Final Draft Feasibility Study

BNSF Parkwater Rail Yard Site
Spokane, Washington

for
BNSF Railway Company

August 11, 2010

GeoEngineers
Earth Science + Technology

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1.0 INTRODUCTION

This report presents the feasibility study (FS) conducted for the BNSF Railway Company (BNSF) Parkwater Rail Yard Site (Site), formerly known as Yardley, located at 5302 East Trent Avenue, Spokane, Washington. The approximate location of the Site is shown with respect to surrounding physical features in the Vicinity Map, Figure 1. The Site is listed on the Washington State Department of Ecology (Ecology) Site Database as Ecology Identifier 676. The Site also includes the Western Fruit Express Company, Ecology Identifier 69324774, and the Western Fruit Express Spokane [Turbo Waste], Ecology Identifier 2450396.

The FS was conducted to develop and evaluate cleanup action alternatives for addressing contamination identified in the RI report, and to select a preferred alternative for cleanup. This report was completed in accordance with the requirements of the Model Toxics Control Act (MTCA) Cleanup Regulation, Chapter 173-340 Washington Administrative Code (WAC). BNSF completed this FS in accordance with Agreed Order No. 6453 with Ecology. BNSF is required to prepare and submit a remedial investigation (RI)/FS for the Site as part of the Scope of Work defined in the Agreed Order and the approved RI/FS Work Plan dated September 30, 2009 (RI/FS Work Plan). This document is the FS report required in the RI/FS Work Plan and Agreed Order.

2.0 SITE DESCRIPTION

The Site is located in an industrial area of Spokane approximately ½ mile south of the Spokane River (Figure 1). The Site overlies the Spokane Valley – Rathdrum Prairie (SVRP) Aquifer, the sole source of drinking water for area residents. The Site generally is level and covers approximately 130 acres. Most of the ground surface has been improved with crushed rock surfacing, although some high use areas have been overlain with concrete or asphalt. Current Site facilities include modern buildings and several historic buildings. 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 development along Trent Avenue; and additional industrial activities south of the BNSF mainline tracks.

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.

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 future plans to change the use or operations at the Site. According to the City of Spokane, the site is currently zoned Heavy Industrial (HI).

3.0 SUMMARY OF SITE CONDITIONS

The FS utilizes information collected during prior investigations and the recent RI. This section summarizes pertinent environmental conditions at the Site such as the nature and extent of contamination and an overview of the conceptual site exposure model.

3.1. Summary of Remedial Investigations

The extent and nature of contamination at the Site is well documented in numerous environmental investigations completed at the Site. Figure 2, Subject Property and Areas of Interest, provides a visual overview of potential areas of concern outlined by these studies. Figures A-1 through A-6 in Appendix A illustrate explorations in these areas and identify locations where chemicals of concern were identified at concentrations exceeding proposed MTCA cleanup levels in soil. Fueling Area, Figure 3, shows groundwater elevations and interpreted flow direction based on a monitoring event in January 2010. The historical extent of diesel contamination in groundwater, also shown on Figure 3, is defined by groundwater monitoring wells that have had COC exceedances greater than MTCA Method A cleanup levels on at least one groundwater monitoring event. More detailed descriptions of Site conditions are provided in the GeoEngineers RI/FS Work Plan dated September 30, 2009 and the Final Draft Remedial Investigation Report dated June 1, 2010.

The environmental investigations identified eight general soil contamination areas and one groundwater contamination area. These areas and contaminants of concern are described further in the sections below.

3.2. Contaminants of Concern

Contaminants of concern (COC) identified in soil at the Site include petroleum hydrocarbons, arsenic, cadmium, lead, mercury, naphthalene, carcinogenic polycyclic aromatic hydrocarbons (cPAH) and methylene chloride. COCs identified in groundwater beneath the Site include petroleum hydrocarbons. These contaminants represent chemicals with concentrations at one or more locations that exceeded the preliminary cleanup levels presented in the Remedial Investigation Report (GeoEngineers 2010).

3.3. Exposure Pathways and Receptors

Complete exposure pathways and potential receptors were identified for the COC detected in various environmental media at the Site. A complete exposure pathway would consist of: (1) an identified contaminant source; (2) a release/transport mechanism from the source to locations (exposure points) where potential receptors may come in contact with COC; and (3) an exposure route (for example, soil ingestion) where potential receptors may be exposed to COC. 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. Potential human exposure pathways and receptors include:

- Dermal contact with contaminated soil during excavation work – on-site workers
- Dermal contact with and inhalation of contaminated windblown dust – on-site workers, adjacent off-site workers, and adjacent residents

- Dermal contact with contaminated surface water runoff – on-site workers, adjacent off-site workers, and adjacent residents

Based on the industrial nature of the Site and the lack of wildlife habitat, it is unlikely that the COC detected in soil will pose an unacceptable risk to terrestrial ecological receptors. A *Terrestrial Ecological Evaluation (TEE) Process-Simplified Evaluation Documentation Form*, (Ecology, 2008) was completed during preparation of the RI/FS Work Plan (GeoEngineers 2009). Based on the results of the simplified TEE, there are no expected impacts to wildlife at the site.

3.4. Locations and Media Requiring Cleanup Action Evaluation

Analytical results from the remedial investigations were compared against preliminary cleanup levels (see Section 4.0 below) to identify contaminated areas that could pose a risk to human health and the environment and, therefore, require an evaluation of cleanup alternatives. These areas and environmental media (soil and groundwater) are summarized in Table 1 below and shown in Figures 4 through 9.

The areas shown in these figures are reasonably accurate for the purpose of this FS, but the actual extent of exceedances in areas could vary because of uncertainty associated with interpreting data between sample locations and the nature of limited sampling density. The boundaries for these areas are based on our interpretation of analytical data, observations regarding the nature of contamination and lithology, the mechanism that caused the contamination (surface spill, visibly distinct fill, etc) and site knowledge. The boundaries include all of the exceedances in that area and generally extend approximately half the distance to the nearest sample location with non-exceeding (less than preliminary cleanup levels) analytical results or extend to physical features (road, track, buildings) that limit the extent of contamination. Based on the results of the RI, the following eight areas and media require evaluation for cleanup action in the Feasibility Study (FS).

TABLE 1. SUMMARY OF AREAS AND MEDIA REQUIRING CLEANUP ACTION EVALUATION

Location	COCs	Approximate Impacted Soil Depth (feet)	Media (Soil Estimated Volume in Cubic Yards)	Description
Former Koch Asphalt Lease Area	arsenic, cadmium, cPAH, petroleum hydrocarbons	0 to 2	Soil (3,120)	One area with impacted soil to a depth of approximately 2 feet. A second localized area was identified as exceeding cleanup levels by previous exploration (TPK-8). However, recent test pit GTP-52 indicates COCs were not detected. This is an accessible open area used for temporary storage of truck trailers.
Diesel Shop	petroleum hydrocarbons	0 to 4	Soil (60)	One area located between the Diesel Shop and Materials Storage Building.

Location	COCs	Approximate Impacted Soil Depth (feet)	Media (Soil Estimated Volume in Cubic Yards)	Description
Material Storage Building	Petroleum hydrocarbons, naphthalene, cPAH	0 to 4	Soil (440)	Two separate areas with impacted soil to a depth of approximately 4 feet. The areas are adjacent to and between active railroad tracks.
Western Fruit Express Area	Lead, arsenic, mercury, cadmium	0 to 2	Soil (950)	One area with impacted soil in an accessible area currently used for storing generator equipment. A second area below the existing washbay building. The washbay area was excluded because it is concrete capped.
Dismantling Spur	arsenic, lead, cadmium	0 to 8	Soil (11,830)	One area (west area) with impacted soil to depth of approximately 4 feet, and a localized area with impacted soil to a depth of approximately 8 feet. One area (east area) with impacted soil to a depth of approximately 4 feet. The two areas are used for equipment storage and also have some piles of debris (concrete, steel, wood, etc.).
Yardley Office (Main Line Track No. 1)	arsenic, cadmium	0 to 4	Soil (250)	Three small areas with impacted soil. All of these areas are adjacent to and between active railroad tracks.
Ralston Lead Area	Methylene chloride, cadmium	0 to 4	Soil (150)	One area with impacted soil to a depth of approximately 4 feet. This area is between a working track and a paved access road.
Fueling Area	petroleum hydrocarbons	12 to 65	Soil and groundwater (19,430)	One area with impacted soil and groundwater). This is an accessible area where a vadose zone soil and groundwater treatment system has operated since March 2009.

3.5. Existing Soil and Groundwater Remediation System

An in-situ soil and groundwater treatment system was installed in the Fueling Area in March 2009. A detailed description of the system is provided in GeoEngineers' Interim Action Work Plan, dated September 30, 2009. Several former underground storage tanks (USTs) that contained diesel and waste oil were located in this area. The system was designed to remediate petroleum hydrocarbon contamination in the vadose-zone soil and groundwater. It consists of soil vapor extraction (SVE), bioventing, and air sparging (AS) enhanced with ozone. The SVE system removes volatile petroleum hydrocarbons stripped from the groundwater by AS and from the vadose zone by air flow. Volatile petroleum hydrocarbons extracted by the SVE system are removed as the vapor is passed through two activated carbon filters connected in series before discharge to the atmosphere. The injection of ozone and operation of the bio-venting wells enhance the biodegradation of petroleum hydrocarbons by bacteria in the vadose and saturated zone by replenishing oxygen to the bacteria. Additional remedial system performance information is provided in the Remedial System Evaluation Report, dated December 11, 2009 for the time period March through September 2009.

The remedial system is successfully removing petroleum hydrocarbons from subsurface soil and groundwater. At least 2,600 pounds of petroleum hydrocarbons had been extracted through the SVE system through September 2009. Analytical results from groundwater samples collected in wells downgradient from the remedial system indicate petroleum hydrocarbons have not been detected at concentrations greater than the MTCA Method A Groundwater Cleanup Criteria since remedial system startup.

3.6. Summary of Key Findings from Remedial Investigation

Key findings of the recent remedial investigation and prior assessments pertinent to development and evaluation of remedial action alternatives are:

- Contaminants requiring remedial action are limited to petroleum hydrocarbons, arsenic, cadmium, lead, mercury, naphthalene, cPAH and methylene chloride.
- Except within the Fueling Area, soil contamination is limited to shallow soil, in most areas less than 4 feet bgs, and no deeper than 8 feet bgs.
- The highest potential for exposure to contaminants is by direct contact by on-site workers.
- Groundwater is not contaminated except near the Fueling Area. With the exception of the Fueling Area, it does not appear that contaminants are leaching from the soil downward to the groundwater table.
- The existing soil and groundwater treatment system operating at the Fueling Area effectively is remediating this area.

4.0 CLEANUP STANDARDS

Cleanup standards consist of: (1) cleanup levels that are protective of human health and the environment; and (2) the point of compliance at which the cleanup levels must be met. Under MTCA, final cleanup standards for the Site will be established in the Cleanup Action Plan (CAP) which will be prepared after completion of the FS. Preliminary cleanup standards presented in this section are adopted for the purpose of developing cleanup action objectives (CAOs) for the Site.

Summary of Preliminary Cleanup Standards

- Soil Cleanup standards based on MTCA Method A for Industrial land use and standard MTCA point of compliance: ground surface to a depth of 15 feet. Soil cleanup standards also are based on protection of groundwater; therefore the point of compliance is throughout the soil column from the ground surface to groundwater.
- Groundwater Cleanup standards are based on MTCA Method A for protection of drinking water and the standard point of compliance will be all groundwater beneath the site from the top of the saturated zone to bedrock.

4.1. Cleanup Levels

Preliminary cleanup levels for the COC are summarized in Table 2 below. Soil cleanup levels are based on MTCA Method A Soil Cleanup Levels [WAC 173-340-745(3) and Chapter 173-340 WAC Table 745-1] for Industrial land use. Cleanup levels for industrial use are appropriate because: (1) BNSF plans to continue using the Site as an active rail yard; (2) existing and future operational and security measures minimize the potential for non-workers to enter the site; and (3) the property will remain zoned for heavy industrial use for the foreseeable future.

Cleanup levels for groundwater are based on drinking water protection. Preliminary groundwater cleanup levels were selected from MTCA Method A Cleanup Levels Groundwater WAC 173 340 720(3) and Chapter 173-340 WAC Table 720-1.

TABLE 2. PRELIMINARY CLEANUP LEVELS FOR CONTAMINANTS OF CONCERN

COC	Soil	Groundwater
Diesel-Range Petroleum Hydrocarbons	2000 mg/kg	500 µg/l
Oil-Range Petroleum Hydrocarbons	2000 mg/kg	500 µg/l
Arsenic	20 mg/kg	not a COC in groundwater
Cadmium	2 mg/kg	not a COC in groundwater
Lead	1000 mg/kg	not a COC in groundwater
Mercury	2 mg/kg	not a COC in groundwater
Methylene chloride	0.02 mg/kg	not a COC in groundwater
cPAHs	2 mg/kg	not a COC in groundwater
Naphthalene	5 mg/kg	not a COC in groundwater

4.2. Points of Compliance

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

4.2.1. Soil

The standard point of compliance for soil cleanup levels to protect humans from direct contact will be throughout the soil column from the ground surface to 15 feet, in accordance with WAC 173-

340-740(6)(d) and WAC 173-340-7490(4)(b). The standard point of compliance for preliminary soil cleanup levels based on protection of groundwater shown in Table 1 will be throughout the soil column [WAC 173-340-740(6)(b]). For cleanup actions that involve containment of hazardous substances, soil cleanup levels will typically not be met inside containment area(s) [WAC 173-340-740(6)(f)].

