PROPOSED PLAN
FOR AN INTERIM CLEANUP ACTION
AT THE HAMILTON ROAD IMPACTED AREA:
OPERABLE UNIT 1 OF THE
HAMILTON/LABREE ROADS GROUNDWATER
CONTAMINATION SUPERFUND SITE
CHEHALIS, WASHINGTON

PREPARED BY:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 10 SEATTLE, WA

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1.0 PURPOSE OF EPA'S PROPOSED PLAN

The U.S. Environmental Protection Agency (EPA) is seeking input from the public on a cleanup proposal for a part of the Hamilton/Labree Roads Groundwater **Superfund** Site (Site). The part of the Site to be addressed by this proposal is called the **Hamilton Road Impacted Area (HRIA)**. This document, the **Proposed Plan,** describes the cleanup alternatives that EPA considered to address contamination within the HRIA, EPA's preferred cleanup alternative, and the rationale for this preference. EPA will select a cleanup alternative for the HRIA after considering all comments received. The selection will be documented in an **Interim Record of Decision (Interim ROD)**. The cleanup will be an interim action because EPA will propose and select other cleanups for the Site after the HRIA cleanup action starts and additional Site-wide data is collected and evaluated.

This **Proposed Plan** summarizes information found in greater detail in the draft Site-wide **Remedial Investigation (RI)** report (CDM Smith 2011a), the draft Site-wide **Baseline Risk Assessment (BLRA)** report (CDM Smith 2011b), the draft HRIA **Feasibility Study (FS)** report (CDM Smith 2012), and other supporting documents in the **Administrative Record.** The Administrative Record contains the documents that form the basis for the selection of EPA's preferred cleanup alternative for the HRIA.

1.1 CLEANING UP THE SITE IN PHASES

The Site is about two miles south of the City of Chehalis, Washington, near the intersection of North Hamilton Road and Labree Road, west of Interstate 5 (I-5) (**Figure 1-1**). The Site has been divided into two areas, called **Operable Units (OUs)**, to facilitate the identification and cleanup of hazardous substances. The Site includes Operable Unit 1 (OU1), also known as the HRIA, and Operable Unit 2 (OU2), which includes all other areas outside of OU1 (the HRIA) where hazardous substances have come to be located, including the Breen Property, the Thurman Berwick Creek Area, and the area west and northwest of Labree Road (**Figure 1-2**). Hazardous substances have been released in both OUs, contaminating sediment, soil, and **groundwater**.

EPA intends to address contamination at the Site through a phased approach beginning with an interim cleanup action in the HRIA. A phased approach to site cleanup is the most appropriate when site **characterization** is not yet complete or when site data are not sufficient to develop and evaluate cleanup alternatives to address risks posed by the entire site or to determine long-term objectives for the entire site (e.g., restoring groundwater to safe drinking water levels). There appears to be other contamination sources at the Site outside of the HRIA; however, additional Site-wide data collection and evaluation is needed to develop, select and implement other cleanup actions for the Site that will achieve long-term protection of human health and the environment. The proposed interim cleanup action for the HRIA presented in this Proposed Plan is necessary to address the known sources of contamination to sediment, soil and groundwater within the HRIA and the most immediate risks posed by these sources, and to minimize further **migration** of contaminated groundwater from HRIA to **downgradient** areas.

1.2 THE INTERIM CLEANUP PREFERRED ALTERNATIVE

The HRIA is located at the most **upgradient** part of the Site and is about 10 acres in size (**Figure 1-2**). The HRIA is crossed from northwest to southeast by North Hamilton Road and Berwick Creek. The primary **contaminant of concern (COC)** at the HRIA, tetrachloroethene (PCE) appears to be the result of a spill or direct release of liquid PCE into Berwick Creek from an unknown entity. PCE is a chemical used for dry cleaning, metal degreasing and other industrial processes. PCE has contaminated creek bed sediment and bank surface soil, subsurface soil, and groundwater based on the results of sampling.

EPA considered a number of cleanup alternatives to best address HRIA contamination. These are discussed in detail in the draft FS report and summarized later in this Proposed Plan. As the lead agency for this interim cleanup, EPA is proposing **Comprehensive Technology Scenario (CTS)** Alternative 2 (Alternative CTS-2**)** as the Preferred Alternative. This alternative includes the following components:

- **Re-route Berwick Creek around areas of contamination.**

  ✓ Re-routing about 200 feet of Berwick Creek around the areas of contamination in the HRIA will help protect wildlife, fish and other organisms that live in or visit the creek channel from possible negative impacts caused by cleanup activities. The creek will be re-routed to a location within the HRIA where it may remain permanently. The creek channel (bed and banks) would be designed to meet requirements that protect ecological inhabitants, e.g., less than 0.468 milligrams per kilogram [mg/kg] PCE, based on EPA's benchmark for protection of organisms living in freshwater sediments.

- **Heat sediment and soil with PCE concentrations greater than 10 mg/kg.**

  ✓ Increasing the temperature by heating the sediment and soil would remove contaminant mass and reduce PCE concentrations to 10 mg/kg or less.

- **Excavate and dispose of remaining sediment and surface soil with PCE concentrations greater than 10 mg/kg.**

  ✓ If heating of the sediment and surface soil is not successful in reducing PCE contamination to 10 mg/kg, the sediment and surface soil will be **excavated**.

  ✓ The excavated sediment and surface soil would be consolidated within the HRIA and treated with a chemical, such as potassium permanganate if necessary to meet disposal requirements, or they may be treated at an off-site, licensed disposal facility.

- **Add organic materials to groundwater with PCE concentrations greater than 4,000 micrograms per liter (µg/L).**
  - ✓ Injecting organic material such as emulsified vegetable oil into groundwater with PCE concentrations greater than 4,000 µg/L would enhance the biological breakdown of PCE and reduce the migration of PCE from the HRIA to other areas of the Site by 90%.
- **Institutional controls**
  - ✓ **Institutional controls** (ICs) will be implemented during and after the interim cleanup action. ICs are non-engineered instruments, such as legal restrictions, covenants or easements on property, and governmental and/or administrative controls that as part of this interim action would be used to help prevent or minimize the potential for human exposure to hazardous substances, pollutants or contaminants. The objectives of the ICs for the HRIA include preventing the use of groundwater for drinking water and requiring workers to wear protective gear.
- **Monitoring**
  - ✓ Sampling of surface water, sediment, soil, groundwater, and air will be performed during and after cleanup in order to ensure protection of humans and the environment, and to determine the effectiveness of the interim cleanup action.

1.3 PUBLIC INVOLVEMENT

This Proposed Plan is being issued as part of the public participation requirement under Section 117(a) of the **Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund)**, as amended, and the **National Oil and Hazardous Substance Pollution Contingency Plan (NCP).** This document is issued by EPA, the lead agency for Site activities, with the support of the Washington State Department of Ecology (Ecology).

This **Proposed Plan** presents EPA's rationale for the preferred interim cleanup action alternative for the HRIA, and also provides a summary of the other remedial alternatives evaluated as part of the selection process. EPA will select the interim cleanup action for the HRIA after reviewing and considering all information and comments submitted during the public comment period. EPA, in consultation with Ecology, may modify the preferred alternative or select another cleanup alternative presented in this Proposed Plan based on new information or on comments. Therefore, we encourage all interested parties to review and comment on all of the alternatives presented in this Proposed Plan. You can find documents referred to in this Proposed Plan in the Administrative Record, which is available for public review at the following locations:

Vernetta Smith Chehalis Timberland Library
400 N. Market Boulevard
Chehalis, WA 98532-0419
(360) 748-3301 *(Call for hours)*

EPA Region 10
Superfund Records Center
1200 Sixth Avenue, Suite 900 (ECL-076)
Seattle, WA 98101
(206) 553-4494 *(Call for an appointment)*

Your Comments: EPA welcomes and encourages your comments on this Proposed Plan during the comment period from September 28, 2012 through November 9, 2012 and on the day of the public meeting on October 23, 2012 at the following location:

Veterans Memorial Museum
100 SW Veterans Way
Chehalis, WA 98532
(360) 740-8875
http://www.veteranmuseum.org

An Open House on the Proposed Plan will take place before the public meeting from 5:00 PM to 6:00 PM where EPA staff will be available to answer your questions. The public meeting is from 6:30 PM to 9:00 PM where there will be a short presentation after which formal oral and written comments will be accepted. The Interim ROD will also include a Responsiveness Summary, which will contain the responses to the comments received during the Proposed Plan public comment period.

Written comments may be submitted either at the public meeting or mailed to:
Ms. Tamara Langton
US EPA Region 10
1200 Sixth Ave, Suite 900
Office of Environmental Cleanup, ECL-113
Seattle, WA 98101
(T) 206-553-2709
(F) 206-553-0124
langton.tamara@epa.gov (For emailed comments, please put "HRIA Proposed Plan" in the subject line.)

1.4 PROPOSED PLAN ORGANIZATION

Following this introduction, the Proposed Plan contains the following major sections:

1) Purpose of EPA's Proposed Plan
2) Site Background
3) Site Characteristics
4) Scope and Role of the Proposed Cleanup Action Plan
5) Summary of Site Risks
6) Remedial Action Objectives
7) Summary of Interim Cleanup Alternatives
8) Evaluation of CTS Alternatives
9) Preferred Alternative
10) Community Participation

2.0 SITE BACKGROUND

This section describes the areas of the Hamilton/Labree Site by Operable Unit, and provides a history of studies (investigations) that have been conducted across the Site.

2.1 THE HRIA (OU1)

The HRIA (OU1) is located at the most upgradient portion of the Site. It is about 10 acres in size (**Figure 1-2)**. It is crossed from northwest to southeast by North Hamilton Road and Berwick Creek. North Hamilton Road was built in 1974 by the Washington State Department of Transportation.

The portion of the HRIA located between North Hamilton Road and I-5 consists of grassy open land that includes Berwick Creek (which flows northwest), overhead power lines, and a wire field fence that prevents access to I-5. This portion of the HRIA is entirely within the rights-of-way of the two paved roads under jurisdiction of the Washington State Department of Transportation. Two unnamed ditches pass underneath I-5 and discharge to Berwick Creek within the HRIA. The portion of the HRIA west of North Hamilton Road includes the area referred to as the former United Rentals Property. The property is level, with mixed gravel, asphalt, and concrete surfaces, and contains two buildings: the main building and the paint shop. An easement containing buried utilities and a storm water conveyance system is located between the former United Rentals Property and North Hamilton Road.

The former United Rentals Property has changed occupants and ownership numerous times since the late 1980s. In 1988, Carl Watson purchased this property, which at the time was a swampy hayfield containing a few old car bodies and empty barrels. The property was graded flat and a layer of fly ash and about 90 truckloads of rocks were imported to build up the footprint for the subsequent buildings. The main building was built during the winter of 1989/1990.

Beginning in June 1990, a transmission rebuilding company operated at the property under the name Westside Trucking Company. In 1991, Westside Trucking Company changed its name to Gear Box, Inc. and operated under that name until October 1992, when the business closed. The property was sold on May 20, 1993, to E.G.W. Machinery, Inc., the owner of High Reach, Incorporated. High Reach, Inc. rented and serviced specialized aerial construction equipment. A second building, known as the paint shop, was built on this property in 1993.

In 1998, High Reach, Inc. was purchased by United Rentals Northwest, Inc. At this location, United Rentals ran a rental and repair service for a variety of construction equipment. United Rentals also operated a small business that painted heavy equipment until 2009, after which the property was vacated. In April 2012, the property was sold to Visitrade, Inc. and in June 2012, Visitrade leased the property to a building materials store named Builder’s Surplus Northwest.

The portion of the HRIA west of North Hamilton Road and south of the former United Rentals Property includes a gravel access road and an open, steep-sided drainage ditch. Both are on a narrow stretch of property that runs from North Hamilton Road to a larger, undeveloped area just southwest of the former United Rentals Property. Only a small section of this undeveloped land is within the HRIA. The access road, drainage ditch and undeveloped land was originally owned by Warren Willard. In 2007, Mr. Willard sold this property to the McGill Investment Company.

The property south of the access road and drainage ditch area includes a level area covered with gravel and a commercial warehouse next to and south of the gravel area. Up to four feet of material, mainly boulders, was used to fill in and level the property before development. The developed property was originally owned by Reginald and Kimberly Hamilton who ran a company named Hamilton Rocking and Contracting Company from the early 1990s to 1997. They shared the property with the Smith Tractor Company until 1997, when Smith Tractor Company became the sole tenant. The Smith Tractor Company rented and sold trucks and construction equipment, along with parts for this type of equipment. The company added a wash rack that had a concrete slab floor behind the building in about 1996 and used the gravel area to park tractor-trailers.

The property has been sold twice since it was developed and has had a number of tenants. The current owner is Hamilton Road Adventures who leases the property to Emerald Recreational Vehicles (Emerald RV). Emerald RV buys, sells, and rents RVs and related equipment to the public.

2.2 OPERABLE UNIT 2 (OU2)

Operable Unit 2 (OU2) includes all other areas outside of OU1 (the HRIA) where hazardous substances have come to be located including the Breen Property, the Thurman Berwick Creek Area, and the area west and northwest of Labree Road.

2.2.1 Breen Property

The Breen Property (part of OU2), is located northwest of the HRIA and covers about 11 acres (**Figure 1-2**). The Breen Property was purchased by Sterling (Bud) Breen, Sr., President of S.C. Breen Construction Company, in the early 1950s. The property was used for agricultural purposes before it was developed by S.C. Breen Construction Company. By the early 1970s, most of the Breen Property had been cleared of vegetation.

The Breen Property, originally one tax **parcel**, was subdivided in 1992. It now consists of two separate tax parcels, currently owned by two different entities.[1] The western portion of the Breen Property is still owned by the S.C. Breen Construction Company and is made up of about 5.75 acres, which includes several wood-framed, steel-clad buildings with concrete floors, and open areas between the buildings used for storing trucks and other heavy equipment and construction materials.

One of these buildings (currently named Building C) was built in about 1960 on the southwest part of the parcel. This building, referred to then as the “Old Shop,” served as the S.C. Breen Construction Company’s main office and truck maintenance shop until the early 1990s. Since

[1] For purposes of this Proposed Plan and earlier site reports, the term “Breen Property” refers to both tax parcels.

then, Building C has been leased to a number of other companies including the Roy F. Weston Company.

North of Building C was the Breen Surplus store which began operating in the mid-1960s. Breen Surplus bought and sold a variety of equipment, tools, paints, thinners and solvents. This store and building no longer exist.

Southeast of Building C is a 24 ft x 28 ft cement slab that was used as a heavy equipment wash-down pad. Based on a review of aerial photographs, this wash-down pad appears to have been constructed between 1966 and 1969. Runoff and sediment from the cleaning operation was collected in a pit, about 5 feet deep, which had been excavated next to the concrete pad. This collection pit has never been located; the wash-down pad is no longer being used.

In 1972, what is currently referred to as Building A was built on the north end of the Breen Property. In about 1983, Building B was constructed on the Breen Property southeast of Building A. In 1995, Bulldog Trailers began operating on this property using both Building A and Building B. Bulldog Trailers makes and sells general-purpose utility trailers.

Bulldog Trailers temporarily vacated Building B in 1999, when a large number of drums containing PCE and other solvents were removed from under a section of the building (see Section 2.2 [Regulatory Activities] for more information on this cleanup action). Bulldog Trailers currently operates out of both Building A and Building B.

The S.C. Breen Construction Company sold the eastern portion of its property to the Chehalis Livestock Market in 1992 (Farallon 2003). The parcel is about 4.92 acres in size and contains a large building (Livestock Auction Building) that houses an arena, a café and offices, plus outside livestock pens. This parcel is primarily used as a cattle auction facility. The livestock market opened around 1960. A smaller wood-framed building with a dirt floor is located along the southern boundary (Livestock Shed). This building is mostly used to hold calves and other small livestock before auction. The remainder of this parcel is an unpaved parking area. Berwick Creek runs along the southern property boundary of this parcel.

2.2.2 Thurman Berwick Creek Area

The Thurman Berwick Creek Area (part of OU2) is located in the southeast corner of the intersection of North Hamilton Road and Labree Road, west and downgradient of the HRIA and south of the Breen Property. The Thurman Berwick Creek Area is divided by Berwick Creek into two portions: the northwest portion, which currently contains a residential structure built in 1930, and the southeast portion, which is undeveloped land.

2.2.3 Downgradient Areas West of Labree Road

This portion of the Site (part of OU2) includes the remaining area within the PCE groundwater plume footprint that is downgradient of the HRIA, the Breen Property, and the Thurman Berwick Creek Area west of Labree Road (**Figure 1-2**). Most of the current land use in this area is farmland, but residential and light commercial uses also occur.

2.3 HISTORY OF SITE-WIDE INVESTIGATIONS

In 1993, a business along North Hamilton Road submitted a public water system application for a commercial well. As part of the approval process, the business was required to perform water quality testing, including a test for **volatile organic compounds (VOCs).** Test results indicated PCE at 122 µg/L in the water sample (the Federal and State drinking water **maximum contaminant level [MCL]** for PCE is 5 µg/L). The discovery of PCE in groundwater led the Lewis County Department of Public Health (LCDPH) to request the Washington State Department of Health (WDOH) to investigate groundwater in private and public supply wells in the area (WDOH 1999).

In late 1993/early 1994, the WDOH sampled 18 private water-supply wells in the area. PCE was detected in 6 of the 18 water-supply wells ranging from 3.3 µg/L to 2,165 µg/L (Ecology 1999). In response to the findings, the LCDPH informed affected well owners of the sampling results and advised them to obtain alternative sources of drinking water (WDOH 1999). Ecology began supplying water to affected well owners for drinking, cooking, and bathing. In 1996, WDOH re-sampled 5 of the 6 PCE-contaminated water supply wells[2] and found that concentrations had increased slightly from those measured in 1993 and 1994 (PCE ranged from 5.75 µg/L to 3,009 µg/L).

In 1996, the LCDPH learned from a confidential source that drums containing solvents might have been buried on the Breen Property. Ecology began an investigation that included a geophysical survey by Geo-Recon International (Geo-Recon 1996) and a subsurface investigation by Science Applications International Corporation (SAIC 1997). Between October 1997 and July 1998, Ecology sampled monitoring wells quarterly. Some of the monitoring wells were installed by SAIC and some were private water-supply wells. In spring 1998, Ecology contracted Transglobal Environmental Geosciences (TEG) Northwest, Inc. to conduct an additional subsurface investigation (Ecology 1999). Based on results of these investigations (mainly from groundwater sampling results) the drums were suspected to be buried under Building B on the Breen Property.

In spring 1998, during the investigation by TEG for Ecology, another source of contamination was found in the area between North Hamilton Road and I-5 around Berwick Creek. This area is now referred to as the HRIA. TEG advanced direct push (i.e., Strataprobe™) borings across the HRIA and collected groundwater samples. The highest concentration of PCE (60,000 µg/L) was detected in a boring advanced between Berwick Creek and North Hamilton Road about 40 feet east of the former United Rentals property. PCE concentrations in groundwater sampled from adjacent borings ranged from 22,000 µg/L to 57,000 µg/L.

In August 1999, the Breens entered into an Agreed Order with Ecology to conduct an additional investigation on the Breen Property. This investigation included a geophysical survey by Northwest Geophysical Associates in August 1999 (GeoEngineers 2001, Appendix D) and additional subsurface investigation by GeoEngineers, Inc. in August 1999 (GeoEngineers 2001). Before conducting the geophysical survey in Building B, a part of the concrete floor was broken

[2] One of the six wells was no longer in service.

up and removed to eliminate the wire mesh reinforcing material within the floor that could have interfered with the geophysical instruments. The concrete floor and offices at the north end of Building B and the paint booth at the southern end of Building B were not removed. The geophysical survey identified an anomaly in the south central portion of Building B, where the slab had been removed. This anomaly turned out to be a buried drum cache.

All of the drums appeared to contain water, as groundwater had seeped into the leaking drums, as well as a black sludge-like material. The contents of two of the excavated drums were sampled and analyzed. Based on laboratory results, the two drums contained a mixture of lubrication oil, grease, and solvents typically associated with painting and equipment degreasing activities. PCE was detected in both drums above the MCL. The other drums were assumed to have similar compounds. A total of sixty-six 55-gallon drums, four 30-gallon drums, and several 1- to 5-gallon containers, as well as 600 tons of PCE and petroleum-contaminated soil, were removed from under Building B and taken to nearby treatment and disposal facilities. Groundwater recovered from the excavation was treated using a granular activated carbon filter and then taken to the City of Longview sewage treatment plant for disposal (GeoEngineers 2001).

On July 27, 2000, the Site was added to the EPA **National Priorities List (NPL),** and EPA took over supplying bottled water to impacted residents (EPA 2001a, EPA 2002a). Also in 2000, the EPA Superfund Technical Assistance and Response Team (START) contractor, Ecology and Environment, Inc. (E&E), began a phased removal assessment in the HRIA. Soil borings and new groundwater monitoring wells were installed and subsurface soil and groundwater samples were taken in and near the HRIA to evaluate the extent of impacts to private water supply systems (E&E 2000, E&E 2001, E&E 2002). The removal assessments resulted in a Time Critical Removal Action to expand the City of Chehalis municipal water-supply system to 18 properties across the Site (15 residential and 3 commercial) (EPA 2002b, EPA 2002c, E&E 2003).

On October 31, 2001, an Administrative Order on Consent (AOC) was signed between EPA and Breen (EPA 2001b). The AOC required the Breens to conduct a Site-wide **Remedial Investigation/Feasibility Study (RI/FS)** within the Breen Property, the area downgradient of the HRIA and cross gradient of the Breen Property (east of Labree Road), and the area downgradient of the HRIA and the Breen Property (west of Labree Road). The Breen investigations were not to include the PCE source area within the HRIA east of North Hamilton Road or at the former United Rentals Property west of North Hamilton Road as these areas were being investigated by EPA. EPA was to submit data collected during the HRIA investigations to Breen for inclusion into Site-wide RI/FS reports.

In accordance with the AOC, Breen (through their consultant, Farallon Consulting, L.L.C. [Farallon]) began Phase I Investigations in 2002 (Farallon 2002). The overall objective of the Phase I Investigation was to review existing Site data and identify data gaps to guide the development of a Site-wide RI/FS Work Plan. Phase I RI activities were initiated in the summer of 2003 under EPA oversight (Farallon 2003).

In 2003, EPA contractor URS Group, Inc. (URS) began additional field investigations at the HRIA to support completion of an Engineering Evaluation/Cost Analysis (EE/CA) report (URS

2004). The purpose of the EE/CA field investigation was to better define the extent of soil and groundwater contamination, including defining the extent of **dense non-aqueous phase liquid (DNAPL)** in the Berwick Creek bed and the shallow **aquifer** (see Section 3 for a description of the shallow aquifer) as related to a potential spill or direct release into Berwick Creek. The purpose of the EE/CA report was to evaluate data collected from previous investigations and alternatives for cleaning up the HRIA, and for EPA to provide a preferred cleanup alternative.

In early 2004, Breen Phase I RI activities were stopped prior to completion when EPA and Breen began negotiating a cash-out settlement. Negotiations ended in 2007 without reaching an agreement.

Also in 2004, EPA completed the EE/CA field investigations in the HRIA which revealed that the source of contamination appeared to be the result of a spill or direct release of liquid PCE into Berwick Creek by an unknown entity no later than 1990, based on the estimate of the plumes' extent in 1993. The exact date of the spill/release is unknown.

Most of the PCE sank to the creek bottom where it pooled in low areas in the sediment and silt layer. PCE then moved downward into the underlying soil and groundwater below the silt layer where it continued to dissolve and move with the regional groundwater flow to downgradient areas. The EE/CA's preferred cleanup alternative was to use a hydraulic containment technology without removing the silt layer from under Berwick Creek in order to stabilize the contaminated groundwater plume. The EE/CA report also recognized that over the long term, a more aggressive technology needed to be used to further reduce PCE concentrations within the HRIA. The EE/CA report envisioned that a more aggressive technology would be determined after a Site-wide RI/FS was completed (URS 2004).

In December 2004, EPA signed a Time-Critical Removal Action Memorandum to build and operate a pump and treat system which would stabilize the contaminated groundwater plume and prevent further migration of PCE from the HRIA source area (EPA 2004). However, due to design and funding issues, the pump and treat system was not implemented.

In 2005 and 2006, with the Breen RI activities still suspended, EPA assembled all of the available investigation data that had been collected across the Site and released draft Site-wide RI and FS reports (Parametrix 2006a and b). The FS concluded that aggressive source control at the HRIA, establishment of institutional controls, and long-term monitoring of the PCE plume was the appropriate course of action for the Site as a whole (Parametrix 2006a). However, upon further review of Site-wide data, EPA reconsidered this decision and pursued a more comprehensive strategy that would also consider cleanup alternatives for other areas of the Site in what is now known as OU2.

As part of the more comprehensive Site-wide strategy, Parametrix, on behalf of EPA, performed supplemental groundwater and surface water sampling across the Site in July 2007 (Parametrix 2009). Seventeen existing wells were sampled (8 private wells and 9 monitoring wells) in the HRIA, the Breen Property, the Thurman Berwick Creek Area, and downgradient areas west and northwest of Labree Road. The purpose of the sampling was to evaluate whether significant changes in concentrations had occurred since the previous Site-wide sampling events in

2003/2004. The private wells sampled included five locations on Rice Road beyond the end of the public water supply line installed in 2002. Two surface water samples were collected from Dillenbaugh Creek. The data from this sampling were used to further define Site-wide groundwater contamination, to assess contaminant migration, and to assess potential groundwater-surface water interaction associated with Dillenbaugh Creek.

In November 2007, EPA's Environmental Response Team (ERT) took air samples in and around private residences and commercial buildings across the Site to assess possible risks to human health from volatilization of contaminants from groundwater to indoor and outdoor (**ambient)** air A total of 34 samples were collected over a 24-hour time period. Low levels of PCE and trichloroethene (TCE) were detected inside most of the residential and commercial buildings, and in ambient locations; however, the levels were low enough that they do not pose a current health risk (Lockheed Martin 2008, EPA 2008, CDM Smith 2011b).

Finally, in May 2010, EPA measured water levels and assessed the condition of most of the monitoring wells at the Site. The results of this assessment, including a water level map, are presented in Appendix C of the Draft Site-wide RI Report (CDM Smith 2011a). After review of additional data collected in 2007 and 2010, and revisiting older data that had been collected across the Site, EPA has determined that there is enough reliable information about the contamination at the HRIA to move forward with a preferred cleanup alternative for this area. Additional studies are needed to further define the nature and extent of contamination and determine options for cleaning up the rest of the Site.

More detailed information on previous investigations and findings about the Site can be found in the Draft Site-wide RI Report (CDM Smith 2011a).

3.0 SITE CHARACTERISTICS

This section first describes the physical characteristics of the entire Site. It then shifts from a Site-wide perspective to focus on the HRIA by first describing the type and amount (called the "nature and extent)" of contamination within the HRIA including a preliminary **Conceptual Site Model (CSM).** For information on the nature and extent of contamination at other areas of the Site, see the draft Site-wide RI Report (CDM Smith 2011a).

3.1 PHYSICAL CHARACTERISTICS

This subsection describes the climate, landscape features (topography), geology, hydrogeology (groundwater and surface water), current and future land and resource uses, and ecology (animals and plants) at the Site.

