

**TABLE 1**

**PHASE I, PHASE II, AND SUPPLEMENTAL RI FIELD INVESTIGATION SAMPLING AND ANALYSIS ACTIVITIES  
BN Havre Fueling Facility**

Field Activity	Description of Work
<b>Phase I</b>	
Task 1 - Construction of Four Onsite Clustered Wells	<ul style="list-style-type: none"> <li>Constructed four clustered wells (HV-CW-1-37.5, HV-CW-1-47, HV-CW-2-23, HV-CW-2-54, HV-CW-3-20, HV-CW-3-41.5, HV-CW-4-37, and HV-CW-4-50) in the vicinity of the Diesel and Car Repair Shops.</li> </ul>
Task 2 - Lagoon Sediment Sampling	<ul style="list-style-type: none"> <li>Collected one composited sediment sample (HV-Lagoon 1 and HV Lagoon 2) from each of the two wastewater lagoons for analysis of VOCs<sup>(a)</sup>, SVOCs<sup>(b)</sup>, PCBs<sup>(c)</sup>/pesticides, herbicides, DRO<sup>(d)</sup> method parameters, select metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver), pH, and ignitability.</li> </ul>
Task 3 - Groundwater Sampling and Analysis	<ul style="list-style-type: none"> <li>Collected groundwater samples from the newly constructed four clustered wells (Task 1) and wells HV-38, HV-75, HV-76, and HV-76 during one sampling event. Samples were analyzed for VOCs, SVOCs, herbicides, PCBs/pesticides, DRO method parameters, and select dissolved metals. Collected samples from wells HV-43, HV-68, and HV-69 during one sampling event, and from wells HV-75, HV-76, and HV-77 during three sampling events. Samples were analyzed for BTEX<sup>(e)</sup> and DRO method parameters.</li> </ul>
Task 4 - Surface Soil Sampling and Analysis	<ul style="list-style-type: none"> <li>Collected 20 surface soil samples (HV-SS-3 through HV-SS-22) in the areas of the Diesel and Car Repair Shops and two samples (HV-SS-1 and HV-SS-2) immediately adjacent to the Work (Railyard) Equipment Maintenance Building. Samples were composited across the upper 2 inches and analyzed for SVOCs, PCBs/pesticides, herbicides, DRO method parameters, and select metals. Twelve of the samples also were analyzed for VOCs.</li> </ul>
Task 5 - Surface Water and Sediment Sampling Analysis	<ul style="list-style-type: none"> <li>Collected two sediment samples (HV-SD-1 and HV-SD-2) from the Bullhook Creek and one sediment sample (HV-SD-3) from the east end drainage ditch. Samples were analyzed for VOCs, SVOCs, PCBs/pesticides, herbicides, DRO method parameters, and select metals (arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, silver, and zinc).</li> <li>Collected three surface water samples (HV-SW1 through HV-SW3) and six sediment samples (HV-SD1 through HV-SD6) from the Milk River. Samples were analyzed for VOC, SVOCs, herbicides, DRO method parameters, and select metals.</li> </ul>
Task 6 - Chemical Composition of Dissolved Fuel Constituents	<ul style="list-style-type: none"> <li>Collected groundwater samples from wells HV-40, HV-68, and HV-69 during one sampling event for volatile petroleum hydrocarbons and extractable petroleum hydrocarbons (VPH/EPH) using the MADEP<sup>(f)</sup> test methods.</li> </ul>