4.2.2. Groundwater

The standard point of compliance for groundwater cleanup levels will be all groundwater beneath the Site from the top of the saturated zone to bedrock.

5.0 DESCRIPTION OF CLEANUP ALTERNATIVES

Three alternatives were developed for evaluation against MTCA requirements. Each alternative addresses contaminated media with a combination of remedial technologies appropriate for Site conditions. The three alternatives represent a reasonable number and range of potentially applicable cleanup components to provide a basis for evaluation.

Summary of Cleanup Alternatives

1. Excavation of all accessible areas of identified contaminated soil except the Fueling Area. In-situ treatment of deep soil and groundwater at the Fueling Area.
2. Excavation of contaminated soil near the Western Fruit Express, Materials Storage Building, Dismantling spur (excluding the East and West Debris Areas), Yardley Office and Ralston Lead Track Surface asphalt or gravel capping with institutional controls in areas with residual contamination. In-situ treatment of deep soil and groundwater at the Fueling Area.
3. Surface asphalt or gravel capping with institutional controls in areas with residual contamination. In-situ treatment of deep soil and groundwater area.

The design parameters used to develop the alternatives are based on engineering judgment and current knowledge of Site conditions. The final design for the selected alternative may require additional characterization and analysis to better define the scope and costs associated with the cleanup action.

The three remedial alternatives were developed to be consistent with current and future land uses at the Site as a railroad yard. To address soil contamination, the alternatives involve various combinations of soil excavation with off-site disposal, capping and institutional controls. Remedial Technologies Applied in Remedial Alternatives, Table 3, summarizes the technologies employed in each alternative. Capping refers to placing and maintaining clean cover over contaminated soil in sufficient thickness to minimize direct dermal contact or ingestion. Institutional controls restrict activities to reduce exposure potential in areas where contamination is left in place.

5.1. Remedial Alternative 1: Excavation

Remedial Alternative 1 involves excavation of all accessible areas (areas not covered by infrastructure such as railroad tracks) of identified contaminated soil except the Fueling Area, which will be treated in-situ by continuing the Interim Action. Excavated soil will be transported off site for disposal at an approved facility. Excavated areas will be backfilled with clean imported fill.

Excavations will extend to the depth of known contaminated soil at each area. Approximately 16,800 cubic yards of contaminated soil will be removed under this alternative. Performance monitoring soil samples will be collected and analyzed to confirm accessible contaminated soil was removed. Excavations will be extended as necessary to remove additional contaminated soil identified by confirmation sample results and field testing. Excavated areas will be backfilled with clean import fill.

For purposes of evaluation and planning only, soil located near the Western Fruit Express (Figure 6) is assumed to fail dangerous waste criteria (about 950 cubic yards) after it has been excavated and loaded for off-site disposal. The remaining soil was assumed to pass dangerous waste criteria after it had been excavated and loaded for off-site disposal. An actual designation would only occur during remedial design, if and when this alternative is implemented. If further evaluation indicates that additional soil fails dangerous waste criteria, then the volume estimates and associated costs would increase. Soils that fail the criteria would be disposed at a Subtitle C landfill permitted to accept dangerous waste. The estimated cost of Alternative 1 assumes only soil from the area near the Western Fruit Express would fail dangerous waste criteria.

Contaminated soil at the Fueling Area will not be excavated because the existing groundwater and vadose zone treatment system (Interim Action) appears to be successfully remediating the contamination, and it is not practical to excavate to a depth of 65 feet without removing several tracks and buildings. The contaminated soil and groundwater at the Fueling area will be remediated by continued operation of the existing groundwater and vadose zone treatment system.

Institutional controls will include groundwater use restrictions at the site.

5.2. Remedial Alternative 2: Excavation and Capping

Remedial Alternative 2 uses a combination of excavation and capping to meet remedial objectives.

Metals-contaminated soil at Western Fruit Express will be excavated and transported off site for disposal at an approved facility. Contaminated soil at the Materials Storage Building, Yardley Office, Ralston Lead Track and a small area near the Dismantling Spur (excluding the East and West Debris Areas) also will be excavated and transported off site for disposal at an approved facility. Excavations will extend to the depth of known contaminated soil at each area. Approximately 1,820 cubic yards of contaminated soil will be removed under this alternative. Performance monitoring soil samples will be collected and analyzed to confirm accessible contaminated soil was removed. Excavations will be extended as necessary to remove additional contaminated soil identified through confirmation sample results and field testing. Excavated areas will be backfilled with clean import fill.

Excavation was selected over capping for the Western Fruit Express area because this area has the highest concentrations of arsenic, cadmium, mercury and lead identified at the site, and these concentrations represent a greater risk than at the other areas. Excavation was selected over capping in the other areas listed above because gravel capping in busy, high-traffic areas presented both a safety and operational hazard.

Gravel will be used as cap material over areas of identified contaminated soil at all other non-excavated areas (Koch Asphalt and the East and West Debris Areas) except for the Diesel Shop area. The primary purpose of installing a cap is to prevent direct contact with contaminated soil. Gravel was selected as an appropriate cap material for these areas because it: (1) provides required protection; (2) is easy to maintain; and (3) gravel is currently used as surface cover over these areas. Gravel caps will be approximately 0.5-foot-thick to create a physical barrier between the contaminated soil and Site workers. The thickness, of the caps, will decrease adjacent to working areas as necessary to maintain a safe working surface. The estimated area of gravel caps under Alternative 2 is approximately 122,000 square feet.

Asphalt instead of gravel will be used to cap contaminated soil at the Diesel Shop area to be more compatible with existing asphalt surfaces in this area. The asphalt cap will be approximately 400 square feet.

Cap construction will include regrading, removal of surface debris (metal, wood, etc.) that would interfere with construction and placement and compaction of gravel (or placement of asphalt). In several locations the caps will have to be constructed around existing power poles and existing access roads.

For purposes of evaluation and planning only, soil located near the Western Fruit Express (Figure 6) is assumed to fail dangerous waste criteria (about 950 cubic yards) after it has been excavated and loaded for off-site disposal. The remaining soil was assumed to pass dangerous waste criteria after it has been excavated and loaded for off-site disposal. An actual designation would only occur during remedial design, if and when this alternative is implemented. If further evaluation indicates that additional soil fails dangerous waste criteria, then the volume estimates and associated costs would increase. Soils that fail the criteria would be disposed at a Subtitle C landfill permitted to accept dangerous waste. The estimated cost of Alternative 2 did not consider the additional costs of disposal of soil designated as dangerous waste, except for the area near the Western Fruit Express.

Contaminated soil at the Fueling Area will not be capped because it is not present near the ground surface. The contaminated soil and groundwater at the Fueling Area will be remediated by continued operation of the existing groundwater and vadose zone treatment system.

Institutional controls will include access controls, signage prohibiting digging and other subsurface disturbance without authorization, and groundwater use restrictions at the site.

5.3. Remedial Alternative 3: Capping

Remedial Alternative 3 involves surface asphalt or gravel capping with institutional controls in areas with residual contamination and in-situ treatment of deep soil and groundwater. The primary purpose of installing a cap is to prevent direct contact with contaminated soil. This alternative is similar to the capping component of Alternative 2.

Gravel will be used as cap material over areas of identified contaminated soil at all areas except for the Diesel Shop area. Gravel was selected as an appropriate cap material for these areas because it: (1) provides required protection; (2) is easy to maintain; and (3) gravel is currently used as surface cover over these areas. Gravel caps will be approximately 0.5- foot-thick to create a physical barrier between the contaminated soil and Site workers. The thickness or the caps will decrease adjacent to the tracks as necessary to maintain a safe working surface. The estimated area of gravel caps under Alternative 3 is approximately 140,900 square feet.

Asphalt instead of gravel will be used to cap contaminated soil at the Diesel Shop area to be more compatible with existing surfaces in this area and at the Western Fruit Express generator storage area to cap soil that might leach metals if a more permeable cap is installed. The asphalt cap will be approximately 400 square feet at the Diesel Shop area and approximately 12,800 square feet at the Western Fruit Express generator storage area.

Cap construction will include regrading, removal of surface debris (metal, wood, etc) that would interfere with construction and placement and compaction of gravel (or placement of asphalt). In several locations the caps will have to be constructed around existing power poles and existing access roads.

Contaminated soil at the Fueling Area will not be capped because it is not present near the ground surface where a worker may come in contact with it during normal activities. The contaminated soil and groundwater at the Fueling area will be remediated by continued operation of the existing groundwater and vadose zone treatment system.

Institutional controls include access controls, signage prohibiting digging and other subsurface disturbance without authorization, and groundwater use restrictions at the site.

6.0 EVALUATION CRITERIA

This section presents a description of the threshold requirements for cleanup actions under MTCA and the additional criteria used in this FS to evaluate the cleanup action alternatives.

6.1. Threshold Requirements

Cleanup actions performed under MTCA must comply with several basic requirements. Cleanup action alternatives that do not comply with these criteria are not considered suitable cleanup actions. As provided in WAC 173-340-360(2)(a), the four threshold requirements for cleanup actions must:

- Protect human health and the environment;
- Comply with cleanup standards;
- Comply with applicable state and federal laws; and
- Provide for compliance monitoring.

6.1.1. Protection of Human Health and the Environment

The results of cleanup actions performed under MTCA must ensure that both human health and the environment are protected.

6.1.2. Compliance with Cleanup Standards

Compliance with cleanup standards requires, in part, that cleanup levels are met at the applicable points of compliance in a reasonable period of time. When a cleanup action involves containment of soils with hazardous substance concentrations exceeding cleanup levels at the point of compliance, the cleanup action may be determined to comply with cleanup standards, provided the requirements specified in WAC 173-340-740(6)(f) are met.

6.1.3. Compliance with Applicable State and Federal Laws

Cleanup actions conducted under MTCA must comply with applicable state and federal laws. The term "applicable state and federal laws" includes legally applicable requirements and those requirements that Ecology determines to be relevant and appropriate as described in WAC 173-340-710.

6.1.4. Provision for Compliance Monitoring

The cleanup action must provide for compliance monitoring in accordance with WAC 173-340-410. Compliance monitoring consists of protection monitoring, performance monitoring and confirmational monitoring. Protection monitoring is conducted to confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of a cleanup action. Performance monitoring is conducted to confirm that the cleanup action has attained cleanup standards and, if appropriate, remediation levels or other performance standards. Confirmational monitoring (groundwater and/or soil) is conducted to confirm the long-term effectiveness of the cleanup action once cleanup standards and, if appropriate, remediation levels or other performance standards have been attained.

6.2. Other MTCA Requirements

Under MTCA, when selecting from the alternatives that meet the minimum requirements described above, the alternatives shall be further evaluated against the following additional criteria:

- **Use permanent solutions to the maximum extent practicable [WAC 173-340-360(2)(b)(i)].** MTCA requires that when selecting from cleanup action alternatives that fulfill the threshold requirements, the selected action shall use permanent solutions to the maximum extent practicable [WAC 173-340-360(2)(b)(i)]. MTCA specifies that the permanence of these qualifying alternatives shall be evaluated by balancing the costs and benefits of each of the alternatives using a "disproportionate cost analysis" in accordance with WAC 173-340-360(3)(e). The criteria for conducting this analysis are described in Section 6.3 below.
- **Provide a reasonable restoration time frame [WAC 173-340-360(2)(b)(ii)].** In accordance with WAC 173-340-360(2)(b)(ii), MTCA places a preference on those cleanup action alternatives that, while equivalent in other respects, can be implemented in a shorter period of time. MTCA includes a summary of factors to be considered in evaluating whether a cleanup action provides for a reasonable restoration time frame [WAC 173-340-360(4)(b)].
- **Consideration of Public Concerns [WAC 173-340-360(2)(b)(iii)].** Ecology will consider public comments submitted during the RI/FS process when making its preliminary selection of an

appropriate cleanup action alternative. This preliminary selection is subject to further public review and comment when the proposed remedy is published in the draft CAP.

6.3. MTCA Disproportionate Cost Analysis

The MTCA disproportionate cost analysis (DCA) is used to evaluate which of the alternatives that meet the threshold requirements are permanent to the maximum extent practicable. This analysis involves comparing the costs and benefits of alternatives and selecting the alternative with incremental costs that are not disproportionate to the incremental benefits. The evaluation criteria for the disproportionate cost analysis are specified in WAC 173-340-360(2) and WAC 173 340-360(3), and include protectiveness, permanence, cost, long-term effectiveness, management of short-term risks, implementability and consideration of public concerns.

As outlined in WAC 173-340-360(3)(e), MTCA provides a methodology that uses the criteria below to determine whether the costs associated with each cleanup alternative are disproportionate relative to the incremental benefit of the alternative above the next lowest-cost alternative. The comparison of benefits relative to costs may be quantitative, but will often be qualitative. When possible for this FS, quantitative factors such as mass of contaminant removed or percentage of area of impacts remaining were compared to costs for the alternatives evaluated, but many of the benefits associated with the criteria described below were necessarily evaluated qualitatively. Costs are disproportionate to benefits if the incremental costs of the more permanent alternative exceed the incremental degree of benefits achieved by the other lower-cost alternative [WAC-173-340-360(e)(i)]. Where two or more alternatives are equal in benefits, Ecology selects the less costly alternative [WAC 173-340-360(e)(ii)(c)].

Each of the MTCA criteria used in the DCA is described below.

6.3.1. Protectiveness

The overall protectiveness of a cleanup action alternative is evaluated based on several factors. First, the extent to which human health and the environment are protected and the degree to which overall risk at a Site is reduced are considered. Both on-site and off-site risk reduction resulting from implementing the alternative are considered.