3.1.1 Climate

Average annual precipitation in the Chehalis area is about 47 inches, with December being the wettest month (Western Regional Climate Center 2006). An estimated three quarters of the annual precipitation falls during October through March. The climate of the region includes wet winters and moderately warm, dry summers. The mean average annual temperature for the Chehalis area is about 50 degrees Fahrenheit (°F).

3.1.2 Topography and Drainage

The Site lies within the Newaukum Prairie, a relatively flat area formed by the Newaukum River. Hills bound the Prairie to the west and east, rising to elevations of 400 to 700 feet above mean sea level (MSL). Site topography ranges from 195 to 210 feet above MSL. Surface water drainage varies from location to location within the area depending on how close the surface water features are, such as Berwick Creek, Dillenbaugh Creek, and the Newaukum River. The valley generally slopes down to the northwest towards the Chehalis River. The regional topography and drainages are shown in **Figure 3-1**.

3.1.3 Geology

Surficial (on the surface) deposits mapped for the Site area consist of **alluvium** and Newaukum terrace unit **glaciofluvial deposits** (Weigle and Foxworthy 1962). The alluvial deposits are referred to as the silt "cap," although some investigators have identified it as a silt and clay cap. Nevertheless, this "cap" appears to be continuous across the Site and ranges between 1 and 15 feet thick. It creates locally-confined groundwater conditions in the underlying Newaukum terrace unit.

The Newaukum terrace unit is a glaciofluvial deposit consisting of sand in a silt and clay matrix that contains the **shallow aquifer**. The maximum depth of the shallow aquifer is about 50 feet **below ground surface (bgs).**

A non-marine sedimentary unit described as thin-bedded "blue" clays (with occasional sand and silt lenses) lies under the shallow aquifer. This bluish-gray clayey silt layer is about 100 feet thick and hardens with depth (Dames and Moore 1994). This layer is believed to be Miocene-Pliocene (Weigle and Foxworthy 1962) and has a fluvial or **lacustrine** origin. This unit is the

aquitard that divides the shallow and deep aquifers at the Site. It appears to be continuous beneath the Site, which is consistent with regional geologic information (Ecology 2005).

Below the silt and clay aquitard is a confined aquifer comprised of older **Miocene** alluvial sediments deposited by a meandering or braided river system. The groundwater in the **deep aquifer** occurs in sand lenses and channel deposits more than 150 feet deep and ranging from 5 to 70 feet thick in the area of the HRIA (Dames and Moore 1994). Wells installed in this aquifer in the Newaukum River valley are typically **artesian**.

3.1.4 Groundwater

Beneath the HRIA, the groundwater flows to the west/northwest, but becomes northwesterly downgradient of the Breen Property. Historic water levels have ranged between about 1.5 and 10 feet bgs. Water levels can vary several feet seasonally; in any individual well as much as a 6.47 foot difference has been observed. Regional investigations have categorized the shallow aquifer in the HRIA as an **unconfined** or **water table aquifer** (Dames and Moore 1994; Ecology 2005). In the HRIA, however, the shallow aquifer exhibits the characteristics of a **confined** or **semi-confined aquifer** primarily due to the silt cap immediately above the shallow aquifer, and water levels measured 4 to 6 feet above the base of this silt cap in December 2003 (URS 2004).

The overall groundwater slope (gradient) beneath the HRIA is 0.0063 foot per foot (ft/ft) (URS 2004). A localized steeper gradient (approximately 0.016 ft/ft) is apparent immediately downgradient of North Hamilton Road. The average groundwater gradient calculated for the entire Site is 0.0032 ft/ft (E&E 2001).

Site-wide vertical gradients within the shallow aquifer are not well understood. There are only five locations with paired monitoring wells screened in the shallow aquifer, and only four of those locations have surveyed elevation data for both wells to enable calculation of vertical gradients. Of these well clusters, two are in the southwestern area of the Breen Property, one is in the northwestern area of the Breen Property, and one is just south of North Hamilton Road between the HRIA and the Thurman Berwick Creek Area. The three locations within 200 feet of Berwick Creek (MW-20/21, MW-22/23, and MW-29/30) have upward gradients, while the cluster located further away (MW-17/18) has a downward gradient.

3.1.5 Surface Water

The Newaukum River is east of the Site and flows northwesterly where it joins with the Chehalis River about five miles northwest of the Site. There are also two creeks that run through the Site; Berwick Creek and Dillenbaugh Creek (**Figure 1-2**). In addition, there are two ditches with intermittent flows that discharge into Berwick Creek at the HRIA. Both ditches pass under I-5 and flow from east to west. Berwick Creek flows through the HRIA from southeast to northwest, turns west at the Breen Property and extends about 1,500 feet where it turns towards the north-northwest, meeting Dillenbaugh Creek about 2,100 feet further. Dillenbaugh Creek flows roughly southeast to northwest through the downgradient area of the Site and discharges into the Chehalis River.

3.1.6 Land and Resource Uses

The Site is located in a rural region used for agricultural activities. An estimated 1,200 people live within four miles of the Site and have been identified by EPA as being within the potential area for adverse effects from PCE contamination from groundwater (E&E 2000). The commercial district of the City of Chehalis is located about 2 to 2.5 miles northwest of the Site.

The boundary between the City of Chehalis and unincorporated Lewis County bisects the Site roughly north to south along Labree Road. The HRIA and the portion of OU2 that is east of Labree Road are located within the City of Chehalis' Urban Growth Area (UGA) and are zoned **Commercial General (CG)**. The Breen Property and the former United Rentals Property are used for commercial purposes. Current land use downgradient (west and north) of Labree Road consists primarily of rural open (Class B Farmlands) and residential (Rural Development District [RDD]-20) use and is not within the Chehalis UGA.

The shallow aquifer is used as a drinking water source for area residences not connected to the City of Chehalis water system, and for cooking, bathing, irrigation, and stock watering by residences, commercial businesses, and farms in the area. About 250 private water-supply wells are located within four miles of the HRIA and the Breen Property (Farallon 2003).
The Site is designated as within the Usual and Accustomed (U&A) area for the Confederated Tribes of the Chehalis Reservation, the Cowlitz Indian Tribe, and the Quinault Indian Nation.

Within the Site, Berwick Creek is classified as a Type F stream by the Washington State Department of Natural Resources (DNR) (DNR 2010). A Type F stream is known to be used by fish or meets the physical criteria to be potentially used by fish. Fish streams may or may not have flowing water all year. There are no use designations specifically for Berwick Creek in Ecology's Water Quality Standards for Surface Waters of the State of Washington (WAC 173-201A-602, Table 602) (Ecology 2006). Ecology lists Berwick Creek as a Category 4A and 5 water body in the 2004 Water Quality Assessment 303(d) list (Ecology 2008) due to exceedances of **fecal coliform.**

Dillenbaugh Creek is classified as a Type F stream by DNR upstream of where it merges with Berwick Creek. Downstream of this area, however, the creek is classified as Type S. A Type S stream is designated "shorelines of the state." There are no use designations specifically for Dillenbaugh Creek in WAC 173-201A-602, Table 602. Ecology lists Dillenbaugh Creek as a Category 4A and 5 water body in the 2004 Water Quality Assessment 303(d) list (Ecology 2008). The Category 4A listing is due to exceedances of fecal coliform. The creek is listed as a Category 5 water body due to an exceedance of dioxin in fish tissue in a section of the creek downstream from the confluence with Berwick Creek.

Future land and resource uses east of Labree Road are anticipated to be similar to current land uses. A freeway interchange was built several years ago on Labree Road and additional commercial use is planned for the area between the HRIA and the Labree Road/Thurman Berwick Creek Area. Future land and resource uses in the area north and west of Labree Road are also anticipated to be similar to current uses, unless it becomes part of the Chehalis UGA. However, there are no plans for this designation at this time.

3.1.7 Ecology

A variety of animals (e.g., birds, mammals, fish) and plants inhabit or use, or have potential to inhabit or use, the creeks and land across the Site. Birds such as the bald eagle, the American Robin, and various ducks, such as the Mallard Duck, may visit the Site. A wide range of mammals, including the short-tailed shrew, raccoon, and white-tailed deer, could also frequent the Site.

Searches of wildlife databases and inquiries with regulatory agencies were conducted to determine if any threatened and endangered species, and environmentally important animals and plants are likely to be present at the Site, especially near Berwick Creek. The only species of special concern that uses certain reaches of Berwick Creek is the Coho salmon (*Oncorhynchus kisutch*). Berwick and Dillenbaugh Creeks are designated as essential fish habitat for the Coho and Chinook salmon (*Oncorhynchus tschawytscha*) under the Magnuson-Stevens Act. Berwick Creek was identified as having Coho salmon spawning and rearing habitat in the lower reaches, which would include areas both downstream and upstream of the HRIA (URS 2004).

A bald eagle nest has been documented about 1.25 miles southeast of the Site, near the Newaukum River. Bald eagles (*Haliaeetus leucocephalus*) were recently delisted under the Federal Endangered Species Act (ESA). It is possible that bald eagles in the area obtain food from Berwick Creek.

For detailed information on the ecology of the Site, see the Draft Site-wide BLRA report (CDM Smith 2011b).

3.2 NATURE AND EXTENT OF CONTAMINATION

This subsection describes the nature and extent of contamination found within the HRIA.

3.2.1 Nature of Contaminants

The COCs within the HRIA are PCE and its degradation products TCE, and cis-1,2-dichloroethene (cis-1,2-DCE), and total petroleum hydrocarbons (TPH), such as from diesel and gasoline. Because PCE has been detected more frequently and at much high concentrations than the other COCs and is the primary risk driver within the HRIA, it is used as the representative or "indicator" COC in this Proposed Plan.

3.2.1.1 Principal Threat Wastes

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. The DNAPL present in the contaminated sediment and soil in the HRIA are considered a principal threat waste. Note that contaminated groundwater generally is not considered to be source material; however, DNAPL in groundwater may be considered as source material (EPA 1991).

3.2.2 Extent of Contamination

This subsection describes the extent of contamination based on the results of investigations conducted within the HRIA. See **Figure 3-2** for historical sampling locations.

Contaminants are found primarily in creek bed sediment and bank surface soil within the HRIA Berwick Creek channel, and in subsurface soil and groundwater. In general, sediment and surface soil are defined as 0 to 5 feet bgs. Subsurface soils are at depths greater than 5 feet and typically start below the silt "cap" of Berwick Creek. Subsurface soil samples have typically been collected between 5 feet bgs to the top of the shallow aquifer aquitard at about 50 feet bgs. In groundwater, contamination occurs in the shallow aquifer located about 5 to 50 feet bgs.

PCE concentrations in sediment, soil and groundwater within the HRIA indicate the presence of DNAPL. PCE concentrations indicative of DNAPL have not been detected on top of the aquitard.

The deep aquifer below the aquitard has not been fully characterized. Minor amounts of PCE have been detected in samples collected from private wells screened in the deep aquifer, but not enough to suggest that significant migration of PCE through the aquitard has occurred.

3.2.2.1 Release Area(s)

The most likely location of the HRIA release is just upstream of where the Unnamed Ditch #1 enters Berwick Creek near Monitoring Well (MW) 602 and MW-603, an area referred to as the "Southeastern Hot Spot" (**Figure 3-3**). High PCE concentrations strongly point to a single release at this location, but multiple releases may have occurred along a 400-foot reach of Berwick Creek. Data supporting this latter assumption include high PCE concentrations identified in an area referred to as the "Northwestern Hot Spot" which begins about 80 feet downstream of Unnamed Ditch #1 (**Figure 3-3)** (CDM Smith 2011a). PCE contamination within these Hot Spots is discussed further in the subsections below.

3.2.2.2 Berwick Creek Channel Bed and Banks

Currently, the only identified sediment and surface soil in the HRIA with PCE concentrations indicative of DNAPL are in the bed and banks of the Berwick Creek channel. The creek bed is at an elevation of about 199 to 200 feet above MSL.

During the August 2003 HRIA EE/CA investigations, URS collected 39 samples from creek bed sediment and bank surface soil along Berwick Creek and both unnamed ditches in the HRIA. The maximum PCE concentration detected was 5,220 mg/kg in creek bed sediment/soil boring (SB) sample SB-409, located at the upper boundary of the Southeastern Hot Spot (**Figure 3-4**). Concentrations indicative of DNAPL in sediment and soil are those that exceed the soil saturation limit of PCE, which in the HRIA is 38 mg/kg of PCE. Other creek bed sediment and bank soil sample locations indicating PCE DNAPL were at SB-410 (1,610 mg/kg) and at SB-411 (685 mg/kg) (URS 2004).

PCE concentrations in creek bed and bank samples within and north of the Northwestern Hot Spot ranged from non-detect to 0.0887 mg/kg at SB-403 (URS 2004). No creek bed sediment and bank soil samples have been collected in the far northern portion of the HRIA, particularly in the segment between MW-R4 in the Northwestern Hotspot and MW-5/MW-33 (**Figure 3-2**). Breen (Farallon) collected one creek channel (CC) sample in the very north of the HRIA just south of the Chehalis Livestock Auction building, but PCE was not detected. It should be noted, however, that Farallon did not use the correct method for preserving this and other soil samples, which could be a reason for not detecting PCE.

3.2.2.3 Subsurface Soil

PCE concentrations high enough to indicate the presence of DNAPL have been observed in subsurface soil beneath the apparent PCE release area in Berwick Creek. The highest PCE concentration in subsurface soil, 3,220 mg/kg, was detected at GP-502 at a depth of 28 feet bgs in the Southeastern Hot Spot. As described earlier, sediment and soil concentrations greater than 38 mg/kg of PCE indicate the presence of DNAPL in the HRIA (URS 2004). In general, the highest subsurface PCE concentrations were found at GP-501 (858 mg/kg at 12 feet bgs), AB-650 (136 mg/kg at 21 feet bgs), and GP-503 (151 mg/kg at 28 feet bgs) **(Figure 3-2);** and at MW-9 (53 mg/kg at 43 ft bgs) and MW-602 (399 mg/kg at 15 feet bgs) **(Figure 3-3).**

3.2.2.4 Groundwater

The maximum PCE concentration in groundwater (2,720,000 µg/L) was detected at MW-602 within the Southeastern Hot Spot in November 2003. Concentrations that exceed 10% of a contaminant's **solubility limit** in groundwater indicate DNAPL. PCE's solubility limit is 200,000 µg/L; therefore, a concentration of 20,000 µg/L or higher in groundwater is indicative of PCE DNAPL.

Maximum PCE concentrations in groundwater within the Northwestern Hot Spot were detected in February and November 2003 at MW-R4 at 5,300 µg/L and 8,800 µg/L, respectively. Dissolved PCE in groundwater appears to have migrated northwest of the Northwestern Hot Spot, based on data collected by Farallon (Farallon 2004). A groundwater sample at MW-33, located northwest of the Northwestern Hot Spot, contained PCE at 1,100 µg/L in April 2004.

Groundwater data within the HRIA suggest **stratification** of PCE within the shallow aquifer. The upper zone of the shallow aquifer, at or above 25 feet bgs, shows higher PCE concentrations than in the lower zone of the shallow aquifer (25 feet bgs down to the top of the silt and clay aquitard). The 20- to 30-foot zone appears to be a transition or mixing zone often characterized by intermediate concentrations.

Multi-level sampling was conducted in November 2002 and February 2003 to assess the potential stratification of the PCE plume in groundwater at the Southeastern Hot Spot and the area immediately downgradient. Results at MW-R8 showed significantly higher PCE concentrations in the upper zone as compared to the lower zone. PCE concentrations ranged from 4,700 µg/L at 15 feet bgs to 360 µg/L at 48.5 feet bgs. Multi-level sampling in MW-R11 did not indicate a significant variation in PCE concentrations in groundwater samples collected at varying depths; however, PCE concentrations were relatively low at about 25 µg/L.

Multi-level samples were also collected from all of the MW-600-series wells when they were installed in October and November 2003. The most dramatic stratification was observed in MW-602, which had 2,720,000 µg/L PCE in the 14.5-foot sample, 203,000 µg/L in the 35-foot sample, and 4,980 µg/L in the 41-foot sample. It should be noted, however, that little information is available on the protocols used for the multi-level sampling efforts.

Stratification also appears to be evident downgradient of the HRIA. The contour lines in **Figure 3-5** show the maximum concentrations detected in the upper zone of the shallow aquifer from the HRIA to the Thurman Berwick Creek Area and to the southwest corner of the Breen Property. **Figure 3-6** shows the maximum concentrations detected at sampling points in the lower zone of the shallow aquifer from the HRIA to the Thurman Berwick Creek Area and the southwest corner of the Breen Property. A comparison of the two figures suggests that contamination in the upper zone declines to negligible concentrations by the HRIA western boundary. However, contamination in the lower zone of the shallow aquifer extends well beyond the HRIA boundary. This trend is reversed at the Thurman Berwick Creek Area and southwest corner of the Breen Property where PCE concentrations greater than 2,000 µg/L have been observed in the upper zone and are greater than the PCE concentrations in the lower zone at this area. The reasons for this need to be evaluated during future OU2 investigations.

The maximum extent of the PCE has not been fully delineated. **Figure 1-2** shows the Site-wide estimated extent of PCE based on limited data. After crossing under Labree Road, the plume turns in a north-northwesterly direction, essentially following Berwick and Dillenbaugh Creeks.

3.2.2.5 Surface Water

Two of the 10 surface water sampling stations are located downgradient of the Southeastern Hot Spot (SW-3 and SW-7) and at the downstream portion of the Unnamed Ditch #1 west of I-5 (SW-5), as are shown on **Figure 3-4.** SW-5 and SW-7 have been sampled four times between July 2002 and November 2003, and SW-3 was sampled once in July 2008. The detections and concentrations of PCE in surface water samples at these locations have varied considerably and no clear seasonal trend has been identified. The highest concentrations of PCE at SW-5 (40 µg/L) and SW-7 (12 µg/L) occurred in November 2002, typically a high rain or snowfall month. However the PCE concentration at SW-3 in July 1998 was similarly high at 15 µg/L, although this station was only sampled once and the other stations were not sampled on this date.

Two additional stations are located upstream of the HRIA. SW-4, located in the upstream portion of Unnamed Ditch #1 east of I-5, was sampled once by Ecology in December 1998; PCE was not detected. SW-6, located near the upstream limit of known contamination in Berwick Creek soils, was sampled four times between July 2002 and February 2003. PCE was detected at concentrations less than 1 µg/L in July 2002 and November 2003, but was not detected during the other two sampling events.

No surface water sampling has been completed in Berwick Creek in the northern part of the HRIA between MW-R4 and MW-5/MW-33. High PCE concentrations have been detected in groundwater sampled from MW-R3 (Northwestern Hot Spot) and MW-33. It is unknown if contaminated groundwater near these wells discharges to surface water.

3.2.2.6 Soil Gas

Soil gas surveys were conducted near Berwick Creek and I-5 within the HRIA in August 2003. PCE concentrations ranged from non-detect to 18 parts per million by volume (ppm-v). Positive soil gas survey results are used to determine whether more intensive soil sampling should be completed in an area. In addition, soil gas surveys are useful in determining whether **vapor intrusion** could be a potential issue. Vapor intrusion is the process in which chemical vapors from contaminated soil or groundwater affect the indoor air quality in a building. While the soil gas survey results do not appear to point to any current issues, the results suggest that monitoring associated with future characterization and remediation efforts at the HRIA include sampling to further evaluate the potential for vapor intrusion.

3.2.2.7 Indoor and Ambient Air Quality

Samples were collected from indoor air, ambient (outside) air and sub-slab soil vapors in November 2007 (see **Figure 3-7).** PCE was detected in all four samples collected at buildings within the HRIA, with the maximum concentration occurring in the sub-slab sample below the paint shop building on the former United Rentals Property (25 micrograms per cubic meter [$\mu g/m^3$]). While the indoor and **ambient air** quality sampling results do not appear to point to any current issues, the results, particularly the sub-slab sample result collected below the paint shop building, suggest that monitoring associated with future characterization and monitoring efforts include sampling to further evaluate the potential for vapor intrusion.

3.2.3 Estimates of PCE Mass, Volume, and Surface Area within the HRIA

Three dimensional (3-D) modeling using Ctech's Mining Visualization Systems (MVS) Version 9.13 was used to help better define the vertical and lateral extent of PCE contamination within the HRIA, and to help provide estimates for PCE mass, volume, and surface area (see **Table 3-1**). Total mass levels were calculated assuming that PCE concentrations in soil samples represent mass **sorbed** (bound) to soil, mass dissolved in groundwater, and mass as DNAPL. Groundwater sample concentrations represent PCE dissolved in groundwater and as DNAPL.

3.3 PRELIMINARY CONCEPTUAL SITE MODEL

A preliminary CSM has been developed for the Hamilton/Labree Site based on Site characteristics and results from the various investigations summarized above. The CSM tells the story of when and where the Site was contaminated, what media was affected, where the contamination migrated (called **pathways**), and who and what can potentially be harmed from the contamination (called **receptors)**. A graphical depiction of the preliminary CSM is presented in **Figure 3-8.** A narrative summary of the CSM is provided below.

Sometime before 1990, based on the estimated extent of the contaminated groundwater plume in 1993, an unknown entity released pure, liquid PCE into Berwick Creek within the HRIA. Berwick Creek is a low velocity stream for most of the year, except when heavy rains or major flooding events occur. Assuming the creek was at a low velocity when the PCE was released; most of it likely sank to the creek bottom rather than being transported by surface water downstream. It would have then spread downstream and a little way upstream (due to localized stream topography) and pooled in low areas. PCE concentrations within Berwick Creek bed sediment and bank soil are indicative of DNAPL (greater than 38 mg/kg; the soil saturation limit of PCE).

The PCE DNAPL then quickly migrated through the one-foot- thick layer of creek bed sediment and the underlying silt "cap," and into the subsurface soil and groundwater within the shallow aquifer. Typically, fine grained material like those in the Berwick Creek bed sediment, and to a lesser extent in the thin layer of silt immediately beneath the sediment, would sorb (bind) the

PCE enough to slow its downward migration into the shallow aquifer. However, it appears that the large volume of PCE that was released into Berwick Creek overwhelmed the capacity of the creek bed sediment and underlying cap to contain the spill.

The sand and gravel shallow aquifer is highly **permeable**, making it easy for the dissolved phase plume to move downward and downgradient. Once in the shallow aquifer, the PCE appears to have continued to move in an irregular pattern following **lenses** of higher **permeability** soils. High concentrations of PCE were found sorbed (bound) to the soil particles under and near the creek. The soil and groundwater data suggest that the PCE mass has tended to be absorbed by and pooled on top of the occasional, discontinuous lower permeability silt lenses in the upper zone of the aquifer (25 feet bgs and above), slowing further PCE migration. PCE concentrations generally (but not always) decrease with depth within the HRIA. In some spots below the release area, low concentrations of PCE were detected in the upper material of the silty/clay aquitard found at 50 feet bgs, but the presence of DNAPL has never been indicated.

For information on receptors and the potential adverse impacts from contaminants, see Section 5 of this Proposed Plan, and the Draft Site-wide BLRA report (CDM Smith 2011b).

4.0 SCOPE AND ROLE OF PROPOSED INTERIM CLEANUP ACTION

This section briefly describes EPA's intent to address the Hamilton/Labree Site in a phased approach starting with an interim cleanup action within the HRIA, which will be the Preferred Alternative or one of the other alternatives considered in this Proposed Plan.

According to the NCP [40 *Code of Federal Regulations* [CFR] 300.430(a)(1)(I)], the goal of the remedy (cleanup) selection process is "to select remedies that are protective of human health and the environment, maintain protection over time, and minimize untreated waste." Expectations for contaminated groundwater as stated in the NCP are as follows: "EPA expects to return usable groundwaters to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site. When restoration of groundwater to beneficial uses is not practicable, EPA expects to prevent further migration of the plume, prevent exposure to the contaminated groundwater, and evaluate further risk reduction." (Federal Register 1990; §300.430 (a)(1)(iii)(F),emphasis added.)

EPA Guidance, (specifically the *Presumptive Response Strategy And Ex-Situ Treatment Technologies For Contaminated Ground Water At CERCLA Sites*, OSWER Directive 9283.1-12, October 1996) recommends that site characterization should be coordinated with cleanup actions and both should be implemented in a step-by-step or phased approach. In a phased approach, early or interim actions should be used to reduce site risks (by addressing known sources of contamination, reducing risks from exposure to contamination, and by reducing or preventing the further migration of contaminants), and to provide additional site data to be followed by a later, more comprehensive action (the long-term cleanup action). Specific objectives for the long-term cleanup are not established until after performance of the earlier interim action is evaluated and used to assess the likelihood that groundwater restoration (or other appropriate objectives) can be attained. Separate decision documents are used, in which cleanup objectives are specified that are appropriate for each action.

In keeping with the above regulations and guidance, EPA is using a phased approach to first address the known sources of PCE contamination to sediment, soil, and groundwater and prevent risks within the HRIA, and to minimize further migration of contaminated groundwater from the HRIA. Doing so will also address the principal threat waste, identified as PCE DNAPL, in the HRIA. The interim cleanup action will be selected, after considering public comments, in an Interim ROD.

Although there appears to be other contamination sources at the Site outside of the HRIA, additional Site-wide data collection and evaluation is needed to develop, select and implement other cleanup actions for the Site that will achieve long-term protection of human health and the environment.

5.0 SUMMARY OF SITE RISKS

CERCLA requires EPA to protect human health and the environment from current and possible future exposures to hazardous substances at Superfund sites. To evaluate exposure risks, EPA conducts studies called Baseline Risk Assessments (BLRAs). The BLRA estimates what risks the site poses if no cleanup action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the cleanup action. This section of the Proposed Plan summarizes the results of the BLRA conducted for the Hamilton/Labree Superfund Site as it relates to the HRIA (CDM Smith 2011b).

5.1 HUMAN HEALTH RISKS

The potential adverse effects on human health from being exposed to contaminants from a Superfund site are expressed in terms of cancer-causing (carcinogenic) risks (individual excess lifetime cancer risks) and non-carcinogenic hazard levels (hazard indices or HIs). EPA's acceptable target range for carcinogenic risk is 1 in ten thousand to 1 in one million (1×10^{-4} to 1×10^{-6}) individual excess lifetime risk of developing cancer from the contaminants at a site, and the acceptable non-carcinogenic target hazard level is a HI of less than 1.0. The estimated carcinogenic risks and non-cancer hazards for four categories of people who may be exposed to contamination within or near the HRIA are as follows:

HRIA Commercial/Industrial Worker: Individual excess lifetime cancer risks and non-cancer hazards were estimated for a long-term commercial/industrial employee working at either the main building or the paint shop on the former United Rentals Property (250, 8-hour days per year for 25 years). Exposure to contaminants in soil and groundwater were evaluated. Under current use scenarios, where workers are not drinking groundwater, the individual excess lifetime cancer risks and non-cancer HIs were less than 8×10^{-5} and 1.0, respectively. If chemical concentrations persist in groundwater and it is used as a drinking water source in the future, over time the estimated individual excess lifetime cancer risks would be about 1×10^{-1} and the non-cancer HIs would be elevated (HI = 55). The former United Rentals Property is currently on the Chehalis public water supply system, which makes this an unlikely scenario.

HRIA Construction/Utility (Trench) Worker: Individual excess lifetime cancer risks and non-cancer hazards were estimated for a short-term construction/utility employee working within the HRIA (20, 8-hour days per year for one year). Exposure to contaminants in soil, groundwater, and outdoor air were evaluated.

