area degradation rates, which in the BIOCHLOR model, was based on measured field data.

The distribution coefficients used in the BIOCHLOR model were based on recommended values for the BIOCHLOR model. The three-dimensional model used lower distribution coefficients, as presented in Table 2 of the Groundwater Fate and Transport Model Supplement. Thus, the three-dimensional model would result in a significantly smaller contaminant mass sorbed than the BIOCHLOR model and would underestimate the time needed until remediation is achieved.

37. ***Comment:*** *The model did not consider any aerobic degradation mechanisms which, as discussed above, are important for the biodegradation of both vinyl chloride and cis-1,2 DCE. This has important implications as Nobis in Appendix E of the FFS has noted that the time to reach clean-up goals is controlled by vinyl chloride... This can lead to an overestimation of clean-up timeframes for vinyl chloride on the fringes of the plume and in the source area where granular fill may be present.*

EPA Response: The BIOCHLOR model did not consider the aerobic degradation of vinyl chloride and cis-1,2 DCE. However, conditions in groundwater are unlikely to be aerobic unless it is close to the ground surface and there is intimate exchange with ambient air. These conditions are unlikely to occur in the bedrock and in much of the overburden aquifer. In addition, aerobes capable of degrading the vinyl chloride and cis-1,2 DCE have not been demonstrated to be present.

38. ***Comment:*** *The model developed by Nobis does not consider vertical gradients and vertical mechanisms of groundwater transport. Given that variable vertical gradients are present at the Site, vertical gradient have important implications in the fate and transport of contaminants. These vertical flows were considered in the URS modeling and have been shown to have extended the time for restoration of the overburden aquifer due to the vertical transport of impacts from the bedrock into the overburden... [it] underestimates restoration times for the overburden aquifer in all remedial options and most notably in the preferred remedial alternative GW3B.*

    EPA Response: Vertical gradients were not considered because the BIOCHLOR model estimated time based on source area degradation, which is the dominant mechanism in the determination of the time to remediate.

39. ***Comment:*** *The modeling approach conducted by Nobis did not consider the presence of NAPL within either the overburden or bedrock aquifers. The likely presence of NAPL was noted by Nobis in its CSM documents, but excluded from consideration in their modeling. Considering possible presence of NAPL, the source treatment would take longer than envisioned by EPA (likely > 5 years) and corresponding attenuation outside the source areas would be slower and comparable to that of MNA. The presence of DNAPL was noted by Nobis in both the CSM and FFS. Further it was recognized by Nobis that DNAPL (if present) was most likely present in the bedrock and ultimately this DNAPL would control the effectiveness of the remedy*

    EPA Response: Both CSM documents speculated on whether NAPL was present. Available analytical data do not indicate their presence. While NAPL presence is possible, it has not been corroborated. Additional soil sampling collected by ESS in 2008 did not conclusively identify NAPL presence within the saturated soil. The selected remedy no longer addresses bedrock contamination. Additional investigations of the bedrock may include further investigations of DNAPL.

40. ***Comment:*** *As discussed by Nobis, it was assumed that the source remediation option addressed 100% of the impacts and only groundwater outside of the area of treatment was impacted. This assumption is not realistic or supported by literature or case studies. Consistent with industry practice and the approach taken by URS in their more comprehensive and rigorous modeling effort, [and] source remediation.*

    EPA Response: The proposed approach will consist of four sequential applications of treatment reagents with the goal of re-treating areas that appear to be recalcitrant. While 100% remediation is not assumed, the goal is to decrease VOC mass such that resultant leaching of chemicals does not exceed ROD Amendment cleanup goals (MCLs, RIDEM GA Objectives, etc).

41. ***Comment**: The foc numbers utilized in the BIOCHLOR model do not reflect the organic rich and fine grained nature of overburden soils… This assumption has led to a gross underestimate of the mass sorbed in the formation as well as the remediation timeframes for all remedial options.*

EPA Response: The foc values used in the BIOCHLOR model were based on field data provided in the 2008 investigation.

42. **Comment:** *In determining the applicability to treatment of COCs it is important to recognize that historical assessments of treatability have been based on either column studies or field data where ZVI has been used in barrier walls which is different than the proposed approach for the Davis Site.*

EPA Response: EPA recognizes the limitation of column or bench-scale studies. Therefore, a pre-design investigation incorporating an on-site pilot test will be conducted to more fully characterize the area or zones to be treated, evaluate the implementation requirements, and assess the effectiveness of treatment. Results of the pilot study will be used to determine how best to implement the remedial action at full-scale and to support the remedial design.