6.3.2. Permanence

MTCA specifies that when selecting a cleanup action alternative, preference shall be given to actions that are "permanent solutions to the maximum extent practicable." Evaluation criteria include the degree to which the alternative permanently reduces the toxicity, mobility or mass of hazardous substances; the effectiveness of the alternative in destroying the hazardous substances; the reduction or elimination of hazardous substance releases and sources of releases; the degree of irreversibility of waste treatment processes; and the characteristics and quantity of treatment residuals generated.

6.3.3. Cost

The analysis of cleanup action alternative costs under MTCA includes all costs associated with implementing an alternative including design, construction, long-term monitoring and institutional controls. Costs are intended to be comparable among different alternatives to assist in the overall analysis of relative costs and benefits of the alternatives. The costs to implement an alternative include the cost of construction, the net present value of any long-term costs and agency oversight costs. Long-term costs include operation and maintenance costs, monitoring costs, equipment replacement costs and the cost of maintaining institutional controls. Unit costs used to develop overall remediation costs for this FS were derived using a combination of published engineering reference manuals (i.e., R.S. Means); construction cost estimates solicited from applicable vendors and contractors; a review of actual costs incurred during similar applicable projects; and professional judgment.

6.3.4. Long-Term Effectiveness

Long-term effectiveness is a parameter that expresses the degree of certainty that the alternative will be successful in maintaining compliance with cleanup standards over the long-term performance of the cleanup action. The MTCA regulations contain a specific preference ranking for different types of technologies that will be considered as part of the comparative analysis. The ranking places the highest preference on technologies such as reuse/recycling, treatment, immobilization/solidification, and disposal in an engineered, lined, and monitored facility. Lower preference rankings are applied for technologies such as on-site isolation/containment with attendant engineered controls, and institutional controls and monitoring.

6.3.5. Management of Short-term Risks

Evaluation of this criterion considers the relative magnitude and complexity of actions required to maintain protection of human health and the environment during implementation of the cleanup action. Cleanup actions carry short-term risks such as potential mobilization of contaminants during construction or safety risks typical of large construction projects. Some short-term risks can be managed through best practices during project design and construction, while other risks are inherent to project alternatives and can offset the long-term benefits of an alternative.

6.3.6. Implementability

Implementability is an overall metric expressing the relative difficulty and uncertainty of implementing the cleanup action. Evaluation of implementability includes consideration of technical factors such as the availability of mature technologies and experienced contractors to accomplish the cleanup work. It also includes administrative factors associated with permitting and completing the cleanup.

6.3.7. Consideration of Public Concerns

The public involvement process under MTCA is used to identify potential public concerns regarding cleanup action alternatives. The extent to which an alternative addresses those concerns is considered as part of the evaluation process. This includes concerns raised by individuals, community groups, local governments, tribes, federal and state agencies, and other organizations that may have an interest in or knowledge of the Site. In particular, public concerns for this Site generally would be associated with environmental issues and cleanup action performance, which are addressed under other criteria such as protectiveness and permanence.

6.4. Other Criteria: Cleanup Action Objectives

In addition to satisfying MTCA required remedial objectives discussed in this document, the Parkwater Rail Yard is an important transport link; therefore, the selected remedy must accommodate the continued safe operation of the Site as a railroad yard and minimally disrupt rail traffic.

7.0 EVALUATION AND COMPARISON OF CLEANUP ALTERNATIVES

This section provides an evaluation and comparative analysis of cleanup action alternatives developed for the Site. The alternatives are evaluated with respect to the MTCA evaluation criteria described in Section 6.0 and then compared to each other relative to its expected performance under each criterion. The components of the three remedial alternatives are described above in Section 5.0 and are summarized in Table 3. Detailed evaluation of the alternatives is presented in Evaluation of Cleanup Action Alternatives, Table 4, and the results of the evaluation are summarized in Summary of MTCA Evaluation and Ranking of Cleanup Action Alternatives, Table 5.

7.1. Threshold Requirements

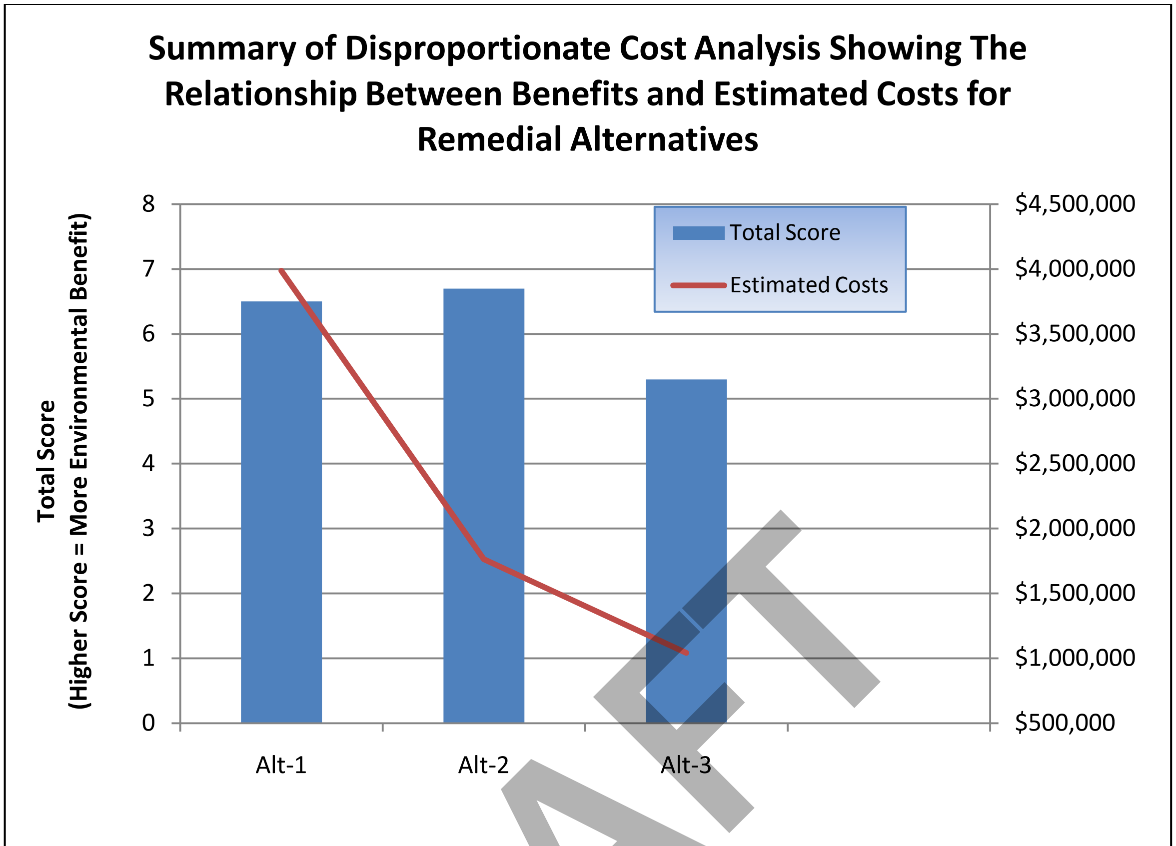
All of the alternatives developed in this FS meet each of the four MTCA threshold requirements described for cleanup actions: protection of human health and the environment, compliance with cleanup standards, compliance with applicable state and federal regulations and provision for compliance monitoring.

Alternative 1 utilizes soil removal to the greatest extent, resulting in complete removal, to the extent feasible, of soil exceeding cleanup levels throughout the Site. Alternative 1 is thus the most permanent solution and forms the baseline cleanup action alternative [WAC 173-340350(8)(c)(ii)(A) and 173-340-360(3)(e)(ii)(B)].

Alternative 2 is a more permanent solution than Alternative 3, because of the removal of more contaminant mass via excavation.

7.2. MTCA Disproportionate Cost Analysis

As discussed in Section 6.0, the MTCA analysis of disproportionate costs is used to determine which cleanup alternative meets threshold requirements and is permanent to the maximum extent practicable. The remedial Alternatives were evaluated based on the relative benefits ranking factors of the DCA. Using a numeric scoring scale of 1 (lowest) to 10 (highest) and the methodology described above in Section 7.0 and in Table 4, each individual criterion is evaluated based on how it applies to each alternative. Table 5 presents the analysis of these results, including the summation of the resulting scores for each alternative and the determination of disproportionate cost. The conclusions of this evaluation are summarized in the following sections and the graph below.



7.3. Protectiveness

Remedial Alternative 1 achieves the highest level of protectiveness of the alternatives as a result of achieving the maximum feasible removal of soil. Alternatives 2 and 3 achieve progressively lower levels of protectiveness relative to Alternative 1 based on removal of less soil. All of the alternatives provide a similar level of protectiveness for groundwater.

7.4. Permanence

Remedial Alternatives 1 and 2 achieve a high level of permanence by removing much of the mass of contamination that poses the greatest risk to human health and the environment.

7.5. Long-Term Effectiveness

Long-term effectiveness of the alternatives has relative rankings similar to those described above for the Permanence category. The long-term effectiveness relies on using proven technologies to remove contaminant mass. Alternatives that rely primarily (Alternative 3) or partially (Alternative 2) on capping and/or institutional controls to protect human health and the environment have lower long-term effectiveness because of the need to monitor and the potential to revisit the cleanup action in the event of failure. Alternative 1 relies on removal of the contaminant mass from the Site to the greatest extent practicable and therefore achieves the highest level of long-term effectiveness.

7.6. Management of Short-Term Risks

The relative difference between the short-term risks associated with these alternatives is low. Remedial Alternative 1 has a higher short-term risk, such as the generation of airborne dust during construction, than the other two alternatives because it involves more intrusive earthwork adjacent to structures and railroad tracks. However, this short-term risk can be mitigated using appropriate best management practices. Alternatives 2 and 3 have similar short-term risks.

7.7. Technical and Administrative Implementability

All of the three Remedial Alternatives are generally implementable using commonly available methods. Alternatives 2 and 3 rate a higher level of technical implementability compared to Alternative 1 because of less intrusive earthwork near active tracks. All of the alternatives will require some disruption of normal railroad yard activities but Alternative 1 probably would be the most disruptive because of an increase in truck traffic and interruption of train activity on some tracks during excavation.

The level of administrative implementability associated with the development and maintenance of institutional controls is similar for all three alternatives as all three alternatives leave residual contamination at the Fueling Area.

7.8. Cost

The cost estimates for Remedial Alternatives 1 through 3 were developed as described in Section 6.3 and are presented in Cost Estimate – Remedial Alternative 1 (Excavation), Table 6, Cost Estimate – Remedial Alternative 2 (Excavation and Capping), Table 7 and Cost Estimate – Remedial Alternative 3 (Capping), Table 8.

- **Remedial Alternative 1** has an estimated cost of approximately $3,987,277. This alternative includes the removal of approximately 16,800 cubic yards of contaminated soil.
- **Remedial Alternative 2** has an estimated cost of approximately $1,764,057. This alternative includes the removal of approximately 1,820 cubic yards of contaminated soil and containment (capping) of approximately 122,000 square feet of contaminated soil.
- **Remedial Alternative 3** has an estimated cost of approximately $1,042,458. This alternative includes the containment (capping) of approximately 140,900 square feet of contaminated soil but no removal of contaminated soil.

7.9. Reasonable Restoration Time Frame

The restoration time frame for all of the proposed Remedial Alternatives is expected to be on the order of one to three years. This time frame includes project design, permitting, contracting and construction. All three alternatives require remedial systems operation and monitoring for an estimated five years and groundwater compliance monitoring associated with the Fueling Area for an estimated seven years. The remedial system operation timeframe is based on experience with similar diesel-impacted remediation projects within this aquifer.

7.10. Consideration of Public Concerns

The remedial alternatives proposed for the Site are generally expected to be acceptable to the public.

8.0 CONCLUSIONS

All three alternatives meet the MTCA threshold criteria. Based on the DCA, remedial Alternative 2 is the preferred alternative. Although Alternative 1 provides more permanence, it does so at a substantially higher cost than Alternative 2, without a proportional incremental increase in environmental benefits. Alternative 3 provides less protection at a similar cost to Alternative 2. Alternatives 2 and 3 are the most compatible with maintaining railroad yard operations during implementation.

9.0 REFERENCES AND ACRONYMS-

Ecology. 2001a, “Cleanup Levels and Risk Calculations under the Model Toxics Control Act Cleanup Regulation,” CLARC Version 3.1. Washington State Department of Ecology Toxics Cleanup Program. Publication No. 94-145, updated November 2001.

GeoEngineers, Inc. “Work Plan, Remedial Investigation/Feasibility Study, BNSF Parkwater Rail Yard Site.: GEI File No. 0506-117-09, September 2009.

GeoEngineers, Inc., “Interim Action Work Plan, Parkwater Rail Yard, Spokane, Washington.” GEI File No. 0506-117-09, September 2009.

GeoEngineers, Inc. “Draft Remedial Investigation Report, BNSF Parkwater Rail Yard Site, Spokane, Washington.” GEI File No. 0506-117-12, March 2010.

GeoEngineers, Inc. “Remedial System Evaluation Report, March through September 2009, Parkwater Rail Yard, Spokane, Washington.” GEI File No. 0506-117-10, December 2009.