Under current uses, where construction/utility workers are not drinking groundwater, the individual excess lifetime cancer risks and HI were less than 1×10^{-6} and 1.0, respectively, from exposure to soil and outdoor air. If chemical concentrations persist in groundwater and it is used as a drinking water source in the future, over time the estimated individual excess lifetime cancer risks would be about 3×10^{-4} and the non-cancer HIs would be 4.4.

The most significant potential exposure pathway is inhalation of COCs (primarily PCE and TCE) from groundwater by construction and utility employees who work in trenches within the HRIA. Based on estimates of trench air concentrations at three HRIA subareas and assuming a total exposure of 500 hours over a course of one year, the individual excess lifetime cancer risks ranged from 2 x 10^{-3} to 4 x 10^{-5} and the non-cancer HIs ranged from 1.3 to 121. Given these high risk estimates, even the assumption of much lower exposure durations by workers in HRIA subarea trenches would have resulted in estimates of unacceptable risk. It should be noted, however, that the accuracy of the model for estimating concentrations in trench air from groundwater concentrations has not been validated for the Site and thus represents a large uncertainty.

HRIA Trespasser: The individual excess lifetime cancer risks for a trespasser at the HRIA exposed to soil and outdoor air were estimated to be less than that of a construction or utility worker (less than 1 x 10^{-6}). This was based on the assumption that a trespasser would be exposed for a shorter period of time.

HRIA Berwick Creek Recreator: Individual excess lifetime cancer risks and non-cancer hazards were estimated for adults and children recreating infrequently at Berwick Creek within the HRIA. Exposure to contaminants in surface water and sediment were evaluated. At Berwick Creek, the estimated individual excess lifetime cancer risks were about 2 x 10^{-4} for both adults and children, which were predominately driven by PCE concentrations in sediment. The non-cancer HI for both adults and children was less than 1.0.

5.2 ECOLOGICAL RISKS

Estimates of risks to ecological receptors from Superfund site contaminants are expressed in terms of **hazard quotients (HQs)** in this Proposed Plan. The acceptable target hazard level is a HQ of less than 1.0. The estimated HQs for four categories of ecological receptors within and near the HRIA are as follows:

Wildlife: Several types of birds (bald eagle, American Robin, Mallard Duck) and mammals (short-tailed shrew, raccoon, white-tailed deer) were evaluated. No elevated risks for bald eagles were identified. However, risks for American Robins (HQs = 1.3 to 11) and Mallard Ducks (HQs = 3) were elevated for PCE primarily due to their high soil/sediment ingestion rate and the elevated PCE concentrations identified in Berwick Creek sediment. Elevated risks were also found for shrews at the HRIA, primarily from inhalation of PCE in burrow air (HQ = 50). Both raccoons (HQs = 8.5 to 43) and deer (HQs = 1.2 to 6.6) had elevated risks at the HRIA, primarily from the high PCE concentrations found in Berwick Creek sediment.

Aquatic Life: Aquatic receptors, (e.g., salmon and rainbow trout), were evaluated for direct contact to chemicals in the surface waters of Berwick Creek. Potential PCE and TCE risks to these receptors are negligible.

Benthic Organisms: **Benthic** organisms live at the bottom of water bodies and are important links in the food chain providing a food source for fishes, birds and mammals. Due to the lack of biologically relevant creek bed sediment samples taken in Berwick Creek, HQs were not able to be estimated. However, given that the maximum PCE concentrations measured in Berwick Creek exceed sediment quality benchmarks by 3 to 4 **orders of magnitude**, it is possible that benthic organisms are negatively impacted by contamination within the HRIA.

Terrestrial Plants: The terrestrial plant HQs from exposure to soils did not exceed 1.0 for any exposure area or COC. However, the terrestrial plant HQ from exposure to groundwater within the HRIA exceeded 1.0. This suggests that plants with root systems deep enough to encounter PCE-contaminated groundwater may be adversely affected.

5.3 BASIS FOR ACTION

Generally, where the BLRA indicates that a cumulative site risk to an individual using reasonable maximum exposure assumptions for either current or future land use exceeds the 1×10^{-4} individual excess lifetime cancer risk end of the risk range, or if MCLs are exceeded, action under CERCLA is generally warranted at the site. Where the non-carcinogenic risk to humans exceeds a hazard quotient of 1, action under CERCLA may also be warranted.

At the HRIA, PCE concentrations in groundwater far exceed the MCL and the risk assessment showed that if PCE concentrations persist in groundwater and it is used as a drinking water source in the future, risks to humans would be approximately 1×10^{-1}. Risks to workers from inhalation exposures to PCE in trench air within the HRIA could also pose significant risks, with carcinogenic risk estimates as high as 2×10^{-3} and a non- cancer HI up to 121. There are also elevated risks to shrew from burrow air (HQ = 50), and to raccoon (HQs up to 43) and deer (HQs up to 6.6) from ingestion of sediment and soil within the Berwick Creek channel.

Therefore, the proposed Preferred Alternative identified in this plan, or one of the other active measures, is necessary to protect the public health, welfare, and the environment from actual or threatened releases of hazardous substances into the environment.

6.0 REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) provide a general description of what a cleanup action is intended to accomplish in terms of contaminants and media of concern, potential exposure pathways, and cleanup (remediation) goals. **Preliminary remediation goals (PRGs**) are the more specific statements of what the cleanup action's endpoint concentrations or risk levels, for each **exposure route**, are to be in order to provide adequate protection of human health and the environment. RAOs and PRGs are developed and refined during the RI/FS based on federal and state environmental laws and the results of the remedial investigations, including the human and ecological risk assessments, to guide the development and evaluation of cleanup alternatives. Final remediation goals are determined and documented in the ROD as cleanup levels.

As explained earlier in Section 4, Scope and Role, EPA is proposing to address the Site with a phased approach, starting with an interim action in the HRIA, which will eventually be followed by additional actions. The RAOs and PRGs for the proposed interim cleanup action are presented below.

6.1 HRIA RAOs

The following RAOs are proposed for the HRIA interim cleanup action:

1. Prevent human exposure to groundwater in the HRIA containing COCs above levels protective for drinking water.

2. Prevent human exposure to COCs in HRIA sediment and soil above levels that are protective of recreational users and construction/utility (trench) workers.

3. Prevent ecological exposure to COCs in HRIA sediment and soil above levels that are protective of ecological receptors.

4. Reduce the DNAPL contaminant mass and subsurface soil contamination within the HRIA to minimize further migration of COCs from the HRIA to downgradient groundwater.

These RAOs and the associated PRGs discussed below address COCs (primarily PCE[3]) in sediment, soil, and groundwater and the risks associated with these contaminants within the HRIA as identified in the risk assessment. Taking action to address these RAOs will also reduce or eliminate HRIA sources of contamination to downgradient groundwater. These RAOs also address the principal threat waste in the HRIA, identified as PCE DNAPL.

[3] As stated in Section 3, the COCs at the HRIA are PCE, TCE, cis-1,2-DCE, and TPH. Since PCE has been detected more frequently and at much higher concentrations than the other COCs, it is considered the primary risk driver and is considered the "indicator" COC in this Proposed Plan.

6.2 PRELIMINARY REMEDIATION GOALS

PRGs are developed based on **applicable or relevant and appropriate requirements (ARARs)** from federal and state environmental and state standards. Where standards do not exist or provide an adequate level of protection, PRGs are based on risk-based calculations of acceptable exposure levels. CERCLA Section 121 requires that cleanup actions at Superfund sites must achieve a level of cleanup which, at a minimum, ensures protection of human health and the environment. CERCLA and the NCP also require cleanup actions to comply with the substantive provisions of ARARs during and at the completion of cleanup actions, unless legal waivers are obtained. Potential HRIA ARARs and items to be considered (TBCs) are listed in **Tables 6-1** through **6-3.**

The Preferred Alternative, and the other alternatives considered for the HRIA, were developed and evaluated for use as interim cleanup actions as described in Section 4, Scope and Role. Consequently, none of the Alternatives evaluated are expected to fully attain all of the ARARs for the HRIA. The ARARs that will be attained and those that will be waived will be specified in the Interim ROD, which is expected to include the interim action waiver provided for in Section 121(d)(4)(A) of CERCLA. The Interim ROD will be followed by a Final ROD for the HRIA or the Site that will fully address **compliance** with all ARARs, consistent with CERCLA, including any waivers. The key ARARs to be addressed by this interim action are discussed below.

6.2.1 Key Factors for Setting HRIA Interim Action PRGs

The key ARARs considered for setting the HRIA interim cleanup action PRGs include the following:

- Federal and State Drinking Water Standards and more specifically, MCLs. MCLs apply to drinking water at the tap but are relevant and appropriate for groundwater that is a potential source of drinking water; therefore, these must be met or waived by the completion of a cleanup action. The MCL for PCE is 5 µg/L. All of the alternatives considered (except the No Action alternative) include institutional controls to prevent human exposure to groundwater above this standard, but restoration of the shallow groundwater aquifer to meet the standard is beyond the scope of this interim action.

- Washington State Model Toxics Control Act (MTCA) soil cleanup standards for unrestricted use are outlined in Washington Administrative Code (WAC) Section 173-340-740. These are considered more appropriate than the standards for industrial use in WAC Section 173-340-745 since the current and reasonably anticipated future land use is a mix of industrial, commercial and recreational uses. All alternatives considered (except the No Action alternative) would comply with the MTCA Method B cleanup level for human direct contact exposure with soils, which requires cleanups to attain the 1×10^{-6} risk level for protection of human direct contact exposure. The PCE concentration which equates to a 1×10^{-6} risk from direct contact assuming residential use is 22 mg/kg, industrial/commercial use is 110 mg/kg, and recreational use is 924 mg/kg.

Other key factors that form the basis for the PRGs include:

- The Superfund program goal and expectations in the NCP Section 300.430(a)(iii)(F) "to return usable groundwaters to their beneficial uses, wherever practicable, within a timeframe that is reasonable given the circumstances of the site. When restoration of groundwater to beneficial uses is not practicable, EPA expects to prevent further migration of the plume, prevent exposure to contaminated groundwater, and evaluate further risk reduction." The alternatives considered would do the latter.

- The Baseline Risk Assessment and **Regional Screening Levels (RSLs)**. The BLRA was used to identify exposed populations and exposure pathways by media and protective site-specific levels where adequate data was available. Where adequate data were not available, RSLs were used. RSLs are risk-based, contaminant-specific levels or concentrations that set concentration limits using carcinogenic or systemic toxicity values under specific exposure conditions. For example, all alternatives (except the No Action alternative) considered the EPA RSL for protection of shrew, a terrestrial ecological receptor, from ingestion and inhalation of surface soil in burrow air (and from food uptake). In addition, given the absence of freshwater sediment standards for protection of aquatic receptors, the EPA freshwater RSLs were used to set a design performance goal to guide the restoration of the HRIA creek channel and reduce the risk to aquatic receptors from direct contact/ingestion of contaminated sediment and soil within the bed and banks of the Berwick Creek channel.

- Technology limitations and uncertainties associated with the proposed interim cleanup actions.

- Site characterization data are not sufficient to determine the likelihood of attaining long term objectives including restoration of groundwater and the timeframe for doing so, if practicable.

6.2.2 HRIA PRGs for Each Remediation Target Zone

To achieve the RAOs for the proposed interim cleanup action, PRGs for PCE are established for three, media-specific areas within the HRIA that are targeted for cleanup. These areas are called "**remediation target zones."** The mass, volume and surface area of each zone is presented in **Table 6-4**. A summary of each zone, the associated PRG and the RAOs these would address are shown in **Exhibit 6-1** and discussed in more detail below. Note there is no PRG proposed or discussed below for RAO 1 because the MCL for human consumption of groundwater is 5 µg/L PCE, and achievement of the MCL is beyond the scope of this interim cleanup action (it will be addressed in subsequent decisions). For this interim cleanup action, ICs to prohibit the use of HRIA groundwater for drinking purposes are the only means of achieving RAO 1.

Exhibit 6-1: PRGs for PCE by Target Zone for Each RAO

RAOs	ARAR	PRG for Creek Bed Sediment/Bank Surface Soil Target Zone	PRG for Subsurface Soil Target Zone	PRG for High Concentration Groundwater Target Zone (PCE concentration greater than 4,000 µg/L)
1) Prevent human exposure to groundwater in the HRIA containing COCs above levels protective for drinking water.	5 µg/L PCE - 40 CFR 141.11-.16 (MCLs) 5 µg/L PCE – WAC 173-340-720	NA	NA	No PRG: ICs will be used for this Interim Action.
2) Prevent human exposure to COCs in HRIA sediment and soil, surface soil, and subsurface soil above levels that are protective of recreational users and construction/utility (trench) workers.	WAC 173-340-740,-745 (soil) 22 mg/kg PCE (residential) 110 mg/kg PCE (industrial/ commercial) 924 mg/kg PCE (recreational)	10 mg/kg PCE	10 mg/kg PCE	NA
3) Prevent ecological exposure to COCs in HRIA sediment and surface soil above levels that are protective of ecological receptors.	WAC 173-204-570 (sediment) EPA RSL for terrestrial ecological receptor 9.92 mg/kg PCE	10 mg/kg PCE	NA	NA
4) Reduce the DNAPL contaminant mass and subsurface soil contamination within the HRIA to minimize further migration of COCs from the HRIA to downgradient groundwater.	WAC 173-340-740-745 (soil) 22 mg/kg PCE (residential) 110 mg/kg PCE (industrial/ commercial) 924 mg/kg PCE (recreational)	NA	10 mg/kg PCE	Reduce mass discharge of PCE contamination by 90%.
Notes:		While not a PRG, requirements that are protective of ecological receptors would need to be met for relocation or reconstruction of the Berwick Creek channel bed and banks, e.g., 0.468 mg/kg PCE based on EPA's RSLs for freshwater sediments.		MCL for PCE =5 µg/l but reaching this number is beyond the scope of this interim cleanup action.

6.2.2.1 Creek Bed Sediment and Bank Surface Soil Remediation Target Zone

Figure 6-1 shows the proposed remediation target zone where creek bed sediment and bank surface soil at depths less than or equal to 5 feet bgs within the Berwick Creek channel are currently contaminated with PCE at levels equal to or greater than 0.468 mg/kg. This level was used to define this zone's boundary based on EPA's fresh water RSLs for protection of aquatic organisms from PCE in sediment, and because the majority of the surface soil contamination found to date within the HRIA is within the bed and banks of the current Berwick Creek channel. According to the preliminary CSM, this zone represents the area where PCE was directly released, and is delineated separately from surface soil outside of the creek channel, and from subsurface soil and groundwater.

The PRG proposed for the creek bed sediment and bank surface soil remediation target zone is 10 mg/kg PCE. Maximum PCE concentrations in this zone ranged from 685 mg/kg to 5,220 mg/kg. These values are indicative of DNAPL as they exceed the soil saturation limit for PCE in the HRIA (38 mg/kg). However, due to the difficulty in analyzing DNAPL in soil borings and uncertainty in the data quality of the soil samples, there was a need to establish a more conservative “cutoff” concentration to account for the characterization uncertainty. In addition, the 10 mg/kg PRG would be well below the MTCA Method B cleanup level for human direct contact exposure with soil which requires cleanups to attain the 1×10^{-6} risk level for protection of human health. The PCE concentrations which equate to a 1×10^{-6} risk from direct contact assuming residential use is 22 mg/kg, industrial/commercial and construction/utility (trench worker) uses is 110 mg/kg, and recreational use is 924 mg/kg. Finally, the EPA RSL that is protective for the ecological receptor considered most sensitive and representative for the HRIA, the shrew, is 9.92 mg/kg PCE, but this RSL is conservative and is based on ingestion of soil and food uptake. Due to all the above, a value of 10 mg/kg PCE is proposed for this zone.

While not a PRG, protection of benthic and freshwater organisms within the creek bed sediment and bank soil of the Berwick Creek channel from PCE concentrations > 0.468 mg/kg would be accomplished when restoring the creek channel. As stated earlier, the 0.468 mg/kg level was set based on an EPA fresh water benchmark RSL for PCE in sediment.

Achievement of this PRG would address RAOs 2 and 3 as they pertain to the creek bed sediment and bank soil of the current Berwick Creek channel and surface soil within the HRIA.

6.2.2.2 Subsurface Soil Remediation Target Zone

Figure 6-2 shows the proposed remediation target zone for subsurface soil. This zone is defined as the area where subsurface soil at depths between 5 to 50 feet bgs are contaminated with PCE levels greater than 10 mg/kg.

As with the Creek Bed Sediment and Bank Surface Soil Remediation Target Zone, a PRG of 10 mg/kg PCE was set for the Subsurface Soil Remediation Target Zone based on the potential for DNAPL to be present in subsurface soil. Maximum PCE concentrations in HRIA subsurface soil ranged from 53 mg/kg to 858 mg/kg. Using the 10 mg/kg value provides a good safety factor (26% of the PCE saturation limit of 38 mg/kg), and is below the MTCA Method B cleanup standards for direct contact with soil for PCE, which equates to a risk level of $1 \times 10^{-6.}$

Achievement of this PRG would address RAOs 2 and 4 as they pertain to subsurface soil.

6.2.2.3 High Concentration Groundwater Remediation Target Zone

Figure 6-2 shows the remediation target zone for high concentration groundwater. This zone is defined as the area where groundwater at depths between 5 to 50 feet bgs is contaminated with PCE levels greater than 4,000 μg/L.

The 4,000 μg/L level was set based on the potential for DNAPL to be present, and because approximately 87% of the contaminant mass in subsurface soil and groundwater found in the HRIA is within the >4,000 μg/L **isocontour**. The maximum PCE concentration in groundwater was detected at MW-602 (2,720,000 μg/L) under the suspected release area. Concentrations that exceed 10% of a contaminant's solubility limit in groundwater are indicative of DNAPL. PCE's solubility limit is 200,000 μg/L; therefore, concentration of 20,000 μg/L or higher in groundwater are indicative of PCE DNAPL within the HRIA.

For the HRIA, while concentration-based data provide information about contaminant levels at specific measuring points, it does not address the level which contaminants are being mobilized from the source area into the downgradient areas. Measuring mass discharge (Md) or flux of contaminants from a source area combines chemical data, groundwater flow velocity, and discharge area into a single measurement (expressed as mass/time or grams/day). Using Md as a performance measure or PRG is a more direct way to measure contaminant migration from the HRIA DNAPL source zone. Generally, it can be expected that a one order of magnitude reduction in contaminant mass discharge can be achieved with targeted DNAPL source treatment with most commonly used technologies. A 90% reduction in PCE mass discharge from the high concentration groundwater remediation target zone should be achievable based on reductions in organic compound concentrations achieved at similar sites where DNAPL source treatment was conducted (McDade et al. 2005, McGuire et al. 2006). This type of reduction also results in significant reduction in the contaminant source strength, thereby reducing the continued discharge of contaminants. Additionally, reductions in contaminant concentrations in the downgradient dissolved phase plume are expected once the reduction in mass discharge from the high concentration source zone has been achieved, although no specific goal has been specified yet for these downgradient areas.

The use of Md as a PRG is not currently a widespread practice and regulations do not address the reduction of Md as a RAO. However, there is significant utility in using Md as a PRG to evaluate DNAPL source treatment because it conveys important information about source strength, aquifer attenuation rates, and to what extent and/or areas mobile contaminant mass is moving. In fact, the EPA points to the following reasons, among others, for using Md estimates during site characterization and remediation, as discussed in Interstate Technology and Regulatory Council's (ITRC) publication *Use and Measurement of* ***Mass Flux*** *and Mass Discharge* (ITRC 2010):

- "The flux [discharge] is the best estimate of the amount of contaminant leaving the source area. This information would be needed to scale an active remedy if necessary."

- "The flux [discharge] estimate across the boundary to a receptor is the best estimate of loading to a receptor."

In addition, Md estimates are effective metrics to characterize site conditions and assess cleanup action performance for the HRIA because of uncertainty of the contribution of HRIA sources to mass loading to the downgradient dissolved phase contaminant plume. A reduction in Md across the 4,000 μg/L boundary will result in a greater understanding of the relationship between the HRIA DNAPL source and the downgradient plume response that can help future remediation decision-making. For instance, the reduction in Md from the HRIA may be sufficient to observe a desired rate of contaminant plume retraction to allow for less-intensive cleanup to address remaining downgradient contamination and achieve long-term ARARs within the desired timeframe (e.g., MCLs at downgradient compliance and/or interim performance monitoring points). Alternatively, it may be determined that contaminant Md from other sources located outside of the HRIA, but within the Site, contribute a much greater overall mass loading to the Site-wide contaminant plume than the remaining contamination within the HRIA and thus are a priority for any additional cleanup actions as part of the comprehensive Site-wide strategy.

Achievement of this PRG would address RAO 4 as it pertains to the High Concentration Groundwater in the HRIA. It would contribute to, but not fully achieve RAO 1.

7.0 SUMMARY OF INTERIM CLEANUP ALTERNATIVES

This section of the Proposed Plan presents the interim cleanup alternatives that were considered to address known sources of contamination (primarily PCE) to sediment, soil and groundwater and reduce risks within the HRIA, and to minimize further migration of contaminated groundwater from the HRIA to downgradient areas of the Site. Doing so will also address the principal threat waste, identified as PCE DNAPL, in the HRIA.

The cleanup alternative development process began in the FS with identification, screening and analysis of all known potentially applicable cleanup alternatives to address contaminated media in each of the HRIA remediation target zones. The retained cleanup alternatives were then combined into comprehensive cleanup alternatives using a combination of synergetic treatment technologies that would best achieve the RAOs identified in Section 6. For purposes of this Proposed Plan, these retained cleanup alternatives are called “Comprehensive Technology Scenarios” or CTSs. The CTSs for each of the remediation target zones are summarized below.

7.1 COMMON ELEMENTS ACROSS ALTERNATIVES

The common elements within each of the retained CTS alternatives, with the exception of CTS-1 (No Action), are as follows:

7.1.1 Re-route Berwick Creek

Berwick Creek would be re-routed around the areas of contamination prior to starting cleanup actions in the HRIA. The permanence of this diversion will be made later in a Site decision document.

A temporary diversion would consist of routing the creek through a 48-inch diameter high density polyethylene (HDPE) pipe around the remediation target zones, and back into Berwick Creek downstream of these zones. Upon completion of the cleanup action, the original creek channel would be reconstructed and habitat restored, and the temporary diversion removed. A permanent diversion of the creek would involve creation of a new creek channel and habitat prior to cleanup actions in the HRIA. Habitat considerations include the planting of native vegetation and installation of fish habitat, such as spawning gravel.

Whether reconstructing the current creek channel after cleanup actions are completed or constructing a new creek channel prior to initiating cleanup actions, requirements that are protective of aquatic and benthic receptors would need to be met, e.g., 0.468 mg/kg PCE based on EPA’s RSLs for protection of benthic and freshwater organisms living in Berwick Creek sediments. The design specifications for the creek diversion, creek channel construction, and habitat restoration would be completed in consultation with the appropriate natural resource agencies. Diversion of Berwick Creek would be conducted during a seasonally dry period within Washington State’s **in-stream work window** in order to protect fish at critical life stages.

7.1.2 Institutional Controls

A variety of ICs would be implemented during and after the interim cleanup action at the HRIA. The objectives of the ICs for the HRIA include preventing the use of HRIA groundwater for drinking water, and requiring workers to wear protective gear.

The types of ICs that would be employed include activity and use restrictions through proprietary (e.g., easements, covenants), and/or governmental (e.g., zoning requirements, building codes and/or restrictions on well drilling) controls. Other ICs that could be added to the above, if warranted, include information device ICs (e.g., warning signs, advisories, additional public education, deed notices, Notices of Environmental Contamination) to inform people of the presence of any residual contamination and the risks such contamination may pose. Implementation, monitoring and enforcement of the ICs would be the responsibility of some combination of property owners, local government, Ecology and/or EPA.

7.1.3 Monitoring

Sampling of surface water, sediment, soil, groundwater, and air will be performed during and after cleanup in order to ensure protection of humans and the environment, and to determine the effectiveness of the interim cleanup action. Future cleanup decisions within the HRIA will also take into account results from future OU2 investigations in order to support a Site-wide, groundwater plume management strategy.

To evaluate the mass discharge PRG for high concentration groundwater (PCE > 4,000 µg/L), performance monitoring wells would be established. **Figure 6-2** shows the proposed Md measurement plane and the wells that may be used to measure discharge relative to the remediation target zones and the PCE contaminant plume. The location of the proposed plane has been chosen to incorporate the following considerations:

- Near the downgradient edge of the high concentration groundwater treatment zone.

- Screened in the upper and lower zones of the shallow aquifer where groundwater contamination is located.

Exact placement and screened intervals of the mass discharge wells may be changed once additional data are collected during the **remedial design** to characterize the vertical and lateral **hydraulic** system more fully. It is also important to note that groundwater samples would be collected in wells that correspond to the mass discharge analysis and analyzed for contaminant concentrations using standard analytical procedures. These data would be used to compare standard analytical contaminant concentration changes as another line of evidence for Md reductions that are observed. In addition, groundwater analytical results would be used to determine when to conduct a Md assessment. For instance, if a 90% reduction in contaminant concentrations is observed at the discharge wells, an assessment of Md may be conducted to verify corresponding reductions.

7.1.4 Five-Year Reviews

Hazardous substances are expected to stay within the HRIA above levels that allow for unrestricted use and unlimited exposure after the interim cleanup action is complete. As such, a review will be conducted at least every five years from the start of the interim cleanup action as required by law.

7.1.5 ARARs Waiver

The Preferred Alternative, and other alternatives considered for the HRIA, were developed and evaluated for use as an interim cleanup action as described in Section 4, Scope and Role. Consequently, none of the Alternatives evaluated are expected to be able to fully attain all of the ARARs for the HRIA. The ARARs that will be attained and those that will be waived will be specified in the Interim ROD, which is expected to include the interim action waiver provided for in Section 121(d)(4)(A) of CERCLA. The Interim ROD will eventually be followed by a Final ROD for the HRIA or Site that will fully address compliance with all ARARs, consistent with CERCLA, including any waivers.

7.2 UNIQUE FEATURES OF EACH CTS ALTERNATIVE

The subsections below summarize the unique features of each of the evaluated alternatives. Please note that a specific implementation sequence of each component within CTS-2 and CTS-3 is not proposed at this time in order to allow flexibility to consider and adapt to new information during the design phase. For example, it may be decided to initiate biological treatment before thermal treatment because of vendor availability or the high costs associated with implementing a thermal technology.

7.2.1 CTS-1 No Action

Evaluation of the No Action Alternative is required by law to provide a baseline against which impacts of the various cleanup alternatives can be compared. Its inclusion is meant to help assure that the consequences of no action are fully evaluated so that unnecessary remedial action is not taken where no action is appropriate.

Under this alternative, no action would be taken to actively clean up the contaminated creek bed sediment and bank surface soil, subsurface soil, or groundwater, nor would monitoring of PCE concentrations to address the associated risks to human health or the environment be conducted.

Estimated Timeframe:

- ***Achieve Interim Action PRGs and RAOs: N/A***

Costs:[4]

- ***Capital Costs: $0***
- ***Annual Operations & Maintenance (O&M) Costs: $0***
- ***Total Present Worth: $0***

[4] See the Glossary for a definition of each type of costs.

