Final Draft Remedial Investigation Report BNSF Parkwater Rail Yard Site Spokane, Washington

BNSF Parkwater Company

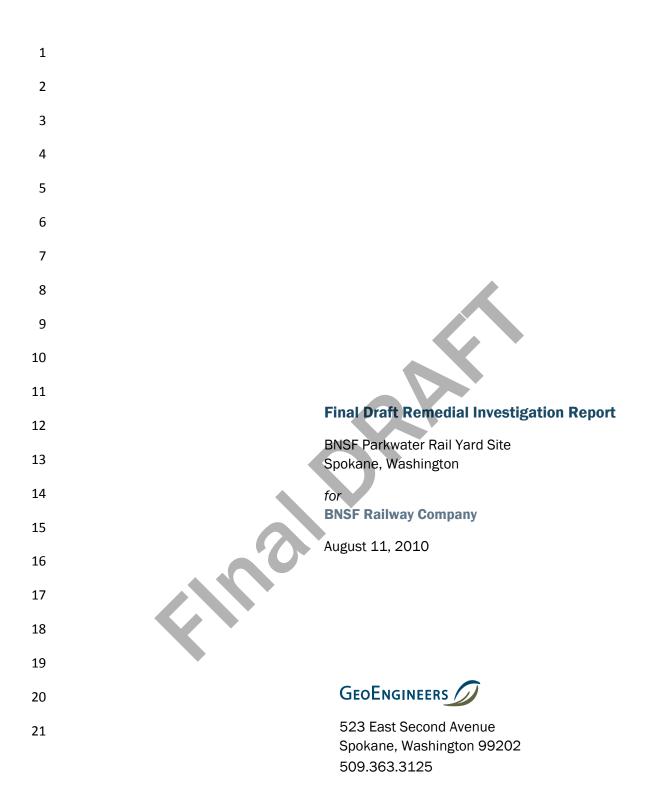
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174 EXECUTIVE SUMMARY

175 Introduction

This remedial investigation (RI) report describes investigations conducted between
December 3, 2009 and February 25, 2010 at the BNSF Railway Company (BNSF) Parkwater Rail
Yard Site (Site), formerly known as Yardley, located at 5302 East Trent Avenue, Spokane Valley,
Washington. The general location of the Site is shown with respect to surrounding physical
features in the Vicinity Map, Figure 1.

The purpose of this RI was to collect, develop and evaluate sufficient soil and groundwater data to determine what, if any, cleanup actions at the Site are necessary pursuant to the Model Toxics Control Act, RCW 70.105D (MTCA). In addition to the 2009/2010 investigations, the scope and results of previous investigations are also described in this report to provide a comprehensive summary of Site conditions. This RI was prepared in accordance with Agreed Order No. 6453, and in accordance with the RI/FS Work Plan approved by Ecology pursuant to that Agreed Order.

187 Site Description

The Site is an active rail yard bounded on the east by North Fancher Road, on the north by East Trent Avenue, on the west by North Havana Street and on the south by the BNSF mainline tracks as shown in Subject Property and Areas of Potential Environmental Concern, Figure 2. The Site covers approximately 130 acres. The ground surface is generally level and most has been improved with crushed rock surfacing, although some high use areas are covered with concrete or asphalt.

193 RI Scope

194 The scope of work for the RI at the Site is described in detail in the RI/FS Work Plan and includes 195 the following:

- Installed two, 2-inch-diameter groundwater monitoring wells, MW-22 and MW-23, to depths of approximately 75 feet (depths discussed in this report are with respect to existing ground surface at the time of exploration) and develop the newly installed wells.
- Drilled, probed, or excavated 67 soil excavations from areas potentially impacted with contaminant of potential concern (COPCs) based on field screening results in the Koch Asphalt
 Lease Area, Diesel Shop and Materials Storage Building Area, Western Fruit Express (Generator Storage Area), Dismantling Spur and East and West Debris and Soil Deposit Areas, Yardley
 Office (Main Line Track No. 1), Ralston Lead Track and the TTX Facility.
- Submitted up to three soil samples from each monitoring well boring, test pit, direct push or
 sonic boring to Pace Analytical Laboratory for analysis of the relevant COPCs.
- Obtained groundwater samples from the screened interval of the newly installed wells using
 low-flow sampling techniques and submitted groundwater samples to a qualified laboratory for
 analysis of COPCs.



209 RI Results

210 Koch Area Asphalt Lease Area

211 Eight explorations were conducted in this area. Analytical results indicate samples obtained in the 212 upper 2 feet of soil in test pits GTP-46 contain diesel-range petroleum hydrocarbons (DRPH) at a 213 concentration of 4,120 milligrams per kilogram (mg/kg) and oil-range petroleum hydrocarbons 214 (ORPH) at 6,940 mg/kg. Samples obtained from test pit GTP-47, also at a depth of 2 feet or less, 215 contained concentrations of ORPH at 2,130 mg/kg. Test pit GTP-49 contained arsenic and 216 cadmium at concentrations of 26.4 and 3.3 mg/kg, respectively, in a sample obtained at a depth 217 of 2 feet or less. ORPH, DRPH, polycyclic aromatic hydrocarbons (PAHs) and metals were not 218 detected in samples obtained below depths of approximately 2 feet.

219 Diesel Shop and Materials Storage Building

220 Twenty explorations were conducted in this area. Analytical results indicate samples obtained in 221 the upper 4 feet of soil in borings DP-2, DP-3, DP-7 and DP-8 contain DRPH concentrations from 222 3,950 to 12,800 mg/kg and ORPH concentrations from 2,330 to 10,600 mg/kg. In borings DP-3 223 and DP-7 naphthalene was detected in soil samples obtained in the upper 4 feet of the borings at 224 concentrations of 5.4 and 34.5 mg/kg, respectively. Methylene chloride was detected at a 225 concentration of 0.023 mg/kg in a soil sample obtained at a depth of approximately 60 feet in monitoring well MW-23. With the exception of MW-23, ORPH, DRPH, PAHs, metals and benzene. 226 227 ethylbenzene, toluene and xylenes (BETX) were not detected at concentrations exceeding cleanup 228 levels in soil samples obtained below depths of approximately 4 feet.

229 Western Fruit Express (Generator Storage Area)

230 Nine explorations were conducted in this area. Analytical results indicate soil samples obtained in test pits GTP-32, GTP-33, GTP-34, GTP-35 and GTP-35B contain lead concentrations ranging from 231 232 1,690 to 48,200 mg/kg. Arsenic was detected in test pits GTP-32, GTP-34 and GTP-35 at concentrations ranging from 95.2 to 204 mg/kg. Cadmium was detected in six test pits at 233 234 concentrations ranging from 2.4 to 653 mg/kg. Mercury was detected in test pit GTP-35 at a concentration of 6.1 mg/kg. All samples noted above were obtained in the upper 2 feet of soil. 235 236 DRPH, ORPH, metals and polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), 237 PAHs and metals were not detected at concentrations exceeding preliminary cleanup levels in soil 238 samples obtained below depths of approximately 2 feet.

239 Dismantling Spur and East and West Debris and Soil Deposit Area

Eight explorations were conducted in this area. Analytical results indicate soil samples obtained in test pits GTP-36, GTP-37, GTP-38 and GTP-38A contain concentrations of arsenic ranging from 22.9 to 91.9 mg/kg at an approximate depth of 8 feet or less. Soil samples obtained in test pits GTP-36 through GTP-38 contained concentrations of lead ranging from 1,120 to 3,130 mg/kg. Cadmium was detected at concentrations ranging from 4.9 to 39.2 mg/kg in samples collected from four test pits. DRPH, ORPH, PCBs and metals were not detected at concentrations exceeding preliminary cleanup levels in soil samples obtained below a depth of approximately 8 feet.

247 Yardley Office (Main Line No. 1)

Eleven explorations were conducted in this area. Analytical results indicate soil samples obtained in borings DP-15, DP-21 and DP-23 contained concentrations of arsenic ranging from 21.2 to 53.9 mg/kg at an approximate depth of 4 feet or less. Cadmium was detected at concentrations of 3.8 and 5.2 mg/kg in samples collected from DP-21 and DP-23, respectively. DRPH, ORPH and metals were not detected at concentrations exceeding preliminary cleanup levels in soil samples obtained below depths of approximately 4 feet.

254 Ralston Lead Track

Six explorations were conducted in this area. Analytical results indicate soil samples obtained in borings DP-43 and DP-44 contained concentrations of methylene chloride from 0.074 to 0.18 mg/kg at an approximately depth of 4 feet or less. Cadmium was detected at 2.3 mg/kg in a sample collected from ground surface to 2 feet below grade in boring DP-44A. DRPH, ORPH, metals, PAHs and VOCs were not detected at concentrations exceeding preliminary cleanup levels in soil samples obtained below depths of approximately 4 feet.

261 TTX Facility

One exploration was conducted in this area. Analytical results indicate soil samples obtained in
 boring DP-45 at a depth of 16 feet or less did not contain concentrations of DRPH, ORPH or metals
 exceeding preliminary cleanup levels.

265 Fueling Area

Analytical results of groundwater samples obtained from monitoring wells MW-22 and MW-23 indicate DRPH and ORPH were not detected above laboratory reporting limits.

268 Locations and Media Requiring Cleanup Action Evaluation in Feasibility Study

Based on the results of this RI, the following eight areas and media require evaluation for cleanup action in the Feasibility Study (FS). Based on the results of the RI, no further action is recommended at the TTX Facility or near monitoring wells MW-22 and MW-23 such that these areas will not be further evaluated in the FS.

- Koch Asphalt Lease Area: soil to a depth of at least 2 feet near test pits GTP-46, GTP-47 and
 GTP-49 for DRPH, ORPH, arsenic, cadmium and PAH's.
- Diesel Shop: soil near the former remedial excavation between the Diesel Shop and Material
 Storage Building for DRPH, ORPH, naphthalene and PAH's.
- Material Storage Building: soil to a depth of at least 4 feet near DP-2, DP-3 and DP-7 through
 DP-9 for DRPH, ORPH, naphthalene and PAH's.
- Western Fruit Express (Generator Storage Area): soil to a depth of at least 2 feet near test pits
 GTP-32 through GTP-35 and GTP-35B, and soil boring DP-12 for arsenic, lead, cadmium and
 mercury..
- Dismantling Spur and East and West Debris and Soil Deposit Areas: soil to a depth of at least
 8 feet near test pits GTP-36B, GTP-36 through GTP-38, and GTP-38A for arsenic, lead,
 cadmium and mercury.



- Yardley Office (Main Line Track No. 1): soil to a depth of at least 4 feet near borings DP-15,
 DP-21 and DP-23 for arsenic and cadmium.
- Ralston Lead: soil to a depth of at least 4 feet near borings DP-43, DP-44 and DP-44A for
 methylene chloride and cadmium.
- Fueling Area: soil and groundwater near former petroleum tanks. This area currently is being
 addressed with the soil and groundwater remediation system that has been in operation since
 March 2009.

292 **1.0 INTRODUCTION**

This report presents the objectives and results of remedial investigation (RI) activities conducted between December 3, 2009 and February 25, 2010 at the BNSF Railway Company (BNSF) Parkwater Rail Yard Site (Site), formerly known as Yardley, located at 5302 East Trent Avenue, Spokane, Washington (Figure 1). In addition to the studies completed in December 2009/ February 2010, this RI report also incorporates the results of earlier investigations and interim remedial actions to present a comprehensive summary of Site conditions. The subject property and areas of interest are shown in Figure 2.

The Site is located in a historical industrial area approximately ¹/₂-mile south of the Spokane River.
 The Site overlies the Spokane Valley – Rathdrum Prairie (SVRP) Aquifer, the sole source of drinking
 water for area residents.

BNSF is performing this RI in accordance with Agreed Order No. 6453 with the Washington State Department of Ecology (Ecology) and the RI/FS Work Plan approved by Ecology pursuant to that Agreed Order. The Site is listed on the Ecology Site Database as Ecology Identifier 676. The Site also includes the Western Fruit Express Co., Ecology Identifier 69324774, and the Western Fruit Express Spokane [Turbo Waste], Ecology Identifier 2450396.

BNSF and its predecessors have owned and operated the Site since the early 1900s. Typical railroad operations during this time have included locomotive and rail car maintenance and repair, rail commodities storage and transfer, and locomotive refueling. BNSF leased a 3-acre portion of the Site to various other industrial businesses including Koch Materials, Tri-State Oil and Continental Coal Company. These lessees operated at least 13 above ground storage tanks (ASTs) at the Site which stored asphalt, fuel oil and bunker oil. The ASTs were dismantled in 1988.

Previous environmental investigations conducted at the Site have documented petroleum
 hydrocarbons in soil and groundwater, and PCBs in soil at concentrations exceeding Model Toxics
 Control Act (MTCA) Method A cleanup levels.

BNSF is required to prepare and submit a RI/FS for the Site as part of the Scope of Work defined in
the Agreed Order as described in the mutually agreed RI/FS Work Plan dated September 30, 2009
(RI/FS Work Plan). This document fulfills the RI report component outlined in the RI/FS Work Plan.

This RI report was prepared in general accordance with the requirements defined by the MTCA Regulation (Washington Administrative Code [WAC] 173-340-350) for submittal to Ecology. Appendices to this RI include Appendix A – Remedial Investigation Field Methods; Appendix B – Soil Chemical Analytical Results Tables; Appendix C – Data Quality Assessment Summary; and Appendix D - Laboratory Analytical Reports (CD).

1.1. RI Objective

The objective of this RI was to collect, develop and evaluate sufficient information to determine what, if any, areas at the Site require cleanup and should be analyzed in the FS. This RI report also references summaries of previous investigations conducted at the Site.

329 **1.2. Report Organization**

Section 2.0 of this report describes Site history, environmental setting, current land uses, basis of concern and regulatory framework. Section 3.0 describes cleanup standards development. Soil investigations associated with the RI and results of these investigations are presented in Section 4.0. Section 5.0 explains groundwater investigations and presents the results of these investigations. Section 6.0 presents a conceptual site model based on existing data. Section 7.0 describes the locations and media that should be evaluated in the FS, based on the results of the RI and Section 8.0 presents report references and acronyms.

337 2.0 SITE DESCRIPTION, HISTORY, AND REGULATORY FRAMEWORK

This section describes the Site, including location, history and current uses, and describes the existing regulatory framework.

340 2.1. Property Description

The Site is bounded on the east by North Fancher Road, on the north by East Trent Avenue, on the 341 342 west by North Havana Street and on the south by the BNSF mainline tracks as shown in Figure 2. 343 The Site generally is level and covers approximately 130 acres. Most of the ground surface has 344 been improved with crushed rock surfacing, although some high use areas are covered with 345 concrete or asphalt. Current Site facilities include modern buildings and several historic buildings. 346 Adjacent properties include additional rail yard facilities and operations west of Havana Street and east of Fancher Road (BNSF Intermodal Facility); Trent Avenue to the north and commercial 347 development along Trent Avenue; and additional industrial areas south of the BNSF mainline 348 349 tracks.

350 2.2. Historical Operations and Site Uses

351 Parkwater is located along an active BNSF east-west mainline and is the principal BNSF rail yard in 352 the Spokane area. Parkwater initially was constructed in the early 1900s as the main roundhouse 353 and terminal facility for the Northern Pacific Railroad (Northern Pacific Railroad and Great Northern 354 Railway and other railroads merged in 1972). Parkwater was the central operations maintenance 355 and switching facility for the Northern Pacific Railroad from the early 1900s to 1959, when the 356 roundhouse was demolished. During this time period, Parkwater supported several rail operations 357 including fueling, maintenance, intermodal operations and switching. Parkwater continued to 358 support many of these operations in a lesser capacity from 1959 to 2004 when BNSF opened the 359 new fueling facility in Hauser, Idaho. Presently, Parkwater provides refueling, maintenance and 360 switching operations.

361 1. Documentation of specific historic activities that have occurred over the 100-year operational period of the Parkwater Rail Yard is limited. However, the general Site layout has remained 362 relatively unchanged over the years. Former facilities such as the Koch Materials asphalt lease 363 364 area, which included ASTs, have been removed. Based on historic information obtained under 365 development of the RI/FS Work Plan and this study, the primary areas at the Site that use(d) 366 hazardous materials in routine operations and areas of documented and/or suspected 367 releases include: (1) Former Koch Materials asphalt lease area; (2) Diesel Shop and Materials 368 Storage Building; (3) Western Fruit Express Maintenance Facility; (4) Dismantling Spur and East and West Debris and Soil Deposit Areas; (5) Yardley Office (Main Line No. 1) Area; (6)
Ralston Lead; (7) TTX Facility; (8) a former building shown on a historic site plan labeled
"paint"; and (9) a former gasoline storage tank shown on a historic site plan. Descriptions of
these areas are detailed in the RI/FS Work Plan and the Environmental Site Assessment
Report (June 30, 2008).

374 2.3. Fueling Area and Interim Groundwater Treatment System

The east-central portion of Parkwater, about 500 feet west-southwest of the turntable and between the Materials Storage Building and Western Fruit Express Maintenance Facility, has historically been used for locomotive fueling. Several former underground storage tanks (USTs), including a 10,000-gallon, a 17,000-gallon, and a 25,000-gallon diesel USTs, and an 18,000-gallon waste oil UST were located west and northwest of the current Fueling Area. The general location of the Fueling Area is shown in Figure 2.

The Fueling Area is an area of past diesel release(s) resulting from a former leaking underground 381 382 storage tank(s). The Fueling Area has undergone extensive studies prior to development of the 383 RI/FS Work Plan. Currently, soil vapor extraction (SVE) and air sparging (AS) systems are in 384 operation as interim remedial actions. These systems were put into operation on March 25, 2009 385 pursuant to Agreed Order No. 6453 and approved work plans. Preliminary details of this remedial 386 alternative were provided to Ecology in the report titled "Interim Cleanup Action Plan, Diesel Fuel 387 Release Parkwater Railyard, Spokane, Washington" dated December 17, 2008. Details of the current operational systems are discussed in greater detail in the following sections. Groundwater 388 389 analytical results are provided in Table 1 and compare diesel-range petroleum hydrocarbons before 390 and after the startup of the interim remedial system.

Soil vapor extraction is used to extract diesel vapors entrained within the interstitial spaces in vadose-zone soils. The SVE system can be modified to introduce oxygen into contaminated vadose-zone soils (bioventing) to stimulate natural biodegradation of petroleum hydrocarbons. Air sparging is used to introduce oxygen, enhanced with ozone, into the aquifer to both promote natural biodegradation of diesel in groundwater, to breakdown petroleum hydrocarbons via oxidation, and to strip volatile components of diesel from groundwater.

397 In the short-term the physical effects of vapor extraction and stripping appear to have removed the 398 lighter-end compounds in the beginning of the remedial period. The long-term remedial approach 399 will be to provide sufficient oxygen into both soil and groundwater to promote biodegradation of the 400 heavier-end compounds typically found in diesel.

401 Data obtained during routine monitoring, since system start up in March 2009, indicates the 402 system is performing as designed, removing petroleum hydrocarbons from subsurface soil and 403 groundwater. Semi-annual remedial system progress reports (GeoEngineers, January 28, 2010 404 and May 11, 2010) document the operation of these systems.

405 **2.4. Environmental Setting**

406 This section describes the geology and hydrogeology of the Parkwater Rail Yard Area. The 407 description is based on information obtained during previous investigations; however, the



408 groundwater occurrence summary and flow directions also incorporate information from the 409 2009/2010 RI.

410 **2.4.1. Geologic and Soil Conditions**

Geologic maps indicate the region is underlain by glacial flood-channel deposits, predominantly gravel (Qfcg). This geologic unit was deposited during prehistoric catastrophic ice-age flooding at the end of the last ice age, on the order of 10,000 years ago. The Qfcg geologic unit is described as a thickly bedded to massive mixture of boulders, cobbles, gravel and sand with localized beds and lenses of sand and silt. Boulders can be more than 5 feet diameter. The color is typically gray to yellowish gray, or light brown.

417 As indicated above, in general, regional surface soil conditions consist of gravel and/or crushed 418 According to the United States Department of Agriculture (USDA) Natural rock surfacing. 419 Resources Conservation Service (NRCS), the Site is underlain by the Garrison Gravelly Loam, 0 to 5 percent slopes (Unit GgA). The NRCS Web Soil Survey described the GgA soil unit as, "very deep, 420 421 somewhat excessively drained soil situated on nearly level to gently sloping terraces. It formed in glacial outwash mixed with volcanic ash in the upper part. Typically the surface layer is gravelly 422 423 loam 15 inches thick. The subsoil is very gravelly loam, 29 inches thick. The substratum is very 424 gravelly loamy coarse sand to a depth of 60 inches."

Subsurface explorations conducted on portions of the Site as part of past environmental investigations indicate soil conditions similar to those described in soil and geologic maps and literature. In general, these explorations indicate that portions of the Site are underlain by fill soil to maximum depths of 20 feet, overlying predominantly gravel deposits with variable silt and sand content.

The gravel includes interbeds and lenses of sand, silty sand and occasional lenses of silt. In general, deeper investigations at the Site terminated in gravel unit at depths on the order of 80 feet below the current ground surface. Interpreted subsurface conditions near the fueling area are shown on cross sections included in the *Interim Action Work Plan* (GeoEngineers, 2009).

434 2.4.2. Hydrogeologic Conditions

Parkwater is underlain by at least two aquifers. These aquifers occur within: (1) basement rocks;
and (2) unconsolidated glaciofluvial sediments. Groundwater occurs in basement rocks in
fractured and/or weathered zones. Porosity, hydraulic conductivity, and transmissivity generally
are low. Water wells penetrating the basement rock aquifer typically can be expected to yield
several gallons per minute (gpm) or less.

Groundwater within unconsolidated sediments near Parkwater generally occurs within glaciofluvial
sediments associated with the SVRP Aquifer, which covers a land area of about 408 square miles
in Idaho and Washington. The SVRP aquifer is highly transmissive, unconfined throughout much of
its length, and reaches saturated thicknesses exceeding 800 feet within the Rathdrum Prairie and
600 feet within the Hillyard Trough (Kahle and Bartolino, 2007). The hydraulic properties of the
SVRP Aquifer have been estimated by Vaccaro and Bolke (1983), Jensen and Eckart (1989), CH2M
Hill (1998), Buchanan (1999), and Hsieh et. al. (2007), and are summarized by the following:

- 447 Hydraulic conductivity estimates range from about 100 to 6,200 feet per second (ft/s);
- 448 Transmissivity estimates range from 0.05 to 70 square feet per second (ft²/s);
- 449 Specific yield estimates range from 0.1 to 0.3; and
- 450 Groundwater velocity estimates range from 0.01 to 80 feet per day (ft/d).
- Groundwater flux through the SVRP aquifer was estimated at about 250 to 650 million gallons
 per day near the Washington-Idaho border (Kahle et. al., 2005).

453 Based on measurements in several existing monitoring wells at the Site, depths to groundwater 454 range from about 62 to 68 feet, but can vary as much as 10 to 15 feet seasonally within the SVRP 455 Aquifer underlying the site. Groundwater flow direction generally is to the west and northwest and 456 hydraulic gradient is on the order of $2.2x10^{-3}$ (feet/feet).

457 2.5. Current and Likely Future Land Use

The Site currently is an active rail yard, and routine operations include fueling, locomotive and rail car maintenance and switching of rail cars. There currently are no plans to change the use or operations at the Site in the future. According to the City of Spokane, the site is currently zoned Heavy Industrial (HI).

462 2.6. Exposure Pathways and Receptors

Prior to the 2009/2010 investigations, available information indicated releases to the environment
of materials used at the Site. Ecology listed portions of the Site on its Confirmed and Suspected
Contaminated Sites List because of the presence of DRPH, ORPH and gasoline range petroleum
hydrocarbons (GRPH), VOCs, metals and PCBs in soil and/or groundwater. Potential groundwater
impacts include hazardous substances that migrate from soil to groundwater.

The City of Spokane supplies water for on-site use. Currently, there are no known active groundwater supply wells at the Site; therefore, there is no current use of groundwater beneath the Site. Numerous resource protection wells are maintained at the site for the purpose of monitoring groundwater conditions underlying the Site.

472 Potential exposure pathways related to soil and/or groundwater are discussed below; further,
473 exposure pathways deemed to be incomplete were not considered further in this RI. Additional
474 details of contamination sources and mechanisms are discussed in Section 6.0, Conceptual Site
475 Model.

- 476 The following potential exposure pathways and receptors include:
- 477 Ecological
- 478 Direct contact with contaminated soil and surface water runoff small mammals,
 479 birds, soil biota, plants
- 480 Ingestion of contaminated soil and surface water runoff small mammals and birds
- 481 Ingestion of plants or fauna that have ingested or absorbed contaminants from the site
 482 predatory small mammals and birds
- 483 🔳 Human



- 484 Dermal contact with contaminated soil during excavation work on-site workers
 485 Dermal contact with contaminated groundwater removed from on-site monitoring wells

 on-site workers

 487 Dermal contact with and inhalation of contaminated windblown dust on-site workers,
 adjacent off-site workers, and adjacent residents
 489 Dermal contact with contaminated surface water runoff on-site workers, adjacent off-
- 491 **2.7. Regulatory Framework**

site workers, and adjacent residents

490

In 2009, BNSF Railway entered into Agreed Order 6453 with the Washington State Department of Ecology under the MTCA. Work to be performed under the Agreed Order includes: (1) project planning including a RI Work Plan, Interim Action Work Plan, Sampling and Analysis Plan, and a Health and Safety Plan; (2) complete RI field activities based on the Ecology approved Work Plan; (3) complete a Feasibility Study (FS) based on the RI results; and (4) prepare RI and FS reports for submittal to Ecology. Interim actions are being implemented pursuant to the Agreed Order and the approved Interim Action Work Plan.

499 3.0 DEVELOPMENT OF CLEANUP STANDARDS

500 Cleanup standards consist of: (1) cleanup levels that are protective of human health and the 501 environment; and (2) the point of compliance at which the cleanup levels must be met. Preliminary 502 cleanup standards are developed in this RI. Proposed cleanup standards for remedial alternative 503 evaluation are presented in the FS, and serve as the basis for developing media-specific objectives 504 for the cleanup action. Final cleanup standards for the Site will be established in the Cleanup 505 Action Plan to be prepared following completion of the FS.

506 3.1. Cleanup Levels

In accordance with MTCA, development of preliminary cleanup levels includes identifying potential
 exposure pathways for human and environmental impacts based on planned land use. The Site is
 currently zoned industrial and future zoning is not anticipated to change. As discussed previously,
 the site is part of an active rail yard that will remain in service.

511 **3.1.1.Soil**

512 Access to the property is currently restricted to BNSF employees and their authorized contractors. 513 Based on current and likely future zoning and Site use, preliminary soil cleanup levels will be based 514 on industrial land use. Therefore, preliminary cleanup levels were developed using MTCA Method A 515 Industrial and Method C cleanup levels. During the FS, cleanup levels based on protection of 516 groundwater and/or risk-based remediation levels for specific land uses and associated 517 institutional controls might be considered a component of cleanup alternative development and 518 evaluation. Preliminary soil cleanup levels based on protection of groundwater are presented in 519 Table 2.

- 520 Preliminary cleanup levels were selected from the following regulatory criteria:
- 521 MTCA Method A Soil Cleanup Levels Industrial Land Use

522 MTCA Method C Soil Cleanup Levels – Soil Direct Contact/Ingestion

In addition to the criteria listed above, Washington State soil background concentrations for metals
(Ecology, 1994) and method reporting limits were considered in accordance with WAC 173340-709, WAC 173-340-705(6), and WAC 173-340-707.

526 In general, the lowest applicable soil criteria were identified as the preliminary soil cleanup levels.527 The following exceptions were considered:

Background: If the lowest regulatory criterion is less than the background concentration, the
 preliminary soil cleanup level was set at the background concentration.

Method Reporting Limit: If the lowest regulatory criterion is less than the method reporting limit, the preliminary soil cleanup level was set at the method reporting limit unless the method reporting limit is less than the background concentration. In that case, the preliminary soil cleanup level was set at the background concentration. Method reporting limits are included in Table 2 for site COPCs.

535 BNSF plans to continue using the Site as an active rail yard indefinitely. It is unlikely that the 536 COPCs detected in soil will pose an unacceptable risk to terrestrial ecological receptors because of 537 the industrial nature of the Site and lack of habitat. A *Terrestrial Ecological Evaluation Process-*538 *Simplified Evaluation Documentation Form* (TEE), (Ecology, 2008) was completed during 539 preparation of the RI/FS Work Plan and is summarized in Section 3.1.3 of this report. Based on 540 the results of the simplified TEE, there are no expected impacts to wildlife at the site.

541 **3.1.2. Groundwater**

542 Preliminary groundwater cleanup levels were selected from MTCA Method A Cleanup Levels 543 Groundwater WAC 173-340-720(3) and Chapter 173-340 WAC Table 720-1.

In addition to the criteria listed above, Washington State groundwater background concentrations
and method reporting limits were considered in accordance with WAC 173-340-709 and
WAC 173-340-705(6), and WAC 173-340-707.

- 547 The following exceptions were considered:
- 548 Background: If the lowest published regulatory criterion is less than the background
 549 concentration, the preliminary groundwater cleanup level was set at the background
 550 concentration.
- Method Reporting Limit: If the lowest published regulatory criterion is less than the method reporting limit, the preliminary groundwater cleanup level was set at the method reporting limit, unless the method reporting limit is less than the background concentration. In that case, the preliminary groundwater cleanup level was set at the background concentration.
- 555 Preliminary cleanup levels for groundwater are shown in Table 3.

556 **3.1.3. Terrestrial Ecological Evaluation**

557 BNSF plans to continue using the Site as an active rail yard indefinitely. Based on the industrial 558 nature of the Site and the lack of habitat, it is unlikely that the COPCs detected in soil will pose an 559 unacceptable risk to terrestrial ecological receptors. Based on WAC 173-340-7491, the site does 560 not meet the criteria for a terrestrial ecological evaluation (TEE) exclusion. A review was performed 561 of the TEE forms [Terrestrial Ecological Evaluation Process - Primary Exclusions Documentation 562 Form and Terrestrial Ecological Evaluation Process-Simplified Evaluation Documentation Form, 563 (Ecology, 2008)]. Based on that review, a simplified TEE was completed for the Site consistent 564 with the criteria in WAC 173-340-7492(2)(a)(ii): land use at the Site and surrounding area makes 565 substantial wildlife exposure unlikely based on completion of Table 749-1. The following values 566 were used in Table 749-1 to complete the simplified TEE:

- Box 1 (Area Size): 4 points for 0.25 acres or less of undeveloped land The Site is an active railyard surrounded by other developed properties. The entire Site is developed and used for railroad-related activities.
- 570 2. Box 2 (Site Use): 3 points for industrial site The Site is an active railyard.
- Box 3 (Habitat Quality): 3 points for low habitat quality There is minimal plant life and heavy
 industrial human activity disturbs the entire Site. There are no habitat areas surrounding the
 Site.
- Box 4 (Wildlife Attraction): 2 points for low potential for the property to attract wildlife There is
 no undeveloped land on the Site to attract wildlife.
- 576 5. Box 5 (Contaminants Present): 1 point, releases have been documented at the Site.
- 6. Box 6 Summary of above scores in Boxes 2 through 5: 9 points If the Box 6 total is greater
 than the Box 1 value, the simplified TEE is complete.
- 3.2. Based on the results of the simplified TEE, there are no expected impacts to wildlife at
 the Site. Points of Compliance

581 Under MTCA, the point of compliance is the point or location on a site where the cleanup levels 582 must be attained. The points of compliance for affected media will be approved by Ecology and 583 presented in the site-wide CAP. However, it is necessary to identify proposed points of compliance 584 to develop and evaluate the effectiveness of cleanup action alternatives in the FS. This section 585 describes the proposed points of compliance for soil and groundwater.

586 **3.2.1.Soil**

587 The standard point of compliance for preliminary soil cleanup levels based on protection of 588 humans from direct contact shown in Table 2 will be throughout the soil column from the ground 589 surface to 15 feet, in accordance with WAC 173-340-740(6)(d) and WAC 173-340-7490(4)(b). The 590 standard point of compliance for preliminary soil cleanup levels based on protection of 591 groundwater shown in Table 2 will be throughout the soil column [WAC 173-340-740(6)(b)]. For 592 potential terrestrial ecological exposures, MTCA regulations allow a conditional point of compliance 593 to be established from the ground surface to 6 feet (the biologically active zone according to MTCA 594 default assumptions), provided institutional controls are used to prevent excavation of deeper soil 595 [WAC 173-340-7490(4)(a)]. Accordingly, in areas of the Site where potential ecological exposures 596 are a concern, and where appropriate institutional controls can be implemented, a conditional 597 point of compliance for soil concentrations protective of terrestrial ecological receptors may be 598 proposed throughout the soil column from the ground surface to 6 feet. For cleanup actions that involve containment of hazardous substances, soil cleanup levels will typically not be met insidecontainment area(s) [WAC 173-340-740(6)(f)].

601 **3.2.2. Groundwater**

The standard point of compliance for preliminary groundwater cleanup levels shown in Table 3 will be all groundwater at the Site from the top of the saturated zone to the lowest depth which could be affected by the site {WAD173-340-720(8)(b)}.

605 4.0 SOIL INVESTIGATIONS AND RESULTS

606 This section presents a description of the RI activities associated with the soil conducted at the 607 Site and the physical and chemical characterizations of the soil. A summary of previous 608 investigations for Site soil also are presented in this section. Refer to the RI/FS Work Plan for more 609 detailed descriptions of previous investigations. Logs of the explorations and descriptions of the 610 remedial investigation field methods are presented in Appendix A. A summary of explorations 611 completed as part of the RI is presented in Tables 4 and A-1. Note borings DP-6 and DP-31 were 612 not completed because of surface infrastructure conflicts and/or underground utility conflicts. Summary tables of the soil chemical analytical results are presented in Appendix B. Laboratory 613 614 analytical reports are provided on CD in Appendix D.

615 4.1. Soil Investigation Activities

616 4.1.1. General

Soil investigation activities were completed at the Site from December 3, 2009 through 617 February 25, 2010 as part of Phase I of the RI to address data gaps described in the RI/FS Work 618 619 Plan. The soil investigation consisted of a series of drilled and direct push borings and test pits and the installation of two groundwater monitoring wells. Phase II of the RI included completing 620 621 three hand auger borings to a depth of approximately $1\frac{1}{2}$ feet in the WFE Generator Storage Area. 622 The locations of the explorations are shown in Figures 3 through 9. The following sections describe 623 soil sampling RI activities as well as previous soil investigation activities. Refer to the RI/FS Work 624 Plan for a comprehensive summary of previous investigations completed at the Site. Note the 625 depths that samples were obtained from the borings and the depths at which the soils 626 encountered change, were normalized to 100 percent recovery. Refer to Appendix A for discussion 627 of methods used to normalize the depths during exploration.

628 4.1.2. Former Koch Materials Lease Area

629 4.1.2.1. SUMMARY OF PREVIOUS INVESTIGATIONS

According to reports prepared by SCS Engineers (1989) and (1990) an area of total petroleum hydrocarbon (TPH) and PAH contamination was discovered in soil samples from 10 shallow test pits excavated at the former Koch facility. However, the vertical extent of the TPH and PAH contamination was not determined.

634 4.1.2.2. 2009/2010 INVESTIGATIONS

The RI data objective at the Former Koch Materials Lease Area was to characterize the vertical and
lateral extent of TPH and PAH soil contamination that had not been delineated by previous
investigations In addition to TPH and PAH, COPCs included DRPH and metals. The data objective

- 638 was accomplished by excavating eight test pits (GTP-46 through GTP-53) at the approximate test
- 639 pit locations shown in Figure 3. Test pits were excavated to depths from 11 to 15 feet below the
- 640 ground surface. Sample screening and collection were completed in accordance with the Sampling
- and Analyses Plan (SAP), Appendix B, of the RI/FS Work Plan. Up to three samples were obtained
- from each test pit based on field observations and screening. Select samples obtained from the
- 643 explorations with moderate sheen or headspace vapor detection of 10 ppm or greater were
- 644 submitted for chemical analyses. Refer to Appendix A for description of field screening methods.

645 **4.1.3.** Diesel Shop and Materials Storage Building

646 4.1.3.1. SUMMARY OF PREVIOUS INVESTIGATIONS

A remedial excavation was conducted to remove diesel-contaminated soil between the Diesel Shop
 and the Materials Storage Building. Confirmation samples obtained from the base (6 feet bgs) and
 west sidewall of the excavation indicated the presence of diesel-contaminated soil at
 concentrations exceeding MTCA Method A cleanup levels (Olympus Environmental Services, 1999).

Four borings were completed between the Diesel Shop and the Materials Storage Building along the north side of the Diesel Shop. DRPH and ORPH were detected in only one boring at concentrations less than cleanup levels. DRPH, ORPH and BETX were not detected in soil samples from the remaining three borings (Remediation Technologies, Inc., 2003).

Previous remediation activities, including subsequent overexcavation and confirmation sampling at the Material Storage Building, included excavation, transport and disposal of petroleumcontaminated soil removed from a rail bed south of the Materials Storage Building (Olympus Environmental Services, 1999). Confirmation sampling indicated contamination levels less than MTCA Method A Cleanup levels.

660 4.1.3.2. 2009/2010 INVESTIGATIONS

661 The RI data objective at the Diesel Shop and Materials Storage Building areas was to: 662 (1) characterize the nature and extent of staining observed along the tracks south of the Materials 663 Storage Building; (2) contamination remaining from previous remedial investigation between the 664 Diesel Shop and the Materials Storage Building; and (3) staining observed west of the Diesel Shop. 665 COPCs included DRPH, ORPH, BETX, metals and PAHs.

Eleven borings (DP-1, DP-1A, DP-2 through DP-5 and DP-7 through DP-11) were drilled along the tracks south of the Materials Building; six borings west of the Diesel Shop (DP-24 through DP-29); and one boring (DP-30) in the former remedial excavation area between the Diesel Shop and Materials Storage Building. Borings were completed to depths of 15 to 16 feet, and approximate locations of the explorations are shown in Figure 4. Additional borings were not completed in the former remedial excavation area because of space limitations and the presence of railroad tracks.

672 **4.1.4. Western Fruit Express (Generator Storage Area)**

673 4.1.4.1. SUMMARY OF PREVIOUS INVESTIGATIONS

A previous evaluation conducted by Retec in 2001 in the generator storage and portable fuel tank

- 675 storage area presents evidence that potential releases occurred in the WFE oil/water separator
- and generator storage areas (Retec, 2001). Details of previous evaluations completed at the WFE
- 677 facility are provided in the RI/FS Work Plan.

678 4.1.4.2. 2009/2010 INVESTIGATIONS

The RI data objective at the Western Fruit Express Facility included characterizing the nature and extent of staining observed near the generator storage area, the former portable storage tanks area and to confirm the presence of a release from an oil/water separator located near the wash bay. COPCs included DRPH, ORPH, metals, PCBs, VOCs and PAHs.

683 Five test pits, (GTP-32 through GTP-35 and GTP-35B), were excavated near the generator and 684 former portable 250-gallon waste oil tank storage area, and Boring DP-12 was completed inside a 685 wash bay near the former oil/water separator. Three hand auger borings, GTP-56 through GTP-58, 686 were excavated at the west end of the generator storage area, after receipt of analytical results 687 from the initial test pits to better define the lateral limits of metals contamination in soil. The 688 locations of the five initial test pits, which were excavated to depths from 4 to 8 feet, are shown in 689 Figure 5. The three additional explorations, GTP-56 through GTP-58, were completed using hand 690 equipment to maximum depths of only about 11/2 feet, because analytical data from samples obtained below a depth of 2 feet in the initial test pits were non-detect for the COPCs. The hand 691 692 auger borings were completed through the shallow fill soil into the native gravel. The direct push boring, completed within the wash bay, was advanced to a depth of 12 feet. 693

694 4.1.5. Dismantling Spur and East and West Debris and Soil Deposit Areas

695 4.1.5.1. SUMMARY OF PREVIOUS INVESTIGATIONS

PCB-contaminated soil was excavated from an area southeast of the WFE Maintenance Facility and
 stockpiled north of the dismantling spur prior to removal from the site. Reportedly, no previous
 investigations were completed specific to the dismantling spur area.

Previous investigations were conducted by ThermoRetec in 1999; Foss Environmental Services Company on April 22, 2003; and GeoEngineers, Inc. on October 17, 2006 in the debris and soil deposit areas. These investigations yielded detections of ORPH, DRPH and metals. The sources and vertical and lateral and extent of the contamination in the debris and soil deposit areas were delineated.

704 4.1.5.2. 2009/2010 INVESTIGATIONS

The RI data objective near the dismantling spur primarily was to characterize possible impacts of PCB in soil stockpiled in the area prior to removal from the site. Explorations also were conducted to augment existing data for the east and west debris and soil deposit areas. COPCs included DRPH, ORPH, PCBs and metals.

Eight test pits, (GTP-36, GTP-36A, GTP-36B and GTP-37 through GPT-40), were completed to
depths from 7½ to 11 feet and are approximately shown in Figure 6.

711 4.1.6. Yardley Office (Main Line Track No. 1) Area

712 4.1.6.1. SUMMARY OF PREVIOUS INVESTIGATIONS

According to a previous investigation conducted by Retec in 2001, diesel was released from a locomotive on Main Line Track No.1 near the Havana Street crossing on November 27, 2000. The

release reportedly was caused by a broken fuel injection line. The volume of the release was not

stated in the report and only minor cleanup was performed on the spill. No further assessments

717 were completed (Retec, 2001).



718 4.1.6.2. 2009/2010 INVESTIGATIONS

The RI data objective near the Yardley Office (Main Line Track No. 1) was to characterize the nature and extent of soil impacted by a fuel release along the Main Line Track No. 1. COPCs included

721 DRPH, ORPH and metals.

Eleven borings, DP-13 through DP-23, were drilled along alternating sides of Main Line Track No. 1 between Havana Street and the first signal post crossing east of Havana Street, near the BNSF Yardley Office (Main Line Track No. 1). Borings were located within 5 feet of the track and completed to a depth of 15 feet with the exception of DP-22, which encountered refusal at 8 feet. Further, an additional boring near DP-22 could not be completed because of train traffic. Borings were continuously sampled, and select samples were submitted for chemical analyses based on field observations and screening. Boring locations approximately are shown in Figure 7.

729 4.1.7. Ralston Lead Track

730 4.1.7.1. SUMMARY OF PREVIOUS INVESTIGATIONS

In 2009, during excavation of soil contaminated by a small motor spill, petroleum-contaminated
soil was discovered beneath the Ralston Lead Track. The contamination appeared to be old
because only native soil beneath the track was affected; overlying ballast was not contaminated.
An assessment was not completed and remedial activities associated with the contamination were
not pursued.

736 4.1.7.2. 2009/2010 INVESTIGATIONS

The RI data objective at the Ralston Lead Track area was to characterize the location, nature, and
 extent of historic contamination along an approximately 300-foot-long section of the track. COPCs
 included DRPH, ORPH, metals, VOCs and PAHs.

Six borings (DP-41 through DP-44, and DP44A and DP-44B) were completed along the north side of
the Ralston Lead track, approximately as shown in Figure 8. The borings were completed to depths
of 15 feet using sonic drilling and continuous sampling methods. Select samples obtained from
the explorations with moderate sheen or head space vapor detection of 10 ppm or greater were

submitted for chemical analyses. Refer to Appendix A for description of screening methods.

745 4.1.8.TTX Facility

746 4.1.8.1. SUMMARY OF PREVIOUS INVESTIGATIONS

Personal Communication with Ray Wilson, NRC Environmental, on February 27, 2009 indicates
several hundred gallons of oil reportedly were spilled between two trailers. Contaminated soil was
excavated and replaced with clean gravel; no previous assessments have been completed in this
area.

751 4.1.8.2. 2009/2010 INVESTIGATIONS

The RI data objective at the TTX facility was to collect confirmation samples to verify the
 effectiveness of a previous remediation that involved the removal of contaminated soil associated
 with an oil release between the two trailers. COPCs included ORPH and metals.

Boring DP-45 was drilled to a depth of 16 feet using direct-push and continuous sampling methods
between two supply trailers, approximately as shown in Figure 9. Select samples were submitted
for chemical analyses.

758 **4.1.9.** Former Building Labeled "Paint"

759 4.1.9.1. SUMMARY OF PREVIOUS INVESTIGATIONS

The labeling on the historic site plan suggests the potential use of paints and solvents at a former
 building at this location. During development of the RI/FS Work Plan, no documentation was found
 regarding potential assessments in this area.

763 4.1.9.2. 2009/2010 INVESTIGATIONS

The RI data objective at the location of the former "paint" building was to evaluate the area for
potential soil contamination possibly associated with paint storage or operations. COPCs included
VOCs and lead.

Boring DP-54 was completed near the former building location, approximately as shown in
 Figure 3. The boring was drilled to a depth of 15 feet using sonic drilling and continuous sampling
 methods. Select samples were submitted for chemical analyses based on field observations and
 screening.

771 **4.1.10.** Former Gasoline Storage Tank

772 4.1.10.1. SUMMARY OF PREVIOUS INVESTIGATIONS

- A historic site plan indicates a former gasoline storage tank located near the 90-day storage area.
- No other historic documentation was found during development of the RI/FS Work Plan regarding
- details of this storage tank or information regarding potential assessments in this area.

776 4.1.10.2. 2009/2010 INVESTIGATIONS

The RI data objective at the location of the former gasoline storage tank was to evaluate potentialsoil contamination near the former storage tank site. COPCs included GRPH, TPH and lead.

779 Test pit GTP-55 was excavated near the former gasoline storage tank location, approximately as 780 shown in Figure 4. The test pit was completed to a depth of 9 feet. Samples were obtained from 781 the test pit based on field observations and screening, and select samples were submitted for 782 chemical analyses.

783 4.2. Soil Investigation Results

784 **4.2.1.** Former Koch Materials Lease Area

785 4.2.1.1. PHYSICAL CHARACTERIZATION

786 Subsurface conditions were evaluated by excavating eight test pits to a maximum depth of 15 feet 787 below the ground surface. Subsurface conditions encountered at the locations of test pits GTP-46 788 through GTP-53 can be characterized into two general units including: (1) fill; and (2) gravel. Fill 789 was encountered at depths from 11/2 to 5 feet and consisted of black to dark brown gravel with 790 sand and variable debris including fragments of tar/asphalt and brick. The fill is underlain by a 791 native gravel unit generally consisting of brown gravel with variable sand and silt content, and 792 occasional cobbles and boulders. Each of the test pits was completed within the gravel unit. In 793 general, soil staining observed within the test pits was contained within the fill unit.

794 4.2.1.2. CHEMICAL CHARACTERIZATION

Select samples obtained from test pits GTP-46 though GTP-53 were submitted for chemicalanalysis of ORPH, DRPH, PAHs, and RCRA metals. In addition, after field screening, three samples



obtained from GTP-46 were submitted for chemical analysis of BETX. At least two soil samples
from each test pit were submitted for chemical analysis, one from stained near-surface soil
obtained at a depth of 1 to 2 feet, and samples within native soil at a depth of approximately 3 to 7
feet. Samples obtained at a depth of approximately 11 feet from test pits GTP-46 and GTP-47 also
were submitted for chemical analysis.

Chemical data for soil samples obtained within the Koch Materials Lease Area were compared to preliminary soil cleanup levels to assess the nature and extent of soil contamination. Analytical results indicate that BETX were not detected in the Koch Asphalt Lease Area soil at concentrations exceeding preliminary cleanup levels. ORPH, DRPH, arsenic cadmium and PAHs were detected at concentrations exceeding preliminary cleanup levels from depths of 2 feet or less; concentrations are shown in Table 5 and in Figure 3.

808 TABLE 5. SOIL ANALYTICAL EXCEEDANCE SUMMARY - KOCH ASPHALT LEASE AREA

				TPH (n	ng/kg)	Metals	(mg/kg)	PAHs (mg/kg)
Location ID	Sample ID	Sample Date	Sample Depth	Diesel-range Petroleum Hydrocarbons	Oil-range Petroleum Hydrocarbons	Arsenic	Cadmium	CPAH TEQ
MTCA Me	thod A Ind	ustrial Clear	nup Level	2,000	2,000	20	2	2
GTP-46	GTP46-1	12/21/09	1	<mark>4,120</mark>	<mark>6,940</mark>	6.6	1.2	<mark>4.88</mark>
GTP-47	GTP47-1	12/22/09	1	467	<mark>2,130</mark>	4.9	0.2	0.658
GTP-49	GTP49-1	12/21/09	1	55.4	347	<mark>26.4</mark>	<mark>3.3</mark>	1.030

809 Notes

810 TPH = total petroleum hydrocarbons;

811 mg/kg = milligram per kilogram

812 Bolding indicates detected greater than the method reporting limit (MDL)

813 Shading indicates detected exceeding Method A Industrial cleanup level

814 4.2.2. Diesel Shop and Materials Storage Building

815 4.2.2.1. PHYSICAL CHARACTERIZATION

816 Subsurface conditions were evaluated by drilling 11 borings using sonic and direct push drilling 817 methods to a maximum depth of 16 feet below the ground surface. Subsurface conditions at the 818 locations of borings DP-1, DP-1A, DP-2 through DP-5 and DP-7 through DP-11 and DP-24 through 819 DP-29 and DP-30 consisted of two general units including: (1) fill; and (2) sand and gravel. Fill was 820 encountered at depths ranging from ¹/₂ to 3 feet and consisted of black to dark brown gravel with 821 variable sand content (railroad ballast). With the exception of DP-4, DP-7 and DP-8, the fill overlies 822 alternating layers of sand and gravel with variable silt and clay content. In DP-4 a layer of sand was 823 encountered between 9¹/₂ feet and the completion of the boring at 15 feet depth. In DP-7 and DP-824 8, a zone of well-graded gravel was encountered between 6 feet and the completion of the borings 825 at 15 feet depth. Each boring was completed in the sand and gravel unit. In general, the darker, 826 black to dark brown, soil terminated at about 31/2 feet.

827 4.2.2.2. CHEMICAL CHARACTERIZATION

Select samples obtained from borings DP-1, DP-1A, DP-2 through DP-5, DP-7 through DP-11 and
 DP-24 through DP-29 were submitted for chemical analysis of ORPH, DRPH, PAHs, metals and

830 BETX. After field observations and screening, one to three samples from each boring were 831 submitted for chemical analysis. In general, a near-surface sample was obtained from each boring, 832 within approximately 4 feet of the ground surface, and subsequent samples obtained below depths 833 of 4 feet. In boring MW-23, a deep sample obtained at approximately 60 feet was the only sample 834 that met the field screening criteria; that sample was submitted for chemical analysis of DRPH, 835 ORPH, metals, PCBs, VOCs and PAHs.

Chemical data for soil samples obtained within the Diesel Shop and Material Storage Building Area were compared to the preliminary soil cleanup levels to assess the nature and extent of contamination. Analytical results indicate that metals were not detected in the Diesel Shop and Materials Storage Building Areas at levels exceeding preliminary cleanup levels. ORPH, DRPH and naphthalene and CPAHs were detected at depths of 4 feet or less at concentrations exceeding preliminary cleanup levels as shown in Table 6 and in Figure 4.

TABLE 6. SOIL ANALYTICAL EXCEEDANCE SUMMARY - DIESEL SHOP AND MATERIALS STORAGE BUILDING AREA

				TPH (n	ng/kg)	PAHs (mg/kg)	PAH (mg/kg)
Location ID	Sample ID	Sample Date	Sample Depth	Diesel-range Petroleum Hydrocarbons	Oil-range Petroleum Hydrocarbons	Naphthalene	CPAH TEQ
MTCA Method A Industrial Cleanup Level				2,000	2,000	5	2
DP-2	DP02-1-2	12/14/09	1.5 - 3	<mark>3,950</mark>	<mark>2,330</mark>	2.61	0.228
DP-3	DP03-1.5-2	12/14/09	1.5 - 2	<mark>12,800</mark>	<mark>10,600</mark>	<mark>34.5</mark>	0.542
DP-7	DP07-2-2.7	12/14/09	3-4	<mark>4,630</mark>	<mark>10,200</mark>	<mark>5.4</mark>	0.423
DP-8	DP08-1.6-2.4	12/14/09	2.1 - 3.2	968	<mark>4,570</mark>	0.714	0.459
DP-9	DP-9-1-2	12/14/09	1-2	519	1,700	0.568	<mark>2.524</mark>

- 844 Notes
- 845 TPH = total petroleum hydrocarbons
- 846 PAHs = polycyclic aromatic hydrocarbons
- 847 mg/kg = milligram per kilogram
- 848 Bolding indicates detected greater than the method reporting limit (MDL)
- 849 Shading indicates detected exceeding Method A Industrial cleanup level

4.2.3. Western Fruit Express (Generator Storage Area)

851 4.2.3.1. PHYSICAL CHARACTERIZATION

852 Subsurface conditions were evaluated by excavating five test pits, drilling one direct push boring and completing three hand augers to maximum depths of 8, 12 and 1¹/₂ feet, respectively. Similar 853 854 subsurface conditions were observed at the locations of test pits GTP-32 through GTP-35 and 855 GTP-35B, boring DP-12 and hand auger borings GTP-56 through GTP-58. Soil units consisted of three general units including: (1) fill; (2) silty gravel; and (3) gravel. The fill unit was consistently 856 857 encountered to approximately 2 feet in the test pits and thinned to about $1\frac{1}{2}$ feet toward the west 858 as evidenced by hand auger borings GTP-56 through GTP-58 and consisted of black silty sand and 859 silty gravel intermixed with wood, brick, clay tiles and metal debris. The silty gravel unit was



860 encountered from about 2 to 4 feet, and the gravel unit was encountered from about 4 feet to the861 completion of the test pits and hand auger borings.