Acronyms

AS = air sparging
ASTs = above ground storage tanks
bgs = below ground surface
BNSF = BNSF Railway Company
CAP = Corrective Action Plan
CAOs = cleanup action objectives
COC = contaminants of concern
cPAH = carcinogenic polycyclic aromatic hydrocarbons
DCA = disproportionate cost analysis
Ecology = Washington State Department of Ecology
FS = feasibility study
HI = Heavy Industrial
MTCA = Model Toxics Control Act

RI = remedial investigation
Site = Parkwater Rail Yard Site
SVE = soil vapor extraction
SVRP = Spokane Valley – Rathdrum Prairie
TEE = Terrestrial Ecological Evaluation
USTs = underground storage tanks
WAC = Washington Administration Code

TABLES

Table 3

Remediation Technologies Applied in Remedial Alternatives

BNSF Parkwater Facility Feasibility Study
Spokane, Washington

Location	Approximate area (square feet) of contaminated soil requiring cleanup action evaluation	Approximate depth (feet) of contaminated soil requiring cleanup action evaluation	Approximate volume (cubic yards) of contaminated soil requiring cleanup action evaluation	Alternative 1: Excavation of all accessible areas of identified contaminated soil except the Fueling Area. In-situ treatment of deep soil and groundwater at the Fueling Area.				Alternative 2: Excavation of contaminated soil near Western Fruit Express, Materials Storage Building, Dismantling Spur (excluding East and West Debris Areas), Yardley Office and Ralston Lead Track. Surface asphalt or gravel capping with institutional controls in areas with residual contamination (Koch Asphalt, Diesel Shop and East and West Debris Areas). In-situ treatment of deep soil and groundwater at the Fueling Area.				Alternative 3: Surface asphalt or gravel capping with institutional controls in areas with residual contamination. In-situ treatment of deep soil and groundwater at the Fueling Area.			
				Excavation with offsite disposal	Surface Cap	Institutional Controls	In-situ Soil and Groundwater Treatment	Excavation with offsite disposal	Surface Cap[1]	Institutional Controls	In-situ Soil and Groundwater Treatment	Excavation with offsite disposal	Surface Cap[1]	Institutional Controls	In-situ Soil and Groundwater Treatment
Koch Asphalt Lease Area (Figure 4)	42,150	2	3,120	X					X[G]	X			X[G]	X	
Materials Storage Building (Figure 5)	3,000	4	440	X				X					X[G]	X	
Diesel Shop (Figure 5)	400	4	60	X					X [A]	X			X [A]	X	
Western Fruit Express Facility (Figure 6)	12,800	2	950	X				X					X[G]	X	
Dismantling Spur (Figure 7)[2]	79,850	4 to 8	11,830	X				X	X[G]	X			X[G]	X	
Yardley Office (Figure 8)	1,700	4	250	X				X					X[G]	X	
Ralston Lead Track (Figure 9)	1,000	4	150	X				X					X[G]	X	
Fueling Area (Figure 6)	9,900	53	19,430			X	X			X	X			X	X

Notes:
1. For fueling area, depth of contamination extends from about 12 to 65 feet below ground surface. Therefore, depth for the Fueling Area is the contaminated soil thickness.
[1] [A] = asphalt cap [G] = gravel cap
2. Includes a small (200 ft^2) area near the Dismantling Spur and two larger areas (East and West Debris Areas)

Table 4

Evaluation of Cleanup Action Alternatives

BNSF Parkwater Facility Feasibility Study

Spokane, Washington

	Alternative 1: Excavation of all accessible areas of identified contaminated soil except the Fueling Area. In-situ treatment of deep soil and groundwater at the Fueling Area.	Alternative 2: Excavation of contaminated soil near Western Fruit Express, Materials Storage Building, Dismantling Spur (excluding East and West Debris Areas), Yardley Office and Ralston Lead Track. Surface asphalt or gravel capping with institutional controls in areas with residual contamination (Koch Asphalt, Diesel Shop and East and West Debris Areas). In-situ treatment of deep soil and groundwater at the Fueling Area.	Alternative 3: Surface asphalt or gravel capping with institutional controls in areas with residual contamination. In-situ treatment of deep soil and groundwater at the Fueling Area.
Alternatives Descriptions	Contaminated soil will be excavated and transported off-site for disposal at an approved facility, except at the Fueling Area and beneath active railroad tracks. Soil near the Western Fruit Express is assumed to designate as dangerous waste. Excavated areas will be backfilled with clean imported fill material. Contaminated soil and groundwater at the Fueling Area will be remediated by continued operation of the current remedial system.	Contaminated soil at three identified areas of contamination (Koch Asphalt, East and West Debris Areas and the Diesel Shop) will be covered with either an asphalt or gravel cap. Contaminated soil at the Diesel Shop will be capped with asphalt; the other two areas will be capped with gravel. Soil near the Western Fruit Express will be excavated and disposed at an approved facility; this soil is assumed to designate as dangerous waste. Soil near the Materials Storage Building, Dismantling Spur (excluding the debris areas), Yardley Office and Ralston Lead Track will be excavated and disposed at an approved faciltiy; this soil is assumed to not designate as dangerous waste. Excavated areas will be backfilled with clean imported fill material. Contaminated soil and groundwater at the Fueling Area will be remediated by continued operation of the current remedial system. Institutional controls will be implemented.	Contaminated soil at all identified areas of contamination will be covered with either an asphalt or gravel cap, except soil at the Fueling Area and beneath active railroad tracks. Contaminated soil at the Diesel Shop and Western Fruit Express will be capped with asphalt; other areas will be capped with gravel. Contaminated soil and groundwater at the Fueling Area will be remediated by continued operation of the current remedial system. Institutional controls will be implemented.
Approximate Volume of Contaminated Soil Removed	16,800 cubic yards	1,820 cubic yards	none
Area of Containment (surface cap)	none	122,000 square feet	140,900 square feet
Average Score (see Table 5)	6.5	6.7	5.3
Alternative Ranking Under MTCA			
1. Compliance with MTCA Threshold Criteria			
Protection of Human Health and the Environment	Yes- alternative will protect human health and the environment	Yes - Alternative will protect human health and the environment. Residual contaminated soil managed with capping and institutional controls.	Yes - Alternative will protect human health and the environment. Residual contaminated soil managed with capping and institutional controls.
Compliance with Cleanup Standards	Yes - contaminated soil will be removed to the extent feasible. Residual shallow contamination in soil limited to non-accessible active railroad tracks. Deeper contaminated soil and groundwater addressed by active remedial measures.	Yes - Alternative is expected to comply with soil cleanup standards through combination of excavation and capping. Deeper contaminated soil and groundwater addressed by active remedial measures.	Yes - active remedial measures (capping for soil and in-situ treatment for vadose zone soil and groundwater) are used for areas of contaminated soil and groundwater.
Compliance with Applicable State and Federal Regulations	Yes - Alternative complies with applicable state and federal regulations	Yes - Alternative complies with applicable state and federal regulations	Yes - Alternative complies with applicable state and federal regulations
Provision for Compliance Monitoring	Yes - Alternative includes provision for compliance monitoring (i.e., compliance sampling during remedial excavation and groundwater treatment).	Yes - Alternative includes provision for compliance monitoring (i.e., compliance sampling during remedial excavation, long-term cap monitoring, and groundwater treatment).	Yes - Alternative includes provision for compliance monitoring (i.e., long-term cap monitoring and compliance sampling during groundwater treatment).
2. Restoration Time Frame			

	Alternative 1: Excavation of all accessible areas of identified contaminated soil except the Fueling Area. In-situ treatment of deep soil and groundwater at the Fueling Area.		Alternative 2: Excavation of contaminated soil near Western Fruit Express, Materials Storage Building, Dismantling Spur (excluding East and West Debris Areas), Yardley Office and Ralston Lead Track. Surface asphalt or gravel capping with institutional controls in areas with residual contamination (Koch Asphalt, Diesel Shop and East and West Debris Areas). In-situ treatment of deep soil and groundwater at the Fueling Area.		Alternative 3: Surface asphalt or gravel capping with institutional controls in areas with residual contamination. In-situ treatment of deep soil and groundwater at the Fueling Area.	
	Soil cleanup levels would be achieved at the point of compliance (ground surface to 15 feet deep) at completion of cleanup activities. The timeframe for long-term monitoring of groundwater associated with contamination in the Fueling Area is difficult to predict. Although petroleum hydrocarbon concentrations in the proposed groundwater compliance wells have been below detection levels in recent monitoring events, timeframe is based on 5 years of remedial system operations and 7 years of groundwater monitoring.		Initial restoration timeframe for soil is relatively short. This alternative is expected to require 1 to 3 years for design and construction. The timeframe for long-term monitoring of groundwater associated with contamination in the Fueling Area is difficult to predict. Although petroleum hydrocarbon concentrations in the proposed groundwater compliance wells have been below detection levels in recent monitoring events, timeframe is based on 5 years of remedial system operations and 7 years of groundwater monitoring.		Initial restoration timeframe for soil is relatively short. This alternative is expected to require 1 to 2 years for design and construction. The timeframe for long-term monitoring of groundwater associated with contamination in the Fueling Area is difficult to predict. Although petroleum hydrocarbon concentrations in the proposed groundwater compliance wells have been below detection levels in recent monitoring events, timeframe is based on 5 years of remedial system operations and 7 years of groundwater monitoring.	
		Score		Score		Score
3. Disproportionate Cost Analysis - Relative Benefits Ranking (Scored from 1-lowest to 10-highest)						
Protectiveness	Achieves highest level of protectiveness of the alternatives. This alternative is more protective than Alternative 2 because more contaminated soil is removed. The level of protectiveness for groundwater is the same as the other alternatives.	8	This alternative will achieve overall protectiveness.	7	Achieves overall protectiveness. This alternative is less protective than Alternatives 1 and 2 because it relies more on long term maintenance of surface caps than those alternatives.	5
Permanence	This alternative achieves the most permanent reduction in toxicity and volume of hazardous substances because it removes the most contaminated soil from the Site. Permanence for groundwater is the same as Alternatives 2 and 3.	8	Achieves permanent reduction in toxicity and volume of hazardous substances in areas where contaminated soil is excavated and disposed off-site. Any remaining contaminated soil beneath would be isolated/contained by surface caps. This alternative provides slightly less permanence than Alternative 1 because a smaller volume of contaminated soil is removed.	7	Achieves little permanent reduction in toxicity and volume of contaminated soil. Any remaining contaminated soil beneath would be isolated/contained by surface caps. This alternative provides less permanence than Alternative 2 because a no contaminated soil is removed.	2
Long-Term Effectiveness	Contaminated soil would be permanently removed from the site. Capping and institutional controls are used to minimize human contact with contaminated soil left in place. Long-term effectiveness depends on maintaining integrity of caps and continued operation of the soil and groundwater treatment system.	8	Utilizes removal and off-site disposal of most highly contaminated soil. Capping and institutional controls are used to minimize human contact with contaminated soil left in place. Long-term effectiveness depends on maintaining integrity of caps and continued operation of the soil and groundwater treatment system.	6	Capping and institutional controls are used to minimize human contact with contaminated soil left in place. Long-term effectiveness depends on maintaining integrity of caps and continued operation of the soil and groundwater treatment system.	4
Management of Short-Term Risks	This alternative involves excavation and related truck traffic and excavation in areas with high train traffic; therefore, it presents higher short term risks than Alternatives 2 and 3.	6	Soil excavation and transport of excavated soil off-site present short term risks. The construction of surface caps in general present less short term risks than excavation and off-site disposal because intrusive earthwork adjacent to tracks and structures has inherent risks.	7	Similar to Alternative 2. The construction of surface caps in general present less short term risks than excavation and off-site disposal because intrusive earthwork adjacent to tracks and structures has inherent risks.	8
Technical and Administrative Implementability	More difficult to implement because this alternative requires disruption to train service during excavation in areas adjacent to active tracks.	4	Implementable; it may require temporary access restrictions in areas near active train tracks and short-term disruption to train service. The maintaining of surface caps are easily implementable but rely on long term maintenance.	8	Implementable; it may require temporary access restrictions in areas near active train tracks and short-term disruption to train service. The maintaining of surface caps are easily implementable but rely on long term maintenance.	8
Consideration of Public Concerns	Public concerns not expected other than concern about negative impacts to local economy.	5	Public concerns not expected other than concern about negative impacts to local economy.	5	Public concerns not expected other than concern about negative impacts to local economy.	5

Table 5

Summary of MTCA Evaluation and Ranking of Cleanup Action Alternatives

BNSF Parkwater Facility Feasibility Study
Spokane, Washington

	Alternative 1: Excavation	Alternative 2: Excavation and Capping	Alternative 3: Capping
Alternative Ranking Under MTCA			
1. Compliance with MTCA Threshold Criteria[1]	Yes	Yes	Yes
2. Restoration Time Frame	Soil cleanup levels would be achieved at the point of compliance (ground surface to 15 feet deep) at completion of cleanup activities. The time frame for long-term monitoring of groundwater associated with contamination in the Fueling Area is difficult to predict. Even though petroleum hydrocarbon concentrations in the proposed groundwater compliance wells has been below detection levels in recent monitoring events it is assumed that at least 5-years of monitoring will be required. Ranking = <1 year	Initial restoration time frame for soil is relatively short. This alternative is expected to require one to three years for design and construction. The time frame for long-term monitoring of groundwater associated with contamination in the Fueling Area is difficult to predict. Even though petroleum hydrocarbon concentrations in the proposed groundwater compliance wells has been below detection levels in recent monitoring events it is assumed that at least 5-years of monitoring will be required. Ranking = 1 to 3 years	Initial restoration time frame for soil is relatively short. This alternative is expected to require one to two years for design and construction. The time frame for long-term monitoring of groundwater associated with contamination in the Fueling Area is difficult to predict. Even though petroleum hydrocarbon concentrations in the proposed groundwater compliance wells has been below detection levels in recent monitoring events it is assumed that at least 5-years of monitoring will be required. Ranking = 1 to 2 years
3. Disproportionate Cost Analysis Relative Benefits Ranking			
Protectiveness	8	7	5
Permanence	8	7	2
Long-Term Effectiveness	8	6	4
Management of Short-Term Risks	6	7	8
Technical and Administrative Implementability	4	8	8
Consideration of Public Concerns	5	5	5
Average Scores	6.5	6.7	5.3
4. Disproportionate Cost Analysis			
Probable Remedy Cost (+25%/-25%, rounded to nearest $1,000)	$3,987,277	$1,764,057	$1,042,458
Costs Disproportionate to Incremental Benefits	Yes	No	No
Practicability of Remedy	Least Practicable	Practicable	Practicable
Remedy Permanent to Maximum Extent Practicable	Yes-most permanent remedy	Yes	Yes
Overall Alternative Ranking	3rd	1st	2nd