43. **Comment:** *While the biodegradation processes for vinyl chloride and cis 1,2 DCE within the aquifer may have slowed, they still exist. Therefore, as the PCE and TCE is depleted and associated production of daughter products declines, a point will be reached where the biodegradation rates for vinyl chloride and cis 1,2 DCE exceeds the production rates from degradation of PCE and TCE.*

No discussion is provided on the aerobic mechanisms of biodegradation of vinyl chloride and cis 1,2 DCE. These conditions are prevalent in Latham Brook and some areas immediately adjacent to Latham Brooke. The half life of these constituents (particularly of vinyl chloride) is short under aerobic conditions.

In the FFS, Nobis stated that the extent of 1,2 DCE and vinyl chloride is increasing and accumulating. The recent groundwater monitoring data collected at the Site during the Pre-Design Investigation and the tables and figures in the document indicate that Nobis is incorrect.

EPA Response: While aerobic degradation can be effective for vinyl chloride and cis-1,2DCE, this degradation process has not been demonstrated to be present at the Davis Liquid Site. Additional data can be acquired, possibly during the pre-design investigation, to assess aerobic degradation pathways.

EPA agrees with the assessment that once much of the PCE and TCE sources are removed, the production of vinyl chloride and cis-1,2 DCE will also be slowed.

However, it is uncertain whether the degradation of vinyl chloride and cis 1,2 DCE will outpace PCE and TCE degradation, since anaerobic degradation is very slow. If the electron donors are depleted during PCE and TCE degradation, this process will also slow, extending the period for vinyl chloride and csi-1,2 DCE attenuation.

Appendix E of the Commenter correspondence presents a good compilation of VOC trends in both overburden and bedrock monitoring wells. The FFS was referring to the information provided in the CSM Addendum document where the extent of VOCs from 1984 through 2001, was compared with the extent in 2006 and 2008. Various graphics were prepared to compare the plume extent for vinyl chloride, PCE, TCE, cis-1,2DCE, etc. There are no cis-1,2DCE data from the RI Report. Comparison of the 2006 and 2008 results indicated a larger detected extent of cis-1,2 DCE during the 2008 sampling event. In the Appendix E charts, vinyl chloride concentrations in OW-038 and OW-043 appear to be increasing (both downgradient of the former Source Area and near the leading edge of the plume). While vinyl chloride has not been detected in OW-034 at the leading edge of the plume, increases in the OW-038 and OW-043 wells suggest that the vinyl chloride may be migrating towards the OW-034 location. While not confirmed, it is suspected that the vinyl chloride extent will increase unless additional action is taken.

44. **Comment:** *In the FFS, Nobis states that the electron donors in the down-gradient portion of the plume appear to have been depleted in the overburden. This conclusion is inconsistent with the recent groundwater monitoring data collected at the Site during the Pre-Design Investigation. Significant concentrations of dissolved hydrogen, which can be generated by the fermentation of petroleum hydrocarbons or natural organic carbon, were detected. Hydrogen is an effective electron donor in support of reductive dechlorination and exists in sufficient quantities to support a level of MNA that will achieve the site remediation goals in a manner and in a timeframe comparable to the proposed action.*

EPA Response: Organic carbon is an indicator of potential electron donor strength. Review of the 2008 ESS data indicates that in the overburden plume, TOC concentrations were generally below 4 mg/L, with TOC exceeding 20 mg/L only at OW-302-O (27.2). In screening for reductive dechlorination, 20 mg/L was identified as a TOC concentration that is conducive to reductive dechlorination processes. However, as indicated by the relatively low TOC values, TOC may not be an effective electron donor source for the overburden plume.

A review of the 2008 groundwater sampling data indicates that 8 out of 23 samples were analyzed for hydrogen presence. Of these, elevated hydrogen concentrations were detected at OW-54 (92 nMol), at OW-93-O (90 nMol), and at

OW-94-O (78 nMol); however, elevated vinyl chloride presence was also detected at these same locations (190 ug/L, 99 ug/L, and 240 ug/L, respectively), some of the highest detected onsite. These results indicate that while hydrogen ion concentrations are a factor, they do not represent the only factor governing reductive dechlorination.