862 4.2.3.2. CHEMICAL CHARACTERIZATION

Select samples obtained from test pits GTP-32 through GTP-35 and GTP-35B, direct push boring DP-12 and hand auger borings GTP-56 through GTP-58 were submitted for chemical analysis of DRPH, ORPH, PAHs, PCBs, metals and VOCs. At least two samples from each test pit and boring were submitted for chemical analysis, with the exception of GTP-56 through GTP-58. Only one sample was submitted from each of these shallow hand auger borings. In general, a sample was submitted from the stained near-surface soil obtained at a depth of 1 to 2 feet, and a second sample was obtained in the native soil below a depth of approximately 2 feet.

Chemical data for soil samples obtained within the Western Fruit Express (generator storage area) were compared to preliminary soil cleanup levels to assess the nature and extent of soil contamination. Analytical results indicate that DRPH, ORPH, PAHs, PCBs and VOCs were not detected in the generator storage area at concentrations exceeding preliminary cleanup levels. Metals consisting of Arsenic, Cadmium, Lead and mercury were detected at depths of 4 feet or less at concentrations exceeding preliminary cleanup levels.

876 TABLE 7. SOIL ANALYTICAL EXCEEDANCE SUMMARY - WESTERN FRUIT EXPRESS (GENERATOR 877 STORAGE AREA)

		Sample	Sample		Meta	ls (mg/kg)	
Location ID	Sample ID	Date	Depth	Arsenic	Lead	Mercury	Cadmium
MTCA Method A	A Industrial Cleanu	ıp Level		20	1,000	2	2
GTP-32	GTP32-1-2	1/4/10	1-2	<mark>98.9</mark>	<mark>34,700</mark>	0.3	<mark>9.0</mark>
GTP-33	GTP33-1-2	1/4/10	1-2	8.5	<mark>1,690</mark>	0.11	<mark>2.4</mark>
GTP-34	GTP34-1-2	1/4/10	1-2	<mark>95.2</mark>	<mark>44,200</mark>	0.71	<mark>6.7</mark>
GTP-35	GTP35-1-2	1/4/10	1-2	<mark>204</mark>	<mark>48,200</mark>	<mark>6.1</mark>	<mark>653</mark>
GTP-35B	GTP35B-1.5	1/4/10	1.5	13.2	<mark>3,100</mark>	0.16	<mark>3.3</mark>
DP-12	DP-12-Q5-1.25	1/19/10	0.5-1.25	9.9	225	0.1	<mark>7.3</mark>

878 Notes

879 mg/kg = milligram per kilogram

880 Bolding indicates detected greater than the method reporting limit (MDL)

881 Shading indicates detected exceeding Method A Industrial cleanup level

882 4.2.4. Dismantling Spur and East and West Debris and Soil Deposit Areas

883 4.2.4.1. PHYSICAL CHARACTERIZATION

884 Subsurface conditions were evaluated by excavating eight test pits to a maximum depth of 11 feet 885 below the ground surface. Subsurface conditions at the locations of test pits GTP-36, GTP-36A, 886 GTP-36B and GTP-37 through GPT-40 can be characterized into two general units including: (1) 887 fill/debris; and (2) gravel. The fill/debris unit occurred in all of the test pits completed in the 888 dismantling spur/debris and soil deposit area. It was encountered from 11/2 to 9 feet and generally 889 consisted of black to dark brown silt, silty sand, sand and silty gravel intermixed with debris 890 including glass, brick, tile, metal, asphalt, drywall and hose. In test pit GTP-39, approximately 891 2 feet of white sand, interpreted as sandblasting sand, was encountered overlying the fill/debris

unit. Test pit GTP-38 contained approximately 1½ feet of dark brown to black silty gravel; however,
the fill did not include debris. The gravel unit generally consisted of brown gravel with variable silt
and sand content, and occasional cobbles and boulders. All of the test pits were completed to a
maximum depth of 11 feet below the ground surface into the gravel unit with the exception of
GTP-40, which was completed at a depth of approximately 11 feet into a sand layer.

897 4.2.4.2. CHEMICAL CHARACTERIZATION

Select samples obtained from test pits GTP-36, GTP-36A, GTP-36B, GTP-37, GTP-38, GTP-38A,
GTP-39 and GTP-40 were submitted for chemical analysis of DRPH, ORPH, PCBs and metals. At
least two soil samples—one from the fill/debris zone from a depth to approximately 9 feet and one
from the underlying native soil—were submitted for chemical analysis.

902 Chemical data for soil samples obtained within Dismantling Spur and East and West Debris and 903 Soil Deposit Areas were compared to preliminary soil cleanup levels to assess the nature and 904 extent of soil contamination. Analytical results indicate that DRPH, ORPH and PCBs were not 905 detected in the Dismantling Spur and East and West Debris and Soil Deposit Areas soil at 906 concentrations exceeding preliminary cleanup levels. Metals including arsenic, cadmium and lead 907 were detected in the fill/debris, at depths of 9 feet or less, at concentrations exceeding preliminary 908 cleanup levels as shown in Table 8 and in Figure 6.

TABLE 8. SOIL ANALYTICAL EXCEEDANCE SUMMARY - DISMANTLING SPUR AND EAST AND WEST DEBRIS AND SOIL DEPOSIT AREAS

	Sample	Sample	Sample		Metals (mg/kg	()
Location ID	ID	Date	Depth	Arsenic	Lead	Cadmium
MTCA Method A Indus	trial Cleanup L	.evel		20	1,000	2
GTP-36	GTP36-1-2	1/4/10	1-2	<mark>22.9</mark>	<mark>1,120</mark>	<mark>36.8</mark>
GTP-36B	GTP36B-1	2/9/10	1	15.6	494	<mark>4.9</mark>
GTP-37	GTP37-5	12/22/09	5	<mark>91.9</mark>	<mark>3,130</mark>	<mark>39.2</mark>
GTP-38	GTP38-4	12/22/09	4	<mark>30.9</mark>	<mark>1,560</mark>	<mark>12</mark>
GTP-38A	GTP38A-1	2/9/10	1	<mark>25.8</mark>	666	1.9

911 Notes

912 mg/kg = milligram per kilogram

913 Bolding indicates detected greater than the method reporting limit (MDL)

914 Shading indicates detected exceeding Method A Industrial cleanup level

915 4.2.5. Yardley Office (Main Line Track No. 1) Area

916 4.2.5.1. PHYSICAL CHARACTERIZATION

917 Subsurface conditions were evaluated by drilling 11 borings using sonic drilling methods to a 918 maximum depth of 15 feet below the ground surface. Variable subsurface conditions were 919 encountered at the locations of borings DP-13 through DP-23. However, for the purposes of this 920 report, subsurface conditions were characterized into four general units including: (1) gravel fill; (2) 921 clayey gravel fill; (3) gravel; and (4) silty gravel.

All of the borings contained fill consisting of black coarse gravel with variable sand content
 (railroad ballast) from the ground surface to depths from approximately 2¹/₂ to 5 feet. Clayey

- 924 gravel, encountered from $2\frac{1}{2}$ to $4\frac{1}{2}$ feet, consisted of black clayey gravel with variable sand 925 content and occasional cobbles. This fill unit was encountered in all the borings except DP-14 and
- 926 DP-21, which contained poorly-graded and well-graded gravel approximately from 3 to 4 feet.
- 927 A dark brown to brown gravel unit occurred approximately from 2½ to 13 feet. In borings DP-13, 928 DP-18, DP-19 and DP-21 the gravel was encountered to a depth of approximately 15 feet. The 929 gravel unit consisted of alternating layers of dark brown to brown well-graded and silty gravel with 930 occasional zones of poorly-graded gravel and was encountered within all borings except DP-22, 931 which met refusal in a silty sand layer at a depth of approximately 8 feet.
- In borings DP-14, DP-15, DP-16, DP-17, DP-20 and DP-23 the gravel unit overlaid a silty gravel unit
 consisting of gray to grayish brown silty gravel. The lower gravel unit consisted of silty fine to
 coarse gravel with variable sand content and occasional cobbles, and was encountered from 7 to
 15 feet.

936 4.2.5.2. CHEMICAL CHARACTERIZATION

937 Select samples obtained from borings DP-13 through DP-23 were submitted for chemical analysis
938 of DRPH, ORPH and metals. At least two samples were obtained from each boring with the
939 exception of DP-22, in which only one sample was obtained, were submitted for chemical analysis.
940 In general, a sample was submitted from soil obtained at a depth of 4 feet or less, and a second
941 sample obtained below 4 feet.

942 Chemical data for soil samples obtained within the Yardley Office (Main Line Track No. 1) Area 943 were compared to the preliminary soil cleanup levels to assess the nature and extent of 944 contamination in soil. Analytical results indicate that DRPH and ORPH were not detected in the 945 Yardley Office (Main Line Track No. 1) Area at concentrations exceeding preliminary cleanup levels. 946 Metals consisting of arsenic and cadmium were detected at depths of 4 feet or less exceeded 947 preliminary cleanup levels, as shown in Table 9 and in Figure 7.

948TABLE 9. SOIL ANALYTICAL EXCEEDANCE SUMMARY - YARDLEY OFFICE (MAIN LINE TRACK NO. 1)949AREA

		Sample		Metals	(mg/kg)
Location ID	Sample ID	Date	Sample Depth	Arsenic	Cadmium
MTCA Method	A Industrial Cle	anup Level		20	2
DP-15	DP15-1-2	12/28/09	1.4 - 2.7	<mark>21.2</mark>	0.44
DP-21	DP21-1.5-2.5	12/28/09	2 - 3.4	<mark>38.3</mark>	<mark>3.8</mark>
DP-23	DP23-1-2	12/28/09	1.3 - 2.6	<mark>53.9</mark>	<mark>5.2</mark>

- 950 Notes
- 951 mg/kg = milligram per kilogram
- 952 Bolding indicates detected greater than the method reporting limit (MDL)
- 953 Shading indicates detected exceeding Method A Industrial cleanup level

954 4.2.6. Ralston Lead Track

955 4.2.6.1. PHYSICAL CHARACTERIZATION

Subsurface conditions were evaluated by drilling six borings using sonic drilling methods to amaximum depth of 15 feet below the ground surface. Variable subsurface conditions were

958 encountered at the locations of DP-41 through DP-44 and DP-44A and DP-44B. However, for the
959 purposes of this report, subsurface conditions were characterized into three general units
960 including: (1) fill; (2) alternating sand and gravel; and (3) sand.

All of the borings encountered a fill unit consisting of black sand with variable silt and clay content 961 962 from the ground surface to approximately 2 feet. In borings DP-41, DP-43, DP-44, DP-44A and 963 DP-44B, a unit of alternating sand and gravel layers occurs approximately from 2 to 7¹/₂ feet. In 964 boring DP-41, the fill and alternating sand and gravel units are separated by a clayey gravel layer 965 approximately from 1¹/₂ to 3 feet. In borings, DP-41, DP-44, and DP-44A the alternating sand and 966 gravel unit overlies a sand unit consisting of fine sand with gravel and variable silt content. The 967 sand unit was encountered from a depth of approximately 6 to 8 feet, to the completion of the 968 borings at approximately 15 feet.

969 4.2.6.2. CHEMICAL CHARACTERIZATION

970 Select samples obtained from borings DP-41 through DP-44 and DP-44A and DP44B were 971 submitted for chemical analysis of DRPH and ORPH, PAHs, metals and VOCs. At least two soil 972 samples from each boring were submitted for chemical analysis, with the exception of boring 973 DP-44B, in which one sample was submitted. In general, one shallow sample was obtained at a 974 depth of 1 to 4 feet, and a second sample was obtained below a depth of 4 feet.

975 Chemical data for soil samples obtained within the Ralston Lead Track were compared to the 976 preliminary soil cleanup levels to assess the nature and extent of soil contamination. The 977 analytical results indicate that DRPH, ORPH and PAHs were not detected in the Ralston Lead Track 978 area at concentrations exceeding preliminary cleanup levels. Cadmium and Methylene Chloride 979 was detected in samples obtained between the ground surface to a depth of approximately 4 feet 980 in borings DP-43, DP-44, and DP-44A, as shown in Table 10 and Figure 8.

981 TABLE 10. SOIL ANALYTICAL EXCEEDANCE SUMMARY - RALSTON LEAD TRACK

Location ID	Sample ID	Sample Date	Sample Depth	Methylene Chloride	Cadmium
MTCA Method	A Industrial Cle	anup Level		0.02	2
DP-43	DP43-0-1	12/16/09	0 - 1	<mark>0.18</mark>	1.8
DP-44	DP44-0.5-1.5	12/16/09	0.5 - 1.5	<mark>0.0738</mark>	1.4
DP-44A	DP44A-0-1	12/16/09	0-1.7	NA	<mark>2.3</mark>

982 Notes

983 mg/kg = milligram per kilogram

984 NA = not analyzed

985 Bolding indicates detected greater than the method reporting limit (MDL)

986 Shading indicates detected exceeding Method A Industrial cleanup level

987 4.2.7.TTX Facility

988 4.2.7.1. PHYSICAL CHARACTERIZATION

989 Subsurface conditions were evaluated by one boring advanced using direct-push drilling methods 990 to a maximum depth of 16 feet below the ground surface. Subsurface conditions at the location of 991 boring DP-45 generally consisted of fill overlying sand. The upper portion of the fill consisted of 992 light gray gravel with sand and trace silt from ground surface to approximately 2 feet. The lower 993 portion of the fill consisted of black to reddish brown sand with gravel and trace silt from

approximately 2 to 8½ feet. Light gray to brown sand with gravel occurred to the completion of the
boring at 16 feet.

996 4.2.7.2. CHEMICAL CHARACTERIZATION

997 A select sample obtained from boring DP-45 at a depth of 1.7 to 2.7 feet, was submitted for 998 chemical analysis of DRPH, ORPH and metals. Chemical data for the soil sample was compared to 999 preliminary soil cleanup levels to assess the nature and extent of soil contamination. Analytical 1000 results indicate that DRPH, ORPH and metals were not detected in the TTX Facility area at 1001 concentrations exceeding preliminary cleanup levels.

1002 4.2.8. Former Building Labeled "Paint"

1003 4.2.8.1. PHYSICAL CHARACTERIZATION

Subsurface conditions were evaluated by drilling one boring using sonic drilling methods to a maximum depth of 15 feet below the ground surface. Subsurface conditions at the location of boring DP-54 included approximately 3 inches of asphalt concrete overlying fill and clayey gravel. The fill underlying the asphalt consisted of black to dark brownish gray silty and clayey gravel with charcoal and brick fragments, extending to a depth of approximately 3 feet. Brown clayey gravel occurred to the completion of the boring at approximately 15 feet.

1010 4.2.8.2. CHEMICAL CHARACTERIZATION

1011 Select samples obtained from boring DP-54, within the former "paint" building area, were 1012 submitted for chemical analysis of lead and VOCs. Chemical data were compared to the 1013 preliminary soil cleanup levels to assess the nature and extent of soil contamination. Analytical 1014 results indicate that lead and VOCs were not detected at concentrations exceeding preliminary 1015 cleanup levels.

1016 4.2.9. Former Gasoline Storage Tank

1017 4.2.9.1. PHYSICAL CHARACTERIZATION

1018 Subsurface conditions were evaluated by excavating one test pit to a maximum depth of 9 feet 1019 below the ground surface. Subsurface conditions at test pit GTP-55 included approximately 4 feet 1020 of fill overlying gravel. The upper portion of the fill, from the ground surface to approximately $\frac{1}{2}$ 1021 foot, consisted of black gravel including a light yellow powdery material. The lower portion of the 1022 fill, from approximately $\frac{1}{2}$ to 4 feet, consisted of fine to coarse gravel with sand, silt and wood 1023 debris. Fine to coarse gravel with coarse sand and clay was encountered to the completion of the 1024 test pit at 9 feet.

1025 4.2.9.2. CHEMICAL CHARACTERIZATION

1026 Select samples obtained from test pit GTP-55 were submitted for chemical analysis of DRPH, 1027 ORPH, GRPH, BETX and lead. Chemical data for soil samples obtained within the former gasoline 1028 storage tank area were compared to preliminary soil cleanup levels to assess the nature and 1029 extent of contamination in soil. Analytical results indicate that DRPH, ORPH, GRPH, BETX and lead 1030 were not detected at concentrations exceeding preliminary cleanup levels.

1031 **5.0 GROUNDWATER INVESTIGATION AND RESULTS**

1032 This section presents a description of associated groundwater RI activities conducted at the Site.1033 RI data objectives for characterizing groundwater at the Site included:

- **1034** Further characterized the extent of the Fueling Area diesel plume.
- 1035 Provided hydrogeologic information including groundwater depths, elevations and flow1036 direction.
- Evaluated data gaps, including groundwater characterization in areas not previously explored
 during preceding studies.
- **1039** Evaluated groundwater samples for selected COPCs not previously analyzed.
- 1040 Obtained hydraulic conductivity data to calculate site-specific groundwater velocities.

1041 5.1. 2009/2010 Investigations

Data objectives were accomplished by installing two, 2-inch-diameter monitoring wells, MW-22 and
 MW-23 to depths of approximately 75 feet near the Fueling Area. Groundwater samples were
 obtained and submitted to an Ecology-certified laboratory for analysis of DRPH and ORPH,.

Slug tests were completed within four representative site monitoring wells, including the most
upgradient and downgradient wells. Details of hydraulic conductivity testing are provided in
Section 5.4.

1048 5.2. Groundwater Field Parameters MW-22 and MW-23

1049 Groundwater samples were obtained and field parameters measured for MW-22 and MW-23 on 1050 January 21 and 22, 2010, respectively. Depths to groundwater and vapor headspace tests using a 1051 photo-ionization detector (PID) were completed during sample collection. In addition, water quality 1052 parameters including pH, specific conductivity, turbidity, dissolved oxygen, temperature and 1053 oxidation reduction potential were measured. Calculated groundwater elevations are shown in Summary of Groundwater Elevations, Table 11. Results of vapor headspace tests are shown in 1054 1055 Summary of Well/Sample PID Measurements, Table 12, and water quality parameters are provided 1056 in Summary of Groundwater Field Parameters, Table 13.

1057 Dissolved oxygen in MW-23 measured 0.0 mg/l on January 22, 2010. The reason for the low 1058 dissolved oxygen measurements in MW-23 is uncertain. This low reading could be the result of 1059 silting of the well resulting in a stagnant condition.

1060 **5.3. Chemical Characterization**

1061 As shown in Table 14, DRPH and ORPH were not detected above laboratory reporting limits in 1062 groundwater samples obtained from MW-22 and MW-23. However, as indicated in Table 12, PID 1063 measurements in the well space and samples indicated 0.3 ppm and 21.2 ppm, and 0.8 ppm and 1064 0.2 ppm for MW-22 and MW-23, respectively. It is important to note that the PID is used to field 1065 screen samples for potential analytical testing. The PID instrument is subject to error from 1066 calibration, air temperature, air moisture and background vapors. Monitoring wells MW-22 and 1067 MW-23 are located near the fueling area where fuel transfer operations are conducted. It is 1068 possible that the anomalous PID readings discussed in the preceding paragraph are related to

1069 VOC's present in the ambient air during fueling operations. The analytical laboratory testing1070 results, which are the primary basis for interpretation, indicate non-detect for the COC's.

1071 5.4. Hydraulic Conductivity Testing

1072 **5.4.1. Method Selection**

1073 Assessment of the saturated hydraulic conductivity of the shallow aquifer beneath the Parkwater 1074 facility was conducted as a basis for estimating groundwater velocity. A number of techniques for 1075 estimating hydraulic conductivity were considered, including (in order of decreasing complexity) 1076 aquifer testing, slug testing, laboratory permeability testing, and empirical analysis of grain-size 1077 distribution data. In our opinion, in-place hydraulic testing (aquifer or slug testing) provide more 1078 accurate hydraulic conductivity estimates in sand and gravel aquifers than laboratory or empirical 1079 grain-sized based analyses. Aquifer testing (via one or more conventional pumping tests) was not 1080 selected because of the following considerations:

- Limited feasibility of creating sufficient aquifer drawdown within the SVRP Aquifer to allow for
 meaningful data analysis;
- Large volume of potentially contaminated groundwater that would have to be treated and discharged;
- 1085 Large cost in testing infrastructure; and
- 1086 Permitting and associated schedule constraints.

1087 Based on these considerations, slug testing was selected for use. However, the following1088 limitations are inherent to the selected methodology:

- Slug tests provide a point estimate of hydraulic conductivity near the tested well screen (as
 opposed to pumping tests which stress a larger volume of aquifer material);
- 1091 Inadequate well development can cause slug testing to underestimate the hydraulic
 1092 conductivity of the subject aquifer;
- Falling head test data are not valid when water level decrease occurs within the screened
 portion of the well, which was the case for each test location described in this report section;
 and
- 1096 In highly permeable formations (such as the SVRP Aquifer), water level response can be too
 1097 rapid to achieve precise hydraulic conductivity estimates.
- 1098 **5.4.2. Test Methodology**

1099 The saturated hydraulic conductivity of the aquifer beneath the Parkwater facility was estimated by 1100 performing rising-head slug tests in monitoring wells MW-11, MW-17 and MW-22. Although slug 1101 testing was performed in monitoring well MW-20, water level response was too rapid to constrain 1102 with the testing equipment and the associated data are not presented in this report. Testing 1103 locations are presented in Figure 10.

1104 A rising-head slug test is performed by rapidly lowering the water level in a well and measuring the 1105 subsequent rate of water level change as head conditions recover. Lowering the water level is achieved by quickly removing a slug (in this case a sealed PVC pipe filled with impermeablematerial) from the water column.

Water level data were recorded by a pressure transducer and data logger. After slug testing, the
data were downloaded, reduced and analyzed for hydraulic conductivity using a solution derived by
Bouwer and Rice (1976) and updated by Bouwer (1989).

1111 Slug test data are presented for monitoring wells MW-11, MW-17 and MW-22 in Rising Head Test 1112 Plots, Figures 11 through 13. Two to three rising head tests were performed at each test location.

1113 A summary of the inputs and results of the hydraulic conductivity analyses are presented in Rising

1114 Head Test Analyses, Table 15.

1115 **5.4.3. Results**

- 1116 Water level recovery in tested monitoring wells during slug testing was rapid, which is indicative of
- 1117 permeable soil conditions. This observation was substantiated by the hydraulic conductivity
- 1118 analyses, which are summarized in Table 16 below.

1119 TABLE 16. HYDRAULIC CONDUCTIVITY SUMMARY

	Average Hydraulic Conductivity ¹		
Monitoring Well	(feet per day)		
MW-11	2.7 x 10 ²		
MW-17	3.8 x 10 ²		
MW-22	3.5 x 10 ²		

1120 Notes:

1121 1: Hydraulic conductivity estimates represent average result of rising-head slug tests conducted at each location.

Based on the results of the analyses, the saturated hydraulic conductivity of the aquifer near the selected monitoring wells ranges from about 270 feet per day near monitoring well MW-11 to about 380 feet per day near MW-17. These saturated hydraulic conductivity estimates are within a relatively narrow range and on the low end of the range typically reported for the SVRP Aquifer. This could suggest that, because of highly permeable aquifer conditions, slug testing results were impacted by the permeability of the sand pack surrounding the installed well screens.

1128 Nevertheless, these hydraulic conductivity estimates are, on balance, relatively high and generally
1129 indicative of a permeable aquifer that has potential for transport of significant quantities of
1130 groundwater and, consequently, associated soluble groundwater contaminants.

1131 **5.4.4. Groundwater Velocity**

Based on the results and limitations presented above, a literature search was conducted to assess pumping test information associated with previous SVRP Aquifer studies near the facility. Pumping test results were reviewed within the Draft Groundwater Remedial Investigation/Feasibility Study (July 2003) for the Kaiser Trentwood Facility, which is situated above the SVRP Aquifer about 5½ miles east of Parkwater. For the shallow aquifer, this study provided a median horizontal hydraulic conductivity estimate of 2,500 feet per day. This estimate is used in the groundwater flow velocity calculations presented below.



Groundwater flow velocity for the shallow unconsolidated aquifer underlying the site was estimatedusing a standard Darcy's Law-based analysis:

1141
$$V = -(K/n_e) * dh/dl$$
 Equation 1

- 1142 where V = groundwater flow velocity, K = saturated hydraulic conductivity, n_e = effective 1143 porosity of the aquifer material, and dh/dl = hydraulic gradient.
- 1144 The following inputs were assumed:
- A hydraulic conductivity of 2,500 feet per day, based on pumping test information from the
 Kaiser Trentwood Facility;
- An effective porosity of 25 percent, based on typical values for sand and gravel aquifers
 presented in Domenico and Schwartz (1990); and
- A hydraulic gradient of 2.2 x 10⁻³ feet per foot, based on site groundwater elevation information
 collected on January 19, 2010 and submitted under separate cover.
- 1151 Based on these inputs, we estimate the groundwater flow velocity within the shallow 1152 unconsolidated aquifer underlying the Parkwater facility is about 22 feet per day.

1153 6.0 CONCEPTUAL SITE MODEL

1154 This section provides the conceptual model for the Site based on the data presented in this RI 1155 report and additional detail from the Exposure Pathways and Receptors discussed in Section 2.6. 1156 The conceptual site model includes a discussion of the sources of COPCs at the site, the 1157 subsequent potential migration of those hazardous substances in environmental media, and 1158 complete exposure pathways. The model was developed to help direct remediation at the site, 1159 where necessary.

- A complete exposure pathway consists of: (1) an identified contaminant source; (2) a transport pathway to locations (exposure points) where potential receptors might come in contact with COPCs; and (3) an exposure route (e.g., soil ingestion) through which potential receptors might be exposed to COPCs. Exposure pathways deemed to be incomplete need not be considered further.
- 1164 Contamination sources and mechanisms are shown in Conceptual Site Model Figure 14, and 1165 include the following:
- Spills from fueling locomotives and from above ground storage tanks, stockpiling of contaminated soil from remedial excavations, releases of materials transported in open boxcars and leakage from industrial equipment can cause surficial soil contamination.
 Contaminants of concern include petroleum hydrocarbons, metals, VOCs, PCBs, and PAHs.
 Contaminants might be leached and/or transported downwards by infiltrating water towards the water table. Stormwater runoff might transport contaminated soil within and off the site.
 Wind might mobilize dry, contaminated soils and deposit the dust on and off the site.
- 1173 Soil in the Debris and Soil Deposit Area and Western Fruit Express Area is contaminated with 1174 metals. Contaminants might be leached and/or transported downwards towards the water

- table by infiltrating water. Stormwater runoff might transport contaminated soil within and offthe site. Wind might mobilize dry, contaminated soils and deposit the dust on and off the site.
- UST leakage has contaminated subsurface soil with diesel and heavy oil. In some areas,
 contaminants have migrated downward to the water table.
- A plume of diesel-contaminated groundwater is located beneath and downgradient of the fueling area. Groundwater movement has caused the plume to migrate to the west-northwest.
 Based on groundwater analytical data it appears that the diesel plume is shrinking in size.
 However, this interpretation could be related to one or more of the following:
- 1183 Affects of the groundwater treatment system in the fueling area
- 1184 Natural attenuation and/or biodegradation of the plume
- A consequence of changing sampling procedures from disposable bailer to standard low-flow sampling protocol, which provides samples that better reflect aquifer conditions. As such, the initial estimate of the size of the plume might have been exaggerated as it was based on data from bailer sampling
- Contaminated subsurface soil from unknown sources is present on the site. Contaminants
 might be leached and/or transported downwards towards the water table by infiltrating water.
- 1191 As discussed previously in Section 2.5, potential exposure pathways and receptors include:
- 1192 Ecological
- Direct contact with contaminated soil and surface water runoff small mammals, birds, soil biota, plants
- Ingestion of contaminated soil and surface water runoff small mammals and birds
- 1196 1197
- Ingestion of plants or fauna that have ingested or absorbed contaminants from the site

 predatory small mammals and birds
- 1198 🔳 Human
- Dermal contact with contaminated soil during excavation work on-site workers and trespassers
- Dermal contact with contaminated groundwater removed from on-site monitoring wells
 on-site workers
- Dermal contact with and inhalation of contaminated windblown dust on-site workers, adjacent off-site workers, trespassers and adjacent residents
- 1205• Dermal contact with contaminated surface water runoff on-site workers, adjacent off-
site workers, trespassers and adjacent residents
- 1207 6.1. Soil

Site soil consists of multiple layers of fill overlying native sand and gravel (Pleistocene-age flood deposits). Surface soil is predominantly recent gravel and sand fill material (railroad ballast) with occasional mixed wood debris. In the Debris and Soil Deposit Areas the soil is intermixed with other debris including scrap metal, glass and ash. Analytical results indicate virtually all of the COPCs at concentrations detected greater than preliminary cleanup levels occurred within the upper 4 feet of the soil column, with the exception of the Debris and Soil Deposit Area where COPCs were detected up to a depth of approximately 8 feet.

- 1215 The following potential exposure pathways and receptors were previously identified in 1216 Section 2.5.1 for contaminants in Site soil:
- 1217 Contact (dermal, incidental ingestion or inhalation) by visitors, workers (including excavation workers) and potential future residents or other Site users with hazardous substances in soil;
- 1219 Contact (dermal, incidental ingestion or inhalation) by terrestrial wildlife with hazardous
 1220 substances in soil; and
- 1221 Contact by terrestrial plants and soil biota and/or food-web exposure to hazardous substances
 in soil.
- 1223 Constituents detected in the upper 15 feet of soil were evaluated to assess the potential risk to 1224 humans, plants and animals posed by contaminated soil.

1225 6.2. Groundwater

Groundwater contamination associated with the fueling area is contained within the Site. 1226 1227 Groundwater elevations at the site vary as much as 10 feet seasonally, which has created a 1228 contaminated smear zone within the zone of groundwater fluctuation. Based on drilling 1229 observations, contamination within this zone appeared thickest near the source area. During 1230 much of the year, contaminants in the unsaturated portion of the smear zone are above the groundwater table and not readily mobilized. During periods of seasonally high groundwater 1231 1232 conditions, contaminants adsorbed within previously unsaturated soil can transition to a dissolved 1233 state, and migrate downgradient. Observed subsurface conditions below and downgradient of the 1234 service area suggest these processes have occurred at the Site. However, the thickness (vertical 1235 distribution) of the contaminated smear zone appears to decrease with increasing distance from the source area, indicating biodegradation of petroleum hydrocarbons is occurring downgradient of 1236 1237 the source area.

Drinking water is supplied by the City of Spokane. No drinking water wells are located on the Site; therefore, no complete exposure pathway exists for ingestion of contaminated groundwater. The nearest downgradient water supply well is located at 4423 Hutton Street, approximately 0.5 miles northwest of the northwest site boundary, according to the Ecology on-line water well log database.

1242 7.0 LOCATIONS AND MEDIA REQUIRING CLEANUP ACTION EVALUATION IN FEASIBILITY 1243 STUDY

1244 This section identifies the locations and environmental media (soil and groundwater) at the Site 1245 that require evaluation in the FS. Based on the results of this RI the following areas should be 1246 evaluated in the FS: (1) Koch Asphalt Lease Area for DRPH, ORPH, arsenic, cadmium and PAHs, (2) 1247 Diesel Shop and Materials Storage Area for DRPH, ORPH, naphthalene and PAHs; (3) Western Fruit 1248 Express (Generator Storage Area) for arsenic, lead, cadmium and mercury; (4) Dismantling Spur 1249 and East and West Debris and Soil Deposit Areas for arsenic, lead and cadmium; (5) the Yardley 1250 Office (Main Line Track No. 1 Area) for arsenic and cadmium; and 6) the Ralston Lead Track for 1251 methylene chloride and cadmium.

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- 1323 Acronyms
- 1324 ASTs = above ground storage tanks
- 1325 BETX = benzene, ethylbenzene, toluene and xylenes
- 1326 BNSF = BNSF Railway Company
- 1327 COPCS = contaminant of potential concern
- 1328 DRPH = diesel-range petroleum hydrocarbon
- 1329 Ecology = Washington State Department of Ecology
- 1330 FS = Feasibility Study
- 1331 GPS = global positioning system
- 1332 GRPH = gasoline-range petroleum hydrocarbons
- 1333 HI = Heavy Industrial
- 1334 mg/kg = milligrams per kilogram
- 1335 MTCA = Model Toxics Control Act
- 1336 NRCS = Natural Resources Conservation Service
- 1337 ORPH = oil-range petroleum hydrocarbon
- 1338 PAHs = polycyclic aromatic hydrocarbons
- 1339 Qfcg = predominately gravel
- 1340 RI = remedial investigation
- 1341 SAP = Sampling and Analysis Plan
- 1342 SVRP = Spokane Valley Rathdrum Prairie
- 1343 TPH = total petroleum hydrocarbon
- 1344 Unit GgA = Garrison Gravelly Loam
- 1345 USDA = United State Department of Agriculture
- 1346 WAC = Washington Administrative Code
- 1347 VOCs = volatile organic compounds



Summary of Chemical Analytical Results - Diesel Range

Petroleum Hydrocarbons in Groundwater - Pre and Post Groundwater Treatment System Operation BNSF Parkwater Rail Yard Spokane, Washington

		Pre Remedial System	m 11/14/01 - 1/22/09		Post F	Remedial Syste	em 4/29/09 - 1/	′19/10
Well Number	Low (µg/L)	High (µg∕L)	Average (μg/L)	Number of Samples	Low (µg/L)	High (µg∕L)	Average (µg/L)	Number of Samples
MW-1	65 ¹	4,680	618	19	65	65	65	1
MW-2	854	306,000	41,922	15	N/A	N/A	N/A	N/A
MW-3	614	321000	54,190	9	N/A	N/A	N/A	N/A
MW-4	65	409	91	13	65	65	65	5
MW-5	65	1,280	334	12	65	65	65	1
MW-6	65	9,430	2,843	13	65	260	119	5
MW-7	65	6,820	1,134	14	65	65	65	5
MW-8	65	48,100	9,551	13	65	65	65	5
MW-9	65	11,000	2,922	12	65	65	65	5
MW-10	65	524	146	13	65	65	65	5
MW-11	65	65	65	13	65	65	65	5
MW-12	65	65	65	12	65	65	65	5
MW-13	65	65	65	3	65	65	65	1
MW-14	65	16,600	6,674	4	65	267	157	3
MW-15	65	65	65	3	65	65	65	3
MW-16	65	362	139	4	65	65	65	1
MW-17	65	65	65	3	65	65	65	1
MW-18	65	3,820	1,918	3	65	65	65	1
MW-19	65	65	65	3	65	65	65	1
MW-20	65	65	65	3	65	510	213	3
MW-21	65	13,400	4,268	4	65	65	65	3
MW-22	N/A	N/A	N/A	N/A	65	65	65	2
MW-23	N/A	N/A	N/A	N/A	65	65	65	2

Notes:

 1 A detection of 65 µg/L listed in this table represents non-detectable concentration. The method detection limit (MDL) is 130 µg/L for diesel.

For averaging purposes, one-half of the MDL was used to calculate average concentrations.

https://projects.geoengineers.com/sites/0050611712/Final/BNSF RI Report Final Draft/[Table 1 Compilation Pre and Post IA GW Data.xlsx]Compilation Table



Preliminary Soil Cleanup Levels

BNSF Parkwater Facility Remedial Investigation

Spokane Valley, Washington

				Soil Criteria		Analytical L	aboratory Criteria ⁶	
Analytes	Units	Washington State Background ¹	MTCA Method A Industrial Land Use ²	Soil, Method C, Carcinogen, Standard Formula Value, Direct Contact (ingestion only), industrial land use ⁵	Soil, Method C, Non- carcinogen, Standard Formula Value, Direct Contact (ingestion only), industrial land use ⁵	Reporting Limits	Analytical Method	Preliminary Soil Cleanup Level ⁷
Total Petroleum Hydrocarbons								
Diesel-Range ⁴	mg/kg		2,000		-	10	NW-TPH-Dx	2,000
Oil-Range ⁴	mg/kg		2,000			25	NW-TPH-Dx	2,000
Metals								
Cadmium ³	mg/kg	1	2		3500	0.20	6010	2
Arsenic ³	mg/kg	9	20	88	1100	2.50	6010	20
Lead ⁴	mg/kg	15	1000			1.50	6010	1,000
Mercury ³	mg/kg	0	2	-		0.02	EPA 7471	2
Volatile Organic Compounds								
Benzene ³	mg/kg		0.03	2,400	14,000	0.015/0.020	EPA 8260B	0.03
Ethylbenzene ³	mg/kg		6		350,000	0.20/0.10	EPA 8260B	6
Toluene ³	mg/kg	-	7		280,000	0.20/0.10	EPA 8260B	7
Xylenes ³	mg/kg	-	9		700,000	0.60/0.40	EPA 8260B	9
Methylene Chloride ³	mg/kg	- /	0.02		-	0.057	EPA 8260B	0.02
Methyl tert-butyl ether (MTBE) ³	mg/kg		0.1	73,000	3,000,000	0.100	EPA 8260B	0.1
Ethylene Dibromide (EDB) ³	mg/kg		0.005	1.5		0.100	EPA 8260B	0.005
1,2-Dichloroethane (EDC)	mg/kg			1,400	70,000	0.100	EPA 8260B	1,400
Tetrachloroethylene (PCE) ³	mg/kg		0.05	240	35,000	0.100	EPA 8260B	0.05
Trichloroethylene (TCE) ³	mg/kg		0.03	1,500	1,100	0.100	EPA 8260B	0.03
1,1,1-Trichloroethane ³	mg/kg		2		3,200,000	0.100	EPA 8260B	2
Vinyl Chloride	mg/kg			88	11,000	0.100	EPA 8260B	88
Polycyclic Aromatic Hydrocarbons								
Naphthalene ³	mg/kg		5		70,000	0.10	EPA 8270C SIM	5
Benzo(a)anthracene ⁸	mg/kg					0.10	EPA 8270C SIM	2 ⁸

				Soil Criteria		Analytical L	aboratory Criteria ⁶	
Analytes	Units	Washington State Background ¹	MTCA Method A Industrial Land Use ²	Soil, Method C, Carcinogen, Standard Formula Value, Direct Contact (ingestion only), industrial land use ⁵	Soil, Method C, Non- carcinogen, Standard Formula Value, Direct Contact (ingestion only), industrial land use ⁵	Reporting Limits	Analytical Method	Preliminary Soil Cleanup Level ⁷
Benzo(a)pyrene ⁸	mg/kg		2	18		0.10	EPA 8270C SIM	2 ⁸
Benzo(b)fluoranthene ⁸	mg/kg				-	0.10	EPA 8270C SIM	2 ⁸
Benzo(k)fluoranthene ⁸	mg/kg					0.10	EPA 8270C SIM	2 ⁸
Chrysene ⁸	mg/kg					0.10	EPA 8270C SIM	2 ⁸
Dibenz(a,h)anthracene ⁸	mg/kg					0.10	EPA 8270C SIM	2 ⁸
Indeno(1,2,3-cd)pyrene ⁸	mg/kg			-	-	0.10	EPA 8270C SIM	2 ⁸
Total cPAHs (TEF) ³	mg/kg		2	18		0.10	EPA 8270C SIM	2 ³
Polychlorinated Biphenyls								
Total PCBs	mg/kg		10	66		0.1	8082 Low Level	10

Notes:

¹ Natural Background Soil Metals Concentrations in Washington State for Spokane Basin. October 1994.

² MTCA Method A Industrial Soil Cleanup Levels [WAC 173-340-745(3) and Chapter 173-340 WAC Table 745-1].

³ MTCA Method A Industrial Soil Cleanup Levels (WAC 173-340-900 Table 745-1) based on protection of groundwater.

⁴ MTCA Method A Industrial Soil Cleanup Levels (WAC 173-340-900 Table 745-1) based on direct contact.

⁵ MTCA Method C Soil Cleanup Levels; Direct Contact/Ingestion (WAC 173-340-745).

⁶ Reporting limits obtained from Pace.

⁷ Preliminary Soil Cleanup Level is the lowest soil criteria as indicated by shading; adjusted based on Washington State background. Additional adjustments were made based on reporting limits or minimum levels per WAC 173-340-720(7)(c).

⁸ Carcinogenic PAH cleanup level will be based on Toxicity Equivalency Factor (TEF) as described in WAC 173-340-708. The cleanup level for cPAHs is 2 mg/kg.

BOLD indicates value was selected as the Applicable Soil Cleanup Level.

https://projects.geoengineers.com/sites/0050611712/Final/BNSF RI Report Final Draft/[050611712_Table 2.xlsx]T3 Soil PrelimCULs



Preliminary Groundwater Cleanup Levels

BNSF Parkwater Facility Remedial Investigation

Spokane Valley, Washington

		Groundwat	er Criteria		Analytical Laboratory Crit	eria ¹
Analytes	Units	Washington State Groundwater Background Concentrations	Method A Cleanup Levels for Groundwater ²	Reporting Limit	Analytical Method	Preliminary Groundwater Cleanup Level
Petroleum Hydrocarbons						
Diesel Range	µg/L	-	500	250	NW-TPH-Dx	500
Oil Range	µg/L		500	500	NW-TPH-Dx	500
Metals (Total or Dissolved)						
Cadmium	µg/L	2	5	200	EPA 6020/200.8 ICP-MS	5
Arsenic	µg/L		5	200	EPA 6020/200.8 ICP-MS	5
Lead	µg/L	10	15	66.3	EPA 6020/200.8 ICP-MS	15
Volatile Organic Compounds						
Benzene	µg/L	-	5	0.500/0.200	EPA 8260B	5
Toluene	µg/L	-	1000	1.00/1.00	EPA 8260B	1,000
Ethylbenzene	µg/L	-	700	2.00/1.00	EPA 8260B	700
Xylenes	µg/L		1000	1.50/2.00	EPA 8260B	1,000
Methyl tert-butyl ether (MTBE)	µg/L	-	20	1.0	EPA 8260B (5 mL purge)	20
Ethylene Dibromide (EDB)	µg/L		0.01	1.0	EPA 8260B (5 mL purge)	2.0
1,2-Dichloroethane (EDC)	µg/L		5	1.0	EPA 8260B (5 mL purge)	5
Tetrachloroethylene (PCE)	µg/L	-	5	1.0	EPA 8260B (20 mL purge)	5
Trichloroethylene (TCE)	µg/L	_	5	1.0	EPA 8260B (5 mL purge)	5
1,1,1-Trichloroethane	µg/L	-	200	1.0	EPA 8260B (5 mL purge)	200
Vinyl Chloride	µg/L	-	0.2	0.2	EPA 8260B (5 mL purge)	0.2
Polycyclic Aromatic Hydrocarbons	•					
Naphthalene	µg/L		160	0.01	8270C-SIM	160
Benzo(a)anthracene ³	µg/L	-		0.01	8270C-SIM	0
Benzo(a)pyrene ³	µg/L	-	0.1	0.01	8270C-SIM	0.1
Benzo(b)fluoranthene ³	µg/L	-		0.01	8270C-SIM	0
Benzo(k)fluoranthene ³	µg/L	-		0.01	8270C-SIM	0
Chrysene ³	µg/L	-		0.01	8270C-SIM	0
Dibenz(a,h)anthracene ³	µg/L	-		0.01	8270C-SIM	0
Indeno(1,2,3-cd)pyrene ³	µg/L			0.01	8270C-SIM	0



		Groundwat	er Criteria	Analytical Laboratory Criteria ¹					
Analytes	Units	Washington State Groundwater Background Concentrations	Method A Cleanup Levels for Groundwater ²	Reporting Limit	Analytical Method	Preliminary Groundwater Cleanup Level			
Total cPAHs (TEQ)	µg/L		0.1	0.01	8270C-SIM	0.1			
Polychlorinated Biphenyls			-						
Total PCBs	µg/L		0.1		EPA 8081	0.10			

Notes:

¹ Reporting limits obtained from Pace.

² MTCA Method A Groundwater Cleanup Levels [WAC 173-340-720(3) and Chapter 173-340 WAC Table 720-1].

³ Carcinogenic PAH cleanup level will be based on Toxicity Equivalency Factor (TEF) as described in WAC 173-340-708. The cleanup level for cPAHs is 0.1 µg/L.

BOLD indicates value was selected as the Applicable Soil Cleanup Level.

https://projects.geoengineers.com/sites/0050611712/Final/BNSF RI Report Final Draft/[050611712_Table 3.xlsx]T4 GW Prelim CULs



Exploration and Sample Analyses Summary

BNSF Parkwater Facility Remedial Investigation

Spokane Valley, Washington

Area	Explorations (Total Completed)	Exploration Method	Depth or Depth Range (feet bgs)	Contaminants of Concern	Analytical Methods	RI Objectives
Former Koch Asphalt Lease Area	GTP-46 through GTP-53 (8)	Test Pit	11-15	Soil: Diesel, Heavy Oil, Metals, PAHs, BETX	NWTPH-Dx Metals (including Mercury) by 6010/7471 PAHs by 8270C-SIM	Define extent and concentrations of remaining impacted soil exceeding MTCA cleanup levels.
Fueling Area	Monitoring Wells MW-22 and MW-23 (2)	Sonic Boring	75	Soil: Diesel, Heavy Oil, Total Metals, PCBs, VOCs, PAHs Groundwater: Diesel, Heavy Oil, Total Metals, Dissolved Metals, PCBs, VOCs, PAHs	NWTPH-Dx Metals (including Mercury) by 6010/7471 PAHs by 8270C-SIM VOCs by 8260B PCBs by 8082	Augment data to define extent of existing groundwater plume.
Materials Storage Building	DP-1, DP-1A, DP-2 through DP-5 and DP-7 through DP-11 (11)	Sonic Boring	15-16	Soil: Diesel, Heavy Oil, BETX, Metals, PAHs	NWTPH-Dx Metals (including Mercury) by 6010/7471 PAHs by 8270C-SIM VOCs by 8260B	Confirm the presence of diesel release extent and concentrations.
Diesel Shop	DP-30 (1)	Sonic Boring	15	Soil: Diesel, Heavy Oil, BETX, Metals, PAHs	NWTPH-Dx Metals (including Mercury) by 6010/7471 PAHs by 8270C-SIM VOCs by 8260B	Define extent and concentrations of remaining impacted soil exceeding MTCA cleanup levels.
	DP-24 through DP-29 (6)	Sonic Boring	15	Soil: Diesel, Heavy Oil, BETX, Metals, PAHs	NWTPH-Dx Metals (including Mercury) by 6010/7471 PAHs by 8270C-SIM VOCs by 8260B	Define contaminants, concentrations and extents, in area of visible staining.
Western Fruit Express (Generator Storage Area)	GTP32 through GTP-35, GTP-35B and hand augers GTP-56 through GTP-58 (8)	Test Pit and Hand Augers		Soil: Diesel, Heavy Oil, Metals, PCBs, VOC, PAHs	NWTPH-Dx Metals (including Mercury) by 6010/7471 PAHs by 8270C-SIM VOCs by 8260B PCBs by 8082	Define contaminants, concentrations and extent, in area of visible staining and the area historically occupied by portable tanks.
Western Fruit Express (oil/water separator /washbay Area)	DP-12 (1)	Direct Push	12	Soil: Diesel, Heavy Oil, Metals, PCBs, VOC, PAHs	NWTPH-Dx Metals (including Mercury) by 6010/7471 PAHs by 8270C-SIM VOCs by 8260B PCBs by 8082	Evaluate potential release from oil/water separator.
Dismantling Spur and East and West Debris and Soil Deposit Areas	GTP 36, GTP-36A, GTP-36B, GTP-37, GTP-38, GTP-38A, GTP-39 and GTP-40 (8)	Test Pit	10-11	Soil: Diesel, Heavy Oil, Metals, PCBs	NWTPH-Dx Metals (including Mercury) by 6010/7471 PCBs by 8082	Evaluate potential soil impacts from stockpiled contaminated soil and augment data on vertical extent of debris.
Yardley Office	DP-13 through DP-23 (11)	Sonic Boring	15, except DP-22 refused at 8 feet	Soil: Diesel, Heavy Oil, Metals	NWTPH-Dx Metals (including Mercury) by 6010/7471	Confirm the presence of diesel release extents and concentrations.

Area	Explorations (Total Completed)	Exploration Method	Depth or Depth Range (feet bgs)	Contaminants of Concern	Analytical Methods	RI Objectives
	DP-41 through DP-44 and DP-44A and DP-44B (6)	Sonic Boring	15		NWTPH-Dx Metals (including Mercury) by 6010/7471 PAHs by 8270C-SIM VOCs by 8260B	Delineate extents and contaminants of concern for potential impacted soil.
TTX Facility	DP-45 (1)	Direct Push	16	Soil: Diesel, Heavy Oil, Metals	NWTPH-Dx Metals (including Mercury) by 6010/7471	Evaluate former oil spill area for remaining impacted soil.
Former Building Labeled "Paint"	DP-54 (1)	Sonic Boring	15	Soil: VOC, Lead	Metals (including Mercury) by 6010/7471 VOCs by 8260B	Evaluate potential contamination below former building location.
Former Gasoline Storage Tank Near Current 90- day Hazardous Waste Storage	GTP-55 (1)	Test Pit	9	Soil: Gasoline, Diesel, Heavy Oil, BETX, Lead	NWTPH-Gx VOCs by 8260B Metals (including Mercury) by 6010/7471	Evaluate potential contamination at location of former gasoline storage tank.

Notes:

MTCA = Washington State Department of Ecology Model Toxics Control Act

BETX = benzene, ethylbenzene. toluene and xylenes

EPA = United States Environmental Protection Agency

TPH = total petroleum hydrocarbons

PAH = polycyclic aromatic hydrocarbon

PCB = polychlorinated biphenyls

VOC = volatile organic compounds

https://projects.geoengineers.com/sites/0050611712/Final/BNSF RI Report Final Draft/[050611712_Table 4.xlsx]Sheet1



Summary of Groundwater Elevations¹

BNSF Parkwater Facility Remedial Investigation

Spokane, Washington

Well Number	Top of Casing Elevation (feet)1	Date Sampled	Depth to Water (feet)	Groundwater Elevation (feet) ²
MW-22	1951.72	01/19/10	66.88	1884.84
MW-23	1951.35	01/19/10	67.06	1884.29

Notes:

¹Elevations are referenced to the North American Vertical Datum of 1988 (NAVD 88 datum). Well casing elevations were surveyed in January 2010.

https://projects.geoengineers.com/sites/0050611712/Final/BNSF RI Report Final Draft/[050611712 Tables 11_14.xlsx]T11 GW Elevations



Summary of Well/Sample Headspace PID Measurements

BNSF Parkwater Facility Remedial Investigation

Spokane, Washington

Well	Date	LPH Thickness ¹	PID Reading Well ²	PID Reading Sample ³
Number	Measured	(inches)	(ppm)	(ppm)
MW-22	01/19/10	0.0	0.3	21.2
MW-23	01/19/10	0.0	0.8	0.2

Notes:

¹Liquid Phase Hydrocarbons (LPH) were measured by partially filling a disposable bailer with groundwater

sample and then measuring observed product thickness, if any.

²PID measurements were collected within well headspace immediately upon removing the

well cap and represent the maximum reading observed during a 20-second measurement period.

³PID measurements were collected within the headspace of a groundwater sample collected from the monitoring

well with a disposable bailer.

PID = Photoionization detector; ppm = parts per million

https://projects.geoengineers.com/sites/0050611712/Final/BNSF RI Report Final Draft/[050611712 Tables 11_14.xlsx]T12 Headspace



Summary of Groundwater Quality Parameters¹

BNSF Parkwater Facility Remedial Investigation

Spokane, Washington

Well	Date	рН	Specific Conductivity	Turbidity ²	Dissolved Oxygen	Temperature	ORP
Number	Measured		(m\$/m)	(ntu)	(mg/l)	(°C)	(mV)
MW-22	01/21/10	7.50	26.4	2.9	8.10	10.9	355
MW-23	01/22/10	6.90	30.8	3.1	0.00	10.5	358

Notes:

¹Water quality parameter reading recorded at stabilization prior to sampling.

²Turbidity was measured with a Hanna Instruments tubidity meter.

mS/m = milliSiemens per meter; ntu = nephelometric turbidity units; mg/l = milligrams per liter; °C = degrees Celsius; and mV = millivolts

ill'

ORP = oxidation reduction potential

https://projects.geoengineers.com/sites/0050611712/Final/BNSF RI Report Final Draft/[050611712 Tables 11_14.xlsx]T13 WQ Parameters



Summary of Groundwater Chemical Analytical Results¹

BNSF Parkwater Facility Remedial Investigation

Spokane, Washington

Well Number	Date Sampled	DRPH ² (µg/I)	ORPH ² (µg/l)
MW-22	01/21/10	ND	ND
MW-23	01/22/10	ND	ND
MTCA ³ Method A cleanup levels		500	500

Notes:

¹Chemical analyses conducted by TestAmerica's laboratory in Tacoma, Washington.

²Diesel- (DRPH) and heavy oil-(ORPH) range petroleum hydrocarbons analyzed using Northwest Method NWTPH-Dx.

³MTCA = Washington State, Model Toxics Control Act

 μ g/l = micrograms per liter; ND = not detected

https://projects.geoengineers.com/sites/0050611712/Final/BNSF RI Report Final Draft/[050611712 Tables 11_14.xlsx]T14 Chemical Analytical



Rising Head Test Analyses

BNSF Parkwater Facility Remedial Investigation Spokane, Washington

Monitoring Well	Test Type and Number ¹	Well Casing Radius	Borehole Radius	Saturated Screen Interval	Sand Pack Porosity (if applicable) ²	Corrected Well Casing Radius (if applicable) ²	Static Potentiometric Level to Screen Bottom	Static Potentiometric Level to Aquifer Bottom ³	(i	ionless Par f applicable 2, Fig.2, p.	e) ⁴	In(R _e ∕ r _w) (Ref. 2, Eqn. 4, p. 305) ⁵	Log Change in Y	Time Change	Slope ⁶ (In(Y _{1/} Y ₂)/t ₂ -t ₁)	Hydraulic Conductivity (Ref. 2, Eqn. 3, p. 305)	Hydraulic Conductivity (Ref. 2, Eqn. 3, p. 305)
		r _c	r _w	L e	n	r _{ec}	L _w	н	Α	В	С		$ln(Y_1/Y_2)$	t ₂ -t ₁		K	к
		feet	feet	feet		feet	feet	feet						minutes	feet/minute	feet/day	cm/sec
MW-11	RH1	0.083	0.25	10.1	0.30	0.154	10.14	130.14	2.9	0.45	NA	2.29	1.23	0.02	73.36	282	1.0E-01
MW-11	RH2	0.083	0.25	10.1	0.30	0.154	10.14	130.14	2.9	0.45	NA	2.29	1.10	0.02	65.79	253	8.9E-02
MW-17	RH1	0.083	0.25	13.2	0.30	0.154	13.18	133.18	3.2	0.50	NA	2.52	1.86	0.02	111.67	363	1.3E-01
MW-17	RH2	0.083	0.25	13.2	0.30	0.154	13.18	133.18	3.2	0.50	NA	2.52	2.05	0.02	122.99	400	1.4E-01
MW-22	RH2	0.083	0.25	8.5	0.30	0.154	8.48	132.98	2.65	0.43	NA	2.13	1.23	0.02	73.80	315	1.1E-01
MW-22	RH3	0.083	0.25	8.5	0.30	0.154	8.48	132.98	2.65	0.43	NA	2.13	1.47	0.02	87.91	376	1.3E-01

Notes:

 1 RH = Risinng-head test; FH = Falling-head test.

²Sand pack porosity and corrected well radius values are applicable to slug tests where water level rise occurs within the screened or open portion of the well.