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Table 6

Cost Estimate - Remedial Alternative 1 (Excavation)

BNSF Parkwater Facility Feasibility Study
Spokane, Washington

Item No.	Description	Plan Quantity	Unit	Unit Price	Amount (2010$)	Notes
Mobilization and Site Preparation						
1	Mobilization/Site Controls/Demobilization	1	LS	$10,000.00	$10,000	
	Subtotal				**$10,000**	
Contaminated Soil Excavation, Disposal and Backfilling						
2	Excavate, load soil, transport by rail	16,800	CY	$17	$285,600	Does not include the Fueling Area. Includes screening of soil to remove rock and debris. Assumes transported in intermodal boxes to Rabanco in Roosevelt, WA or WMI in Arlington, OR. Cost based on recent similar project in Spokane.
3A	Contaminated soil (non-dangerous waste) disposal at approved off-site facility	30,432	Ton	$24	$730,400	Assumes disposal at Rabanco facility in Roosevelt, WA. Disposal fee based on recent project. In-place cubic yards converted to tons using 20% expansion factor and 1.6 tons per cubic yard (1.92 tons per cubic yard).
3B	Contaminated soil (dangerous waste) disposal at approved off-site facility	1,824	Ton	$175	$319,200	Assumes disposal at WMI facility in Arlington, OR. Disposal fee based on recent project. In-place cubic yards converted to tons using 20% expansion factor and 1.6 tons per cubic yard (1.92 tons per cubic yard).
4	Purchase, place, and compact general backfill material	32,256	Ton	$13	$419,300	Assume tonnage equal to off-site disposal soil tonnage. Cost includes purchase, filling and compaction.
5	Handling of (non-hazardous debris-rock) screened from soil	1	LS	$4,500	$4,500	Assume this material will remain at the railroad yard (not transported offsite). Cost based on three days of backhoe/truck.
	Subtotal				**$1,759,000**	
Continued Operation of Soil and Groundwater Treatment System at Fueling Area						
6	Operating and maintenance costs for 5 years	5	YR	$37,000	$185,000	Includes yearly carbon change out. Yearly costs based on actual costs for 2009.
7	Decommissioning costs	1	LS	$20,000	$20,000	Removal of treatment system and decommission wells
8	Annual reporting to Ecology	5	YR	$16,000	$80,000	
	Subtotal				**$285,000**	
Groundwater Monitoring						
9	Perform 4 quarterly monitoring events per year for 7 years, monitor for TPH only	7	YR	$16,000	$112,000	Yearly costs based on actual costs for 2009.
10	Annual reporting to Ecology	7	YR	$20,000	$140,000	Yearly costs based on actual costs for 2009.
	Subtotal				**$252,000**	
Institutional controls						
11	Adminstrative restriction on groundwater use is already in place by BNSF.	0	LS	$0	$0	
	Subtotal				**$0**	
	Contractor Overhead (Based on total of Items 2-5 and Item 7)	10.00%	%		$177,900	Applied to Items 2-5 and Item 7
	Sales Tax	8.7%	%		$170,250	Sales Tax applied to sum of construction Items 2-5 and 7 and construction overhead.
	Total Purchase and Installation Cost				$2,654,150	
	Construction management, field monitoring, confirmational soil sampling at excavations.	7.0%	%		$185,791	
Construction Total					**$2,839,941**	
	Contingency (Concept design level)	30.0%	%		$851,982	
Construction Total with Contingency					**$3,691,923**	
	Design and Permitting	8.0%	%		$295,354	
OVERALL PROJECT TOTAL COSTS					**$3,987,277**	

http://projects/sites/0050611712/Final/BNSF FS Report Second DRAFT/[BNSF FS Report Tables.xlsx]T-6 Alt-1 cst

Table 7

Cost Estimate - Remedial Alternative 2 (Excavation and Capping)

BNSF Parkwater Facility Feasibility Study
Spokane, Washington

Item No.	Description	Plan Quantity	Unit	Unit Price	Amount (2010$)	Notes
Mobilization and Site Preparation						
1	Mobilization/Site Controls/Demobilization	1	LS	$10,000.00	$10,000	
	Subtotal				**$10,000**	
Contaminated soil excavation, disposal and backfilling						
2A	Excavate and load (dangerous waste) soil from Western Fruit Express	950	CY	$17	$16,200	Inlcudes screening of soil to remove rock and debris. Assumes transported in intermodal boxes to WMI in Arlington, OR. Cost based on recent similar project in Spokane.
2B	Excavate and load (non-dangerous waste) soil from several locations	870	CY	$17	$14,800	Does not include the Fueling Area, Koch Asphalt, Diesel Shop and East and West Debris Areas. Includes Materials Storage Building, Dismantling Spur, Yardley Office (Main Line Track No. 1), and Ralston Lead Track. Includes screening of soil to remove rock and debris. Assumes transported in intermodal boxes to Rabanco in Roosevelt, WA. Cost based on recent similar project in Spokane.
3A	Contaminated soil (dangerous waste) disposal at approved off-site facility	1,824	Ton	$175	$319,200	Assumes disposal at WMI facility in Arlington, OR. Disposal fee based on recent project. In-place cubic yards converted to tons using 20% expansion factor and 1.6 tons per cubic yard (1.92 tons per cubic yard).
3B	Contaminated soil (non-dangerous waste) disposal at approved off-site facility	1,670	Ton	$24	$40,100	Assumes disposal at Rabanco facility in Roosevelt, WA. Disposal fee based on recent project. In-place cubic yards converted to tons using 20% expansion factor and 1.6 tons per cubic yards (1.92 tons per cubic yard).
4	Purchase, place and compact general backfill material	3,494	Ton	$13	$45,400	Assume tonnage equal to off-site disposal soil tonnage. Cost includes purchase, filling and compaction.
5	Handling of (non-hazardous debris-rock) screened from soil	1	LS	$1,500	$1,500	Assume this material will remain at the railroad yard (not transported offsite). Cost based on one day of backhoe/truck.
	Subtotal				**$437,200**	
Capping						
6	Place gravel cap: purchase, transport, place cap material	2,259	CY	$35.00	$79,100	Assume 0.5 foot thick over 122,000 square feet.
7	Place asphalt caps (includes regrading and surface preparation)	44	SY	$40.00	$1,800	Approximately 400 square feet x 0.5 feet thick.
8	Handling of debris (non-hazardous solid waste) removed to prepare base for pad areas	1	LS	$3,000	$3,000	Assume this material remains at railroad yard (not transported offsite). Cost based on two days of backhoe/truck.
	Subtotal				**$83,900**	
Continued Operation of Soil and Groundwater Treatment System at Fueling Area						
9	Operating and maintenance costs for 5 years	5	YR	$37,000	$185,000	Includes yearly carbon change out. Yearly costs based on actual costs for 2009.
10	Decommissioning costs	1	LS	$20,000	$20,000	Removal of treatment system and decommission wells
11	Annual reporting to Ecology	5	YR	$16,000	$80,000	
	Subtotal				**$285,000**	
Groundwater Monitoring						
12	Perform 4 quarterly monitoring events per year for 7 years, monitor for TPH only	7	YR	$16,000	$112,000	Yearly costs based on actual costs for 2009.
13	Annual reporting to Ecology	7	YR	$20,000	$140,000	Yearly costs based on actual costs for 2009.
	Subtotal				**$252,000**	
Institutional controls						
14	Prepare and install signage at areas with caps	1	LS	$2,000	$2,000	
	Subtotal				**$2,000**	
	Contractor Overhead (Based on total of Tasks 2-5 and Item 7)	10.00%	%		$54,110	Applied to Items 2-8 and 10
	Sales Tax	8.7%	%		$50,043	Sales Tax applied to sum of construction Items 2-8, and 10 and construction overhead.
	Total Purchase and Installation Cost				$1,174,253	
	Construction Management, Field Monitoring, Confirmational soil sampling at excavations.	7.0%	%		$82,198	
Construction Total					**$1,256,451**	

Item No.	Description	Plan Quantity	Unit	Unit Price	Amount (2010$)	Notes
	Contingency (Concept design level)	30.0%	%		$376,935	
Construction Total with Contingency					**$1,633,386**	
	Design and Permitting	8.0%	%		$130,671	
OVERALL PROJECT TOTAL COSTS					**$1,764,057**	

http://projects/sites/0050611712/Final/BNSF FS Report Second DRAFT/[BNSF FS Report Tables.xlsx]T-7Alt-2 cst

Table 8

Cost Estimate - Remedial Alternative 3 (Capping)

BNSF Parkwater Facility Feasibility Study
Spokane, Washington

Item No.	Description	Plan Quantity	Unit	Unit Price	Amount (2010$)	Note
Mobilization and Site Preparation						
1	Mobilization/Site Controls/Demobilization	1	LS	$10,000.00	$10,000	
	Subtotal				**$10,000**	
Capping						
2	Place gravel cap: purchase, transport, place cap material	2,602	CY	$35.00	$91,100	Assume 0.5-foot thick over 140,500 square feet.
3	Place asphalt caps (includes regrading and surface preparation)	733	SY	$40.00	$29,300	Assume approximately 13,200 square feet x 0.5-foot thick at Diesel Shop and Western Fruit Express.
4	Handling of debris (non-hazardous debris) removed to prepare base for pad areas	1	LS	$3,000	$3,000	Assume this material remains at railroad yard (not transported offsite). Cost based on two days of backhoe/truck.
	Subtotal				**$123,400**	
Continued Operation of Soil and Groundwater Treatment System at Fueling Area						
5	Operating and maintenance costs for 5 years	5	YR	$37,000	$185,000	Includes yearly carbon change out. Yearly costs based on actual costs for 2009.
6	Decommissioning costs	1	LS	$20,000	$20,000	Removal of treatment system and decommission wells
7	Annual reporting to Ecology	5	YR	$16,000	$80,000	
	Subtotal				**$285,000**	
Groundwater Monitoring						
8	Perform 4 quarterly monitoring events per year for 7 years, monitor for TPH only	7	YR	$16,000	$112,000	Yearly costs based on actual costs for 2009.
9	Annual reporting to Ecology	7	YR	$20,000	$140,000	Yearly costs based on actual costs for 2009.
	Subtotal				**$252,000**	
Institutional controls						
10	Prepare and install signage at areas with caps	1	LS	$2,000	$2,000	
	Subtotal				**$2,000**	
	Contractor Overhead (Based on total of Tasks 2-5 and item 7)	10.00%	%		$14,340	Applied to Items 2-4 and Item 6
	Sales Tax	8.7%	%		$13,723	Sales Tax applied to sum of construction Items 2-4, 6 and construction overhead.
	Total Purchase and Installation Cost				$700,463	
	Construction Management and Field Monitoring	6.0%	%		$42,028	
Construction Total					**$742,491**	
	Contingency (Concept design level)	30.0%	%		$222,747	
Construction Total with Contingency					**$965,239**	
	Design and Permitting	8.0%	%		$77,219	
OVERALL PROJECT TOTAL COSTS					**$1,042,458**	

http://projects/sites/0050611712/Final/BNSF FS Report Second DRAFT/[BNSF FS Report Tables.xlsx]T-8 Alt 3 cst