7.2.2 CTS-2 (EPA's Preferred Alternative)

The conceptual approach for CTS-2 is illustrated in **Figure 7-1**. In addition to the common elements discussed in section 7.1, CTS-2 consists of the following components:

- **Heat sediment and soil with PCE concentrations greater than 10 mg/kg.**
- **Excavate and dispose of remaining sediment and surface soil with PCE concentrations greater than 10 mg/kg.**
- **Add organic materials to groundwater with PCE concentrations greater than 4,000 µg/L.**

Heat Sediment, Surface Soil and Subsurface Soil with PCE Concentrations Greater Than 10 mg/kg

Under CTS-2, **in-situ** thermal treatment would be used on contaminated creek bed sediment and bank surface soil within the current creek channel, on other surface soil outside of the creek channel, and on subsurface soil. Thermal treatment is expected to reduce PCE concentrations to 10 mg/kg to ensure removal of DNAPL. Substantial reductions in PCE DNAPL in sediment and soil would also decrease PCE concentrations in groundwater within and downgradient of the HRIA.

A full suite of thermal technologies (e.g., steam injection, steam **extraction**, electrical heating), would be considered as part of the remedial design. Thermal treatment methods work by heating contaminated soil and groundwater. The heat helps push up chemicals through the soil to collection wells. The heat can also destroy or evaporate certain types of chemicals. When they evaporate, the chemicals change into gases, which move more easily through the soil. Collection wells capture the harmful chemicals and gases and pipe them to the ground surface for treatment.

Construction of the thermal treatment system would be accomplished using conventional construction equipment and services, with contractors that specialize in this innovative technology. During operation, temperature, groundwater quality, vapor emissions, and condensate/discharge will be monitored. The total heating/treatment time is estimated to range from six to nine months to reduce PCE concentrations to 10 mg/kg.

Excavate and Dispose of Remaining Sediment and Surface Soil with PCE Concentrations Greater than 10 mg/kg

Under CTS-2, confirmation sampling would be conducted in sediment and soil after thermal treatment to evaluate compliance with the 10 mg/kg PCE PRG. Although it is anticipated that that in-situ thermal treatment will be effective at reducing the high levels of PCE found in HRIA sediment and soil, it is possible that it will not be reduced to the PRG level in all locations. The reasons for this are varied, e.g., Site geology and/or hydraulic conditions may restrict some of the PCE from being pushed up through the heated soil to collection wells or in some locations the starting PCE concentrations may be so high that even a 99% reduction in concentration still leaves > 10 mg/kg in the soil. It is also possible that the results of additional sampling find isolated "hotspots" of elevated PCE levels that would be too costly to address by extending the thermal treatment zone. To address these potential situations, the following actions are proposed:

- If after thermal treatment sediment and surface soil are found to exceed 10 mg/kg PCE, they would be excavated and consolidated within the HRIA prior to disposal. Excavated soils would be placed on an impermeable liner and the stockpile covered to minimize the risk of contaminants leaking into the underlying soil until waste characterization testing can be completed.

- If further treatment of the excavated sediment and surface soil is required prior to off-site disposal (based on landfill restrictions), a chemical would be injected or mixed into the contaminated materials to help destroy or "oxidize" the PCE. Oxidizing chemicals help change harmful chemicals into harmless ones, like water, carbon dioxide and diluted hydrochloric acid. Typical chemical oxidants include hydrogen peroxide (H2O2) and potassium permanganate (KMnO4). Soil sampling and testing would be required to determine the best chemical oxidant and dosage needed to effectively reduce contaminants in the excavated material. The excavated sediment and surface soil, whether treated on or off-site, would be loaded into dump trucks and transported to a licensed disposal facility.

- If after thermal treatment, subsurface soil is found to exceed 10 mg/kg PCE, another technology such as in-situ biological treatment would be considered to further reduce PCE concentrations.

Add Organic Materials to High Concentration Groundwater
Under CTS-2**,** in-situ biological treatment would be used on groundwater with PCE concentrations greater than 4,000 µg/L. Biological treatment is expected to reduce migration (Md or flux) of PCE contamination by 90% from the high concentration groundwater zone (greater than 4,000 µg/L PCE) to the downgradient dissolved phase plume as quickly as technically achievable. Residual contamination in subsurface soils would also be reduced. Biological treatment could be conducted either before or after thermal treatment.

Biological treatment, also called bioremediation, has been described as a technology that uses natural processes to reduce the concentration or toxicity of a hazardous substance. Microbes that live in soil and groundwater such as bacteria or fungi, will eat certain harmful chemicals. When microbes completely digest these chemicals, they change them into water and harmless gases such as carbon dioxide. In order for microbes to clean up harmful chemicals, the right temperature, nutrients, and amount of oxygen must be present in the soil and groundwater.

In order to boost or enhance this natural process, certain organic materials can be injected into the soil and groundwater. Examples of these "amendments" include whey, lactate, emulsified vegetable oil, and suspensions of zero-valent iron. Testing will be done during remedial design to determine the best amendment or combination of amendments to use, and to determine where injection wells are to be placed. This testing area would be located in the area of highest PCE concentrations along the most downgradient boundary of the 4,000 µg/L PCE remediation target zone.

Estimated Timeframe:

- ***Achieve Interim Action PRGs and RAOs: 3 years***

Costs:

- ***Capital Cost: $8.02 Million***
- ***Annual Operation and Maintenance Cost: $142,000***
- ***Total Present Worth Cost: $8.8 Million***

7.2.3 CTS-3

The conceptual approach for CTS-3 is illustrated in **Figure 7-2**. In addition to the common elements discussed in section 7.1, CTS-3 consists of the following components:

- **Heat sediment and soil with PCE concentrations greater than 10 mg/kg.**

- **Excavate and dispose of remaining sediment and surface soil with PCE concentrations greater than 10 mg/kg.**

- **Chemically Treat Groundwater with PCE concentrations greater than 4,000 µg/L.**

Heat Sediment, Surface Soil and Subsurface Soil with PCE Concentrations Greater than 10 mg/kg

This is the same as described under CTS-2.

Excavate and Disposal of Remaining Sediment and Surface Soil with PCE Concentrations Greater than 10 mg/kg

This is the same as described under CTS-2.

Chemically Treat High Concentration Groundwater

Under CTS-3, contaminated groundwater greater than 4,000 µg/L would be treated by injection of a chemical oxidant(s) via wells into the subsurface soil and groundwater within the high concentration groundwater remediation target zone. As stated under CTS-2, oxidizing chemicals help change harmful chemicals into harmless ones, like water, carbon dioxide and diluted hydrochloric acid. Chemical treatment is expected to reduce the migration of PCE from the HRIA to other areas of the Site by 90%.

Estimated Timeframe:

- ***Achieve Interim Action PRGs and RAOs: 3 years***

Costs:

- ***Capital Cost: $9.9 Million***
- ***Annual Operation and Maintenance Cost: $142,000***
- ***Total Present Worth Cost: $10.7 Million***

8.0 EVALUATION OF CTS ALTERNATIVES

The CTS alternatives presented in Section 7 were evaluated using seven of the **nine criteria**[5] described in Section 121(b) of CERCLA and NCP Section 300.430(e)(9)(iii). These criteria address statutory requirements and considerations for cleanup actions in accordance with the NCP and additional technical and policy considerations that have proven to be important for selecting among cleanup alternatives (EPA 1988).

This section first describes the nine criteria used in the evaluation. This section then provides a comparison of the CTS alternatives identifying the relative advantages and disadvantage of the alternatives in terms of the criteria. A more detailed analysis of alternatives can be found in the draft FS (CDM Smith 2012).

8.1 THE NINE CRITERIA

The nine evaluation criteria are separated into three groups, as outlined in **Table 8-1,** that establish a priority for evaluating each CTS alternative. **Threshold criteria** are standards that an alternative must meet to be eligible for selection as a cleanup action unless an ARAR waiver is used. **Balancing criteria** weigh the tradeoffs among alternatives. **Modifying criteria** are fully evaluated after comments are received on the Proposed Plan; therefore, only seven of the nine CERCLA criteria guide the comparative evaluation presented in this Proposed Plan.

8.1.1 Threshold Criteria

The threshold criteria include:

- **OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT:** This criterion evaluates whether an alternative eliminates, reduces or controls risks to public health and the environment through treatment, **engineering**, or institutional **controls**.

- **COMPLIANCE WITH ARARS:** This criterion evaluates whether an alternative meets federal, state, and tribal environmental statutes, regulations, and other requirements that pertain to the site, and/or whether a waiver is justified. If the evaluation indicates an ARAR will not be met, then the basis for justifying one of the six ARAR waivers allowed under CERCLA is discussed.

[5] The last two criteria, or "Modifying Criteria," are not fully evaluated until after comments on the Proposed Plan are received. However, EPA has coordinated with the State (Ecology) and it concurs with the Preferred Alternative at this time.

8.1.2 BALANCING CRITERIA

The balancing criteria include**:**

- **LONG-TERM EFFECTIVENESS AND PERMANENCE:** This criterion considers an alternative's ability to protect human health and the environment over time.

- **REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT:** This criterion evaluates an alternative's use of treatment technologies to reduce the harmful effects of principal contaminants (e.g., principal threat wastes), their ability to move in the environment, and the amount of contamination present.

- **SHORT-TERM EFFECTIVENESS:** This criterion considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during construction and implementation of a cleanup action.

- **IMPLEMENTABILITY:** This criterion considers the technical and administrative feasibility of implementing an alternative, including factors such as the availability of goods and services

- **COST:** This criterion includes estimated capital, annual O&M, periodic, and present worth costs. Costs are expected to be accurate within a range of +50 to -30 percent.

8.1.3 MODIFYING CRITERIA

The modifying criteria include:

- **STATE ACCEPTANCE:** This criterion considers whether the State agrees with EPA's analyses and recommendations.

EPA has received comments on the draft Proposed Plan from the State (Ecology) and they concur with the preferred cleanup alternative at this time. Final assessment of State concerns will be completed after comments on the Proposed Plan have been received by EPA and addressed in the interim ROD.

- **COMMUNITY ACCEPTANCE:** This criterion considers whether the local community agrees with EPA's analyses and the preferred alternative.

Community acceptance of the preferred alternative will be evaluated after the public comment period ends. Comments received during that time will be included and responded to in a Responsiveness Summary section of the interim ROD.

8.2 COMPARATIVE ANALYSIS OF CTS ALTERNATIVES

In this subsection, the CTS alternatives discussed in Section 7 are comparatively evaluated against the two threshold criteria and five balancing criteria. The results of this evaluation are presented in **Table 8-2** and discussed below.

8.2.1 Overall Protection of Human Health and the Environment

Protection of human health and the environment is one of two threshold criteria that each alternative must meet in order to be further evaluated as a potential cleanup action (the other being compliance with ARARs).

The CTS-1 alternative (No Action) would not address any risks and therefore is not protective of human health and the environment and does not achieve this criterion.

The CTS-2 and CTS-3 alternatives would achieve the criterion of overall protection of human health and the environment within the scope of the interim action by removing or substantially reducing the amount of contaminant mass, including DNAPL, and through implementation of ICs to prevent the use of HRIA groundwater for drinking, and to require workers to wear protective gear.

A reduction in contaminant mass would also result in a reduction of source material and contaminant migration to areas downgradient of the HRIA, thereby increasing the likelihood of achieving this criterion across more areas of the Hamilton/Labree Site.

8.2.2 Compliance with ARARs

Compliance with ARARs is the second of the two threshold criteria that each alternative must meet in order to be further evaluated as a potential cleanup action, unless one of the ARARs is waived.

The No Action alternative (CTS-1) does not implement any action and therefore will not achieve this criterion. Because CTS-1 does not meet either of the threshold criteria (overall protection of human health and the environment, and compliance with ARARs), it will not be further evaluated as an alternative.

Both CTS-2 and CTS-3 would comply with the MTCA Method B cleanup level for human direct contact exposure with soil, which requires cleanups to attain the 1×10^{-6} risk level for protection of human direct contact exposure. The PCE concentration which equates to a $1 \times 1 0^{-6}$ risk from direct contact assuming residential use is 22 mg/kg, industrial/commercial (trench worker) use is 110 mg/kg, and recreational use within the HRIA creek bed sediment and bank surface soil is 924 mg/kg. The soil PRG for both CTS-2 and CTS-3 is 10 mg/kg PCE which far exceeds the 1×10^{-6} protection level.

CTS-2 and CTS-3 would also both meet the 10 mg/kg PCE level for protection of terrestrial ecological receptors, e.g., short-tailed shrew, from ingestion and inhalation of surface soil in burrow air, and would meet EPA's RSL of 0.468 mg/kg PCE for protection of benthic and freshwater organisms in creek bed sediment and bank surface soil when the impacted creek channel is relocated or reconstructed.

Both CTS-2 and CTS-3 include institutional controls to prevent human exposure to groundwater above the Federal and State MCL of 5 µg/L PCE, and cleanup actions that would help prevent further migration of contaminated groundwater to areas downgradient of the HRIA. Since this will be an interim action which is limited in scope, neither alternative is expected to achieve

MCLs and restore groundwater to its most beneficial use (as a drinking water source) across the entire Site. Therefore, the selected interim cleanup action would include a waiver, based on the interim action, of the MCL ARAR.

8.2.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence is the first of the five balancing criteria which weigh the tradeoffs between among alternatives.

CTS-2 and CTS-3 would both provide a high degree of long-term effectiveness and permanence by substantially reducing sediment, soil, and groundwater contaminant concentrations and mass, including DNAPL which is a principal threat waste, from the HRIA. These alternatives would result in a reduction in source material, and contaminant Md to areas downgradient from the HRIA over the long term.

The valley in which the Hamilton/Labree Site is located is prone to flooding every few years which could negatively impact the effectiveness of equipment employed for long-term treatment. The treatment technologies considered for both CTS-2 and CTS-3, however, would be equally impacted by these events over the short- and long-terms.

8.2.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Reduction of toxicity, mobility, or volume through treatment is the second of the five balancing criteria.

CTS-2 and CTS-3 would both provide a high level of reduction in toxicity, mobility, or volume of contaminated materials, and satisfy the statutory preferences for treatment of principal waste threats. All of the evaluated alternatives would be effective at reducing contaminant mass and discharge and result in a substantial reduction in contaminant mobility. Toxicity would be decreased by lowering PCE concentrations in the sediment, soil, and groundwater.

One trade-off to be considered when evaluating these two alternatives against this criterion is the use of amendments to enhance reduction of contaminants. Under CTS-2, enhanced bioremediation will entail injection of non-toxic food grade materials into the subsurface soil and groundwater. Under CTS-3, chemical oxidants will be injected. Some chemical oxidants can create toxic by-products which may increase toxicity in the short-run; however, the potential for this to happen would be mitigated during the design of this alternative. Different chemical oxidants will be evaluated in bench scale and/or pilot treatability studies to evaluate performance, including creation of toxic by-products and those products tracked over time. Oxidants will be selected based on the ability to achieve PRGs and minimize formation of undesirable by-products.

8.2.5 Short-Term Effectiveness

Short-term effectiveness is the third of the five balancing criteria.

The estimated time to achieve RAOs under CTS-2 is 3 years. The estimated time to achieve RAOs under CTS-3 is also 3 years. Although there are a number of issues that may impact the construction and cleanup schedule and achievement of RAOs, the first priority is to ensure the schedule is not delayed because of the State of Washington's in-stream work window. In-stream work windows have been established for all waters of the State of Washington. These are in place to protect fish species at critical life stages. For Berwick Creek, the in-stream work window is June 15 to September 30. It may be possible, however, to obtain a waiver from the State in order to work outside the work window. If the work window is missed and a waiver cannot be obtained, the project will be delayed from the start since Berwick Creek needs to be relocated prior to initiating any other activities.

The community around the Site will not be subject to significant risks associated with the cleanup actions under CTS-2 or CTS-3. Potential risks to the community can be mitigated by preventing the use of HRIA groundwater for drinking and Berwick Creek for swimming through the use of access controls and information devices (e.g., fences and posted warning signs).

The CTS-2 and CTS-3 alternatives both involve treatment, and possible excavation of contaminated materials within the HRIA. These activities could pose moderately high risks to on-site cleanup workers. Treatment involves placement of delivery systems for injection of thermal, chemical or biological substances into soil and groundwater, and collection of vapors. This poses physical risks, as well as direct contact and inhalation risks from contaminants. Digging and working in a trench, such as when relocating or reconstructing the Berwick Creek channel or installing horizontal soil vapor extraction wells for thermal treatment, poses an increased inhalation risk from volatilization of contaminants from the soil and shallow groundwater table. Additional short-term issues include increased physical risks, noise levels, and **fugitive dust** emissions associated with the use of heavy equipment for excavation and/or disposal of materials. Controls such as requiring cleanup workers to wear Personal Protection Equipment (PPE) to include air monitoring devices, minimizing the exposed work area, working in cooler weather, using standard construction practices such as dust suppression with water, foam or a vacuum manifold to capture emissions, covering truck loads that are transported off the Site, using conventional traffic controls to minimize accidents, and effectively capturing vapors created during treatment would be used to minimize air pollutants and risks to cleanup workers.

Both CTS-2 and CTS-3 include the use of a thermal technology for treating contaminated sediment and soil. Thermal technologies require significantly large amounts of energy compared to other treatment technologies, which can drive up project costs in the short-term. In addition, a rapid sustained increase in energy costs would increase overall project costs. Thermal treatment, however, is particularly useful on DNAPLs. By using a thermal treatment technology, DNAPL mass is substantially reduced within a relatively short time period. A secondary benefit to thermal is that the warmed sediment and soil can enhance bioremediation in groundwater as is being proposed under CTS-2. To combat thermal energy impacts, the thermal treatment area can be minimized to focus only on DNAPL-impacted sediment and soil, energy efficient equipment can be used to minimize energy consumption, and alternative fuels could be used to minimize greenhouse gas emissions. In addition, renewable energy sources, such as solar panels, could be used to help power treatment or auxiliary systems.

Short-term issues and impacts also exist with whatever technology is used in treating the high concentration groundwater remediation target zone. CTS-2 proposes the use of food-grade amendments such emulsified vegetable oil, so negative impacts to drinking water wells and the environment are not a large concern. In contrast, under CTS-3, chemical treatment within the groundwater remediation target zone is proposed. Injection of certain chemicals may produce unfavorable byproducts such as manganese oxide which could be harmful to human health and the environment. This risk could be mitigated, however, during design. As noted in Section 8.2.5, different chemical oxidants will be evaluated in bench scale and/or pilot treatability and oxidants will be selected based on the ability to achieve PRGs and minimize formation of undesirable by-products.

8.2.6 Implementability

Implementability is the fourth of the five balancing criteria:

As stated above, the use of thermal technology to treat contaminated sediment and soil is proposed in both CTS-2 and CTS-3. Using a thermal technology would be technically and administratively implementable; however, very few vendors are able to provide the proprietary technology needed for this type of treatment. On the other hand, those that are available are very experienced at using this innovative technology to effectively reduce contaminants, including DNAPL. Using a thermal treatment technology would potentially increase the volatilization of contaminants; therefore, installing an effective vapor recovery system is essential. Installing and implementing such a system, however, may be challenging due to the impermeable silt “cap” below Berwick Creek and the shallow groundwater table across the HRIA. This may necessitate the installation of a series of trenches containing horizontal soil vapor extraction wells which are more expensive to install than the more common vertical wells. The regulatory and substantive permitting requirements associated with installation of electrode or soil vapor extraction wells, laying piping, constructing the treatment system, and securing approval for air emissions are considered to be moderately intensive. Heat retention and transport within and downgradient of the target treatment volume are also uncertain. Impacts on heat transfer to Berwick Creek should be considered and evaluated to minimize any undesirable impacts. A pilot test may be necessary prior to full-scale implementation of thermal treatment to mitigate these issues.

In regards to the high concentration groundwater remediation zone, the enhanced bioremediation included in CTS-2 is relatively standard and several contractors are available that have experience with their installations. Treatment of volatile contaminants like PCE in groundwater using enhanced bioremediation is a proven technology. However, to facilitate the proper application of the technology, the installation may need to proceed in phases in order to obtain key engineering design parameters (e.g., feasible injection rates, preferential pathways, area of influence from an injection point). The results of the first phase would be used to help guide subsequent phases.

The chemical treatment technology included as part of CTS-3 is well established and can be implemented at the HRIA within the high concentration groundwater remediation target zone. Chemical oxidants would be delivered to the subsurface using readily available, conventional construction equipment. Testing would be required to determine the dose of chemical oxidant required. Testing may also be necessary prior to full scale implementation in order to obtain key engineering design parameters (e.g., feasible injection rates, preferential pathways, area of influence from an injection point, longevity of oxidant).

Off-site disposal at a licensed disposal facility of treated or non-treated residual contaminated sediment and soil is considered under both CTS-2 and CTS-3. Delays in the project and increased costs could be realized if there is not an appropriate disposal facility relatively close to the Site.

8.2.7 Cost

Cost is the last of the five balancing criteria**:**

CTS-2 and CTS-3 both include treatment that would be completed within 3 years and monitoring for a 30-year period. The present value cost for CTS-2 is estimated at $8.8 million. The capital cost for CTS-2 is $8.02 million and the annual O&M cost is $142,000. The present value cost for CTS-3 is estimated at $10.7 million. The capital cost for CTS-3 is $9.9 million and the annual O&M cost is $142,000.

As stated earlier in this section, these cost estimates are expected to be accurate within a range of +50 to - 30 percent. Future O&M and periodic costs are included and reduced by the appropriate present value discount rate as outlined in *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (EPA 2000). Per the guidance, the present value analysis was performed on remedial alternatives using a 7 percent discount (interest) rate over the period of evaluation for each alternative. Inflation and depreciation were not considered in preparing the present value costs.

9.0 PREFERRED ALTERNATIVE FOR OU1

This section presents EPA's Preferred Alternative. The State of Washington supports EPA's Preferred Alternative at this time; however, EPA will seek formal State concurrence after EPA and the State consider comments received on this Proposed Plan. The Preferred Alternative can change in response to comments or if new information becomes available before the interim cleanup action is selected in the Interim ROD.

9.1 A PHASED APPROACH

EPA intends to address contamination at the Site through a phased approach beginning with an interim cleanup action in the HRIA. A phased approach to site cleanup is the most appropriate when site characterization is not yet complete or when site data are not sufficient to develop and evaluate cleanup alternatives to address risks posed by the entire site or to determine long-term objectives for the entire site (e.g., restoring groundwater to safe drinking water levels). There appears to be other contamination sources at the Site outside of the HRIA; however, additional Site-wide data collection and evaluation is needed to develop, select, and implement other cleanup actions for the Site that will achieve long-term protection of human health and the environment. The proposed interim cleanup action for the HRIA presented in this Proposed Plan is necessary to address the known sources of contamination to sediment, soil, and groundwater within the HRIA and the most immediate risks posed by these sources, and to minimize further migration of contaminated groundwater from HRIA to downgradient areas.

9.2 THE PREFERRED ALTERNATIVE

EPA has identified Alternative CTS-2 as the Preferred Alternative for the interim cleanup action at the HRIA. The Preferred Alternative includes the following components:

- **Re-route Berwick Creek around areas of contamination.**

  - ✓ Re-routing about 200 feet of Berwick Creek around the areas of contamination in the HRIA will help protect wildlife, fish and other organisms that live in or visit the creek channel from possible negative impacts caused by cleanup activities. The creek will be re-routed to a location within the HRIA where it may remain permanently. The creek channel (bed and banks) would be designed to meet requirements that protect ecological inhabitants, e.g., less than 0.468 mg/kg PCE, based on EPA's benchmark for protection of organisms living in freshwater sediments.

- **Heat sediment and soil with PCE concentrations greater than 10 mg/kg.**

  - ✓ Increasing the temperature by heating the sediment and soil would remove contaminant mass and reduce PCE concentrations to 10 mg/kg or less.

- **Excavate and dispose of remaining sediment and surface soil with PCE concentrations greater than 10 mg/kg.**

  - ✓ If heating of the sediment and soil is not successful in reducing PCE contamination to 10 mg/kg, the sediment and surface soil will be excavated.

  - ✓ The excavated sediment and surface soil would be consolidated within the HRIA and treated with a chemical, such as potassium permanganate if necessary to meet disposal requirements or they may be treated at an off-site, licensed disposal facility.

- **Add organic materials to groundwater with PCE concentrations greater than 4,000 micrograms per liter (µg/L).**

  - ✓ Injecting organic material such as emulsified vegetable oil into groundwater with PCE concentrations greater than 4,000 µg/L would enhance the biological breakdown of PCE and reduce the migration of PCE from the HRIA to other areas of the Site by 90%.

- **Institutional controls**

  - ✓ ICs will be implemented during and after the interim cleanup action. ICs are non-engineered instruments, such as legal restrictions, covenants or easements on property, and governmental and/or administrative controls that as part of this interim action would be used to help prevent or minimize the potential for human exposure to hazardous substances, pollutants or contaminants. The objectives of the ICs for the HRIA include preventing the use of groundwater for drinking water and requiring workers to wear protective gear.

- **Monitoring**

  - ✓ Sampling of surface water, sediment, soil, groundwater, and air will be performed during and after cleanup in order to ensure protection of humans and the environment, and to determine the effectiveness of the interim cleanup action.

9.3 BENEFITS OF PROPOSED PREFERRED ALTERNATIVE

Based on the information currently available, EPA believes the proposed Preferred Alternative can achieve the RAOs and PRGs identified in Section 6 of this Proposed Plan, and can meet the two threshold criteria, within the scope of this interim action, and provide the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria as evaluated in Section 8. EPA also expects the Preferred Alternative to be cost effective, utilize permanent solutions and alternative treatment technologies to the maximum extent practicable, and satisfy the preference for treatment as a principal element. The Preferred Alternative is expected to attain a level of protection from risks to human health and the environment that is commensurate to the scope of the selected interim cleanup action to be identified in the Interim ROD, and will not exacerbate conditions at the HRIA or the Hamilton-Labree Site as a whole.

10.0 COMMUNITY PARTICIPATION

Community engagement plays a key role in the process of developing an effective cleanup plan for the Hamilton Road Impacted Area. Public comments can help shape EPA's cleanup decisions. EPA will continue to provide information regarding the cleanup activities of the Hamilton/Labree Roads Groundwater Contamination Superfund Site to the public through the Administrative Record for the Site, Site updates, newsletters, direct mailings, announcements published in the Chehalis Chronicle and other local papers or blogs, public meetings, and through its Hamilton/Labree Roads Superfund Site website which may be accessed at:

http://yosemite.epa.gov/R10/cleanup.nsf/sites/HLabree

EPA and Ecology encourage the public to gain a more comprehensive understanding of the Site and proposed cleanup activities. Details about the public meeting and instructions for providing comments on this Proposed Plan are provided in Section 1.3 of this Proposed Plan. Section 14.0 contains a blank comment form to facilitate submission of comments.

For additional information on this project, please contact:
Ms. Tamara Langton
US EPA Region 10
1200 Sixth Ave, Suite 900
Office of Environmental Cleanup, ECL-113
Seattle, WA 98101
(T) 206-553-2709
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langton.tamara@epa.gov (For emailed comments, please put "HRIA Proposed Plan" in the subject line.)