³Effective aquifer thickness assumed to be 200 feet, based on Kahle and Bartolino (2007) and inferred distribution of interbedded aquitard units.

⁴Dimensionless parameters A and B are applicable to the case where $L_w < H$. Dimensionless parameter C is applicable to the case where $L_w = H$.

⁵Re = the effective radial distance over which Y is dissipated.

⁶Slope of the best fit line to data, see Figures 11 through 13.

feet/ day = feet per day; cm/sec = centimeters per second

References:

1) Bouwer, H. and R.C. Rice, 1976. A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells. Water Resources

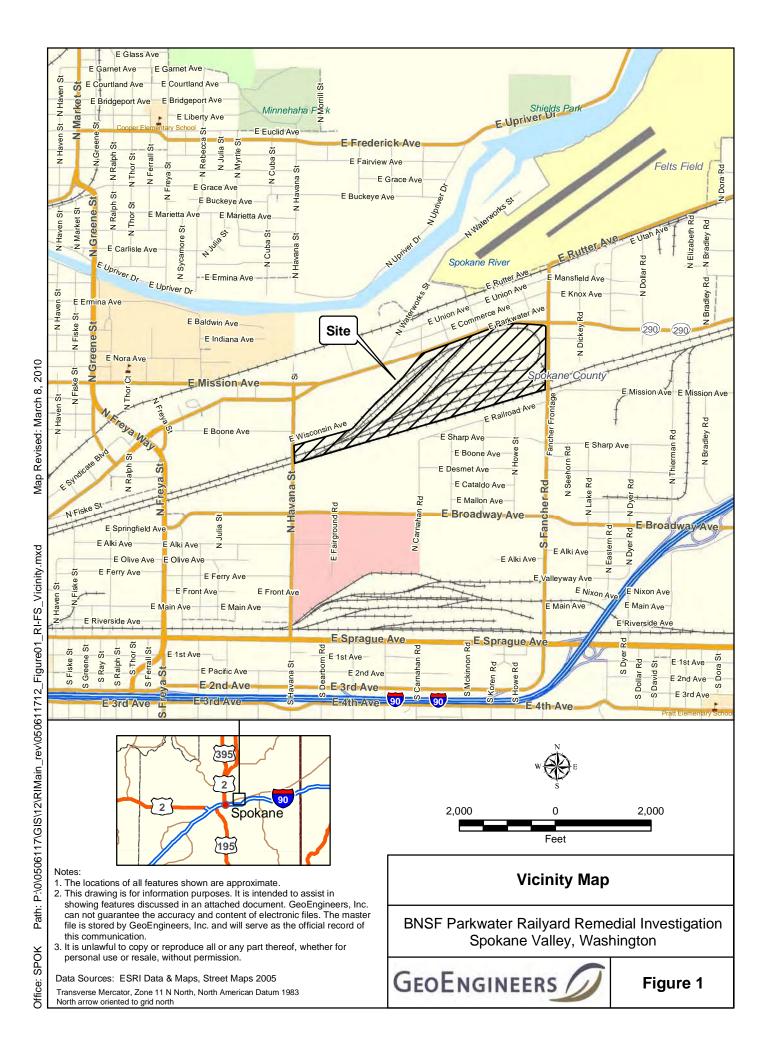
Research, v. 12, pp. 423-428.

2) Bouwer, H., 1989. The Bouwer and Rice Slug Test - An Update. Ground Water, v. 12, No. 3, pp. 304 - 309.

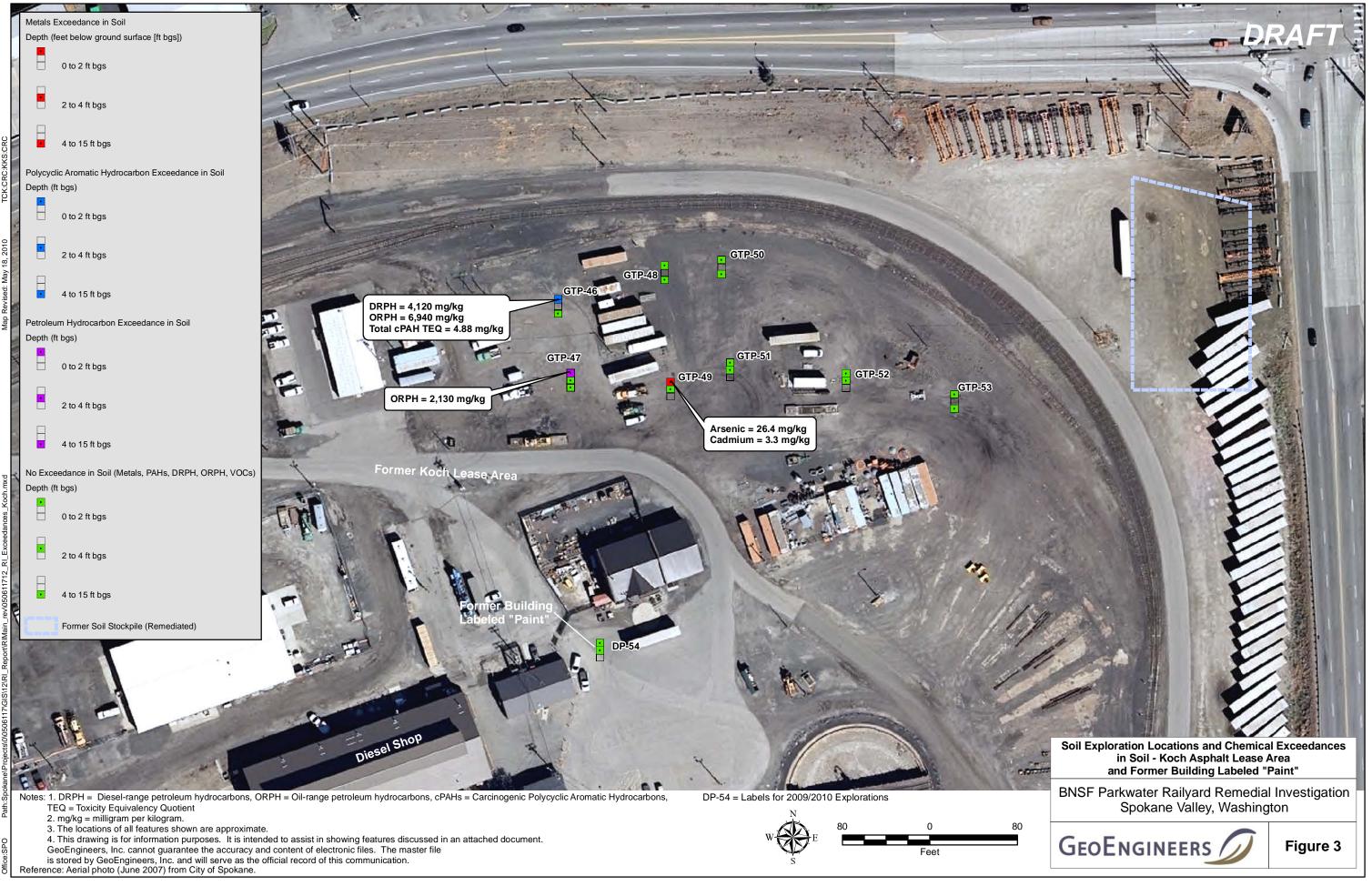
https://projects.geoengineers.com/sites/0050611712/Final/BNSF RI Report Final Draft/[050611712 Table 15.xlsx]Calculations

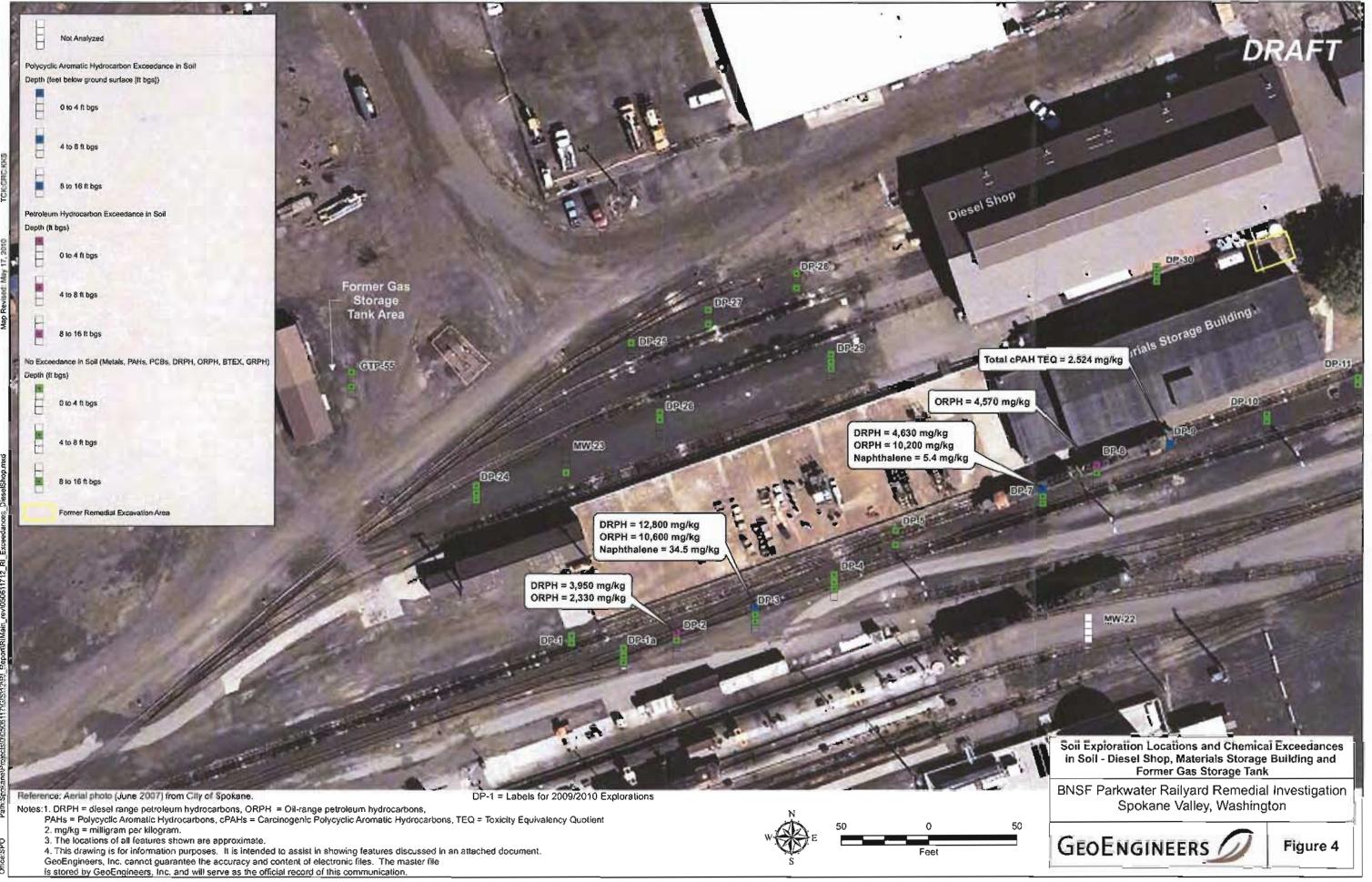


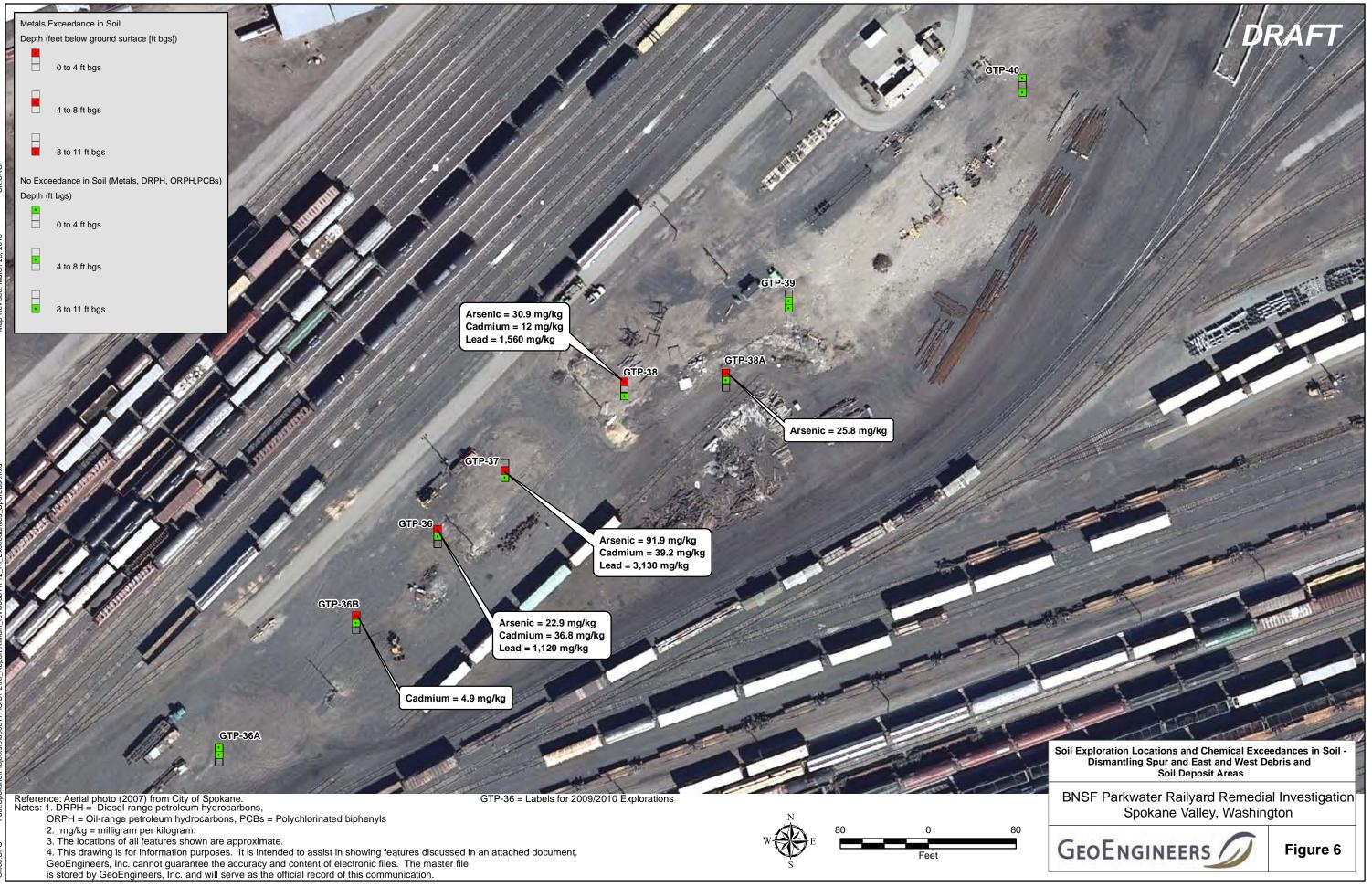


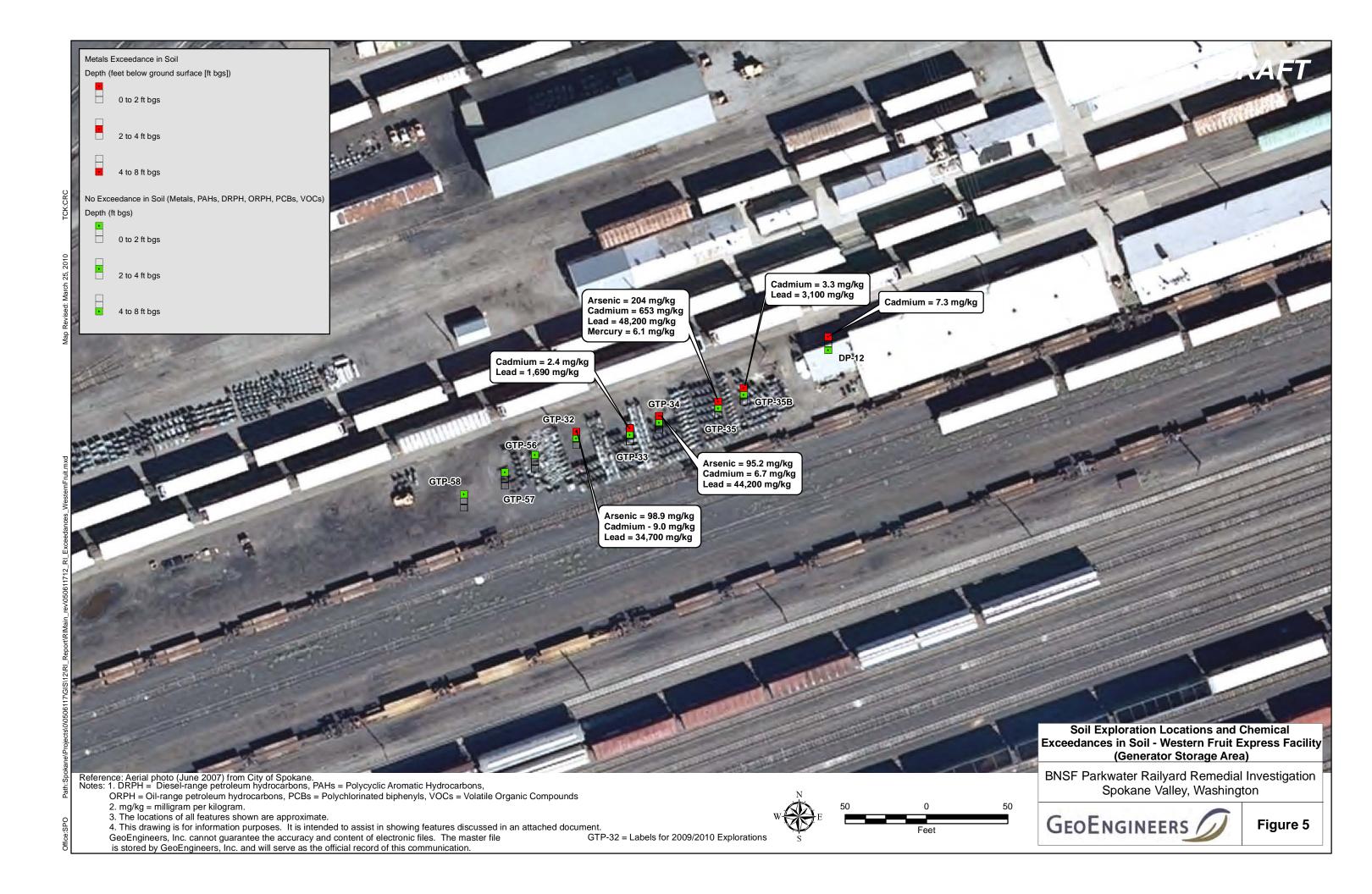


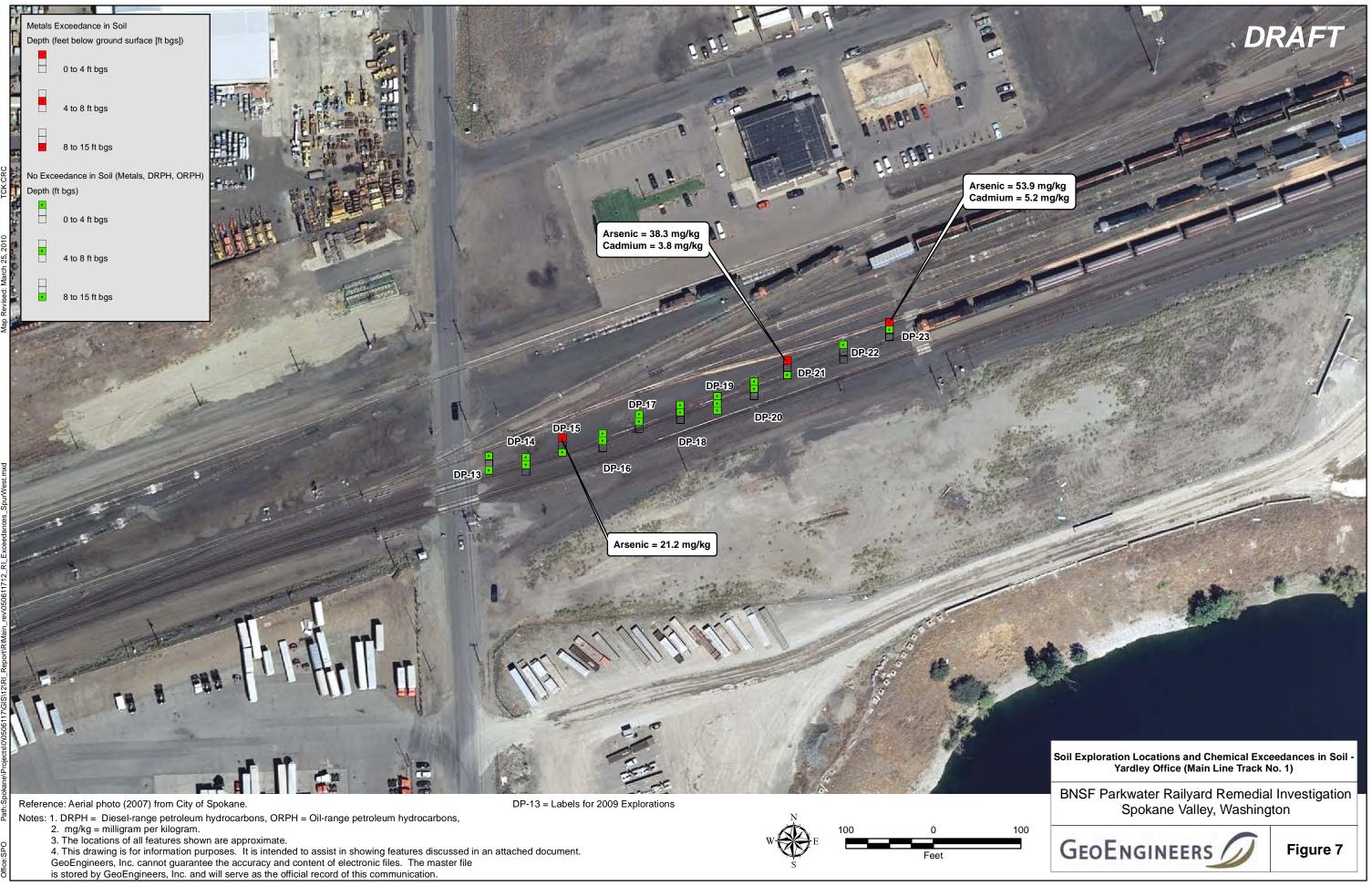




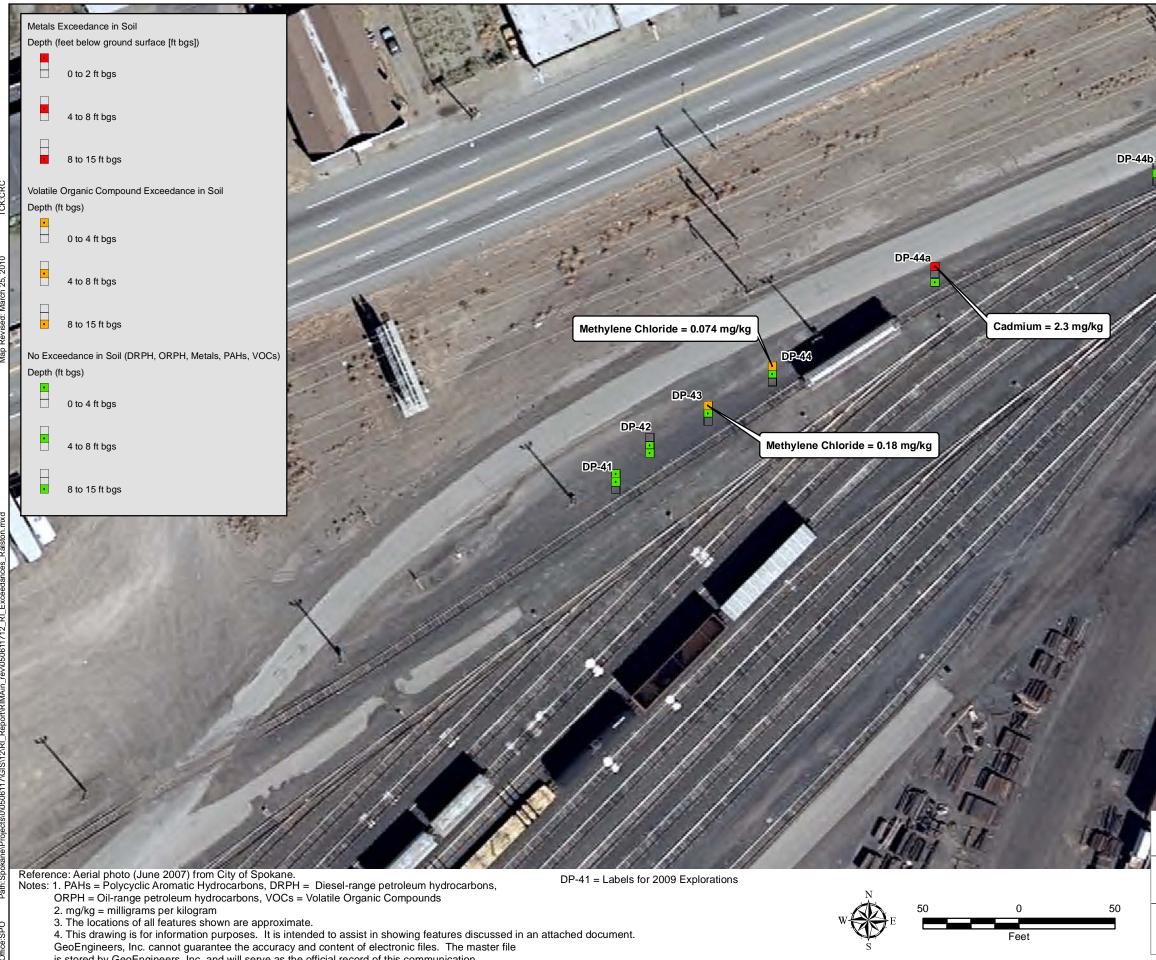












is stored by GeoEngineers, Inc. and will serve as the official record of this communication.



BNSF Parkwater Railyard Remedial Investigation Spokane Valley, Washington

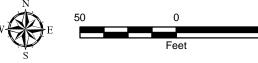
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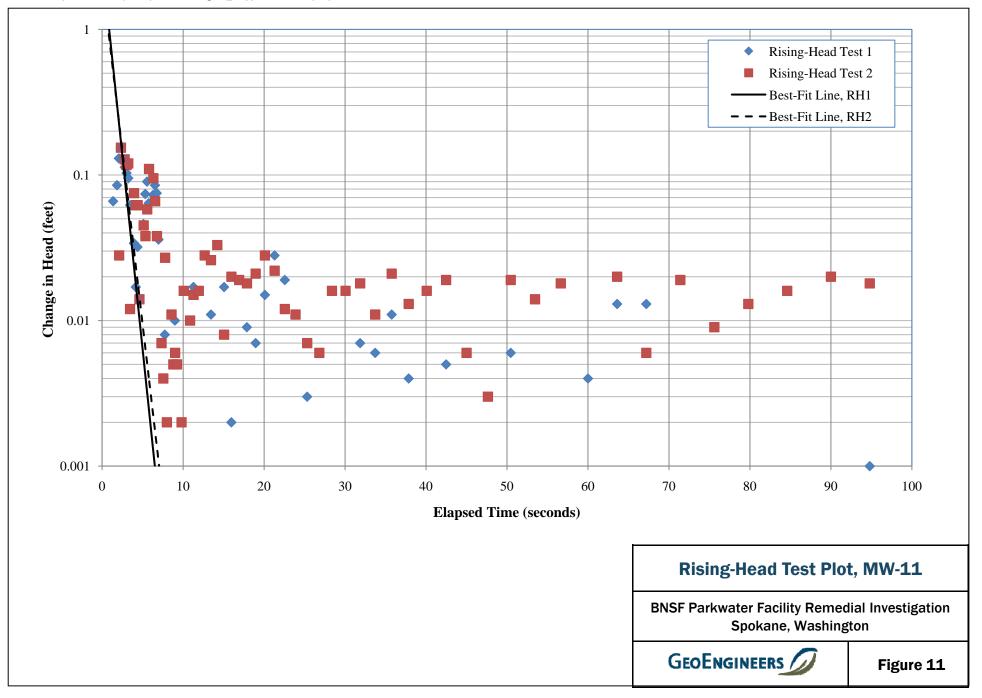
Figure 8

DRAFT



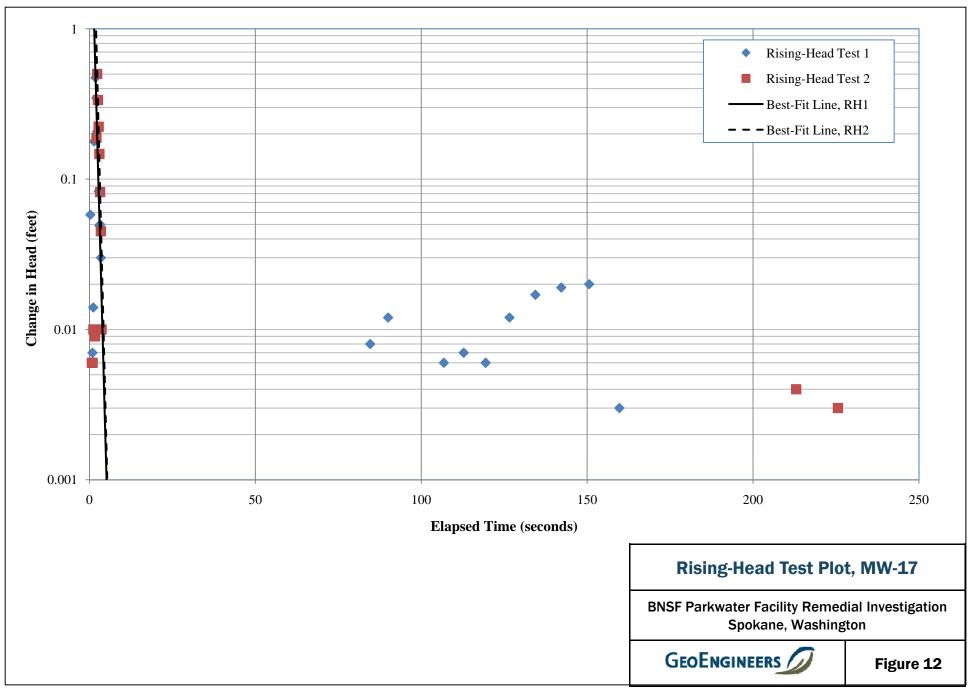


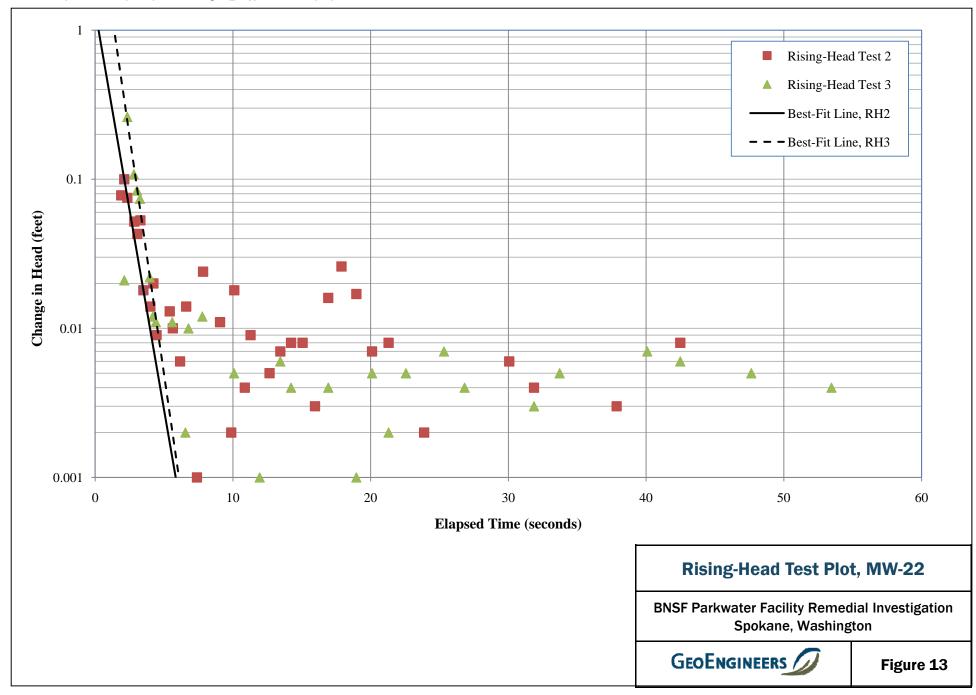




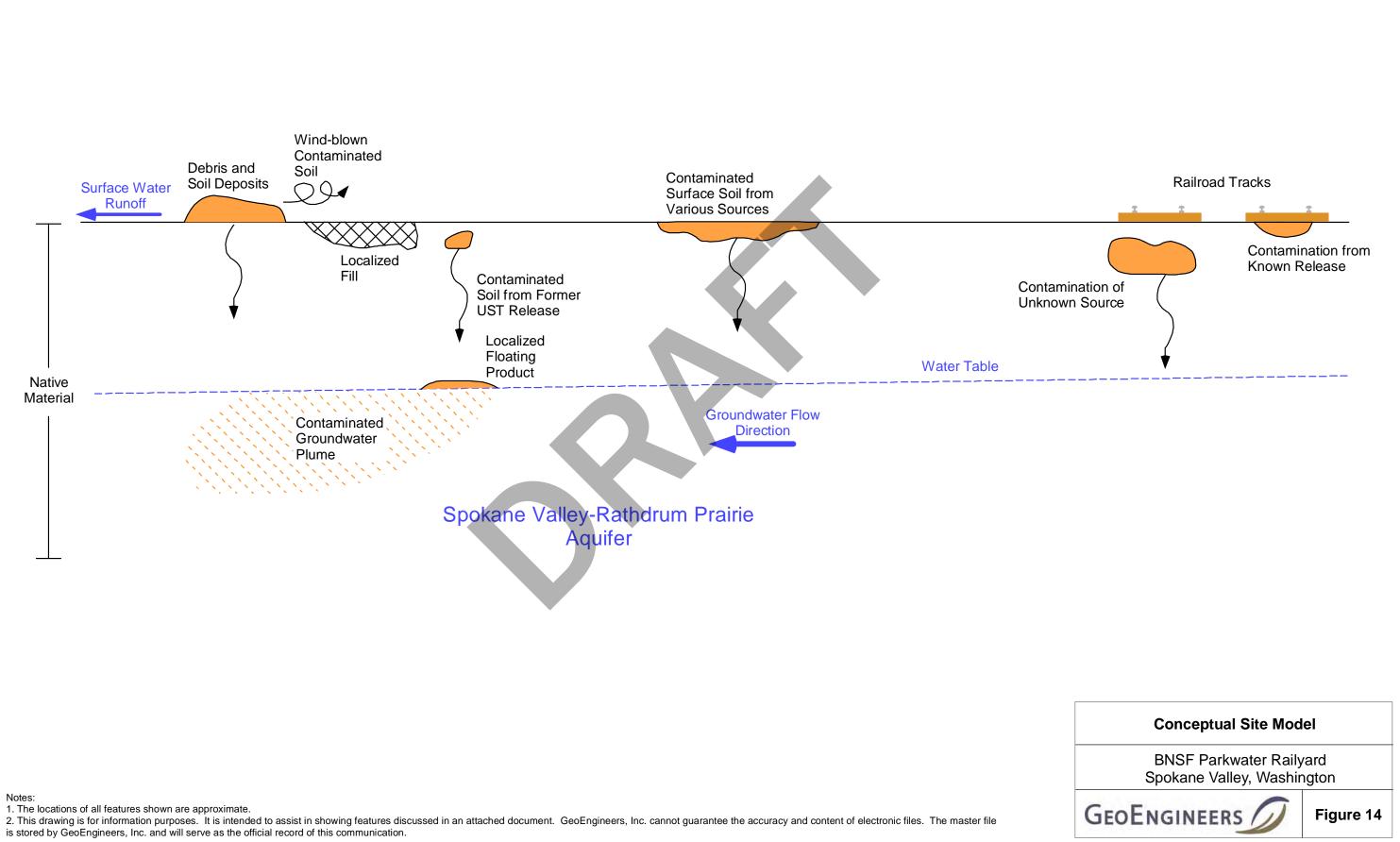
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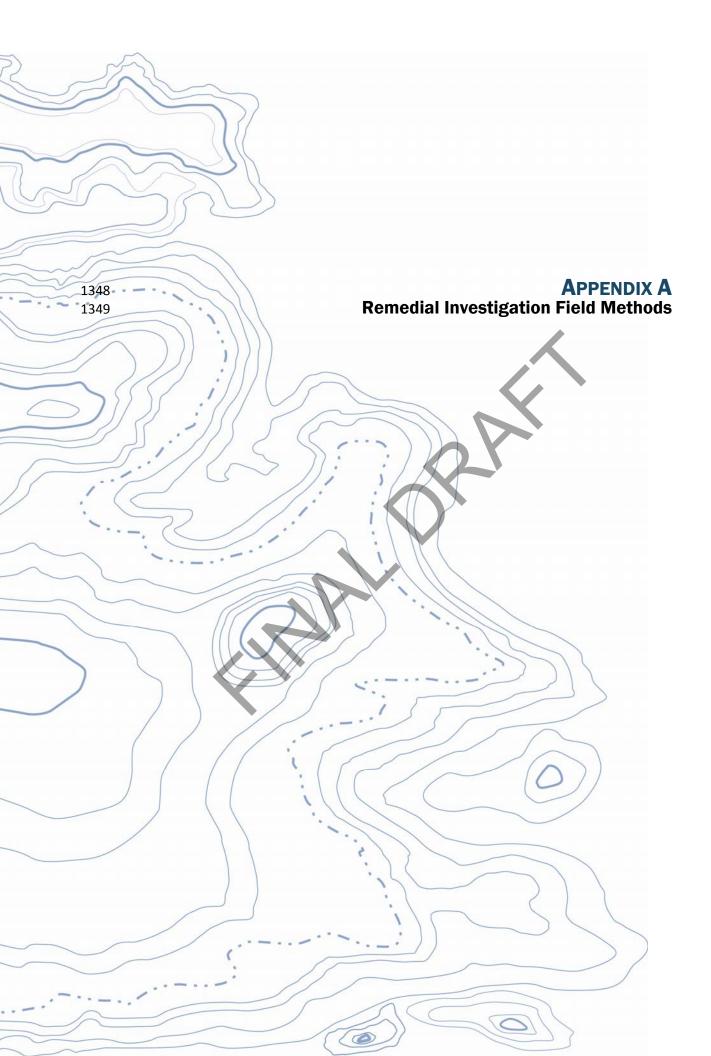




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1350 **APPENDIX A**

1351 REMEDIAL INVESTIGATION FIELD METHODS

1352 Field Explorations

Prior to completion of the explorations, GeoEngineers contacted the One-Call Utility Notification Center in accordance with Washington State law. In addition, GeoEngineers subcontracted Advanced Underground Locating Inc., a private underground utility location subcontractor. In cooperation with GeoEngineers, a representative of advanced Underground Locating, Inc. coordinated with Site personnel regarding the presence and location of underground utilities onsite relative to the proposed explorations.

Following clearance of utilities, subsurface conditions at the Site were explored fromDecember 3, 2009 through February 25, 2010 by:

- 1361 excavating 22 test pits;
- drilling 38 borings using sonic drilling methods, including 2 monitoring wells, and 2 borings
 using direct push exploration methods; and
- 1364 completing three shallow borings using hand tools.

1365 The approximate exploration locations are shown in Figures 3 through 9. A chronological summary 1366 of the completed explorations and the methods used are provided in Table A-1.

1367 TABLE A-1. EXPLORATION SUMMARY

Exploration Number	Date Completed	Exploration Method
MW-22	12/3/09	Sonic Drill
MW-23	12/4/09	Sonic Drill
DP-10, DP-11, DP-45	12/10/09	Geoprobe®, Direct Push
DP-1A, DP-2 through DP-5, DP-6 ⁽²⁾ , DP-7 through DP-9	12/14/09	Sonic Drill(1)
DP-1, DP-24, DP-26, DP-29, DP-30, DP-31(2)	12/15/09	Sonic Drill(1)
DP-25, DP-27, DP-28, DP-43, DP-44, GTP-54	12/16/09	Sonic Drill ⁽¹⁾
DP-41, DP-42, DP-44B	12/17/09	Sonic Drill ⁽¹⁾
GTP-50 through GTP-53	12/18/09	Backhoe
GTP-46, GTP-48, GTP-49	12/21/09	Backhoe
GTP-37 through GTP-40, GTP-47	12/22/09	Backhoe
DP-13 through DP-23	12/28/09	Sonic Drill(1)
GTP-32 through GTP-35, GTP-35B, GTB-55, GTP-36	1/4/10	Backhoe
DP-12	1/19/10	Geoprobe®, Direct Push
GTP-36A, GTP-36B, GTP-38A	2/9/10	Backhoe
GTP-56 through GTP-58	2/25/10	Hand Auger

1368 Notes:

1369 1. Changed to sonic drill method because direct push method was generally unsuccessful or because surface infrastructure

1370 conflicted with test pit methodology.

1371 2. Deleted from exploration program because of surface infrastructure and/or underground utility conflicts.



In accordance with the RI/FS Work Plan, the majority of the borings were planned to be completed 1372 1373 using direct push exploration methods. An attempt was made to complete the soil borings, DP-10, 1374 DP-11 using direct push exploration methods. However, because of the generally coarse granular 1375 subsurface conditions, this method was not effective at reaching the target depths with sufficient 1376 recovery. On this basis, with the exception of DP-12, which required low a low clearance drill rig, 1377 the remainder of the planned borings were completed using sonic drilling and continuous sampling 1378 methods. Additional detail on specific changes between the RI/FS Work Plan and the actual 1379 drilling program are provided in the following section.

1380 The test pits discussed above were excavated to depths in the range of 4 to 15 feet using a 1381 backhoe operated by NRC Environmental Inc. under subcontract to GeoEngineers. The borings 1382 completed using sonic drilling methods were drilled using a truck-mounted Sonic Speedstar 15k 1383 owned and operated by Environmental West Exploration, Inc., also under subcontract to 1384 GeoEngineers. The sonic borings were typically completed to depths in the range of 15 to 16 feet. 1385 The borings completed using direct push exploration methods were completed using a trackmounted Geoprobe® owned and operated by GeoEngineers, Inc. The direct push borings were 1386 1387 typically completed to depths in the range of 12 to 16 feet. Hand auger borings were completed to 1388 depths of approximately 1¹/₂ feet using a 4-inch-diameter extendable hand auger.

1389 Variance between RI/FS Work Plan and Actual Explorations

- 1390 The following are modifications from the September 30, 2009 Work Plan and rationale for the 1391 change.
- Boring DP-6 was not drilled because of underground utilities and surface infrastructure conflicts. However, an additional boring DP-1A, was drilled in the area.
- Borings DP-30 and DP-31 were planned in a relatively small area between the Diesel Shop and
 Materials Storage buildings. Only one boring (DP-30) was needed to assess the area.
 Therefore, DP-31 was eliminated from the program.
- Boring DP-22, completed near the Main Line Track No. 1 encountered refusal on a boulder at a depth of approximately 8 feet. Logistical and infrastructure limitations including high frequency train traffic prevented completing a second attempt adjacent to the same location to reach the 15-foot target depth. Based on the results of chemical analysis of other nearby borings, making a second attempt at a later date was not deemed necessary.
- The following test pits were eliminated from the program because of space limitations in the generator storage area relative to caving of the test pit side walls (GTP-31, GTP-32A, GTP-33A, GTP-34A, and GTP-35A). The exploration area was deemed adequately assessed by GTP-32, GTP-33, GTP-34, GTP-35, and GTP-35B, and the addition of three shallow hand auger excavations GTP-56 through GTP-58.
- As discussed in the previous section, the proposed direct push borings were marginally successful at obtaining quality samples. Therefore, the majority of the proposed direct push (DP) borings were completed using sonic drilling. A few proposed test pit locations also were assessed using direct push or sonic drill methods because of surface infrastructure conflicts relative to caving soils within the test pits.

1412 Soil Sampling from Borings and Test Pits

As discussed above, soil borings were completed using sonic, or direct-push drilling techniques by a licensed driller. For sonic drilling methods, subsurface soil samples were obtained continuously by advancing an approximately 4-inch-diameter, 10-foot-long barrel sampler. For the direct-push drilling samples were also continuously obtained using 4-foot-long, 1-inch-diameter acrylic sleeves.

1417 Each boring was continuously monitored by a geologist from our firm to observe and classify the 1418 soil encountered, and prepare a detailed log of each boring. Soil encountered in the borings was 1419 classified in the field in general accordance with ASTM International (ASTM) D-2488, the Standard 1420 Practice for Classification of Soils, Visual-Manual Procedure, which is summarized in Figure A-1. 1421 Logs of the test pits are provided in Figures A-2 through A-66. Preservation of VOC samples was 1422 completed in accordance with Ecology Memo 5, document number 04-09-087. Sample containers 1423 were labeled and placed into an ice chest containing ice/ice packs. Soil samples for VOCs 1424 analyses were obtained consistent with EPA Method 5035A. Chain-of-custody procedures were 1425 followed during transport of the soil samples.

Sampling equipment was decontaminated between each sampling attempt for either drilling
method. Samples were obtained using either a decontaminated soil knife or new, clean nitrile
glove and placed into 8-ounce glass sample jars with Teflon lids.

1429 In test pits, soil samples were obtained from the side walls and/or bottom of test pits either by 1430 hand if the test pit depth is less than four feet and conditions permit safe entry into the test pit, or 1431 from the backhoe bucket if the test pit is greater than four feet deep. Samples were obtained 1432 using either a decontaminated soil knife or new, clean nitrile gloves into 8-ounce glass sample jars 1433 with Teflon lids.

1434 Samples were placed in a cooler with ice and delivered to the analytical laboratory; standard chain-1435 of-custody procedures were observed during transport of the samples to the laboratory.

1436 Depth Normalization for Sonic Bore Logging

Sonic drilling is an effective method to obtain relatively continuous samples, and optimum sample
quantity, for analytical testing. However, certain sampling limitations are inherent to the sonic
drilling method in coarse-grained soils. These limitations include: 1) potential consolidation and/or
loss of portions of the sample during drilling; and 2) consolidation of the sample during extraction.
These limitations are described in further detail below.

During sonic drilling, the drill stem and sampler barrel are vibrated vertically as they are pushed and rotated into the soil. As the drill stem and sampler barrel are advanced, portions of the sample can be "lost" by being pushed into the soil formation outside the sampler barrel. This results in less than 100 percent of the sample being recovered. For example, if the drill advances 10 feet, it is possible that only 6 feet of the sample might be recovered.

After reaching depth, the drill stem and sampler barrel are pulled to the ground surface. To extract the sample from the barrel, the barrel is vibrated. This vibration can cause consolidation of the sample, especially in coarse-grained soil, and if less than 100 percent is recovered. This skews interpretation of the actual depth a soil sample is obtained and the depth at which soil types might



change. To account for these limitations, for the purposes of this RI, the soil sample depth and the depth at which the soil types change, shown on the boring logs, have been normalized to 100 percent recovery. Where appropriate, this was accomplished by applying the ratio of the drilling run length and the amount of soil recovered, to the measured depths logged in the field. In general, depths were normalized for run lengths of 5 feet or greater with less than 100 percent recovery. The run length and actual sample recovered, measured in feet, are shown on the Logs of Borings, Figures A-2 through A-41.

1458 Field Screening Methods

A GeoEngineers field geologist performed field screening tests on selected soil samples from the explorations. Field screening results were used to aid in the selection of soil samples for chemical analysis. Screening methods included (1) visual examination, (2) water sheen screening, and (3) headspace vapor screening using a photo-ionization detector (PID). Field screening was completed in accordance with that described in the RI/FS Work Plan, Sampling and Analysis Plan.

1464 Monitoring Well Construction, Development, and Surveying

Monitoring wells MW-22 and MW-23 were constructed in accordance with WAC 173-160, Section 400, Washington State Resource Protection Well Construction Standards. Monitoring well records were submitted in accordance with Washington monitoring well construction standards. Monitoring well installation will be observed by a GeoEngineers field geologist, who maintained a detailed log of the materials and depths of the well. Well construction details, including the depths of the well screen and filter packs are shown on Figures A-40 and A-41.

1471 The two monitoring wells each were constructed using 2-inch-diameter polyvinyl chloride (PVC) well 1472 casing. The annular space in each well was sealed between the top of the filter pack and the 1473 ground surface with bentonite to prevent infiltration of groundwater into the well bore from 1474 shallower zones. A lockable compression-type cap was installed in the top of the PVC well casing. 1475 A flush-mount above-grade monument equipped with a watertight cover was installed to protect the 1476 PVC well casing. A concrete surface seal was placed around the monument at the ground surface 1477 to divert surface water away from the well location.

1478 The monitoring wells were developed to remove water introduced into the well during drilling, 1479 stabilize the filter pack and formation materials surrounding the well screen, and restore the 1480 hydraulic connection between the well screen and the surrounding soil. The well screen was gently 1481 surged with a decontaminated stainless steel bailer or surge-block several times after installation. 1482 The wells were allowed to equilibrate following development and sampled on January 19, 2010.

1483 The elevation of the top of each monitoring well casing and the ground surface of each well was 1484 surveyed by Thomas, Dean and Hoskins, Inc., on February 4, 2010, relative to an on-site 1485 benchmark. A survey reference notch was established on the north side of each monitoring well 1486 casing.

1487 Groundwater Sampling

1488 The wells were allowed to equilibrate at least 72 hours after well development and subsequently 1489 sampled on January 19, 2010. Each groundwater sample was obtained using low-flow purging methods. The groundwater samples were transferred in the field to laboratory-prepared sample
containers and kept cool during transport to the testing laboratory. The sample containers were
filled completely to eliminate headspace in the container. Chain-of-custody procedures were
observed from the time of sample collection to delivery to the testing laboratory.

1494 **Decontamination Procedures**

1495 The objective of the decontamination procedure is to minimize the potential for cross-1496 contamination between sample locations.

A designated decontamination area was established for decontamination of drilling equipment and
 reusable sampling equipment. Drilling equipment was cleaned using high-pressure/low-volume
 cleaning equipment.

1500 Sampling equipment was decontaminated in accordance with the following procedures before1501 each sampling attempt or measurement.

- 1502 1. Brush equipment with a nylon brush to remove large particulate matter.
- 1503 2. Rinse with potable tap water.
- 1504 3. Wash with non-phosphate detergent solution (Liquinox[®] and potable tap water).
- 1505 4. Rinse with potable tap water.
- 1506 5. Rinse with distilled water.
- 1507 Handling of Investigation-Derived Waste

1508 Investigation Derived Waste (IDW), which consists of mainly drill cuttings and 1509 decontamination/purge water, typically was placed in DOT-approved 55-gallon drums. Each drum 1510 was labeled with the project name, exploration number, general contents, and date. The drummed 1511 IDW was stored onsite pending analysis and disposal.

1512 Disposable items, such as sample tubing, disposable bailers, bailer line, gloves and protective 1513 overalls, paper towels, etc., were placed in plastic bags after use and deposited in trash 1514 receptacles for disposal.