FIGURES

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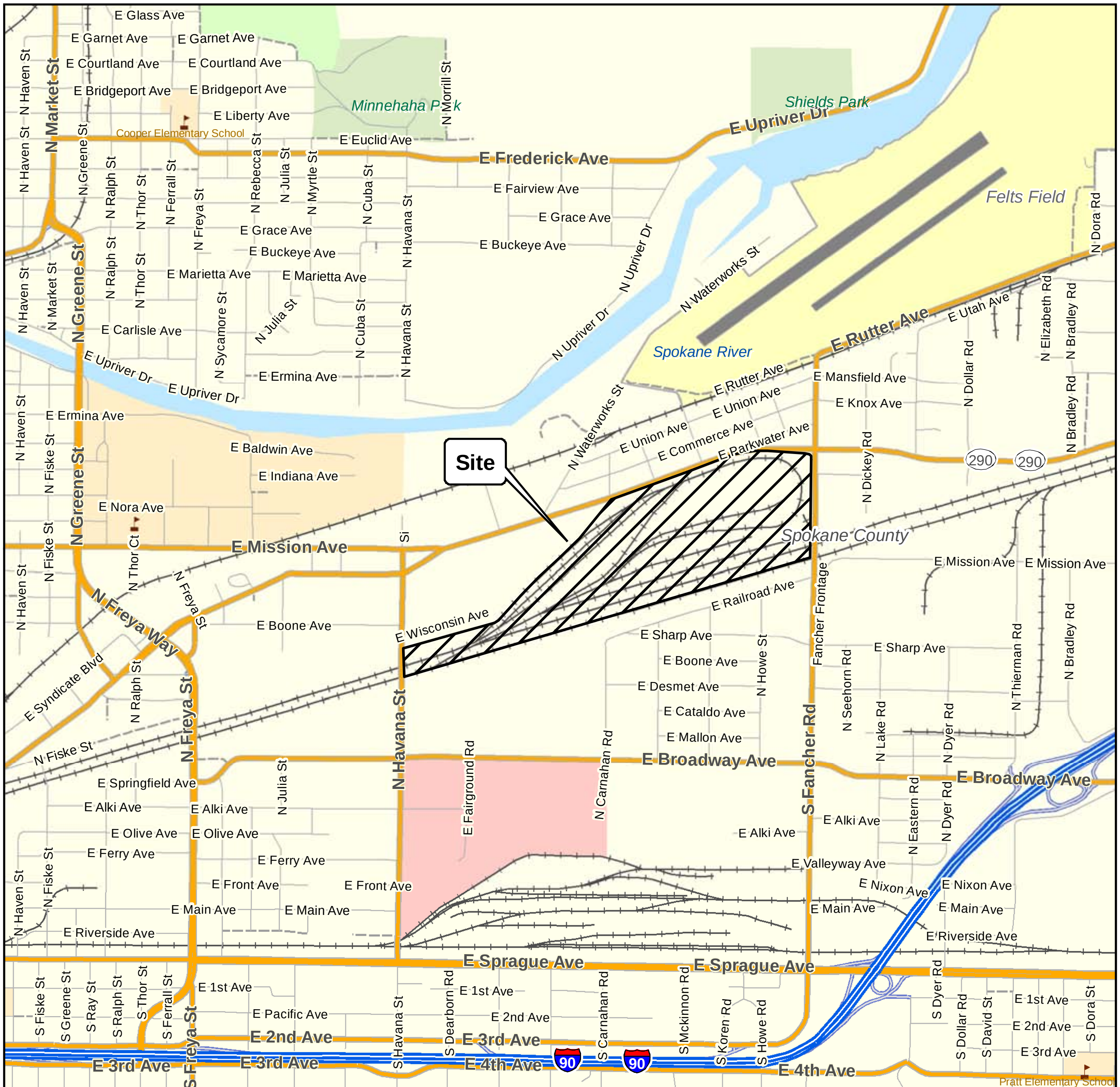

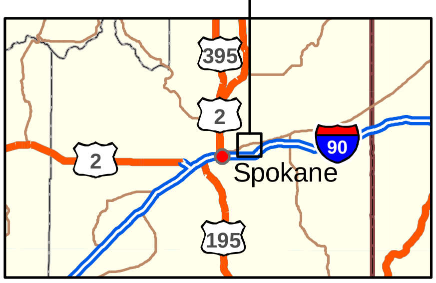

N
W
E
S

2,000 0 2,000
Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
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Data Sources: ESRI Data & Maps, Street Maps 2005

Transverse Mercator, Zone 11 N North, North American Datum 1983
North arrow oriented to grid north

Vicinity Map

BNSF Parkwater Railyard Feasibility Study
Spokane Valley, Washington

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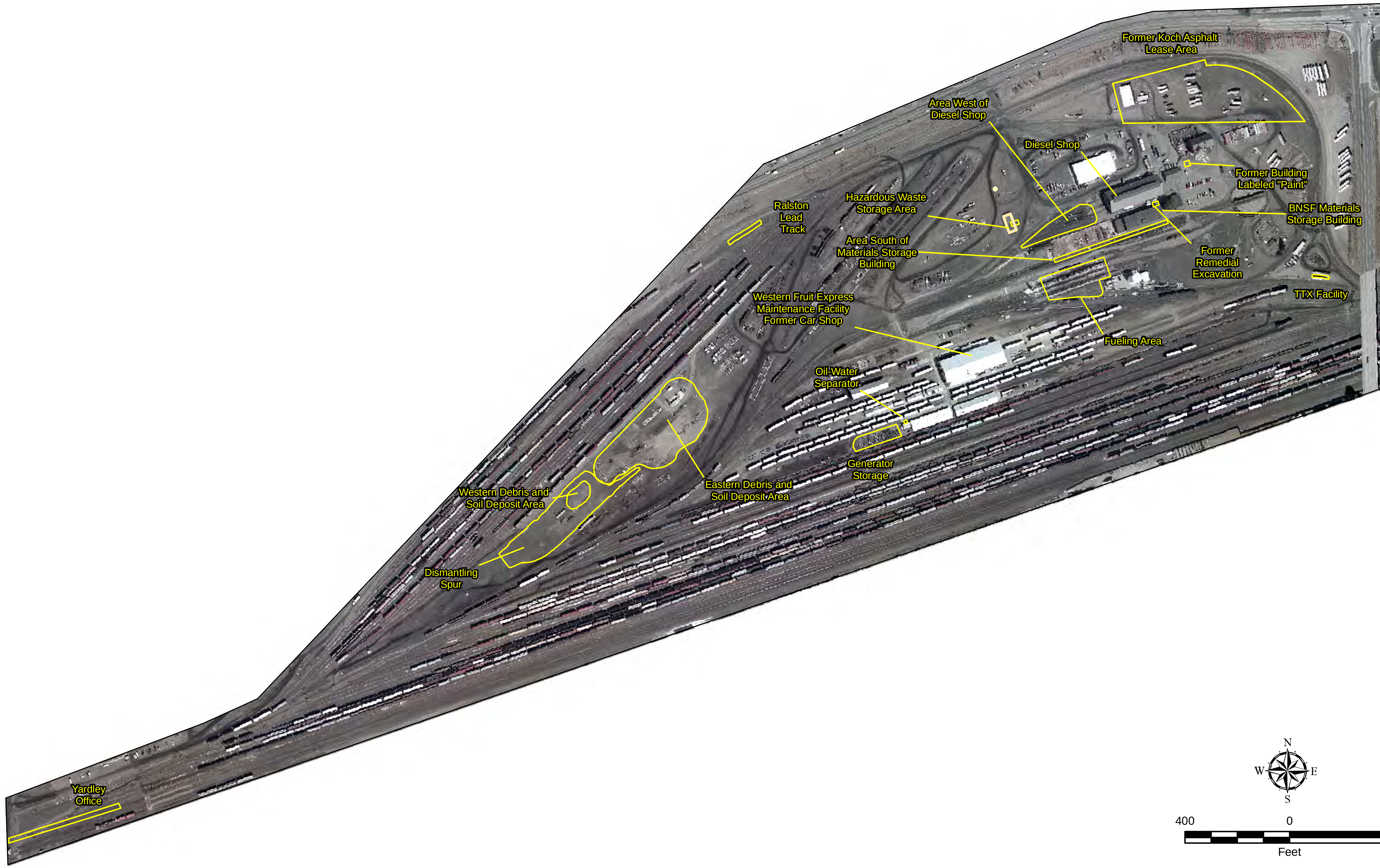
Figure 1

Office: SPOK Path: P:\0\0506117\GIS\12\FS\050611712_Figure01_FS_Vicinity.mxd Map Revised: March 16, 2010

DRAFT



Map Revised: March 29, 2010

Path: P:\00\0506117\GIS\12\RIMain_rev\0506117l2_FS_Figure2_SitePlan.mxd

Office:Spo

Reference:
2006 aerial photograph from Spokane County. Approximate extent of former Koch Materials operations based on information from SCS Engineers, 1989.
Approximate extent of fueling area, debris and soil deposit areas, petroleum contaminated soil, and diesel fuel release from RETEC Group Inc., 2001.

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Subject Property and Areas of Interest

BNSF Parkwater Rail Yard Feasibility Study
Spokane, Washington

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Figure 2

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Legend

- MW-18 1884.61 — Monitoring Well Identification, Approximate Location, and Groundwater Elevation (feet)
- 1,881.0 — Groundwater Elevation Contour, 0.5-foot Interval
- Interpreted Groundwater Flow Direction
- Approximate Limit of COC Excavation Area (soil)
- Approximate Limit of Historic Groundwater Plume

N W E S

200 0 200

Feet

Reference: 2007 aerial photograph provided by Spokane County.

Notes:
1.Groundwater Elevations and Flow Direction - January 19, 2010
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. Groundwater elevations are relative to the NAVD 88 datum.

Fueling Area

BNSF Parkwater Railyard Feasibility Study
Spokane, Washington

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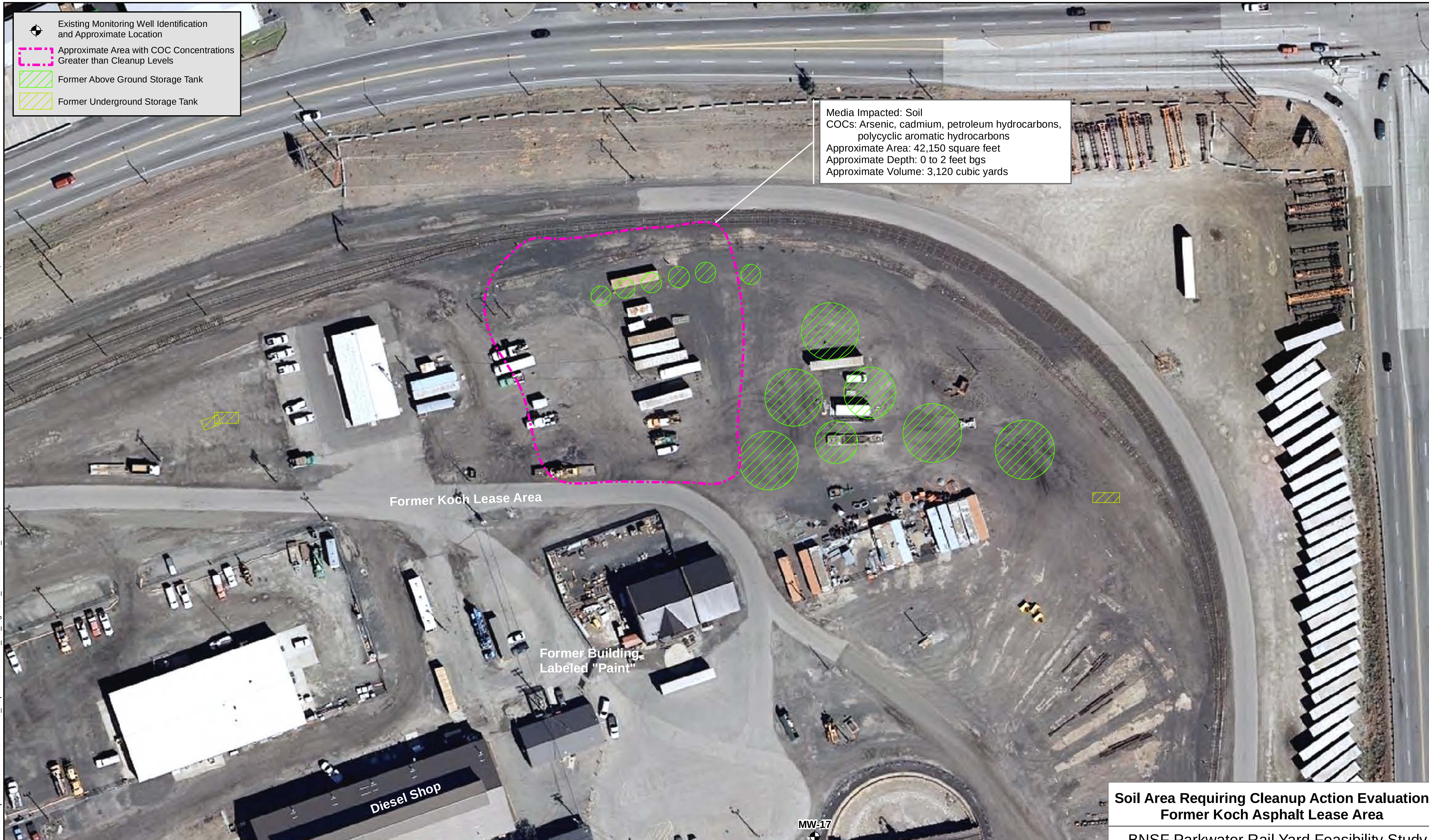
Figure 3

Map Revised: May 20, 2010 CRC:TCK:CRC Path: P:\0\0506117\GIS\12\FS_Report\0506117\12_FS_Figure3_GWCont01_19_2010.mxd Spokane

DRAFT



Reference: Aerial photo (June 2007) from City of Spokane.

Notes: 1. bgs = below ground surface
2. COC = Contaminants of concern
3. The locations of all features shown are approximate.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

N W E S

80 0 80
Feet

Soil Area Requiring Cleanup Action Evaluation
Former Koch Asphalt Lease Area

BNSF Parkwater Rail Yard Feasibility Study
Spokane, Washington

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Figure 4

Office:SPO
Path:Spokane\Projects\0\0506117\GIS\12\FS_Report\050611712_FS_Figure04_Exceedances_Koch.mxd
Map Revised: March 16, 2010
TCK:CRC

Reference: Aerial photo (June 2007) from City of Spokane.