45. **Comment:** *The proposed approach for implementing the selected remedy does not take into consideration the known Site conditions. Based on the work completed to date at the Site, particularly within the former Source Areas, direct push drilling techniques as proposed by EPA cannot effectively be implemented to perform the deeper injections required for the performance of the selected remedy due to the presence of a rubble zone that was encountered during the performance of the Source Remedy. Rotasonic or air rotary drilling rigs will undoubtedly be required, increasing the cost of the project considerably to penetrate this zone. The Agencies are aware of these conditions based on their oversight of historic drilling activities on the Site and the involvement during the performance of the Source Remedy.*

EPA Response: The advancement of injection points for in-situ treatment will be further evaluated during the pre-design investigation. While there are cobbles and debris that underlie some portions of the site, many areas are free of these impediments. The boring logs from the 2008 investigation did not identify widespread cobble presence.

46. **Comment:** *The source remedy was effective at removing a large amount of contaminant mass from the former disposal areas. However, the assessments conducted by Nobis have clearly indicated that the source removal action did not achieve the original intent of mitigating the further release of impacts from soil into groundwater. Assessments conducted by Nobis indicated that unsaturated soils outside the source treatment area, treated soils within the source area, and saturated zone soils below the source area are all ongoing sources of impact to the groundwater. On this basis, the failure of the source remediation action to achieve the remedial objective will impede, if not prevent, the achievement of compliance with the remedial action objectives and, as a result, the groundwater remedy is now required to address both unsaturated and saturate zone soils through use of uncertain in situ treatment to meet RIDEM soil cleanup levels. This is outside the scope of the groundwater remediation as set forth in the ROD and inconsistent with the remedial objectives outlined in the proposed plan.*

EPA Response: The source control remedy was effective, based on the information available at the time of the 1987 ROD. Since 1987, advancements have been made in the understanding of residual contamination and long-term impacts to groundwater quality. The selected remedy addresses contaminated groundwater which includes contaminated saturated soil. Treatment of unsaturated soil may not be necessary, pending further sampling and analysis results to be performed during the pre-design investigation.

47. **Comment:** *Key limitations with the previously conducted source removal action that are supported by the discussions and conclusions presented in the CSM and FFS are as follows:*

1. The depth to which the soil removal actions were required by EPA was not sufficient to address significant soil impacts while, at the same time, impacting organic rich soils which control the longevity of groundwater impacts and limit the potential success of any groundwater treatment option.

2. The treatment standard of 2 mg/kg total VOCs did not adequately consider the potential for continued leaching of contaminants into groundwater and that on a seals basis, the treatment soils would be present below the water table.

3. 40 CFR 261.24 as soil remediation criteria for metals is inappropriate and does not consider the limited dilution and attenuation that will occur between treated soils and groundwater.

EPA Response: 1. The source control action specified in the 1987 ROD and the ensuing 1996 ESD were appropriately selected and implemented. Contaminated soil present above the water table (unsaturated soil) is typically addressed differently than contamination below the water table (saturated soil). It was the intent of the 1987 ROD that contamination below the water table be addressed under the management of migration response action. Contaminated groundwater consists of both saturated aquifer materials and the aqueous medium; contaminants are present in both fractions. When "groundwater" is addressed under a remedial action, both the saturated aquifer matrix and the aqueous medium are both addressed. Therefore, the proposed in-situ treatment of "saturated soil" is a component of the groundwater remediation.

2. The 2 mg/Kg total VOCs soil remediation goal was developed based on site-specific information available at the time of the RI/FS. The 2 mg/Kg value was derived based on leaching of residual VOCs coupled with flushing of treated extracted groundwater (from the pump and treat system) through the treated backfill and the contaminated saturated soil underlying the former Source Area. However, recent hydrogeologic investigations have concluded that the recirculation of treated groundwater was not plausible. Therefore, a new remediation approach was required to address the contaminated groundwater, including the contaminated saturated soil underlying the former Source Area. EPA believes that most, if not all, unsaturated soil that remains in the former Source Area no longer impacts groundwater. Additional investigations will be performed to confirm this.

3. 40 CFR 261.24 refers to the RCRA toxicity characteristic, in which the Toxicity Characteristic Leaching Protocol (TCLP) is used to determine whether a waste is considered hazardous through the toxicity characteristic. Rhode Island uses TCLP to determine whether metal-contaminated soils comply with the soil remediation objectives as presented in Section 8.02 (B)(ii) of the State's Remediation Regulations, which is an ARAR under this ROD Amendment.