			SYME		TYPICAL	SYME	301.5
м	AJOR DIVISI	ONS	GRAPH	LETTER	DESCRIPTIONS	GRAPH	LETTE
	GRAVEL	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES		сс
	AND GRAVELLY SOILS	(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES		AC
COARSE GRAINED SOILS	MORE THAN 50% OF COARSE FRACTION	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES		CR
	RETAINED ON NO. 4 SIEVE	(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES		TS
IORE THAN 50%	SAND	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS		
ETAINED ON NO. 200 SIEVE	AND SANDY SOILS	(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND		Measu
	MORE THAN 50% OF COARSE FRACTION	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES	\ /	Ground
	PASSING NO. 4 SIEVE	(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES		Perche explora
				ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY		Measur piezom
FINE GRAINED	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS		Graph
SOILS			m	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY		Disting geolog
NORE THAN 50% ASSING NO. 200 SIEVE				МН	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS		Approx change
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		СН	INORGANIC CLAYS OF HIGH PLASTICITY	Mate	<mark>erial D</mark> Disting
			Hiphi	ОН	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY		geolog Approx
н	GHLY ORGANIC	SOILS		РТ	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS		change
OTE: Multiple	e symbols are u	sed to indicate bo	rderline or o	dual soil cl	assifications	La	borat
	2.4	<u>r Symbol De</u> inch I.D. split I ndard Penetrat	oarrel			%F AL CA	Percen Atterbe Chemic Labora Consol
		elby tube	1001			HA MC	Direct s Hydron Moistur Moistur
		4 m m					
	Pist						Permea
	Dire	ton ect-Push k or grab				PM PP SA TX	Permea Pocket Sieve a Triaxia
Blow	Dire	ect-Push	n sampler	s as the	number	PM PP SA TX UC	Permea Pocket Sieve a Triaxia Uncont
of blo dista	Dire Dire Bul count is reco bws required nce noted).	ect-Push k or grab	mpler 12 i	inches (d	or	PM PP SA TX UC VS	Permea Pocket Sieve a Triaxia Unconf Vane s Sheen
of blo distar and d	Dire Dire Bul count is reco ows required nce noted). S Irop.	ect-Push k or grab orded for driver to advance sau See exploration	mpler 12 i 1 log for h	inches (d ammer v	or weight	PM PP SA TX UC VS VS	Organie Permea Pocket Sieve a Triaxial Unconf Vane si Sheen No Visi Slight S Modera
of blo distar and d	Dire Dire Bul count is reco ows required nce noted). S Irop.	ect-Push k or grab orded for driver to advance sau	mpler 12 i 1 log for h	inches (d ammer v	or weight	PM PP SA TX UC VS VS NS SS MS	Permea Pocket Sieve a Triaxia Uncon Vane s Sheen No Visi

MATERIAL SYMBOLS

SYM	BOLS	TYPICAL
GRAPH	LETTER	DESCRIPTIONS
	сс	Cement Concrete
	AC	Asphalt Concrete
	CR	Crushed Rock/ Quarry Spalls
	TS	Topsoil/ Forest Duff/Sod

- red groundwater level in ation, well, or piezometer
- lwater observed at time of tion
- d water observed at time of tion
- ed free product in well or eter

ic Log Contact

t contact between soil strata or ic units imate location of soil strata within a geologic soil unit

escription Contact

- t contact between soil strata or ic units
- imate location of soil strata within a geologic soil unit

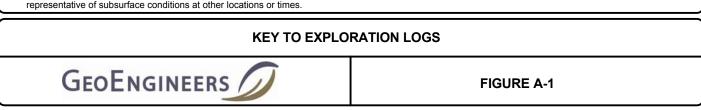
ory / Field Tests

- t fines
- rg limits
- cal analysis
- tory compaction test
- shear
- neter analysis re content
- re content and dry density
- c content
- ability or hydraulic conductivity
- penetrometer
- nalysis
- compression
- ined compression
- hear

Classification

- ble Sheen
- Sheen
- te Sheen Sheen
- sted

of subsurface conditions. are not warranted to be



1	Drilled	12/15/2009	9	Total 15 Depth (ft)	L C	_ogged E Checked I	By KE By JD	BC DL	Dri	ller Environmental We	st	Drilling Method Sonic
	Location East (X): 25 Datum: NAE	503167 North 083 (feet)- Stat	(Y): 26 e Plane	5115 WA (North)	<u>Grou</u>	ndwater Date Me				epth to Water (ft) Encountered	Drilling Equipment	Sonic Speedstar 15k
1			FIELD	AND RUN DAT	A							
	o Depth (feet)	Run Run Number Run Length (ft) Actual	Recovered (ft) Testing	SAMPLE NAME	Sheen	 Headspace Vapor (ppm) 	Water Level	Group		Black sand with gravel and	DES	TERIAL CRIPTION e. moist) (fill?)
	- - - 5 —	1 5 3		DP01-1-2	NS	0				Brown clayey gravel with Brown silty gravel with sa		nal cobbles (moist)
	- - - - - - - - - - - -			DP01-5-6	NS	0		G G S V		- Reddish brown claycy gra Light brown sand with gra		nd occasional cobbles (moist) ay (moist)
n:P.30/0506117/GINT/0506117.GPU DB1emplate/Lib1emplate/Lib1emplate/SecoenVGINEEKS8.GD1/0506117_SON/CLOG	2. Where recovery	e appropriate, to by applying the	he soil s e ratio o	planation of symbols. ample depth and the f the drilling run lengt sussion of the depth n	h and t	he amou	the soint of so	I types il recc	s cha	inge, shown on this log, f ed, to the measured dept	have been no	ormalized to 100 percent the field. Refer to Appendix
6/10 Pa						Lo	og o	f Bo	orir	ng DP-1		

BNSF Parkwater Facility Remedial Investigation Project: Project Location: Spokane, Washington Figure A-2 Sheet 1 of 1 Project Number: 0506-117-12

1	Drilled	12/14/2009	Total 15 Depth (ft)		Logged B Checked E				ller Environmental We	st	Drilling Method Sonic
	Location East (X): 25 Datum: NAD	03197 North (Y): 26 083 (feet)- State Plane	5108 WA (North)	Grou	ndwater Date Me	easur	red		<u>epth to Water (ft)</u> Encountered	Drilling Equipment	Sonic Speedstar 15k
ĺ		FIELD	AND RUN DAT	A							
	o Depth (feet) ∣	Run Run Number Run Length (ft) Actual Recovered (ft) Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)		Graphic Log	Group Classification		DES	TERIAL CRIPTION
	-	CA	DP01A-1-2			Ĺ		SW-SM	Dark brown to black sand Light gray to light brown s	-	
	- 5 -	CA	DP01A-2-3			0 0 0 0 00		SW	- Orange to brown sand with	h gravel and tra	- ce silt (dry)
	-					• • •	÷.,	SP	 Light gray fine sand with § 	gravel and trace	silt (dry)
	- - 10 —					· • · · ·		GW	Dark orangish brown grav	rel with sand, oc	ccasional cobbles and trace silt (moist)
	-	2 10 6.5					00000				
	- - 15	СА	DP01A-11-12.5				Ą	SP	Light gray fine sand with g	gravel and occas	sional cobbles (dry)
	2. Where recovery	e see figure A-1 for exp appropriate, the soil s by applying the ratio attached report for disc	sample depth and the of the drilling run length	h and t	he amou	the s	soil t	ypes cha recover	ange, shown on this log, h ed, to the measured depth	nave been no	ormalized to 100 percent the field. Refer to Appendix
26/10 Pat					Lo	go	of I	Borin	g DP-1A		

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-3 Sheet 1 of 1 Project Number: 0506-117-12

	rilled	12/14	/200)9		Total Dept		15		.ogged E hecked	-		I [oriller En	vironmental We	est	Drilling Method Sonic	
Ea	ocation ast (X): 28 atum: NAI	503227 D83 (feet)	North)- Sta	h (Y) ate P	: 265 Plane V	117 VA (N	orth)		Grou	ndwater Date M		ured	Nc	Depth to W ot Encour		Drilling Equipment	Sonic Spee	dstar 15k
				FI	ELD	AND	RUN	DAT	A							4		
	Depth (feet)	Run Run Number	Run Length (ft) Actual	Recovered (ft)	Testing				Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification				TERIAL CRIPTION	
	-0 -				<u> </u>	SA	MPLE N	IAME	0	1/	~		SW		brown sand with gr	ravel (dry) (fill?)		
	-		6	4	CA		DP02-1	-2	MS				SP GC		sand with gravel (r brown clayey grave		naterial) (fill?)	
	- 5 —		Ū						SS				SC GP		n clayey sand with brown to light gray		sand and trace clay (dry)	
	-				CA		DP02-6	-7	NS				GC	Brow	n clayey gravel (mo	bist)		
	-												GW	Gray	fine to coarse grave	el with sand (dry)	1	
	10 —	2	96	6.5								, , ,	SP		brown fine sand wi	th gravel and tra	ce silt (dry)	
	-														des to brown			-
									~									
2_SONICLOG																		
.GDT/0506117						X												
Spokare: Date: 32610 Path.p:0/0506117/GINT/0506117.GPJ DBTemplate/LibTemplate/GEOENSINEERS8 GDT/0506117_SONICLOG																		
emplate:GEO																		
emplate/LibT	Notes:	-																
117.GPJ DB1	1. Please 2. Where recovery A of the	e appropri	riate, /ing th	the he ra	soil sa atio of	ample the dr	depth a	nd the n lengt	h and tl	he amou	the int o	soil soi soi	types c I recove	hange, sh ered, to the	own on this log, e measured dep	have been no	ormalized to 100 percen the field. Refer to Appe	t ndix
\GINT\05061																		
P:\0\0506117																		
26/10 Path:										Lo	og	of	Bor	ing D				
e: Date:3/	GE	-E					c /	1		Proje			ation		⁼ Parkwater ane, Washi	-	Remedial Investig	ation
Spokar	GFO	UER	٩G	11	NE	EK	5/			-				-	-117-12	ington		Figure A-4 Sheet 1 of 1

Figure A-4 Sheet 1 of 1

Dri	lled	1	2/14	/2009		Total 15 Depth (ft)		Logged E Checked				iller Environmental We	est	Drilling Method Sonic
Eas	ation st (X): 2 sum: NA	2503: \D83	271 (feet)	North (` ⊦ State	Y): 265 Plane	5131 WA (North)	<u>Grou</u>	ndwater Date M		ured		eepth to Water (ft) Encountered	Drilling Equipment	Sonic Speedstar 15k
\square				F	IELD	AND RUN DAT	A							
	Depth (feet)	Run	Run Number	Run Length (ft) Actual Recovered (ft)	Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification			TERIAL CRIPTION
	0 -					SAIVIPLE NAIVIE	SS				SM	Dark gray silty sand (dry)		
			1	3 3	CA	DP03-1.5-2	HS				SP	Black sand with gravel (m		(odor) (fill)
		-	+								GC SP	 Dark brown clayey gravel Brownish gray sand with 		al cobbles and trace silt (dry, moist)
	_	1			CA	DP03-3-4	MS					-		-
	5 -											[-
		-					MS					-		-
		-									GW	Light brown gravel with s	and and trace sil	lt (dry)
	10 -		2	12 5.5								t /		-
	10 -	_								о О.Д.		-	*	-
		-									SP	Light gray fine sand with	gravel and trace	silt (dry)
					CA	DP03-7.5-8.5								
	15 -										SW	Light brown fine to coarse	e sand with grav	el and trace silt (dry)
	2. Wher recovery	re ap y by	propr	iate, the	e soil s ratio of	lanation of symbols. ample depth and the the drilling run lengt ussion of the depth r	h and t	he amou	the unt c	e soil t	ypes ch: recover	ange, shown on this log, f ed, to the measured dept	have been nc hs logged in t	ormalized to 100 percent the field. Refer to Appendix
									_	of	Bori	ng DP-3		
22	~	- 3	-					Proje					-	Remedial Investigation
	GE	0	EN	IGI	NE	ERS		Proje	ct I		ation:	Spokane, Washi	ngton	Figure A-5

Project Number: 0506-117-12

Figure A-5 Sheet 1 of 1

okane: Dat

	Drilled	12/14	/2009		Total 15 Depth (ft)	L	.ogged E hecked	3y By	KBC JDL	; D	riller Environmental We	st	Drilling Method Sonic
	Location East (X): 25 Datum: NAD	03316 983 (feet)	North (Y - State	'): 265 Plane \	150 WA (North)	Grou	ndwater Date M		ured		Depth to Water (ft) t Encountered	Drilling Equipment	Sonic Speedstar 15k
1			F	IELD	AND RUN DAT	4							
	o Depth (feet) │	Run Run Number	Run Length (ft) Actual Recovered (ft)	Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification	Dark brown to brown gra	DESC	TERIAL CRIPTION
	-	1	64	CA	DP04-0.5-1.5	NS SS SS	13.1 91 95.9			GW GC	 Black gravel with sand, cla Dark brown to brown clay - 	ay and trace silt	(moist) (fill?)
	5 — - -			CA	DP04-3-4	NS	92.4 28.3 37.1 28.3			SP	Light gray to light brown i	fine sand with g	ravel, occasional cobbles and trace silt (dry)
	10 — - - -	2	97	СА	DP04-12-13		41.4			SW	Light brown to brown san	d with gravel, o	- ccasional cobbles and trace clay (dry)
:P::000506117/GINT/0506117.GPJ DBTemplate/LibTemplate:GEOENGINEEKS8.GDT/0506117_SONICLOG	 Where recovery 	appropr by apply	iate, the	soil sa atio of	anation of symbols. ample depth and the the drilling run lengt ussion of the depth m	ו and t	he amou	the	e soil t	ypes cl	hange, shown on this log, f rred, to the measured dept	nave been no hs logged in f	rmalized to 100 percent the field. Refer to Appendix
26/10 Pat							Le	og	of	Bor	ing DP-4		

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-6 Sheet 1 of 1 Project Number: 0506-117-12

ĺ	Drilled	1	2/1	4/2	2009		Total 15 Depth (ft)			.ogged E hecked				Dril	ler Environmental W	est	Drilling Method Sonic
	Location East (X): 25 Datum: NAD	033)83 (52 (fee	No et)- :	orth (State	Y): 26 Plane	5175 WA (North)	<u>c</u>	Grour	ndwater Date M		ured	N		epth to Water (ft) Encountered	Drilling Equipment	Sonic Speedstar 15k
(F	IELD	O AND RUN DA	TA									
	b Depth (feet)	Run	Run Number	Run Length (ft)	Actual	Testing	SAMPLE NAME	E	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group	Classification		MA DES	ATERIAL CRIPTION
	0					СА			NS	0 0		1	SP	_	Black to dark brown coa	_	
	-		1	5	4.5		DP05-1.3-2.6		NS NS	0 0			GC SW	Ī	 Dark brown to brown cla Light brown to brown m 		gravel and trace silt (moist)
	- 5 		•	-					NS	0 .5					-		-
	- - - 10 -					СА	DP05-8			.2 .4			GW-C	-	Brown gravel with clay,	$\langle \rangle$	nal cobbles (moist)
	-		2	10	6.5					.3					-	,	
	- - 15 		,			CA	DP05-10.6			.3 .4 .4					Grades dark grayish bro	own	
(2006117/1GINT W0006117, ואריט יו אין	 Where recovery 	app by a	oroj app	pria Iyin	te, th a the	e soil : ratio c	planation of symbols sample depth and the of the drilling run leng cussion of the depth	ie de gth a	ind th	ne amou	the	e soil of soi	types	chai	nge, shown on this log, id, to the measured dep	have been no ths logged in	ormalized to 100 percent the field. Refer to Appendix
6/10 Fatture										L	og	of	Во	rir	ng DP-5		
20										Ducia							Domodial Investigation

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-7 Sheet 1 of 1 Project Number: 0506-117-12

Loo Ea	illed <u>cation</u> st (X): 25	12/14/2009 03435 North (Y)	: 265	Total 15 Depth (ft)	С	ogged E hecked hdwater Date M	By	JDL	Dri	ller Environmental We	est Drilling Equipment	Drilling Method Sonic Sonic Speedstar 15k
Da	tum: NAD	83 (feet)- State P	lane	WA (North)					Not	Encountered		
		FIE	ELD	AND RUN DAT	Ą							
	Depth (feet)	Run Run Number Run Length (ft) Actual Recovered (ft)	Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification		DESC	TERIAL CRIPTION
GPJ DBTel	0 — - - 5 — - - - - - - - - - - - - - - - - - - -	2 9 3	CA CA CA	DP07-2-2.7 DP07-3.2-4 DP07-6-7	NS NS HS NS NS NS	5 5 13.5 3.5 3.5 0.4 0.4 0.8	the		SP GC GW GW-GC	Brown gravel with clay, so	st) ine sand, occasio	nal cobbles and trace silt (dry) nal cobbles (moist)
V10 Path						Lo	og	of	Bori	ng DP-7		
:3/26						Proio						Remedial Investigation

pokane: Date:

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Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-8 Sheet 1 of 1 Project Number: 0506-117-12

ĺ	Drilled	12/14/2009		Total 15 Depth (ft)		_ogged E Checked		KBC JDL	Dri	ller Environmental We	st	Drilling Method Sonic
	Location East (X): 25 Datum: NAD	03467 North (Y 083 (feet)- State I	'): 265 Plane '	212 WA (North)	Grou	<u>ndwater</u> Date M		red		epth to Water (ft) Encountered	Drilling Equipment	Sonic Speedstar 15k
ſ		F	IELD	AND RUN DATA	٩							
	⊳ Depth (feet)	Run Run Number Run Length (ft) Actual Recovered (ft)	Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification		DES	TERIAL CRIPTION
7/GIN10506117.GPJ DB1emptate/Lib7emptate/ED206NGINEEX58.GD70506117_SONICLOG	0	e see figure A-1 fi e appropriate, the by applying the r	CA CA	DP08-1.6-2.4 DP08-3.5-4.5	depth a and ti	0.5 1.7 1.2 0.3 0.3			GP SW GW-GC GW GW	Black fine to coarse grave Black gravel with sand an Brown gravel with sand, o	with gravel and I with clay (moi d trace clay (moi cecasional cobbl	I trace silt (dry to moist) (fill?) - ist) (very oily appearance) (fill?) - ist) (fill?) -
atn:P:/0/05/												
101/92						Lo	og	of	Boriı	ng DP-8		

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-9 Sheet 1 of 1 Project Number: 0506-117-12

ſ	Drilled	12/14/2009	Total 15 Depth (ft)		Logged E Checked			Dri	ller Environmental We	st	Drilling Method Sonic					
	Location East (X): 2 Datum: NAI	503509 North (Y): 26 D83 (feet)- State Plane	5224 WA (North)	Grou	ndwater Date M		ed.		epth to Water (ft) Encountered	Drilling Equipment	Sonic Speedstar 15k					
Ì		FIELD	AND RUN DAT	4												
	o Depth (feet)	Run Run Number Run Length (ft) Actual Recovered (ft) Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification			TERIAL CRIPTION					
	-0	CA	DP09-1-2		88.6 11.5 15	0 1.1 80		GP SP GW-GC	Brown coarse gravel (moi Black sand with trace silt (Black gravel with clay (mo	(moist) (fill?) bist) (fill)	ccasional cobbles and trace clay (moist)					
	- - 5 -	- 1 5.5 3 CA	DP09-2.5-3		8.6			GW	Light brown to brown grav	vel with sand, o	casional cobbles and trace clay (moist)					
	-				2	01018	000	GC	Brown clayey gravel with	sand (moist)						
	- - 10 -				7.8 12		0 Ø 9	SW/SP	- - Light brown to brown sam	d with gravel an	d trace silt (dry)					
		2 9.5 6			4.8	1.11.2.11.11.1 11.11.2.11.11.1										
	15 -				5.4 1.5	11, 11, 11, 11, 12, 13, 14, 11, 12, 14, 14, 14, 14, 14, 14, 14, 14, 14, 14			25							
	2. Where recovery															
SZCOLIO FAIL					Lo	_	of	Boriı	ng DP-9		Pomodial Investigation					

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-10 Sheet 1 of 1 Project Number: 0506-117-12

ſ	Drilled	12/10/2009	Total 16 Depth (ft)		ogged E hecked I				er Environmental We	st	Drilling Method Direct Push
	Location East (X): 25 Datum: NAD	03564 North (Y): 265 83 (feet)- State Plane	5245 WA (North)	Grour	ndwater Date Me	easu	red.		epth to Water (ft) Encountered	Drilling Equipment	Geoprobe
ſ		FIELD	AND RUN DATA	١							
	. Depth (feet)	Run Run Number Run Length (ft) Actual Recovered (ft) Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification			TERIAL CRIPTION
	0 — - - 5 — - - - - - - - - - - - - - - - - - - -	1 4 1 CA CA CA CA CA CA CA CA CA CA	DP10-4-5.8 DP10-5 (BTEX) DP10-8-9	NS	0		1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	GW-GM SP-SM GC-GC	Dark grayish brown fine te Dark grayish brown coarse Brownish to black gravel v Light orangish brown coar Light orangish brown clay	e sand with grav	el and trace clay (fill) - d (fill?) : and gravel (moist) - - - - - - - - - - - - -
Date:328/10 Path P: 000506117/GINT0506117.GPJ DBTemplate/LibTemplate.GEOE/NGINEERS8.GDT/0506117_SONICLOG	2. Where recovery		ample depth and the c f the drilling run length	and the	he amou ations.	int o	f soil	recovere	nge, shown on this log, h d, to the measured depth		ormalized to 100 percent the field. Refer to Appendix
Date:3/26/1	-	-			Projec	ct:			BNSF Parkwater	-	Remedial Investigation
Spokane:	GEO	ENGINE	ERS		-				Spokane, Washir 0506-117-12	ngton	Figure A-11 Sheet 1 of 1

Figure A-11 Sheet 1 of 1

ĺ	Drilled	12/10/2009		Total 16 Depth (ft)		.ogged E hecked I				iller Environmental We	st	Drilling Method Direct Push
	Location East (X): 25 Datum: NAD	503616 North (Y 083 (feet)- State F	'): 26: Plane	5266 WA (North)	Grou	ndwater Date Me		<u>ired</u>		<u>epth to Water (ft)</u> Encountered	Drilling Equipment	Geoprobe
ſ		FI	IELD	AND RUN DATA	۹.							
	. Depth (feet)	Run Run Number Run Length (ft) Actual Recovered (ft)	Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification			TERIAL CRIPTION
	0 — - -	1 4 2.1			NS	0		No.	GW-GM GW-GC	Dark brown to gray grave - Orange to brown gravel w		nd (fill) -
	- - 5 —	2 4 1.2	CA	DP11-4.2-4.85					GP-GC SP	Dark brown fine gravel w Orange to brown coarse s		
	- - - 10 -	3 4 1.4	CA CA	DP11-8-8.4 DP1-8-9								-
	- - - 15 —	4 4 2.2								2	,	-
	 Where recovery 	e appropriate, the by applying the r	soil s atio o	lanation of symbols. ample depth and the of the drilling run length ussion of the depth m	and t	he amou	the int o	soil t	ypes cha recover	ange, shown on this log, f ed, to the measured dept	nave been nc hs logged in t	ormalized to 100 percent the field. Refer to Appendix
8:3/20/10 F					-	Lo Projec	_	of	Borir	Ig DP-11 BNSE Parkwater	Facility F	Remedial Investigation
pokane: Dati	GEO	DENGI	NE	ERS		-		-002	ation:	Spokane, Washi	-	Figure A-12

Project Location: Spokane, Washington Project Number: 0506-117-12

Figure A-12 Sheet 1 of 1

	rilled	1/19/2010	Total Depth (ft)	12	Logged Checked			Dri	ller Environmental We	st	Drilling Method Direct Push
	ocation ast (X):	North (Y):		G	roundwater Date M		red		epth to Water (ft) Encountered	Drilling Equipment	Geoprobe
		FIELD	AND RUN	DATA							
	o Depth (feet)	Run Run Number Run Length (ft) Actual Recovered (ft) Testing	SAMPLE N	AME	Sheen Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification			TERIAL CRIPTION
	0-	- 1 3.5 1.25		1	NS 0.0 NS 0.0 NS 0.0	· W· · · · · ·		CC SP	 5 inches concrete Brownish gray coarse san 	d with trace silt	(moist)
	5 -	- 2 4 1.8		1 1	NS 0.0 NS 0.0 NS 0.0 NS 0.0		2000	GW	Black to dark brown fine — Slight increase in sand cor —		with sand and trace silt
	10 -			1 1	NS 0.0 NS 0.0 NS 0.0 NS 0.0		00000				- - -
Spokane: Date::328'10 Path::400506117/GINT/0506117/GPJ DB1emplate/Lib1emplate/GECENSINEERS8 GD1/0506117_SONICLOG	2. When recover		ample depth a f the drilling rur	nbols. nd the dej n length ai	nd the amo				ange, shown on this log, f ed, to the measured dept		ormalized to 100 percent the field. Refer to Appendix
20/10 Par					Lo	og (of E	Borin	ig DP-12		
Spokane: Date:2	Ge	oEngine	ERS	J		ct L			BNSF Parkwater Spokane, Washin 0506-117-12	-	Remedial Investigation Figure A-13 Sheet 1 of 1

	Drilled	12/28/2009	Total 15 Depth (ft)		Logged E Thecked I			Dri	ller Environmental We	st	Drilling Method Sonic
	Location East (X): 24 Datum: NAI	499225 North (Y): 26 D83 (feet)- State Plane	2897 WA (North)	Grou	ndwater Date Me		red		epth to Water (ft) Encountered	Drilling Equipment	Sonic Speedstar 15k
		FIELD	AND RUN DAT	A							
	o Depth (feet)	Run Number Run Number Run Length (ft) Actual Recovered (ft) Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)		Graphic Log	Group Classification		DESC	TERIAL CRIPTION
EERSS GD //0506117_SONICLOG	0- - - 5- - - - - - - - - - - - - - - -		DP13-1-2 DP13-6-7	NS NS NS NS NS NS	39.3 15.0 17.8 10.9 19.1 20.8 10.8 10.3 11.0			GP GP GW	Dark brown clayey gravel Brown coarse gravel with Decrease in clay content	with sand and o	-
ath:P:\0\0506117\GiN1\0506117.GPJ_DB1emplate/Lib1emplate:GEOENG	 Where recovery 	e see figure A-1 for exp e appropriate, the soil s by applying the ratio o attached report for diso	sample depth and the of the drilling run lengt	h and t	he amou ations.	int of	f soil	recovere		nave been no hs logged in t	rmalized to 100 percent the field. Refer to Appendix
3/26/10 -							of E	Borin	g DP-13	=	
ate					Projec	ct:			BNSF Parkwater	Facility R	Remedial Investigation

Project Location: Spokane, Washington

Project Number: 0506-117-12

Figure A-14 Sheet 1 of 1

ookane: Date

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1	Drilled	12/28	/2009		Total 15 Depth (ft)		Logged E Checked				ller Environmental We	est	Drilling Method Sonic
	Location East (X): 24 Datum: NAD	99267 083 (feet	North (\)- State	(): 262 Plane \	895 VA (North)	Grou	Indwater Date M		<u>ired</u>		epth to Water (ft) Encountered	Drilling Equipment	Sonic Speedstar 15k
(F	IELD	AND RUN DAT	A							
	⊳ Depth (feet) I	Run Run Number	Run Length (ft) Actual Recovered (ft)	Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification		DES	TERIAL CRIPTION
	0 — 	e see figu appropri	15 10	CA CA	DP14-2.5-3 DP14-4	NS NS NS NS NS NS NS NS	0.4 0.3 0.5 0.2 0.3 0 0 0 0 0 0 0 0	the	soil f soil	GP GP-GC GW-GM ML GW ML	Light brown silt with grav Brown gravel with sand a Light brown silt with occa	d sand (moist) (f	ill?) ist) (fill?) i and occasional cobbles (dry) al sand and cobbles (dry) gravel (dry) d and cobbles (dry)
126/10							LO	g	OŤ	Boui	ng DP-14		

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Project Number: 0506-117-12

Figure A-15 Sheet 1 of 1

Drilled	12/28/2009		Total 15 Depth (ft)		.ogged E hecked			oriller Environmental We	est	Drilling Method Sonic
Location East (X): 24 Datum: NAD	499309 North (Y D83 (feet)- State	(): 262 Plane	2918 WA (North)	Grou	ndwater Date M	easured	No	Depth to Water (ft) t Encountered	Drilling Equipment	Sonic Speedstar 15k
	F	IELD	AND RUN DATA	١.						
o Depth (feet)	Run Run Number Run Length (ft) Actual Recovered (ft)	Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	ら 日 日 の の の の の の の の の の の の の の の の の	Black coarse gravel (mois	DES	
-		CA	DP15-1-2	NS	34.5	6	GC	Black clayey gravel with	sand (moist) (fill	?)
				NS	41.9		GC	Dark brown clayey grave	l (moist)	
						6	GW-GN			nal cohblas (moist)
5 —	-			NS NS	32.7 31.1			Decrease in clay content	-	
-	1 15 11	CA	DP15-6-7	NS	20.0		GP	Brown fine grayel with sa	ind and trace silt	- - - (dry)
10 — -				NS	6.2		GM	Grayish brown silty fine t	o coarse gravel	with sand (dry) -
- - 15 —				NS	5.5			Grades brownish gray		-
2. Where recovery	e appropriate, the	e soil s ratio o	lanation of symbols. ample depth and the of the drilling run length ussion of the depth m	and th	he amou	the soi unt of so	types c	hange, shown on this log, l ered, to the measured dept	have been no	ormalized to 100 percent the field. Refer to Appendix
					Lo	og of	Bori	ng DP-15		
Geo	oEngi	NE	ERS		Proje Proje		ation	BNSF Parkwater Spokane, Washi	-	Remedial Investigation Figure A-16

Spokane: Dat

Remedial Inv Project Location: Spokane, Washington Project Number: 0506-117-12

Figure A-16 Sheet 1 of 1

ĺ	Drilled	1	2/2	8/2	009		Total 15 Depth (ft)		Logged Checked				Drille	er Environmental Wes	st	Drilling Method Sonic
	Location East (X): 24 Datum: NAD	993 83	55 (fee	Nc et)- S	orth (N State	(): 262 Plane	2923 WA (North)	Gro	undwater Date N		ured	No		<u>oth to Water (ft)</u> ncountered	Drilling Equipment	Sonic Speedstar 15k
(F	IELD	AND RUN DAT	Ā								
	o Depth (feet) ∣	Run	Run Number	Run Length (ft)	Actual Recovered (ft)	Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level		Group			DES	TERIAL CRIPTION
	- - - 5-					CA	DP16-1.5-2.5	ss				GP GC GC		Black coarse gravel with o Black clayey gravel with s Dark brown clayey gravel	and (moist) (fill with sand and e	?)
	- - - 10 - - - 15		1	15	13	СА	DP16-4-5	NS NS NS NS	3.1 2.3 3.2			GW		Dark brown fine to coarse		-
PJ DBTemplate/LibTemplate:GEOENGINEERX8.GDI/090611/_SONICLOG	2. Where	ap	oro	oriat	e. the	e soil s	lanation of symbols.	e depth	h at which	n the	e soil i	types c	han	ge, shown on this log, h	ave been no	rmalized to 100 percent the field. Refer to Appendix
ath:P:\0\0506117\GINT\0506117.C	A of the a	itta	che	d re	port f	or disc	ussion of the depth r	nodifie	cations.							
/26/10 F									Lo	bg	of	Bori	n	g DP-16		

pokane: Date:

GEOENGINEERS

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-17 Sheet 1 of 1 Project Number: 0506-117-12

	Drilled	12	2/28	/2009		Total 15 Depth (ft)	c	ogged E hecked	By			ller Environmental We		Drilling Method Sonic
1	Location East (X): 2 Datum: NAI	4993 083 (96 feet)	North - State	(Y): 26 Plane	2945 WA (North)	Grou	ndwater Date M		ured	_	epth to Water (ft) Encountered	Drilling Equipment	Sonic Speedstar 15k
ſ					FIELD	AND RUN DAT	A							
	o Depth (feet)	Run	- Run Number	Run Length (ft) Actual	Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification		DES	ATERIAL CRIPTION
	5-	-			CA CA	DP17-1.5-2.5 DP17-3-4	NS NS NS	17.1 20.3 2.7			GP GC GW-GM GW	Ū.	sand (moist) (fill rel with clay, sar	
	10 –	-	1	15 8			NS	4.4 4.5				- - - - Grades grayish brown		- - - -
	15 –	-					NS	3.0		10000	GM	Light gray silty fine to coa	arse gravel with	fine sand (dry) - - -
3/28/10 Path.P. 00(506/117/GINT/0506/117/GPJ DBTemplate/LIbTemplate/GEOENGINEERS8. GDT/0506/117_SONICLOG	2. When recovery	e app by a	propr	iate, th ing the	ne soil s e ratio o		depth and ti	he amou				ange, shown on this log, f ed, to the measured dept		ormalized to 100 percent the field. Refer to Appendix
26/10 Path:P:\0\050								Lo	g	of	Borir	ig DP-17		
a:3/2(Proie	<u>.</u>			PNSE Parkwator	Eacility E	Remedial Investigation

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Project Number: 0506-117-12

Figure A-18 Sheet 1 of 1

	Drilled		1	2/2	8/2	009			Total 15 Depth (ft)		Logged I Checked				Drille	r Environmental We	st	Drilling Method Sonic
F	.ocation East (X): Datum: №	249	994 83	43 (fee	Nc t)- S	orth (State	Y): 2 Plan	629 e W	55 /A (North)	<u>Grou</u>	Indwater Date M		ured	N		<u>th to Water (ft)</u> ncountered	Drilling Equipment	Sonic Speedstar 15k
ſ						F	IEL	DA	AND RUN DAT	Ą	1	_						
		o uepin (reet)	Run	Run Number	Run Length (ft)	Actual	Testina	5	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification			DES	TERIAL CRIPTION
							CA		DP18-1-2	SS	60			GP GC	E	Black coarse gravel (moise Black clayey gravel with s		
		- 5 — -					CA		DP18-4	NS NS	11.6 2.5				-	Grades to brown		- - -
				1	15	10				NS NS	2.5 3.4			GM GP	-	Gray to brown silty gravel Light brown fine gravel w) onal cobbles and trace silt (dry)
	1	0 — - -								NS	1.1			GP	-	White to light brown grave Grades light brown	el with sand, oc	casional cobbles and trace silt (dry)
	1	- 5				_				NS	2.3				ł	2X		
	2. Wł recov	ease nere rery l	apj by a	orop app	oriat ying	te, th g the	e soil ratio	cplar sar of th	nation of symbols. nple depth and the he drilling run lengt ssion of the depth n	h and	the amou	n the	e soil of soi	types of I recov	chan	ge, shown on this log, h , to the measured depth	nave been no hs logged in t	ormalized to 100 percent the field. Refer to Appendix
											Lo	bg	of	Bor	ing	J DP-18		

pokane: Date:3

GEOENGINEERS

BNSF Parkwater Facility Remedial Investigation Project: Project Location: Spokane, Washington Project Number: 0506-117-12

Figure A-19 Sheet 1 of 1

ſ	Drilled		1:	2/2	8/2	009			Fotal 15 Depth (ft)		ogged I				Drill	er Environmental We	est	Drilling Method Sonic
	Location East (X): Datum: N	249 IAD)94 33 (86 fee	Nc t)- S	orth (State	Y): 20 Plano	6296 e W.	65 A (North)	Grou	ndwater Date M		ured	١		oth to Water (ft) Incountered	Drilling Equipment	Sonic Speedstar 15k
ſ						F	IELI	D A	ND RUN DAT	A								
	o Denth (feet)		Run	- Run Number	Run Length (ft)	Actual	Testing		SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group			DES	TERIAL CRIPTION
							CA		DP19-2	NS NS	83 40			GF		-	-	and occasional concrete (moist) (railroad ballast) casional cobbles (moist) (fill?)
	5	5		1	15	8	CA		DP19-5	NS	45			GW-				ay and occasional cobbles (moist)
	10	- 								NS	32		000000	GN GW-	-	Whitish gray silty coarse p	-	sional cobbles
	15	-					CA		DP19-7-8	NS	15.2					2		
	2. Wh recove	ase ere ery t	app by a	porop	oriat ving	e, th the	e soil ratio	plar sam	nation of symbols. nple depth and the re drilling run lengt sion of the depth n	h and t	he amoı	the	e soil	types I reco	char	ige, shown on this log, l	have been no hs logged in	ormalized to 100 percent the field. Refer to Appendix
6/10 Pat											Lo	bg	of	Bo	ring	g DP-19		

pokane: Date:3

GEOENGINEERS

BNSF Parkwater Facility Remedial Investigation Project: Project Location: Spokane, Washington Figure A-20 Sheet 1 of 1 Project Number: 0506-117-12

ĺ	Drilled	12/28/2009		Total 15 Depth (ft)	L	ogged E hecked I	3y By	KBC JDL	Dr	iller Environmental We	est	Drilling Method
	Location East (X): 24 Datum: NAD	99528 North (Y 83 (feet)- State I): 262 Plane '	982 WA (North)	Grou	ndwater Date Me	eası	ured	_	Depth to Water (ft) Encountered	Drilling Equipment	Sonic Speedstar 15k
ſ		F	ELD	AND RUN DATA	ł							
	o Depth (feet) 	Run Run Number Run Length (ft) Actual Recovered (ft)	Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification	Black coarse gravel (moi	DES	TERIAL CRIPTION
ampiaterGECENSINEEKS8.60/N0506111_SONICLOG			CA CA	DP20-2 DP20-5-6	SS NS NS NS NS	123 83.6 52.6 47.6 12 0.4			GP GC GP GW GW	Increase in clay content Brown gravel with sand, o Light brown fine to coarse	yey fine to coars with occasional occasional cobbl	?) se gravel with sand and occasional cobbles
20/0506117/GINI /0506117.GPJ DB1emplate/Lib	 Where recovery 	appropriate, the by applying the r	soil satio of	anation of symbols. ample depth and the of the drilling run length ussion of the depth m	i and tl	he amou	the int c	soil t <u>i</u> of soil	ypes cha recover	ange, shown on this log, ed, to the measured dept	have been no hs logged in	ormalized to 100 percent the field. Refer to Appendix
Zor TU Pam:P						Lo	g	of I	Borir	ng DP-20		

BNSF Parkwater Facility Remedial Investigation Project: Project Location: Spokane, Washington Figure A-21 Sheet 1 of 1 Project Number: 0506-117-12

ĺ	Drilled		1:	2/28	3/20	009			Total 15 Depth (ft)		.ogged [hecked				Drill	er Environmental We	st	Drilling Method Sonic
	Location East (X): 2 Datum: NA	249 \D8	95 3 (66 feet	No)- S	orth (State	Y): Pla	263 ane \	006 VA (North)	Grou	ndwater Date M		ured	N		<u>pth to Water (ft)</u> Encountered	Drilling Equipment	Sonic Speedstar 15k
ſ						F	EIE	LD	AND RUN DAT	A								
	o Depth (feet)	1		- Run Number	Run Length (ft)	Actual		Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group		Plack coarse graval (mais	DES	TERIAL CRIPTION
	0- 5- 10- 15-			1		11		CA	DP21-1.5-2.5	NS NS NS NS NS NS	85 75.5 73.0 71.4 267 17.0 12.8 6.6			GP GW-C GW-C GW GW GW	7 00C	Dark brown gravel with cl Dark brown gravel with se Dark grayish brown grave Brown gravel with sand, o	ccasional cobble lay, sand, and co and, occasional hyperbolic and and accasional cobble	s and trace clay (moist) (fill?) obbles (moist) cobbles and trace silt (moist) cobbles (dry)
ith:P::010506117/GINT/0506117.GPJ_UBTemplate/LibTemplate:GEOENGINEEKS8.GD1/vove117_sovicLOG	2. When recover	re a y b	app y a	rop pply	riat /ing	e, th g the	e so rati	oil sa io of	anation of symbols. ample depth and the the drilling run lengt ussion of the depth n	h and t	he amou ations.	unt	of soil	recov	vere	d, to the measured depth	nave been nc hs logged in t	ormalized to 100 percent the field. Refer to Appendix
101/02											LC	рg	of	Bor	'n	g DP-21		

BNSF Parkwater Facility Remedial Investigation Project: Project Location: Spokane, Washington Project Number: 0506-117-12

Figure A-22 Sheet 1 of 1

Di	rilled		12/2	28/20	09		Total Depth (ft)	8		ogged B hecked E			Dri	ller Environmental We	est	Drilling Method Sonic	
	ecation ast (X):	No	rth (Y):		i		-	Grour	ndwater Date Me	easure	ed.		_{epth to Water (ft)} Encountered	Drilling Equipment	Sonic Speed	dstar 15k
Ē		Τ			FI	FLD	AND RUN										
	o Depth (feet)		Run Number	Run Length (ft)	Actual Recovered (ft)		SAMPLE		Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification			TERIAL CRIPTION	
	0	-				CA	DP22-7	I-2			0/0/0/0	00000	GP GC	Black coarse gravel (moi Black clayey coarse grav			 - -
	5 -	-	1	8	5								SM	Brown silty fine sand (mo	pist)		
													5	Rock blocked sampler a	t approximately	5 foot depth	
DB1emplate/Lb1emplate:GEOENG/NEFRS8.GD1/0506117_SONICLOG	Notes:																
GPJ	2. When recovery	e a y by	ppro app	priate lying	e, the the r	soil sa atio of	lanation of sy ample depth : the drilling ru ussion of the	and the do In length a	and th	ne amou	the sont of s	oil typ soil re	bes cha	inge, shown on this log, ed, to the measured dep	have been no ths logged in t	ormalized to 100 percent the field. Refer to Appe	: ndix
/10 Path:										Lo	g o	of B	orin	g DP-22			
ate:3/26	5000		0-01							Projec	-			BNSF Parkwater	· Facility R	Remedial Investig	ation
pokane: C	Ge	0	E	N	GII	NE	ERS /)				ocat	ion:	Spokane, Washi	ngton	-	Figure A-23

Project Location: Spokane, Washington Project Number: 0506-117-12

Figure A-23 Sheet 1 of 1

	rilled	12/28/2009	Total 15 Depth (ft)		Logged I Thecked				iller Environmental We	est	Drilling Method Sonic	
E	ocation ast (X): 24 atum: NAE	99683 North (Y): 26 983 (feet)- State Plane	3050 WA (North)	Grour	ndwater Date M		ured	Depth to Water (ft) Drilling Sonic Speedstar 15 Equipment				
Ē		FIELD	AND RUN DAT	4								
	⇔ Depth (feet) I	Run Number Run Number Run Length (ft) Actual Recovered (ft) Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification		DESC	TERIAL CRIPTION	
	-	CA	DP23-1-2	NS	6.7			GP	Black gravel with sand an	id trace clay (mo	ist) (railroad ballast) - -	
	- 5—	CA	DP23-3-4	NS NS	7.4 4.8			GC	_ Dark brown clayey gravel	l with sand and o	occasional cobbles (moist)	
	-	1 15 11.5			5.2			GW-GC	Brown gravel with clay, s	and and occasion	nal cobbles (dry) -	
	10 — - -			NS	3.9				Increase in clay content		-	
	- - 15 —			NS	3.5			GW	Light grayish brown grave	el with sand, occ	asional cobbles and trace silt (dry)	
	2. Where recovery	e see figure A-1 for exp e appropriate, the soil s by applying the ratio attached report for disc	sample depth and the	n and th	he amoı	n the	e soil	types cha I recover	ange, shown on this log, f ed, to the measured dept	have been no hs logged in f	ormalized to 100 percent the field. Refer to Appendix	
					Lo	bg	of	Borir	ng DP-23			

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Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-24 Sheet 1 of 1 Project Number: 0506-117-12

ĺ	Drilled	12/15/2009	Total 15 Depth (ft)		.ogged E hecked			Dr	iller Environmental We	st	Drilling Method Sonic	
	Location East (X): 25 Datum: NAD	503113 North (Y): 265 083 (feet)- State Plane	5201 WA (North)	Grour	ndwater Date M		ed.	Depth to Water (ft) Drilling Sonic Speedstar 15k				
ſ		FIELD	AND RUN DAT	۹.								
	o Depth (feet) ∣	Run Run Number Run Length (ft) Actual Recovered (ft) Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification		DESC	TERIAL CRIPTION	
	-0	CA	DP24-0.5-1.5	ss	139			SC	Black clayey sand with gra	avel (moist) (fill))	
	- - 5 	1 5 3 CA	DP24-2-3		44			GC GM ML	Brown clayey gravel with Light brown silty gravel w Light gray silt with gravel	vith sand, occasion	onal cobbles and trace clay (moist)	
	-				0			GP	Brown gravel with sand ar		-	
	-	2 5 2.5			0			GP	Brown fine gravel with sar	nd, occasional c	obbles and trace silt (moist)	
	- 10 —	CA	DP24-7-7.5	SS	7.0 0	l þ	。 •	SW	Brown fine to coarse sand	with gravel and	-	
	-				0	•						
	-	3 5 3			0			ML	Light gray to light brown s	silt with sand and	d trace gravel	
	15 —											
00506117/GINT0506117.GPJ_DB1emplate/Lib1emplate:GEOENGINEEKS8.GU1/0506117_SONICLOG	 Where recovery 	e see figure A-1 for exp e appropriate, the soil s by applying the ratio of attached report for disc	ample depth and the f the drilling run length	n and th	ne amou	the s	soil ty	pes ch	ange, shown on this log, h ed, to the measured depth	nave been no ns logged in t	rmalized to 100 percent the field. Refer to Appendix	
S/10 Path:P					Lo	og o	of E	Borir	ng DP-24			
Ň												

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-25 Sheet 1 of 1 Project Number: 0506-117-12

Drilled	12/16/2009	Total 15 Depth (ft)		_ogged B Checked E			Drill	er Environmental We	st	Drilling Method Sonic
Location East (X): 2 Datum: NA	2503201 North (Y): 26 D83 (feet)- State Plane	5286	Grou	ndwater Date Me	easur	red	Depth to Water (ft) Not Encountered			Sonic Speedstar 15k
	FIELD) AND RUN DATA								
o Depth (feet)	Run Run Number Run Length (ft) Actual Recovered (ft) Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification		DES	TERIAL CRIPTION
	- - - 1 5 4 CA	DP25-3-4			0 0 0	00000	GP GC	Dark brownish gray coars ballast) Brown clayey coarse gray	-	casional cobbles and trace sand (moist) (railroad - -
5 -			NS	0			GW	-		nd, occasional cobbles and trace silt (dry)
	- CA	DP25-5-6	110		0	S-	GC	- Dark gray clayey gravel w	with trace cand ()	-
			NS	0			GW			noist) nd, occasional cobbles and trace silt (dry)
10 -	-				9	A -	GP	Gray fine gravel with sand		
	3 7 3						GW-GC	Brown fine to coarse grav	ei with clay (mo	
					01		SP	Brown coarse sand with g	gravel and trace	clay (moist)
2. When recover		sample depth and the d	and th	he amou						ormalized to 100 percent the field. Refer to Appendix
610 Pamir				Lo	go	of E	Borin	g DP-25		
Date: 32	-			Projec	ct:			BNSF Parkwater	-	Remedial Investigation
GE	OENGINE	ERS		Projec	t L	oca	tion:	Spokane, Washi	ngton	Figure A-26

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-26 Sheet 1 of 1 Project Number: 0506-117-12

	Drilled	12/15/2009	Total 15 Depth (ft)		Logged B Checked I			Dril	ler Environmental We	st	Drilling Method Sonic
	Location East (X): 25 Datum: NAE	03217 North (Y): 26 083 (feet)- State Plane	5243 WA (North)	Gro	undwater Date Me	easure	ed		epth to Water (ft) Encountered	Drilling Equipment	Sonic Speedstar 15k
1		FIELD	AND RUN DAT	Ą							
	. Depth (feet)	Run Run Number Run Length (ft) Actual Recovered (ft) Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification		MA DESC	TERIAL CRIPTION
	0 — - -	CA	DP26-1-2		0	0 \ \ .		GP SP SM	Black coarse gravel with t Brown fine to coarse sand Brown to light gray silty s	with gravel and	clay lenses (moist)
ou de le emplater la compater de la companya de	2. Where	e see figure A-1 for exp	DP26-5-6	deptt	at which	the s	oil ty	JW-GM SP-SM GP SP	Brown fine to coarse graw Brown fine sand with sfit, Brown fine gravel with trac Brown fine sand with trac	el with silt and s gravel and occa ce silt e silt	and (moist)
500117/051N1/0500117.05	A of the a	by applying the fallo c	cussion of the depth n	nodific	cations.		5011		a, to the measured dept	na logged iff (he field. Refer to Appendix
Jatn:P://0/0	<u> </u>										
3/26/10 F				—	Lo Projec		of E		g DP-26 BNSE Parkwater	Facility P	emedial Investigation
ate					-ruje(. از			DINOF FAIRWALE	r aunity R	เอกาอนเลเ แทงออแฎลแบบไ

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pokane: Date

Project Location: Spokane, Washington Project Number: 0506-117-12

Figure A-27 Sheet 1 of 1

ĺ	Drilled 12/16/2009 Total Depth (ft) 15 Logged By k Checked By c Location Groundwater								ller Environmental We	st	Drilling Method Sonic
	East (X): 2	503244 North (Y): 26 D83 (feet)- State Plane	5301	Grou	ndwater Date Me	easured			<u>epth to Water (ft)</u> Encountered	Drilling Equipment	Sonic Speedstar 15k
ſ		FIELD	AND RUN DATA								
	o Depth (feet)	Run Number Run Number Run Length (ft) Actual Recovered (ft) Testing	SAMPLE NAME	Sheen		Water Level Graphic Log		Classification	Distances and with	DES	TERIAL CRIPTION
UDTT/GNT USUOTT.GP/ DB16mpjage/LD16mpjage/SeCUENSINEEX58.G9/10300117_SONLCUG	0	e see figure A-1 for exp e appropriate, the soil s	DP27-2.5-3.5 DP27-5-6	NS NS	0 0	the sol		P P P	Light gray silty fine sand v	b coarse sand with gravel, occasis with gravel and the gravel and the gravel, occasis with gravel, occasis of the gravel, occasion of the gravel of the grav	ith clay and gravel (moist) ional cobbles and trace silt (dry) occasional cobbles (dry) onal cobbles and trace clay (moist)
					1	a c ⁴					
31 ZU 10				-		-	В0	rin	BNSE Parkwater	Facility F	Pemedial Investigation
pokane: Date	Ge	OENGINE			Projec Projec		catio	n:	Spokane, Washir	-	Remedial Investigation Figure A-28

okane: Date

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-28 Sheet 1 of 1 Project Number: 0506-117-12

	Drilled	12/16/2009	Total 15 Depth (ft)		Logged B Checked E			riller Environmental We	st	Drilling Method Sonic
	Location East (X): 25 Datum: NAE	03295 North (Y): 2 083 (feet)- State Plan	65322 e WA (North)	Grou	indwater Date Me	asured		<u>Depth to Water (ft)</u> t Encountered	Drilling Equipment	Sonic Speedstar 15k
ĺ		FIEL	D AND RUN DAT	Ā						
	o Depth (feet)	Run Run Number Run Length (ft) Actual Recovered (ft) Testina	SAMPLE NAME	Sheen		Water Level Graphic Log	Group Classification			TERIAL CRIPTION
	0		DP28-1.4-2	NS	0 Vegors		GP GP GP GP	Black coarse gravel with si Brown clayey gravel with Light gray fine to medium Brown clayey gravel with Brown fine to coarse sand	sand and occass sand with grave sand (moist) with gravel and	ional cobbles (moist)
0\0506117\GINI\0506117.GPJ L	recovery	by applying the ratio	sample depth and the of the drilling run leng scussion of the depth r	th and t	the amou	the soil	types cl il recove	nange, shown on this log, h red, to the measured depth	have been no hs logged in f	rmalized to 100 percent the field. Refer to Appendix
IO Path:P:W					Lo	a of	Bori	ng DP-28		
1/97/2						3 01	2011			

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-29 Sheet 1 of 1 Project Number: 0506-117-12

ĺ	Drilled	12/15/2009	Total Depth	(ft) 15			gged By KBC Driller Driller Drilling Drilling ecked By JDL Driller Environmental West Drilling Sonic dwater Drilling Drilling Sonic Sonic								
	Location East (X): 25 Datum: NAD	03314 North (Y): 183 (feet)- State Pla	265276 ane WA (No	rth)	Grour	Sonic Speedstar 15k									
ſ		FIE	LD AND I	RUN DATA	4										
	o Depth (feet) 	Run Run Number Run Length (ft) Actual Recovered (ft)	Testing	PLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification						
	- 0		CA E)P29-1-2	NS	0			SP/CL	Dark brown sand with gra –	avel, trace clay a	nd interbedded clay lenses (moist)			
	-	1 5 4			NS	0			SP	 Brown sand with gravel, or 	occasional cobbl	es and trace silt			
	- 5 —		CA E	DP29-3-4	NS	0				Increase in silt content		-			
	10 2 10 5 CA DP29-7 SS 0 0 -														
	2. Where recovery	Notes: 1. Please see figure A-1 for explanation of symbols. 2. Where appropriate, the soil sample depth and the depth at which the soil types change, shown on this log, have been normalized to 100 percent recovery by applying the ratio of the drilling run length and the amount of soil recovered, to the measured depths logged in the field. Refer to Appendix A of the attached report for discussion of the depth modifications.													
COLIN Fall						Lo	g	of	Borin	g DP-29					
1					-		-								

ookane: Date

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Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-30 Sheet 1 of 1 Project Number: 0506-117-12

	Drilled	12/15/2009	Total 15 Depth (ft)		.ogged I hecked				iller Environmental We	st	Drilling Method Sonic		
	Location East (X): 25 Datum: NAD	03501 North (Y): 3 83 (feet)- State Pla	265325 he WA (North)	Grou	ndwater Date M		ured.	<u></u>	Depth to Water (ft) Drilling Sonic Speedstar				
(FIEL	D AND RUN DAT	Ā									
	o Depth (feet) ∣	Run Run Number Run Length (ft) Actual Recovered (ft)	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification	Light to gray fine sand wit	DES	TERIAL CRIPTION		
	-	1 5 4.5	A DP30-1-2		0.4 15.5			51	- - -				
		, c	A DP30-4		14.4			SP GC	 Brown fine to coarse sand Brown clayey gravel with 	-	d trace silt (dry)		
	 10 - - -	2 10 2.5 C	A DP30-6-7	NS	2.1 0.5			ML SP SM	 Light grayish brown sift w Brown to gray sand with g Silty sand with gravel (mo 	gravel and trace	and occasional cobbles (moist)		
0506117/GINT0506117.GPJ DB1emplate/LibTemplate:GEOENGINEERS8.GD1/0506117/_SONICLOG	2. Where recovery	appropriate, the so by applying the ratio	explanation of symbols. It sample depth and the of the drilling run leng iscussion of the depth of	e depth a th and tl	he amou	the	soil	types cha recover	ange, shown on this log, f ed, to the measured dept	nave been no hs logged in t	ormalized to 100 percent the field. Refer to Appendix		
V10 Path:F					Lo	bg	of	Borir	ng DP-30				
:3/26				_	<u> </u>	-			-		Domodial Investigation		

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-31 Sheet 1 of 1 Project Number: 0506-117-12