Notes: 1. bgs = below ground surface
2. COC = Contaminants of concern
3. The locations of all features shown are approximate.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

N W E S

50 0 50
Feet

Soil Area Requiring Cleanup Action Evaluation
Diesel Shop and Materials Storage Building

BNSF Parkwater Rail Yard Feasibility Study
Spokane, Washington

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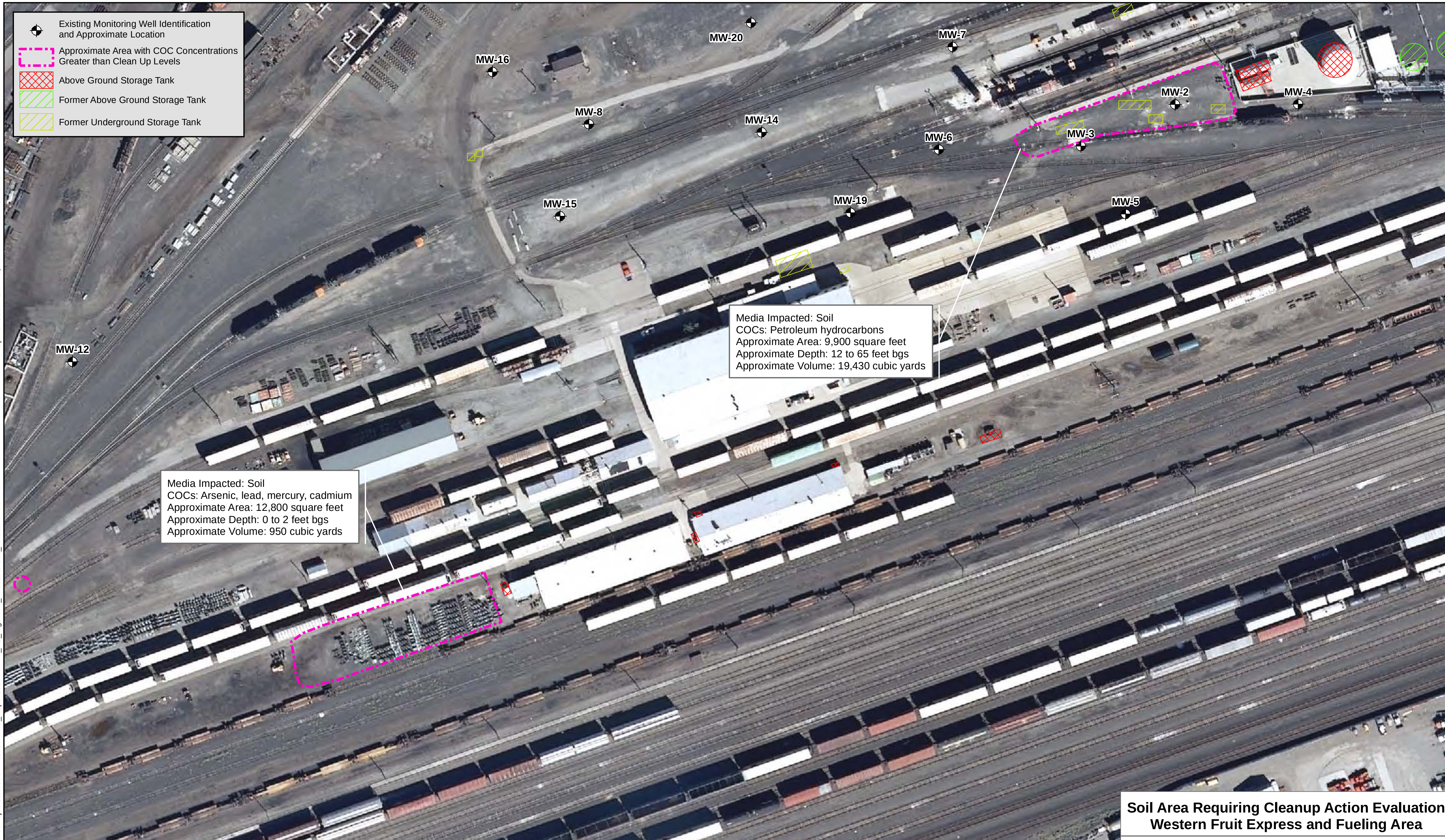
Figure 5

Office:SPO
Path:Spokane\Projects\0\0506117\GIS\12\FS_Report\050611712_FS_Figure05_Exceedances_DieselShop.mxd
Map Revised: March 29, 2010
TCK:CRC

DRAFT



Reference: Aerial photo (June 2007) from City of Spokane.

Notes: 1. bgs = below ground surface
2. COC = Contaminants of concern
3. The locations of all features shown are approximate.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

N W E S

100 0 100

Feet

Soil Area Requiring Cleanup Action Evaluation
Western Fruit Express and Fueling Area

BNSF Parkwater Rail Yard Feasibility Study
Spokane, Washington

GeoEngineers

Figure 6

Office:SPO Path:Spokane\Projects\0\0506117\GIS\12\FS_Report\050611712_FS_Figure06_Exceedances_WesternFruit.mxd Map Revised: March 29, 2010 TCK:CRC

DRAFT

Reference: Aerial photo (2007) from City of Spokane.

Notes: 1. bgs = below ground surface
2. COC = Contaminants of concern
3. The locations of all features shown are approximate.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

N W E S

80 0 80

Feet

Soil Area Requiring Cleanup Action Evaluation Dismantling Spur and East and West Debris and Soil Deposit Areas

BNSF Parkwater Rail Yard Feasibility Study
Spokane, Washington

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Figure 7

TCK:CRC:KKS
Map Revised: May 14, 2010
Path:Spokane\Projects\0\0506117\GIS\12\FS\050611712_FS_Figure07_Exceedances_SpurEast.mxd
Office:SPO

DRAFT

Reference: Aerial photo (2007) from City of Spokane.

Notes: 1. bgs = below ground surface
2. COC = Contaminants of concern
3. The locations of all features shown are approximate.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

N W E S

100 0 100
Feet

Soil Area Requiring Cleanup Action Evaluation
Yardley Office (Main Line Track No. 1)

BNSF Parkwater Rail Yard Feasibility Study
Spokane, Washington

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Figure 8

TCK:CRC
Map Revised: March 29, 2010
Path:Spokane\Projects\0\0506117\GIS\12\FS_Report\050611712_FS_Figure08_Exceedances_Yardley.mxd
Office:SPO

DRAFT

Reference: Aerial photo (June 2007) from City of Spokane.

Notes: 1. bgs = below ground surface
2. COC = Contaminants of concern
3. The locations of all features shown are approximate.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

N W E S

50 0 50

Feet

Soil Area Requiring Cleanup Action Evaluation
Ralston Lead Track

BNSF Parkwater Rail Yard Feasibility Study
Spokane, Washington

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Figure 9

TCK:CRC
Map Revised: March 29, 2010
Path:Spokane\Projects\0\0506117\GIS\12\FS_Report\0506117_12_FS_Figure09_Exceedances_Ralston.mxd
Office:SPO

APPENDICES

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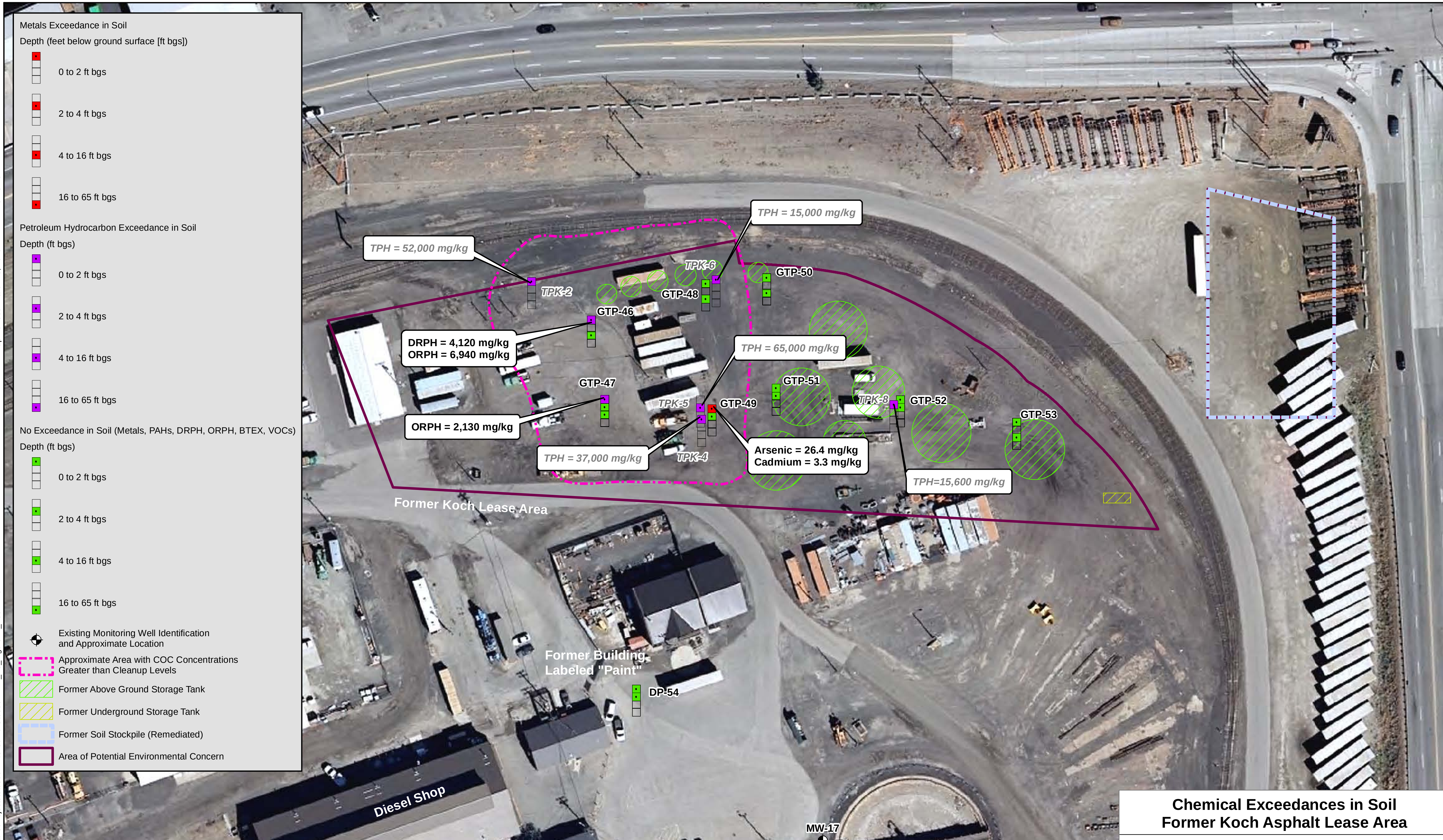
APPENDIX A
Remedial Investigation Exploration Locations



Reference: Aerial photo (June 2007) from City of Spokane.

Notes: 1. DRPH = Diesel-range petroleum hydrocarbons, ORPH = Oil-range petroleum hydrocarbons, PAHs = Polycyclic Aromatic Hydrocarbons, TPH = Total petroleum hydrocarbons, VOCs = Volatile organic compounds, BTEX = benzene, toluene, ethylbenzene, and xylene
2. mg/kg = milligrams per kilogram. bgs = below ground surface.
3. The locations of all features shown are approximate.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

DP-54 = Labels for 2009/2010 Explorations
TPK-2 = Labels for Pre-2009 Explorations

N W E S

80 0 80
Feet

Chemical Exceedances in Soil
Former Koch Asphalt Lease Area

BNSF Parkwater Rail Yard Feasibility Study
Spokane, Washington

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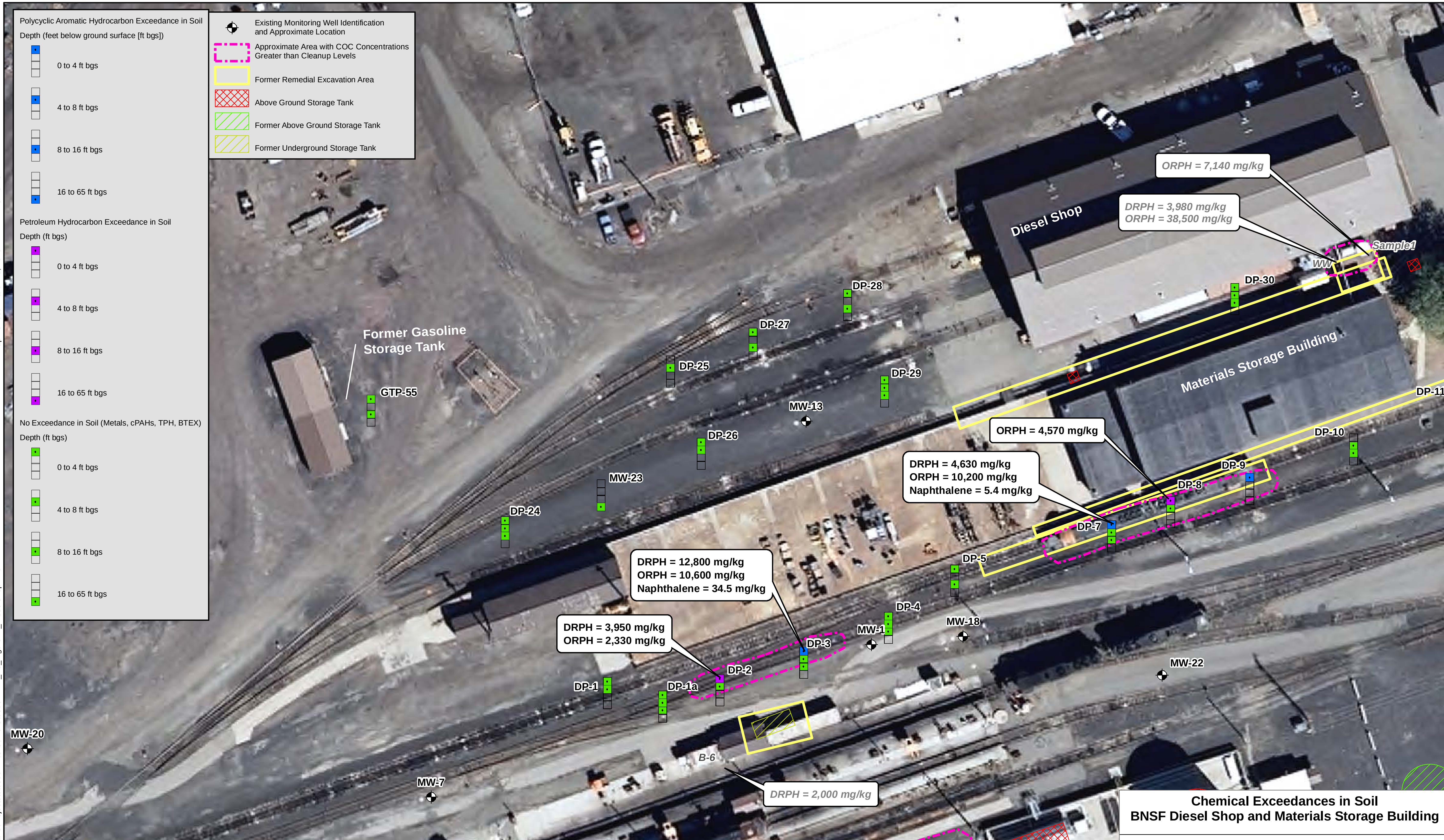
Figure A-1

TCK:CRC
Map Revised: March 29, 2010
Path:Spokane\Projects\0\0506117\GIS\12\FS\050611712_FS_FigureA1_Koch.mxd
Office:SPO

DRAFT



Reference: Aerial photo (June 2007) from City of Spokane.