48. **Comment:** *The natural attenuation processes that occur in surface water have not been considered in the assessment provided by Nobis. The combination of turbulence and associated stripping and aerobic biodegradation are important mass loss mechanisms for both cis 1,2 DCE and vinyl chloride in surface water. Further, both compounds are known to degrade under aerobic conditions and, in the case of vinyl chloride the biodegradation half life under aerobic conditions is short.*

EPA Response: EPA acknowledges that groundwater contaminated with VOCs that discharge to surface water, especially if there is turbulence, will result in partitioning of the VOCs from the aqueous to the gaseous phase. In the atmosphere, the two VOCs will likely undergo degradation through processes such as photolysis or hydrolysis.

For aerobic degradation to occur, the appropriate aerobic microbes need to be present in the aquifer. At this time, it has not yet been demonstrated that aerobic microbes are indeed degrading the vinyl chloride that is present in the plume. In addition to the VOCs, there are other non-volatile groundwater contaminants (such as bis-2(chloroethylether), pesticides, and metals) that are unaffected by these processes, which may be discharging into the adjacent wetlands and Latham Brook. Impacts from the discharges of these contaminants are unknown and will be evaluated as part of pre-design investigations.

Also, VOCs are not the only contaminants that are conveyed in groundwater that discharges to the adjacent wetlands or into Latham Brook. SVOCs, pesticides, and metals are also present in groundwater, and will be evaluated during pre-design investigations.

49. **Comment:** *Consistent with the Class B designation of the surface water provided by RIDEM, surface water is classified for recreational use and fishing and any ingestion of groundwater would be incidental based on these activities. In the 1986 RI, EPA did not consider Latham Brook suitable for swimming or as a drinking water source and, therefore, human ingestion risks were considered negligible. On this basis Nobis has evaluated surface water criteria against RIDEM criteria for human ingestion of fish only and has noted one exceedance in surface water. The use of this RIDEM criteria is not considered appropriate for this site as: The area of exceedance is small and it is unrealistic to consider fish species (suitable for ingestion by humans) would be* *confined to this section of Latham Brook and that a human could catch sufficient fish from this section of Latham Brook to meet the ingestion assumptions used... The RIDEM criteria for human ingestion of fish does not include a "source allocation factor" and therefore assumes that 100% of the life time ingestion (a rate of 17.58 g/day) of fresh and estuarine fish is from Latham Brook... The RIDEM criteria for human ingestion of fish are based on a cancer risk of* 1×10^{-6} *which is inconsistent with remedial objective specified into the ROD of a cancer risk of less than* 1×10^{-5}.

EPA Response: The comparison to the RIDEM criteria was to identify whether there are any potential contaminants that may pose a threat. Available screening data included the RIDEM criteria. The RI was prepared in 1986 and new data will be evaluated to ascertain current conditions. During the pre-design investigation, surface water and sediment that may be affected by the Site will be more fully evaluated. If flow conditions are turbulent in Latham Brook, as indicated by a previous comment, it would be unusual to see any VOC detections in the existing surface water samples. Regardless, surface water and sediment contamination are not directly addressed by this ROD Amendment except to the extent that there are groundwater impacts to these media. Depending upon the results of additional investigations, further response actions may be required to address surface water and/or sediment.

50. **Comment***:* *"The concept that surface water impacts could be further impacting sediment quality at the site is not supported by the data. Considering the low concentrations detected in surface water and the extensive nature of historical impacts and natural attenuation processes, the most probable source of sediment impacts are initial impacts during and immediately following waste disposal activities and direct discharges of untreated water from soil remediation activities over ten years ago. On this basis, and consistent with the ROD, the management of sediment in place is the best option and no action is needed for the management of surface-water beyond periodic monitoring of surface-water quality" (pg. 20). The recent surface water analytical results from Latham Brook are compliant with the Aquatic Life Risk Screening values as shown on Table 1-11 of the FFS and, thus, there is no ecological risk associated with surface water discharging from the site.*

EPA Response: Surface samples were only collected and analyzed for VOCs, but not the other groundwater contaminants including SVOCs, pesticides, and metals. Additional data will need to be collected to determine whether groundwater originating from the Site or other Site–related activities have impacted wetlands and Latham Brook. As discussed above, surface water and sediment contamination are not directly addressed by this ROD Amendment except to the extent that there are groundwater impacts to these media. Depending upon the results of additional investigations, further response actions may be required to address surface water and/or sediment.