ſ	Drilled		12	/17/	200)9		Total Depth (ft)	15		_ogged I Checked				ller Environr	mental We	est	Drilling Method Sonic	
E	ocation East (X): Datum: N	250 AD8	194 33 (fe	6 N eet)-	lort ∙ Sta	h (Y ate F): 265 Plane \	205 WA (North)		Grou	ndwater Date M		ured	<u>D</u>	epth to Water (fi	<u>t)</u>	Drilling Equipment	Sonic Speedstar 15k	
ſ						FI	ELD	AND RU	N DAT	A									\equiv
	o Deoth (feet)		Run Dur Number	Dun Longth (4)	Adrin Lengun (III)	Actual Recovered (ft)	Testing	SAMPLE	E NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification			DESC	TERIAL CRIPTION	
ate:32810 Path:P:006061171GINT0506117.GPJ DBTemplate/LibTemplate/GEOENGINEERS8.GDT/0508117_SONCLOG	Notes: 1. Plea 2. Where		see	1 of	5 9	5.5 7.5	CA CA	DP41-0 DP41-4	0.5-1.5 4.5-5.5 symbols. a and the run lengt	depth and the	0		soil	SP GC GC SW GP SP-SM SP-SM	Black to dar Dark brown Brown fine t Light brown Light gray fi	k brown claye clayey gravel o medium sar fine gravel w ne sand with the ne sand the ne s	with sand (mois nd with gravel (d ith silt and trace silt and gravel (d silt and gravel (n	gravel with sand (moist) (fill?) st) lry) sand (dry) lry)	
26/10 Pa											Lo	bg	of	Borin	ig DP-41				
te:3/:											Proje	ct.			BNSF Pa	rkwater	Facility R	Remedial Investigation	

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Project Number: 0506-117-12

Figure A-32 Sheet 1 of 1

ſ	Drilled	12/17/2009	Total 15 Depth (ft)		.ogged E hecked			Dr	iller Environmental We	st	Drilling Method Sonic
	Location East (X): 25 Datum: NAD	01964 North (Y): 268 83 (feet)- State Plane	5224 WA (North)	Groundwater Date Measured Depth to Water (ft) Depth to Water (ft) Equipment						Sonic Speedstar 15k	
ſ		FIELD	AND RUN DATA	\							
	o Depth (feet) 	Run Run Number Run Length (ft) Actual Recovered (ft) Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification		DESC	TERIAL CRIPTION
	-				16.5			SP SP	Black sand with gravel and Brown sand with gravel ar		-
	- - 5—	1 6 6 CA	DP42-4-5		4.6 17.7			GP	Light brown fine gravel w	ith trace silt and	sand (dry)
	-	СА	DP42-7-7.5		1.9 30		0 	SP			occasional cobbles and trace silt (dry -
	- 10 -	CA 2 9 6	DP42-8		0			SP	Light brown fine sand with	h gravel, occasio	nal cobbles and trace silt
	-										-
	15 —						•••				
V0056117/GIN10506117,GPU DBTemplate/LioTemplate/GEOENGINEEKS8.GU/U0006117_SONICLOG	2. Where recovery	see figure A-1 for exp appropriate, the soil s by applying the ratio of titached report for disc	ample depth and the of the drilling run length	and the	ne amou	the int o	soil ty	/pes cha recover	ange, shown on this log, h ed, to the measured depti	nave been no hs logged in t	rmalized to 100 percent the field. Refer to Appendix
26/10 Pat					Lo	g	of E	Borir	ng DP-42		

BNSF Parkwater Facility Remedial Investigation Project: Project Location: Spokane, Washington Project Number: 0506-117-12

Figure A-33 Sheet 1 of 1

	Drilled	12/19/2009	Total 15 Depth (ft)		.ogged E hecked I				ller Environmental We	st	Drilling Method Sonic			
E	ocation ast (X): 2 atum: NA	2501994 North (Y): 263 AD83 (feet)- State Plane	5241 WA (North)	Groun	ndwater Date Me		ired	<u>D</u>	epth to Water (ft)	Drilling Equipment	Sonic Speedstar 15k			
Ē		FIELD	AND RUN DATA	٩										
	o Depth (feet)	Run Run Number Run Length (ft) Actual Recovered (ft) Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification		DESC	TERIAL CRIPTION			
	0			NS NS	2.5 0.6			SW-SC SP	Dark brown sand with cla Brown sand with gravel ar					
	_	CA	DP43-2-3.5	NS	18.4 10			SP-SM SP	Light brown fine to mediu Light brown sand with trai	im sand with gra	-			
	5	2 11 6.5		NS	1.2			ML	 Light gray silt with sand, ş - 		ional cobbles (dry)			
	10			NS	0.8						-			
				NS NS	0.6 29.4				Grades to light brown Grades to light gray		-			
	15			NS	10.9			-						
LD terriptate: OF OF ENVIREENSS. OU 1/05/00117_SOUNCELOS														
	2. Whe recover	Notes: 1. Please see figure A-1 for explanation of symbols. 2. Where appropriate, the soil sample depth and the depth at which the soil types change, shown on this log, have been normalized to 100 percent recovery by applying the ratio of the drilling run length and the amount of soil recovered, to the measured depths logged in the field. Refer to Appendix A of the attached report for discussion of the depth modifications.												
					Lo	g	of I	Borin	ig DP-43					

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-34 Sheet 1 of 1 Project Number: 0506-117-12

	Drilled		12/1	9/20	009		Total 15 Depth (ft)	Logged By H Checked By Groundwater Date Measur					Dril	ller Environmental We	st	Drilling Method Sonic
E	ocation ast (X): atum: N/	2502 AD8	2028 3 (fee	No et)- S	rth (Y State I): 26 Plane	5261 WA (North)	Grou			ured		De	epth to Water (ft)	Drilling Equipment	Sonic Speedstar 15k
Ē					F	IELD	AND RUN DAT	A								
	b Depth (feet)		Run Number	Run Length (ft)	Actual Recovered (ft)	Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification	Classification		DES	TERIAL CRIPTION
	0	_	ł			CA	DP44-0.5-1.5	NS	2.5		1	SP		Black medium sand with g		
		-						NS	10.3			SP-SC	SC .	Dark brown coarse sand w	vith clay (moist	-
			1	6	6			NS	3.5					-		
	5							NS NS	1.4 0.6		جا- ^ ہ	SP-SN GW		Brown coarse sand with si - Brown fine to coarse graw		
		-	╢	-				NS	7.0		P	ML	_	Light gray silt with gravel	(dry)	
		_	ΙŢ			CA	DP44-6-7							-	K	-
		-						NS	7.0			SP-SN	М	Light brown fine to coarse	sand with silt a	nd gravel (dry)
	10	_	2	9	5.5			NS	1.9						· · · ·	-
		-						NS	3.3							-
		_														-
	15				_			NS	60							
P.0000011/GIN1000011/GPU DB1empageLtb1emplage.GEOENGINEEKS8.GD1/000011/_SOUNCLOG	2. Whe recove	ise s ere a ry by	ppro	priat lying	e, the 1 the 1	soil s atio o	lanation of symbols. ample depth and the i the drilling run lengt ussion of the depth m	ו and t	he amoı	a the	e soil	types o	cha	ange, shown on this log, h ed, to the measured dept	nave been nc	ormalized to 100 percent the field. Refer to Appendix
10 P.									Lo	bg	of	Bor	rin	g DP-44		

BNSF Parkwater Facility Remedial Investigation Project: Project Location: Spokane, Washington Figure A-35 Sheet 1 of 1 Project Number: 0506-117-12

Drilled	12/16/2009	Total 15 Depth (ft)		Logged E Checked				ller Environmental We	st	Drilling Method Sonic
Location East (X):	North (Y):		Grou	ndwater Date M		ired		<u>epth to Water (ft)</u> Encountered	Drilling Equipment	Sonic Speedstar 15k
	FIELD	AND RUN DAT	A							
o Depth (feet)	Run Run Number Run Length (ft) Actual Recovered (ft) Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification		DESC	TERIAL CRIPTION
2. When recovery	e see figure A-1 for exp e appropriate. the soils	DP44a-9	NS NS NS NS	0 1.1 103 15.4 19.3 0	the	soilt	SP GC GW ML SP	Black sand with gravel an Dark brown clayey gravel Brown gravel with sand an Brown to light gray coarse Clight gray silt with gravel Brown sand with gravel an Grades to light brown	DESC d trace clay (soc with trace sand ind trace clay (mil- e gravel with tra- and trace sand ind trace silt (mol- b)	CRIPTION ty fill) (moist) ce clay and sand (moist) ist)
				Log	g c	of B	Boring	g DP-44A		

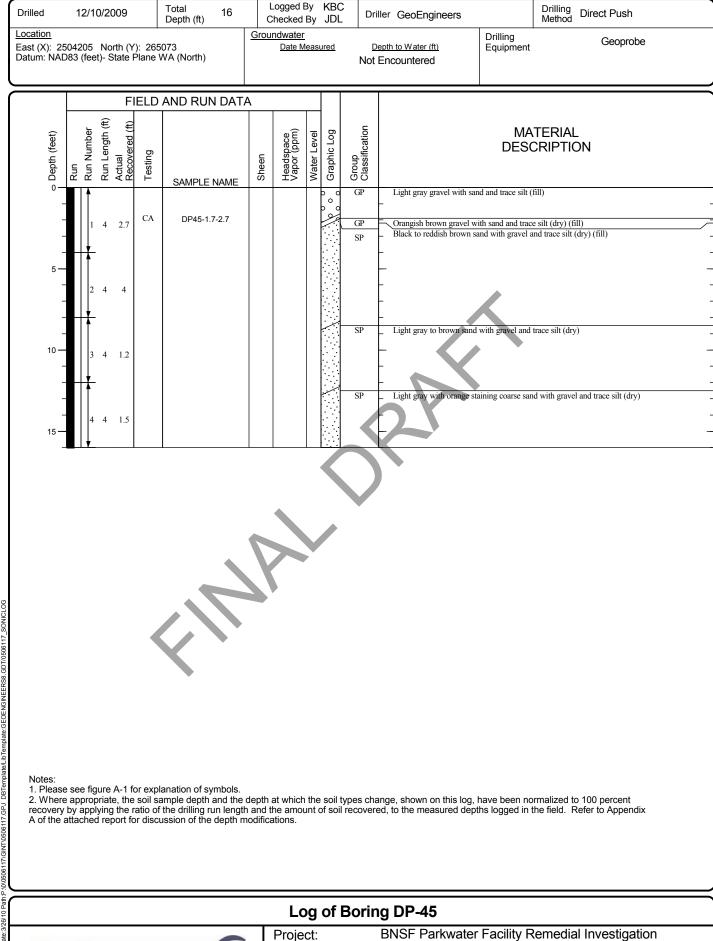
Project:BNSF Parkwater Facility Remedial InvestigationProject Location:Spokane, WashingtonProject Number:0506-117-12Figure A-36
Sheet 1 of 1

ſ	Drilled		12/ ⁻	17/2	2009		Total 15 Depth (ft)		.ogged E hecked				Driller	Environmental We	st	Drilling Method Sonic
ĺ	Location East (X): Datum: N		2228 3 (fe	3 No et)-	orth (Y State	'): 265 Plane '	366 WA (North)	Grou	ndwater Date M		ured.	No		<u>h to Water (ft)</u> countered	Drilling Equipment	Sonic Speedstar 15k
ſ					F	IELD	AND RUN DAT	A								
	. Danth (faat)		Run Number	Run Lenath (ft)	Actual Recovered (ft)	Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification				TERIAL CRIPTION
mpate/LbTemplate.GECENSINEERS8.GDT/0506117_SONICLOG	(S.5	CA CA CA	SAMPLE NAME DP44b-3.8-4.6 DP44b-5 DP44b-6-7	NS NS NS NS	Ispace 0 18.0 8.4 80 0.0 0.3 0.2 0.5 0	Water	C & & & & & & & & & & & & & & & & & & &	dnoug SP GC GW GM GM	-	Black medium sand with a Dark brown clayey gravel Light brown gravel with s Light gray fine sand with s Light brown silty gravel w Grades to light gray Light brown clayey gravel	with trace sand and and trace cl silt and gravel (c ith sand (moist) with sand (moi	try)
00/0506117/GINT/0506117.GPJ DB	2. Where appropriate, the soil sample depth and the depth at which the soil types change, shown on this log, have been normalized to 100 percent recovery by applying the ratio of the drilling run length and the amount of soil recovered, to the measured depths logged in the field. Refer to Appendix A of the attached report for discussion of the depth modifications.												ormalized to 100 percent the field. Refer to Appendix			
26/10 Path:P:									Loç	g o	of E	Borir	ng	DP-44B		

pokane: Date

GEOENGINEERS

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-37 Sheet 1 of 1 Project Number: 0506-117-12



GEOENGINEERS8.GDT/0506117 506117.GP te c Date: 3/26/

GEOENGINEERS /

BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Project Number: 0506-117-12

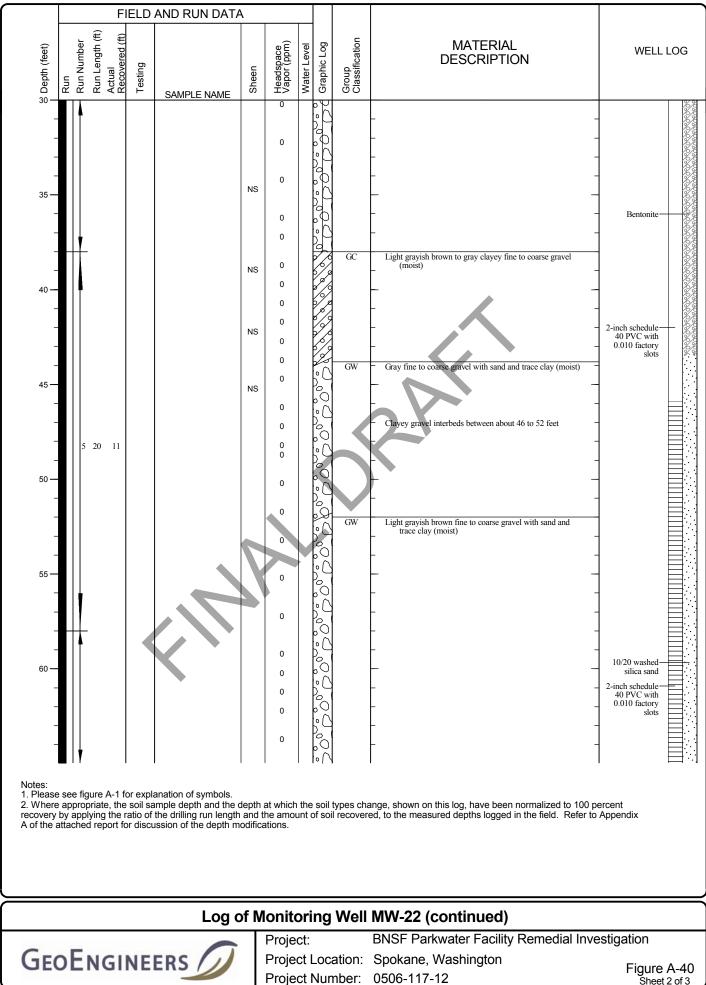
Figure A-38 Sheet 1 of 1

	Drilled Location East (X): Datum: N	250 IAD)369	14	/200 Nort	th (Y)): 265 Plane \	Total 15 Depth (ft) 482 NA (North)	C	ogged E hecked ndwater Date M	By	JDL	Dri	ler Environmental We apth to Water (ft) Encountered	est Drilling Equipment	Drilling Method Sonic Sonic Speedstar 15k
ì						FI	ELD	AND RUN DAT	A						I	
	Danth (faat)		Run	Kun Number	Run Length (ft)	Actual Recovered (ft)	Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification		DES	ATERIAL CRIPTION
328/10 Pahr:P:010506117/GNT/0506117/GPJ DBTemplate/LibTemplate/GEOENGINEERS8.GDT/0506117_SONICLOG	Notes 1. Pie 2. Wh recover		see	1 2 figure	3 12	2.5 3	CA CA	DP54-0-1 DP54-1-2	NS NS NS NS	0.3 0 0 0 0 0 0 0 0 0 0 0 0 0			AC GM GC GC	Approximately 3 inches a Black silty gravel with sar Dark brownish gray claye Brown clayey gravel with	ad (moist) (soot/ yy gravel with sa sand (moist)	
6/10 Pa										Lo	g	of I	Borin	g DP-54		
a:3/2/										Proie	ct.			BNSE Darkwater	Eacility B	Remedial Investigation

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-39 Sheet 1 of 1 Project Number: 0506-117-12

Open Holdson Open Holdson Well LOG Image: Holdson Holds		FI	IELD	AND RUN DAT	4							
0 AC Acclassical concrete promoti 1 15 1.5 NS 0 0 Data to light hows gravel with said and trace clay (moist) Concrete 5 2 6.5 3.5 NS 0 </th <th></th> <th>Run Run Number Run Length (ft) Actual Recovered (ft)</th> <th>Testing</th> <th>SAMPLE NAME</th> <th>Sheen</th> <th>Headspace Vapor (ppm)</th> <th>Water Level</th> <th>Graphic Log</th> <th>Group Classification</th> <th></th> <th></th> <th>Flush-mount Steel</th>		Run Run Number Run Length (ft) Actual Recovered (ft)	Testing	SAMPLE NAME	Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification			Flush-mount Steel
	- - 5 - - - - - - - - - - - - - - - - -	2 6.5 3.5			NS NS NS NS NS				GP GW GW-GC GM	Dark to light brown grave (fill) Light brown to tan gravel trace silt (moist) Becomes light gray Brown gravel with clay an Orangish brown indurated cobbles and trace sam Gray fine to coarse gravel	el with sand and trace clay (moist) with sand, occasional cobbles and nd sand (moist) d silty gravel with occasional d (moist)	Bentonite
30	- - 30 —	4 20 10			NS	0		0000	· · ·	-		

Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-40 Sheet 1 of 3 Project Number: 0506-117-12



Sheet 2 of 3

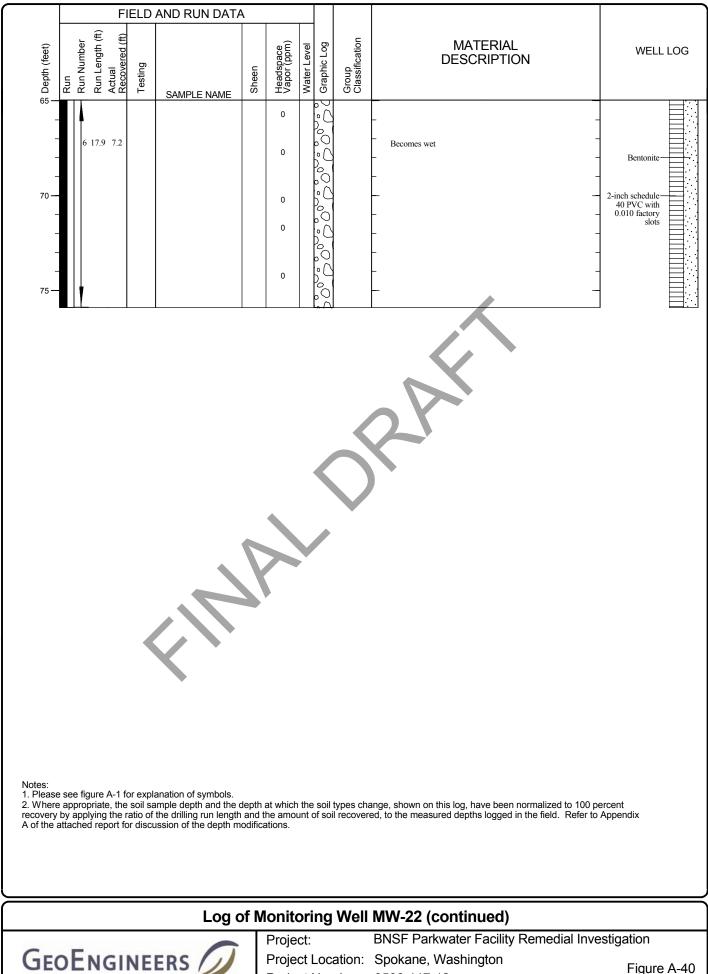
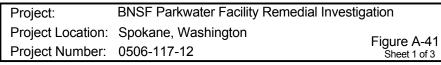


Figure A-40 Sheet 3 of 3

Drilled Location Top of Casin East (X):	ng E	2/3/ levat	ion:		1.35 (1	Total 75 Depth (ft)		Logged Checked oundwate Date I 1/22	d By <u>er</u> Mea:	y JDI sured	- Dr	iller Environmental We hepth to Water (ft) 67.06	est Drilling Equipment	Drilling Method Sonic	Speedstar 15k
				FI	ELD	AND RUN DA	TA		_						
› Depth (feet)	Run	Run Number	Run Length (ft)	Actual Recovered (ft)	Testing	SAMPLE NAMI	Cheen Sheen	Headspace Vapor (ppm)	Water Level	Graphic Log	Group Classification	DES	ATERIAL CRIPTION		WELL LOG Flush-mount Steel Monument
 Where recovery 	app by a	2 a figuropropri	8 10 10	6.5	or expl soil sa atio of	lanation of symbol	N: N: N: N: N: N: N:	S 0 S 0 S 0 S 0 S 0 S 0 S 0 S 0 S 0 S 0 S 0 S 0 S 0 S 0 S 0 S 0 S 0 S 0 O 0 S 0 O 0 S 0 O 0 S 0 O 0 O 0 O 0	th th		GM GP	Dark to light brown grave (fill) Tan gravel with sand and Light brownish gray fine Light brownish gray fine Light grayish brown fine Light grayish	trace silt (moist) gravel with sand avel with trace s gravel with sand	and trace silt and tr	Concrete Bentonite 2" schedule 40 PVC
								og of	M	loni	toring	q Well MW-23			



FIELD AND RUN DATA												
© Depth (feet) Run Run Number Run Length (ft) Actual Testing Testing	Headspace Vapor (ppm)	water Level Graphic Log Group	MATERIAL DESCRIPTION	WELL LOG								
30	0 0 0 0		C A MW23860-62 C A MW23860-62 Becomes wet c schange, shown on this log, have been normalized to 100 overed, to the measured depths logged in the field. Refer	Bentonite Bentonite 2" schedule 40 PVC PVC 10/20 washed silica sand 2" OD schedule 4 0 PVC with 0.010 factory slots								
Log of Monitoring Well MW-23 (continued)												
	Project		BNSF Parkwater Facility Remedial In	vestigation								
GEOENGINEERS	Project	t Locatio	n: Spokane, Washington r: 0506-117-12	Figure A-41 Sheet 2 of 3								

FIELD AND RUN DATA		
Depth (feet) Run Number Run Number Run Length (ft) Actual Testing Testing	Vater Level Vater Level Group Classification Classification	WELL LOG
65 - SAMPLE NAME		10/20 washed silica sand 2" schedule 40 PVC
Notes: 1. Please see figure A-1 for explanation of symbols. 2. Where appropriate, the soil sample depth and the dept recovery by applying the ratio of the drilling run length and A of the attached report for discussion of the depth modif	at which the soil types change, shown on this log, have been normalize the amount of soil recovered, to the measured depths logged in the field ations.	d to 100 percent . Refer to Appendix
Log of	Ionitoring Well MW-23 (continued)	
GEOENGINEERS	Project:BNSF Parkwater Facility RemedProject Location:Spokane, WashingtonProject Number:0506-117-12	dial Investigation Figure A-41 Sheet 3 of 3

	Excavated		1/4/20 ackhoe	Logged By: . Total Depth		<u>KBC</u> 8.0
				·	()	
Elevation (feet) Depth (feet)	Testing Sample Sample Sample Name Testing	Graphic Log Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
- 1 — 2 —	CA	SM GM	-	silty sand intermixed with debris (wood, brick, clay, tiles and medium dense, moist) (fill)		GTP32-1-2
- 3 - - 4 -	CA	GW GW	-	des to medium brown orangish brown fine to coarse gravel with sand, occasional cobh d trace silt (loose to medium dense, moist)	les	GTP32-3-4
5 — 6 — 7 —			-	nd trace silt (loose to medium dense, moist)	-	
8 –			ר ז ז	oit completed at approximately 8 foot depth roundwater seepage observed r caving observed		
			5			
Notes: P	Please see Figu	re A-1 for exp	lanation of	bols.		
				Log of Test Pit GTP-32		



pokane: Date

Project:BNSF Parkwater Facility Remedial InvestigationProject Location:Spokane, WashingtonProject Number:0506-117-12Figure A-42
Sheet 1 of 1

		avated		Ba	<u>1/4/2</u> ckhoe	10	Logged By: Total Depth (ft)	KE	<u>3C</u>
	uipine	· · · · ·							
Elevation (feet)	Deptn (reet) Testing Sample	<u>Sample Name</u> Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION		Moisture Content, %	REMARKS
	- 1 - 2 - -	CA	0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0	GM GM	-	 Plack silty fine to coarse gravel with sand interr wood and asphalt) (medium dense, moist) (f Plack brownish gray to brown silty gravel with t 			GTP33-1-2
	3	CA	000		_				GTP33-3-4
Notes	s: Please	see Figur	re A-1	for expla		symbols.			
						Log of Test Pit GT	P-33		
						Project: BNSF	Parkwater Facility F	Remedial	nvestigation



pokane: Date

Figure A-43 Sheet 1 of 1

	Date	Exca	vated:			1/4/	2010 Logged By:		КВС
		pment			-	ckho			8.0
	Depth (feet)		Sample Name Testing AT	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS
	1- 2- 3-	-	CA		SM GM		Black silty fine to coarse sand intermixed with debris (metal, wood and coal) (medium dense, moist) (fill) Dark brown silty gravel with trace sand (medium dense, moist)	-	GTP34-1-2
	4 - 5 - 6 -	-	CA		GW	-	Light orangish brown fine to coarse gravel with sand, occasional cobbles and trace silt (loose to medium dense, moist)	-	GTP34-4
	7 - 8 -	_		00000			Test pit completed at approximately 8 foot depth No groundwater seepage observed	-	
				•					
P.000506117/GINT/05061171PL0GS.	Notes: F	Please se	ee Figure	e A-1 1	for expla	natior	of symbols.		
:4/1/10 Path:							Log of Test Pit GTP-34		liel Investigation
Spokane: Uate	Ge	oEr	NGI	NE	ER	s /	Project: BNSF Parkwater Facility Project Location: Spokane, Washington Project Number: 0506 117 12	≺emec	Figure A-44

GEOENGINEERS

BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Project Number: 0506-117-12

Figure A-44 Sheet 1 of 1

Date	e Excavated:		1/4/2010	Logged By:	KBC				
Equipment:Backhoe				Total Depth (ft)	8.0				
Elevation (feet) Depth (feet)	Testing Sample Sample Name Testing	Graphic Log Group Classification	Encountered Water	MATERIAL DESCRIPTION	Woisture Scontent %				
1 - 2 -	CA	SM GM	-	o dark brown silty fine to coarse sand with gravel intermixed with is (metal, wood and coal) (medium dense, moist) (fill) own to brown silty gravel with trace sand (medium dense, moist)	- GTP35-1-2				
3 - 4 - 5 - 6 - 7 -	CA			angish brown fine to coarse gravel with sand, occasional cobbles trace silt (loose to medium dense, moist)	GTP35-3-4				
Notes: F									
				Log of Test Pit GTP-35					
	Project: BNSF Parkwater Facility Remedial Investigation								

GEOENGINEERS Project: BNSF Parkwater Facili Project Location: Spokane, Washington Project Number: 0506-117-12

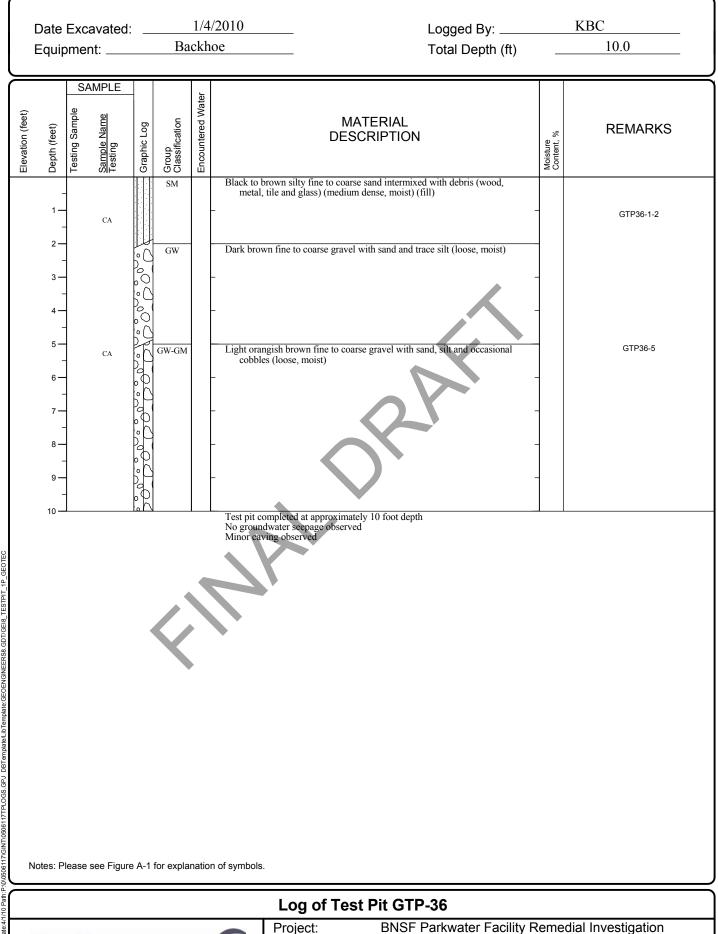
pokane: Date

Figure A-45 Sheet 1 of 1

Date Excavated:			1/4	2010	Logged By:		KBC		
		nt:		-	<u>ckh</u>	be	Total Depth (ft)	_	8.0
Elevation (feet)	Deptn (reet) Testing Sample	Sample Name Testing	Graphic Log	Group Classification	Encountered Water	DESC	TERIAL RIPTION	Moisture Content, %	REMARKS
		CA CA		GM GW		 weight, moist) (fill) Dark brown silty fine to coarse gravel. Light orangish brown gravel with s (medium dense, moist) Test pit completed at approximately No groundwater seepage observed Minor caving observed 	and, occasional cobbles and trace clay	Moist	GTP35B-1.5 GTP35B-3
Notes	s: Please	see Figur	e A-1	for expla	natior	of symbols.			
	Log of Test Pit GTP-35B								

pokane: Date

Project:BNSF Parkwater Facility Remedial InvestigationProject Location:Spokane, WashingtonProject Number:0506-117-12Figure A-46
Sheet 1 of 1

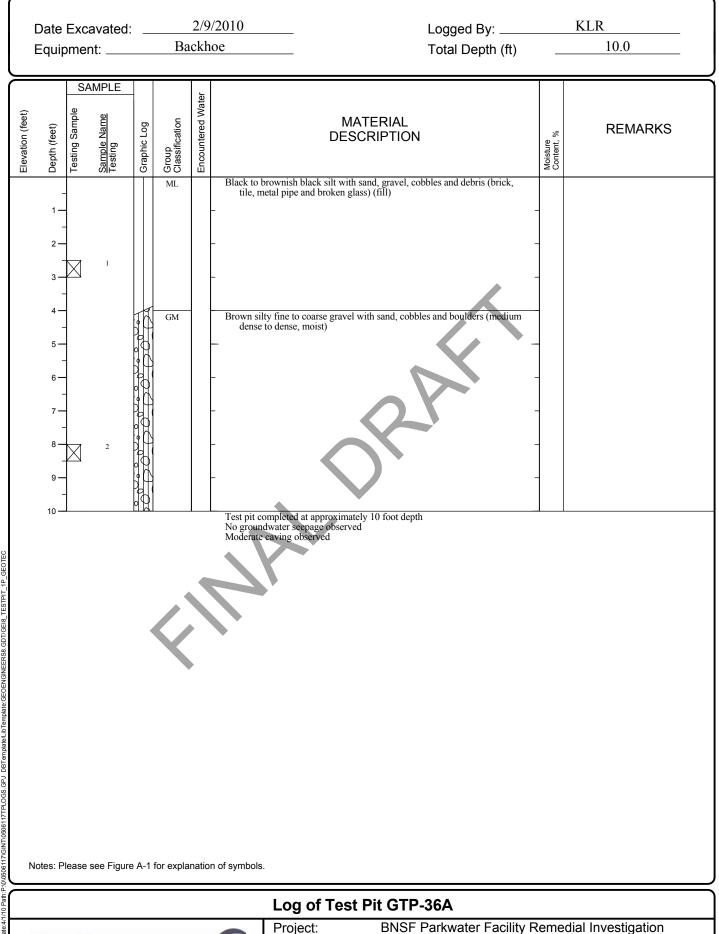


Project Number: 0506-117-12

G Date

GEOENGINEERS /

Figure A-47 Sheet 1 of 1

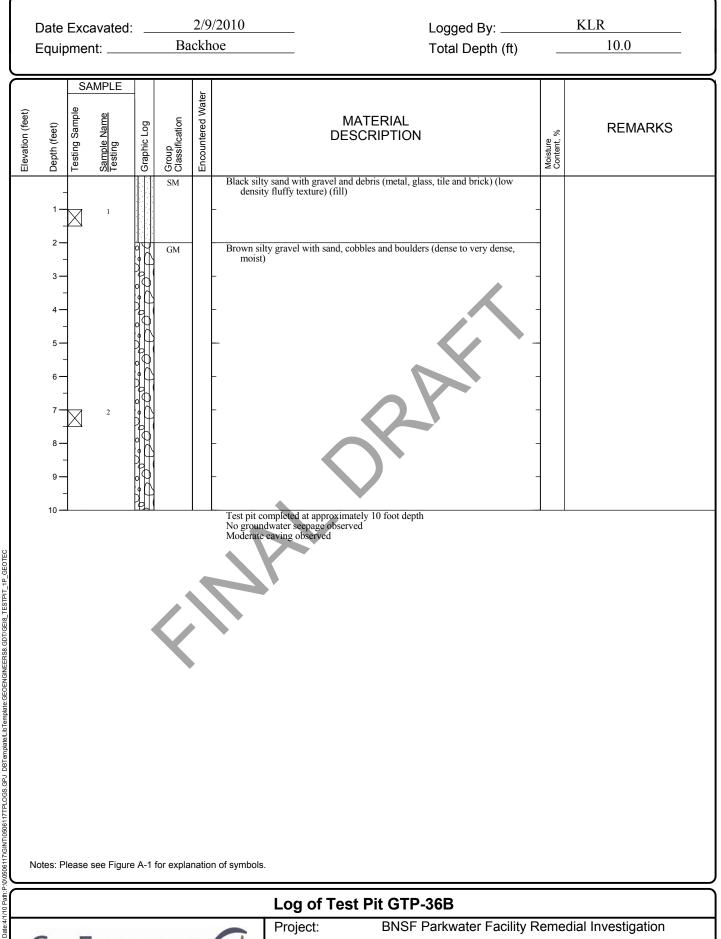


Project Number: 0506-117-12

G Date

GEOENGINEERS /

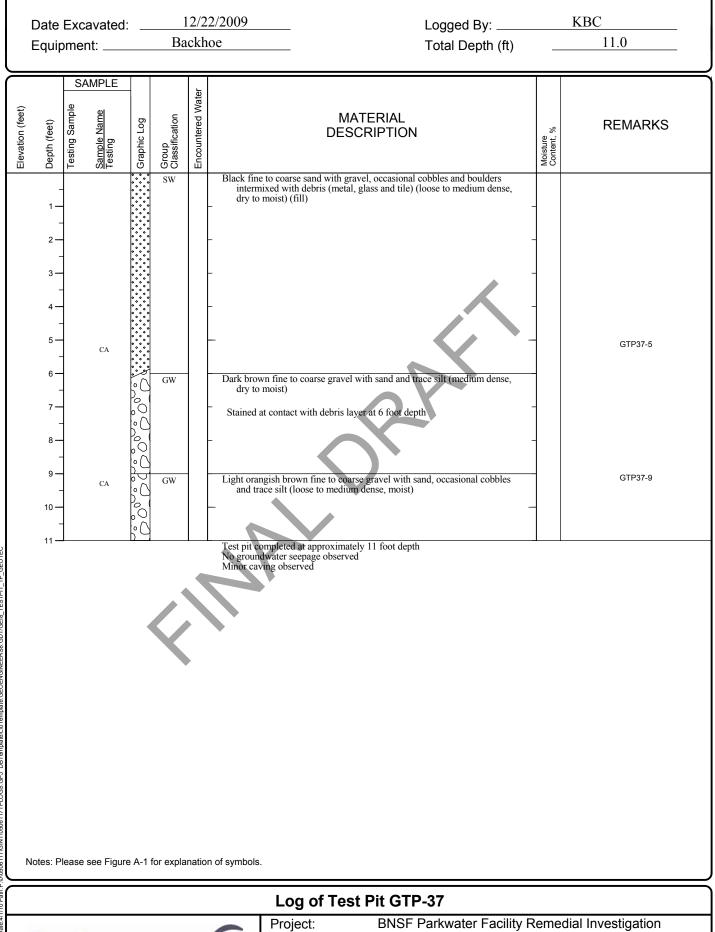
Figure A-48 Sheet 1 of 1



Project Number: 0506-117-12

GEOENGINEERS

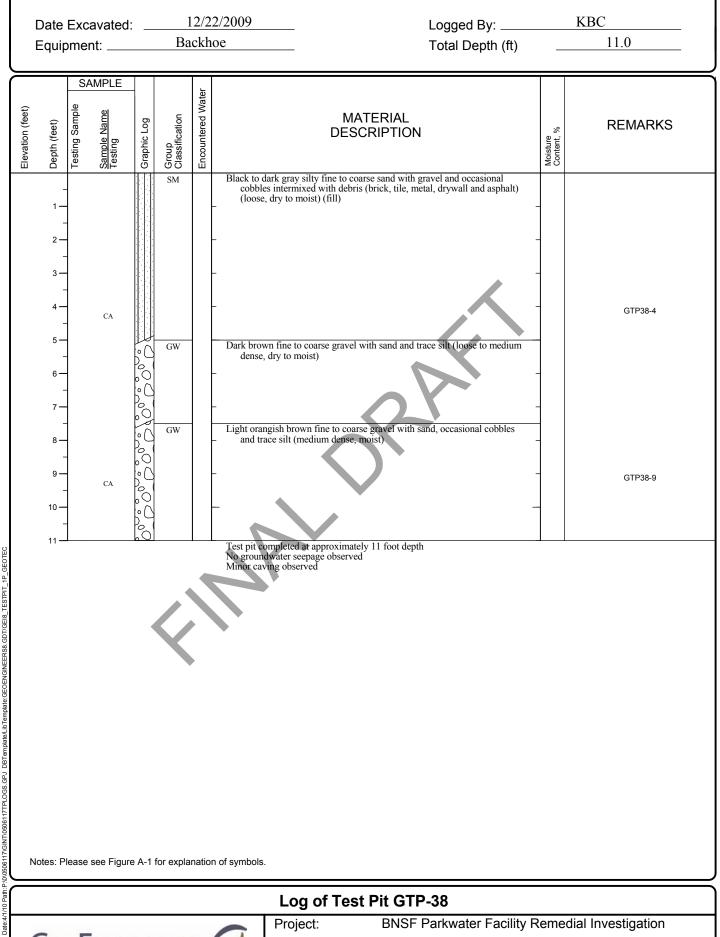
Figure A-49 Sheet 1 of 1



GEOENGINEERS / Project Number: 0506-117-12

Project Location: Spokane, Washington

Figure A-50 Sheet 1 of 1



Project Number: 0506-117-12

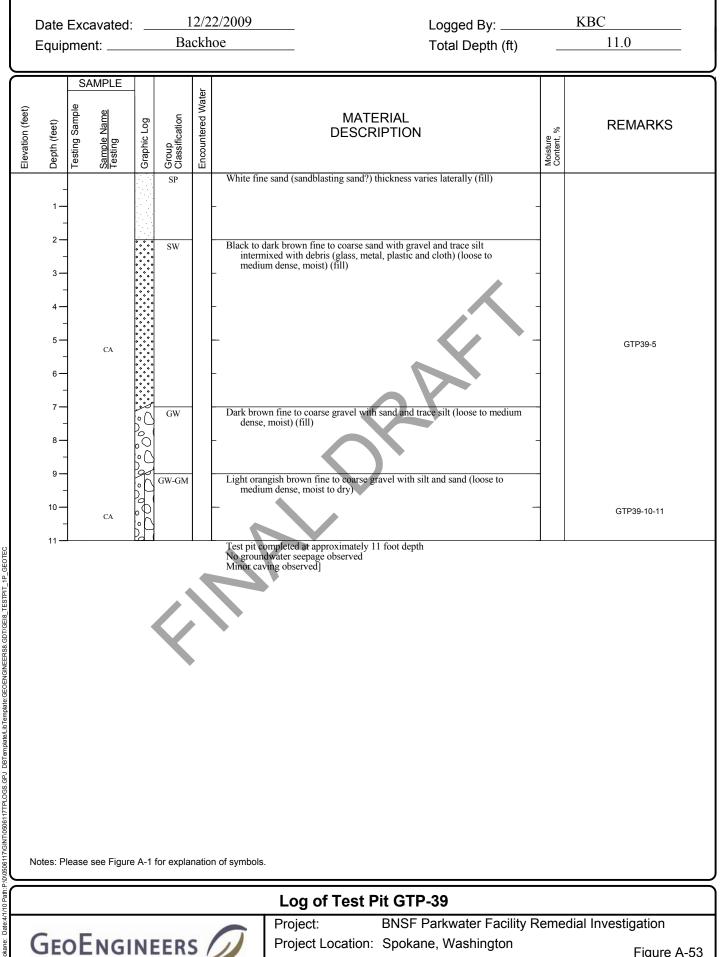
Project Location: Spokane, Washington

Figure A-51 Sheet 1 of 1

	Date Excavated:2/9/2010 Equipment: Backhoe							ged By: I Depth (ft)	KL	<u>R</u> 7.5
			=	P	Leckhoe		Tota TERIAL RIPTION ith sand (medium dense ith cobbles and occasic l)	l Depth (ft)	KL	
1/10 Path:P:\0\0506117\GINT\0506	Notes: Please see Figure A-1 for explanation of symbols.									
Spokane: Date:4/.	GE	оЕма	SINI	EER	s Ø	Project: Project Location	n: Spokane, W		Remedial I	nvestigation Figure A-52

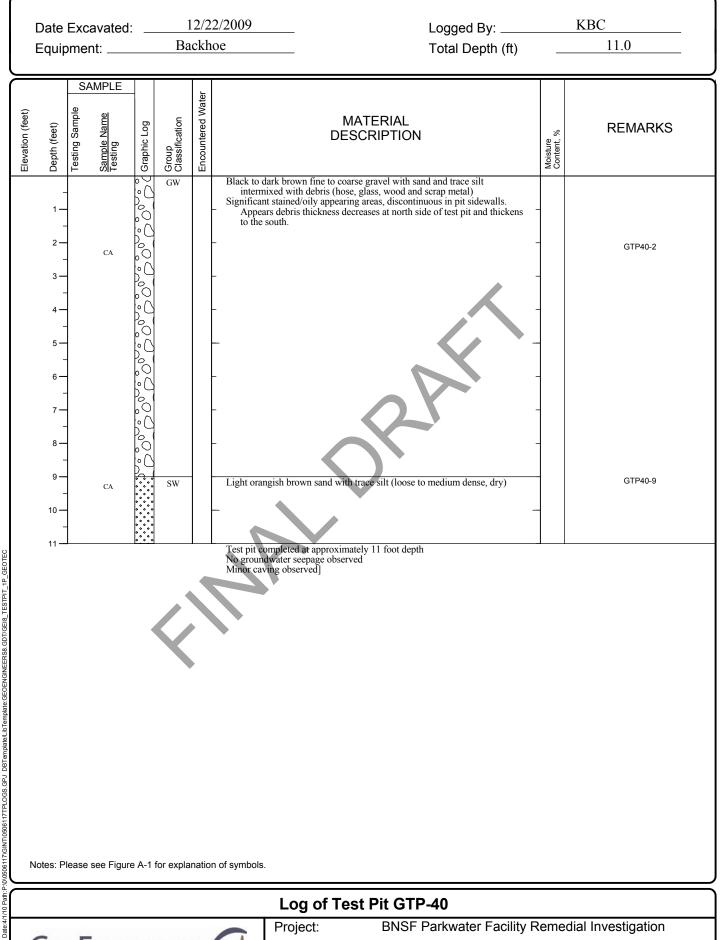
GEOENGINEERS Project Location: Spokane, Washington Project Number: 0506-117-12

Figure A-52 Sheet 1 of 1



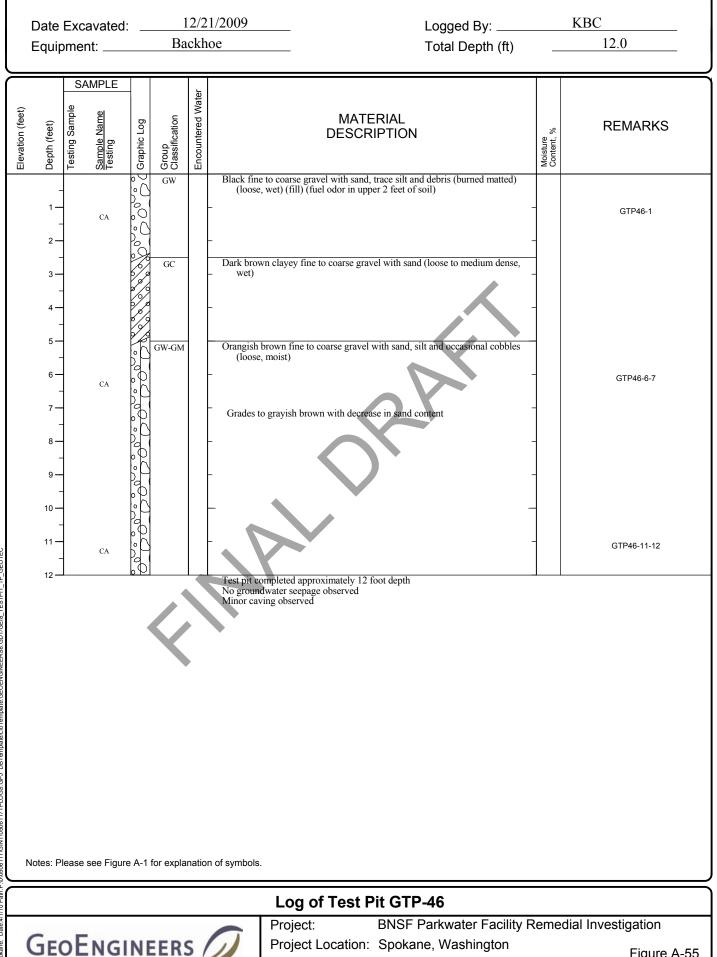
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Spokane:		

Project Location: Spokane, Washington Figure A-53 Project Number: 0506-117-12 Sheet 1 of 1



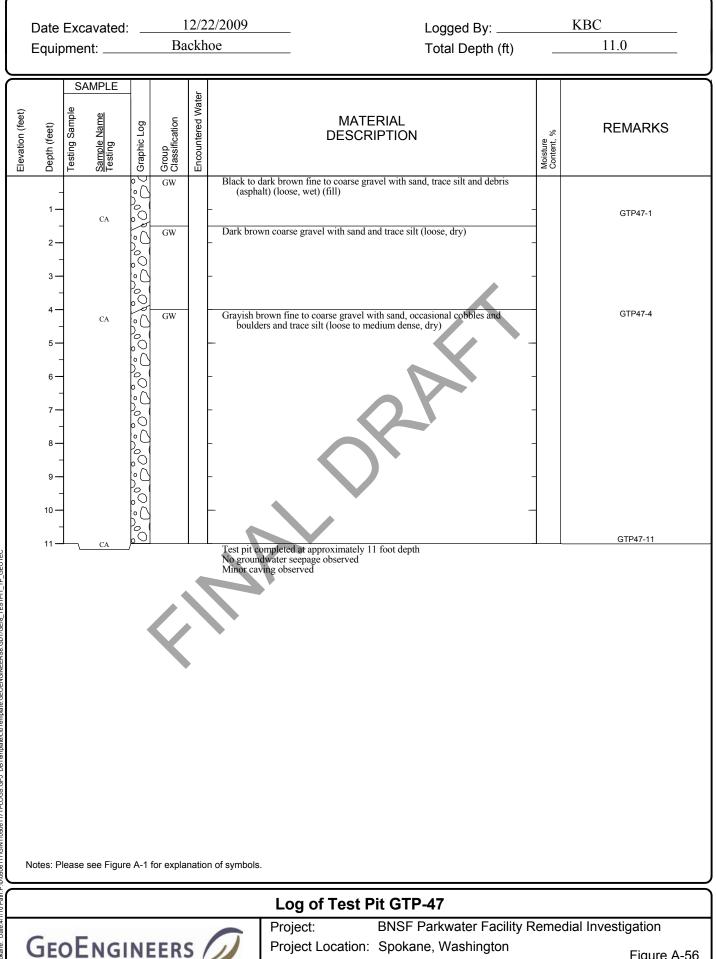
GEOENGINEERS Project: BNSF Parkwater Facili Project Location: Spokane, Washington Project Number: 0506-117-12

Figure A-54 Sheet 1 of 1



G. Date

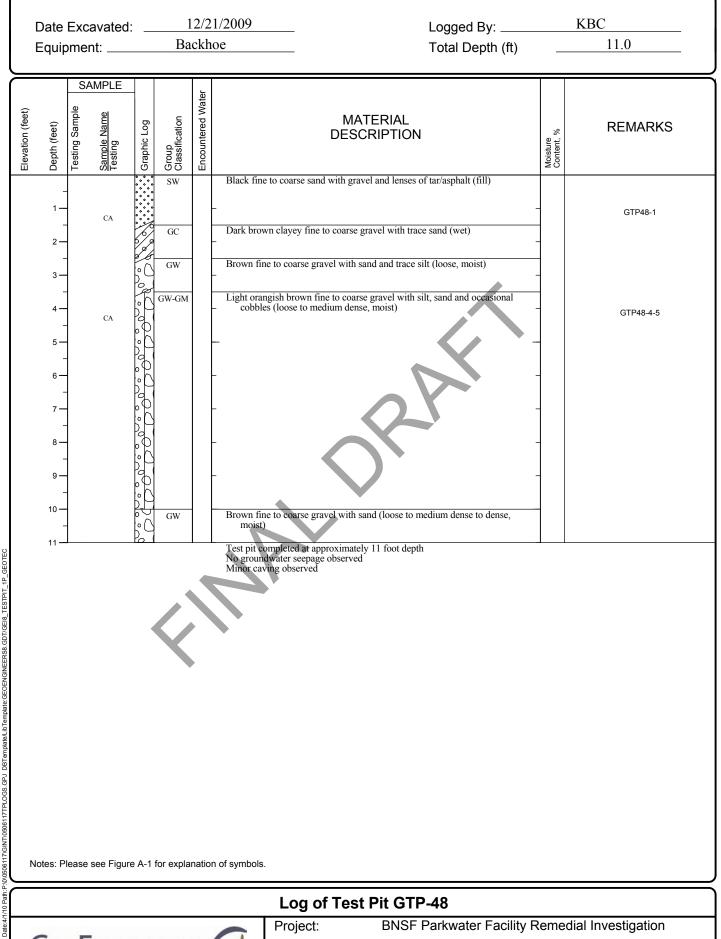
> Figure A-55 Sheet 1 of 1



Project Number: 0506-117-12

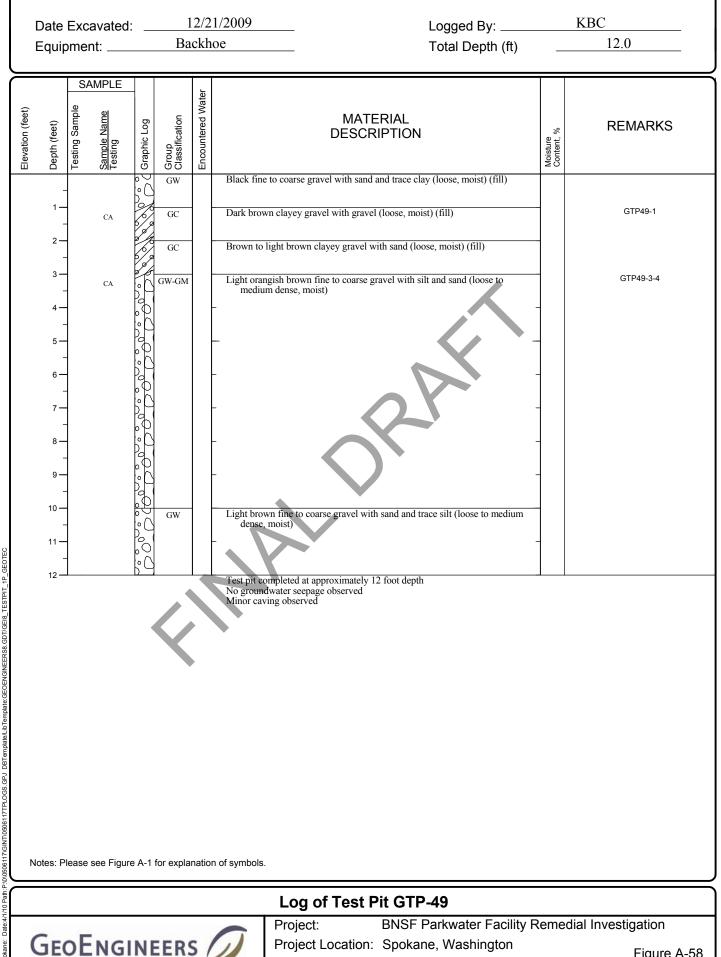
G Date

Figure A-56 Sheet 1 of 1



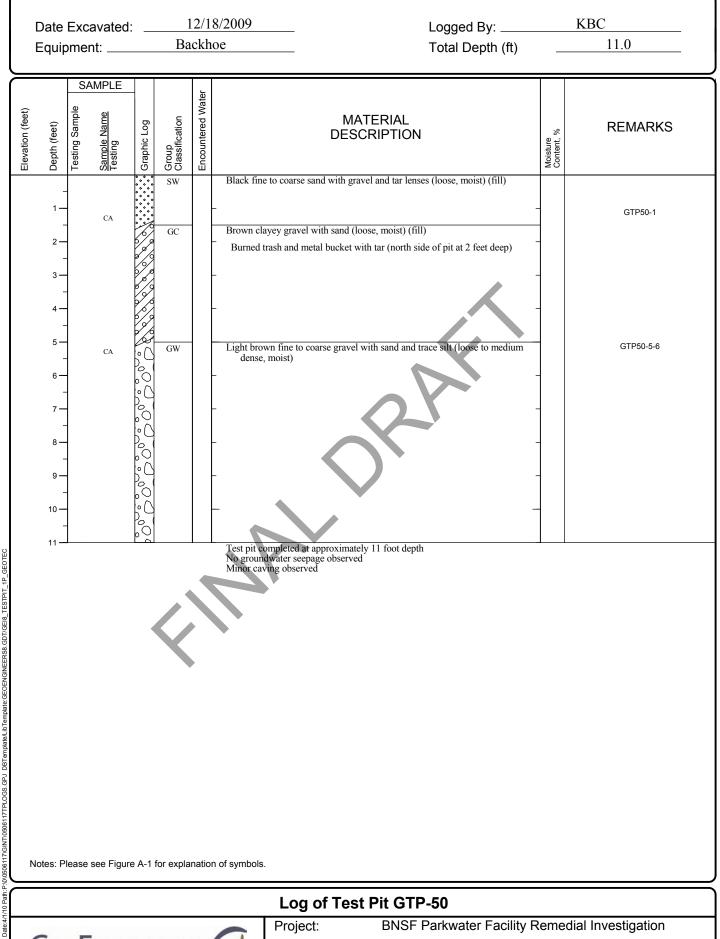
	Project:	BNSF Parkwater Facili
GEOENGINEERS	Project Location:	Spokane, Washington
	Project Number:	0506-117-12