Notes: 1. DRPH = Diesel-range petroleum hydrocarbons, cPAHs = Carcinogenic Polycyclic Aromatic Hydrocarbons, ORPH = Oil-range petroleum hydrocarbons, BTEX = benzene, toluene, ethylbenzene, and xylene
2. mg/kg = milligrams per kilogram. bgs = below ground surface.
3. The locations of all features shown are approximate.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

B-6

DP-1 = Labels for 2009/2010 Explorations
= Labels for Pre-2009 Explorations

N W E S

50 0 50
Feet

Chemical Exceedances in Soil
BNSF Diesel Shop and Materials Storage Building

BNSF Parkwater Rail Yard Feasibility Study
Spokane, Washington

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Figure A-2

TCK:CRC
Map Revised: March 29, 2010
Path:Spokane\Projects\0\0506117\GIS\12\FS\050611712_FS_FigureA2_DieselShop.mxd
Office:SPO

Chemical Exceedances Areas
Western Fruit Express and Fueling Area

BNSF Parkwater Rail Yard Feasibility Study
Spokane, Washington

GeoEngineers

Figure A-3

Reference: Aerial photo (June 2007) from City of Spokane.
Notes: 1. DRPH = Diesel-range petroleum hydrocarbons, ORPH = Oil-range petroleum hydrocarbons, PAHs = Polycyclic Aromatic Hydrocarbons, VOCs = Volatile Organic Compounds, PCBs = Polychlorinated biphenyls
2. mg/kg = milligrams per kilogram. bgs = below ground surface.
3. The locations of all features shown are approximate.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

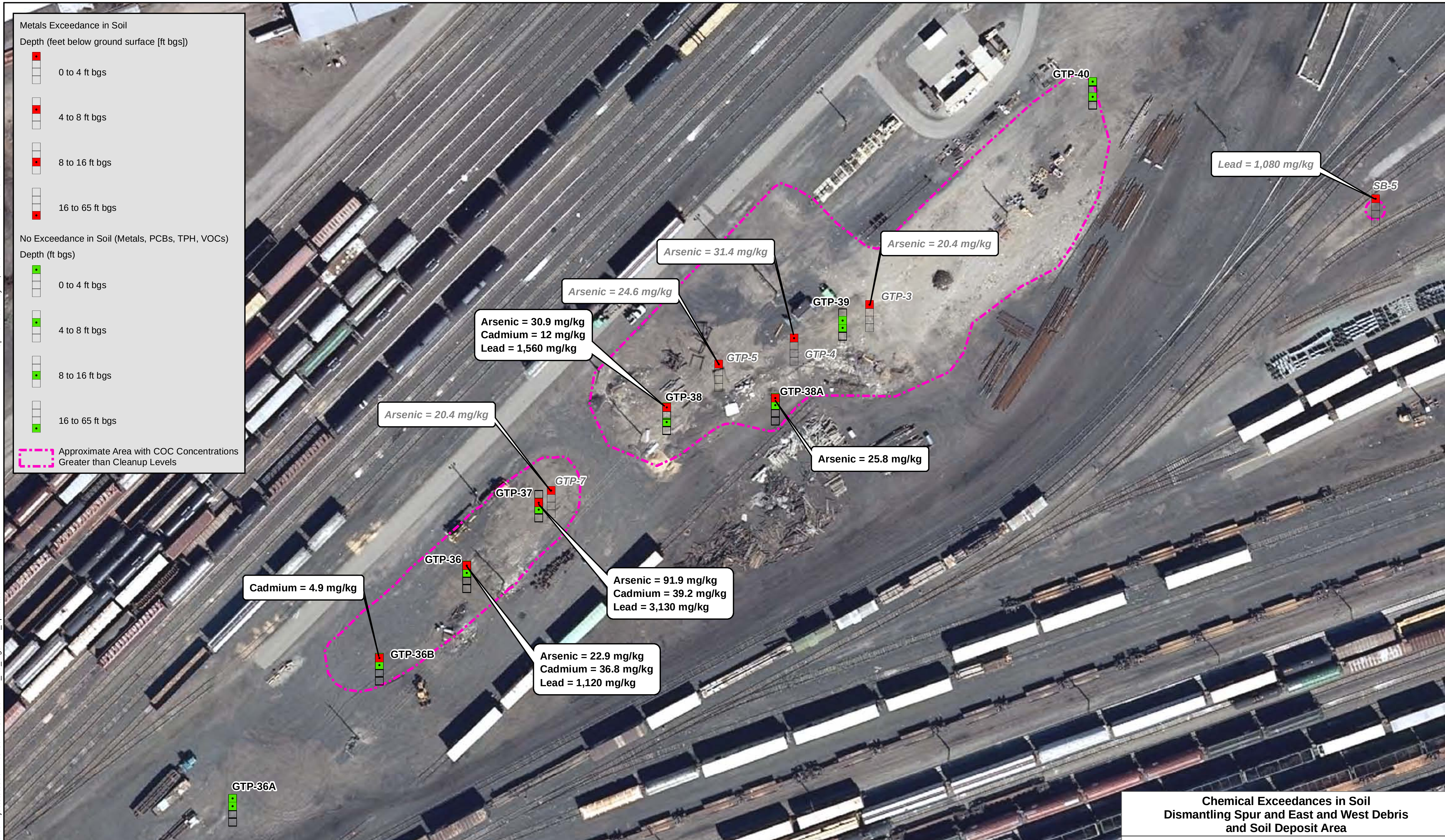
GTP-32 = Labels for 2009/2010 Explorations
SB-5 = Labels for Pre-2009 Explorations

N S E W

100 0 100
Feet

TCK:CRC
Map Revised: March 29, 2010
Path:Spokane\Projects\0\0506117\GIS\12\FS\050611712_FS_FigureA3_WesternFruit.mxd
Office:SPO

DRAFT



TCK:CRC:KKS

Map Revised: May 14, 2010

Path:Spokane\Projects\0\0506117\GIS\12\FS\050611712_FS_FigureA4_SpurEast.mxd

Office:SPO

Reference: Aerial photo (2007) from City of Spokane.

Notes: 1. PAHs = Polycyclic Aromatic Hydrocarbons, TPHs = Total Petroleum Hydrocarbons, PCBs= Polychlorinated Biphenyls

2. mg/kg = milligrams per kilogram. bgs = below ground surface.

3. The locations of all features shown are approximate.

4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

GTP-36 = Labels for 2009/2010 Explorations
GTP-7 = Labels for Pre-2009 Explorations

N E S W

80 0 80
Feet

Chemical Exceedances in Soil
Dismantling Spur and East and West Debris and Soil Deposit Area

BNSF Parkwater Rail Yard Feasibility Study
Spokane, Washington

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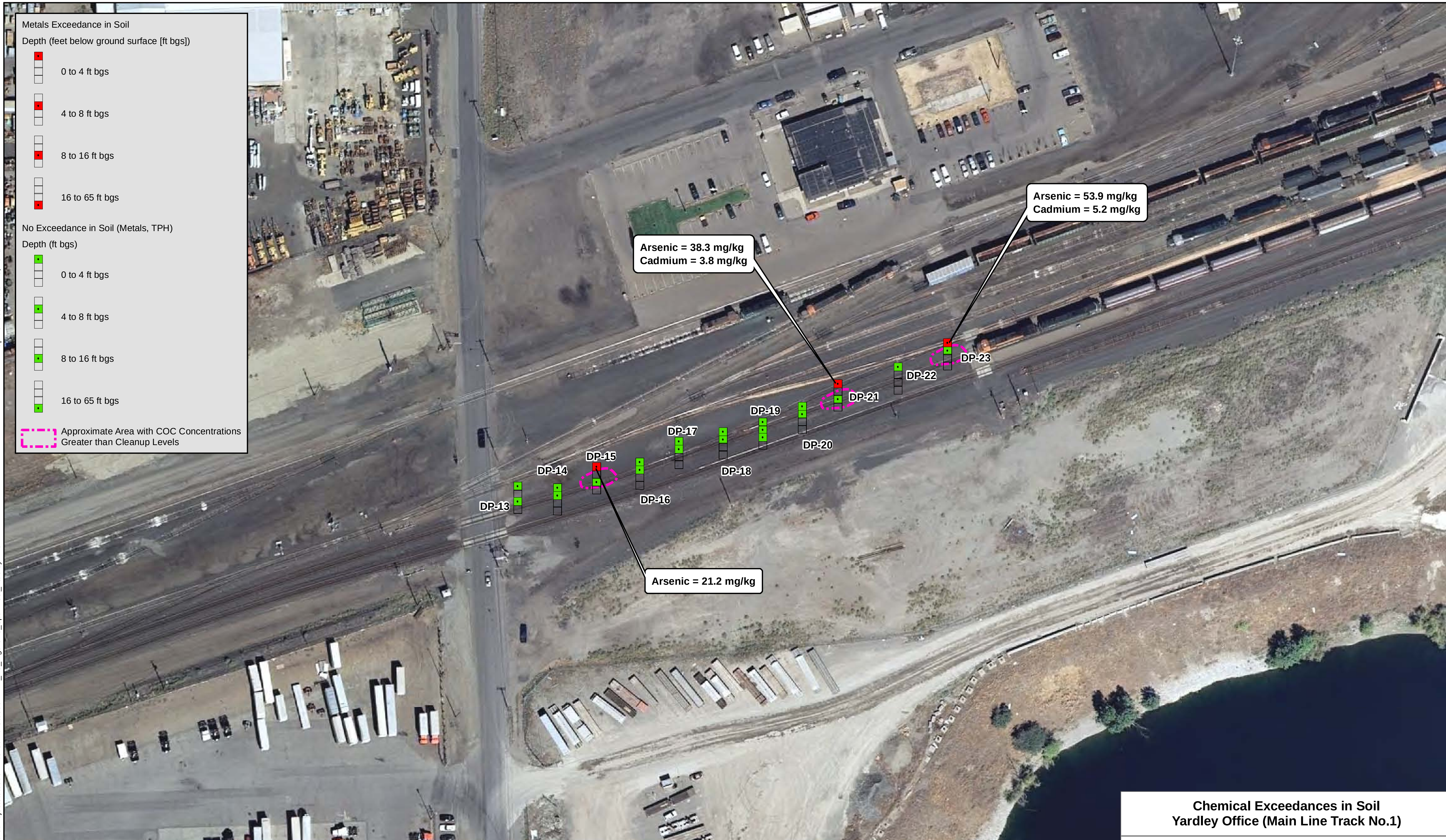
Figure A-4

DRAFT



TCK:CRC

Map Revised: March 29, 2010

Path:Spokane\Projects\0\0506117\GIS\12\FS\0506117122_FS_FigureA5_SpurWest_Yardley.mxd

Office:SPO

Reference: Aerial photo (2007) from City of Spokane.

Notes: 1. TPH = Total Petroleum Hydrocarbons
2. mg/kg = milligrams per kilogram. bgs = below ground surface.
3. The locations of all features shown are approximate.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

N W E S

100 0 100

Feet

Chemical Exceedances in Soil
Yardley Office (Main Line Track No.1)

BNSF Parkwater Rail Yard Feasibility Study
Spokane, Washington

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Figure A-5

DRAFT

Reference: Aerial photo (June 2007) from City of Spokane.

Notes: 1. PAHs = Polycyclic Aromatic Hydrocarbons, PHs = Petroleum Hydrocarbons, VOCs = Volatile Organic Compounds
2. mg/kg = milligrams per kilogram
3. The locations of all features shown are approximate.
4. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

N W E S

50 0 50
Feet

Chemical Exceedances in Soil
Ralston Lead Track

BNSF Parkwater Rail Yard Feasibility Study
Spokane, Washington

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Figure A-6

TCK:CRC
Map Revised: March 29, 2010
Path:Spokane\Projects\0\0506117\GIS\12\FS\0506117l2_RI_FigureA6_Ralston.mxd
Office:SPO

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