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Field Activity	Description of Work																					
Task 7 - Evaluation of Indicators of Natural Attenuation	<ul style="list-style-type: none"> <li>• Collected quarterly groundwater samples from selected wells. Samples were initially analyzed or monitored for:               <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">- Dissolved oxygen</td> <td style="width: 33%;">- Ammonia nitrogen</td> <td style="width: 33%;">- Ferrous iron</td> </tr> <tr> <td>- pH</td> <td>- Nitrate+ Nitrite</td> <td>- Ferric iron</td> </tr> <tr> <td>- Temperature</td> <td>- Sulfate - Methane</td> <td></td> </tr> <tr> <td>- Reduction-oxidation potential</td> <td>- Sulfide</td> <td>- DRO</td> </tr> <tr> <td>- Orthophosphate</td> <td>- BTEX</td> <td>- Conductivity</td> </tr> <tr> <td>- Hardness</td> <td>- Water level</td> <td>- Total dissolved solids</td> </tr> <tr> <td>- LNAPL<sup>(g)</sup> level</td> <td>- Total, carbonate, and bicarbonate alkalinity</td> <td></td> </tr> </table> </li> </ul> <p>Groundwater samples collected from subsequent three quarters of sampling were analyzed for a condensed list of indicators.</p>	- Dissolved oxygen	- Ammonia nitrogen	- Ferrous iron	- pH	- Nitrate+ Nitrite	- Ferric iron	- Temperature	- Sulfate - Methane		- Reduction-oxidation potential	- Sulfide	- DRO	- Orthophosphate	- BTEX	- Conductivity	- Hardness	- Water level	- Total dissolved solids	- LNAPL <sup>(g)</sup> level	- Total, carbonate, and bicarbonate alkalinity	
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Task 8 - Quarterly Groundwater Monitoring	<ul style="list-style-type: none"> <li>• Monitored LNAPL thicknesses and static water elevations in Facility wells quarterly for one year.</li> </ul>																					
<b>Phase II</b>																						
Task II-1 – LNAPL Delineation Reconnaissance Sampling and Construction of New Monitoring Wells	<ul style="list-style-type: none"> <li>• Collected reconnaissance soil samples using a StrataProbe direct-push sampling system in the area south of Recovery Area 2 and north and east of the First Street North Interceptor Trench. Sampled 39 locations; at each location, soil samples were field screened and visually assessed to identify soil containing LNAPL.</li> <li>• Collected 13 soil samples near the capillary fringe from locations outside the zone where LNAPL is observed for DRO method parameters, and collected one soil sample from each area from an area where LNAPL was observed for DRO/GRO<sup>(h)</sup> method parameters, VPH, EPH, and PAHs<sup>(i)</sup>.</li> <li>• Constructed four monitoring wells in the area south of Recovery Area 2 (HV-78, HV-79, HV-80, and HV-85) and four wells in the area north and east of the First Street North Intercept Trench (HV-81 through HV-84) based on soil reconnaissance sampling results.</li> </ul>																					
Task II-2 - Subsurface Soil Sampling and Analysis	<ul style="list-style-type: none"> <li>• Advanced three soil coreholes (RFASP1 through RFASP3) along the 8 1/2 track (located approximately 2,500 feet west of the western boundary of the railyard). Two samples were collected from each core hole and analyzed for BTEX and DRO method parameters.</li> </ul>																					
<b>Supplemental RI Task</b>																						
Surface Soil Sampling for Asbestos Analysis	<ul style="list-style-type: none"> <li>• Collected three surface soil samples (HV-SS-23, HV-SS-25, and HV-SS-26) in the area immediately adjacent to the Car Shop for asbestos analysis.</li> </ul>																					

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Field Activity	Description of Work
Task II-3 - Groundwater Sampling and Analysis <sup>(i)</sup>	<ul style="list-style-type: none"> <li>• Collected groundwater samples from the four constructed wells (Task 1) and wells HV-6, HV-27, HV-38, HV-52, HV-57, HV-68, HV-74, HV-75, HV-76, and HV-77 in March and June 1999 and from wells HV-8 and HV-58 in June 1999 only. Samples were analyzed for VOCs, BTEX, DRO method parameters, and/or natural attenuation parameters. Sample from HV-38 was analyzed for herbicides. Collected samples from wells HV-75, HV-76, and HV-77 in September 1999 for BTEX and DRO method parameters. Also collect a sample from CW-1-37.5 in August 1999 for VOCs.</li> </ul>
Task II-4 - Slug Testing of Uppermost Saturated Zone and 50-Foot Zone Monitoring Wells	<ul style="list-style-type: none"> <li>• Performed slug testing of the 50-foot zone wells using wells HV-76 and HV-77 and of the fine-grained saturated unit using wells HV-23 and HV-66. Data collected during the slug test were analyzed using standard slug test data solutions.</li> </ul>
Task II-5 - Estimate LNAPL Volume at the Site	<ul style="list-style-type: none"> <li>• Collected additional field and laboratory data regarding soil and LNAPL properties, LNAPL residual saturation, and thickness and depth of LNAPL.               <ul style="list-style-type: none"> <li>- Advanced 10 StratraProbe corings; collected a subsurface soil sample from each coring for soil properties testing.</li> <li>- Collected LNAPL and groundwater samples from wells HV-5, HV 25, HV-45, and HV-47 for density and viscosity and air-LNAPL and water-LNAPL interfacial tension.</li> <li>- Advanced 11 StrataProbe corings; collected at least three subsurface soil samples from each coring for analysis of DRO method parameters.</li> </ul> </li> <li>• Data collected was entered into finite-element and spreadsheet-type models to estimate the volume of LNAPL present in the zones of mobile LNAPL.</li> </ul>

Notes:

- (a) VOC = Volatile organic compounds.
- (b) SVOCs = Semivolatile organic compounds.
- (c) PCBs = Polychlorinated biphenyls.
- (d) DRO = Diesel range organics.
- (e) BTEX = Benzene, toluene, ethylbenzene, and xylenes.
- (f) MADEP = Massachusetts Department of Environmental Protection.
- (g) LNAPL = Light non-aqueous phase liquid.
- (h) GRO = Gasoline range organics.
- (i) PAHs = Polynuclear aromatic hydrocarbons.
- (j) Groundwater sampling and analysis is scheduled to continue until December 2000.