Figure A-57 Sheet 1 of 1



Project Location: Spokane, Washington Project Number: 0506-117-12

Figure A-58 Sheet 1 of 1



Project Number: 0506-117-12

GEOENGINEERS /

Figure A-59 Sheet 1 of 1

Date Excavated: <u>12/18/2009</u> Equipment: <u>Backhoe</u>	_ Logged By: _ Total Depth (ft) _	KBC 12.0					
Elevation (feet) Depth (feet) Testing Sample Sample Name Graphic Log Group Group Classification Encountered Water	MATERIAL DESCRIPTION wisiting	REMARKS					
	pravel and trace sand (loose, moist) (fill)	GTP51-1-2					
4 - CA GW Light brown find 5 - GW - Light brown find 6 - GW	e to coarse gravel with sand, occasional cobbles and trace medium dense, moist)	GTP51-4					
No groundwater	ted at approximately 12 foot depth r seepage observed						
Minor caving observed							
Notes: Please see Figure A-1 for explanation of symbols.							
Pro	og of Test Pit GTP-51 oject: BNSF Parkwater Facility Reme oject Location: Spokane, Washington	edial Investigation Figure A-60					

Spokane: 1

Figure A-60 Sheet 1 of 1

	Date Excavated: <u>12/18/2009</u> Equipment: <u>Backhoe</u>		Logged By: Total Depth (ft)		BC		
Elevation (feet) Depth (feet) Testing Sample Sample Name Testing		Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS		
- CA 2 - CA 2 - CA 2 - CA 3 - CA 4	SW SW GC	Black to brown sand tar chunks) (fill) Orange to brown clay	with gravel, trace silt, and debris (brick, asphalt and /ey gravel with sand (loose, moist) n fine to coarse gravel with sand, occasional cobbles se, moist)		GTP52-1 GTP52-3-4		
11 12 12 Test pit completed at approximately 12 foot depth No groundwater seepage observed Minor caving observed Notes: Please see Figure A-1 for explanation of symbols. Log of Test Pit GTP-52							
GEOEN	GEOENGINEERS Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Project Number: 0506 117 12 Figure A-61						

Figure A-61 Sheet 1 of 1

Dat	e Exca	avated:		1	2/18/2	009 Logged By:	k	KBC	
Equ	uipmer	nt:		Ba	ckhoe	Total Depth (ft)		15.0	
Elevation (feet) Deoth (feet)	ple	Sample Name Testing	Graphic Log	Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS	
1 2 3	_ 2 _	CA		SP GW	-	lack fine to coarse sand with gravel and trace silt (loose, moist) (fill) ark brown to light brown fine to coarse gravel with sand, occasional cobbles and trace silt (loose, moist)	-	GTP53-1 GTP53-3-5	
4 5 6	· - - - - -				_		-		
7 8 9 10	- 3 - - -				-		-		
11 12 13	- 2		0	SP		oarse sand with gravel and trace silt (loose to medium dense, moist)	-		
14	-					est pit completed at approximately 15 foot depth o groundwater seepage observed linor caving observed			
Notes: Please see Figure A-1 for explanation of symbols.									
						Log of Test Pit GTP-53			
G	GEOENGINEERS Project: BNSF Parkwater Facility Remedial Investigation Project Location: Spokane, Washington Figure A-62 Project Number: 0506-117-12 Sheet 1 of 1								

Spokai

Figure A-62 Sheet 1 of 1

Date Excavated:1/4/2010				Logged B	y:	KBC				
Equip	pment:	В	ackhoe	Total Dep	oth (ft)	9.0				
Elevation (feet) Depth (feet)	Testing Sample Sample Name Testing	Graphic Log Group Classification	Encountered Water	MATERIAL DESCRIPTION	Moisture Content, %	REMARKS				
- 1 - - 2 -	CA	GW GW GW		k fine to coarse gravel with sand; underlain by 3 inches of rec gravel; underlain by black to light yellow powdery material (fi k, dark brown and orangish brown fine to coarse gravel with and and silt content and wood/timber debris (loose, moist) (fi	ddish pink ill) variable ill) -	GTP55-1-2				
3 — - 4 — 5 —	СА СА	GO GW-GO	- - F	to grayish brown fine to coarse gravel with sand and clay (loo nedium dense, moist)	ose to	GTP55-3-4				
6 - 7 - 8 - - - - - - 		10000000000000000000000000000000000000	-	R	-	GTP55-8-9				
9 Test pit completed at approximately 9 foot depth No groundwater seepage observed Minor caving observed										
Notes: P	Notes: Please see Figure A-1 for explanation of symbols.									
	Log of Test Pit GTP-55									

Project:



pokane: Date

Project:BNSF Parkwater Facility Remedial InvestigationProject Location:Spokane, WashingtonProject Number:0506-117-12Figure A-63
Sheet 1 of 1

Date Excavated:2/25/ Equipment:Backho		<u>KBC</u> <u>1.5</u>					
Elevation (feet) Depth (feet) Testing Sample Sample Name Testing Group Group Classification Encountered Water	MATERIAL DESCRIPTION	Woisture Content, %					
1 - 1	Black fine to medium sand with gravel and trace silt (soil includes sand to gravel-sized whitish and orange substance with metal fragments) (loose, moist) (fill)	- Hard in-place, at ground surface, becomes loose when disturbed.					
1 - (loose, moist) (fill)							
4/1/10 Patr	Log of Hand Auger GTP-56						
GeoEngineers	Project: BNSF Parkwater Facility F Project Location: Spokane, Washington Project Number: 0506 117 12	Remedial Investigation Figure A-64					

Project Number: 0506-117-12

Figure A-64 Sheet 1 of 1

Date Excavated: <u>2/25/2010</u> Equipment: <u>Backhoe</u>	Logged By: Total Depth (ft)	<u>KBC</u> <u>1.5</u>
Elevation (feet) Depth (feet) Testing Sample Sample Name Testing Graphic Log Group Classification Encountered Water	MATERIAL DESCRIPTION	REMARKS
	own and black fine to medium sand with gravel and trace silt (soil ides sand to gravel-sized whitish and orange substance with metal nents) (loose, moist) (fill)	Hard in-place, at ground surface, becomes loose when disturbed.
Hand auger completed at approximately 1% foot depth Whether Please see Figure A-1 for explanation of symbols. Image: Completed at approximately 1% foot depth Image: Completed at approximately		
Log of Hand Auger GTP-57		
GEOENGINEERS	Project: BNSF Parkwater Facility Re Project Location: Spokane, Washington	emedial Investigation Figure A-65

Project Number: 0506-117-12

Figure A-65 Sheet 1 of 1

	Excavated: ment:		2/25/2010 ackhoe		Logged By: Total Depth (ft)		KBC 1.5
Elevation (feet) Depth (feet)	Testing Sample Sample Name Testing	Graphic Log Group Classification	Encountered Water	MATERIAL DESCRIPTIC	DN	Moisture Content, %	REMARKS
1-	 1	SP	_	ne to medium sand with gravel and tra el-sized whitish and orange substance se, moist) (fill) ger completed at approximately 11/2 fc		_	Hard in-place, at ground surface, becomes loose when disturbed.
Notes: Ple	ease see Figure		unation of symbol		GTP-58		
				Log of Hand Auger Project: BNS	GTP-58 F Parkwater Facility	Reme	dial Investigation
GEC	Engi	NEER	s Ø	Project Location: Spol	kane, Washington		Figure A-66

Spokane: Da

Project Location: Spokane, Washington Figure A-66 Sheet 1 of 1 Project Number: 0506-117-12

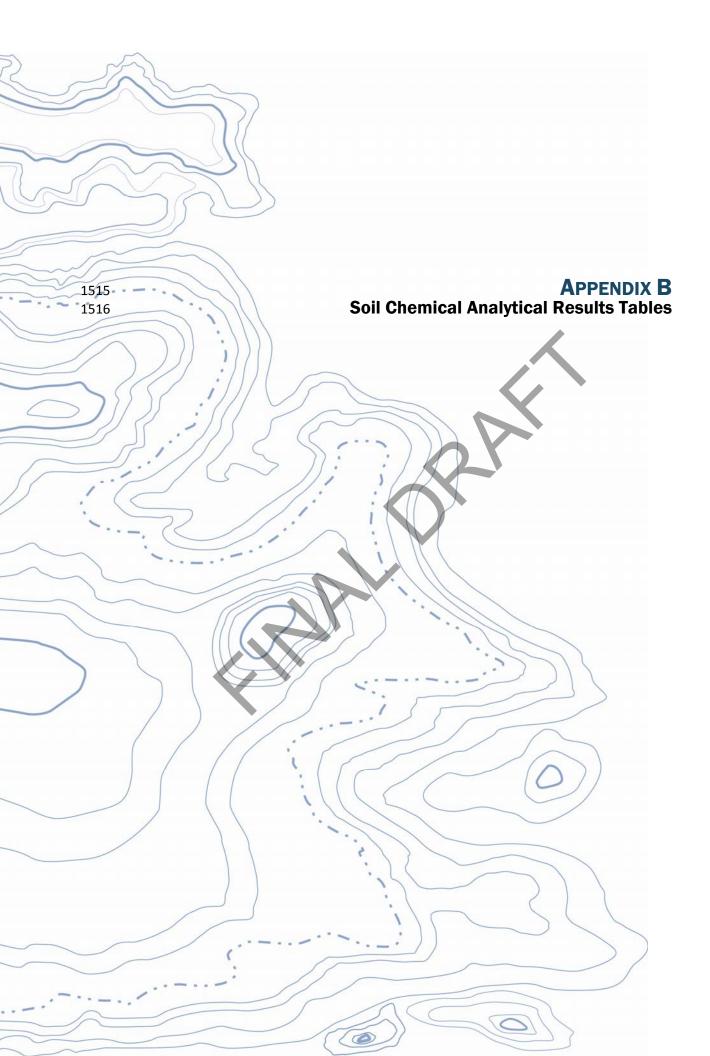


Table B-1

Summary of Chemical Analytical Data in Soil¹

Total Petroleum Hydrocarbons (TPH), RCRA 8 Metals and Polychlorinated Biphenyls

BNSF Parkwater Facility Remedial Investigation

Spokane, Washington

				TPH ² (mg/kg)					Metals ³ (I	ng/kg)							Pol	ychlorina	ted Biphe	nyls ⁴ (mg	(/kg)		
Sample Name	Sample Date	Depth ⁵ (feet)	Gasoline-range Petroleum Hydrocarbons	Diesel-range Petroleum Hydrocarbons	Oil-Range Petroleum Hydrocarbons	Arsenic	Barium	Cadmium	Total Chromium	Lead	Mercury	Selenium	Silver	PCB- aroclor 1016	PCB- aroclor 1221	PCB- aroclor 1232	PCB- aroclor 1242	PCB- aroclor 1248	PCB- aroclor 1254	PCB- aroclor 1260	PCB- aroclor 1262	PCB- aroclor 1268	Total PCB aroclors (Detects and NDs = Reporting Limit)
MTCA Method A Industria	al Cleanup Criteria	a	100	2,000	2,000	20	NE	2	2,000	1,000	2	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	10
Former Koch Materials Lo	ease Area				-	-	-	-						-				-				-	
GTP46-1	12/21/09	1	-	4,120	6,940	6.6	883	1.2	14.8	76.1	0.17	2.7	ND										
GTP46-11-12	12/21/09	11 - 12		ND	ND	11.9	44.3	0.92	8.1	10.4	ND	1.5	ND										
GTP46-6-7	12/21/09	6 - 7		ND	ND	7.4	37.4	0.93	8.9	7.1	ND	1.8	ND										
GTP47-1	12/22/09	4		467	2,130	4.9	267	0.2	11.8	67.3	0.26	0.95	ND										
GTP47-11	12/22/09	11		ND	ND	5.1	48.5	ND	9.9	12.6	ND	ND	ND										
GTP47-4	12/22/09	4		ND	ND	5.6	58.1	0.053	14	11.6	ND	ND	ND										
DUPLICATE-2	12/22/09	4		ND	ND	7.6	52.9	0.074	12.7	10.8	ND	ND	ND										
GTP48-1	12/21/09	1		31 J	264 J	13.4	368	1.4	18.6	42.5	0.053	2.2	ND										
GTP48-4-5	12/21/09	4 - 5		ND	ND	9.6	50.2	1.3	12.1	11	ND	1.9	ND										
GTP49-1	12/21/09	1		55.4	347	26.4	870	3.3	28.9	509	2	4.4	0.67										
GTP49-3-4	12/21/09	3 - 4		ND	ND	12.4	138	1.7	10.9	73	0.037	2.3	ND										
GTP50-1	12/18/09	1		40.7 J	285 J	11.3	258	1.5	16.9	35.1	0.3	2.4	ND					-					
GTP50-5-6	12/18/09	5 - 6		ND	ND	8.5	62.5	1.1	9.2	9.2	ND	2.1	ND										
GTP51-1-2	12/18/09	1-2		32.8	215	10.7	1,780	1.8	156	414	0.28	3.5	ND										
GTP51-4	12/18/09	4		ND	ND	8	54.9	1.1	10.7	8.9	0.053	2	ND										
DUPLICATE-1	12/18/09	4		ND	ND	9.3	56.7	1.3	12.1	11.8	ND	2.2	ND										
GTP52-1	12/18/09	1		35 J	256	12.7	486	1.5	15.8	55.1	0.056	2.2	ND										
GTP52-3-4	12/18/09	3 - 4		ND	ND	8.6	79.3	1.3	13.1	12.4	ND	2.6	ND										
GTP53-1	12/18/09	1		104	400	7.6	662	1	12.9	26	0.025	1.6	ND										
GTP53-3-5	12/18/09	3 - 5		ND	ND	8.9	46.9	1.2	12.7	10.7	ND	1.9	ND										
Diesel Shop and Materia																							
DP01-1-2	12/15/09	1.7 - 3.3		222	1,080	6.3	176	1.2	21.2	21.1	0.025	2.7	ND	-				-	- 1		-		
DP01-5-6	12/15/09	5 - 7		76	187	9.9	42.1	1.3	15.4	8.6	ND	3.2	ND										
DP01A-1-2	12/14/09	1.4 - 2.9		91.2	316	9.6	401	1.9	226	81.1	0.049	4.3	ND										
DP01A-2-3	12/14/09	2.9 - 5		ND	ND	8.4	81	1.2	11.3	10.7	ND	2	ND										
DP01A-11-12.5	12/14/09	14.2 - 15					-			-													
DP02-1-2	12/14/09	1.5 - 3		3.950	2,330	6.1	338	1.3	63.4	69.4	0.027	2.5	ND										
DP02-6-7	12/14/09	6 - 7.4		ND	ND	10.7	201	1.5	37.2	12.9	ND	3.1	ND										
DP03-1.5-2	12/14/09	1.5 - 2		12,800	10,600	2.5	367	0.9	11.1	74	0.037	2.4	ND										
DP03-3-4	12/14/09	3 - 5.2		158	304	8.3	57.3	1.1	11.1	10	ND	2.4	ND										
DP03-7.5-8.5	12/14/09	12.8 - 15		-	-		-			-													
DP04-0.5-1.5	12/14/09	0.8 - 2.3		355	1,060	11.3	65.4	1.7	6.4	34.9	ND	3	ND										
DP04-3-4	12/14/09	4.5 - 6		ND	ND	4.2	214	1.1	4.1	4.4	ND	2.5	ND										
DP04-12-13	12/14/09	12.7 - 15			-																		
DP05-1.3-2.6	12/14/09	1.3 - 2.6		ND	ND	7.1	78.8	1.2	12.2	10.6	ND	3.4	ND										
DP05-8	12/14/09	9.6		ND	ND	12.8	38.5	0.74	9.2	10.0	ND	1.2	ND					-					
DP05-10.6	12/14/09	13.6			-																		
DP07-2-2.7	12/14/09	3 - 4		4,630	10,200	9	139	1.4	14.8	15.4	ND	3	ND										
DP07-3.2-4	12/14/09	4.9 - 6		ND	ND	- 9 7.3	90.5	1.4	14.8	13.4	ND	2.4	ND					-					
DP07-6-7	12/14/09	6-9												-									
DP08-1.6-2.4	12/14/09	2.1 - 3.2	-	968	 4,570	6.5	283	1.2	18.4	30.8	0.043	2.3	ND										
DP08-3.5-4.5	12/14/09	4.7 - 6		154	1,170	0.5 11.7	60.7	1.2	10.4	16.3	0.13	2.3	ND										

File No. 0506-117-12 Table B-1 | August 11, 2010

				TPH ² (mg/kg)					Metals ³ (I	mg/kg)							Poly	chlorinat	ted Biphe	nyls ⁴ (mg	(/kg)		
						1			- (,				1					· · ·				
																							Total PCB
			Gasoline-range	Diesel-range	Oil-Range									PCB-	PCB-	PCB-	PCB-	PCB-	PCB-	PCB-	PCB-	PCB-	aroclors (Detects
			Petroleum	Petroleum	Petroleum				Total					aroclor	aroclor	aroclor	aroclor	aroclor	aroclor	aroclor	aroclor	aroclor	and NDs =
Sample Name	Sample Date	Depth ⁵ (feet)	Hydrocarbons	Hydrocarbons	Hydrocarbons	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	1016	1221	1232	1242	1248	1254	1260	1262	1268	Reporting Limit)
MTCA Method A Industrial	i		100	2,000	2,000	20	NE	2	2,000	1,000	2	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	10
DP09-1-2	12/14/09	1-2		519	1,700	7.3	708	1.6	98.2	68.7	0.029	2.7	ND										
DP09-2.5-3	12/14/09	2.5 - 3		ND	ND	8.4	122	1.3	5.8	6.5	ND	2.7	ND										
DP10-4-5.8	12/10/09	4 - 5.8		ND	ND	12.7	78.8	0.15	11.1	40.1	0.21	ND	ND										
DP10-5	12/10/09	5									-	-											
DP10-8-9	12/10/09	8-9		ND	ND	3.4	18.5	ND	3.9	5	0.023	0.85	ND										
DP11-4.2-4.85	12/10/09	4.2 - 4.85		ND	ND	7	10.0	0.06	17.1	14.6	ND	ND	ND										
DP11-8-8.4	12/10/09	8 - 8.4		ND	ND	3.8	24.1	ND	5	13.5	ND	ND	ND										
DP11-8-9	12/10/09	8-9										-											
DP24-0.5-1.5	12/15/09	0.8 - 2.5		ND	ND	16.5	312	1.8	16.9	59.4	0.04	3	ND										
DP24-2-3	12/15/09	3.3 - 5		ND	ND	6.9	71.9	1.0	8.9	8	ND	3	ND		-								
DP24-7-7.5	12/15/09	9 - 10		ND	ND	7.3	36.2	0.69	7.9	8.3	ND	1.6	ND		-								
DP25-3-4	12/16/09	3.8 - 5		ND	ND	8.4	53.3	1.1	9	11.2	ND	2.3	ND		-								
DP25-5-6	12/16/09	5 - 6.5		ND	ND	9.5	50.7	0.84	9.7	13.1	ND	2.5	ND										
DP26-1-2	12/15/09	1-2		ND	ND	8.9	135	1.6	13.8	15.1	ND	3.7	ND		-		-						
DP26-5-6	12/15/09	5 - 6.8		ND	ND	4.6	44.3	0.64	8.7	5.2	ND	1.4	ND		-								
DP27-2.5-3.5	12/16/09	2.8 - 4		ND	ND	7.3	131	1.3	17.9	11.4	ND	3.3	ND										
DP27-5-6	12/16/09	5 - 8.6		ND	ND	4.8	55.7	0.54	7.7	7.3	ND	1	ND										
DP28-1.4-2	12/16/09	1.8 - 2.5		33.2	237	10	308	1.6	137	81	ND	2.7	ND										
DP28-5-6	12/16/09	5 - 8.5		ND	ND	9.1	63.4	1.0	11.6	11.5	ND	2.8	ND										
DP29-1-2	12/15/09	1.3 - 2.5		ND	ND	9	108	1.6	15.1	12.4	ND	3.2	ND										
DP29-3-4	12/15/09	3.8 - 5		ND	ND	7.8	57.4	1.0	13.2	9.8	ND	2.2	ND										
DP29-7	12/15/09	9-9		ND	ND	8.7	40.8	0.88	10.1	9.6	ND	1.8	ND										
DP30-1-2	12/15/09	1.1 - 2.2		ND	ND	5.1	-40.0 64.7	0.5	10	5.3	ND	1.3	ND										
DP30-4	12/15/09	4.4		ND	ND	5.2	148	0.93	19.5	6.5	ND	1.8	ND										
DP30-6-7	12/15/09	10 - 13		ND	ND	8.9	50.7	0.56	10.3	6.9	ND	1.3	ND										
Western Fruit Express (Ge				HB	nb	0.0	0011	0.00	2010	0.0		1.0	THB .										
DP12-0.5-1.25	01/19/10	0.5 - 1.25		68	438	9.9	168	7.3	20.1	225	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP12-4-5.8	01/19/10	4 - 5.8		ND	ND	2.9	147	ND	47.5	11.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP12-8-9.5	01/19/10	8 - 9.5		ND	ND	6.1	93.3	0.3	17.4	45.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP13-1-2	12/28/09	1.5 - 3		34.5	160	16.3	126 J	0.89	14.3	126	0.11 J	ND	ND										
GTP32-1-2	01/04/10	1-2		152	711	98.9	922	9	68.6	34,700	0.11 5	ND	5.4 J	ND	ND	ND	ND	ND	ND	0.2	ND	ND	0.5712
GTP32-3-4	01/04/10	3-4		ND	ND	4.8	60.6	ND	12.4	31.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP33-1-2	01/04/10	1-2		ND	ND	8.5	525	2.4	9.9	1,690	0.11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP33-3-4	01/04/10	3-4		ND	ND	6.8	126	0.088	12.6	30.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP34-1-2	01/04/10	1-2		ND	ND	95.2	746	6.7	41.7	44,200	0.71	ND	7.3 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP34-4	01/04/10	4		ND	ND	8.6	117	0.11	12.9	40 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DUPLICATE-6	01/04/10	4		ND	ND	6.9	117	0.05	15.3	18.8 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP35-1-2	01/04/10	1-2		37.9	180	204	478	653	6.6	48,200	6.1	3.1	235 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP35-3-4	01/04/10	3 - 4		ND	ND	8.2	91	0.11	15.2	23.6	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP35B-1.5	01/04/10	1.5		29.1	ND	13.2	311	3.3	21.5	3,100	0.16	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP35B-3	01/04/10	3		ND	ND	5.2	88.2	ND	11.7	17.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP56-1.3-1.5	02/25/10	1.3 - 1.5		33.2	ND	1.4	551	1	5.7	45.6	0.063	ND	ND		-		-						
GTP57-1.3-1.5	02/25/10	1.3 - 1.5		35.5	136	0.81	822	1.6	9.2	115	ND	1.2	ND										1
GTP58-1.3-1.5	02/25/10	1.3 - 1.5		33.5	126	4	560	0.97	6.6	132	ND	1.1	ND										1
Dismantling Spur and Eas			eas									I							<u>.</u>				1
GTP36-1-2	01/04/10	1-2	-	58	303	22.9	380	36.8	218	1,120	0.16	1 U	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP36-5	01/04/10	5		ND	ND	6.5	66.5	0.18	10.7	29.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP36A-2.5	02/09/10	2.5		34.4	127	11.9	647	1.9	12.5	196	0.063	3.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP36A-8	02/09/10	8		ND	ND	8.4	109	0.57	11	51.9	0.031	3.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	-, -, -, -,	-	l	=		1												L	I				1



				TPH ² (mg/kg)					Metals ³ (r	ng/kg)							Poly	chlorinat	ted Biphe	nyls ⁴ (mg	(/kg)		
																					• •		
																							Total PCB
			Gasoline-range	Diesel-range	Oil-Range									PCB-	PCB-	PCB-	PCB-	PCB-	PCB-	PCB-	PCB-	PCB-	aroclors (Detects
			Petroleum	Petroleum	Petroleum				Total					aroclor	aroclor	aroclor	aroclor	aroclor	aroclor	aroclor	aroclor	aroclor	and NDs =
Sample Name	Sample Date	Depth 5 (feet)	Hydrocarbons	Hydrocarbons	Hydrocarbons	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	1016	1221	1232	1242	1248	1254	1260	1262	1268	Reporting Limit)
MTCA Method A Industrial	l Cleanup Criteria	1	100	2,000	2,000	20	NE	2	2,000	1,000	2	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	10
GTP36B-1	02/09/10	1		543	1850	15.6	965	4.9	27.1	494	0.87	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP36B-7	02/09/10	7		ND	ND	10	81.2	0.13	11.5	17.2	ND	3.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP37-5	12/22/09	5		50.1	228	91.9	559	39.2	34.8	3,130	0.49	ND	54.7 J	ND	ND	ND	ND	ND	ND	0.198	ND	ND	0.5188
GTP37-9	12/22/09	9		ND	ND	8.1	57.4	0.24	9.4	23.8	0.026	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP38-4	12/22/09	4		37.5 J	518	30.9	610	12	33.7	1,560	0.24	ND	16.8 J	ND	ND	ND	ND	ND	ND	0.111	ND	ND	0.4270
GTP38-9	12/22/09	9		ND	ND	9.3	65.4	0.38	12.8	44.2	0.024	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP38A-1	02/09/10	1		118	205	25.8	556	1.9	30.1	666	0.075	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP38A-5	02/09/10	5		ND	ND	5.1	63.7	ND	11.4	9.8	ND	1.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP39-5	12/22/09	5		72.2	477	5.4	417	0.68	19.7	133	0.063	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP39-10-11	12/22/09	10 - 11		ND	ND	4.9	44.8	0.051	9.3	18.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP40-2	12/22/09	2		ND	ND	9.3	99.3	0.51	14.8	77	0.18	ND	ND	ND	ND	ND	ND	ND	ND	0.0548	ND	ND	0.3420
GTP40-9	12/22/09	9	-	ND	ND	12.6	49.6	0.26	5.6	11.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Yardley Office Area DP13-6-7	12/28/09	9 - 10.5		ND	ND	7	38.7 J	0.075	8.8	10	ND	ND	ND	1					1	1	1	1	
DP13-6-7 DP14-2.5-3	12/28/09	2.5 - 3		ND ND	ND	7 5.8	38.7 J 145 J	0.075	8.8 13.8	10	ND ND	ND	ND ND										
DP14-2.5-3 DP14-4	12/28/09	6-6		ND	ND	5.8	68.1 J	ND	13.8	10.3	ND	ND	ND										
DP15-1-2	12/28/09	1.4 - 2.7		ND	ND	21.2	167 J	0.44	16.5	27.9	ND	ND	ND										
DP15-6-7	12/28/09	8.2 - 9.5		ND	ND	5.6	52.2 J	ND	10.3	9.6	ND	ND	ND										
DUPLICATE-4	12/28/09	8.2 - 9.5		ND	ND	9.9	51.9 J	0.08	11.7	11.8	ND ND	ND	ND										
DP16-1.5-2.5	12/28/09	1.7 - 2.9		ND	ND	7.4	157 J	0.098	11.3	33.8	ND	ND	ND										
DP16-4-5	12/28/09	5.6 - 5.8		ND	ND	6.3	59.9 J	ND	12.7	11.5	ND	ND	ND										
DP17-1.5-2.5	12/28/09	1.7 - 2.9		ND	ND	7.2	112 J	0.11	11.5	13.9	ND	ND	ND										
DP17-3-4	12/28/09	3.5 - 4.8		ND	ND	8.8	79.8 J	0.077	10.2	12.3	ND	ND	ND										
DP18-1-2	12/28/09	1.5 - 2.3		31.3 J	286 J	11	177 J	0.71	25.8	97	0.11 J	ND	ND										
DUPLICATE-3	12/28/09	1.5 - 2.3		39.8 J	362 J	16.1	202 J	0.89	27.3	129	0.085 J	ND	ND										
DP18-4	12/28/09	6		ND	ND	4.4	87.2 J	ND	9	8.4	ND	ND	ND										
DP19-2	12/28/09	2		ND	ND	10.9	181 J	0.36	20.2	81.2	0.051 J	ND	ND										
DP19-5	12/28/09	7.5		ND	ND	2.5	135 J	ND	11.4	7.1	ND	ND	ND										
DP19-7-8	12/28/09	13 - 15		ND	ND	11.2	45.6 J	0.053	9.5	8.1	ND	ND	ND										
DP20-2	12/28/09	2		28.9 J	222 J	16	159 J	1.3	29.6	160	0.14 J	ND	ND										
DP20-5-6	12/28/09	6.3 - 7.5		ND	ND	8.4	42.8 J	0.096	10.4	10.8	ND	ND	ND										
DP21-1.5-2.5	12/28/09	2 - 3.4		ND	ND	38.3	207 J	3.8	11.1	79.1	0.061 J	4	ND										
DP21-7	12/28/09	9.5 - 9.5		ND	ND	11.9	65.4 J	1.2	17.2	9.9	ND	1.9	ND										
DP22-1-2	12/28/09	2 - 4		ND	ND	9.7	130 J	0.11	12.6	52.6	0.041 J	ND	ND										
DP23-1-2	12/28/09	1.3 - 2.6		36.5	222	<mark>53.9</mark>	221 J	5.2	18.1	458	0.098 J	3.2	1.1 J										
DP23-3-4	12/28/09	3.9 - 5.2		ND	ND	10.8	134 J	1.8	13.8	14.2	ND	2.9	ND										
Ralston Lead Track			-																				
DP41-0.5-1.5	12/17/09	0.5 - 1.5		23.7	151	7.3	282	0.19	12.7	50.6 J	0.039	2.8	0.56							-			
DP41-4.5-5.5	12/17/09	4.5 - 6		ND	ND	6.4	128	ND	7.5	6.6 J	ND	0.82	0.43										
DP42-4-5	12/17/09	4 - 5		ND	ND	7	42.3	ND	8.7	5.4 J	ND	1.1	0.38										
DP42-7-7.5	12/17/09	7.5 - 8.3		ND	ND	6.5	59.3	ND	9.3	10.8 J	ND	1.4	0.45										
DP42-8	12/17/09	9					-	-															
DP43-0-1	12/16/09	0-1		ND	159	10.7	266	1.8	17.6	84	0.053	4	ND										
DP43-2-3.5	12/16/09	2.5 - 4.3		ND	ND	9.8	48.3	1.4	11.9	19.8	ND	3.4	ND										
DP44-0.5-1.5	12/16/09	0.5 - 1.5		ND	ND	9.3	139	1.4	11.1	15	ND	3.7	ND										
DP44-6-7	12/16/09	6 - 7.6		ND	ND	5.4	78.3	0.93	12.6	9.8	ND	2.4	ND										
DP44A-0-1	12/16/09	0 - 1.7				13.4	389	2.3	16.1	65.9		4.3	ND										
DP44A-2-3 DP44A-9	12/16/09	3 - 3.5		ND	ND ND	9.7	72.4	1.4	13.8	11.3	ND	3.5	ND										
UF44A-9	12/16/09	9		ND	ND	11.7	141	1	20.8	15.4	ND	2.5	ND										



				TPH ² (mg/kg)					Metals ³ (ng/kg)							Poly	chlorina	ted Biphe	nyls ⁴ (mg	/kg)		
Sample Name	Sample Date	_	Gasoline-range Petroleum Hydrocarbons	Diesel-range Petroleum Hydrocarbons	Oil-Range Petroleum Hydrocarbons	Arsenic	Barium	Cadmium	Total Chromium	Lead	Mercury	Selenium	Silver	PCB- aroclor 1016	PCB- aroclor 1221	PCB- aroclor 1232	PCB- aroclor 1242	PCB- aroclor 1248	PCB- aroclor 1254	PCB- aroclor 1260	PCB- aroclor 1262	PCB- aroclor 1268	Total PCB aroclors (Detects and NDs = Reporting Limit)
MTCA Method A Industria	al Cleanup Criteria		100	2,000	2,000	20	NE	2	2,000	1,000	2	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	10
DP44B-3.8-4.6	12/17/09	4.1 - 5		ND	ND	5.2	193	ND	14.6	8.2 J	ND	2.8	0.49										
DP44B-5	12/17/09	5.5 - 5.5											-										
DP44B-6-7	12/17/09	6 - 7.3		ND	ND	11.7	61.1	0.094	8.6	8.7 J	ND	1.7	0.5										
TTX Facility							-			-				-									
DP45 1.7-2.7	12/10/09	1.7 - 2.7		ND	ND	6.5	142	0.15	12.1	15.3	ND	ND	ND										
Former Building Labeled	"Paint"						-			-				-									
DP54-0-1	12/16/09	0 - 1.2	-							146		-											
DP54-1-2	12/16/09	1.2 - 2.4								12.5		-	-										
Former Gasoline UST								•															•
GTP55-1-2	01/04/10	1-2	ND							15.9		-	_										
DUPLICATE-5	01/04/10	1-2	ND							14.9													
GTP55-3-4	01/04/10	3 - 4	ND	ND	117					76													
GTP55-8-9	01/04/10	8 - 9	ND							12.6	-	-											
Fueling Area	· ·		-	•		•	•	•	-	-				•	-	•	•	•	•	•	·		•
MW23-60-62	12/03/09	60 - 62		50.7	ND	10.6	41.5	0.066	9.6	9.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

¹Analyses completed by Pace Analytical, Minneapolis, Mn.

 ^{2}TPH analyzed by method NWTPH-Gx/8021 and NWTPH-Dx.

³RCRA 8 metals analyzed by Method EPA 6010 and EPA 7471.

⁴PCBs analyzed by Method EPA 8082.

⁵As a consequence of the sonic drilling method, where appropriate, the soil sample depths have been normalized to 100 percent recovery. Therefore, the depth indicated in the sample name may vary from the normalized sample depth shown. Refer to Appendix A of the attached report for rationale and discussion of the depth modifications.

ND = Compound was not detected at the Method Reporting Limit (MRL); mg/kg = milligrams per kilogram; J = estimated value greater than MRL; value is estimated typically because of sample dilution or QC recovery issues. See discussion in Appendix C; - = not tested; NE = screening criteria not established; Bold indicates a value was detected greater than reporting limit; shading indicates value was detected exceeding Method B Industrial Cleanup level

https://projects.geoengineers.com/sites/0050611712/Final/BNSF RI Report Final Draft/[050611712_AppendixTables.xlsx]TPH_Metals_PCBs





Table B-2

Summary of Chemical Analytical Data in Soil 1

Benzene, Ethybenzene, Toluene, Xylene (BETX) and Volatile Organic Compounds (VOCs)

BNSF Parkwater Facility Remedial Investigation

Spokane, Washington

					BETX ²	(mg/kg)								VC)C ³ (mg/kg)					
Sample ID	Sample Data	Sample Depth ⁴	Benzene	Ethylbenzene	Toluene	Total Xylenes	Xylene, m-,p-	Xylene, o-	1,1,1,2- Tetrachloro ethane	1,1,1- Trichloro ethane	1,1,2,2- Tetrachloro ethane	1,1,2- Trichloro ethane	1,1- Dichloro ethane	1,1- Dichloro thene	1,1- Dichloro propene	1,2,3- Trichloro benzene	1,2,3- Trichloro propane	1,2,4- Trichloro benzene	1,2,4- Trimethyl benzene	1,2-Dibromo-3- Chloropropane
MTCA Method A Industr	ial Cleanup Criter	ia	0.03	6	7	9	NE	NE	NE	2	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Former Koch Materials	Lease Area																			
GTP46-1	12/21/09	1	ND	ND	ND		ND	ND					-				-			-
GTP46-11-12	12/21/09	11 - 12	ND	ND	ND		ND	ND				-	-				-			-
GTP46-6-7	12/21/09	6 - 7	ND	ND	ND		ND	ND								-	-			-
Diesel Shop and Materi	als Storage Buildi	ng																		
DP01-1-2	12/15/09	1.7 - 3.3	ND	ND	0.0874	0.204						-		-			-		-	-
DP01-5-6	12/15/09	5 - 7	ND	ND	ND		ND	ND			-	1								-
DP01A-1-2	12/14/09	1.4 - 2.9	ND	ND	ND	ND														-
DP01A-11-12.5	12/14/09	14.2 - 15	ND	ND	ND		ND	ND									-			-
DP02-1-2	12/14/09	1.5 - 3	ND	0.247	0.183	0.725					_	-					-			-
DP02-6-7	12/14/09	6 - 7.4	ND	ND	ND		ND	ND		-		-					-			-
DP03-1.5-2	12/14/09	1.5 - 2	ND	2.08	ND	2.9		-				-	-				-			-
DP03-7.5-8.5	12/14/09	12.8 - 15	ND	ND	ND		ND	ND		-	-									-
DP04-0.5-1.5	12/14/09	0.8 - 2.3	ND	ND	ND	ND				-										
DP04-12-13	12/14/09	12.7 - 15	ND	ND	ND		ND	ND			-									
DP05-1.3-2.6	12/14/09	1.3 - 2.6	ND	ND	ND	ND					-									
DP05-10.6	12/14/09	13.6	ND	ND	ND		ND	ND												
DP07-2-2.7	12/14/09	3 - 4	ND	ND	ND	ND											-			-
DP07-6-7	12/14/09	6 - 9	ND	ND	ND		ND	ND	-								-			-
DP08-1.6-2.4	12/14/09	2.1 - 3.2	ND	ND	ND	ND		-	-								-			-
DP08-3.5-4.5	12/14/09	4.7 - 6	ND	ND	ND		ND	ND	-								-			-
DP09-1-2	12/14/09	1-2	ND	ND	ND	ND		- · ·	-											
DP09-2.5-3	12/14/09	2.5 - 3	ND	ND	ND		ND	ND												
DP10-4-5.8	12/10/09	4 - 5.8	ND	ND	ND	ND	ND	ND	-											
DP10-5	12/10/09	5	ND	ND	ND		ND	ND	-											
DP11-4.2-4.85	12/10/09	4.2 - 4.85	ND	ND	ND	ND	ND	ND										-		-
DP11-8-9	12/10/09	8 - 9	ND	ND	ND	-	ND	ND												-
DP24-2-3	12/15/09	3.3 - 5	ND	ND	ND	ND		-												
DP24-7-7.5	12/15/09	9 - 10	ND	ND	ND		ND	ND												
DP25-3-4	12/16/09	3.8 - 5	ND	ND	ND		ND	ND	-								-	-		-
DP26-1-2	12/15/09	1-2	ND	ND	ND		ND	ND	-								-	-		-
DP26-5-6	12/15/09	5 - 6.8	ND	ND	ND	ND			-								-	-		
DP27-2.5-3.5	12/16/09	2.8 - 4	ND	ND	ND		ND	ND	-								-	-		-
DP28-1.4-2	12/16/09	1.8 - 2.5	ND	ND	ND		ND	ND	-								-	-		-
DP29-1-2	12/15/09	1.3 - 2.5	ND	ND	ND		ND	ND	-								-	-		-
DP29-3-4	12/15/09	3.8 - 5	ND	ND	ND	ND														
DP29-7	12/15/09	9	ND	ND	ND	ND														
DP30-4	12/15/09	4.4	ND	ND	ND		ND	ND												
DP30-6-7	12/15/09	10 - 13	ND	ND	ND	ND														
Western Fruit Express (1						1				1		•			
DP12-0.5-1.25	01/19/10	0.5 - 1.25	ND	0.0819	0.53	0.299	0.182	0.117	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.14	ND
DP12-4-5.8	01/19/10	4 - 5.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP32-1-2	01/04/10	1-2	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP33-1-2	01/04/10	1-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND



					BETX ²	(mg/kg)								VO	C ³ (mg/kg)					
Sample ID	Sample Data	Sample Depth ⁴	Benzene	Ethylbenzene		Total Xylenes	Xylene, m-,p-	Xylene, o-	1,1,1,2- Tetrachloro ethane	1,1,1- Trichloro ethane	1,1,2,2- Tetrachloro ethane	1,1,2- Trichloro ethane	1,1- Dichloro ethane	1,1- Dichloro thene	1,1- Dichloro propene	1,2,3- Trichloro benzene	1,2,3- Trichloro propane	1,2,4- Trichloro benzene	1,2,4- Trimethyl benzene	1,2-Dibromo- Chloropropar
ITCA Method A Industri	ial Cleanup Crite	ria	0.03	6	7	9	NE	NE	NE	2	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
GTP33-3-4	01/04/10	3 - 4	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP34-1-2	01/04/10	1-2	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP34-4	01/04/10	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP35-1-2	01/04/10	1-2	0.003 J	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP35-3-4	01/04/10	3 - 4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP35B-1.5	01/04/10	1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP35B-3	01/04/10	3	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ismantling Spur and E	ast and West Del	bris and Soil E	eposit Areas	3	-	-	-	-	-									-	-	
Ralston Lead Track																				
DP41-0.5-1.5	12/17/09	0.5 - 1.5	ND	ND	0.108	0.206	0.112	0.0946	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.102	ND
DP41-4.5-5.5	12/17/09	4.5 - 6	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP42-4-5	12/17/09	4 - 5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP42-7-7.5	12/17/09	7.5 - 8.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP42-8	12/17/09	9	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP43-0-1	12/16/09	0-1	ND	ND	0.164	0.143	0.0685	0.0744	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.123	ND
DP43-2-3.5	12/16/09	2.5 - 4.3	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44-0.5-1.5	12/16/09	0.5 - 1.5	ND	ND	ND	ND	ND	0.0328	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44-6-7	12/16/09	6 - 7.6	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44A-2-3	12/16/09	3 - 3.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44A-9	12/16/09	9	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44B-3.8-4.6	12/17/09	4.1 - 5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44B-5	12/17/09	5.5	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44B-6-7	12/17/09	6 - 7.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ormer Building Labeled	d "Paint"						•										•	•	•	
DP54-0-1	12/16/09	0 - 1.2	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP54-1-2	12/16/09	1.2 - 2.4	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP55-1-2	01/04/10	1-2	ND	ND	ND		ND	ND	-	-	-							-		-
Former Gasoline UST				•			•			r	•						•	•		
DUPLICATE-5	01/04/10	1-2	ND	ND	ND		ND	ND			-									
GTP55-3-4	01/04/10	3 - 4	ND	ND	ND		ND	ND			-									
GTP55-8-9	01/04/10	8 - 9	ND	ND	ND		ND	ND	-											
ueling Area																		•		
MW23560-62	12/03/09	60 - 62	ND	ND	ND	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

²BETX analyzed by method NWTPH-Gx/8021.

³VOCs analyzed by EPA 8260.

⁴As a consequence of the sonic drilling method, where appropriate, the soil sample depths have been normalized to 100 percent recovery. Therefore, the depth indicated in the sample name may vary from the normalized sample depth shown.

Refer to Appendix A of the attached report for rationale and discussion of the depth modifications.

ND = Compound was not detected at the Method Reporting Limit (MRL); mg/kg - milligrams per kilogram; J = estimated value greater than MRL; value is estimated typically because of sample dilution of QC recovery issues. See discussion in Appendix C; - = not tested; NE = screeing criteria not established; Bold indicates a value was detected greater than reporting limit; shading indicates value was detected exceeding Method A Industrial Cleanup level.



								VOC (mg/kg)								
Sample ID	Sample Data	Sample Depth ⁴	1,2-Dichloro benzene	1,2-Dichloro ethane	1,2-Dichloro ethene	1,2-Dichloro propane	1,3,5-Trimethyl benzene	1,3-Dichloro benzene	1,3-Dichloro propane	1,4-Dichloro benzene	2,2-Dichloro propane	2-Butanone	2-Chlorotoluene	4-Chlorotoluene	4-Methyl-2-Pentanone (Methyl isobutyl ketone)	Acetone	Allyl Chloride
MTCA Method A Indust	rial Cleanup Criter	ia	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Former Koch Materials	Lease Area		-	-				-					-				
GTP46-1	12/21/09	1								-	-		-				
GTP46-11-12	12/21/09	11 - 12			-		-			-	-						
GTP46-6-7	12/21/09	6 - 7								-	-						
Diesel Shop and Mater	ials Storage Buildi	ng	•		•		•	•	•						•	•	
DP01-1-2	12/15/09	1.7 - 3.3								-							
DP01-5-6	12/15/09	5 - 7		-						-							
DP01A-1-2	12/14/09	1.4 - 2.9		-						- 1							
DP01A-11-12.5	12/14/09	14.2 - 15	-	-	-			-						-	-		
DP02-1-2	12/14/09	1.5 - 3		-						-					-		
DP02-6-7	12/14/09	6 - 7.4							- 1	-					-		
DP03-1.5-2	12/14/09	1.5 - 2							-	-							
DP03-7.5-8.5	12/14/09	12.8 - 15				-		-	-								
DP04-0.5-1.5	12/14/09	0.8 - 2.3				-		-							-		
DP04-12-13	12/14/09	12.7 - 15				-		-	-						-		
DP05-1.3-2.6	12/14/09	1.3 - 2.6				-		-	-								
DP05-10.6	12/14/09	13.6													-		
DP07-2-2.7	12/14/09	3 - 4													-		
DP07-6-7	12/14/09	6 - 9						-							-		
DP08-1.6-2.4	12/14/09	2.1 - 3.2					-	-							-		
DP08-3.5-4.5	12/14/09	4.7 - 6						-									-
DP09-1-2	12/14/09	1 - 2					-	-									
DP09-2.5-3	12/14/09	2.5 - 3					-										
DP10-4-5.8	12/10/09	4 - 5.8					-										
DP10-5	12/10/09	5				-									-		-
DP11-4.2-4.85	12/10/09	4.2 - 4.85					-										
DP11-8-9	12/10/09	8 - 9					_										
DP24-2-3	12/15/09	3.3 - 5				S - /	-										
DP24-7-7.5	12/15/09	9 - 10														-	
DP25-3-4	12/16/09	3.8 - 5															-
DP26-1-2	12/15/09	1-2				-											-
DP26-5-6	12/15/09	5 - 6.8															-
DP27-2.5-3.5	12/16/09	2.8 - 4													-	-	
DP28-1.4-2	12/16/09	1.8 - 2.5															-
DP29-1-2	12/15/09	1.3 - 2.5													-	-	
DP29-3-4	12/15/09	3.8 - 5															
DP29-7	12/15/09	9															
DP30-4	12/15/09	4.4															
DP30-6-7	12/15/09	10 - 13															
Western Fruit Express (Generator Storage	e Area)	-	-	•		-	-	•	-	•	-	-	-	-	-	
DP12-0.5-1.25	-	0.5 - 1.25	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
DP12-4-5.8	01/19/10	4 - 5.8	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
GTP32-1-2	01/04/10	1-2	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP33-1-2	01/04/10	1-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND



		I						VOC (I	mg/kg)			Γ					
Sample ID	Sample Data	Sample Depth ⁴	1,2-Dichloro benzene	1,2-Dichloro ethane	1,2-Dichloro ethene	1,2-Dichloro propane	1,3,5-Trimethyl benzene	1,3-Dichloro benzene	1,3-Dichloro propane	1,4-Dichloro benzene	2,2-Dichloro propane	2-Butanone	2-Chlorotoluene	4-Chlorotoluene	4-Methyl-2-Pentanone (Methyl isobutyl ketone)	Acetone	Allyl Chloride
MTCA Method A Indust	rial Cleanup Crite	ria	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
GTP33-3-4	01/04/10	3 - 4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0046 J	ND
GTP34-1-2	01/04/10	1-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP34-4	01/04/10	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
GTP35-1-2	01/04/10	1-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP35-3-4	01/04/10	3 - 4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
GTP35B-1.5	01/04/10	1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
GTP35B-3	01/04/10	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dismantling Spur and I	East and West De	bris and Soil D	eposit Areas	•				•	•	•							
Ralston Lead Track																	
DP41-0.5-1.5	12/17/09	0.5 - 1.5	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	0.0183 U	ND	ND
DP41-4.5-5.5	12/17/09	4.5 - 6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	0.0013 U	0.0255	ND
DP42-4-5	12/17/09	4 - 5	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	0.0165 U	ND	ND
DP42-7-7.5	12/17/09	7.5 - 8.3	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	0.0162 U	ND	ND
DP42-8	12/17/09	9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	0.0013 U	ND	ND
DP43-0-1	12/16/09	0 - 1	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	0.0177 U	ND	ND
DP43-2-3.5	12/16/09	2.5 - 4.3	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0014 U	0.0281	ND
DP44-0.5-1.5	12/16/09	0.5 - 1.5	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	0.0181 U	ND	ND
DP44-6-7	12/16/09	6 - 7.6	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0013 U	ND	ND
DP44A-2-3	12/16/09	3 - 3.5	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	0.0171 U	ND	ND
DP44A-9	12/16/09	9	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0014 U	ND	ND
DP44B-3.8-4.6	12/17/09	4.1 - 5	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	0.0161 U	ND	ND
DP44B-5	12/17/09	5.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	0.0013 U	ND	ND
DP44B-6-7	12/17/09	6 - 7.3	ND	ND		ND	ND	ND	ND	ND	ND	ND		ND	0.017 U	ND	ND
Former Building Labele	ed "Paint"															I	
DP54-0-1	12/16/09	0 - 1.2	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP54-1-2	12/16/09	1.2 - 2.4	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP55-1-2	01/04/10	1-2						-									
DUPLICATE-5	01/04/10	1-2															-
GTP55-3-4	01/04/10	3 - 4															
GTP55-8-9	01/04/10	8-9				-											
Fueling Area	, - , - ,															1	
MW23560-62	12/03/09	60 - 62	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
		1	1	•				1	1	1	1					1	



										VOC (mg/kg)									
Sample ID	Sample Data	Sample Depth ⁴	Bromo benzene	Bromo chloro methane	Bromo form	Bromo methane	Carbon Tetrachloride	CFC-113	Chloro- benzene	Chloroethane		Chloro- methane	Cis-1,2-Dichloro- ethene	Cis-1,3-Dichloro- propene	Dibromo- chloro methane	Dibromo- methane	Dichloro- bromo methane	Dichloro- difluoro methane (CFC-12)	Dioxane, 1,4-	Ethyl Ether
MTCA Method A Indust	trial Cleanup Criter	ia	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Former Koch Materials																				
GTP46-1	12/21/09	1			-		-	-	-	-	-		-		-					-
GTP46-11-12	12/21/09	- 11 - 12								-			-					_		
GTP46-6-7	12/21/09	6 - 7											-							
Diesel Shop and Mater					1															
DP01-1-2	12/15/09	1.7 - 3.3						-	-			-	-							
DP01-5-6	12/15/09	5 - 7																		
DP01A-1-2	12/14/09	1.4 - 2.9																		
DP01A-11-12.5	12/14/09	14.2 - 15											-							
DP02-1-2	12/14/09	1.5 - 3									-	-	-							
DP02-1-2 DP02-6-7	12/14/09	6 - 7.4										-								
DP03-1.5-2	12/14/09	1.5 - 2												1	_					
DP03-1.5-2 DP03-7.5-8.5	12/14/09	1.5 - 2						-				-			-					
DP04-0.5-1.5	12/14/09	0.8 - 2.3																-		
DP04-0.5-1.5 DP04-12-13	12/14/09	0.8 - 2.3 12.7 - 15			-					-			-	1				-		
DP05-1.3-2.6		1.3 - 2.6					-			-	-		-	-	-					-
DP05-1.3-2.6 DP05-10.6	12/14/09									-	-		-	-	-					
	12/14/09	13.6								-			-							
DP07-2-2.7	12/14/09	3 - 4							- (-			-		-					
DP07-6-7	12/14/09	6-9					-		-	-			-							
DP08-1.6-2.4	12/14/09	2.1 - 3.2											-							
DP08-3.5-4.5	12/14/09	4.7 - 6																		
DP09-1-2	12/14/09	1-2							-	-								-		
DP09-2.5-3	12/14/09	2.5 - 3					-		-	-	-		-		-			-		
DP10-4-5.8	12/10/09	4 - 5.8						-		-										
DP10-5	12/10/09	5						-												
DP11-4.2-4.85	12/10/09	4.2 - 4.85					-	-	-											
DP11-8-9	12/10/09	8-9					-													
DP24-2-3	12/15/09	3.3 - 5																		
DP24-7-7.5	12/15/09	9 - 10					-	-												
DP25-3-4	12/16/09	3.8 - 5					-	-		-										
DP26-1-2	12/15/09	1-2						·		-										
DP26-5-6	12/15/09	5 - 6.8					-			-			-		-			-	-	-
DP27-2.5-3.5	12/16/09	2.8 - 4					-			-			-		-			-	-	-
DP28-1.4-2	12/16/09	1.8 - 2.5		-			-		-	-	-		-							
DP29-1-2	12/15/09	1.3 - 2.5					-			-			-					-		
DP29-3-4	12/15/09	3.8 - 5					-			-										-
DP29-7	12/15/09	9		-						-	-							-	-	
DP30-4	12/15/09	4.4							-				-					-		
DP30-6-7	12/15/09	10 - 13					-		-	-	-		-		-			-		
Western Fruit Express	(Generator Storage	e Area)																		
DP12-0.5-1.25	01/19/10	0.5 - 1.25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
DP12-4-5.8	01/19/10	4 - 5.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
GTP32-1-2	01/04/10	1-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
GTP33-1-2	01/04/10	1-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND



Sample ID	Sample Data	Sample Depth ⁴	Bromo benzene	Bromo chloro methane	Bromo form	Bromo methane	Carbon Tetrachloride	CFC-113	Chloro- benzene	Chloroethane	Chloroform	Chloro- methane	Cis-1,2-Dichloro- ethene	Cis-1,3-Dichloro- propene	Dibromo- chloro methane	Dibromo- methane	Dichloro- bromo methane	Dichloro- difluoro methane (CFC-12)	Dioxane, 1,4-	Ethyl Ether
MTCA Method A Indust	trial Cleanup Criter	ia	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
GTP33-3-4	01/04/10	3 - 4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
GTP34-1-2	01/04/10	1-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
GTP34-4	01/04/10	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
GTP35-1-2	01/04/10	1-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
GTP35-3-4	01/04/10	3 - 4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
GTP35B-1.5	01/04/10	1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
GTP35B-3	01/04/10	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
Dismantling Spur and	East and West Del	oris and Soil D	Deposit Areas																	
Ralston Lead Track																				
DP41-0.5-1.5	12/17/09	0.5 - 1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
DP41-4.5-5.5	12/17/09	4.5 - 6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP42-4-5	12/17/09	4 - 5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
DP42-7-7.5	12/17/09	7.5 - 8.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
DP42-8	12/17/09	9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP43-0-1	12/16/09	0 - 1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
DP43-2-3.5	12/16/09	2.5 - 4.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	ND
DP44-0.5-1.5	12/16/09	0.5 - 1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	ND
DP44-6-7	12/16/09	6 - 7.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	ND
DP44A-2-3	12/16/09	3 - 3.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	ND
DP44A-9	12/16/09	9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	ND
DP44B-3.8-4.6	12/17/09	4.1 - 5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	ND
DP44B-5	12/17/09	5.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44B-6-7	12/17/09	6 - 7.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
Former Building Labele																				
DP54-0-1	12/16/09	0 - 1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
DP54-1-2	12/16/09	1.2 - 2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND
GTP55-1-2	01/04/10	1-2							-											
	•						-											-		
DUPLICATE-5	01/04/10	1-2	-	-			-			-										
GTP55-3-4	01/04/10	3 - 4	-	-			-		-	-										-
GTP55-8-9	01/04/10	8 - 9	-	-	-			-	- /	-						-				
Fueling Area			-	-	-	1										-			1	
MW23560-62	12/03/09	60 - 62	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND



1										VOC (m	g/kg)											
Sample ID	Sample Data	Sample Depth ⁴	Ethylene dibromide	HCFC-21	Hexachloro butadiene	lsopropyl benzene (Cumene)	Methyl t-butyl ether	Methylene Chloride		n-Butyl benzene	n-Propyl benzene	p-lsopropyl toluene	Sec- Butyl benzene	Styrene	Tert-Butyl benzene	Tetra- chloro ethene	Tetra- hydrofuran	Trans-1,2- Dichloro ethene	Trans-1,3- Dichloro propene	Trichloro- ethene	Trichloro- fluoromethane (CFC-11)	Vinyl Chloride
MTCA Method A Industri	ial Cleanup Criteri	ia	0.005	NE	NE	NE	0.1	0.02	5	NE	NE	NE	NE	NE	NE	0.05	NE	NE	NE	0.03	NE	NE
Former Koch Materials L	Lease Area					.									1 1							·
GTP46-1	12/21/09	1	- 1	-				-											_		_	
GTP46-11-12	12/21/09	11 - 12											-	-								
GTP46-6-7	12/21/09	6 - 7						-	-				· _ `	-								
Diesel Shop and Materia			1			1											1				1	
DP01-1-2	12/15/09	1.7 - 3.3	-	-					-			-	-	-								
DP01-5-6	12/15/09	5 - 7										-	-									
DP01A-1-2	12/14/09	1.4 - 2.9																				
DP01A-11-12.5	12/14/09	14.2 - 15	-																			
DP02-1-2	12/14/09	1.5 - 3	-										-									
DP02-6-7	12/14/09	6 - 7.4	-							-												
DP03-1.5-2	12/14/09	1.5 - 2																				
DP03-7.5-8.5	12/14/09	12.8 - 15	_						-	-												-
DP04-0.5-1.5	12/14/09	0.8 - 2.3																-				
DP04-0.3-1.3	12/14/09	0.8 - 2.3 12.7 - 15						-	-												-	
										-				-								
DP05-1.3-2.6	12/14/09	1.3 - 2.6		-						-	-										-	
DP05-10.6	12/14/09	13.6							-		-											
DP07-2-2.7	12/14/09	3 - 4							-													
DP07-6-7	12/14/09	6-9							-	-										-		
DP08-1.6-2.4	12/14/09	2.1 - 3.2							-	-												
DP08-3.5-4.5	12/14/09	4.7 - 6						-	-	-						-		-				
DP09-1-2	12/14/09	1-2																				
DP09-2.5-3	12/14/09	2.5 - 3				-		-														
DP10-4-5.8	12/10/09	4 - 5.8						-														
DP10-5	12/10/09	5						-	-													
DP11-4.2-4.85	12/10/09	4.2 - 4.85					-	-	-											-		
DP11-8-9	12/10/09	8 - 9						-														
DP24-2-3	12/15/09	3.3 - 5																				
DP24-7-7.5	12/15/09	9 - 10					-															
DP25-3-4	12/16/09	3.8 - 5						-														
DP26-1-2	12/15/09	1-2																				
DP26-5-6	12/15/09	5 - 6.8										-										
DP27-2.5-3.5	12/16/09	2.8 - 4	-	-	-		-										-	-				
DP28-1.4-2	12/16/09	1.8 - 2.5	-	-		-				-		-					-	-		-		
DP29-1-2	12/15/09	1.3 - 2.5																				
DP29-3-4	12/15/09	3.8 - 5																				
DP29-7	12/15/09	9		-																		
DP30-4	12/15/09	4.4																				
DP30-6-7	12/15/09	10 - 13																				
Western Fruit Express (0		e Area)				•												_			•	
DP12-0.5-1.25	01/19/10	0.5 - 1.25	ND	ND	ND	ND	ND	ND	ND	0.0809	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP12-4-5.8	01/19/10	4 - 5.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP32-1-2	01/04/10	1-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP33-1-2	01/04/10	1-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND



Sample ID	Sample Data	Sample Depth ⁴	Ethylene dibromide	HCFC-21	Hexachloro butadiene	lsopropyl benzene (Cumene)	Methyl t-butyl ether	Methylene Chloride	Naphthalene	VOC (m n-Butyl benzene	g/ kg) n-Propyl benzene	p-Isopropyl toluene	Sec- Butyl benzene	Styrene	Tert-Butyl benzene	Tetra- chloro ethene	Tetra- hydrofuran	Trans-1,2- Dichloro ethene	Trans-1,3- Dichloro propene	Trichloro- ethene	Trichloro- fluoromethane (CFC-11)	• Vinyl Chloride
MTCA Method A Industr			0.005	NE	NE	NE	0.1	0.02	5	NE	NE	NE	NE	NE	NE	0.05	NE	NE	NE	0.03	NE	NE
GTP33-3-4	01/04/10	3 - 4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP34-1-2	01/04/10	1-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP34-4	01/04/10	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP35-1-2	01/04/10	1-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP35-3-4	01/04/10	3 - 4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP35B-1.5	01/04/10	1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.29	ND
GTP35B-3	01/04/10	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dismantling Spur and E	ast and West Deb	oris and Soil D	eposit Areas																			
Ralston Lead Track		-															-		-			
DP41-0.5-1.5	12/17/09	0.5 - 1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP41-4.5-5.5	12/17/09	4.5 - 6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP42-4-5	12/17/09	4 - 5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP42-7-7.5	12/17/09	7.5 - 8.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP42-8	12/17/09	9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP43-0-1	12/16/09	0 - 1	ND	ND	ND	ND	ND	0.18	ND	ND	0.0947	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP43-2-3.5	12/16/09	2.5 - 4.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44-0.5-1.5	12/16/09	0.5 - 1.5	ND	ND	ND	ND	ND	0.0738	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44-6-7	12/16/09	6 - 7.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44A-2-3	12/16/09	3 - 3.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44A-9	12/16/09	9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44B-3.8-4.6	12/17/09	4.1 - 5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44B-5	12/17/09	5.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44B-6-7	12/17/09	6 - 7.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Former Building Labele	d "Paint"																					
DP54-0-1	12/16/09	0 - 1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP54-1-2	12/16/09	1.2 - 2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP55-1-2	01/04/10	1-2								-												-
																						1
DUPLICATE-5	01/04/10	1-2						-														
GTP55-3-4	01/04/10	3 - 4							-													
GTP55-8-9	01/04/10	8 - 9						Ţ														
Fueling Area																						
-	12/03/09	60 - 62	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

https://projects.geoengineers.com/sites/0050611712/Final/BNSF RI Report Final Draft/[050611712_AppendixTables.xlsx]VOC_BETX



Table B-3

Summary of Chemical Analytical Data in Soil $^{\rm 1}$

Polycyclic Aromatic Hydrocarbons (PAHs) BNSF Parkwater Facility Remedial Investigation Spokane, Washington

											PAHs ² (m	g/kg)							
Sample ID	Sample Data	Sample Depth ³	TEQ ⁴ (Detects and Non-Detects = 1/2 Reporting Limit)	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(b) fluoranthene	Benzo(ghi) perylene	Benzo(k) fluoranthene	Chrysene	Dibenzo(a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-cd) pyrene	Naphthalene	Phenanthrene	Pyrene
MTCA Method A Indu	ustrial Cleanup	o Criteria	2	NE	NE	NE	NE	2	NE	NE	NE	NE	NE	NE	NE	NE	5	NE	NE
Former Koch Materia	als Lease Area	3																	
GTP46-1	12/21/09	1	4.88	8.51	ND	ND	ND	ND	9.07	ND	ND	10.9	ND	ND	8.53	ND	ND	31.6	9.47
GTP46-11-12	12/21/09	11 - 12	0.0090	0.0114	ND	ND	ND	ND	0.014	ND	ND	0.0137	ND	ND	0.0131	ND	ND	0.0426	0.0124
GTP46-6-7	12/21/09	6 - 7	0.034	0.0455	0.0111	0.0158	0.0296	0.0269	0.0242	0.0109	ND	0.058	ND	0.0139	0.0705	ND	0.0126	0.25	0.0534
GTP47-1	12/22/09	1	0.658	0.899	0.228	0.25	0.56	0.501	0.558	ND	ND	1.16	ND	0.335	1.1	ND	0.528	3.86	0.987
GTP47-11	12/22/09	11	0.0088	ND	ND	ND	ND	ND	0.0129	0.0138	ND	ND	ND	ND	ND	ND	ND	0.0125	ND
GTP47-4	12/22/09	4	0.0081	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DUPLICATE-2	12/22/09	4	0.0081	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP48-1	12/21/09	1	0.2058	ND	ND	ND	0.0912	ND	ND	ND	ND	0.211	ND	0.0815	ND	ND	ND	ND	0.185
GTP48-4-5	12/21/09	4 - 5	0.0083	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP49-1	12/21/09	1	1.030	0.279	ND	0.649	0.921	0.742	0.953	0.378	0.44	0.768	ND	1.96	ND	0.375	ND	2.25	2.03
GTP49-3-4	12/21/09	3 - 4	0.0268	ND	ND	ND	0.0252	0.0184	0.0273	0.013	0.0113	0.0196	ND	0.0343	ND	0.0126	ND	0.0217	0.0342
GTP50-1	12/18/09	1	0.2006	ND	ND	ND	0.0697	ND	ND	ND	ND	0.178	ND	0.0988	ND	ND	ND	0.0728	0.198
GTP50-5-6	12/18/09	5-6	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP51-1-2	12/18/09	1-2	0.967	ND	ND	ND	0.718	0.7	0.926	0.414	0.399	0.653	ND	1.28	ND	0.439	ND	0.545	1.36
GTP51-4	12/18/09	4	0.0082	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DUPLICATE-1	12/18/09	4	0.0302	ND	ND	0.0182	0.0286	0.0211	0.0282	0.016	0.0115	0.0225	ND	0.0611 J	ND	0.0147	ND	0.0729 J	0.0622 J
GTP52-1	12/18/09	1	0.4073	ND	ND	ND	ND	0.298	0.491	0.329	ND	0.376	ND	0.302	ND	ND	ND	0.114	0.445
GTP52-3-4 GTP53-1	12/18/09	3 - 4	0.0082	ND	ND	ND	ND 1.83	ND ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP53-1 GTP53-3-5	12/18/09 12/18/09	1 3-5	1.26 0.0082	0.217 J ND	ND ND	0.401 J ND	1.83 ND	ND	2.44 ND	ND ND	ND ND	1.6 ND	ND ND	3.38 ND	0.157 J ND	ND ND	ND ND	2.09 J ND	3.13 ND
Diesel Shop and Mat			0.0082	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP01-1-2	12/15/09	1.7 - 3.3	0.0477	ND	ND	ND	ND	ND	0.0841	ND	ND	ND	ND	ND	ND	ND	0.101	0.15	0.0805
DP01-5-6	12/15/09	5 - 7	0.0418	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP01A-1-2	12/13/03	1.4 - 2.9	0.502	0.223	0.131	0.264	0.393	0.331	0.723	0.285	0.25	0.501	ND	1.1	ND	0.23	0.189	0.432	2.12
DP01A-2-3	12/14/09	2.9 - 5	0.0079	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP02-1-2	12/14/09	1.5 - 3	0.228	1.49	0.448	ND	0.252	0.128	0.46	ND	ND	0.322	ND	0.863	3.06	0.136	2.61	7.49	0.916
DP02-6-7	12/14/09	6 - 7.4	0.0082	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP03-1.5-2	12/14/09	1.5 - 2	0.542	5.94	1.14	ND	ND	ND	0.966	ND	ND	0.761	ND	3.34	12	ND	34.5	41.6	3.53
DP03-3-4	12/14/09		0.0800	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP04-0.5-1.5	12/14/09		0.0908	ND	ND	0.115	ND	ND	0.147	0.237	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP04-3-4	12/14/09		0.0077	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP05-1.3-2.6	12/14/09	1.3 - 2.6	0.0085	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP05-8	12/14/09	9.6	0.0079	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP07-2-2.7	12/14/09	3 - 4	0.423	3.95	1.17	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.84	ND	5.4	6.86	ND
DP07-3.2-4	12/14/09	4.9 - 6	0.0079	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP08-1.6-2.4	12/14/09	2.1 - 3.2	0.459	1.34	ND	0.625	ND	ND	0.681	ND	ND	ND	ND	2.5	1.85	ND	0.714	4.37	2.59
DP08-3.5-4.5	12/14/09	4.7 - 6	0.0808	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP09-1-2	12/14/09	1-2	2.524	0.483	0.273	1.13	1.94	1.88	2.12	0.778	1.18	1.88	0.26	4.44	0.39	0.756	0.568	5.26	5.38
DP09-2.5-3	12/14/09	2.5 - 3	0.0079	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP10-4-5.8	12/10/09	4 - 5.8	0.0090	ND	ND	ND	ND	ND	0.0127	ND	ND	ND	ND	ND	ND	ND	ND	0.0142	ND



											PAHs ² (m	g/kg)							
Sample ID	Sample Data	Sample Depth ³	TEQ ⁴ (Detects and Non-Detects = 1/2 Reporting Limit)	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(b) fluoranthene	Benzo(ghi) perylene	Benzo(k) fluoranthene	Chrysene	Dibenzo(a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-cd) pyrene	Naphthalene	Phenanthrene	Pyrene
- MTCA Method A Indu	ustrial Cleanur	- Criteria	2	NE	NE	NE	NE	2	NE	NE	NE	NE	NE	NE	NE	NE	5	NE	NE
DP10-8-9	12/10/09	8-9	0.0079	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP11-4.2-4.85	12/10/09	4.2 - 4.85	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP11-8-8.4	12/10/09	8 - 8.4	0.0079	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP24-0.5-1.5	12/15/09	0.8 - 2.5	0.0587	ND	ND	ND	ND	ND	0.143	0.0645	ND	0.0776	ND	0.0919	ND	0.0632	0.0617	0.0747	0.0855
DP24-2-3	12/15/09	3.3 - 5	0.0080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP24-7-7.5	12/15/09	9 - 10	0.0079	ND	ND	ND	ND	ND	ND	ND	ND	_ ND	ND	ND	ND	ND	ND	ND	ND
DP25-3-4	12/16/09	3.8 - 5	0.0079	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP25-5-6	12/16/09	5 - 6.5	0.0087	ND	ND	ND	ND	ND	0.0129	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP26-1-2	12/15/09	1-2	0.0085	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP26-5-6	12/15/09	5 - 6.8	0.0078	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP27-2.5-3.5	12/16/09	2.8 - 4	0.0178	ND	ND	ND	0.0127	0.0122	0.0252	ND	ND	0.0133	ND	0.0211	ND	ND	ND	0.0152	0.0176
DP27-5-6	12/16/09	5 - 8.6	0.0089	ND	ND	ND	ND	ND	0.0168	ND	ND	ND	ND	0.0137	ND	ND	ND	0.0123	0.0129
DP28-1.4-2	12/16/09	1.8 - 2.5	0.0099	ND	ND	ND	ND	ND	0.0213	ND	ND	ND	ND	0.0133	ND	ND	ND	0.0128	ND
DP28-5-6	12/16/09	5 - 8.5	0.0094	ND	ND	ND	ND	ND	0.0206	ND	ND	ND	ND	0.0113	ND	ND	ND	ND	ND
DP29-1-2	12/15/09	1.3 - 2.5	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP29-3-4	12/15/09	3.8 - 5	0.0081	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP29-7	12/15/09	9	0.0079	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP30-1-2	12/15/09	1.1 - 2.2	0.0078	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP30-4	12/15/09	4.4	0.0078	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP30-6-7	12/15/09	10 - 13	0.0078	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Western Fruit Expres	ss (Generator S	Storage Area)				•										•	•		
DP12-0.5-1.25	01/19/10	0.5 - 1.25	0.0269	ND	ND	0.0134	0.0176	0.0165	0.0615	0.0121	ND	0.026	ND	0.0361	ND	0.0113	0.012	0.0252	0.0277
DP12-4-5.8	01/19/10	4 - 5.8	0.0080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP12-8-9.5	01/19/10	8 - 9.5	0.0081	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP32-1-2	01/04/10	1-2	0.1123	ND	0.0154	0.0251	0.0558	0.0761	0.169	0.0486	0.0701	0.0983	0.0172	0.113	ND	0.0403	0.0423	0.0851	0.109
GTP32-3-4	01/04/10	3 - 4	0.0086	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP33-1-2	01/04/10	1-2	0.0434	ND	ND	ND	0.0267	0.0283	0.0694	0.0181	0.0276	0.0443	ND	0.0416	ND	0.0162	0.0215	0.04	0.0449
GTP33-3-4	01/04/10	3 - 4	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP34-1-2	01/04/10	1 - 2	0.1106	ND	ND	ND	0.0569	0.081	0.125	0.0453	0.0499	0.0633	0.0209	0.0752	ND	0.0365	0.049	0.0615	0.0807
GTP34-4	01/04/10	4	0.0086	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DUPLICATE-6	01/04/10	4	0.0085	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP35-1-2	01/04/10	1-2	0.4842	ND	ND	ND	0.202	0.377	0.358	0.271	0.147	0.199	0.166	0.183	ND	0.179	ND	0.0842	0.202
GTP35-3-4	01/04/10	3 - 4	0.0087	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
GTP35B-1.5	01/04/10	1.5	0.0528	ND	ND	ND	0.0337	0.0358	0.0852	0.0183	0.0223	0.0482	ND	0.048	ND	0.0179	0.0356	0.0555	0.0573
GTP35B-3	01/04/10	3	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ralston Lead Track													-						
DP41-0.5-1.5	12/17/09	0.5 - 1.5	0.567	ND	ND	ND	0.376	0.41	0.584	0.212	0.279	0.353	ND	0.495	ND	0.239	ND	0.259	0.433
DP41-4.5-5.5	12/17/09	4.5 - 6	0.0077	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP42-4-5	12/17/09	4 - 5	0.0084	ND	ND	ND	ND	ND	0.0105	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP42-7-7.5	12/17/09	7.5 - 8.3	0.0078	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP43-0-1	12/16/09	0 - 1	0.105	ND	ND	ND	ND	ND	0.249	ND	ND	0.144	ND	0.143	ND	ND	ND	ND	0.131
DP43-2-3.5	12/16/09	2.5 - 4.3	0.0081	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44-0.5-1.5	12/16/09	0.5 - 1.5	0.0383	ND	ND	ND	0.0271	0.0264	0.0499	0.0149	0.0175	0.0295	ND	0.0365	ND	0.0162	ND	0.0167	0.032
DP44-6-7	12/16/09	6 - 7.6	0.0077	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44A-2-3	12/16/09	3 - 3.5	0.0082	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44A-9	12/16/09	9	0.008	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44B-3.8-4.6	12/17/09	4.1 - 5	0.0085	ND	ND	ND	ND	ND	0.0135	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
DP44B-6-7	12/17/09	6 - 7.3	0.0082	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND



											PAHs ² (m _i	g/kg)							
Sample ID	Sample Data	Sample Depth ³	TEQ ⁴ (Detects and Non-Detects = 1/2 Reporting Limit)		Acenaphthylene	Anthracene	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(b) fluoranthene	Benzo(ghi) perylene	Benzo(k) fluoranthene	Chrysene	Dibenzo(a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-cd) pyrene	Naphthalene	Phenanthrene	Pyrene
MTCA Method A Ind	lustrial Cleanup	Criteria	2	NE	NE	NE	NE	2	NE	NE	NE	NE	NE	NE	NE	NE	5	NE	NE
Fueling Area																			
MW23-60-62	12/03/09	60 - 62	0.0080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0137	ND	ND	ND	ND	0.0147

Notes:

¹Analyses completed by Pace Analytical, Minneapolis, Mn.

²PAHs analyzed by method EPA 8270 by SIM.

³As a consequence of the sonic drilling method, where appropriate, the soil sample depths have been normalized to 100 percent recovery. Therefore, the depth indicated in the sample name may vary from the normalized sample depth shown. Refer to Appendix A of the attached report for rationale and discussion of the depth modifications.

⁴TEQ = Toxicity Equivalency Quotient. TEQs were calculated using the guidelines TEQs were calculated using the guidelines "Evaluating the Toxicity and Assessing the Carcinogenic Risk of Environmental Mixtures Using Toxicity Equivalency Factors" by Washington State Department of Ecology.

ND = Compound was not detected at the Method Reporting Limit (MRL); mg/kg - milligrams per kilogram; J = estimated value greater than MRL; value is estimated typically because of sample dilution of QC recovery issues. See discussion in Appendix C; - = not tested; NE = screeing criteria not established; Bold indicates a value was detected greater than reporting limit.; shading indicates value was detected exceeding Method A Industrial Cleanup level.

File No. 0506-117-12 Table B-3 | August 11, 2010 https://projects.geoengineers.com/sites/0050611712/Final/BNSF RI Report Final Draft/[050611712_AppendixTables.xlsx]PAHs





1519 APPENDIX C

1520 DATA QUALITY ASSESSMENT SUMMARY

- 1521 Gasoline-Range Petroleum Hydrocarbons by Northwest Method NWTPH-Gx
- 1522 Diesel- and Motor Oil-Range Petroleum Hydrocarbons by Northwest Method NWTPH-Dx
- 1523 Metals (Including Mercury) by EPA Methods 6010/7471
- 1524 Polycyclic Aromatic Hydrocarbons (PAHs) by EPA Method 8270C-SIM
- 1525 Volatile Organic Compounds (VOCs) by EPA Method 8260B
- 1526 Polychlorinated Biphenyls (PCBs) by EPA Method 8082
- 1527
- 1528 Laboratory Sample Delivery Groups (SDG):
- 1529 **10118932, 10118810, 10118631, 10119388, 10119104, 10119003, 10118946,**
- 1530 10119390, 10119500, 10119703, 10120799, 10119885, 10122203, and 10123202
- 1531
- 1532 Project: BNSF Parkwater (0506-117-12)
- 1533 This report documents the results of an EPA defined level 2a data validation of analytical data from
- 1534 the analyses of soil samples and the associated laboratory and field quality control (QC) samples.
- 1535 The review included the following:
- 1536 Hold Times and Sample preservation
- 1537 Surrogates (for organics only)
- 1538 Blanks (method, trip, and equipment rinsate)
- 1539 Laboratory Control Samples
- 1540 Matrix Spikes/Matrix Spike Duplicates
- 1541 Field Duplicates
- 1542 Laboratory Duplicates
- 1543 Project Required Target Reporting Limits

1544 DATA PACKAGE COMPLETENESS

1545 The samples were analyzed by Pace Analytical, located in Minneapolis, Minnesota. The laboratory 1546 provided only Forms I, Forms II, and Forms III for a cursory level validation. The following sections 1547 discuss in detail the parameters and qualifier estimations to the data.

- 1548 **Objective**
- 1549 The objective of the data quality assessment was to review laboratory analytical procedures and 1550 quality control (QC) results to evaluate whether:
- The samples were analyzed using well-defined and acceptable methods that provide detection
 limits below applicable regulatory criteria;



- The precision and accuracy of the data are well defined and sufficient to provide defensible data; and
- 1555 The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet 1556 acceptable industry practices and standards.

1557 Data Quality Assessment Summary

1558 This data assessment was performed using guidance in the USEPA Contract Laboratory Program 1559 National Functional Guidelines for Inorganic Data Review (USEPA 2002) and USEPA Contract 1560 Laboratory Program National Functional Guidelines for Organic Data Review (USEPA 2008).

1561 Hold Times and Sample Preservation:

1562 The holding time is defined as the time that elapses between sample collection and sample 1563 analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte 1564 concentrations found at the time of analysis reflect the concentration present at the time of 1565 sample collection. Established holding times were met for all analyses.

1566 **Chain-of-Custody (COC) Documentation:**

1567 COC forms were provided with the laboratory analytical reports. No transcription errors were found, 1568 the appropriate signatures were applied, and the cooler temperatures were within the appropriate

1569 control limits of 2 to 6°C.

1570 *Method, Trip, and Equipment Rinsate Blanks:*

1571 Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce 1572 measurable concentrations of the analytes of interest. Method blanks were analyzed with each 1573 batch of samples, at a frequency of one per twenty samples. For all sample batches, method 1574 blanks for all applicable methods were analyzed at the required frequency. None of the analytes of 1575 interest were detected above the reporting limits in any of the blanks.

1576 No method blank detections were reported by the testing laboratory.

1577 Trip blanks are analyzed to ensure that the field sampling procedures do not introduce measurable

1578 concentrations of the analytes of interest. Trip blanks were analyzed with each field sampling 1579 event, at a frequency of one per day.

1580 No trip blank detections were reported by the testing laboratory.

1581 SDGs 10119003 and 10119104: (Volatiles)

These sample delivery groups contained two trip blank samples (both named "TRIP BLANK"). In
both cases, it was noted that one trip blank was a water sample, while the other was a soil sample.
Both samples were ND for all target analytes.

1585 SDGs 10120799: (Volatiles)

1586 This sample delivery group contained one trip blank sample (named "TRIP BLANK"). There was no1587 positive results for any target analytes in this sample.

1588 **SDGs 10119885: (Volatiles)**

1589 This sample delivery group contained one methanol blank sample (named "MEOH BLANK"). There 1590 was no positive results for any target analytes in this sample.

1591 Surrogate Recoveries:

A surrogate compound is a compound that is chemically similar to the analytes of interest, but unlikely to be found in any environmental sample. Surrogates are used for organic analyses and are added to all samples, standards, and blanks to serve as an accuracy and specificity check of each analysis. The surrogates are added at a known concentration and percent recoveries are calculated following analysis. All surrogate recoveries for field samples were within the laboratory control limits.

1598 **SDG 10119003**:

1599 (VOLATILES)

1600 The %R value for 4-bromofluorbenzene was less than the control limit in Sample DP54-0-1. The 1601 laboratory only used three surrogates, as opposed to four in the analysis. The reporting limits for 1602 all compounds were qualified as estimated (UJ).

1603 (PAHS)

Sample GTP53-1 was analyzed at both a 20x dilution and at a standard 1x dilution. No duplicate results were reported. The surrogates were diluted out of the 20x dilution, whereas the 1x dilution only reported two surrogates. As the laboratory is held to three surrogates being used for the analysis, the positive results and reporting limits in the 1x dilution were estimated (J/UJ). The compounds affected were acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene.

1610 **SDG 10119388**:

1611 (NWTPH-DX)

1612 The %R value for n-pentacosane was less than the control limit in sample GTP50-1. The positive 1613 results for Diesel Fuel and Motor Oil were estimated (J) in the sample.

1614 (PAHS)

Sample GTP53-1 was analyzed at both a 20x dilution and at a standard 1x dilution. No duplicate results were reported. The surrogates were diluted out of the 20x dilution, whereas the 1x dilution only reported two surrogates. As the laboratory is held to three surrogates being used for the analysis, the positive results and reporting limits in the 1x dilution were estimated (J/UJ). The compounds affected were acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene.

1621 **SDG 10118946**:

1622 (NWTPH-DX)

1623 The surrogate n-pentacosane was not recovered in five samples because the sample matrix 1624 required the analyst to dilute the samples ten times or more. No action was required.



1625 (PAHS)

- 1626 At least one surrogate %R value was outside the control limits in four samples because the sample
- 1627 matrix required the analyst to dilute each sample ten times or more. No action was required.

1628 **SDG 10119390**:

1629 (NWTPH-DX)

1630The %R value for n-pentacosane was less than the control limit in Sample GTP-48-1. The positive1631results for Diesel Fuel and Motor Oil were estimated (J) in the sample. The %R value for

- 1632 n-pentacosane was outside the control limits in Sample GTP-46-1 (20x) because the sample matrix
- 1633 required the analyst to dilute the sample ten times or more. No action was required

1634 (PAHS)

1635 The %R values for all surrogates were outside the control limits in Sample GTP-46-1 (100x) 1636 because the sample matrix required the analyst to dilute the sample ten times or more. No action 1637 was required.

1638 **SDG 10119500**:

1639 (NWTPH-DX)

1640 The surrogate n-pentacosane was not recovered in Sample GTP47-1 (10x) because the sample 1641 matrix required the analyst to dilute the samples ten times or more. No action was required.

1642 **SDG 10119703**:

1643 (NWTPH-DX)

1644 The %R value for n-pentacosane was less than the control limit in seventeen samples. The positive 1645 results and reporting limits for Diesel Fuel and Motor Oil were estimated (J/UJ) in each sample.

1646 **SDG 10120799**:

1647 (PAHS)

1648 The surrogate terphenyl-d14 was less than the control limit in Sample DP12-0.5-1.25. The 1649 National Functional Guidelines state that one surrogate outlier is allowed per fraction if all 1650 surrogate recoveries are greater than 10 percent. No further action was required.

1651 (**VOCS**)

1652 The %R values for all surrogates were greater than the control limit in Sample DP12-4-5.8. There 1653 were no positive results for any target analytes in the sample. As these surrogate outliers were 1654 indicative of a high bias, no further action was required.

1655 **SDG 10119885:**

1656 (VOCS)

The %R values for toluene-d8 and 4-bromofluorobenzene were outside of the control limits in Samples GTP34-1-2 and GTP35-1-2. There were no positive results for any target analytes in these samples. The reporting limits for all target analytes were qualified as estimated (UJ) in these samples. The %R value for toluene-d8 was greater than the control limit in Sample GTP32-1-2. As there was only one surrogate outlier of the three surrogates required by the method, no action was required.

1663 **SDG 10122203**:

1664 (NWTPH-DX)

1665 The %R value for n-pentacosane was greater than the control limit in Sample GTP36B-1. The 1666 sample concentrations of diesel fuel range and motor oil range petroleum hydrocarbons were both 1667 greater than 500 ppm. These concentrations represent a chromatographic interference that is 1668 masking the presence of the surrogate spike. No action was taken.

1669 Matrix Spikes/Matrix Spike Duplicates (MS/MSD):

1670 Because actual analyte concentration in environmental samples is not known, the accuracy of a 1671 particular analysis is usually inferred by performing a matrix spike (MS) analysis. One aliquot of 1672 sample is analyzed in the normal manner, than a second aliquot of the sample is spiked with a 1673 known amount of analyte concentration and analyzed. From these analyses, a percent recovery 1674 (%R) is calculated. Matrix spike duplicates (MSD) analyses are generally performed for organic 1675 analyses as a precision check. For some organic analytical methods, such as NWTPH-Dx, a 1676 laboratory control sample/ laboratory control sample duplicate (LCS/LCSD) sample set is 1677 performed in lieu of a MS/MSD analysis.

For inorganic methods, the matrix spike (referred to as a "spiked sample" is typically followed by a
post spike sample if any element recoveries were outside the control limits in the "spike sample".
In this case, the laboratory did not analyze a post spike sample. No other action was taken other
than to note it here.

Matrix spike analyses should be performed once per analytical batch or every twenty field samples, whichever is more frequent. The recovery criteria for matrix spikes and laboratory control samples are specified in the laboratory documents as are the relative percent difference values. The frequency requirements were met for all analyses, and the %R/RPD values were within the proper control limits.

1687 **SDG 10118932**:

1688 (METALS)

1689 Two matrix spike (MS) sample sets were performed on Sample DP01-1-2 and DP30-4. The %R 1690 values for barium were outside of the control limits in both sample sets. No action was required, 1691 as the parent sample concentrations were greater than the amount spiked into the sample.

1692 (PAHS)

1693 A MS/MSD sample set was performed on Sample DP30-60-7. The %R values for all compounds 1694 were outside of the control limits in the sample set. No action was required, as 10 of the parent 1695 sample concentrations were greater than the amount spiked into the sample.

1696 **SDG 10118810**:

1697 No MS/MSD sample set was analyzed with this sample delivery group. There was insufficient 1698 sample mass to conduct a MS/MSD.



1699 **SDG 10118631**:

1700 (Metals) A MS/MSD sample set was performed on Sample DP45-1.7-2.7. The %R values for 1701 barium were outside of the control limits in the sample set. Professional judgment was used to 1702 determine that no samples should be qualified, as the parent sample concentrations were greater 1703 than the amount spiked into the sample. The %R values for silver were less than the control limits 1704 in the same sample set. As there were no positive results for silver in the associated samples, the 1705 reporting limits were qualified as estimated (UJ) in all of the associated samples. The %R values 1706 for mercury were greater than the control limits in the sample set. No action was required, as there 1707 were no positive results for mercury in any of the associated samples.

1708 (PAHs) A MS/MSD sample set was performed on Sample DP11-4.2-4.85. The MS %R values for 1709 several compounds were outside of the control limits in the sample set. No action was required, as 1710 the corresponding MSD %R values were within the control limits. Also, several RPD values in the 1711 same sample set were greater than the control limits. No action was required because there were

1712 no positive results for these compounds in the parent sample.

1713 **SDG 10119003**:

1714 (NWTPH-DX)

- 1715 A MS/MSD sample set was performed on Sample DP27-2.5-3.5. The RPD value for Diesel Fuel 1716 Range was greater than the control limit in the sample set. As there was no positive value for
- 1717 diesel fuel in the parent sample, no action was taken.

1718 (METALS)

- 1719 A MS sample set was performed on Sample DP44A-9. There was no barium recovery in the sample
- 1720 set. No action was taken, as the parent sample concentration was at least 4x the amount spiked
- into the sample.

1722 **SDG 10119388:**

1723 (NWTPH-DX)

A MS/MSD sample set was performed on Sample GTP52-1. The RPD value for Diesel Fuel Range
was greater than the control limit in the sample set. The positive result for diesel fuel in the parent
sample was qualified as estimated (J).

1727 (METALS)

1728 A MS/MSD sample set was performed on Sample GTP53-1. There was no barium recovery in the 1729 sample set. No action was taken, as the parent sample concentration was at least 4x the amount 1730 spiked into the sample.

1731 (PAHS)

- 1732 A MS/MSD sample set was performed on Sample GTP51-1-2. The MS/MSD %R and RPD values
- 1733 for several compounds were outside of the control limits in the sample set. No action was taken,
- as the parent sample was diluted 20x, the spiked compounds were diluted out of the sample.

1735 **SDG 10119104**:

1736 (METALS)

A MS/MSD sample set was performed on Sample DP44b-3.8-4.6. The %R values for silver were
lower than the control limits, with the MS yielding no recovery at all. As there was no positive result
for silver in the parent sample, the absence of a spiked percent recovery resulted in the rejection
(R) of the silver reporting limits in the entire data set.

- 1741 The %R values for lead were lower than the control limits in the same sample set. The positive 1742 results for lead were gualified as estimated (J) in the entire data set.
- The %R values for barium were lower than the control limits in the same sample set. As the parent
 sample barium concentration was greater than the amount spiked into the sample, no action was
 taken.

1746 **SDG 10119500**:

1747 (NWTPH-DX)

A MS/MSD sample set was performed on Sample GTP38-4. The RPD value for Diesel Fuel was
greater than the control limit. The positive result for Diesel Fuel was qualified as estimated (J) in
the parent sample.

1751 (METALS)

A MS sample set was performed on Sample GTP37-9. The %R value for silver was lower than the
 control limits. The positive results and reporting limits for silver were qualified as estimated (J/UJ)
 in the entire data set.

1755 **SDG 10119703**:

1756 (METALS)

1757 One MS/MSD sample set was performed on Sample DP14-2.5-3. The %R values for silver and 1758 mercury were outside the control limits. The positive results and reporting limits for these 1759 compounds were qualified as estimated (J/UJ) in the entire data set.

Another MS/MSD sample set was performed on Sample DP17-3-4. The %R values for silver,
barium, and mercury were outside the control limits. The positive results and reporting limits for
these compounds were qualified as estimated (J/UJ) in the entire data set.

1763 **SDG 10120799**:

1764 (PCB AND PAHS)

One MS/MSD sample set was performed on a sample from a different SDG. Even though there
were %R and RPD outliers for various target analytes in these quality control sample sets, no action
was required as the parent sample was taken from a different laboratory sample delivery group.

1768 (METALS)

- 1769 One MS/MSD sample set was performed on Sample DP12-0.5-1.25. The %R values for silver were
- 1770 lower than the control limits. The reporting limits for silver were qualified as estimated (UJ) in the
- 1771 entire data set. The %R and RPD values for barium and lead were outside the control limits. As the



parent sample concentrations were both greater than the amount spiked into the sample, noaction was taken.

1774 **SDG 10119885**:

1775 (METALS)

An MS sample set was performed on Sample DUPLICATE-6, while another MS/MSD sample set was performed on a sample from an unrelated analytical batch. The silver %R value was less than the control limit in the MS sample set. The silver results and reporting limits were qualified as estimated (J/UJ) in all of the samples in the analytical batch.

1780 (PAHS)

1781 A MS/MSD sample set was performed on Sample GTP32-1-2. The MS %R values for 1782 benzo(g,h,i)perlyene and indeno(1,2,3-cd)pyrene were outside of the control limits in the sample 1783 set. No action was taken, as the corresponding MSD %R values for these compounds were within 1784 the control limits.

1785 **SDG 10122203**:

1786 (METALS)

A MS/MSD sample set was performed on a sample from an unrelated analytical batch. The %R and RPD values for barium and lead were outside of the control limits in the sample set. No samples were qualified, as the parent sample concentrations were greater than four times the amount spiked into the sample. The %R value for chromium was less than the control limits in the MSD from the same sample set. No action was taken, as the corresponding MS %R value for this compound was within the control limits. The %R and RPD values for silver were outside of the control limits. No action was taken as there were no parent samples taken from this SDG.

1794 Laboratory Control Samples/Laboratory Control Sample Duplicates (LSC/LCSD):

1795 A laboratory control sample is essentially a blank sample that is spiked with a known amount of 1796 analyte concentration and analyzed. It is to be treated much like a matrix spike, without the 1797 possibility for matrix interference. As there is no actual sample matrix in the analysis, the analytical 1798 expectations for accuracy and precision are usually more rigorous and qualification would apply to 1799 all samples in the batch, instead of the parent sample only.

Laboratory control sample analyses should be performed once per analytical batch or every twenty field samples, whichever is more frequent. The recovery criteria for laboratory control samples are specified in the laboratory documents as are the relative percent difference values. The frequency requirements were met for all analyses, and the %R/RPD values were within the proper control limits, with the following exceptions:

1805 The %R values and the RPD values for all target analytes were within the appropriate QC limits,1806 with the exceptions below:

1807 **SDG 10119104**:

1808 (VOLATILES)

1809 The LCS percent recovery (%R) value for acetone was greater than the control limit in the laboratory
1810 QC batch prepared on 12/23/09. No action was taken, as the corresponding LCSD %R value for
1811 acetone was within the control limits.

1812 **SDG 10119885**:

1813 (NWTPH-GX)

1814 The LCS %R value for the gasoline range hydrocarbon compounds was greater than the control
1815 limit in the laboratory QC batch prepared on 1/7/10. No action was taken, as the corresponding
1816 LCSD %R value for gasoline range hydrocarbons was within the control limits.

1817 (VOLATILES)

1818 The LCS/LCSD %R values for bromoform were less than the control limits in the laboratory QC 1819 batch prepared on 1/7/10. The reporting limits for this compound were qualified as estimated (J) 1820 in all of the samples in this analytical batch. The LCS %R value for trans-1,3-dichloropropene was 1821 less than the control limit in the same laboratory QC batch. No action was taken, as the 1822 corresponding LCSD %R value for this compound was within the control limits.

1823 Laboratory Duplicates:

1824 Internal laboratory duplicate analyses are performed to monitor the precision of the analyses. Two 1825 separate aliquots of a sample are analyzed as distinct samples in the laboratory, and the RPD 1826 between the two results is calculated. Duplicate analyses should be performed once per analytical 1827 batch. If one or more of the samples used has a concentration greater than five times the 1828 reporting limit for that sample, the absolute difference is used instead of the RPD.

1829 Laboratory duplicates were analyzed at the proper frequency and the specified acceptance criteria1830 were met in all cases.

1831 Field Duplicates

Field duplicate samples were collected and analyzed along with the reviewed sample batches. The duplicate samples were analyzed for the same parameters as the associated parent samples. As mentioned above for the laboratory duplicates the RPD is used as the criteria for assessing precision, unless one or more of the samples used has a concentration greater than five times the reporting limit for that sample, the absolute difference is used instead of the RPD. The RPD control limit for soils is 50 percent, while the RPD control limit for waters is 35 percent.

1838 Field duplicates met the specified acceptance criteria, except where noted below.

1839 **SDG 10119388**:

1840 One field duplicate set, GTP51-4 and Duplicate1, was submitted with this analytical batch. The 1841 absolute difference values for fluoranthene, phenanthrene, and pyrene were greater than the 1842 control limit of twice the MRL. The positive results and reporting limits were estimated (J/UJ) in 1843 both samples.



1844 **SDG 10119500**:

One field duplicate set, GTP47-4 and Duplicate-2, was submitted with this analytical batch. The
absolute difference and RPD values for all target analytes were within the control limits described
above.

1848 **SDG 10119703**:

1849 Two field duplicate sets, DP18-1-2 and Duplicate-3 and DP15-6-7 and Duplicate-4, were submitted
1850 with this analytical batch. The absolute difference and RPD values for all target analytes were
1851 within the control limits described above.

1852 **SDG 10119885:**

1853 Two field duplicate sets, GTP55-1-2 and Duplicate-5 and GTP34-4 and Duplicate-6, were submitted 1854 with this analytical batch. The RPD value for lead was greater than the control limit in the second 1855 duplicate set. The positive results for lead were estimated (J) in both samples.

1856 Overall Assessment

As was determined by this EPA level 2a evaluation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the surrogate, MS/MSD, and LCS/LCSD %R values, with the exceptions mentioned above. Precision was acceptable, as demonstrated by the field duplicate, laboratory duplicate, MS/MSD, and LCS/LCSD RPD values, with the exceptions mentioned above.

1862 Data were qualified as estimated because of surrogates, field duplicates, LCS/LCSD %R, MS/MSD
 1863 %R outliers.

1864 Data were rejected because of MS/MSD outliers.

- 1865 All other data points are acceptable for the intended use.
- 1866 Any estimated detection of compounds less than the MRL are listed in Tables B-1 through B-3 as1867 ND.
- 1868 Refer to Appendix D for laboratory reports.

BNSF – Parkwater Rail Yard Site

Project # 0506-117-12

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Analyte Group (including methods): NWTPH-Dx, Metals (6010 & 7471),

GeoEngineers Sampling Event Date(s): 2/25/10

Laboratory SDG: 10123202

Validator Initials/Date: MJL 3/1/10

TECHNICAL EVALUATION CHECKLIST

A (Summaries of holding times, sample results; accuracy; precision; blanks)

B (Summaries of calibration, instrument performance & compound ID)

Regular HRMS (High Resolution Mass Spectrometry)

<u>No</u> Qualifiers Issued to the database.

Y Ν N/A 1.0 Technical Holding Times and Sample Handling (A) 1.1 Is the chain-of-custody (COC) properly signed/dated? Correct analyses requested? All samples analyzed? Х 1.2 Were the samples properly preserved in the appropriate containers? Х 1.3 Are all holding times within the technical criteria? Х see attached Holding Time worksheet or data package page no outliers see below Х 1.4 Are all cooler temperatures within the control limits? Cooler Temperature: 3.8 °C Х X no outliers see attached Holding Time worksheet or data package page see below

2.0 Surrogates/Labeled Compounds (A)	Y	Ν	N/A
2.1 Are all recovery values within the control limits?	v		
<u>X</u> no outliers <u>see attached Surrogate Summary Form or data package page</u> see below	^		

Project # 0506-117-12

3.0 Method/Field Blank (A)	Y	Ν	N/A
3.1 Are Method Blanks free from contamination?	V		
X no outliers see attached Blank Summary Form or data package page see below	Х		
3.2 Are there any trip/equipment blanks included in the data package (list below)?		Х	
3.3 Are trip/equipment/field blanks free from contamination?			v
<u>X</u> no outliers <u>see attached Blank Summary Form or data package page</u> see below			Х
Comments: No positive results in associated samples; no action required for method / trip / equip. / other			
10X action level established for common lab cont.; 5X action level for others			
4.0. Laboratory Control Sample (Plank Spike/OPP Sample) (4)			
4.0 Laboratory Control Sample (Blank Spike/OPR Sample) (A) QC ID/Date:	Y	N	N/A
4.1 Are all %R-values within the control limits?			
X no outliers see attached Summary Form or data package page see below	Х		
4.2 Are all RPD values within control limits (if duplicate analyzed)?	v		
<u>X</u> no outliers see attached Summary Form or data package page see below	Х		
<u>Compound</u> <u>%R values</u> <u>Action</u>			
5.0 Matrix Spike/Matrix Spike Duplicate (A)			

Parent Sample ID:	Y	Ν	N/A
5.1 Are all %R-values within the control limits?	×		
_X no outliers see attached MS/MSD Summary Form or data package pageX see below	X		
5.2 Are all RPD values within control limits?	V		
X no outliers see attached MS/MSD Summary Form or data package pageX see below	Х		
Compound <u>%R or RPD values</u> Control Limits <u>Action</u>			

Project # 0506-117-12

6.0 Field Duplicate (A) Field Duplicate Sample ID(s):	Y	Ν	N/A
6.1 Were field duplicates collected and analyzed?		Х	
6.2 Are all RPD values within control limits?			v
<u>X</u> no outliers <u>see attached Field Dup.</u> Summary Form or data package page <u>see below</u>			Х
Comments: No qualifiers assigned based on field duplicate outliers			
7.0 Sample Results (A)	Y	Ν	N/A
7.1 Are there results for all analytes on the client required target compound list(s) see QAPP for lists?	Х		
7.2a Were TIC requested for this project?		Х	
7.2b If "yes", were TIC reported as required?			Х
7.3 Are reporting limits and sample results adjusted for sample size, % moisture (solid samples), etc.?	Х		
7.4 Is there any interference acting on any of the analyte concentrations?	Х		

BNSF – Parkwater Rail Yard Site

Project # 0506-117-12

Analyte Group (including methods): NWTPH-Dx, Metals (6010 & 7471), PAHs (8270-SIM), BTEX compounds (8260)

GeoEngineers Sampling Event Date(s): 12/14/09

Laboratory SDG: 10118631

Validator Initials/Date: MJL 1/8/10

TECHNICAL EVALUATION CHECKLIST

A (Summaries of holding times, sample results; accuracy; precision; blanks)

B (Summaries of calibration, instrument performance & compound ID)

Regular HRMS (High Resolution Mass Spectrometry)

<u>Yes</u> Qualifiers Issued to the database.

1.0 Technical Holding Times and Sample Handling (A) Y N N/A 1.1 Is the chain of custody (COC) properly signed/dated? Correct analyses requested? All samples analyzed? X X

1.1 Is the chain-of-custody (COC) properly signed/dated? Correct analyses requested? All samples analyzed?	X	
1.2 Were the samples properly preserved in the appropriate containers?	Х	
1.3 Are all holding times within the technical criteria ? _X_ no outliers	x	
1.4 Are all cooler temperatures within the control limits? Cooler Temperature: 0.2. 1.0, 2.0 °C X_ no outliers	х	

2.0 Surrogates/Labeled Compounds (A)	Y	N	N/A
2.1 Are all recovery values within the control limits?	v		
<u>X</u> no outliers <u>see attached Surrogate Summary Form or data package page</u> see below	^		

Project # 0506-117-12

3.0 Method/Field Blank (A)	Y	Ν	N/A
3.1 Are Method Blanks free from contamination?			
<u>X</u> no outliers see attached Blank Summary Form or data package page see below	Х		
3.2 Are there any trip/equipment blanks included in the data package (list below)?		Х	
3.3 Are trip/equipment/field blanks free from contamination? TRIP BLANK (Water)			
X no outliers see attached Blank Summary Form or data package page see below			Х
Comments: No positive results in associated samples; no action required for method / trip / equip. / other			
10X action level established for common lab cont.; 5X action level for others			
4.0 Laboratory Control Sample (Blank Spike/OPR Sample) (A)			
QC ID/Date:	Y	N	N/A
4.1 Are all %R-values within the control limits?	-		
X no outliers see attached Summary Form or data package page see below	Х		
4.2 Are all RPD values within control limits (if duplicate analyzed)?			
X no outliers see attached Summary Form or data package page see below	Х		
Compound <u>%R values</u> <u>Action</u>			
5.0 Matrix Spike/Matrix Spike Duplicate (A)			
Parent Sample ID: See below for different analyses parent samples.	Y	Ν	N/A
5.1 Are all %R-values within the control limits?		V	
no outliers see attached MS/MSD Summary Form or data package pageX_ see below		Х	
5.2 Are all RPD values within control limits?		v	
no outliers see attached MS/MSD Summary Form or data package page x see below		Х	
Metals Parent Samples: DP45 1.7-2.7			
The barium %R values in the MS/MSD sample set was greater than the control limit.			
No action was taken because the parent sample concentration was > 3x the amount spiked.			
As the MS/MSD was the only outlier – professional judgement was used.			
The silver %R values in the MS/MSD sample set were less than the control limit.			
The silver reporting limits (no positive detects) were estimated UJ in all associated samples.			
• The mercury %R values in the MS/MSD sample set were greater than the control limit. No action -			

No positive results in the parent sample.

Project # 0506-117-12

		X	
6.2 Are all RPD values within control limits?			x
X no outliers see attached Field Dup. Summary Form or data package page see below	V		
Comments: No qualifiers assigned based on field duplicate outliers			

6.3 Laboratory Duplicate (Fuels and Metals only)

Y	Ν	N/A
Х		
	Х	
		Х
Х		
Х		
I		
	×	

PAHs Parent Sample: DP11-4.2-4.85

•	Several of the MS %R values in the MS/MSD sample set were greater than the control limits.
	No action was taken because in each case, the corresponding MSD %R values were within the control
	limits.
•	Several RPD values in the same MS/MSD sample set were greater than the control limits.
-	No action – no positive results for these compounds in the parent sample.

BNSF – Parkwater Rail Yard Site

Project # 0506-117-12

Analyte Group (including methods): NWTPH-Dx, Metals (6010 & 7471), PAHs (8270-SIM), BTEX compounds (8260)

GeoEngineers Sampling Event Date(s): 12/15/09

Laboratory SDG: 10118923

Validator Initials/Date: MJL 1/8/10

TECHNICAL EVALUATION CHECKLIST

A (Summaries of holding times, sample results; accuracy; precision; blanks)

B (Summaries of calibration, instrument performance & compound ID)

Regular HRMS (High Resolution Mass Spectrometry)

<u>No</u> Qualifiers Issued to the database.