Documents referred to in this Proposed Plan may be found in the Administrative Record, which is available for public review at the following locations:

Vernetta Smith Chehalis Timberland Library
400 N. Market Blvd.
Chehalis, WA 98532-0419
(360) 748-3301

EPA Region 10
Superfund Records Center
1200 Sixth Avenue, Suite 900 (ECL-076)
Seattle, WA 98101
(206) 553-4494

11.0 LIST OF ACRONYMS USED IN PROPOSED PLAN

>	Greater Than
<	Less Than
%	Percent
3-D	Three dimensional
AES	Architect and Engineering Services
AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
bgs	Below Ground Surface
BLRA	Baseline Risk Assessment
CC	Creek Channel
CDM Smith	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CG	Commercial General
cis-1,2-DCE	cis-1,2-Dichloroethene
COCs	Contaminants of Concern
CSM	Conceptual Site Model
CTS	Comprehensive Treatment Scenario
DNAPL	Dense Non-Aqueous Phase Liquid
DNR	Department of Natural Resources
Ecology	Washington State Department of Ecology
E&E	Ecology & Environment
EE/CA	Engineering Evaluation/Cost Analysis
EPA	U. S. Environmental Protection Agency
ERT	Emergency Response Team
ESA	Federal Endangered Species Act
°F	Degrees Fahrenheit
Farallon	Farallon Consulting, L.L.C.
FS	Feasibility Study
ft/ft	Foot per Foot

H_2O_2	Hydrogen Peroxide
HDPE	High Density Polyethylene
HRIA	Hamilton Road Impacted Area
HIs	Hazard Indices
HQ	Hazard Quotient
I-5	Interstate 5
ICs	Institutional Controls
KMnO4	Potassium Permanganate
LCDPH	Lewis County Department of Public Health
MCL	Maximum Contaminant Level
Md	Mass Discharge
µg/L	Micrograms per Liter
$\mu g/m^3$	Micrograms per cubic Meter
mg/kg	Milligrams per Kilogram
MSL	Mean Sea Level
MTCA	Model Toxics Control Act
MVS	Mining Visualization Systems
MW	Monitoring well
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operations and Maintenance
OU	Operable Unit
OU1	Operable Unit 1
OU2	Operable Unit 2
PCE	Tetrachloroethene (also known as Perchloroethylene)
PPE	Personal Protective Equipment
ppm-v	Parts per Million by Volume
PRG	Preliminary Remediation Goal
RAO	Remedial Action Objective
RDD	Rural Development District
RI	Remedial Investigation

ROD	Record of Decision
RSL	Regional Screening Level
Site	Hamilton/Labree Roads Groundwater Contamination Superfund Site
START	EPA Superfund Technical Assistance and Response Team
TBC	To Be Considered
TCE	Trichloroethene
TPH	Total Petroleum Hydrocarbons
U&A	Usual and Accustomed
UGA	Urban Growth Area
URS	URS Group, Inc.
VOCs	Volatile Organic Compounds
WAC	Washington Administrative Code
WDOH	Washington State Department of Health

12.0 GLOSSARY

Administrative Record: Material documenting EPA's selection of cleanup remedies at Superfund sites, usually placed in the **Information Repository** near the site.

Alluvium: A general term for clay, silt, sand, gravel or similar material deposited by a stream or other body of running water.

Ambient: Existing or present on all sides; surrounding.

Ambient Air: Any unconfined portion of the atmosphere: open air, surrounding air.

Applicable or Relevant and Appropriate Requirements (ARARs): Refers to federal and state requirements a selected remedy must attain, which vary from site to site.

Aquifer: A geologic formation, group of formations, or part of a formation that is capable of yielding a significant amount of water to a well or spring.

Aquitard: A geological formation that may contain groundwater but is not capable of transmitting significant quantities of groundwater under normal hydraulic gradients. An aquitard may prevent different **aquifers** from mixing.

Artesian: Water in an **aquifer** that is confined and held under positive pressure by impermeable geological formations. This causes the water level in a well to rise to a level higher than the water level in the top of the aquifer, sometimes even reaching the ground surface.

Balancing Criteria: Criteria 3 through 7 of the **nine criteria** used to evaluate and compare remedial alternatives developed in a Feasibility Study. The balancing criteria are long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, and cost.

Baseline Risk Assessment (BLRA): A qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and the environment by the presence or potential presence and use of specific pollutants.

Below ground surface (bgs): The depth at which contamination, groundwater, or any other object of interest is found below the surface of the ground.

Benthic: Of, relating to, or occurring at the bottom of a body of water.

Characterization: The use of scientific techniques to determine properties and compositions of something.

Commercial General (CG): A City of Chehalis zoning classification. The intent of the CG zone is to provide an area for development of general commercial businesses, offices, retail stores, institutions, and similar commercial uses, with zoning controls designed to address significant impacts that may occur with such development.

Compliance: Meeting or exceeding requirements of relevant laws and regulations.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or **Superfund):** A federal law passed in 1980 and amended in 1986 by the Superfund Amendments and Reauthorization Act (SARA); the Act created a trust fund, known as Superfund, to investigate and cleanup abandoned or uncontrolled hazardous waste sites.

Comprehensive Technology Scenario (CTS) Alternative: A clean-up approach that includes multiple components to address contamination in affected **media** and/or locations.

Confined Aquifer: An **aquifer** in which groundwater is confined between impermeable geologic formations, such that the pressure is significantly greater than atmospheric pressure and causes **artesian** conditions.

Contaminant of Concern (COCs): Those chemicals detected in soil, sediment, water or air that could pose an unacceptable risk to human health.

Costs (**capital, annual O&M, periodic, and present worth costs):** Criterion for evaluation of alternatives. Includes estimated costs: capital, annual operation and maintenance (O&M), periodic, and present worth. Costs are expected to be accurate within a range of +50 to -30 percent.

- **Capital costs:** Are those expenditures that are required to construct a remedial action. They are exclusive of costs required to operate or maintain the action throughout its lifetime. Capital costs consist primarily of expenditures initially incurred to build or install the remedial action (e.g., construction of a water treatment system and related site work). Capital costs include all labor, equipment, and material costs (including contractor markups, such as overhead and profit) associated with activities, such as mobilization/demobilization; monitoring site work; installation of extraction, containment, or treatment systems; and disposal. Capital costs also include expenditures for professional/technical services that are necessary to support construction of the remedial action.

- **Annual O&M costs:** Are those post-construction costs necessary to ensure or verify the continued effectiveness of a remedial action. These costs are estimated mostly on an annual basis. Annual O&M costs include all labor, equipment, and material costs (including contractor markups, such as overhead and profit) associated with activities, such as monitoring; operating and maintaining extraction, containment, or treatment systems; and disposal. Annual O&M costs also include expenditures for professional/technical services necessary to support O&M activities.

- **Periodic costs:** Are those costs that occur only once every few years (e.g., 5-year reviews, equipment replacement) or expenditures that occur only once during the entire

O&M period or remedial timeframe (e.g., site closeout, remedy failure/replacement). These costs may be either capital or O&M costs but, because of their periodic nature, it is more practical to consider them separately from other capital or O&M costs in the estimating process.

- **Present Worth Costs:** Provides the basis for cost comparison between alternatives. The present value cost represents the amount of money that, if invested in the initial year of the remedial action at a given rate, would provide the funds required to make future payments to cover all costs associated with the remedial action over its planned life. The present value analysis was performed on remedial alternatives using a 7 percent discount (interest) rate over the period of evaluation for each alternative. Inflation and depreciation were not considered in preparing the present value costs.

Deep Aquifer: A deeper aquifer underlies the Site and is separated from the shallow aquifer by a silt and clay **aquitard**. The deeper aquifer occurs at depths greater than 150 feet bgs in the area of the HRIA. Sampling results for the deeper aquifer wells have historically been “non-detect” for PCE, except for three isolated detections.

Dense Nonaqueous Phase Liquid (DNAPL): Non-aqueous phase liquids, such as chlorinated hydrocarbon solvents, with a specific gravity greater than 1.0 that sink through the water column until they reach a confining layer. Because they are at the bottom of aquifers instead of floating on the water table, typical monitoring wells do not indicate their presence.

Downgradient: The direction that groundwater flows; similar to "downstream" for surface water.

Engineering Controls: Containment and/or treatment systems that are designed and constructed to prevent or limit the movement of or exposure to hazardous substances. An example of an engineering control is a fence.

Excavation: The act of cutting, scooping, or digging out a part of a solid mass.

Exposure Route: Path for contaminants to reach people either working or residing near a site or ecological receptors living at or near the site.

Extraction: The process used to remove groundwater, vapor or steam through a well.

Feasibility Study (FS): An analysis of remediation alternatives often with a proposed or recommended Alternative. For cleanup of a Superfund site, the FS usually starts shortly after the Remedial Investigation (RI) is underway.

Fecal Coliform: Bacteria found in the intestinal tracts of mammals. Their presence in water or sludge is an indicator of pollution and possible contamination by pathogens (e.g., bacteria, viruses, or parasites that can cause disease in humans, animals and plants).

Fugitive Dust: Particles lifted into the ambient air caused by human-made and natural activities such as the movement of soil, vehicles, equipment, blasting, and wind. This excludes particulate matter emitted directly from the exhaust of motor vehicles and other internal combustion engines, from portable brazing, soldering, or welding equipment, and from pile drivers.

Glaciofluvial Deposits: Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice.

Groundwater: The supply of fresh water found beneath the Earth's surface (usually aquifers) which is often used for supplying wells and springs.

Hazard Index: The summation of the **hazard quotients** for all chemicals to which an individual is exposed. A hazard index value of 1.0 or less than 1.0 indicates that no adverse human health effects (non-cancer) are expected to occur.

Hazard Quotient: The ratio of estimated site-specific exposure to a single chemical from a site over a specified period to the estimated daily exposure level, at which no adverse health effects are likely to occur. A typical acceptable range for a hazard quotient is less than 1.0.

Hydraulic: Of or related to water or other liquid in motion; operated, moved or affected by means of water.

Information Repository: A library or other location where documents and data related to a Superfund project are placed to allow the public access to the material.

In-Situ: In the natural or original position; in place.

In-Stream Work Windows: Restrictions on when work can be carried out in waters of the State of Washington. These are in place to protect fish species at critical life stages. For Berwick Creek, the in-stream work window is June 15 to September 30.

Institutional Controls: Restriction that prevents the owner to inappropriately develop the property. The restriction could be implemented as a "Deed Restriction" and is designed to prevent harm to workers (i.e., those digging in the area) or restrict potential residential development.

Interim Record of Decision (Interim ROD): A public document describing EPA's rationale for selection of a Superfund cleanup alternative. The document is interim because the cleanup will be an interim action. EPA will propose and select other cleanups for the Site after the HRIA cleanup action starts and additional Site-wide data is collected and evaluated.

Isoconcentration: More than one sample point exhibiting the same concentration.

Isocontour: The line or area represented by an **isoconcentration**.

Lacustrine: Pertaining to, produced by, or inhabiting a lake.

Lenses: Deposit that are thick in the middle and thin at the edges,

Mass Discharge (Md) or Flux: Mass of contaminant per unit time migrating from source area.

Maximum Contaminant Level (MCL): The maximum permissible level of contaminant in water that may be delivered to any user of a public water system.

Medium/Media: Environmental category (e.g., surface water, groundwater, soil, air) in which contaminants may be present and may migrate.

Miocene: Noting or pertaining to a period of the geologic time scale from 25 million to 5.3 million years ago

Migration: The movement of a contaminant (or anything else) from one location or media to another.

Modifying Criteria: Criteria 8 and 9 of the nine criteria used to evaluate and compare remedial alternatives developed in a Feasibility Study. The modifying criteria are state (and/or tribal) acceptance and community acceptance.

National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan or NCP): Federal regulations for Superfund site cleanups and responses to oil and other spills into surface waters or elsewhere.

National Priorities List (NPL): EPA's list of priority hazardous waste sites that are eligible to receive federal money for response under Superfund.

Nine criteria: The criteria in the **NCP** used to evaluate and compare remedial alternatives developed in a **Feasibility Study**. The nine criteria are overall protectiveness of human health and the environment, compliance with **ARARs**, long-term effectiveness and permanence, reduction of toxicity, mobility, and volume through treatment, short-term effectiveness, implementability, cost, state (and/or tribal) acceptance, and community acceptance.

One Order of Magnitude: A range of magnitude extending from some value to ten times that value.

Operable Unit (OU): Different areas of a remediation project. Often a Superfund site is divided into phases to better address different pathways or areas of contamination.

Operation and Maintenance (O&M): Activities conducted at **NPL** sites after cleanup remedies have been constructed to ensure that they are properly functioning.

Parcel: A piece of land.

Pathway: The physical course a contaminant takes from its source to gain exposure to organisms.

Permeability: The rate at which liquids pass through soil or other materials in a specified direction.

Permeable: Capable of being permeated or penetrated, especially by liquids or gases. Allowing liquids or gases to pass through.

Preliminary Remediation Goal (PRG): A goal that combines current human health toxicity values with standard exposure factors to estimate contaminant concentrations in environmental media (soil, air, and water) that are considered by EPA to be health protective of human exposures over a lifetime.

Preferred Alternative: The remedial alternative proposed by the EPA in a Proposed Plan using the nine criteria in the **NCP**.

Proposed Plan: Superfund public participation fact sheet that summarizes the preferred cleanup strategy, the rationale, and the **Remedial Investigation/Feasibility Study** (**RI/FS)**.

Receptors: Human or other living organism potentially impacted by site contamination

Regional Screening Level (RSL): Risk-based screening levels, calculated using the latest toxicity values, default exposure assumptions and physical and chemical properties

Remedial Design (RD): The Superfund cleanup phase prior to Remedial Action that primarily consists of the development of engineering plans and specifications for a cleanup, but may include further sampling or other investigatory tasks to resolve uncertainties and/or refine cleanup actions.

Remedial Investigation (RI): An in-depth study including sampling and analyses to determine the nature and extent of contamination at a Superfund site, and establish criteria to support the analyses of alternatives in the succeeding FS.

Remedial Investigation/Feasibility Study (RI/FS): A two-part investigation conducted to fully assess the nature and extent of the release, or threat of release, of hazardous substances, pollutants, or contaminants, and to identify alternatives for cleanup. The Remedial Investigation gathers the necessary data to support the corresponding Feasibility Study.

Remediation Target Zones: Specific area and media within the HRIA to be cleaned up.

Semi-confined Aquifer: An aquifer partially confined by soil layers of low permeability through which recharge and discharge can still occur.

Shallow Aquifer: Groundwater that occurs between approximately 5 feet and 50 feet bgs at the HRIA. Contamination at the HRIA is found in this zone.

Solubility: The ability of a substance to dissolve. In the process of dissolving, the substance that is being dissolved is called a **solute** and the substance in which the solute is dissolved is called a **solvent.** A mixture of solute and solvent is called a **solution.**

Solubility Limit: The amount of solute a solvent can hold; the maximum amount of solute that can dissolve in the solvent under set conditions (temperature and pressure).

Solute: A substance dissolved in another substance, usually the component of a solution present in the lesser amount.

Solvent: A substance in which another substance is dissolved, forming a solution.

Sorb: To take up and hold.

Stratification: Layered.

Superfund: A term for the hazardous waste cleanup law (CERCLA), also the EPA program that implements that law.

Surficial: Of or relating to a surface.

Terrestrial: Living or growing on land, rather than in the sea or the air.

Threshold Criteria: Criteria 1 and 2 of the nine criteria used to evaluate and compare remedial alternatives developed in a Feasibility Study (FS). Threshold criteria are overall protection of human health and the environment and compliance with ARARs. Alternatives that do not meet both threshold criteria are not carried forward as viable alternative in a FS.

Unconfined Aquifer: An aquifer containing water that is not under pressure; the water level in a well is the same as the water table beyond the well.

Upgradient: The direction from which groundwater flow originates; similar to "upstream" for surface water.

Vapor Intrusion: Process in which chemical vapors from contaminated soil or groundwater affect the indoor air quality in a building. Contaminated soil or groundwater can emit vapors that spread to areas occupied by buildings. Vapors can enter the buildings through cracks in basements, foundations, sewer lines, and any other type of opening.

Volatile Organic Compounds (VOCs): Volatile organic compounds, or VOCs, are organic chemical compounds whose composition makes it possible for them to evaporate under normal atmospheric conditions of temperature and pressure.

Water Table Aquifer: An unconfined Aquifer.

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Environmental Protection
Agency

Written Comments

The U.S. Environmental Protection Agency (EPA) invites your comments on its **Proposed Plan** for cleaning up contamination in the **Hamilton Road Impacted Area (HRIA)**. Your comments are encouraged to help shape the final cleanup plan. EPA will consider all comments received during the public comment period from September 28, 2012 through November 9, 2012.

NAME	ADDRESS and/or E-mail	AFFILIATION	Are you interested in future mailings? Check Here
			☐

YOUR COMMENTS
If you would like more time to consider your comments, please take this with you. To mail this form, please fold it twice (see the markings on the back), staple or tape it shut. Add a postage stamp and mail it no later than November 9, 2012. Or, e-mail your comments to langton.tamara@epa.gov

Please send comments, postmarked by November 9, 2012. Fold paper along dotted lines, tape it closed, and add postage stamp.

Place
Stamp
Here

Ms. Tamara Langton
US EPA Region 10
1200 Sixth Ave, Suite 900
Office of Environmental Cleanup, ECL-113
Seattle, WA 98101

TABLES

Table 3-1 Contaminant Mass, Volume, and Surface Area

Concentration Area	Mass Groundwater in (kg)*	Mass (kg) Soil*	Total (Mass kg)*	Total Plume Volume (cubic yards)	Surface Area (square feet)
Berwick Creek Sediment, >0.468 mg/kg		163	163	1360	7348
Subsurface Soil >1 mg/kg	221	245	421	21981	38,805
Subsurface Soil >10 mg/kg	92	171	250	3599	8,741
Subsurface Soil >38 mg/kg	35	102	137	1035	3769
>20,000 µg/L	238	268	506	42,235	33,342
>10,000 µg/L	275	291	566	62,876	45,575
>4,000 µg/L	289	308	597	87,840	64,162
>3,000 µg/L	307	311	618	105,000	83,619
>2,000 µg/L	315	318	633	136,000	91,942
>1,500 µg/L	320	320	640	150,000	100,695
>1,000 µg/L	325	325	650	177,000	120,253
>500 µg/L	337	329	661	336,000	209,119
>100 µg/L	343	336	679	485,000	305,979
> 5 µg/L (MCL)	349	337	686	639,000	339,260

Notes:
Average Bulk Soil Density: 1.7 gm/cc
Total Porosity: 0.36
kg: Kilograms
mg/kg: Milligrams per kilogram
µg/L: Micrograms per liter
>: Greater than

Table 6-1 Chemical-Specific ARARs/TBCs

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
FEDERAL				
Soil: EPA Soil Screening Guidance	EPA/540/R-96/018	Provides methodology for calculating risk-based, site-specific soil screening levels.	TBC	Used to standardize and accelerate site cleanup.
Groundwater: MCLs; Safe Drinking Water Act, National Primary Drinking Water Regulations	40 CFR 141.11-.16	MCLs regulate concentration of contaminants in public drinking water supplies but may also be considered for groundwater aquifers used for drinking water.	Relevant and Appropriate	Relevant to VOCs, SVOCs and metals in groundwater.
Maximum Contaminant Limit Goals (MCLGs); Safe Drinking Water Act, National Primary Drinking Water Regulations	40 CFR 141.50-.54	MCLGs are health-based criteria that should be evaluated for groundwater contamination.	Relevant and Appropriate	Relevant to contaminants in groundwater.
Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites	EPA/540/G-88/003	Provides information on remedial technologies to address groundwater contamination.	TBC	Relevant to contaminants in groundwater.
Guidelines for Ground-Water Classification Under the EPA Groundwater Protection Strategy	813R86001 (nepis.epa.gov)	Presents guidelines for classifying groundwater in one of three classification categories based on ecological importance, replaceability, and vulnerability considerations.	TBC	Useful in identifying ARARs and establishing cleanup goals for site groundwater based on policy that different groundwaters merit different levels of protection.
Surface Water: Clean Water Act Section 304—Federal Ambient Water Quality (National Recommended Water Quality Criteria, November 2002)	EPA-822-R-02-047	Provides chemical concentrations for acceptable ambient water quality.	Relevant and Appropriate	Potentially relevant and appropriate to ambient surface water quality and point-source discharges to the surface water in Berwick Creek should remedial activities cause a release to surface water. The PCE value for human exposure to both water and organisms is 0.69 µg/L and to organisms only is 3.3 µg/L.

Table 6-1 Chemical-Specific ARARs/TBCs (continued)

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
FEDERAL (Continued)				
Clean Water Act's National Toxics Rule	40 CFR 131.36	Provides values that have to be met for point-source discharges to surface water.	Applicable	Potentially applicable to point-source discharges to Berwick Creek and on-site storm water ditches should remedial activities cause release to surface water. If applicable, these values would have to be met at the mixing zone boundary established for the discharge. The PCE value for human exposure to both water and organisms is 0.8 µg/L and to organisms only is 8.85 µg/L.
Hazardous Waste: RCRA Part 261 - Identification and Listing of Hazardous Waste	40 CFR Part 261-265, 270, and 271	Defines those solid wastes which are subject to regulations as hazardous wastes, and lists specific chemical and industry-source wastes.	Applicable	Applicable to determining whether wastes are considered hazardous under RCRA.
RCRA TCLP and Land Ban Requirements for Landfilling	40 CFR 261	Requirements and restrictions on hazardous waste disposal in landfills.	Applicable	Applicable to disposal of contaminated material.
RCRA Land Disposal Restrictions	40 CFR 268	Establishes standards for land disposal of RCRA hazardous waste. Requires treatment to diminish a waste's toxicity and/or minimize contaminant migration.	Applicable	Applicable if remedial activities generate and include land disposal of waste that is characterized as hazardous.
Other: EPA Region III Risk-based Concentration Table	NA	Establishes chemical screening guidelines for use during risk assessment.	TBC	May be useful in development of cleanup goals.
Oak Ridge National Laboratory Screening Criteria	http:/epa-prgs.ornl.gov/chemicals/index.shtml	Establishes regional chemical screening levels to be used in risk assessments.	TBC	May be useful in development of cleanup goals.
National Ambient Air Quality Standards	40 CFR 50.6, 50.12	Provides acceptable ambient air quality levels for particulate matter and lead.	Applicable	Applicable to earth-moving activities as well as to treatment processes that may include mixing or other processes that result in potential releases of particulates or lead.

Table 6-1 Chemical-Specific ARARs/TBCs (continued)

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
STATE – WASHINGTON				
Soil: Model Toxics Control Act Regulations	WAC 173-340-740, -745	Regulates the investigation and cleanup of releases to the environment that may pose a threat to human health or the environment. Establishes cleanup levels for soil.	Applicable	The Method A soil value for PCE is 0.05 mg/kg for both unrestricted and industrial land use for human health protection. The unrestricted land use Method B value for PCE is 22 mg/kg for protection from direct contact (residential); 110 mg/kg (commercial/industrial), and 924 mg/kg (recreational).
Groundwater: MTCA Regulations	WAC 173-340-720	Regulates the investigation and cleanup of releases to the environment that may pose a threat to human health or the environment. Establishes cleanup levels for groundwater.	Applicable	MTCA groundwater cleanup levels are potentially applicable to HRIA groundwater. The Method A groundwater cleanup value for PCE is 5 μg/L, and the Method B groundwater cleanup value for PCE is 0.81 μg/L.
Water Quality Standards	WAC 173-200-040	Provides criteria establishing maximum contaminant concentrations for the protection of a variety of beneficial uses of Washington's groundwater.	TBC	Not applicable to cleanups approved under MTCA 70.105D or by EPA under CERCLA. Cleanup standards for such sites shall be developed under WAC 173-340-720.
Sediment: Sediment Cleanup Standards	WAC 173-204-570	Provide standards to eliminate adverse effects on biological resources and significant health threats to humans from sediment contamination.	Applicable	Sediment clean up objectives are the freshwater sediment standards provided in 173-204-340. Ecology determines on a case by case basis the criteria, methods and procedures necessary to meet the intent of the chapter.
Sediment Cleanup Standards	WAC 173-340-760	Sediment cleanup actions conducted under this chapter must comply with the requirements of chapter 173-204 WAC.	Applicable	Applicable to establishment of sediment PRGs.
Surface Water: MTCA Regulations	WAC 173-340-730	Regulates the investigation and cleanup of releases to the environment that may pose a threat to human health or the environment. Establishes cleanup levels for surface water.	Applicable	Applicable if remedial activities cause a release to surface water. MTCA surface water cleanup levels are potentially applicable to Berwick Creek and the small and unnamed ditches. The Method B value for PCE is 0.39 μg/L.

Table 6-1 Chemical-Specific ARARs/TBCs (continued)

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
STATE – WASHINGTON (Continued)				
Air: MTCA Regulations	WAC 173-340-750	Regulates the investigation and cleanup of releases to the environment that may pose a threat to human health or the environment. Establishes cleanup levels for air.	Applicable	Applicable if remedial activities cause a release to air.
Hazardous Waste: Washington Hazardous Waste Management Act Regulations	WAC 173-303	Requirements and restrictions on hazardous waste disposal.	Applicable	This regulation is potentially applicable to alternatives that would involve disposal of contaminated media in an off-site location. The area of contamination policy allows contaminated media to be consolidated within the same area of a site without triggering RCRA or Washington dangerous waste regulations. Several waste streams from the site could be hazardous wastes as they could contain PCE at concentrations high enough to fail the TCLP; the PCE TCLP threshold is 0.7 mg/L.
Other: MTCA Regulations: Cleanup Standards: (General)	WAC 173-340 -700	Provides an overview of the methods for establishing cleanup standards that apply to a release or threatened release of a hazardous substance at a site.	Applicable	Applicable to establishment of PRGs.
MTCA Regulations: (General Policies)	WAC 173-340 -702	Defines the general policies and principles that shall be followed when establishing and implementing cleanup standards. Shall be used in combination with other sections of this chapter	Applicable	Applicable to establishment of PRGs.

Table 6-1 Chemical-Specific ARARs/TBCs (Continued)

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
STATE – WASHINGTON (Continued)				
MTCA Regulations: Cleanup Standards	WAC 173-340-703	Describes elimination of certain hazardous substances that contribute a small percentage of the overall threat to human health and the environment at a site, and use of the remaining hazardous substance(s) as an indicator for purposes of defining site cleanup requirements.	Applicable	Applicable to establishment of PRGs.
	WAC 173-340-704 Use of Method A	Provides a method to establish cleanup levels for sites that have few hazardous substances.		
	WAC 173-340-705 Use of Method B	Provides a method to establish cleanup levels for sites unless one or more of the conditions for using Method A or Method C are demonstrated to exist and the person conducting the cleanup action elects to use that method.		
	WAC 173-340-706 Use of Method C	Method C cleanup levels represent concentrations that are protective of human health and the environment for specified site uses and conditions. A site (or portion of a site) that qualifies for a Method C cleanup level for one medium does not necessarily qualify for a Method C cleanup level in other media. Each medium must be evaluated separately using the criteria applicable to that medium.		