51. **Comment:** *The Upper Constructed Wetland system [on the Davis Liquid Waste Site] is an artificially created wetland that was developed on the Site subsequent to the* *completion of the Source Remedy in 2001. Water quality in the basin is believed to be acceptable based on measurements taken in the system's outlet to Latham Brook; however, water quality in this basin has not been specifically assessed to date. Given the lack of any significant depth and the lack of evidence of any fish being present, it is unlikely that the Upper Constructed Wetland system has the potential to support a sustainable game fish population and therefore there is little potential for fish to be removed from this system for human consumption... The Lower Wetland is a naturally formed wetland that exists on the Site that drains immediately to Latham Brook. Water quality in the basin is believed to be acceptable based on measurements taken in the system's outlet to Latham Brook... Given that this wetland exists at the headwaters of the Latham Brook system, there is little potential for nutrients to be contributed from its watershed at excessive levels which would raise the potential productivity of this system. Therefore, any fish population that may be able to survive the winter would be expected to exhibit the characteristics of relatively low fertility system and therefore the fish carrying capacity of this system would be categorized as low (<100 lbs/acre/year) with slower than normal rates of growth. However, it is possible that no fish overwinter in this system or that the fish population is severely stunted by anoxic winter conditions. Fishing activity would also be expected to be hindered by the emergent wetland vegetation along many areas of the pond's perimeter. No evidence of aquatic insects or fish were found within the stream channel of Latham Brook and it is unlikely that this system would be sufficiently deep to support a population of game sized fish at any period of time during the year*

EPA Response: The assessment provided by the Commenter identifies several valid points about the potential viability for fish to be present in the headwaters of Latham Brook. However, there are no current data regarding contaminants other than the VOCs in surface water. Groundwater from the Site contains other chemicals including SVOCs, pesticides, and metals, which may also be discharging into the wetlands (Upper Constructed and Lower) and Latham Brook. Again, surface water and sediment contamination are not directly addressed by this ROD Amendment except to the extent that there are groundwater impacts to these media. Depending upon the results of additional investigations, further response actions may be required to address surface water and/or sediment.

52. **Comment:** *The intense nature of EPA's proposed remedy will be both energy intensive and disruptive to the community and current landowner. The scale of the proposed drilling program and associated transportation of materials for the injection will involve an intensive program of drilling activities periodically over a five year period. The green house gas emissions associated with the proposed activities will be extensive and have not been accounted for in EPA's assessment. In addition, noise, odor, and traffic are a concern to the landowner and surrounding residents.*

EPA Response: The remedy will use much less energy and have less emissions than other active remediation options including the groundwater extraction and treatment and in-situ thermal treatment, which are alternatives GW4 and GW5, respectively, as presented in the Proposed Plan and the FFS. While there will be greater short term impacts from the construction/implementation of the selected remedy, we believe these impacts are minor in nature given the end result and are no different than any other standard construction project.

53. **Comment:** *The proposed remedy fails to meet [NCP] cost standards by requiring a significantly more expensive remedy for the identical result and timeframe of an alternative remedy (i.e., MNA).*

EPA Response: While Alternative GW2 is less expensive, cost is not the only consideration. The NCP requires selection of a remedy that meets the two threshold criteria – overall protection of human health and the environment and compliance with ARARs. Natural attenuation is not as protective as the selected remedy and does not meet ARARs. In addition, a cost-effective remedy in the Superfund program is defined as one whose "costs are proportional to its overall effectiveness" (NCP §300.430(f)(1)(ii)(D)). To make this determination, EPA compared the cost to effectiveness of each alternative individually and the cost and effectiveness of alternatives in relation to one another. Because EPA has found that GW2 has limited overall effectiveness when evaluated in terms of long-term effectiveness and permanence and ability to reduce toxicity mobility and volume by treatment, EPA does not believe the cost of Alternative GW2 is proportional to its overall effectiveness.

54. **Comment:** *In addition to the potential risks associated with ingestion of groundwater, vapor intrusion was identified as an exposure pathway of potential concern. This is currently not a complete exposure pathway as no structures are built over or in close proximity to the footprint of the plumes. Potential future risks associated with exposures to indoor air that may or may not ever occur can be addressed through the use of easily-implementable and cost-effective engineering controls if and when any structures are constructed.*

EPA Response: As part of determining the need for response actions at the Site, EPA reviewed available data and information to determine what health threats may be posed by the presence of contaminated groundwater through different exposure pathways. One factor was whether VOCs in groundwater represented a potential vapor intrusion risk due to the fact that the reasonable anticipated future use of the Site is "residential". The analytical results were screened against available benchmarks for residential exposure, and it was determined that vapor intrusion may be a potential exposure pathway due to the high concentrations of VOCs in groundwater still present. As a result, additional investigation is being required. EPA agrees that if vapor intrusion presents a potential future risk, engineering controls are one effective way to address this problem.