1.0 Technical Holding Times and Sample Handling (A)

1.1 Is the chain-of-custody (COC) properly signed/dated? Correct analyses requested? All samples analyzed?	Х	
1.2 Were the samples properly preserved in the appropriate containers?	Х	
1.3 Are all holding times within the technical criteria ?	v	
X no outliers see attached Holding Time worksheet or data package page see below	^	
1.4 Are all cooler temperatures within the control limits? Cooler Temperature: 6.0. 5.7, 6.0, 4.8 °C	v	
X no outliers see attached Holding Time worksheet or data package page see below	^	

N/A

Υ

Ν

2.0 Surrogates/Labeled Compounds (A)	Y	Ν	N/A
2.1 Are all recovery values within the control limits?	v		
<u>X</u> no outliers <u>see attached Surrogate Summary Form or data package page</u> see below	^		

Project # 0506-117-12

3.0 Method/Field Blank (A)	Y	N	N/A
3.1 Are Method Blanks free from contamination?			
X no outliers see attached Blank Summary Form or data package page see below	Х		
3.2 Are there any trip/equipment blanks included in the data package (list below)?	Х		
3.3 Are trip/equipment/field blanks free from contamination? TRIP BLANK (Water and Methanol)	V		
X no outliers see attached Blank Summary Form or data package page see below	X		
Comments: No positive results in associated samples; no action required for method / trip / equip. / other			
10X action level established for common lab cont.; 5X action level for others			
4.0 Laboratory Control Sample (Blank Spike/OPR Sample) (A)			
QC ID/Date:	Y	N	N/A
4.1 Are all %R-values within the control limits?	<u>г</u>		
<u>X</u> no outliers <u>see attached Summary Form or data package page</u> <u>see below</u>	Х		
4.2 Are all RPD values within control limits (if duplicate analyzed)?			
<u>X</u> no outliers <u>see attached Summary Form or data package page</u> <u>see below</u>	Х		
<u>Compound</u> <u>%R values</u> <u>Action</u>		·	
5.0 Matrix Spike/Matrix Spike Duplicate (A)			
Parent Sample ID: See below for different analyses parent samples.	Y	Ν	N/A
5.1 Are all %R-values within the control limits?		~	
no outliers see attached MS/MSD Summary Form or data package pageX_ see below		Х	
5.2 Are all RPD values within control limits?			
no outliers see attached MS/MSD Summary Form or data package page X see below		Х	
Metals Parent Samples: DP01-1-2 and DP30-4			•

• The barium %R values in both MS/MSD sample sets were greater than the control limit.

No action was taken because the parent sample concentration was > 3x the amount spiked.

As the MS/MSD was the only outlier – professional judgement was used.

PAH Parent Sample: DP30-6-7

• All compound %R values were outside of the control limits because 10 out of the 16 target analyte

concentrations were greater than 4 times the amount spiked into the sample. No action.

6.0 Field Duplicate (A) Field Duplicate Sample ID(s):	Y	Ν	N/A
6.1 Were field duplicates collected and analyzed?		Х	
6.2 Are all RPD values within control limits?			V
<u>X</u> no outliers see attached Field Dup. Summary Form or data package page see below			Х
Comments: No qualifiers assigned based on field duplicate outliers			
6.3 Laboratory Duplicate (Fuels and Metals only)			
7.0 Sample Results (A)	Y	N	N/A
7.1 Are there results for all analytes on the client required target compound list(s) see QAPP for lists?	Х		
7.2a Were TIC requested for this project?		Х	
7.2b If "yes", were TIC reported as required?			Х
7.3 Are reporting limits and sample results adjusted for sample size, % moisture (solid samples), etc.?	Х		
7.4 Is there any interference acting on any of the analyte concentrations?	Х		
		•	

Project # 0506-117-12

Analyte Group (including methods): BTEX compounds (8260)

GeoEngineers Sampling Event Date(s): 12/14/09

Laboratory SDG: 10118810

Validator Initials/Date: MJL 1/8/10

TECHNICAL EVALUATION CHECKLIST

A (Summaries of holding times, sample results; accuracy; precision; blanks)

B (Summaries of calibration, instrument performance & compound ID)

Regular HRMS (High Resolution Mass Spectrometry)

<u>No</u> Qualifiers Issued to the database.

Υ Ν N/A 1.0 Technical Holding Times and Sample Handling (A) 1.1 Is the chain-of-custody (COC) properly signed/dated? Correct analyses requested? All samples analyzed? Х 1.2 Were the samples properly preserved in the appropriate containers? Х 1.3 Are all holding times within the technical criteria? Х see attached Holding Time worksheet or data package page no outliers see below Х 1.4 Are all cooler temperatures within the control limits? Cooler Temperature: 6.0 °C Х X no outliers see attached Holding Time worksheet or data package page see below

2.0 Surrogates/Labeled Compounds (A)		Y	Ν	N/A
2.1 Are all recovery values within the control limits?		×		
<u>X</u> no outliers <u>see attached Surrogate Surrog</u>	mmary Form or data package page se	e below ^		

3.0 Method/Field Blank (A)		Y	Ν	N/A
3.1 Are Method Blanks free from contamination?		X		
<u>X</u> no outliers see attached Blank Summary Form or data package page _	see below	X		
3.2 Are there any trip/equipment blanks included in the data package (list below)?			Х	
3.3 Are trip/equipment/field blanks free from contamination? TRIP BLANK (Water and Methanol)			V
<u>X</u> no outliers see attached Blank Summary Form or data package page	see below			Х
Comments: No positive results in associated samples; no action required for method / trip	/ equip. / other			
10X action level established for common lab cont.; 5X action level for others				
4.0 Laboratory Control Sample (Blank Spike/OPR Sample) (A)				
QC ID/Date:		Y	Ν	N/A
4.1 Are all %R-values within the control limits?				
X no outliers see attached Summary Form or data package page s	ee below	Х		
4.2 Are all RPD values within control limits (if duplicate analyzed)?				
X no outliers see attached Summary Form or data package page s	ee below	Х		
Compound <u>%R values</u>	<u>Action</u>			
5.0 Matrix Spike/Matrix Spike Duplicate (A)				

Parer	Parent Sample ID: Insufficient sample volume for analysis.			Ν	N/A
5.1 Are all	%R-values within the control limits?				v
no	outliers see attached MS/MSD Summary Form or data package pageX	see below			^
5.2 Are all I	RPD values within control limits?				V
no	o outliers see attached MS/MSD Summary Form or data package pageX	see below			X

6.0 Field Duplicate (A) Field Duplicate Sample ID(s):	Y	Ν	N/A
6.1 Were field duplicates collected and analyzed?		Х	
6.2 Are all RPD values within control limits?			V
<u>X</u> no outliers see attached Field Dup. Summary Form or data package page see below			Х
Comments: No qualifiers assigned based on field duplicate outliers			
6.3 Laboratory Duplicate (Fuels and Metals only)			
7.0 Sample Results (A)	Y	N	N/A
7.1 Are there results for all analytes on the client required target compound list(s) see QAPP for lists?	Х		
7.2a Were TIC requested for this project?		X	
7.2b If "yes", were TIC reported as required?			Х
7.3 Are reporting limits and sample results adjusted for sample size, % moisture (solid samples), etc.?	Х		
7.4 Is there any interference acting on any of the analyte concentrations?	Х		
			•

Project # 0506-117-12

Analyte Group (including methods): NWTPH-Dx, Metals (6010 & 7471), PAHs (8270-SIM), Volatile compounds (8260)

GeoEngineers Sampling Event Date(s): 12/14/09

Laboratory SDG: 10118946

Validator Initials/Date: MJL 1/19/10

TECHNICAL EVALUATION CHECKLIST

A (Summaries of holding times, sample results; accuracy; precision; blanks)

B (Summaries of calibration, instrument performance & compound ID)

Regular HRMS (High Resolution Mass Spectrometry)

<u>NO</u> Qualifiers Issued to the database.

1.0 Technical Holding Times and Sample Handling (A) Y N N/A

1.1 Is the chain-of-custody (COC) properly signed/dated? Correct analyses requested? All samples analyzed?	Х	
1.2 Were the samples properly preserved in the appropriate containers?	Х	
1.3 Are all holding times within the technical criteria? _X_ no outliers	x	
1.4 Are all cooler temperatures within the control limits? Cooler Temperature: 6.0, 5.7, 6.0, 4.8°C X_ no outliers	x	

2.0 Surrogates/La	beled Compounds (A)			Y	Ν	N/A
2.1 Are all recovery val	ues within the control limits?				v	
<u>X</u> no outliers	see attached Surrogate Summary Form or data package page	<u>X</u>	see below		^	
NWTPH-Dx:						

•	Sample DP02-1-2 (10	x. 20x)	%R value for n-Pentacosane	(0%) – (Control Limit= 50-150)

- Sample DP03-1.5-2 (50x) %R value for n-Pentacosane (0%) (Control Limit= 50-150)
 Sample DP07-2-2.7 (20x) %R value for n-Pentacosane (0%) (Control Limit= 50-150)
 - Sample DP08-1.6-2.4 (20x) %R value for n-Pentacosane (0%) (Control Limit= 50-150)
 - Sample DP09-1-2 (10x) %R value for n-Pentacosane (0%) (Control Limit= 50-150)
 - No action; the samples were diluted at least 10 times-surrogate diluted out in all cases.

PAHs:

•	Sample DP02-1-2 (10x) %R value for nitrobenzene-d	5 (168%) – (Control Limit= 45-126)
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- Sample DP03-1.5-2 (10x) no recovery for any surrogates.
- Sample DP07-2-2.7 (10x) no recovery for any surrogates.
- Sample DP08-1.6-2.4 (10x) no recovery for any surrogates.

•

No action; the samples were diluted at least 10 times-surrogate diluted out in all cases.

3.0 Method/Field Blank (A)	Y	Ν	N/A
3.1 Are Method Blanks free from contamination?	V		
<u>X</u> no outliers see attached Blank Summary Form or data package page see below	X		
3.2 Are there any trip/equipment blanks included in the data package (list below)?		Х	
3.3 Are trip/equipment/field blanks free from contamination?			х
no outliers see attached Blank Summary Form or data package pageX see below			^
Comments: No positive results in associated samples; no action required for method / trip / equip. / other			
10X action level established for common lab cont.; 5X action level for others			
4.0. Laboratory Control Sample (Plank Spike/OPP Sample) (4)			
4.0 Laboratory Control Sample (Blank Spike/OPR Sample) (A) QC ID/Date:	v		
4.1 Are all %R-values within the control limits?	Y	N	N/A
<u>X</u> no outliers see attached Summary Form or data package page see below	Х		
4.2 Are all RPD values within control limits (if duplicate analyzed)?			
<u>X</u> no outliers <u>see attached Summary Form or data package page</u> see below	Х		
Compound %R values Action			
5.0 Matrix Spike/Matrix Spike Duplicate (A)			
Depend Semple ID: All complex that were taken from this SDC were within Cl	V	NI	NI/A

Parent Sample ID: All samples that were taken from this SDG were within CL.	Ŷ	N	N/A
5.1 Are all %R-values within the control limits?	V		
<u>X</u> no outliers see attached MS/MSD Summary Form or data package page see below	ow X		
5.2 Are all RPD values within control limits?	X		
X no outliers see attached MS/MSD Summary Form or data package page see be	low X		
Compound %R or RPD values Control Limits Action			

6.0 Field Duplicate (A) Field Duplicate Sample ID(s):	Y	Ν	N/A
6.1 Were field duplicates collected and analyzed?	Х		
6.2 Are all RPD values within control limits? no outliers see attached Field Dup. Summary Form or data package page see below		x	
Comments: No qualifiers assigned based on field duplicate outliers		L	
7.0 Sample Results (A)	Y	Ν	N/A
7.1 Are there results for all analytes on the client required target compound list(s) see QAPP for lists?	Х		
7.2a Were TIC requested for this project?		Х	
7.2b If "yes", were TIC reported as required?			Х
7.3 Are reporting limits and sample results adjusted for sample size, % moisture (solid samples), etc.?	Х		
7.4 Is there any interference acting on any of the analyte concentrations?	Х		
			. <u> </u>

Project # 0506-117-12

Analyte Group (including methods): NWTPH-Dx, Metals (6010 & 7471), PAHs (8270-SIM), Volatile compounds (8260)

GeoEngineers Sampling Event Date(s): 12/16/09

Laboratory SDG: 10119003

Validator Initials/Date: MJL 1/17/10

TECHNICAL EVALUATION CHECKLIST

A (Summaries of holding times, sample results; accuracy; precision; blanks) \bowtie

B (Summaries of calibration, instrument performance & compound ID)

Regular HRMS (High Resolution Mass Spectrometry)

<u>Yes</u> Qualifiers Issued to the database.

N/A Υ Ν 1.0 Technical Holding Times and Sample Handling (A) 1.1 Is the chain-of-custody (COC) properly signed/dated? Correct analyses requested? All samples analyzed? Х 1.2 Were the samples properly preserved in the appropriate containers? Х 1.3 Are all holding times within the technical criteria? Х see attached Holding Time worksheet or data package page no outliers see below Х 1.4 Are all cooler temperatures within the control limits? Cooler Temperature: 1.2 °C Х N

<u>X</u>	_ no outliers	see attached Holding	Time worksheet or	data package page	see below
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2.0 Surrogates/Labeled Compounds (A)	Y	Ν	N/A
2.1 Are all recovery values within the control limits?		V	
X_ no outliers see attached Surrogate Summary Form or data package pageX see below	/	^	
			-

Volatiles:

Sample DP54-0-1 %R value for 4-Bromofluorobenzene (64%) - (Control Limit=70-130) ٠

The lab only used three surrogates, as opposed to four. All reporting limits gualified as estimated (UJ).

3.0 Method/Field Blank (A)	Y	Ν	N/A
3.1 Are Method Blanks free from contamination?			
X no outliers see attached Blank Summary Form or data package page see below	Х		
3.2 Are there any trip/equipment blanks included in the data package (list below)?	Х		
3.3 Are trip/equipment/field blanks free from contamination? TRIP BLANK	V		
X no outliers see attached Blank Summary Form or data package page see below	Х		
Comments: No positive results in associated samples; no action required for method / trip / equip. / other			
10X action level established for common lab cont.; 5X action level for others			
4.0 Laboratory Control Sample (Blank Spike/OPR Sample) (A)			
QC ID/Date:	Y	Ν	N/A
4.1 Are all %R-values within the control limits?	V		
X no outliers see attached Summary Form or data package page see below	Х		
4.2 Are all RPD values within control limits (if duplicate analyzed)?	x		
<u>X</u> no outliers see attached Summary Form or data package page see below	^		
<u>Compound</u> <u>%R values</u> <u>Action</u>			
5.0 Matrix Spike/Matrix Spike Duplicate (A)			
Parent Sample ID: Taken from different SDG(PCBs); DP12-0.5-1.25 (Metals)	Y	Ν	N/A
5.1 Are all %R-values within the control limits?	v		
X no outliers see attached MS/MSD Summary Form or data package page see below	Х		
5.2 Are all RPD values within control limits?	x		
X no outliers see attached MS/MSD Summary Form or data package page see below	^		
Compound %R or RPD values Control Limits Action			

6.0 Field Duplicate (A) Field Duplicate Sample ID(s):	Y	Ν	N/A
6.1 Were field duplicates collected and analyzed?	Х		
6.2 Are all RPD values within control limits?			
no outliers see attached Field Dup. Summary Form or data package page see below		Х	
Comments: No qualifiers assigned based on field duplicate outliers			
6.3 Laboratory Duplicate (Fuels and Metals only)			
7.0 Sample Results (A)	Y	Ν	N/A
7.1 Are there results for all analytes on the client required target compound list(s) see QAPP for lists?	Х		
7.2a Were TIC requested for this project?		Х	
7.2b If "yes", were TIC reported as required?			Х
7.3 Are reporting limits and sample results adjusted for sample size, % moisture (solid samples), etc.?	Х		
7.4 Is there any interference acting on any of the analyte concentrations?	Х		
	-		

Project # 0506-117-12

Analyte Group (including methods): NWTPH-Dx, Metals (6010 & 7471), PAHs (8270-SIM), BTEX compounds (8260)

GeoEngineers Sampling Event Date(s): 12/17/09

Laboratory SDG: 10119104

Validator Initials/Date: MJL 1/17/10

TECHNICAL EVALUATION CHECKLIST

A (Summaries of holding times, sample results; accuracy; precision; blanks)

B (Summaries of calibration, instrument performance & compound ID)

🗌 Regular 🔲 HRMS (High Resolution Mass Spectrometry)

<u>Yes</u> Qualifiers Issued to the database.

Υ Ν N/A 1.0 Technical Holding Times and Sample Handling (A) 1.1 Is the chain-of-custody (COC) properly signed/dated? Correct analyses requested? All samples analyzed? Х 1.2 Were the samples properly preserved in the appropriate containers? Х 1.3 Are all holding times within the technical criteria? Х see attached Holding Time worksheet or data package page no outliers see below Х 1.4 Are all cooler temperatures within the control limits? Cooler Temperature: 2.6 °C Х X no outliers see attached Holding Time worksheet or data package page see below

2.0 Surrogates/Labe	eled Compounds (A)		Y	Ν	N/A
2.1 Are all recovery value	s within the control limits?		×		
<u>X</u> no outliers	see attached Surrogate Summary Form or data package page	see below	^		

3.0 Method/Field Blank (A)		Y	N	N/A
3.1 Are Method Blanks free from contamination?				
X no outliers see attached Blank Summary Form or data package page	see below	X		
3.2 Are there any trip/equipment blanks included in the data package (list below)?		Х		
3.3 Are trip/equipment/field blanks free from contamination? TRIP BLANK (Water); TRIP BLANK (Soil)	V		
X no outliers see attached Blank Summary Form or data package page see attached Blank Summary Form or data package page	see below	Х		
Comments: No positive results in associated samples; no action required for method / trip / equi	p. / other			
10X action level established for common lab cont.; 5X action level for others				
4.0 Laboratory Control Sample (Blank Spike/OPR Sample) (A)				
QC ID/Date: VOCs (water: Extracted 12/23/09)		Y	Ν	N/A
4.1 Are all %R-values within the control limits?			х	
<u>X</u> no outliers see attached Summary Form or data package page see be	low		~	
4.2 Are all RPD values within control limits (if duplicate analyzed)?		x		
<u>X</u> no outliers <u>see attached Summary Form or data package page</u> see be	low	^		
	<u>tion</u>			
Acetone 202, 189 (C.L. = 10-200) None; only of	ne outlier			
5.0 Matrix Spike/Matrix Spike Duplicate (A)				
Parent Sample ID: See below for different analyses parent samples.		Y	Ν	N/A

5.1 Are all %R-values within the control limits?		×	
no outliers see attached MS/MSD Summary Form or data package pageX see below		^	
5.2 Are all RPD values within control limits?	V		
X no outliers see attached MS/MSD Summary Form or data package page see below	X		
Metals Parent Sample: DP44b-3.8-4.6			

• The Barium %R values were less than the control limits. No action, the parent sample concentration >4x amount spiked.

• The Silver %R values were less than the control limits – the MS %R value "0". Qualified (J/R) in all samples.

• The Lead R values were less than the control limits –. Qualified (J/UJ) in all samples.

6.0 Field Duplicate (A) Field Duplicate Sample ID(s):	Y	Ν	N/A
6.1 Were field duplicates collected and analyzed?	Х		
6.2 Are all RPD values within control limits?			
no outliers see attached Field Dup. Summary Form or data package page see below		Х	
Comments: No qualifiers assigned based on field duplicate outliers			
6.3 Laboratory Duplicate (Fuels and Metals only)			
7.0 Sample Results (A)	Y	Ν	N/A
7.1 Are there results for all analytes on the client required target compound list(s) see QAPP for lists?	Х		
7.2a Were TIC requested for this project?		Х	
7.2b If "yes", were TIC reported as required?			Х
7.3 Are reporting limits and sample results adjusted for sample size, % moisture (solid samples), etc.?	Х		
7.4 Is there any interference acting on any of the analyte concentrations?	Х		
	-		. <u> </u>
			<u> </u>

Project # 0506-117-12

Analyte Group (including methods): NWTPH-Dx, Metals (6010 & 7471), PAHs (8270-SIM), BTEX compounds (8260)

GeoEngineers Sampling Event Date(s): 12/18/09

Laboratory SDG: 10119388

Validator Initials/Date: MJL 1/15/10

TECHNICAL EVALUATION CHECKLIST

A (Summaries of holding times, sample results; accuracy; precision; blanks)

B (Summaries of calibration, instrument performance & compound ID)

🗌 Regular 🔲 HRMS (High Resolution Mass Spectrometry)

<u>Yes</u> Qualifiers Issued to the database.

N/A Υ Ν 1.0 Technical Holding Times and Sample Handling (A) 1.1 Is the chain-of-custody (COC) properly signed/dated? Correct analyses requested? All samples analyzed? Х 1.2 Were the samples properly preserved in the appropriate containers? Х 1.3 Are all holding times within the technical criteria? Х see attached Holding Time worksheet or data package page no outliers see below Х 1.4 Are all cooler temperatures within the control limits? Cooler Temperature: 0.0 °C Х X no outliers see attached Holding Time worksheet or data package page see below

2.0 Surrogates/Labeled Compounds (A)	Y	Ν	N/A
2.1 Are all recovery values within the control limits?		v	
no outliers see attached Surrogate Summary Form or data package pageX_ see below		^	

PAHs by 8270-SIM:

Sample GTP53-1 was analyzed twice; once at 1:1 and another time at a dilution of (20X). No duplicate results were reported.

- 1) For the analytes reported from the 20X Dilution No action was taken, surrogates diluted out.
- 2) For the analytes reported from the regular analysis Only two surrogates were reported.
 - Results/Reporting limits from the regular analysis were estimated (J/UJ).

NWTPH-Dx:

Sample GTP50-1 %R value for n-pentacosane = 32% Control Limits (50-150) Postive results qualified (J).

20 Mothod/Field Plank (A)	Y	N	N/A
3.0 Method/Field Blank (A)			
3.1 Are Method Blanks free from contamination?	Х		
X no outliers see attached Blank Summary Form or data package page see below		X	
3.2 Are there any trip/equipment blanks included in the data package (list below)?		Х	
3.3 Are trip/equipment/field blanks free from contamination? TRIP BLANK (Water)			Х
<u>X</u> no outliers <u>see attached Blank Summary Form or data package page</u> see below			
Comments: No positive results in associated samples; no action required for method / trip / equip. / other			
10X action level established for common lab cont.; 5X action level for others			
4.0 Laboratory Control Sample (Blank Spike/OPR Sample) (A)			
QC ID/Date:	v		N1/A
	Y	Ν	N/A
4.1 Are all %R-values within the control limits?	Х		
X no outliers see attached Summary Form or data package page see below			
4.2 Are all RPD values within control limits (if duplicate analyzed)?	Х		
X no outliers see attached Summary Form or data package page see below			
<u>Compound</u> <u>%R values</u> <u>Action</u>			
5.0 Matrix Spike/Matrix Spike Duplicate (A)			
Parent Sample ID: See below for different analyses parent samples.	Y	Ν	N/A
5.1 Are all %R-values within the control limits?		X	
no outliers see attached MS/MSD Summary Form or data package pageX_ see below		Х	
5.2 Are all RPD values within control limits?			
no outliers see attached MS/MSD Summary Form or data package page x see below		Х	
NWTPH-Dx Parent Sample: GTP52-1			
The Diesel Fuel Range RPD value in the MS/MSD sample set was greater than the control limit.			
The Diesel result in the parent sample was estimated (J).			
Metals Parent Sample: <u>GTP53-1</u>			
There was no Barium recovery in the MS/MSD sample set. The parent sample concentration was > 4x the			
amount spiked into the sample. No Action.			

PAHs Parent Sample: <u>GTP51-1-2</u>

• Several of the %R and RPD values were outside the control limit. The parent sample diluted 20X. The spiked compounds were diluted out of the sample. No Action.

Υ Ν N/A 6.0 Field Duplicate (A) Field Duplicate Sample ID(s): GTP51-4 & Duplicate-1 6.1 Were field duplicates collected and analyzed? Х 6.2 Are all RPD values within control limits? Х no outliers see attached Field Dup. Summary Form or data package page see below х No qualifiers assigned based on field duplicate outliers Comments: The following compounds were estimated because the Absolute Difference values were greater than the control limit of ٠ 2X the lowest MRL: Fluoranthene, Phenanthrene, and Pyrene Estimated (J/UJ) in both samples. 6.3 Laboratory Duplicate (Fuels and Metals only) 7.0 Sample Results (A) Υ Ν N/A 7.1 Are there results for all analytes on the client required target compound list(s) see QAPP for lists? Х 7.2a Were TIC requested for this project? Х 7.2b If "yes", were TIC reported as required? Х 7.3 Are reporting limits and sample results adjusted for sample size, % moisture (solid samples), etc.? Х 7.4 Is there any interference acting on any of the analyte concentrations? Х

Project # 0506-117-12

Analyte Group (including methods): NWTPH-Dx, Metals (6010 & 7471), PAHs (8270-SIM), PCB Aroclors (8082)

GeoEngineers Sampling Event Date(s): 12/22/09

Laboratory SDG: 10119500

Validator Initials/Date: MJL 1/22/10

TECHNICAL EVALUATION CHECKLIST

A (Summaries of holding times, sample results; accuracy; precision; blanks)

B (Summaries of calibration, instrument performance & compound ID)

Regular HRMS (High Resolution Mass Spectrometry)

<u>Yes</u> Qualifiers Issued to the database.

1.0 Technical Holding Times and Sample Handling (A) Y N N/A 1.1 Is the chain-of-custody (COC) properly signed/dated? Correct analyses requested? All samples analyzed? X Image: Correct analyses requested? X Image: Correct analy

 X
 no outliers
 see attached Holding Time worksheet or data package page
 see below
 A

 1.4
 Are all cooler temperatures within the control limits?
 Cooler Temperature: 1.4 °C
 X
 X

 X
 no outliers
 see attached Holding Time worksheet or data package page
 see below
 X

2.0 Surrogates/La	beled Compounds (A)			Y	Ν	N/A
2.1 Are all recovery val	ues within the control limits?				v	
<u>X</u> no outliers	see attached Surrogate Summary Form or data package page	<u>X</u>	see below		^	

NWTPH-Dx:

• Sample GTP47-1 (10x) %R value for n-Pentacosane (0%) – (Control Limit= 50-150)

No action; the sample was diluted at least 10 times-surrogate diluted out in all cases.

3.0 Method/Field Blank (A)	Y	Ν	N/A
3.1 Are Method Blanks free from contamination?			
X no outliers see attached Blank Summary Form or data package page see below	Х		
3.2 Are there any trip/equipment blanks included in the data package (list below)?		Х	
3.3 Are trip/equipment/field blanks free from contamination?			v
no outliers see attached Blank Summary Form or data package pageX_ see below			Х
Comments: No positive results in associated samples; no action required for method / trip / equip. / other			
10X action level established for common lab cont.; 5X action level for others			
4.0 Laboratory Control Sample (Blank Spike/OPR Sample) (A)			
QC ID/Date:	Y	N	N/A
4.1 Are all %R-values within the control limits?	×		
X no outliers see attached Summary Form or data package page see below	Х		
4.2 Are all RPD values within control limits (if duplicate analyzed)?	V		
<u>X</u> no outliers see attached Summary Form or data package page see below	Х		
<u>Compound</u> <u>%R values</u> <u>Action</u>			
Y			
5.0 Matrix Spike/Matrix Spike Duplicate (A)			
Parent Sample ID: See below	Y	N	N/A
		IN	

5.1 Are all %R-values wi	thin the control limits?				х		
<u>X</u> no outliers	see attached MS/MS	SD Summary Form	or data package page	see below	^		
5.2 Are all RPD values w	vithin control limits?					V	
no outliers	see attached MS/MS	SD Summary Form of	or data package page	X see below		Х	
<u>Compound</u>	<u>%R or <i>RPD</i> values</u>	Control Limits	Actio	<u>on</u>			
Diesel Fuel	39	(30)	Qualified (J) ir	n the parent sample.			
Parent sample:	GTP38-4						
Silver	66	(75-125)	Qualified (J/UJ) in all	associated samples.			

6.0 Field Duplicate (A) Field Duplicate Sample ID(s): GTP47-4 & DUPLICATE-2	Y	Ν	N/A
6.1 Were field duplicates collected and analyzed?	Х		
6.2 Are all RPD values within control limits? _X_ no outliers	х		
Comments: No qualifiers assigned based on field duplicate outliers			
7.0 Sample Results (A)	Y	Ν	N/A
7.1 Are there results for all analytes on the client required target compound list(s) see QAPP for lists?	Х		
7.2a Were TIC requested for this project?		Х	
7.2b If "yes", were TIC reported as required?			Х
7.3 Are reporting limits and sample results adjusted for sample size, % moisture (solid samples), etc.?	Х		
7.4 Is there any interference acting on any of the analyte concentrations?	Х		

Project # 0506-117-12

Analyte Group (including methods): NWTPH-Dx, Metals (6010 & 7471)

GeoEngineers Sampling Event Date(s): 12/28/09

Laboratory SDG: 10119703

Validator Initials/Date: MJL 1/24/10

TECHNICAL EVALUATION CHECKLIST

A (Summaries of holding times, sample results; accuracy; precision; blanks)

B (Summaries of calibration, instrument performance & compound ID)

Regular HRMS (High Resolution Mass Spectrometry)

<u>Yes</u> Qualifiers Issued to the database.

Υ Ν N/A 1.0 Technical Holding Times and Sample Handling (A) 1.1 Is the chain-of-custody (COC) properly signed/dated? Correct analyses requested? All samples analyzed? Х 1.2 Were the samples properly preserved in the appropriate containers? Х 1.3 Are all holding times within the technical criteria? Х see attached Holding Time worksheet or data package page no outliers see below Х 1.4 Are all cooler temperatures within the control limits? Cooler Temperature: 4.8, 1.8 °C Х X no outliers see attached Holding Time worksheet or data package page see below

2.0 Surrogates/Labeled Compounds (A)	Y	Ν	N/A
2.1 Are all recovery values within the control limits?		х	
no outliers see attached Surrogate Summary Form or data package page X see below		^	
NWTPH-Dx: (Continued on last page)			
• Sample DP18-1-2 %R value for n-Pentacosane (47%) – (Control Limit= 50-150)			
• Sample DP18-4 %R value for n-Pentacosane (44%) – (Control Limit= 50-150)			
• Sample DP18-2 %R value for n-Pentacosane (46%) – (Control Limit= 50-150)			
• Sample DUPLICATE-3 %R value for n-Pentacosane (44%) – (Control Limit= 50-150)			
• Sample DUPLICATE-4 %R value for n-Pentacosane (42%) – (Control Limit= 50-150)			
 Sample DP19-5 %R value for n-Pentacosane (42 %) – (Control Limit= 50-150) 			
• Sample DP19-7-8 %R value for n-Pentacosane (48%) – (Control Limit= 50-150)			
 Sample DP20-2 %R value for n-Pentacosane (48 %) – (Control Limit= 50-150) 			
• Sample DP20-5-6 %R value for n-Pentacosane (48 %) – (Control Limit= 50-150)			
• Sample DP22-1-2 %R value for n-Pentacosane (48 %) – (Control Limit= 50-150)			
• Sample DP13-6-7 %R value for n-Pentacosane (48 %) – (Control Limit= 50-150)			
• Sample DP15-6-7 %R value for n-Pentacosane (45 %) – (Control Limit= 50-150)			
• Sample DP17-1.5-2.5 %R value for n-Pentacosane (48 %) – (Control Limit= 50-150)			
• Sample DP17-3-4 %R value for n-Pentacosane (37 %) – (Control Limit= 50-150)			

3.0 Method/Field Blank (A)	Y	N	N/A
3.1 Are Method Blanks free from contamination?	V		
X no outliers see attached Blank Summary Form or data package page see below	X		
3.2 Are there any trip/equipment blanks included in the data package (list below)?		Х	
3.3 Are trip/equipment/field blanks free from contamination?			х
no outliers see attached Blank Summary Form or data package pageX see below			^
Comments: No positive results in associated samples; no action required for method / trip / equip. / other			
10X action level established for common lab cont.; 5X action level for others			
4.0 Laboratory Control Sample (Blank Spike/OPR Sample) (A)			
QC ID/Date:	Y	Ν	N/A
4.1 Are all %R-values within the control limits?	х		
<u>X</u> no outliers see attached Summary Form or data package page see below	^		
4.2 Are all RPD values within control limits (if duplicate analyzed)?	x		
<u>X</u> no outliers see attached Summary Form or data package page see below	^		
<u>Compound</u> <u>%R values</u> <u>Action</u>			
5.0 Matrix Spike/Matrix Spike Duplicate (A)			
Parent Sample ID: See below for parent samples.	Y	Ν	N/A

5.1 Are all %R-values wi	thin the control limits?				v
<u>X</u> no outliers	see attached MS/M	SD Summary Fo	rm or data package page	see below	X
5.2 Are all RPD values w	vithin control limits?				V
no outliers	see attached MS/M	SD Summary Fo	rm or data package page	X see below	x
<u>Compound</u>	<u>%R or RPD values</u>	Control Lim	nits <u>Ac</u>	<u>tion</u>	
Silver	50, 50	(75-125)	Qualified (J/UJ) in all a	ssociated samples.	
Mercury	65, 127 - <i>60</i>	(75-125) (30)) Qualified (J/UJ) in all	associated samples.	
• DP14-2.5-3					
Silver	67	(75-125)	Qualified (J/UJ) in all ass	ociated samples.	
Barium	64	(75-125)	Qualified (J/UJ) in all ass	sociated samples.	
Mercury	128	(75-125)	Qualified (J/UJ) in all as	sociated samples.	
• DP17-3-4					

6.0 Field Duplicate (A) Field Duplicate Sample ID(s):

Y N N/A

6.1 Were field duplicates collected and analyzed?	Х	
6.2 Are all RPD values within control limits? no outliers see attached Field Dup. Summary Form or data package page see below	х	
Comments: No qualifiers assigned based on field duplicate outliers	-	
DP19 1 2 % DUPLICATE 2. All DDD/Abaclute difference values less than the central limits		

DP18-1-2 & **DUPLICATE-3**: All RPD/Absolute difference values less than the control limits.

DP15-6-7 & DUPLICATE-4: All RPD/Absolute difference values less than the control limits.

7.0 Sample Results (A)	Y	N	N/A
7.1 Are there results for all analytes on the client required target compound list(s) see QAPP for	or lists? X		
7.2a Were TIC requested for this project?		Х	
7.2b If "yes", were TIC reported as required?			Х
7.3 Are reporting limits and sample results adjusted for sample size, % moisture (solid samples	s), etc.? X		
7.4 Is there any interference acting on any of the analyte concentrations?	Х		

- Sample DP21-1.5-2.5 %R value for n-Pentacosane (41 %) (Control Limit= 50-150)
- Sample **DP21-7** %R value for n-Pentacosane (41 %) (Control Limit= 50-150)
- Sample DP23-3-4 %R value for n-Pentacosane (44 %) (Control Limit= 50-150)

All of the above Diesel Fuel / Motor Oil results and reporting limits were qualified as estimated (J/UJ).

Project # 0506-117-12

Analyte Group (including methods): NWTPH-Dx, Metals (6010 & 7471), PAHs (8270-SIM), Volatile compounds (8260)

GeoEngineers Sampling Event Date(s): 12/21/09

Laboratory SDG: 10119390

Validator Initials/Date: MJL 1/20/10

TECHNICAL EVALUATION CHECKLIST

A (Summaries of holding times, sample results; accuracy; precision; blanks) \bowtie

B (Summaries of calibration, instrument performance & compound ID)

Regular HRMS (High Resolution Mass Spectrometry)

<u>Yes</u> Qualifiers Issued to the database.

1.0 Technical Holding Times and Sample Handling (A) Υ Ν N/A

1.1 Is the chain-of-custody (COC) properly signed/dated? Correct analyses requested? All samples analyzed?	Х	
1.2 Were the samples properly preserved in the appropriate containers?	Х	
1.3 Are all holding times within the technical criteria?	~	
X no outliers see attached Holding Time worksheet or data package page see below	^	
1.4 Are all cooler temperatures within the control limits? Cooler Temperature: 0.0 °C	~	
X no outliers see attached Holding Time worksheet or data package page see below	^	

2.0 Surrogates/La	beled Compounds (A)			Y	Ν	N/A
2.1 Are all recovery val	ues within the control limits?				~	
<u>X</u> no outliers	see attached Surrogate Summary Form or data package page	<u>X</u>	see below		^	

NWTPH-Dx:

Sample GTP48-1 %R value for n-Pentacosane (31%) - (Control Limit= 50-150) - BOTH results qualified (J/UJ).

Sample GTP46-1 (20x) %R value for n-Pentacosane (0%) - (Control Limit= 50-150) •

No action; the sample was diluted at least 10 times-surrogate diluted out in all cases.

PAHs:

Sample GTP46-1 (100x) no recovery for any surrogates. •

No action; the samples were diluted at least 10 times-surrogate diluted out in all cases.

3.0 Method/Field Blank (A)	Y	Ν	N/A
3.1 Are Method Blanks free from contamination?			
X no outliers see attached Blank Summary Form or data package page see below	X		
3.2 Are there any trip/equipment blanks included in the data package (list below)?		Х	
3.3 Are trip/equipment/field blanks free from contamination?			v
no outliers see attached Blank Summary Form or data package page X see below			Х
Comments: No positive results in associated samples; no action required for method / trip / equip. / other			
10X action level established for common lab cont.; 5X action level for others			
4.0 Laboratory Control Sample (Blank Spike/OPR Sample) (A)			
QC ID/Date:	Y	Ν	N/A
4.1 Are all %R-values within the control limits?	x		
X no outliers see attached Summary Form or data package page see below			
4.2 Are all RPD values within control limits (if duplicate analyzed)?	x		
X no outliers see attached Summary Form or data package page see below	~		
<u>Compound</u> <u>%R values</u> <u>Action</u>			
E.O. Matrix Spike/Matrix Spike Duplicate (A)			
5.0 Matrix Spike/Matrix Spike Duplicate (A)			

All parent worked and a group were on.		 INA
5.1 Are all %R-values within the control limits?	V	
<u>X</u> no outliers see attached MS/MSD Summary Form or data package page see below	~	
5.2 Are all RPD values within control limits?	V	
X no outliers see attached MS/MSD Summary Form or data package page see below	~	
Compound <u>%R or RPD values</u> Control Limits <u>Action</u>		

6.0 Field Duplicate (A) Field Duplicate Sample ID(s):	Y	Ν	N/A
6.1 Were field duplicates collected and analyzed?	Х		
6.2 Are all RPD values within control limits? no outlierssee attached Field Dup. Summary Form or data package pagesee below		x	
Comments: No qualifiers assigned based on field duplicate outliers		L	<u> </u>
7.0 Sample Results (A)	Y	Ν	N/A
7.1 Are there results for all analytes on the client required target compound list(s) see QAPP for lists?	Х		
7.2a Were TIC requested for this project?		Х	
7.2b If "yes", were TIC reported as required?			Х
7.3 Are reporting limits and sample results adjusted for sample size, % moisture (solid samples), etc.?	Х		
7.4 Is there any interference acting on any of the analyte concentrations?	Х		

Project # 0506-117-12

Analyte Group (including methods): NWTPH-Dx, PCBs (EPA 8082), Metals (6010 & 7471), PAHs (EPA 8270C/SIM), Volatile Organic Compounds (EPA 8260B)

GeoEngineers Sampling Event Date(s): 1/19/10

Laboratory SDG: 10120799

Validator Initials/Date: MJL 2/5/10

TECHNICAL EVALUATION CHECKLIST

A (Summaries of holding times, sample results; accuracy; precision; blanks)

B (Summaries of calibration, instrument performance & compound ID)

Regular HRMS (High Resolution Mass Spectrometry)

<u>Yes</u> Qualifiers Issued to the database.

1.0 Technical Holding Times and Sample Handling (A)

 1.1 Is the chain-of-custody (COC) properly signed/dated? Correct analyses requested? All samples analyzed?
 X

 1.2 Were the samples properly preserved in the appropriate containers?
 X

Υ

Ν

N/A

1.2 Were the samples properly preserved in the appropriate containers?	Х	
1.3 Are all holding times within the technical criteria?	v	
X no outliers see attached Holding Time worksheet or data package page see below	^	
1.4 Are all cooler temperatures within the control limits? Cooler Temperature: 3.2°C	v	
X no outliers see attached Holding Time worksheet or data package page see below	^	

2.0 Surrogates/Labeled Compounds (A)		Y	Ν	N/A
2.1 Are all recovery values within the control limits?			×	
no outliers see attached Surrogate Summary Form or data package page	<u>X</u> see below		^	

PAHs:

• Sample **DP12-0.5-1.25** %R value for **Terphenyl-d14** (61%) – (Control Limit = 67-125) No action - only one <u>base-neutral</u> outlier.

VOCs:

• Sample DP12-4-5.8 %R value for ALL SURROGATES were greater than the control limits.

No action - no positive results in the sample.

3.0 Method/Field Blank (A)	Y	N	N/A
3.1 Are Method Blanks free from contamination?			
X no outliers see attached Blank Summary Form or data package page see below	Х		
3.2 Are there any trip/equipment blanks included in the data package (list below)?	Х		
3.3 Are trip/equipment/field blanks free from contamination? TRIP BLANK			
X no outliers see attached Blank Summary Form or data package page see below	Х		
Comments: No positive results in associated samples; no action required for method / trip / equip. / other			
10X action level established for common lab cont.; 5X action level for others			
4.0 Laboratory Control Sample (Blank Spike/OPR Sample) (A)			
QC ID/Date:	Y	Ν	N/A
4.1 Are all %R-values within the control limits?	х		
X no outliers see attached Summary Form or data package page see below	^		
4.2 Are all RPD values within control limits (if duplicate analyzed)?	х		
<u>X</u> no outliers see attached Summary Form or data package page see below	^		
<u>Compound</u> <u>%R values</u> <u>Action</u>			
5.0 Matrix Spike/Matrix Spike Duplicate (A)			
Parent Sample ID: Taken from different SDG(PCBs and PAHs); DP12-0.5-1.25 (Metals)	Y	Ν	N/A
5.1 Are all %R-values within the control limits?		v	
X no outliers see attached MS/MSD Summary Form or data package page see below		Х	

5.2 Are all RPD values w	ithin control limits?			V	
no outliers	see attached MS/MS	D Summary Form or da	ta package page <u>X</u> see below	X	
<u>Compound</u>	<u>%R or RPD values</u>	Control Limits	Action		
PCB-1016 & PCB-1260	Outliers; No action	n – parent sample not in	cluded in this SDG.		
Barium	0, 325; 75	(75-125);(30)	None, parent > the amount spiked		
Lead	45, 331; <i>50</i>	(75-125);(30)) None, parent > 4x the amount spiked		
Silver	53, 61	(75-125)	All silver reporting limits qualified (UJ)		
Fluoranthene & Pyrene	Outliers; No action	ı – parent sample not inc	cluded in this SDG.		

6.0 Field Duplicate (A) Field Duplicate Sample ID(s):

Y N N/A

6.1 Were field duplicates collected and analyzed?	Х	
6.2 Are all RPD values within control limits?		х
<u>X</u> no outliers <u>see attached Field Dup. Summary Form or data package page</u> <u>see below</u> Comments: No qualifiers assigned based on field duplicate outliers		

7.0 Sample Results (A)	Y	Ν	N/A
7.1 Are there results for all analytes on the client required target compound list(s) see QAPP for lists?	Х		
7.2a Were TIC requested for this project?		Х	
7.2b If "yes", were TIC reported as required?			Х
7.3 Are reporting limits and sample results adjusted for sample size, % moisture (solid samples), etc.?	Х		
7.4 Is there any interference acting on any of the analyte concentrations?	Х		

Project # 0506-117-12

Analyte Group (including methods): NWTPH-Dx, PCBs (EPA 8082), Metals (6010 & 7471),

GeoEngineers Sampling Event Date(s): 2/9/10

Laboratory SDG: 10122203

Validator Initials/Date: MJL 2/25/10

TECHNICAL EVALUATION CHECKLIST

A (Summaries of holding times, sample results; accuracy; precision; blanks)

B (Summaries of calibration, instrument performance & compound ID)

Regular HRMS (High Resolution Mass Spectrometry)

<u>No</u> Qualifiers Issued to the database.

N/A Υ Ν 1.0 Technical Holding Times and Sample Handling (A) 1.1 Is the chain-of-custody (COC) properly signed/dated? Correct analyses requested? All samples analyzed? Х 1.2 Were the samples properly preserved in the appropriate containers? Х 1.3 Are all holding times within the technical criteria? Х see attached Holding Time worksheet or data package page no outliers see below Х 1.4 Are all cooler temperatures within the control limits? Cooler Temperature: 0.1 °C Х X no outliers see attached Holding Time worksheet or data package page see below

2.0 Surrogates/Labeled Compounds (A)			Y	N	N/A
2.1 Are all recovery values within the control limits?				v	
no outliers see attached Surrogate Summary Form or data package page	e <u>X</u>	_ see below		^	

NWTPH-Dx:

Sample GTP36B-1 %R value for n-pentacosane was greater than the control limits.
 No action - the high concentrations of taget analytes are masking the surrogate spike.

3.0 Method/Field Blank (A)	Y	N	N/A
3.1 Are Method Blanks free from contamination?			
X no outliers see attached Blank Summary Form or data package page see below	X		
3.2 Are there any trip/equipment blanks included in the data package (list below)?		Х	
3.3 Are trip/equipment/field blanks free from contamination?			v
X no outliers see attached Blank Summary Form or data package page see below			Х
Comments: No positive results in associated samples; no action required for method / trip / equip. / other			
10X action level established for common lab cont.; 5X action level for others			
4.0 Laboratory Control Sample (Blank Spike/OPR Sample) (A)			
QC ID/Date:	Y	Ν	N/A
4.1 Are all %R-values within the control limits?	х		
X no outliers see attached Summary Form or data package page see below	^		
4.2 Are all RPD values within control limits (if duplicate analyzed)?	V		
<u>X</u> no outliers <u>see attached Summary Form or data package page</u> see below	Х		
Compound <u>%R values</u> <u>Action</u>			
5.0 Matrix Spike/Matrix Spike Duplicate (A)			
Parent Sample ID: Taken from a different SDG (Metals)	Y	Ν	N/A
5.1 Are all %R-values within the control limits?		х	
no outliers see attached MS/MSD Summary Form or data package page X see below		^	
5.2 Are all RPD values within control limits?		v	
no outlierssee attached MS/MSD Summary Form or data package page see below		Х	

			Different SDG	
Silver	49, 31 (36)	(75-125) (30)	None, parent sample taken from	
Chromium	87, 33	(75-125)	None, only one outlier.	
Lead	1624, 0 (<i>56)</i>	(75-125) (30)	u u	
Barium	199, 229	(75-125) None	; parent concentration > 4x the amount spiked	
<u>Compound</u>	<u>%R or RPD values</u>	Control Limits	Action	

6.1 Were field duplicates collected and analyzed? X 6.2 Are all RPD values within control limits? X X no outliers see attached Field Dup. Summary Form or data package page see below	
X no outliers see attached Field Dup. Summary Form or data package page see below	v
	Х
Comments: No qualifiers assigned based on field duplicate outliers	
7.0 Sample Results (A) Y N	N/A
7.1 Are there results for all analytes on the client required target compound list(s) see QAPP for lists?	
7.2a Were TIC requested for this project?	
7.2b If "yes", were TIC reported as required?	Х
7.3 Are reporting limits and sample results adjusted for sample size, % moisture (solid samples), etc.?	
7.4 Is there any interference acting on any of the analyte concentrations?	

Project # 0506-117-12

Analyte Group (including methods): NWTPH-Gx-BTEX (8021), NWTPH-Dx, PCBs (EPA 8082), Metals (6010 & 7471), PAHs (EPA 8270C/SIM), Volatile Organic Compounds (EPA 8260B)

GeoEngineers Sampling Event Date(s): 1/4/10

Laboratory SDG: 10119885

Validator Initials/Date: MJL 2/7/10

TECHNICAL EVALUATION CHECKLIST

A (Summaries of holding times, sample results; accuracy; precision; blanks)

B (Summaries of calibration, instrument performance & compound ID)

Regular HRMS (High Resolution Mass Spectrometry)

<u>Yes</u> Qualifiers Issued to the database.

1.0 Technical Holding Times and Sample Handling (A)

N N/A

Υ

1.1 Is the chain-of-custody (COC) properly signed/dated? Correct analyses requested? All samples analyzed?	Х	
1.2 Were the samples properly preserved in the appropriate containers?	Х	
1.3 Are all holding times within the technical criteria? X no outliers see attached Holding Time worksheet or data package page see below	x	
1.4 Are all cooler temperatures within the control limits? Cooler Temperature: 1.6, 0.6, 0.4 °C X_ no outliers	х	

2.0 Surrogates/La	abeled Compounds (A)			Y	N	N/A
2.1 Are all recovery va	lues within the control limits?				>	
no outliers	see attached Surrogate Summary Form or data package page	<u>X</u>	see below		^	

VOCs:

٠	Sample GTP32-1-2 %R value for TOLUENE-D8 was greater than the control limits.
	No action - only one surrogate outlier.
•	Sample GTP34-1-2 %R values for TOLUENE-D8 and 4-BROMOFLUOROBENZENE were outside the control limits.
	All reporting limits were qualified as estimated (UJ). Benzene already qualified (J).
•	Sample GTP35-1-2 %R values for TOLUENE-D8 and 4-BROMOFLUOROBENZENE were outside the control limits.
	All reporting limits were qualified as estimated (UJ).

3.0 Method/Field Blank (A)	Y	Ν	N/A			
3.1 Are Method Blanks free from contamination?	x					
X no outliers see attached Blank Summary Form or data package page see below	~					
3.2 Are there any trip/equipment blanks included in the data package (list below)?						
3.3 Are trip/equipment/field blanks free from contamination? MEOH BLANK	x					
<u>X</u> no outliers see attached Blank Summary Form or data package page see below	^					
Comments: No positive results in associated samples; no action required for method / trip / equip. / other						
10X action level established for common lab cont.; 5X action level for others						
4.0 Laboratory Control Sample (Blank Spike/OPR Sample) (A)						
4.0 Laboratory Control Sample (Blank Spike/OPR Sample) (A) QC ID/Date:	Y	N	N/A			
	Y		N/A			
QC ID/Date:	Y	N X	N/A			
QC ID/Date: 4.1 Are all %R-values within the control limits?			N/A			
QC ID/Date: 4.1 Are all %R-values within the control limits? no outliers see attached Summary Form or data package page X see below	Y		N/A			
QC ID/Date: 4.1 Are all %R-values within the control limits? no outliers see attached Summary Form or data package page 4.2 Are all RPD values within control limits (if duplicate analyzed)?			N/A			
QC ID/Date: 4.1 Are all %R-values within the control limits? no outliers see attached Summary Form or data package page 4.2 Are all RPD values within control limits (if duplicate analyzed)? X_ no outliers see attached Summary Form or data package page See attached Summary Form or data package page see below			N/A			
QC ID/Date: 4.1 Are all %R-values within the control limits? no outliers see attached Summary Form or data package page 4.2 Are all RPD values within control limits (if duplicate analyzed)? no outliers see attached Summary Form or data package page no outliers see attached Summary Form or data package page No outliers see attached Summary Form or data package page Compound %R values			N/A			
QC ID/Date: 4.1 Are all %R-values within the control limits? no outliers see attached Summary Form or data package page Xsee below 4.2 Are all RPD values within control limits (if duplicate analyzed)? X X_ no outliers see attached Summary Form or data package page <u>Compound</u> %R values Action Gasoline Range 128, 114 (75-125) None; only one outlier			N/A			
QC ID/Date: 4.1 Are all %R-values within the control limits? no outliers see attached Summary Form or data package page Xsee below 4.2 Are all RPD values within control limits (if duplicate analyzed)?			N/A			
QC ID/Date: 4.1 Are all %R-values within the control limits? no outliers see attached Summary Form or data package page Xsee below 4.2 Are all RPD values within control limits (if duplicate analyzed)?			N/A			
QC ID/Date: 4.1 Are all %R-values within the control limits? no outliers see attached Summary Form or data package page Xsee below 4.2 Are all RPD values within control limits (if duplicate analyzed)?			N/A			
QC ID/Date: 4.1 Are all %R-values within the control limits? no outliers see attached Summary Form or data package page Xsee below 4.2 Are all RPD values within control limits (if duplicate analyzed)?			N/A			

Parent Sample ID: DUPLICATE-6 (Metals); GTP32-1-2 (PAHs) Υ Ν N/A 5.1 Are all %R-values within the control limits? Х X no outliers see attached MS/MSD Summary Form or data package page see below 5.2 Are all RPD values within control limits? Х X___ no outliers see attached MS/MSD Summary Form or data package page see below **Compound** %R or RPD values **Control Limits** Action Silver All silver results/reporting limits qualified (UJ) 46 (75-125) 24,40 (30-150) None, only one outlier. Benzo(g,h,i)perlyene None, only one outlier. Indeno(1,2,3-cd)pyrene 28, 38 (30-150)

6.0 Field Duplicate (A) Field Duplicate Sample ID(s):

GTP55-1-2 & DUPLICATE-5 GTP34-4 & DUPLICATE-6

Y N N/A

6.1 Were field duplicates collected and analyzed?					
6.2 Are all RPD values within control limits?					
no outliers see attached Field Dup. Summary Form or data package pagex_ see below		Х			
Comments: No qualifiers assigned based on field duplicate outliers					

2) (Metals) Lead RPD value =72%

• Lead results qualified as estimated in both samples.

Y	Ν	N/A
Х		
	Х	
		Х
Х		
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1871 APPENDIX D

1872 LABORATORY ANALYTICAL REPORTS (CD)

1873 TABLE D-1. CHAIN OF CUSTODY INFORMATION

CIMP.

Chain of Custody Number	PDF Document Name.
1335094	10118631
1335075	10118810
1335077	10118932
1335099	10118946
1335086	10119003
1335100	10119104
1335101	10119388
1335102	10119390
1335123	10119500
1232731	10119703
1232733	10119885
1232735	10120799
1232737	10122203
1232738	10123202
J17541	Test America

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