Acronyms:
ARAR: Applicable or Relevant and Appropriate Requirement
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
CFR: Code of Federal Regulations
EPA: U. S. Environmental Protection Agency
HRIA: Hamilton Road Impacted Area
mg/kg: Milligram per kilogram
µg/L: Microgram per liter
mg/L: milligram per liter
MTCA: Model Toxics Control Act
PCE: Tetrachloroethene
RCRA: Resource Conservation and Recovery Act
SVOC: Semivolatile Organic Compound
TBC: To Be Considered
TCLP: Toxicity Characteristic Leaching Procedure
VOC: Volatile Organic Compound
WAC: Washington Administrative Code

Table 6-2 Location-Specific ARARs/TBCs

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
FEDERAL				
Federal Protection of Wetlands and Management of Floodplains	Executive Order Nos. 11990 and 11988	Establishes requirements for the preservation of wetlands and floodplain areas.	Applicable	May be applicable to remedial actions that affect wetland and floodplain areas if any affected properties are located within wetlands or floodplain areas.
National Historic Preservation Act Archeological Resources Protection Act	16 USC 470; et. Seq.; 40 CFR 6.301 (b); 36 CFR Part 800 16 USC 469; 40 CFR 6.301 (c)	Minimizes impact of actions on historic properties and landmarks. Provides protection from actions that may cause irreparable harm, loss, or destruction of artifacts.	Applicable	Applicable to actions at historic properties or landmarks, or properties at the site that contain historical and archeological data.
Native American Graves Protection and Repatriation Act	43 CFR Part 10	Protects Native American burials from desecration through the removal and trafficking of human remains and “cultural items,” including funerary and sacred objects.	Applicable	Potentially applicable to remedial actions at the site because it is possible that the disturbance of Native American materials could occur as a result of work in the stream bed or subsurface excavations elsewhere at the site. Such materials are not known to be present at the site, but could be inadvertently uncovered during soil or sediment removal.
Endangered Species Act of 1973	16 USC 1531-1543; 50 CFR Parts 17, 401; 40 CFR 6.302 (h)	Provides protection of critical habitat upon which endangered or threatened species depend.	Applicable	Applicable to actions that impact critical habitat of endangered or threatened species. USFWS has determined that federal threatened species (bald eagle and bull trout) may use the project area.

Table 6-2 Location-Specific ARARs/TBCs (continued)

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
FEDERAL (Continued)				
Magnuson-Stevens Fishery Conservation and Management Act Regulations	50 CFR Part 600	Consideration of the effects of federal actions on EFH for certain species is required. Federal agencies whose actions might adversely affect an EFH-managed species must formally consult with NOAA Fisheries regarding the action. If NOAA fisheries were to determine that an action would adversely affect EFH, the agency would provide EFH conservation recommendations.	Applicable	Potentially applicable to actions within Berwick Creek, which has been designated EFH for both coho and Chinook salmon.
Clean Water Act, Section 401, Water Quality Certification	33 USC 1340	Requires a certification of water quality to be issued by the responsible government authority to state that remedial actions will not violate applicable water quality standards.	Applicable	Substantive requirements potentially applicable to in-water remedial actions at Berwick Creek.
Clean Water Act (Dredge and Fill Requirements)	33 USC 1251-1376; 40 CFR 230, 231	Provides protection to waters in and around the site.	Relevant and Appropriate	Relevant and appropriate to actions involving capping, berm construction and/or onsite disposal of contaminated soil that may impact local water bodies.
STATE - WASHINGTON				
Washington Hydraulics Project Approval	WAC 220-110 WAC 220-110-040 through -224	Requires WDFW approval for projects that will use, divert, obstruct, or change the natural flow or bed of waters of the state. Substantive technical provisions include considerations for: bank protection, channel change/realignment, temporary bypass culvert, flume, or channel, dredging in freshwater areas, gravel removal, outfall structures and/or water diversions.	Applicable	Applicable to remedial actions taken at Berwick Creek. Will require adherence to instream work windows, which are typically issued under the authority of this program.

Acronyms:

ARAR: Applicable or Relevant and Appropriate Requirement
CFR: Code of Federal Regulations
EFH: Essential Fish Habitat
NOAA: National Oceanic and Atmospheric Administration
TBC: To Be Considered
USC: United States Code
WAC: Washington Administrative Code
WDFW: Washington Department of Fish and Wildlife

Table 6-3 Action-Specific ARARs/TBCs

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
FEDERAL				
Hazardous Waste: RCRA Subtitle C Hazardous Waste Treatment Facility Design and Operating Standards for Treatment and Disposal Systems, (i.e., landfill, incinerators, tanks, containers, etc.) (Minimum Technology Requirements)	40 CFR 264 and 265	Develops standards for hazardous waste treatment and disposal activities.	Applicable	Applicable if remedial activities include the management of hazardous wastes at treatment and disposal facilities.
RCRA Manifesting, Transport and Recordkeeping Requirements	40 CFR 262	Develops guidelines for record-keeping of the management actions for hazardous wastes.	Applicable	Applicable if remedial activities include the off-site transport of hazardous waste.
RCRA Storage Requirements	40 CFR 264; 40 CFR 265, Subparts I and J	Develops standards for the storage of hazardous wastes.	Applicable	Applicable if remedial activities include the storage of hazardous waste greater than 90 days.
RCRA Subtitle D Nonhazardous Waste Management Standards	40 CFR 257	Develops standards for the management of non-hazardous wastes.	Applicable	Applicable if remedial activities include the management of non-hazardous wastes.
Off-Site Transport of Hazardous Waste	EPA OSWER Directive 9834.11	Establishes technical guidelines for the off-site transport of hazardous wastes.	TBC	TBC if remedial activities include the off-site transport and management of hazardous waste.
DOT Rules for Hazardous Materials Transport	49 CFR 107,171.1-171.500	Establishes specific DOT rules and technical guidelines for the off-site transport of hazardous materials.	Applicable	Applicable if remedial activities include the off-site transport and management of hazardous waste.
RCRA - Part 262 Standards for Generators. Part 263 Standards for Transporters	40 CFR Parts 262 and 263	Applicable to generators and transporters of hazardous waste.	Applicable	Applicable to off-site disposal or treatment of hazardous waste.
RCRA - Part 264, Subtitle C	40 CFR Part 264	Applicable to the treatment, storage, transportation and disposal of hazardous waste defined in 40 CFR Part 261.	Applicable	Applicable to off-site disposal or treatment of hazardous waste.
RCRA - Part 268 Land Disposal Restrictions	40 CFR Part 268	Establishes standards for land disposal of RCRA hazardous waste. Requires treatment to diminish a waste's toxicity and/or minimize contaminant migration.	Applicable	Applicable if remedial activities include land disposal of RCRA hazardous waste.

Table 6-3 Action-Specific ARARs/TBCs (continued)

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
FEDERAL (Continued)				
Transportation of Hazardous Wastes	49 CFR 170-189	Federal Highway Administration, Department of Transportation National Highway Traffic Safety Administration regulations are codified in 23 CFR Parts 1-1399.	Applicable	Applicable to remedial activities that involve the off-site transportation of hazardous waste.
Groundwater: EPA Underground Injection Control Regulations	40 CFR 144 and 146	Regulates injections of underground sources of drinking water by specific classes of injection wells.	Relevant and Appropriate	Relevant to use of any remediation technologies that involve injections into drinking water aquifer.
Surface Water: Clean Water Act's National Pollutant Discharge Elimination System (NPDES) Regulations	40 CFR Part 122-125	The NPDES program requires that permits be obtained for point-source discharges of pollutants to surface water. Under this regulation, a point-source discharge to a surface water body cannot cause an exceedance of water quality standards in the receiving water body outside the mixing zone.	Applicable	Although permits would not be required for on-site actions under CERCLA, the substantive regulatory requirements of the NPDES permit program are potentially applicable to the direct discharge of treated groundwater to a surface water body such as Berwick Creek as well as the unnamed or small ditches connected to Berwick Creek.
Clean Water Act's National Toxics Rule (NTR)	40 CFR 131.36	Provides values that have to be met for point-source discharges to surface water.	Applicable	Potentially applicable to point-source discharges to Berwick Creek and on-site storm water ditches. If applicable, these values would have to be met at the mixing zone boundary established for the discharge. The PCE value for human exposure to both water and organisms is 0.8 µg/L and to organisms only is 8.85 µg/L.
Clean Water Act Section 304 - Federal Ambient Water Quality	National Recommended Water Quality Criteria, November 2002, and 67 Federal Register 79091-79095, December 27, 2002	Provides chemical concentrations for acceptable ambient water quality.	Relevant and Appropriate	Potentially relevant and appropriate to point-source discharges to Berwick Creek. The PCE value for human exposure to both water and organisms is 0.69 µg/L and to organisms only is 3.3 µg/L.

Table 6-3 Action-Specific ARARs/TBCs (continued)

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
FEDERAL (Continued)				
Other: Surface Mining Control Act of 1977	25 USC. 1201 et. seq.; 30 CFR Parts 816.11, .95, .97, .100, .102, .111, 113, .114, .116	Provides requirements for removing contaminated soils.	Relevant and Appropriate	Includes requirements for postings (.11), stabilization (erosion control)(.95), minimizing disturbances(.97), reclamation (.100), sloping (.102) and revegetation (.100, .102, .111, .113, .114).
Clean Air Act	42 USC 7401, Section 1 12	Established limits on pollutant emissions to atmosphere from specific industrial and commercial activities. Establishes standards to protect public health and welfare and ambient air quality.	Relevant and Appropriate	Some treatment alternatives may impact ambient air quality.
National Ambient Air Quality Standards	40 CFR 50.6	Requires that the remedial action include fugitive dust control measures.	Applicable	Applicable to earth-moving activities as well as to treatment processes that may include mixing or other processes that result in potential releases of particulates.
National Emission Standards for Hazardous Air Pollutants	40 CFR Part 261	Establishes specific emissions levels allowed for toxic air pollutants.	Applicable	Applicable to treatment alternatives that may emit toxic pollutants to the air.
Clean Water Act's Pretreatment Regulations	40 CFR Part 503.5	Limits pollutants in wastewater discharges to sanitary sewer systems to protect POTWs from accepting wastewater that would damage their system or cause them to exceed their NPDES permit discharge limits.	Applicable	Potentially applicable to the discharge of treated groundwater to City of Chehalis POTW. The City of Chehalis pretreatment ordinance would be potentially applicable as well.
Storm water Permit Program	40 CFR 122.26	Best management practices must be used and appropriate monitoring performed to ensure that storm water runoff does not cause an exceedance of water quality standards in a receiving surface water body.	Applicable	Substantive requirements of the general storm water permit program for storm water discharges associated with construction activities disturbing over 1 acre are potentially applicable to remedial actions at HRIA.

Table 6-3 Action-Specific ARARs/TBCs (continued)

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
STATE - WASHINGTON				
Solid Waste: Washington Solid Waste Handling Standards	WAC 173-350	Provides waste management requirements for non-hazardous wastes.	Applicable or Relevant and Appropriate	Potentially applicable to off-site disposal of solid nonhazardous wastes and are potentially relevant and appropriate to on-site remedial actions governing contaminated media management. Requirements for contaminated media disposal will be found in the permit of the landfill that agrees to accept the waste.
Hazardous Waste: Hazardous Waste Management Act Regulations	WAC 173-303	Regulates disposal of contaminated media in an off-site location. Generators of solid waste must determine whether that waste is hazardous (dangerous) waste. If the wastes destined for off-site disposal are determined to be hazardous, then EPA will accumulate, manifest, and transport them as required by WAC 173-303-170, 180, 190, and 200 to an off-site facility that is acceptable under the Off-Site Disposal Rule (40 CFR 300.440). (The area of contamination policy allows contaminated media to be consolidated within the same area of a site without triggering RCRA or Washington dangerous waste regulations.)	Applicable	Applicable if any hazardous materials are taken offsite. Several waste streams from the site could be hazardous wastes if they contain PCE at concentrations high enough to fail the TCLP. PCE TCLP threshold is 0.7 mg/L. Materials that are potential hazardous wastes include stream sediments, drill cuttings, groundwater (purge water, etc.), and spent activated carbon units from the treatment system.
Surface Water: Washington State Water Quality Standards for Surface Waters	WAC 173-201A	Provides limitations on parameters such as turbidity, temperature, dissolved oxygen, and pH for protection of organisms. Protects freshwater aquatic life by specifying protection criteria by stretch of surface waters. Tributaries of waters whose uses are designated salmon and trout spawning, core rearing and migration, or extraordinary primary contact recreation are protected at the same level as the waters themselves.	Applicable	Limitations would not serve as cleanup standards but would be potentially applicable to remedial actions.

Table 6-3 Action-Specific ARARs/TBCs (continued)

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
STATE – WASHINGTON (Continued)				
Washington Surface Water Quality Standards—Short-Term Modifications	WAC 173-201A-410	Provides for short-term modifications of standards for specific water bodies on a short-term basis when necessary to accommodate essential activities, respond to emergencies, or to otherwise protect the public interest.	Applicable	The substantive requirements of this regulation are potentially applicable for remedial action in-water work at Berwick Creek.
Other: Washington Water Well Construction Act Regulations	WAC 173-160	Provides requirements for water well construction.	Applicable	Potentially applicable to the installation, operation, or closure of monitoring and treatment wells at HRIA.
Washington Hydraulics Project Approval	WAC 220-110	Requires WDFW approval for projects that will use, divert, obstruct, or change the natural flow or bed of waters of the state. WDFW typically issues in stream work windows under the authority of this program.	Applicable	Substantive technical provisions written for freshwater hydraulic projects covered in WAC 220-110-040 through -224 are potentially applicable to work within or effecting Berwick Creek
Washington Clean Air Act and Implementing Regulations SWCAA Regulation	WAC 173-400 WAC 173-460 SWCAA 400	Air emissions at the site boundary must fall below the acceptable source impact limit of 1.1 µg/m^3 PCE (WAC 173-460-150). Compliance could be demonstrated through modeling of PCE sources from treatment technologies with air emissions. WAC 173-400 also requires control of fugitive dust emissions during construction.	Applicable	Applicable to earth-moving activities as well as to treatment processes that may include mixing or other processes that result in potential releases of emissions to air.
Model Toxics Control Act Regulations: Selection of Cleanup Action	WAC 173-340-360	Model Toxics Control Act Regulations: Describes the minimum requirements and procedures for selecting cleanup actions. Because cleanup actions will often involve the use of several cleanup action components at a single site, the overall cleanup action shall meet the requirements of this section.	Applicable	Applicable to various components of the remediation alternatives.

Table 6-3 Action-Specific ARARs/TBCs (continued)

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
STATE – WASHINGTON (Continued)				
Model Toxics Control Act: Regulations Compliance Monitoring Requirements	WAC 173-340-410	Describes minimum compliance monitoring requirements. Three types of compliance monitoring: protection (confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of an interim action as described in the safety and health plan); performance (confirm that the interim action has attained cleanup standards and, if appropriate, remediation levels or other performance standards such as construction quality control measurements or monitoring necessary to demonstrate compliance with a permit or, where a permit exemption applies, the substantive requirements of other laws); and, conformational monitoring (confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of an interim action or cleanup action as described in the safety and health plan). In all cases, compliance monitoring plans are required.	Applicable	Applicable to monitoring components of the remediation alternatives.
Model Toxics Control Act Regulations: Interim Actions	WAC 173-340-430	An interim action is distinguished from a cleanup action in that an interim action only partially addresses the cleanup of a site. This regulation describes the general requirements for interim actions, timing and relationship to the larger cleanup action.	Applicable	

Table 6-3 Action-Specific ARARs/TBCs (continued)

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
STATE – WASHINGTON (Continued)				
Model Toxics Control Act Regulations: Institutional Controls	WAC 173-340-440	Institutional controls (ICs) are measures undertaken to limit or prohibit activities that may interfere with the integrity of an interim action or cleanup action or that may result in exposure to hazardous substances at a site. ICs may include use restrictions such as limitations on the use of property or resources; or requirements that cleanup action occur if existing structures or pavement are disturbed or removed; maintenance requirements for engineered controls such as the inspection and repair of monitoring wells, treatment systems, caps or groundwater barrier systems; and educational programs such as signs, postings, public notices, health advisories, mailings, and similar measures that educate the public and/or employees about site contamination and ways to limit exposure.	Applicable	Applicable to IC components of the remediation alternatives.
SEPA	WAC 192-11	Requires a review of potential damage that occurs to the environment as a result of human activities.	Applicable	SEPA checklist may be required prior to construction of a remediation system at the site.
Storm Water Management	WAC 173-220	Best management practices must be used and appropriate monitoring performed to ensure that storm water runoff does not cause an exceedance of water quality standards in a receiving surface water body.	Applicable	Substantive requirements applicable to construction, grading and excavation activities conducted as part of site remediation.
MTCA Regulations: (General Policies)	WAC 173-340-702	Defines the general policies and principles that shall be followed when establishing and implementing cleanup standards. Shall be used in combination with other sections of this chapter.	Applicable	Applicable to establishment of cleanup alternatives.

Acronyms:
ARAR: Applicable or Relevant and Appropriate Requirement
CFR: Code of Federal Regulations
EPA: U. S. Environmental Protection Agency
HRIA: Hamilton Road Impacted Area
IC: Institutional Control
mg/kg: Milligram per kilogram
µg/m^3: Microgram per cubic meter
PCE: Tetrachloroethene
RCRA: Resource Conservation and Recovery Act
SEPA: State Environmental Policy Act
SWCAA: Southwest Clean Air Agency
TBC: To Be Considered
TCLP: Toxicity Characteristic Leaching Procedure
VOC: Volatile Organic Compound
WAC: Washington Administrative Code
WDFW: Washington Department of Fish and Wildlife

Table 6-4 Mass and Volume of PCE in HRIA Remediation Target Zones

Remediation Zone Boundary (PCE Concentration)	Mass (kg)	Mass %	Volume (1,000 cy)	Surface Area (acre)
Creek Bed Sediment/surface soil (>0.468 mg/kg)	163	NA[1]	1.36	0.17
Subsurface Soil (>10 mg/kg)	186	27%[2]	3.60	0.22
High Concentration Groundwater (>4,000 µg/L)	411	60%[3]	87.8	1.6

Notes:

[1] Due to uncertainties in the sediment creek contaminant mass, the estimates were not included in the total mass calculations using MVS for subsurface soil and groundwater.
[2] Percent of the total MVS-estimated subsurface soil contaminant mass within HRIA.
[3] Numbers represent estimated mass less the soil mass estimated for the Subsurface Soil Remediation Target Zone.
PCE: Tetrachloroethene
HRIA: Hamilton Road Impacted Area
MVS: Mining Visualization Systems
cy: Cubic yards
kg: Kilograms
mg/kg: Milligrams per kilogram
µg/L: Micrograms per liter
>: Greater than

Table 8-1 Criteria Priorities

Group	Criteria	Definition
Threshold Criteria	Overall Protection of Human Health and the Environment Compliance with ARARs	Standards that an alternative must meet to be eligible for selection as a cleanup action unless an ARAR waiver is used.
Balancing Criteria	Long-Term Effectiveness and Permanence Reduction of Toxicity, Mobility, or Volume through Treatment Short-Term Effectiveness Implementability Cost	Technical criteria that weigh the tradeoffs between alternatives.
Modifying Criteria	State Acceptance and Community Acceptance	Fully evaluated after comments are received on the Proposed Plan.

Acronym:
ARARs: Applicable or Relevant and Appropriate Requirement

Table 8-2 Summary of Comparative Analysis of Comprehensive Technology Scenarios

CTS	Components	Threshold Criteria		Balancing Criteria					
							Implementability		
CTS	Components	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume through Treatment	Short-Term Effectiveness	Engineering/ Technical Considerations	Estimated Time for Implementation (years)	Present Value Cost (Dollars)
CTS-1	No Action	No	No	⓿	⓿	❸	❺	<1	$0
CTS-2	In-situ thermal treatment of creek sediment, surface soil and subsurface soils; in-situ enhanced bioremediation of groundwater	Yes	Sediment/Soil – Yes Groundwater – Yes, with waivers	❺	❺	❹	❹	3	$8.8M
CTS-3	In-situ thermal treatment of creek sediment, surface soil and subsurface soils; in-situ chemical oxidation of groundwater	Yes	Sediment/Soil – Yes Groundwater – Yes, with waivers	❺	❺	❸	❹	3	$10.7M

Notes:

Threshold and Balancing Criteria (Excluding Cost)

⓿ None
❶ Low
❷ Low to Moderate
❸ Moderate
❹ Moderate to High
❺ High

FIGURES

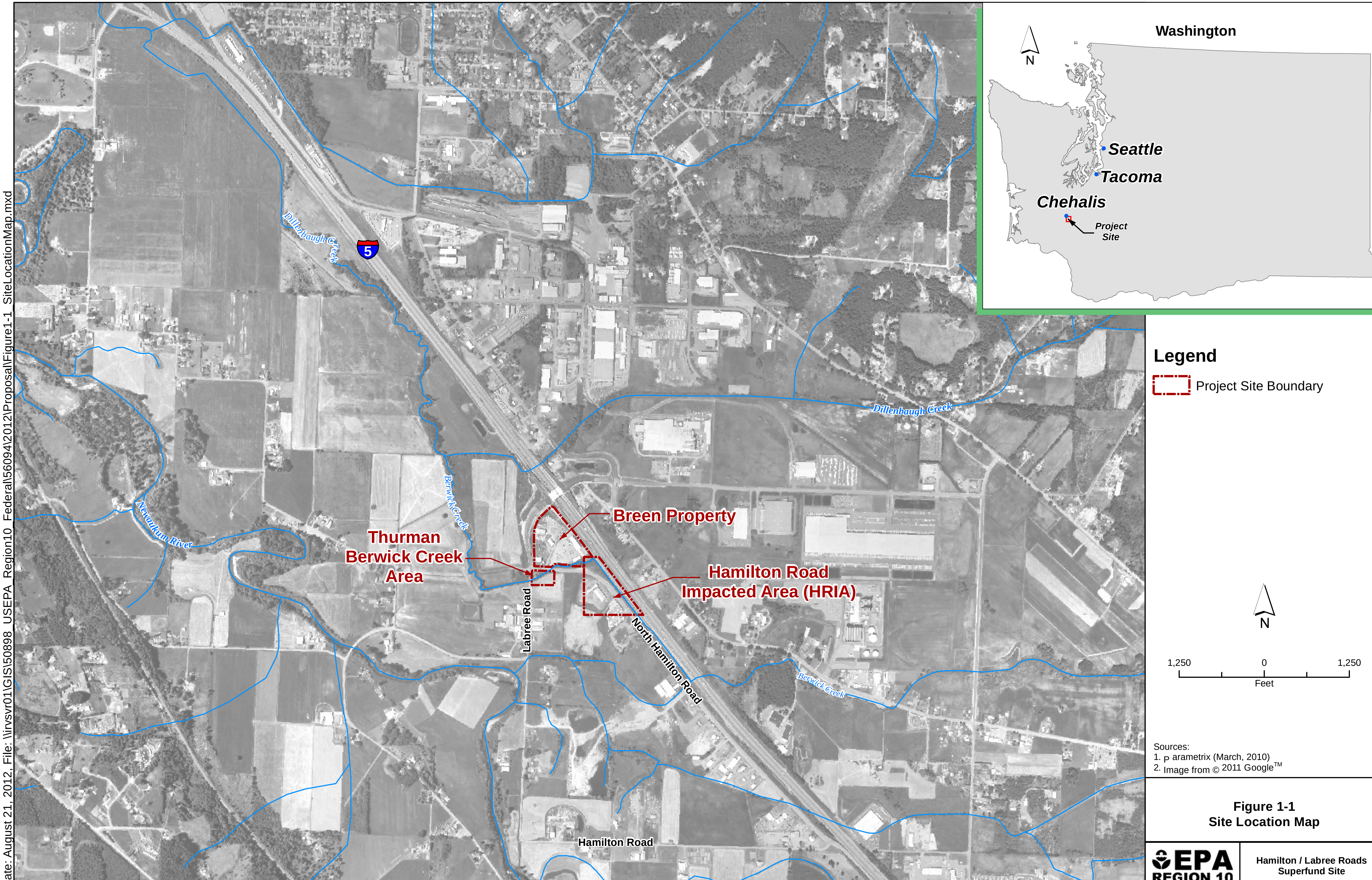


Figure 1-1
Site Location Map

Date: August 21, 2012, File: \\irvsvr01\GIS\50898_USEPA_Region10_Federal\56094\2012\Proposal\Figure1-1_SiteLocationMap.mxd

Date: August 21, 2012, File: \\irvsvr01\GIS\50898_USEPA_Region10_Federal\56094\2012\Proposal\Figure1-2_OverviewofHamiltonLaBreeSuperfundSite.mxd

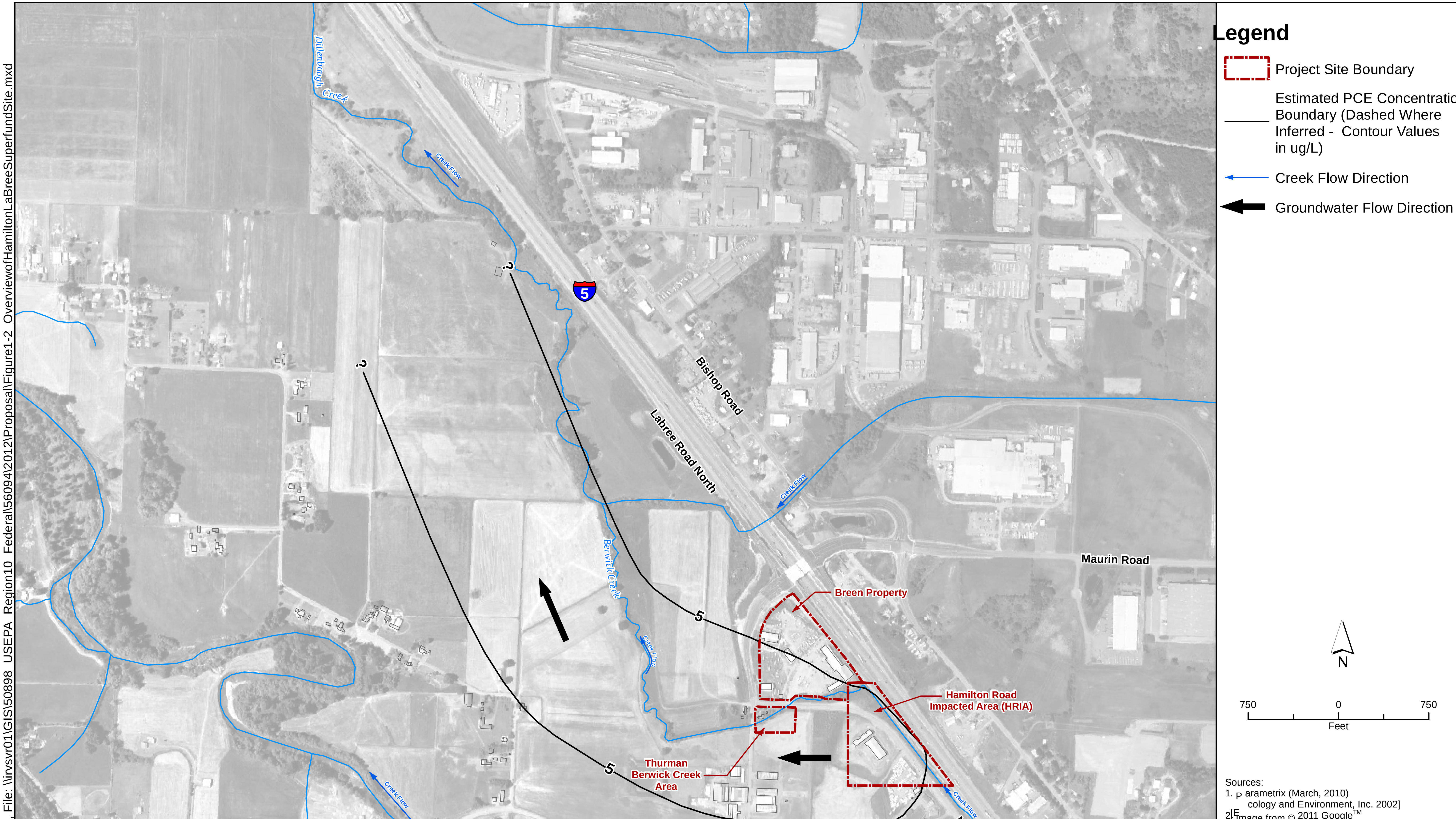
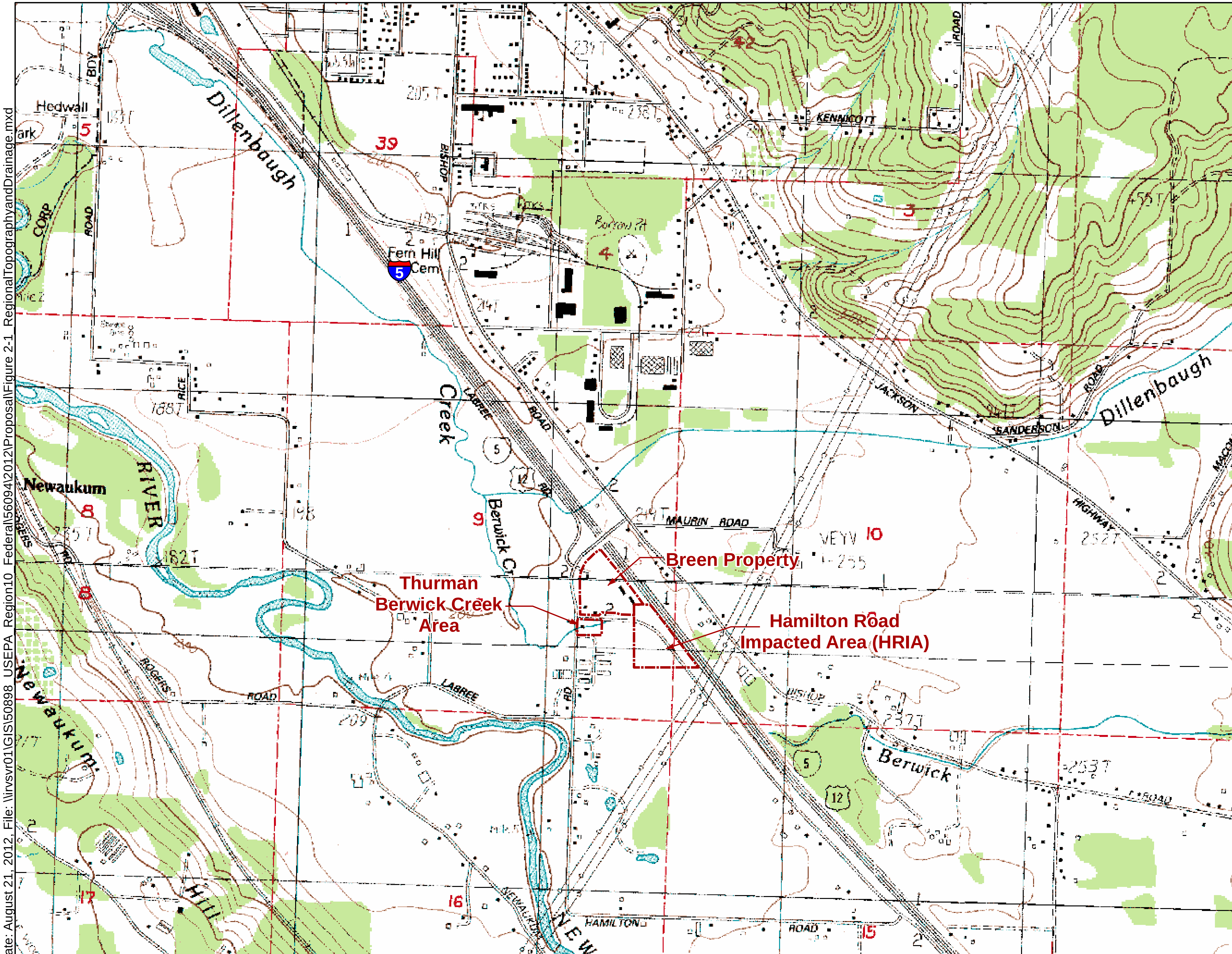


Figure 1-2
Overview of Hamilton/Labree Superfund Site

EPA REGION 10

Hamilton / Labree Roads Superfund Site

Date: August 21, 2012, File: \\lrvsvr01\GIS\50898 USEPA Region10 Federal\56094\2012\Proposal\Figure 2-1 RegionalTopographyandDrainage.mxd



Legend

Project Site Boundary

1,250 0 1,250
Feet

N

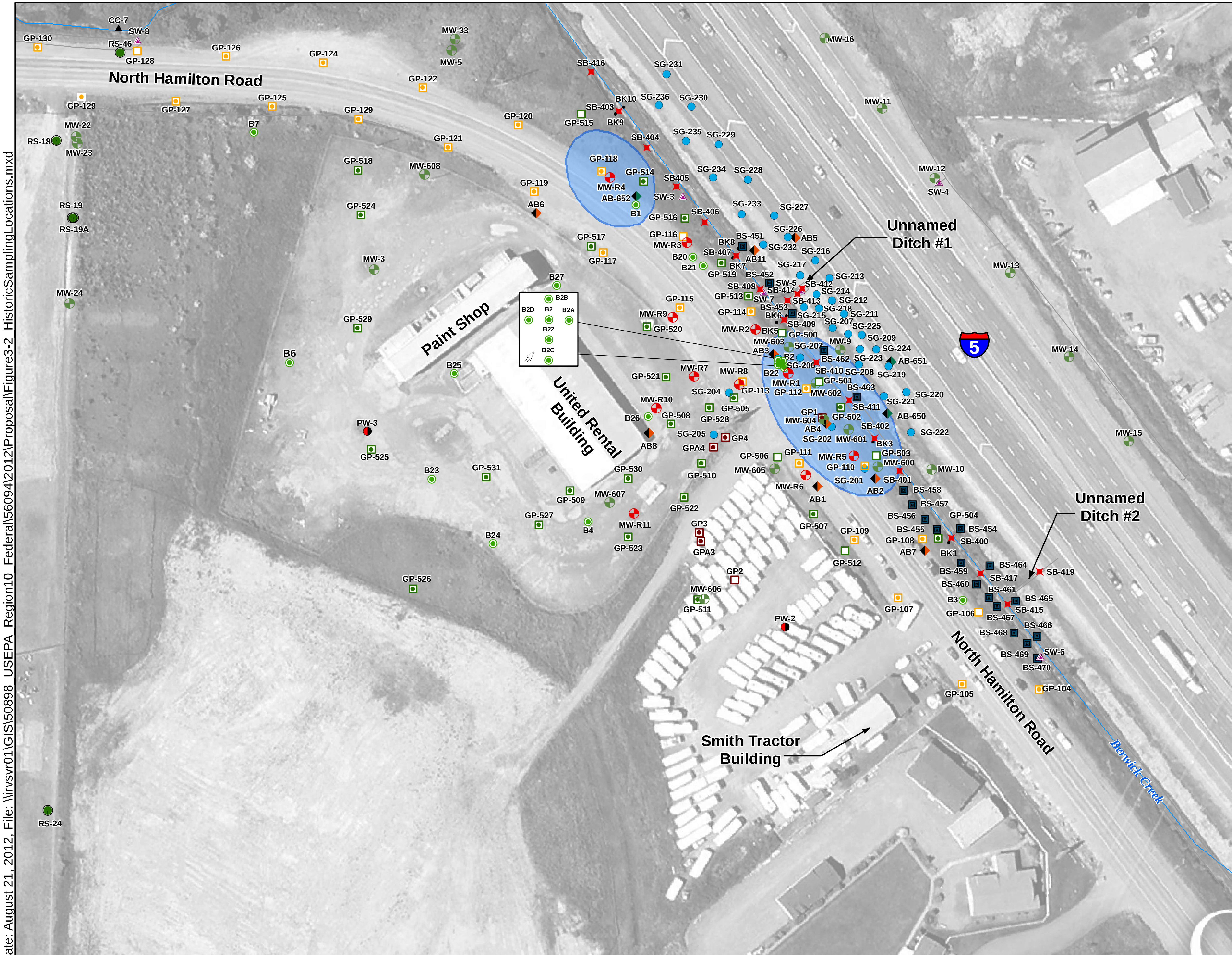
Sources:
1. Parametrix (March, 2010)
Reference:
7.5' USGS Quadrangle - Centralia, Washington. Dated 1985 and 7.5' USGS Quadrangle - Napavine, Washington. Dated 1985

Figure 3-1
Regional Topography and Drainage

EPA REGION 10

Hamilton / Labree Roads Superfund Site

Date: August 21, 2012, File: \\irvsvr01\GIS\50898_USEPA_Region10_Federal\56094\2012\Proposal\Figure3-2_HistoricSamplingLocations.mxd



Legend

AB1	◆	Auger Boring (E&E 2000-2001)
AB-650	◆	Auger Boring (URS 2003)
B1	◎	Soil Boring
BS-451	■	Stream Bed
CC-1	▲	Creek Channel
GP1	▣	Geoprobe Boring (E&E 2000-2001; soil and water samples)
GP-104	▣	Geoprobe Boring (E&E 2000-2001; soil samples only)
GP-520	□	Geoprobe Boring (URS 2003)
MW-10	◎	Monitoring Well
MW-R5	◎	Monitoring Well/Recovery Well
PW-3	●	Private Well
RS-18	●	Reconnaissance Boring
SB-400	✱	Stream Bank
SG1-20	●	Soil Gas
SG-225	●	Soil Gas
SW-5	△	Surface Water
BK10	•	Bank Sample
GA-1	⬬	Geophysical Survey Area
	◯	Hot Spot

N

100 0 100

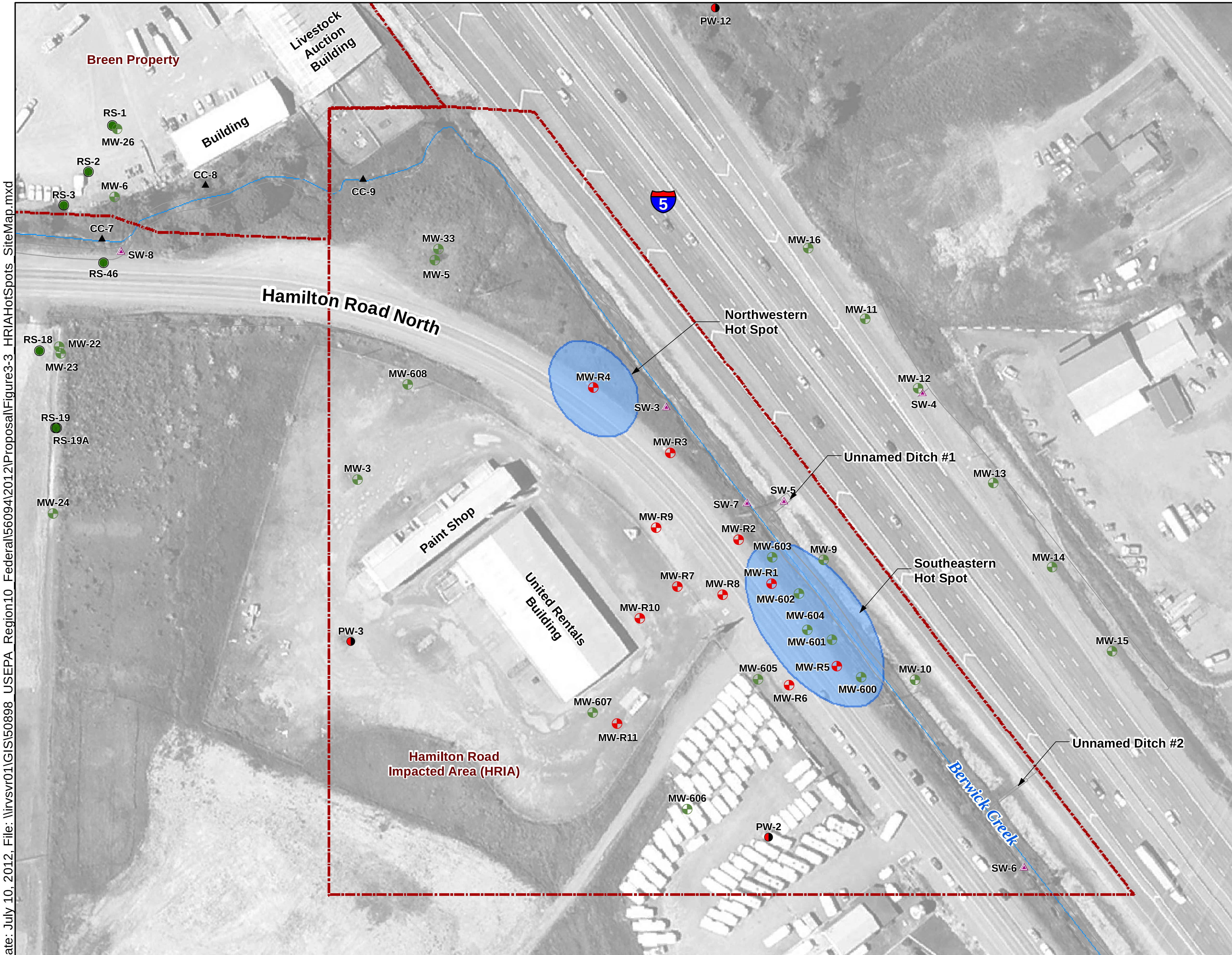
Feet

Sources:
1. Parametrix (March, 2010)
2. Ecology and Environment, Inc. 2002]
3. Image from © 2011 Google™

Figure 3-2
Historical Sampling Locations
HRIA

EPA REGION 10

Hamilton / Labree Roads Superfund Site



Legend

- Project Site Boundary
- Hot Spot
- Creek Channel
- Monitoring Well
- Monitoring Well/Recovery Well
- Private Well
- Reconnaissance Boring
- Surface Water

N

100 0 100

Feet

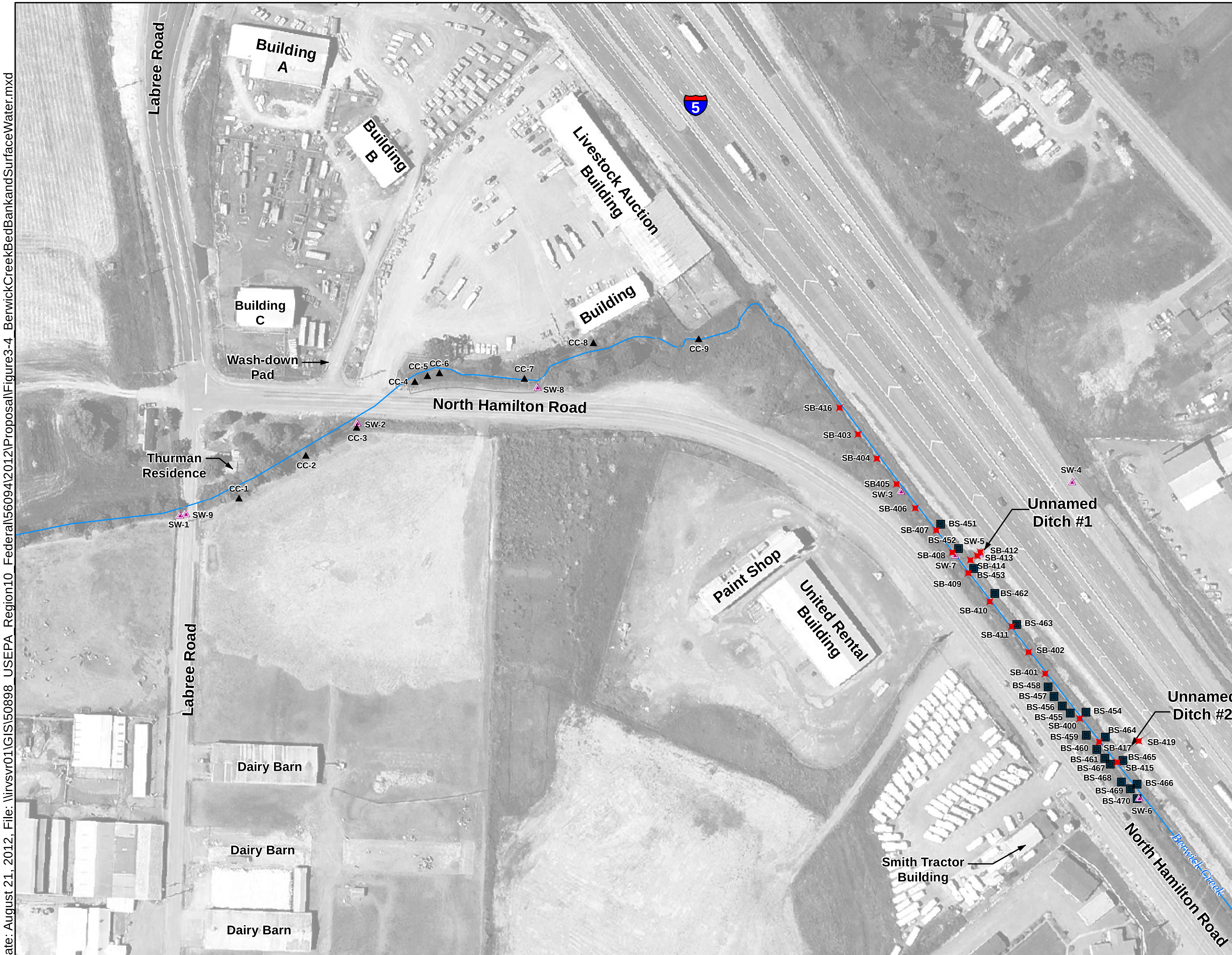
Sources:
1. parametrix (March, 2010)
2. Image from © 2011 Google™

Figure 3-3
HRIA Hot Spots
Site Map

EPA REGION 10

Hamilton / Labree Roads Superfund Site

Date: July 10, 2012, File: \\rvsvr01\GIS\50898_USEPA_Region10_Federal\56094\2012\Proposal\Figure3-3_HRIAHotSpots_SiteMap.mxd



Legend

BS-451	■	Stream Bed
CC-1	▲	Creek Channel
SB-416	✖	Stream Bank
SW-7	△	Surface Water

N

150 0 150

Feet

Sources:
1. Parametrix (March, 2010)
[Ecology and Environment, Inc. 2002]
2. Image from © 2011 Google™

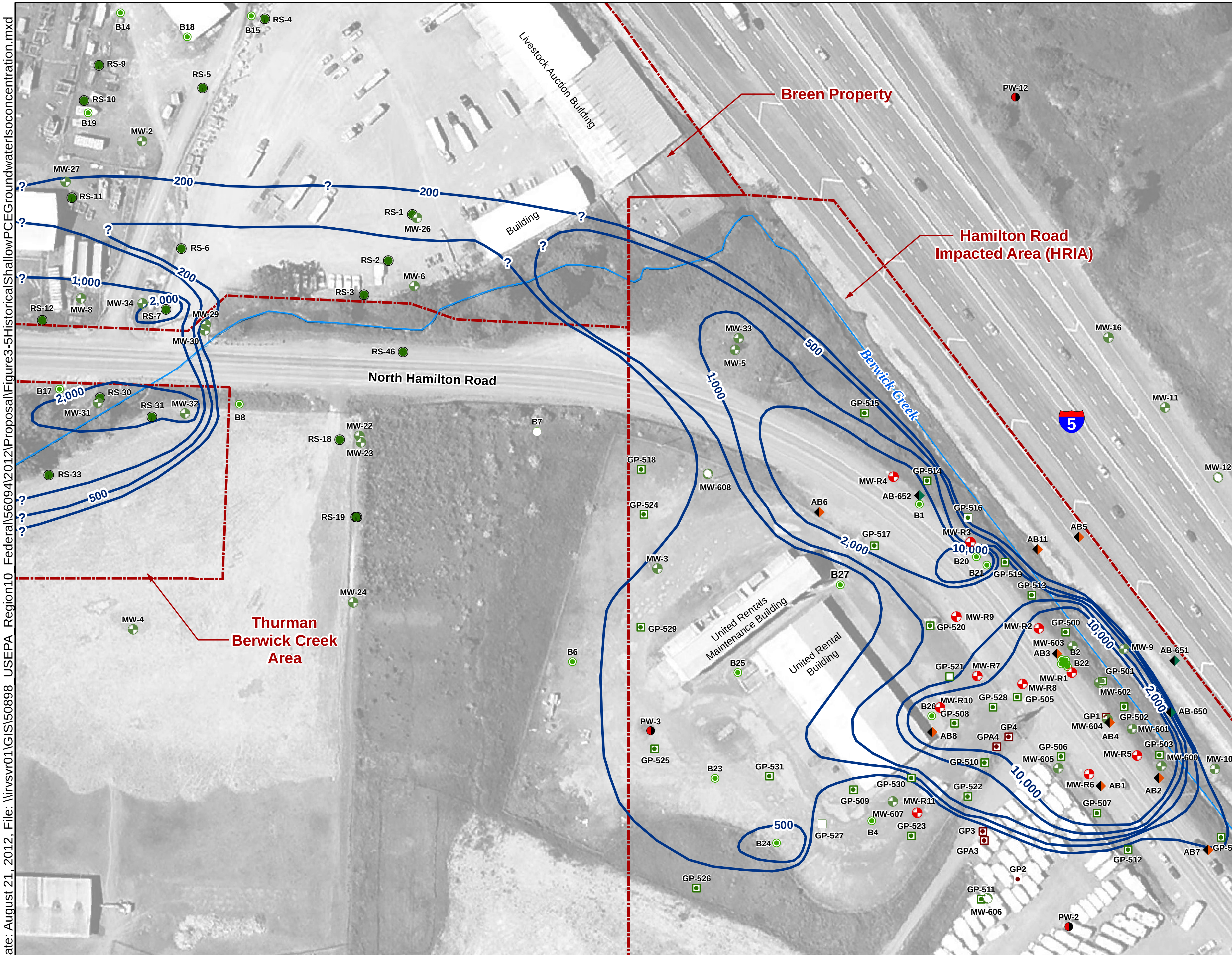
Figure 3-4
Berwick Creek Bed, Bank and Surface Water Sampling Locations

EPA REGION 10

Hamilton / Labree Roads Superfund Site

Date: August 21, 2012, File: \\irvsvr01\GIS\50898_USEPA_Region10_Federal\56094\2012\Proposal\Figure3-4_BerwickCreekBedBankandSurfaceWater.mxd

Date: August 21, 2012, File: \\irvsvr01\GIS\50898_USEPA_Region10_Federal\56094\2012\Proposal\Figure3-5HistoricalShallowPCEGroundwaterIsoconcentration.mxd



Legend

- Project Site Boundary
- 200 — Historical Groundwater Shallow (<= 25 feet depth) for PCE Isoconcentration in ug/L
- Auger Boring (E&E 2000-2001)
- Auger Boring (URS 2003)
- Soil Boring
- Monitoring Well
- Monitoring Well/Recovery Well
- Private Well
- Reconnaissance Boring
- Shallow Soil Boring
- Geoprobe Boring (E&E 2000-2001; soil and water samples)
- Geoprobe Boring (URS 2003)

N

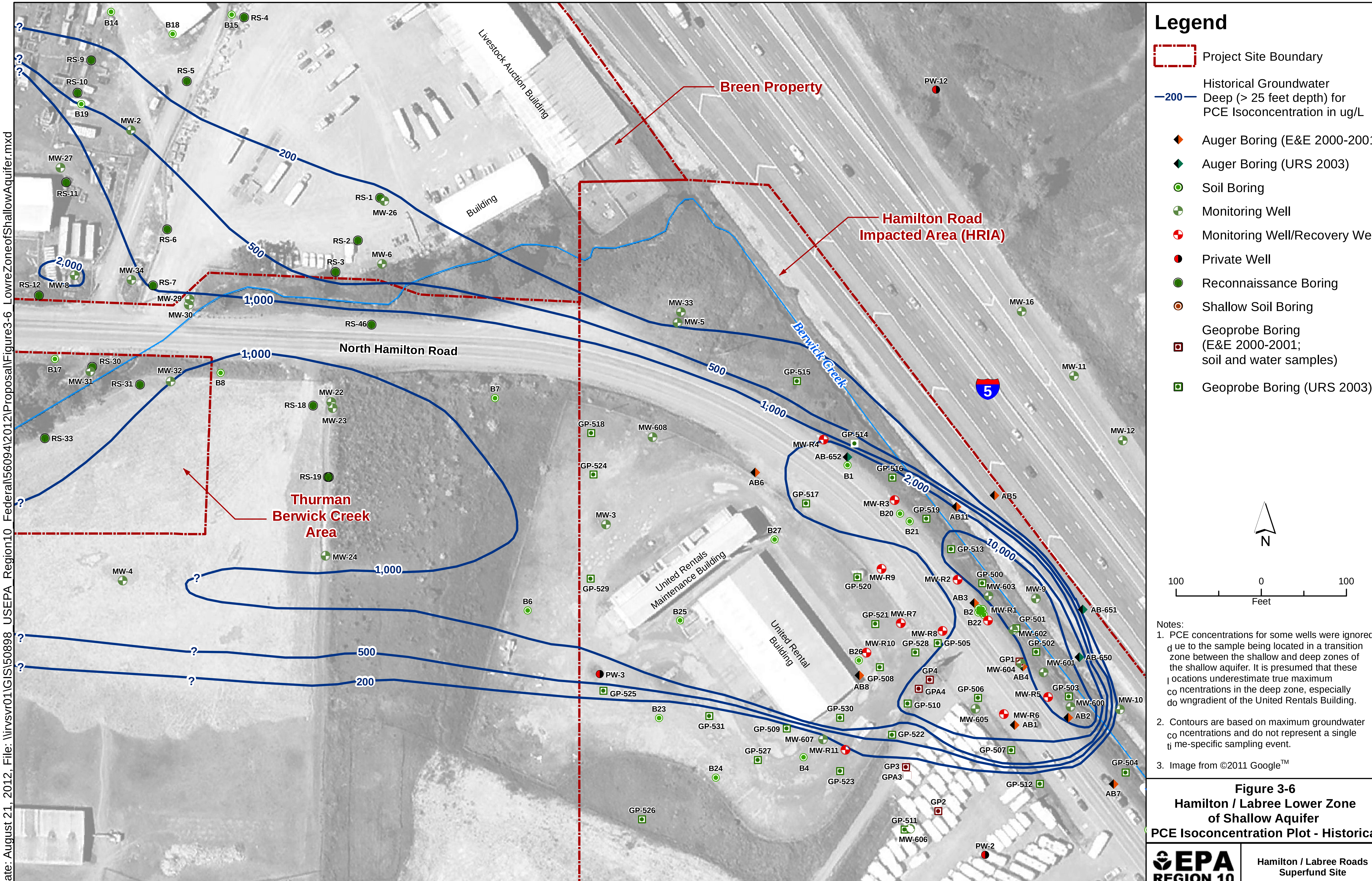
100 0 100
Feet

Notes:
1. Contours are based on maximum groundwater concentrations and do not represent a single time-specific sampling event
2. Image from ©2011 Google™

Figure 3-5
Hamilton / Labree
Upper Zone of Shallow Aquifer
PCE Isoconcentration Plot - Historical

EPA REGION 10

Hamilton / Labree Roads Superfund Site



Notes:

1. PCE concentrations for some wells were ignored due to the sample being located in a transition zone between the shallow and deep zones of the shallow aquifer. It is presumed that these locations underestimate true maximum concentrations in the deep zone, especially downgradient of the United Rentals Building.
2. Contours are based on maximum groundwater concentrations and do not represent a single time-specific sampling event.
3. Image from ©2011 Google™

Figure 3-6
Hamilton / Labree Lower Zone of Shallow Aquifer PCE Isoconcentration Plot - Historical

EPA REGION 10

Hamilton / Labree Roads Superfund Site

Date: August 21, 2012, File: \\irvsvr01\GIS\58098_USEPA_Region10_Federal\56094\2012\Proposal\Figure3-6_LowreZoneofShallowAquifer.mxd

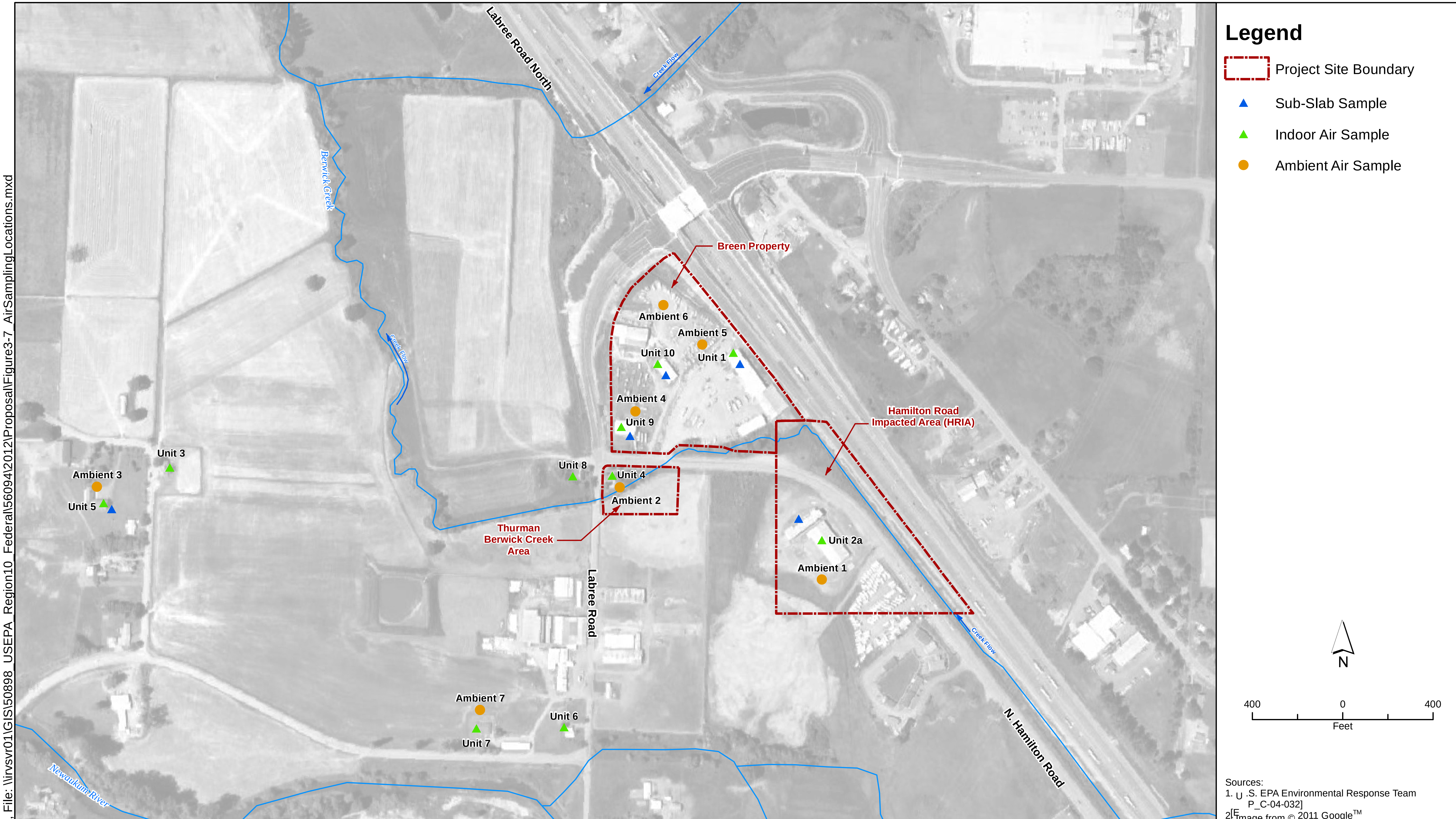
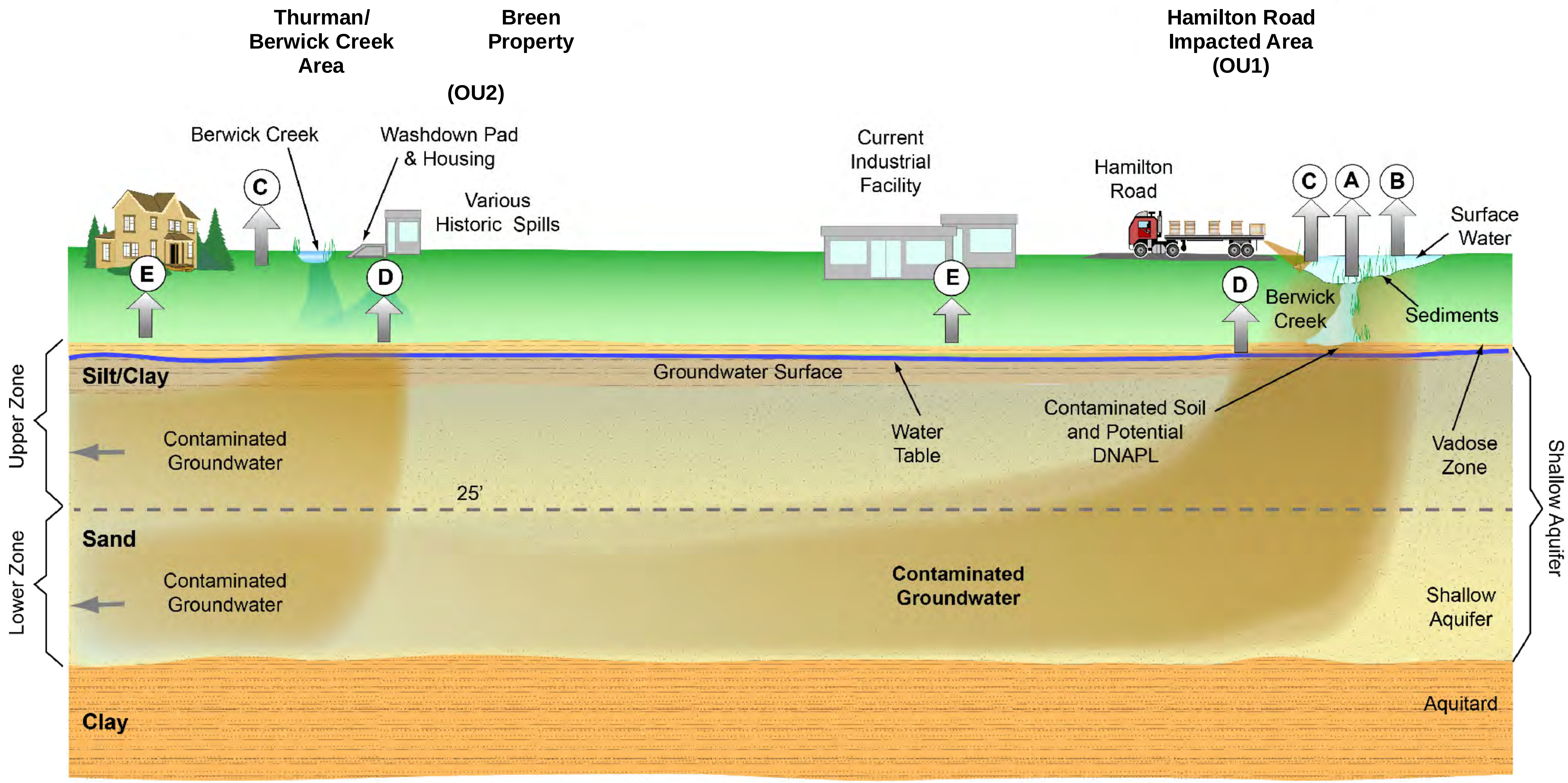


Figure 3-7
Ambient Air and
Soil Vapor Sample Locations

EPA REGION 10

Hamilton / Labree Roads
Superfund Site

Date: August 21, 2012, File: \\lrvsvr01\GIS\50898_USEPA_Region10_Federal\56094\2012\Proposal\Figure3-7_AirSamplingLocations.mxd



Legend

A - Sediment – Ingestion/Direct Contact (Residential, Aquatic, Terrestrial)
B - Surface Water – Ingestion/Direct Contact (Residential, Aquatic, Terrestrial)
C - Outdoor Air – Inhalation (Residential, Terrestrial)
D - Groundwater – Ingestion (Occupational, Residential)
E - Indoor Air – Inhalation (Occupational, Residential)

Groundwater flows from right to left, and slightly into the figure (west-northwest). The two groundwater plumes commingle down gradient of the sources.

North is into page

Not to scale

Figure 3-8
Conceptual Model

EPA REGION 10

Hamilton / Labree Roads Superfund Site

Date: August 21, 2012, File: \\lrvsvr01\GIS\50898_USEPA_Region10_Federal\56094\2012\Proposal\Figure3-8_ConceptualGroundwater.mxd

Sources:
1. Image from ©2011 Google™

Legend

- Subsurface Soil Remediation Zone (PCE greater than 10 mg/kg)
- Creek Bed Sediments/Shallow Soil Remediation Zone (PCE greater than 0.468 mg/kg)
- Subsurface Soil Sample Location Containing DNAPL
- Creek Bed Sediment Sample Location Containing DNAPL
- Auger Boring (URS / EPA, 2003)
- Monitoring Well (MW-602: URS / EPA, 2003) and (MW-9: E & E / EPA (Start, 2000 - 2001))

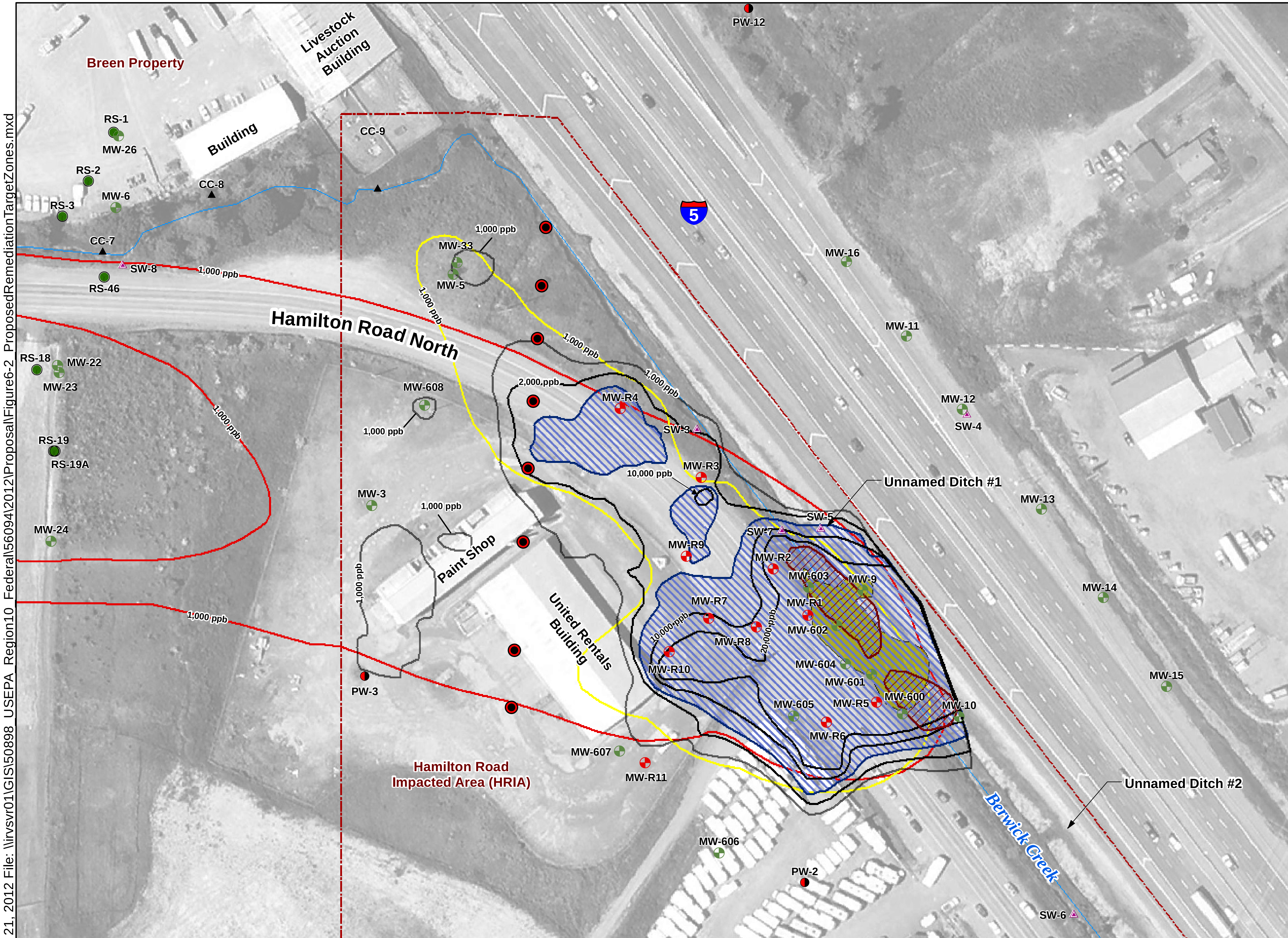
Figure6-1
Creek Bed Sediment/Shallow Soil and Subsurface Soil PCE Target Remediation Zones

EPA REGION 10

Hamilton / Labree Roads Superfund Site

Date: August 21, 2012 File: \\irvsvr01\GIS\50898_USEPA_Region10_Federal\56094\2012\Proposal\Figure6-1_AreaofSignificantPCEConcentrationSediment.mxd

Date: August 21, 2012 File: \\irvsvr01\GIS\50898_USEPA_Region10_Federal\56094\2012\Proposal\Figure6-2_ProposedRemediationTargetZones.mxd



Notes:
1. Shallow aquifer contour from Remedial Investigation (CDM Smith, September 2011) showing maximum historic values.
2. Deep aquifer contour from Remedial Investigation (CDM Smith, September 2011) showing maximum historic values.
3. MVS modeled contours using only the most recent available data from a given locations (Appendix A).

Legend

- HRIA OU1 Boundary
- Creek Bed Sediments/ Shallow SoilRemediation Zone (PCE greater than 0.468 mg/kg) (Area: 7,348 sq. ft.)
- Subsurface Soil Remediation Zone (PCE greater than 10 mg/kg) (Area: 9,450 sq. ft.)
- High Concentration Groundwater Remediation Zone (PCE greater than 4,000 ug/L) (Area: 69,438 sq. ft.)
- 1,000 ppb — Historical Groundwater Shallow (<= 25 feet depth) for PCE Isoconcentration in ug/L
- 1,000 ppb — Historical Groundwater Deep (> 25 feet depth) for PCE Isoconcentration in ug/L
- 1,000 ppb — PCE Greater Than 1,000 ppb (Area: 158,000 sq. ft.)
- 2,000 ppb — PCE Greater Than 2,000 ppb (Area: 95,731 sq. ft.)
- 10,000 ppb — PCE Greater Than 10,000 ppb (Area: 47,421 sq. ft.)
- 20,000 ppb — PCE Greater Than 20,000 ppb (Area: 36,260 sq. ft.)
- Mass Discharge Performance Monitoring Location
- Creek Channel
- Monitoring Well
- Monitoring Well/Recovery Well
- Private Well
- Reconnaissance Boring
- Surface Water

N

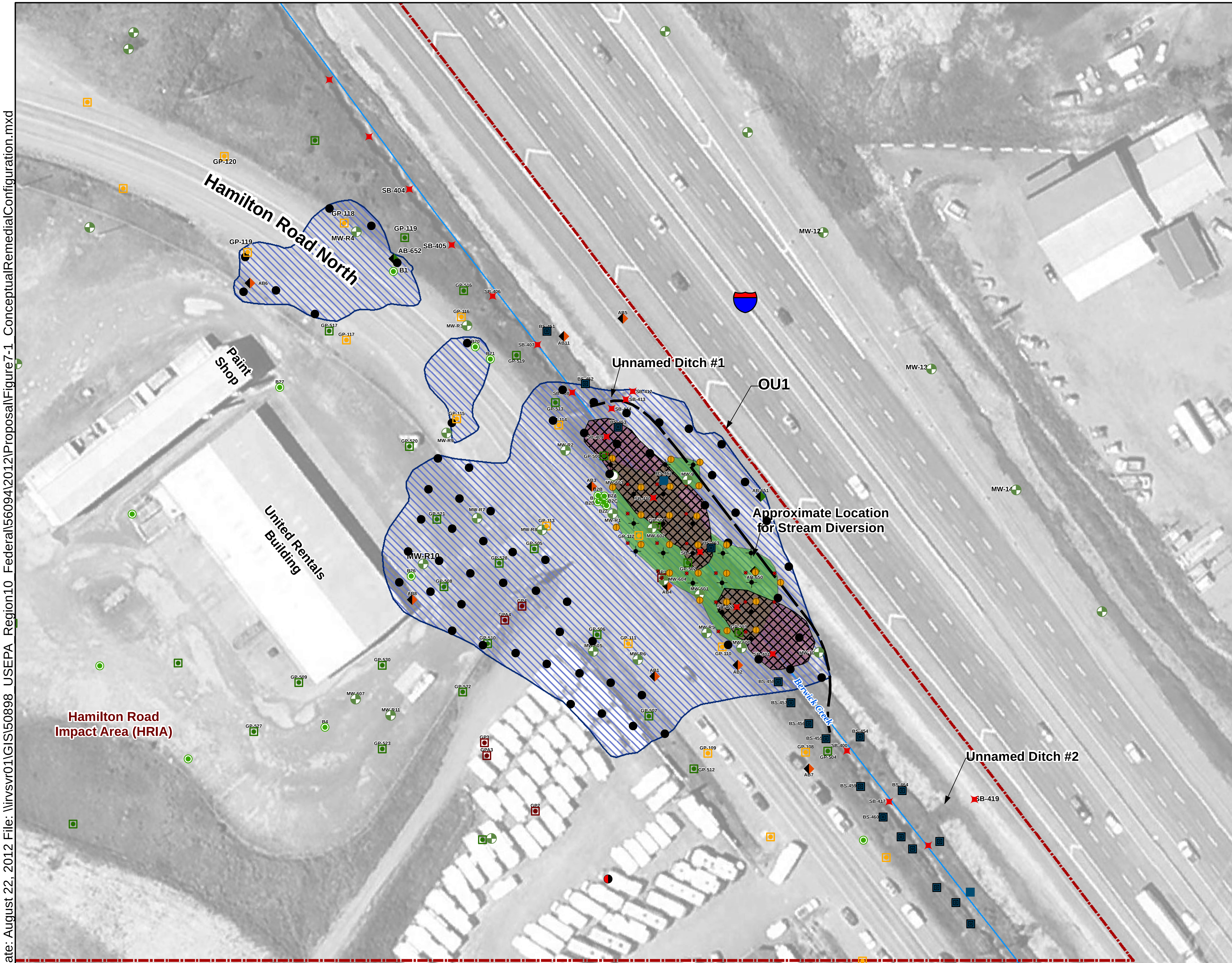
100 0 100
Feet

Sources:
1. Image from © 2011 Google™
2. sq. ft. = square feet
3. MVS = Mining Visualization System

Figure 6-2
Proposed Remediation Target Zones

EPA REGION 10

Hamilton / Labree Roads Superfund Site



Legend

- HRIA OU1 Boundary
- Area of Creek Bed Sedimentary / Soil Removal Replaced by Stream Habitat Underlain by Geosynthetic Clay Liner (GCL)
- Creek Bed Sediments/ Shallow SoilRemediation Zone (PCE greater than 0.468 mg/kg)
- High Concentration Groundwater Remediation Zone (PCE greater than 4,000 ug/L)
- Subsurface Soil Remediation Zone (PCE greater than 10 mg/kg)
- Stream Diversion
- AB5 Auger Boring
- AB-651 Auger Boring
- B2 Soil Boring
- BS-462 Stream Bed
- GP3 Geoprobe Boring
- GP-111 Geoprobe Boring
- GP-511 Geoprobe Boring
- MW-13 Monitoring Well
- SB-411 Stream Bank
- Vapor Recovery Well*
- Thermal Heating Electrodes*
- Temperature Monitoring Point*
- Bioremediation Injection Wells*

40 0 40
Feet

N

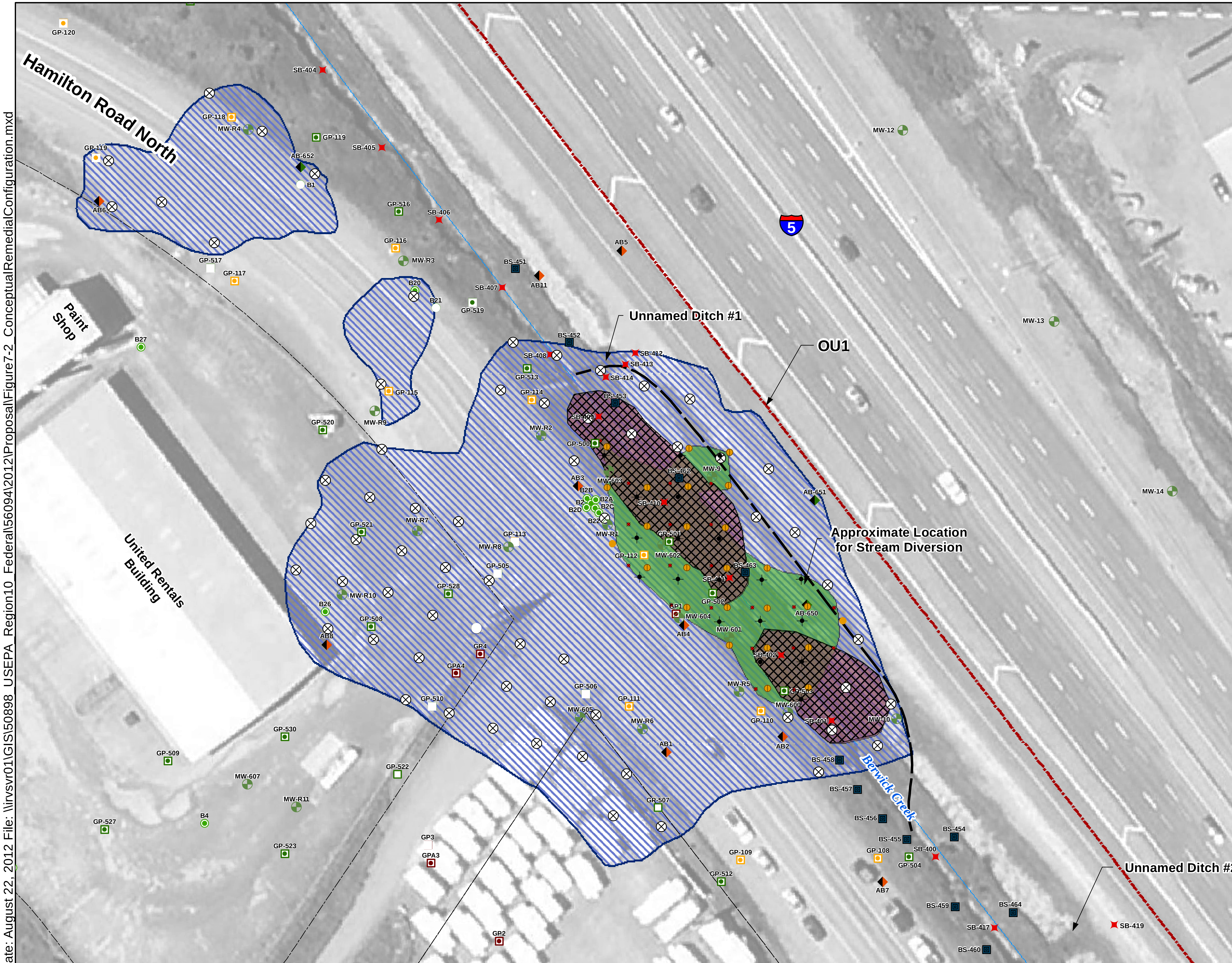
Notes:
1. MVS modeled contours using only the most recent available data from a given locations (Appendix A).
2. Monitoring wells and recovery wells located within the plume will be abandoned prior to implementation of the RH.
3. Remediation target zones based on MVS-modeled contaminant extents in sediment, soil and groundwater.
4. * = Locations approximate, exact locations to be determined by contractor.
5. sq. ft. = square feet
6. MVS = Mining Visualization System
7. Developed from CDM Smith RI Report (2011).
8. Image from ©2011 Google™

Figure 7-1
Comprehensive Treatment Scenario (CTS) 2
Conceptual Remedial Configuration

EPA REGION 10

Hamilton / Labree Roads Superfund Site

Date: August 22, 2012 File: \\irvsvr01\GIS\50898_USEPA_Region10_Federal\56094\2012\Proposal\Figure7-1_ConceptualRemedialConfiguration.mxd



Legend

- HRIA OU1 Boundary
- Area of Creek Bed Sedimentary / Soil Removal Replaced by Stream Habitat Underlain by Geosynthetic Clay Liner (GCL)
- Creek Bed Sediments/ Shallow SoilRemediation Zone (PCE greater than 0.468 mg/kg)
- High Concentration Groundwater Remediation Zone (PCE greater than 4,000 ug/L)
- Subsurface Soil Remediation Zone (PCE greater than 10 mg/kg)
- Stream Diversion
- AB5 Auger Boring
- AB-651 Auger Boring
- B2 Soil Boring
- BS-462 Stream Bed
- GP3 Geoprobe Boring
- GP-111 Geoprobe Boring
- GP-511 Geoprobe Boring
- MW-13 Monitoring Well
- SB-411 Stream Bank
- Oxidant Injection Locations*
- Vapor Recovery Well*
- Thermal Heating Electrodes*
- Temperature Monitoring Point*

40 0 40
Feet
N

Notes:
1. MVS modeled contours using only the most recent available data from a given locations (Appendix A).
2. Monitoring wells and recovery wells located within the plume will be abandoned prior to implementation of ERH.
3. Remediation target zones based on MVS-modeled contaminant extents in sediment, soil and groundwater.
4. * = Locations approximate, exact locations to be determined by contractor.
5. sq. ft. = square feet
6. MVS = Mining Visualization System
7. Developed from CDM Smith RI Report (2011).
8. Image from ©2011 Google™

Figure 7-2
Comprehensive Treatment Scenario (CTS) 3
Conceptual Remedial Configuration

EPA REGION 10

Hamilton / Labree Roads Superfund Site

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